

Report to the Government of
Ivory Coast

ISNAR R 7e

AGRICULTURAL RESEARCH IN IVORY COAST

PRESENTATION, EVALUATION, PROPOSALS
FOR IMPROVEMENT

The logo for ISNAR, featuring the letters 'ISNAR' in a bold, italicized, sans-serif font. The letters are black with a white outline, giving it a three-dimensional appearance.

International Service for National Agricultural Research

The International Service for National Agricultural Research (ISNAR) began operating at its headquarters in The Hague, Netherlands on September 1, 1980. It was established by the Consultative Group on International Agricultural Research (CGIAR), on the basis of recommendations from an international task force, for the purpose of assisting governments of developing countries to strengthen their agricultural research. It is a non-profit autonomous agency, international in character, and non-political in management, staffing and operations.

Of the thirteen centers in the CGIAR network, ISNAR is the only one which focuses primarily on national agricultural research issues. It provides advice to governments, upon request, on organization, planning, manpower development, staff requirements, financial and infrastructure requirements, and related matters, thus complementing the activities of other assistance agencies. Additionally, ISNAR has an active training and communications program which cooperates with national agricultural research programs in developing countries.

ISNAR also plays an active role in assisting these national programs to establish links with both the international agricultural research centers and donors.

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DECEMBER 1984

ISNAR

INTERNATIONAL SERVICE FOR NATIONAL AGRICULTURAL RESEARCH

The Hague, Netherlands

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EXECUTIVE SUMMARY

This study was conducted at the request of the Ivory Coast Ministry of Scientific Research, which gave its support to the study, as did other ministries and institutions concerned with the development and dissemination of improved techniques for agriculture throughout the country. This report is divided into three main sections: a short presentation of agriculture in Ivory Coast, an analysis of the agricultural research system (past and present), and suggestions for improvements.

Ivorian Agriculture: A Model of Development in Transition

Since independence, the pace of economic change in Ivory Coast has been exceptionally fast, not only for Africa, but for all of the Third World. The average Gross Domestic Product (GDP) growth rate (7.7% per annum between 1960 and 1980) has been surpassed by only a few oil-producing countries. Prior to 1960, the average per capita income was among the lowest in Africa south of the Sahara; now it is second from the top (\$1,250 per annum in 1980). This is all the more remarkable since, in the absence of mineral resources, Ivory Coast has had to depend on agricultural (including forestry) exports and growth to generate the income (taxes) and foreign currency needed to diversify its activities and build its economy. This strategy proved effective for a while and then, gradually, when it had reached its limits, drawbacks started appearing.

Its effectiveness is attested to the fact that the national average agricultural production growth rate between 1960 and 1980 was 3.9% per annum, a record for Africa. This sector is by far the main source of employment (79% of the economically active population was employed in agriculture in 1980, 89% in 1960) and generates on average about 90% of the total export earnings. For certain products results have been spectacular. Ivory Coast has become the world's largest producer and exporter of cocoa, the third largest coffee exporter, and is now becoming the largest African producer of palm oil and the leading producer of cotton and sugar of West Africa. But a closer look at agricultural growth rates, per decade, shows a marked drop: from an annual 4.2% between 1960 and 1970, the figure dropped to 3.4% during the 1970s. This, combined with a high population growth rate (2.9% to 4.8%) from one decade to the next, has caused the per capita agricultural product to decline during the last decade, especially during the second half of the 1970s, when the production levels for the prime crops stagnated or dropped (cereals, root and tuber crops, coffee, palm oil, etc.).

Other drawbacks in the previous agricultural development strategy have also come to the fore, viz.:

- * excessive reliance on foreign markets, specially felt under current economic conditions;
- * continued social and regional disparities between the forest and the savanna zones;

- * excessive, land-depleting agricultural growth, without attention to maintaining natural resources or to sustaining forests where wastage costs 300 billion CFAF per year, over 50% of the gross annual agricultural product.

Awareness of this situation convinced the national authorities to redesign their agricultural development strategy. The main objectives (in particular, a high agricultural growth rate to increase rural incomes and job opportunities, and to contribute to the balance of foreign trade) have been expanded to include:

- * better coverage of food needs;
- * reducing inter- and intra-regional disparities;
- * improving rural living and working conditions.

To meet these goals, food crop production rates must rise an average of 4.4% per year in the 1980s. This rate is slightly higher than the earlier consumption increase rate and, hence, should ensure continued self-sufficiency for the traditional crops such as yams, plantains, etc., and should contain the deficit in rice (200,000 tons) and animal products (60,000 tons of beef, milk, etc.). This food production strategy is to be applied essentially in the savanna zone, which is poorer than the forest region but has more -- and easier to mechanize -- land available. To ensure a high growth rate for agriculture and for the national economy will require careful attention to industrial and export crops, programmed for a 5.6% annual growth rate.

In the future, agriculture, especially the small-farm production units (which produce 75% of the gross agricultural product), will be modernized through the development of cooperatives, more training opportunities at all levels, better balanced research, more investment in the agricultural sector, and a proportionately greater effort in the savanna region.

Agricultural Research: Past and Present Situation

The ISNAR evaluation concentrated mainly on the scientific research institutes and advanced agricultural training establishments in Ivory Coast. No evaluation was made of the valuable research-experimentation-survey work carried out by the development agencies and organizations, except when relevant to the analysis of relations between research and development. A separate report has been published on the problems of agro-technological research.

Structures

The agricultural research system in Ivory Coast employs about 240 research scientists. They are spread over many medium-size institutions. The main ones (ORSTOM, specialized institutes under

GERDAT) are French and are operated jointly under Franco-Ivorian agreements (Table 5). This is a good system for managing human and material resources within each institution, but is not satisfactory for controlling the total national resources since:

- * foreign institutions have their own strategies and resources and are thus relatively independent of the authority of the Ministry of Scientific Research (MSR);
- * it is difficult to balance programs, a process involving the transfer of people and equipment between institutions, or at least have some degree of inter-institutional relations for individual disciplines.

There is some disagreement on the management and scientific productivity of this system. It lends itself well to a multidisciplinary approach to product-specific actions, particularly when the team is large enough, extending major responsibility to the research scientists themselves, and stimulating inter-institutional cooperation. But it is an obstacle to cooperation by discipline, and to a farming systems approach to production. Although the problem is partly solved by the existing programming system, the farmers sometimes receive suggestions for innovations and sectoral recommendations that may be contradictory. These contradictions can also be detected in proposals for sector-specific agricultural policy measures, that are made to the various authorities, such as development agencies, ministries, or planners.

Research Programming

Since 1971, MSR has been introducing a method for programming research that unquestionably is shifting the control of the agricultural research system to the national level by implementing new programs designed to lessen the imbalance between basic and applied research, forest and savanna zones, large plantations and smallholdings, and between industrial crops, export crops, and food crops. MSR recently introduced a programming schedule for each region and each production system that is more in line with the new orientations set out in the agricultural policy but has not yet been able to attract its partners in development (who are being reorganized) to join in a dialogue equal in quality to the dialogue that characterized relations prior to 1977-1978 between the various sectoral development agencies and organizations. Such contacts are far deeper than the formal, superficial discussions held during meetings of the program preparation committee. MSR programming endeavors are still hindered by the fact that certain institutions have their own very substantial resources, that national funds and manpower are scarce, and that many research-development activities fall outside the control of the ministry.

Research and Development Programs

Emphasis has been placed on the high scientific quality of research findings, methodologies, and programs, especially for the large programs of international renown, devoted to industrial export crops and rainfed rice. Most of the high-quality work is the result of experience acquired (largely in Ivory Coast) by ORSTOM and GERDAT institutes and their international network of centers for research, information exchange, and cooperation. The problem is that these networks make little use of Ivorian researchers. Further, their work-sharing structure provides for scientific support and laboratory equipment from France to be made available to units operating in Ivory Coast, which has discouraged the research centers of Ivory Coast from internally developing certain capabilities (biometry, publications, documentation, accounting, etc.) vital to greater autonomy.

In the 1970s, MSR launched subject- and region-specific programs that reduced, but did not eliminate, the above-mentioned imbalances (Table 10).

- * Research on industrial and export crops occupies more than 60% of the scientists and absorbs 75% of the funds earmarked for commodity-based programs. It has had considerable effect on the large public and private plantations of oil palms, rubber, bananas, and export pineapples, and on the small-scale production of cotton which, altogether, accounted for about 7% of the value of the gross agricultural product (GAP). But it had little effect on the small coffee or cocoa plantations (30% of the GAP).
- * Research on forests (production and ecosystems), animal production, and social sciences is carried out by various institutions little interested in coordinating their programs and resources which, generally speaking, are insufficient. Forestry research is far from meeting the potential needs of Ivorian forests, but the true importance of research will become visible only when measures have been taken to arrest the rapidly increasing forest depletion rate.
- * Research on food crops (close to 40% of the GAP) cultivated mainly on smallholdings occupies only 21% of the researchers and absorbs 17% of the funds earmarked for commodity-specific programs. The most important traditional crops (plantain, yam, cassava, etc., 31% of the GAP) receive only about 25% of the remaining resources. The rest is absorbed by a large rainfed rice production program that places excessive emphasis on technical issues and neglects production and marketing problems.

The same could be said of all the research programs. Little research is devoted to smallholder production and marketing systems, two subjects that should return to favor as part of an effort to define and organize more analytical, uni-discipline research, and to finalize innovations that could introduce large-scale changes into the production units. They

also constitute a first-rate potential source of information to help the Ivorian authorities formulate national development policies. It is unfortunate that the relations that existed before 1979 between CIRES and the institutions under MSR jurisdiction have not been reestablished. They could help increase the priority of rural socioeconomic programs.

The good relations that linked the research institutes and the development agencies before 1977-1978 have suffered from the regionalization of development work, which is now supported by scarce resources of the regional development agencies. On the research side, these changes have led to the creation of the Savanna Development Institute (IDESSA) at Bouaké, and the introduction of a planning service structured around major regional production systems. There are many important problems to be solved in relations with development agencies; especially the issue of ensuring sound, balanced, two-way communications with the research services, since research has been divided between various institutions (that MSR cannot always fully represent alone), and the matters of scope of jurisdiction and funding.

Lastly, both the provisional and the definitive results of agricultural research are scattered throughout various publications (scientific reports, annual progress reports, specialized magazines) which are not always available in Ivory Coast. Except for the "Cahiers" edited by CIRES, there is no Ivorian scientific publication that reports the agricultural research in Ivory Coast. Documentation is kept within each institute and is difficult to find. One of the weak points in the "communications system," which is supposed to ensure the internal and external flow of information, is that there are no joint publication and documentation services.

Labor and Material Resources

The main problem is an insufficient number of Ivorian scientific staff, especially in the institutes that are comanaged with France (of 204 scientists, 31 are Ivorian). There are many explanations, e.g., in the past, research was not highly regarded in the Ivorian job market, the position of Ivorian scientists in comanaged institutes is slightly marginal, etc.

The fact that more -- although still not enough -- national research scientists are being trained is an indication of the desire to increase the entry of Ivorians into research, but there are two obstacles. First, the quality of higher education is dropping (MSR exerts too little pressure to guarantee high quality, which makes matters worse) and, second, comparable academic training abroad is too long and expensive and may not be relevant to the Ivorian agricultural research system. Another

weak point in the training system has been that, up to the present, the trend has been to use national scientists to round out resident teams, rather than to prepare them for a smooth, early take-over through training in key disciplines and supplementary training in research management.

Total outlay for agricultural research amounts to 1.3%, of the GAP, of which less than half (38%) comes from Ivorian funds. Ivorian participation, thus, is still small. As recommended by the plan, it should be rapidly and selectively increased.

Suggested Improvements for the Agricultural Research System

Notwithstanding the fact that the proposals put forth are numerous and relate to a large variety of structural and functional aspects of the agricultural research system, they nonetheless form a unified whole with two main ideas. The first is that in due time a national institute must be created and put in charge of all agricultural research activities. The second is that a postgraduate-level research-training center must be created.

Establishing a National Agricultural Research Institute

From an organizational point of view, it may seem reasonable to create a national institute that would be fully responsible for Ivorian agricultural research, but organization is not the only consideration. A large, unified institution is not necessarily better than a network of small, well-coordinated institutions. This must be kept in mind to avoid going too far. Excessive centralization could negate the benefits of the right degree of unity and size with appropriate centralization:

- * it is easier to work out a balanced scientific policy with orientations better phased with the national and regional development priorities;
- * there is greater efficiency in solving the complicated problems linked to diversified smallholder production, which in the future will be intensified and considerably changed through multidisciplinary research designed to improve the orientation of specialized research that has been tested under conditions;
- * management of the work force would be more flexible and economical, with better career opportunities for Ivorian scientists.

It does not seem advisable to officially create a national institute before two conditions have been met: i) a minimum degree of diversification in research, to justify decentralization of certain functions discharged hitherto by MSR, and ii) considerable increase in

the national share of human and financial resources, the only bona fide guarantee of national control over the agricultural research system. An official decision on the above would be the final step in the application of a government-approved "master plan" for the preparation of a detailed, realistic plan to create an institute adapted to national needs and capabilities. The plan -- formulated by MSR and the scientific institutions, with advice from other ministries concerned -- would include activities such as an evaluation of minimal needs in national scientific staff, the creation of a forest development institute, single-discipline departments, simplification of planning methods, detailed descriptions of relations with development agencies, etc.

Creation of a Research-Training Center

The planned institute actually provides for the creation of a type of "postgraduate college" that would offer short third-cycle training (Maîtrise en sciences agronomiques), not only for future Ivorian scientists, but also for the highest ministry officials, executive-level staff from public and private companies concerned with agricultural/rural development, and students or senior staff from neighboring countries, or even the developed countries.

This "college" would be accommodated at the ORSTOM Center in Adiopodoumé near Abidjan, where most of the first-year training in methodology would be provided. For the second-year curriculum (mainly in-service training), support would be garnered from all the agricultural and research facilities in Ivory Coast.

To ensure high-level training, the research institutions will have to develop their participation into full-fledged support. The schedule would be as follows:

- * to begin with, special studies in subjects for which there is satisfactory scientific supervision, especially for the first year of the cycle. This would mean strengthening certain disciplines and early creation of certain others (development, statistics, biometry) and the secondment of senior instructors for each major subject offered;
- * training courses and theses (individual or small groups) as part of current or future research programs, after approval by the planning committees;
- * strict selection and a limited number of students: the number of students should not be greater than the number of Adiopodoumé teachers and research scientists directly concerned with the training program. Classes of 50 to 60 students might be envisaged, with about half being Ivorians intending to go into research. (This presupposes a preselection to be confirmed during the training period).

Periodical university courses, and continuous training and information activities (national and international seminars), could turn the research-training center into a high-quality forum for the exchange of information (extended or short duration) between the senior national officials presently or potentially responsible for rural development.

Such a project must, of course, be very carefully designed. Funds will be needed for student housing, classrooms, workshops and conference halls, scientific equipment, operating expenses, and salaries. To reduce the national contribution, funds might be obtained from the savings realized by MSR on scholarships for students previously obliged to study abroad, from Ivorian and foreign institutions interested in upgrading their personnel (study stipendium for instance) and also, hopefully, from international bilateral and multilateral aid donors willing to provide maximum support for a project which in actual fact will be inter-regional in scope.

Other Proposals

If the decision is made to create the research-training center, it should be given maximum assistance, as per the following proposed goals:

- * Within the center, a national documentation, information, and scientific publications service should be created, to serve the needs not only of research, but also of higher education in general, ministries, development agencies, etc.
- * The very weak research programs on production systems, food crops, agroforestry, Guinean savanna with bimodal rainfall patterns, and rural socioeconomics, need strengthening. As concerns the latter, the relations between the Ivorian Center for Economic and Social Research and MSR need to be redefined.
- * Priority should be given to recruiting at least 20 qualified research scientists, not only to make up for imbalances, but also to cope with problems of the future, such as preparing models for stable, more intensive production. The national authorities should be brought together with the future research scientists to work on new activities for which they will have to assume responsibility in the medium-term future, without being able to draw on the experience (generally unparalleled) that exists for industrial and export crops.

Conclusion

The Ivorian authorities must carefully and critically examine these proposals, which extend over various time periods and involve various levels of funding (Recapitulation table at the end). It will be reasonable to increase financial resources (national and, eventually,

foreign) whenever a major decision is made related to these proposals. At present, public expenditure for agricultural research represents a mere 0.52% of the GAP, which is very low, even for Third World countries. A medium-term goal of 1% would be fully justified if it were based on a well-designed, comprehensive program to strengthen the national research capability.

THE MISSION: ORIGIN, OBJECTIVES, SCHEDULE

1.1 Origin and Terms of Reference

Subsequent to an initiative taken by the World Bank's Regional Office for West Africa, an ISNAR delegation visited the Ivory Coast Ministry of Scientific Research from 10 to 14 September, 1981, to explore possible avenues of cooperation between the Ministry and ISNAR.

This meeting kindled a strong desire for broad cooperation. The initial phase was to consist of a mission by ISNAR to evaluate the Ivorian agricultural research system (structures, operating methods, etc.) and suggest ways of improvement.

An exchange of letters between the Minister of Scientific Research (24 December, 1981) and the Director General of ISNAR (15 January, 1982) officially confirmed the principles and purposes of this evaluation mission.

The agreement dated 15 January, 1982 assigned the mission the following Terms of Reference:

- * preparation of a document containing an analysis, evaluation, and recommendations on the linkage between agricultural research and the extension of results to farmers;
- * contribution to the preparation of a master plan and programs for future agricultural research;
- * participation in the preparation of an integrated research program devoted to the intensification of food crop production in both the savanna and forest zones;
- * consideration of research activities relating to the storage, conservation, processing, and added value of food crops.

1.2 Composition, Schedule, Results

The ISNAR mission was carried out by a multidisciplinary international team of seven experts (Annex 1).

Work Program

Between 14 March and 8 April, 1982, the mission visited all the agricultural research institutions under MSR, agricultural research institutions attached to other ministries, schools of higher learning

(National School for Advanced Agriculture, Faculty of Science, Bouaké Institute of Agriculture), and representatives from the Ministry of Agriculture, the Secretariat of State for Food Crops, and agricultural development organizations. Additional information was obtained from numerous visits to research centers and field stations (Korhogo, Katiola, Niéky, etc.). The detailed itemized schedule and the list of persons met appear in Annex 2.

At the end of the mission, the Minister of Scientific Research and his staff received the ISNAR team's oral report on its early impressions of the structure, operations, programs, and results of the Ivorian agricultural research system and links with development operations, and suggested improvements in each.

The Report

The report that was sent to the Minister of Scientific Research details the remarks and proposals presented orally in Abidjan on April 5 and April 7, 1982, in three sections:

- * an analysis of agricultural development in Ivory Coast designed to increase understanding of the previous and potential role of agricultural research;
- * a functional evaluation of the current research system;
- * recommendations from the ISNAR team.

A fourth section, covering the team's assignment to evaluate research activities relating to agro-industrial technology, is presented in a separate publication.

1.3 Expression of Gratitude

The mission received a warm welcome and enjoyed frank, fruitful contacts with many institutions and their representatives, for which it should like to express its sincerest thanks. Special gratitude should be expressed to Mr. Jean-Marie Michotte, technical adviser at MSR, who organized the mission's program, and Mr. N'guetta Bosso, adviser to the minister, and head of research development liaison, who was kind enough to accompany the team to all the meetings, visits, and on all the trips. Help from these two people enabled the team members to make the best possible use of their four weeks in Ivory Coast.

Chapter 2

IVORIAN AGRICULTURE: A MODEL OF DEVELOPMENTIN TRANSITION

Since independence, the pace of economic change in Ivory Coast has been exceptionally rapid, not only for Africa, but for all of the Third World. The average GDP growth rate -- 7.7% per annum between 1960 and 1980 -- has only been surpassed by a few oil-producing countries. Prior to 1960, the average per capita income was among the lowest in Africa south of the Sahara. Now it ranks second (\$1,250 per annum in 1980). This is all the more remarkable since, in the absence of mineral resources, Ivory Coast has depended on the exportation of agricultural and forestry products, and the development of agriculture, to generate the internal income and foreign currency needed to diversify its activities and build its economy. This strategy proved effective for a period of time, and then gradually, when it had reached its limits, shortcomings started appearing (decelerated agricultural growth, new or aggravated social and regional economic imbalances, etc.), which led the Ivorian authorities to define a new rural/agricultural development policy.

2.1 Agricultural Development from 1960 to 1980: Performance and Limits

2.1.1 The agricultural development strategy

During the 1960s and 1970s, Ivorian agricultural development was supported essentially by uncontrolled use of natural resources such as abundant lands and forests, favorable climate, etc. Development efforts were designed to meet the conditions of and optimize the opportunities of foreign markets.

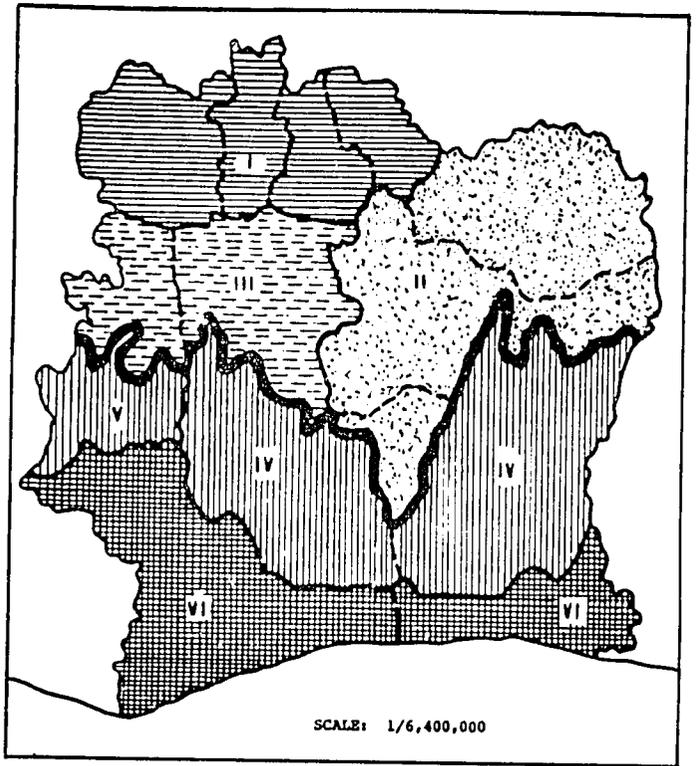
During the first few years after independence, the state encouraged production of traditional export crops inherited from the colonial days: timber, coffee, cocoa, bananas, all located in the forest zone, where the road network was the best. New or expanded felling rights were issued to foresters and forest enterprises, mainly foreign. Coffee and cocoa production were stimulated by allowing smallholders to take over part of the forest reserves through a law that granted land deeds to planters. Further measures included stable, profitable "technical assistance for the modernization of agriculture."

The second phase ran from 1963 to 1970, when industrial export crops were diversified and, thanks to better road connections, extended geographically. In the forest belt, the traditional crops continued progressing and were accompanied by new, or nearly new, crops such as palm oil, rubber, pineapples cold-stored for export, on large plantations operated by or assisted by public, joint venture, or private

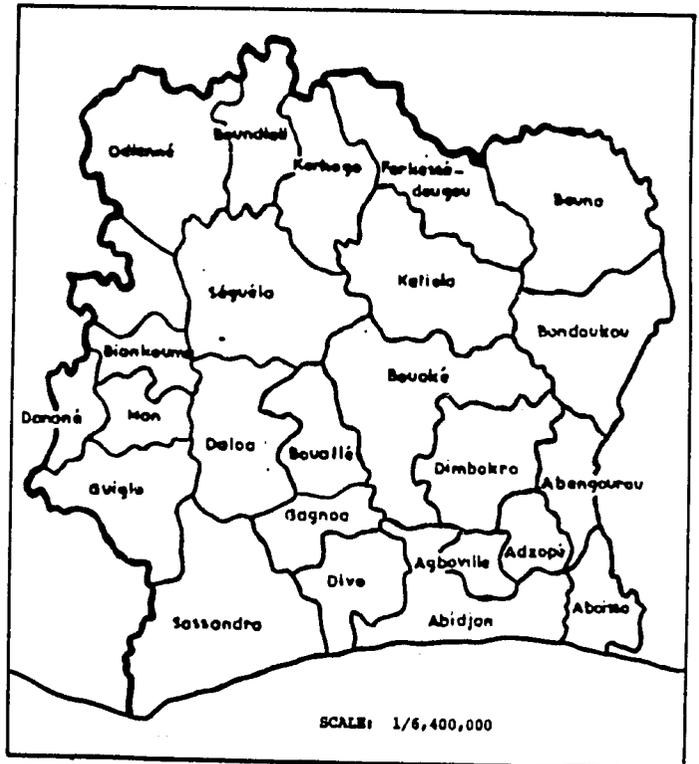
THE MAJOR AGRO-ECOLOGICAL ZONES



- I
SAVANES TROPICALES HUMIDES
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- II
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Boua - Kong
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SAVANES PRE-FORESTIERES
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Séguela - Mankono
Touba - Biankouma
- IV
FORET DENSE HUMIDE
SEMI-DECIDUE
Secteur Oriental
Secteur Occidental
- V
SECTEUR MONTAGNARD
- VI
FORET DENSE HUMIDE
SEMPREVIRENTE



DECOUPAGE
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(Décembre -76)



enterprises¹, and also canned pineapples grown mainly on village plantations. In the savanna zone, cotton was introduced to the small farms, which before had not cultivated any cash crops.

Starting in 1970, because of the sharp increase in the importation of sugar, rice, and animal products demanded by the urban population, especially in Abidjan, the state set new goals: increase production to decrease imports, and in some cases even produce enough for export. This latter goal was achieved for sugar through the establishment of several costly public agro-industrial compounds, run by SODESUCRE, in the savanna zone. For the other two products, two new state companies (SODERIZ and SODEPRA) were created, but they did not show very impressive results. In the animal sector, the industrial farms are doing well, with modern private swine and poultry farms, public and private cattle ranches. For rice, high guaranteed farm-gate prices provided great encouragement for rice cultivation, but because the processing and marketing structures were too weak to cope, financially or physically, with the production increases, the producers finally became discouraged. During the 1970s, up to 1977-1978, the international market for export crops continued to progress nicely. The traditional crops were grown without state aid. Production increased at about the same rate as the population. Plantain bananas and root crops (yams, cassava, taro) primed in the most densely populated area, the forest zone. Maize and other cereals (millet, sorghum, fonio) were predominantly found in the savanna.

The quantitative changes in the main agricultural products are indicated in Table 1, and, for the year 1980, consult Table 2 to observe geographic locations and values, the decreasing order being cocoa, timber, yam, coffee, cassava, plantain, and then, at equal levels, sugar cane, cotton, and maize, which still sharply outrank, in value, crops like pineapples, palm oil, dessert bananas, and rubber.

In conclusion, we can see that Ivorian agriculture is still essentially in the hands of smallholders who grow nearly 100% of the food crops (except for a few industrial plots) and 85% (in value) of the industrial and export crops. For the whole agricultural sector, the smallholders generated, in 1980, 75% of the GAP, forestry enterprises 16%, and modern animal farms and the industrial/export crop plantations combined, only 9%.

2.1.2 Production: the spectacular rate of progress is slowing down

An analysis for the 1960-1980 period as a whole seems satisfactory for the agricultural sector.

1 For palm oil, the government created a palm tree development agency called SODEPALM, which is to launch a development plan. The plantations will be turned over to PALMINDUSTRIE, and processing to PALMIVOIRE. For rubber, the African Rubber Plant Company, a joint venture called SAPH, is taking over from SOCATCI, a state-owned company, to run the state plantations. Fresh pineapple (and bananas) for export are cultivated mainly on large, private plantations.

Table 1. Trends in Ivorian Agricultural Production from 1960 to 1980.

Production in '000 tons	1960	1965	1970	1975	1980	Annual growth rate (%)	
						1960-70	1970-80
Population '000 inhab.	3865	4500	5115	6710	8190	2.9	4.8
Wood ('000 m ³)	655			4600	4950		
Cocoa beans	62	148	181	242	320		
Coffee (green)	147	202	279	270	283	4.2	5.8
Palm kernels (bunches)	8			713	750		
Pineapples	7		110	240	290		11
Bananas	72		178	192		9.5	
Rubber	0	0	11	16	21		6.5
Sugar cane	0	0	-	47	103		
Cotton seed			32	60	150	-	17
Plantain banana	490	600	650	1168	1126		
Yam	1150	1300	1151	2172	1974		
Cassava	450	500	540	938	1051		
Taro	135	158	182	263	296		
Total root crops tubers	2243	2578	2944	4554	4557	2.8	4.5
	58	57	58	68	56	-0.1	-0.3
Rice	160	250	316	496	456		
Maize (kernel)	147	200	231	264	237		
Other cereals	57	52	50	77	68		
Total cereals	364	493	597	837	761	5.1	2.4
Mutton			5.2	6.3	12		
Poultry			10	14	22		
Other meats			26	25	26		
Total meat			41	45	60		4.
Milk			4	6	10		5
Eggs			2.5	3.8	9.7		10
Gross Agricultural Product (GAP) growth rate)						4.2	3.4
) per capita						1.6	-0.7

Sources : * Physical productions; Ivory Coast in Figures 1980-1981, FAO Annual Year book
 * Growth rate for agricultural products; World Bank

Table 2. Main Ivorian Agricultural Products in 1980.

Francs: CFA	FOREST ZONE		SAVANNA ZONE		TOTAL		%
	Volume ('000 t)	Value (billions of francs)	Volume ('000 t)	Value (billions of francs)	Volume ('000 t)	Value (billions of francs)	
1. TIMBER ('000 m ³)	4950	92			4950	92	16.3
Cocoa beans	320	96			320	96	
Coffee (green)	260	74			260	74	
Palm kernels (bunches)	750	7.5			750	7.5	
Fresh pineapple	100	7.0			100	7.0	
Export bananas	130	5.2			130	5.2	
Rubber	21	3.4			21	3.4	
Coconut		3.5				3.5	
Sugar cane			1420	12	1420	12	
Cotton seed			150	12	150	12	
2. INDUSTRIAL AND EXPORT CROPS		196		24		220	39
Paddy rice	284	18	112	7.3	396	26	
Maize	91	5.5	115	6.9	206	12	
Other cereals	-	-	62	4.6	62	4.6	
Yams	884	44	359	38	1643	82	
Cassava	898	36	153	6.1	1051	42	
Plantain	1087	38	27	1	1114	39	
Taro	260	10	9	0.4	269	11	
3. FOOD CROPS		152		64		216	38.3
4. PLANT PRODUCTS 1 + 2 + 3		440		88		588	
Beef		breakdown not available.		13	11	4.8	
Poultry			22		12.7		
Other meat			6.1				
Game			14		6.8		
Milk			10		0.8		
Eggs			9.7	5.0			
5. ANIMAL PRODUCTS						36	6.4
TOTAL 3 + 4						564	100

Sources : * Plant productions: 1981-1985 plan, pp. 40 and 106-109
 Animal productions: Ivory Coast in Figures 1980-1982 pp. 75-76 and SODEPRA (19th national seminar on animal productions, March 1982)

The agricultural production growth rate between 1960 and 1980 was 3.9% per annum, a figure unmatched in Africa. This sector is by far the largest source of employment (79% of the economically active population was employed in agriculture in 1980, 89% in 1960), and it generates about 90% of the total export earnings. For certain products, results have been spectacular. Ivory Coast has become the world's largest producer and exporter of cocoa, the third largest coffee exporter, and is now becoming the largest African producer of palm oil, and the leading producer of cotton and sugar in West Africa.

A look at the agricultural growth rate for each decade shows a considerable decrease: from 4.2% per annum between 1960 and 1970, to 3.4% per annum between 1970 and 1980. This deceleration was concurrent with a sharp increase in the population growth rate (partly related to the heavy immigration into the agricultural areas). The population growth rate rose from 2.9% to 4.8% from one decade to the next, which means that during the second decade there has been a drop in the per capita agricultural product, especially between 1975 and 1980, when the level of production of the main crops stagnated or dropped (cereals, tubers and root crops in general, coffee, palm oil, etc.).

This deceleration does not augur well for the future. The 1981-1985 plan shows (Table 3) that, if nothing is done to improve the production of food crops, during the second half of the 1980s there will be a sharp increase in the rice deficit and a shortage in all other food crops hitherto produced in adequate quantities. Since shortages in yams, plantains, and cassava (about 700,000 tons in 1990) cannot be compensated by imports, more rice will have to be imported than planned. (About one million tons will be needed.) SODEPRA projections indicate that a larger proportion of the domestic demand will be met in the future, but there will be a continuous rise in expenditure for animal products in absolute terms. Imports of rice and animal products alone will cost more than 100 billion CFAF (1980), which is the current value of the timber exports.

2.1.3 A heavy liability

This slowing of performance rates has convinced the Ivorian authorities, in the 1981-1985 plan, to make an uncompromising analysis of the liability side of the agricultural development strategy that has been applied since independence².

This deficit focuses attention on production orientations, resources employed, and the social and regional aspects of development.

2 Most of the items in this liability account, and the need for changes in the agricultural development strategy, were presented in the 1976-1980 plan, even mentioned by perspicacious observers in the beginning of the 1970s. But, since 1975-1978 were economically very good years (coffee and cocoa prices were high), there was little reason to change the development strategy. Such a change is now imperative.

Table 3. Food crops: consumption trends for national and imported foodstuffs.

'000 tons	Home consumption ²			Deficit ³			Deficit/Home consump. %		
	1980	1985	1990	1980	1985	1990	1980	1985	1990
Rice	227	245	260	214	332	500	94	136	192
Maize	188	197	204	0	21	49	0	11	24
Other cereals	59	59	59	0	10	24	0	18	40
Yam	1195	1266	1326	0	90	208	0	7	16
Cassava	1030	1127	1208	0	97	241	0	9	20
Plantain	1083	1202	1300	0	99	235	0	8	18
Taro	207	229	247	0	12	26	0	5	11
Beef	11	18	28	66	53	60	418	294	214
Goat/Sheep/Pigs ¹	12	20	34	8	9	12	66	45	23
Milk	10	18	35	170	-	-	1700	-	-

Sources: Table based on data from the 1980-1985 plan (pp. 106-109) for plant products and SODEPRA for animal products (19th national seminar on animal productions, 30 March, 1982)

1980: real imports and yields, 1985 and 1990 forecast trends, except for animal products where attention is given to the development projects.

¹ Meat from goats, sheep and pigs: meat and offal from farmed goats, sheep, and pigs.

² Home consumption: national production consumed by the local population

³ Deficit: 1980 import figures

Table 4. Plan forecasts for 1980-1990: value and location of food crops and of industrial and export crops (IEC).

In billions of CFAF	1980	1990	1990/80
1. Total food crops	216	332	1.5
2. Total IEC	220	381	1.7
(coffee and cocoa figures)	(170)	(278)	(1.6)
3. Total plant products	436	713	1.62
(forest zone)	(348)	(537)	(1.54)
(savanna zone)	(88)	(176)	(2)
4. Food crops/IEC ratio	0.98	0.87	-
5. Savanna/forest zone ratio	0.25	0.33	-

Excessive Dependence on Foreign Markets

Foreign trade was needed to support economic development and diversification, but there were two major reasons for exercising a certain amount of restraint.

The first reason relates to the terms of trade. The market for tropical agricultural products like coffee and cocoa is highly speculative and can be a liability for the producer countries, while most of the foodstuffs imported from the developed countries enjoy rather high stable prices, and therefore are costly for the buyer countries. In the long term, Ivory Coast will be on the losing side in both cases.

The second reason stems from the fact that too little attention has been devoted to the production and marketing of traditional food crops. The result has been that supply has not met the urban demand, which explains the temporary chronic shortages, with rising prices. To cope with the possible social ramifications, foods that were not produced locally had to be imported. This was especially costly, since the result was a change in eating habits that favored imports and discouraged consumption of traditional crops.

Extensive Land-Depleting Agricultural Growth

Agricultural production grew as a result of extensive cultivation that has depleted the lands somewhat. The 1981-1985 plan states, "because the development model prioritized cash crops grown in the forest zone, there was a significant increase in shifting agriculture (and land clearance) for the production of the crops required to meet the food requirements of the included and natural population increase. The old lands were saturated and new forest lands were taken over (or appropriated, as a precaution)."

An estimated 200,000 ha to 400,000 ha of forest lands are destroyed or made economically unexploitable each year. The national forests may disappear within the near future; a decrease in the timber industry is already visible and, from a longer term perspective, concomitant ecological changes could be disastrous. The value of the forestry potential thus wasted each year can be assessed at about 300 billion CFAF³, i.e., over half the total GAP for 1980.

3 This is the value of agricultural land clearance, which corresponds to an approximate annual 13 million cubic meters of timber or close to three times the volume of forestry offtake. This is costly opportunity loss, since the felled trees and other sources of wood are generally burned at a pure loss, with one exception: the soils thus made available are sufficiently enriched not to require added mineral and organic fertilizers, during at least a few agricultural seasons.

The 1981-1985 plan also indicates that "the development of cash crops, the labor intensity of hand-treated itinerant food crop cultivation, a behavior pattern little inclined towards manual labor altogether, have resulted in heavy dependence on foreign African laborers. This immigration often leads to permanent settlement and the problem of increasing, excessive burden of foreigners in the rural areas."

By the end of the century, all of the forest land and some of the other regions will be fully occupied; available labor will be used to saturation, as a result of the rural exodus and the expected drop in the immigration rate. And hence, the growth model used until now will become less and less applicable.

In the past, production developed without the technologies and structures of agriculture being markedly modernized. Attempts at modernization have led to progress that was too fragmentary to be conclusive. On the positive side, efficient modern animal farms and plantations have been established (although they have not had much impact on production), and cotton has been promoted largely in the smallholdings. On the negative side lies the outright failure, or the minimal effect, of efforts to intensify small-farm production of coffee, cocoa, rice, etc. In the development agencies, supervisory personnel have been overburdened with commercial and administrative duties, have systematically required assistance through subsidies, and have given very little support to groups seeking to form cooperatives. This has not helped to increase the sense of responsibility of the rural populations.

Social and Regional Disparities Unabated

Subsequent to the polarization of agricultural (and economic) development in the south of the country, where natural and socioeconomic conditions are more attractive, people have migrated from the north to the south, thus adding internal migration to immigration figures. The result is a very marked difference between agricultural income in these two major regions, a situation that has not been corrected by the enormous efforts made to help the savanna region during the last few years. "Average differences between the north and the south are 1 to 4 in monetary terms, and 1 to 2 in global revenue terms, including home consumption ... the gaps hide the even greater differences registered within regions and according to local situation ..." (Plan 1981-1985).

There is also a disparity between agricultural and nonagricultural income, and in general between production and service income in rural and in urban areas. This disparity encourages rural exodus⁴, a problem for both the rural and the urban communities. "Young people are certainly motivated to leave the land because of traditional hardships (low

4 According to the World Bank (Accelerated Development in Sub-Saharan Africa, 1981), Ivory Coast has the third highest urban population growth rate in Sub-Saharan Africa. (Botswana and Mauritania have higher rates).

incomes, heavy chores, etc.). But the situation is greatly worsened by the cultural model advertized in the towns and schools. This exodus, created by young school-agers, both boys and girls, deprives the country regions of a potential population of educated progressive young people, who constitute the key to modernization." (Plan 1981-1985).

2.2 The New Agricultural/Rural Development Policy: Continuity Charged with Change

2.2.1 New basic priority orientations

In its 1981-1985 plan, Ivory Coast provided rural and agricultural development with a description of some "basic priority orientations that are the result of an analysis of the main, previously identified problems. These orientations often require directional changes for actions started earlier; this is not a condemnation, but rather a recognition of the new needs of growth and development." (Plan 1981-1985).

Thus the main objectives (in particular a high agricultural growth rate to increase rural income and job opportunities and to contribute to the balance of foreign trade) have been expanded to include:

- * better coverage of food needs,
- * reducing inter- and intra-regional disparities, and,
- * improving rural living and working conditions.

As concerns functional aspects, this report deals only with operational choices related to production and modernization methods, which are very important to a good understanding of the agricultural research system.

2.2.2 Production choices: relative priority for food self-sufficiency

When considering production as a whole, realistic, emphatic attention is given to the target called "better coverage of food needs." In the 1980s, the food crop production rate must rise 4.4% each year. This rate is slightly higher than the earlier consumption increase rate, and hence should ensure continued self-sufficiency for the traditional crops such as yams, plantains, etc., and should contain the deficit in rice (200,000 tons) and in animal products (60,000 tons of beef, milk, etc.). This food production strategy is to be applied mostly in the savanna zone, which is poorer than the forest region, but has more -- and easier to mechanize -- land available. This should make it possible for the agricultural production level in the north to approach one-third of that of the south, a target that has already been proposed in an earlier 5-year plan. For the national economy and agriculture to grow rapidly, careful attention will have to be given to industrial and export crops; it is expected that these will increase at a rate of 5.6% per year. This increase will be accompanied by a small diversification of products, with extension of oil palm, rubber tree, cotton, and the introduction of grain legumes (especially soybean). The foundation crops, coffee and cocoa,

will not change. By 1990, they will account for nearly 86% of the total value of agricultural output in the forest zone. According to the plan, by the year 1990 (Table 4), industrial and export crops should be, in relative terms, even more important than they are now.

2.2.3 The path to agricultural modernization: more rural responsibility, more investments, more and better-adapted research

To modernize agriculture, especially at the grassroots level, requires increasing the farmer's sense of responsibility, and greatly increasing both financial and intellectual investments.

Measures to Heighten the Small Farmer's Sense of Responsibility Include:

- * the development of cooperatives, which can serve as partners for the development agencies, whose efforts should gradually concentrate on two-way communication with the farmers and problem-solving, rather than on material chores like providing supplies, collection, etc., tasks that are more appropriate for the cooperatives;
- * the extension of credit and reduction of subsidies and grants;
- * settlement aid for young beginning farmers.

Increasing Financial Investments

The agricultural sector should receive a large proportion of total investments. 14.6% have been earmarked for agricultural products, 1.6% for waterways and forests (which is very little), and 1.5% for animal products. Looking at the geographical breakdown, we see that the savanna zone is favored over the forest zone (128 billion CFAF to 105 billion CFAF), since three times more is spent per rural inhabitant in the savanna. On a product basis, industrial and export crops are prioritized over food crops (174 billion CFAF to 53 billion CFAF) but, for these crops, no distinction is made between the forest and the savanna zones which receive, respectively, 86 billion (39 billion for coffee-cocoa, 13 billion for oil-yielding plants, 13 billion for rubber, etc.), and 138 billion (30 billion for cotton, 19 billion for soybean, 14 billion for sugar cane, etc.).

Intellectual Investments

As concerns training, the 1981-1985 plan merely emphasizes the serious shortcomings, but does not suggest any solutions. "Agricultural training programs for technical officers and senior staff are influenced by foreign teaching patterns and under-qualified teachers. Undue priority is given to straight technical and scientific knowledge, while the daily

development problems require a multidisciplinary approach with special emphasis on management. Even more serious is that primary education does not prepare young people to fit into the rural environment, and gives virtually no training in farming as a profession." (Plan 1981-1985).

Agricultural research is considered central to the further modernization of agriculture. Resources are too limited, especially for the traditional crops. The approach is still too sectoral: "Questions related to production systems are treated haphazardly and incompletely. New cropping systems have hardly been defined and tested in the savanna zone, and not at all in the forest zone." The plan indicates that agricultural modernization requires the fostering of new production systems that maximize production factors (work, land, equipment). In the small, homogeneous regions, "no longer should uni-product objectives be considered sufficient; objectives should be defined for a combination of products that would fit into the production units, even if some of them are, and will have to remain, dominant."

The new production systems, which still need to be worked out in detail, should give priority to those that include plantations for intensive cultivation of perennial crops (coffee, cocoa) and staple food crop production, both well established in the forest area, and to mixed systems of crops and livestock in the savanna. These systems, however, are unlikely to be adopted in places where land is abundant and readily available.

Research elicits so much hope that in some cases it is considered capable of fueling intensive rejuvenated development, and removing all sorts of obstacles, be they institutional or even political (e.g., more liberal land tenure laws). This was the picture when MSR, heavily solicited and constricted from both within and without, asked ISNAR to help make a constructive, critical evaluation of the agricultural research systems described in Chapter 3 and Chapter 4 of this document.

Chapter 3

BACKGROUND AND CURRENT POSITION OF AGRICULTURAL RESEARCH3.1 Structures: The Puzzle is Complex; Not All of the Pieces Match

The conglomeration of agricultural research institutions in Ivory Coast -- created over time and more or less by opportunity -- form an intricate puzzle in which not all of the pieces fit together.

The puzzle is intricate because of the number and nature of the institutions concerned. There are research institutions fully controlled MSR, or partly by MSR and partly by other national bodies or foreign institutions. And then there are research institutions not under MSR jurisdiction, such as institutes of higher learning with research activities, perfectly legal and unfortunately also perfectly limited. There are also ministries and development agencies that in cooperation -- or in connection -- with the aforementioned institutions have carried out research-experimentation-survey activities they felt were necessary for achieving their particular goals. The puzzle is imperfect because the activities referred to above are not all complementary. Some are duplications, some are competitive with others, and then there are the missing pieces, fields of research that have remained totally untouched.

3.1.1 Specialized research institutions

The most important institutions where 80% of both Ivorian and expatriate scientists work have been inherited from the colonial period. Their methods of work, their human, financial, and material resources are living evidence of the omnipresence of French technical aid. Reference here is being made to ORSTOM and the eight institutes that together form GERDAT (joint group for studies and research on the development of tropical agriculture).

ORSTOM is largely supported by France. It is divided into scientific sections, most of which carry out agricultural research. ORSTOM serves the whole country from its headquarters at Adiopodoumé and its two subunits at Bouaké (in association with IDESSA) and Petit-Bassam (social sciences). Most of its work is carried out with the GERDAT group and development agencies.

The eight GERDAT institutes⁵ are usually known as "coast" or "forest" institutes, and "savanna" institutes. The former work on specific industrial or export crops: timber (IRCA), rubber (IRCA), coffee and cocoa (IRCC), citrus and other fruits (especially pineapples and bananas) (IFRA), oil and coconut palms (IRHO). Each has its own central station, secondary station, substations, etc., its own legal status (quite different from each other) and accounts; there is practically no scientific relation between them. The "savanna" institutes -- IRAT, IRCT, IEMVT -- have been formally grouped under IDESSA created in 1978, and have been converted into departments for food crops, fiber plants, animal products and, last year, sugar crops. IDESSA does not yet have legal status or independent accounts. For the time being, it is an association of research centers located around Bouaké. But it has already become a general meeting place and now intends to adopt a joint accounting system and launch its first joint program. IDESSA is a structural innovation faring through difficult straits, but with time it is expected to prove its value as a model MSR can use to improve research structures on the coast or in the forest area. (The project to create IDEFOR, a forest development institute will be considered later). The eight GERDAT institutes are managed and financed jointly by MSR and France, in compliance with a 1962 convention which the two governments agree badly needs revision. This does not imply narrowing the fields of cooperation.

ORSTOM and the eight GERDAT institutes have their headquarters in France. Each has a "network" of research laboratories and centers in France (continental and overseas), and in most of French-speaking tropical Africa they maintain contact and cooperate with numerous French, foreign, and international scientific institutions. Up to now, all nine have had independent cooperation and research strategies, as defined by their executive board (which includes representatives from the French ministries) and implemented by their centers and laboratories. The units in Ivory Coast -- the biggest outside of France -- form part of, contribute to, and benefit from this complicated fabric of relationships. It will be seen later on that, for the last 10 years, thanks to sheer Ivorian determination, these units have become more independent of the Paris-born international scientific strategies.

In addition to the structure that encompasses both French and Ivorian responsibility, Ivory Coast has created several specialized research institutions that are strictly national and are primarily staffed with Ivorians (Table 5). The most important ones are CIRT, the Ivorian Center for Technological Research, and CIRES, the Ivorian Center for Economic and Social Research. Over half of the CIRT staff work on agro-food technology, and over half of the CIRES staff work on rural economics and sociology. ISNAR has made a special study on CIRT. CIRES is a special

5	CTFT	Technical Center for Tropical Forestry
	IEMVT	Institute for Animal Production and Tropical Veterinary Medicine
	IRAT	Research Institute for Tropical Agriculture
	IRCA	Research Institute for Rubber in Africa
	IRCC	Research Institute for Coffee and Cocoa
	IRCT	Research Institute for Cotton and Fiber Plants
	IRFA	Research Institute for Citrus and Other Fruits
	IRHO	Research Institute for Oils and Oil-yielding Plants

case, worth studying because it is the only Ivorian institute working partly on agricultural research that, since 1979, no longer has structural and financial relations with MSR, and thus has been deprived of very important backing in key disciplines of rural development. There are also some isolated laboratories, such as IET, IGT, CNF, staffed with the minimum scientific personnel needed to keep their scientific activities independent. Then there is GERME which operates as a joint service.

3.1.2 Institutions of higher learning

Other scientific institutions furthering agricultural research activities, e.g., the National School of Agriculture (Ecole Nationale Supérieure Agronomique) and the Abidjan Faculty of Sciences, employ more than 20 teachers who take part in or supervise research programs officially approved or financed by MSR. There are also programs (probably not very many) conducted without any assistance, e.g., long, personal theses. The above-mentioned research should not be overrated, because most of the teachers referred to above devote a small portion of their working time to it. The percentage figure is low, considering the total number of teachers in the higher echelons, and the normal research requirements for higher education. In defence of the teachers, one must recognize that they have negligible research funds and facilities, and that last year, when enrollment figures rose sharply, their teaching obligation required much more of their time.

3.1.3 Non-institutional research

The institutions mentioned above have no exclusive rights to agricultural research. The ISNAR mission had too little time to accurately list all the research activities conducted by ministries, development agencies, development projects partly funded through bilateral or multilateral aid, other public entities such as CIMA, etc. We estimate that these activities engage close to 100 "senior specialists" (mostly expatriates recruited directly or through bilateral agreements from France, Germany, Belgium, etc., or through international agreements with FAO, IBRD) and several hundreds of more or less skilled second or primary school level workers. The budget may be equal to that allocated to "official" research. By way of an example, let us consider the CIDT textiles research-development unit (including experiments on plant protection and agronomy). This is an Ivorian company with 10 senior officers, 50 field assistants, and a budget (600 million CFAF) equivalent to that of IDESSA's food crops department, which is responsible for nearly all of Ivory Coast's "official" research in this field.

Some separate initiatives are justified and make up for shortcomings in the institution's research programs; e.g., SODEFEL (Fruits and Vegetables Development Company) research on market crops stimulates innovative research. Outside initiatives for apparent gaps in research are less justified when established research services are indeed studying a problem, but suffer from lack of funds, time, and the strict discipline needed in order to produce reliable results. Using the above as a pretext (partly justified in some cases when the research workers are perfectionists), many regional or sectoral development agencies and

Table 5. Scientists and technicians employed in agricultural research in Ivory Coast (1981).

	I = Ivorian F = Foreign T = Total I + F	SCIENTISTS			VSN (a)	TECHNICIANS			TOTAL		
		I	F	T		I	F	T	I	F	T
"Co-managed" with foreign enterprises	GERDAT	22	92	114	15	9	15	24			
	ORSTOM (b)	9	52	61	11	2	15	17			
	Swiss Center		3	3							
Subtotal A		31	147	178	26	11	30	41	43	200	243
National institutes and labora- tories	CIRT	4	-	4							
	CNF, GERME) IET, IGT)	11		11		4		4			
	ENSA-Fac Sci.(c)	8	2	10							
	CIRES (b)	7	2	9							
Subtotal B		30	4	34		4		4	28	4	32
Total A + B		61	151	212	26	15	30	45	71	204	275

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Sources: MSR -- Improvement of production systems in the forest zone, 1981, (Annex III, Table 1).
 MSR -- Improvement of production systems in the savanna zone, 1981, (Annex III, Table 2).
 MSR -- Knowledge, conservation, preservation and exploration of natural ecosystems, 1981,
 (Annex III, Table 3).
 MSR -- MSR quantified data, March 1982
 CIRES -- Review and prospects of the agro-economic unit, Nov. 1981.

- (a) VSN -- National Service Volunteers from France, "junior" assistants
 (b) Only scientists working on agricultural research have been included
 (this includes environmental studies)
 (c) Scientist-year equivalents

projects have set up their own experiments, trials, surveys, etc. This is a "lesser evil," when agreements provide for the recruitment of full-fledged scientists (over 40 GERDAT people have been hired). Of course, the scientists have to accept a compromise between a desire for scientific precision and the need for quick solutions, the frustration of having to carry out superficial, "confidential" work, or work that is interrupted prematurely. Their connections, be they formal or informal, with research institutions provide a minimum guarantee of reliability and the conservation and later development of their findings. A balanced relation may develop in which responsibilities are shared and, like between CIDT and IDESSA in the north, problems are volleyed between institutions.

Unfortunately, where development services toy with research, the results are not always felicitous, as can be seen from the following illustrations:

- * The Secretariat of State for Agriculture wanted to introduce soybeans. After discussions with IDESSA and some foreign partners, the Secretariat and one of the latter launched an experiment on 2,000 ha. The results were not significant. Then the maintenance of the seed's germination capacity was tested on 400 tons. All this, when a few samples would have sufficed.
- * To evaluate the possibility of storing yam, the Ministry of Domestic Trade purchased close to 60 million CFAF worth of cold storage chambers. After three agricultural seasons, the results obtained confirmed what could have been learned from carefully studying the scientific literature on the subject.
- * SATMACI recently financed a study on the operating efficiency of production units in the Gagnoa region. This is a very interesting subject, but the study covered so many units that funds were depleted before the study could be finished. The considerable body of valuable information, costly to collect, will not be processed or put to use.

These types of endeavors are indicative of needs felt by development services. In principle, there should be no objections if specialized research organizations were consulted before action was taken, if work was designed to be complementary, and if research protocols and findings were analyzed and evaluated by both parties.

In the absence of these precautionary measures, "parallel" research may become costly, less precise and, less reliable. There can be no question of laying blame for what happened in the past, but it is important to report instances of blatant retention of information, or counter-productive competition, as we can observe in the field of animal and fodder production. Both IDESSA animal production research development and SODEPRA carry out research and experimentation on cattle, sheep, swine, poultry, animal pathology, and nutrition. These two organizations officially know nothing about each other, because each is under a different ministry. The fact that IDESSA's CRZ (Centre de Recherche Zootechnique) was not invited to participate, or attend, a national seminar on animal production, organized recently by the Ministry of Animal Production and SODEPRA, makes this more than obvious.

3.1.4 Field of study

It will not be possible for this brief presentation of agricultural research structures to lead to a systematic analysis of the related advantages and disadvantages. Such an analysis would require a thorough study of methods of operation, programs, results, and resources for each institution (Section 3.2 to Section 3.5). Once this has been done, Chapter 4 of this document can be used to make suggestions for improving the dimensions and structures of the Ivorian agricultural research system. These constructively critical thoughts only apply to specialized research institutions and institutes of higher learning listed in Table 5 for which precise information has been obtained. Other institutions working on research and experimentation are considered in our analysis of research-development relations (Section 3.4) and related proposals (Section 4.4).

3.2 Agricultural Research: Operating Methods and the All-Important Programming System

Agricultural research is conducted by many independent institutions, and by people of many nationalities. Its statutes, supervisory structures, and modes of financing are varied. The expected result is the coexistence of a host of individual research programs that somewhat anarchically cover Ivory Coast's needs and the impossibility to control the whole gamut of institutions. This situation actually existed, apparently, until 1971, when MSR was created.

Since its beginning MSR has been striving patiently and persistently to coax research institutions out of isolation, encourage them to work more harmoniously, with greater unity of purpose, better control, and more attention to the new needs of national development. This became policy.

Against this background, in the early 1970s, a programming system -- that has been gradually improved but still has some way to go -- was introduced to implement this policy. After describing the system, we will turn to its impact on internal relations within the agricultural research system. (Section 3.3 on programs and Section 3.4 on relations with development look at the impact on research orientations and relations with nonscientific institutions, only briefly mentioned in this section).

3.2.1 The MSR programming system: evolution and evaluation of procedures

There are very few developing, or even developed, countries that have exerted as great an intellectual effort as Ivory Coast to develop a programming system that covers research activities and financing, and to replace institutional by program-specific financing that fits in better with the national development policy.

Evolution of the Programming System

Without examining the details of initial design and subsequent remodelling (Annex 4), it should be noted that the programming system always

- * uses three complementary steps: i) standardized identification of research activities, ii) evaluation of the cost of research, iii) examination and selection of research programs, ranking priorities;
- * uses a step-by-step consultation system to ensure proper ordering of actions to be coordinated.

In the beginning, each research organization identified and costed its own programs. A review committee (Commission de Synthèse) composed of representatives from MSR, research user ministries and organizations, the French Technical Assistance Ministry (an important source of funding) examined and ranked the programs in order to ensure interdisciplinary and inter-organization coordination.

By 1976, the institutions' individual program committees had been replaced by multidisciplinary, multiorganizational program committees that worked on each of the main agricultural crops, individually or as crop groups, and studied the land and aquatic ecosystems.

Experience acquired by 1981 showed that the theme approach was no longer well enough adapted and broad enough to refocus research activities and reinvigorate the main streams of national and regional development. The programming system, once again, had to be improved. Because the objectives in the 1981-1985 plan are theme-specific, seven major committees were created, to deal with problems directly connected to the leading priorities. Three priorities of direct concern to agriculture were listed as "improvement of production systems in the forest zone," "knowledge, conservation, preservation, and exploitation of natural ecosystems, and man-made inland and marine systems."

The financial system has also made headway since 1972. When analytical accounting was introduced, funds could be calculated for each program instead of for each organization. Now, with multidisciplinary and multiorganization programs, it is easier to design a budget that matches the scientific plans.

Perfectible Programming Procedures

Despite numerous changes, the programming procedure still suffers from:

- * confusion between: i) political decisions, as evidenced by the allocation of funds to avenues of research that are in keeping with development priorities, ii) scientific decisions that favor research programs and operations needed to solve problems brought out for political reasons, iii) institutional/administrative decisions concerning program implementation proper;

- * the formal nature of representation from ministries and development agencies on the program committees. Because the number of committees has been reduced and their analytical responsibility broadened, meetings are now both too intensive and too superficial. Representatives of development agencies must make a big effort and devote a lot of time to thoroughly analyzing the programs. This is impossible for people actually responsible for development and who, therefore, are directly involved in the decisions, or even for delegates who are not specialized in keeping up with research. These representatives or delegates attend the committee meetings to glean information on research choices and activities, rather than to participate in decision-making work. Most decisions are left to MSR and the research institutes, which of course also take into account information coming from their constant contacts with development services outside of the program committee meetings (Section 3.4);
- * the fact that budget ceilings are not set beforehand, thus leaving program committees free to make an excessive number of insufficiently ranked proposals;
- * an absence of understanding of the relative weight of the various criteria used to rank programs submitted for evaluation (i.e., requirements of the plan, economic cost-benefits, scientific value, international dissemination, etc.) and perhaps of the need to allow research a certain leeway in the early phases of new programs which seem interesting because of the scientific methods used, their originality and their promising, but unconfirmed, results;
- * annual revision of all the programs;
- * calculations based on averages rather than on real costs (including fixed charges). As a result, some programs assigned to MSR cofinanced institutions may be under-funded.

These points of difficulty culminate in administrative cumbersomeness, waste of time for institution executives and scientists, and the need for retroactive financial regularization. All told, this clouds relations between scientists, scientific institutions, and MSR.

3.2.2 The impact of programming on relations between scientific institutions

The programming system, for the last 10 years, has been mustering cooperation -- previously nonexistent -- between the scientific institutions totally or partly under MSR control (including educational centers that receive research funds). The case of CIRES, which recently was removed from MSR jurisdiction and from the programming system, provides a counter-example of the advantages of this system.

Intensification of Relations between Scientific Institutions Totally or Partly under MSR Jurisdiction

Prior to 1971, the specialized institutes (later placed under GERDAT) and ORSTOM had a veritable monopoly on agricultural research in Ivory Coast.

They carefully coexisted, each working in a specific field, well-defined and more or less complementary, with their own network of relations inside the country and abroad.

Institutes carried out mainly applied research, and each handled all the research connected with a crop or group of crops within its domain. ORSTOM efforts went mainly into basic research on physical environments (soil, hydrology, botanical inventories, etc.) and social sciences (geographical, sociological, anthropological studies). Through the priority given to development-oriented inter-institutional programs, MSR was able to convince the specialized institutes to open their doors to ORSTOM and the young national research and education institutions.

As a result, ORSTOM had to restructure its teams (move away from scientific disciplines that focussed on the natural environment, increase its genetics, agronomy and plant protection staff) and embark increasingly on operations that catered to agricultural development. ORSTOM now plays a role in all major lines of production (except cocoa), and has special skills in research on coffee, rubber, rice, pineapples, and range lands (Table 8) and even guides and motivates research programs on coffee genetics and nematodes (for all crops).

Similarly, young national institutions (ENSA, Faculty of Science, IET, etc.) have been able to emerge from scientific isolation. The various program committees have helped by serving as a first-class arena for sharing information and establishing scientific contact, as centers of decision making for choosing and funding research operations, and as a go-between in discussions and joint efforts with the big institutions. MSR brought a "breath of fresh air" to the two educational establishments mentioned above. But its assistance cannot be further developed without closer contacts with higher authorities, who up to now do not seem to have understood the importance of, or the need for, active research to ensure high-quality education.

Paradoxically, relations between the GERDAT institutes have changed very little. The "forest" institutes are still working on their own specialities. Any interest they show in intercropping food plants results from individual contacts; there is no structured cooperation with counterpart departments in IDESSA. The "Savanna" institutes, which are departments of IDESSA, are haltingly beginning to work together, although there is not even a joint service (documentation) or a joint program for two laboratories working on the same discipline under the same roof (IRCT and ORSTOM entomology).

The programming system has not had any effect either on relations between similar disciplines of different institutions, e.g., geneticists, agronomists, plant pathologists, etc. These people generally do not even know each other. Most of the scientists are expatriates who do not feel the need for such relations in Ivory Coast, since they have adequate scientific support from the international network operated by their home institute. This situation must stop. If national agricultural research is to grow, interdisciplinary contacts will be vital for training, furthering education, and making more efficient/flexible use of the national cadres. This undoubtedly explains MSR's decision to expand ORSTOM's role in scientific cooperation, ORSTOM being organized into scientific disciplines. Were it to play a greater role, program costs could be reduced, which is very important.

The Ivorian Center for Economic and Social Research (CIRES):
the National and International Challenge of Social Sciences

CIRES was created by the University of Abidjan in 1971 but only "took off" in 1974. With strong support from MSR, it accepted responsibility for coordinating all of Ivory Coast's agro-economic research. Then it accepted leadership of the theme-specific program committee meetings on "the economic and human problems of rural development"⁶ and thus helped orient the GERDAT and ORSTOM programs in these fields.

CIRES itself conducted considerable research on the Ivorian rural environment and published its interesting findings in a national review called "Les Cahiers du CIRES." CIRES research was designed primarily as a tool for training activities at various levels. University teachers were encouraged to participate in research, so that the curriculum of the Faculty of Economic Sciences could be related to Ivorian realities.

Young national scientists⁷ were encouraged to participate, to facilitate the selection of future scientific staff for the center, etc. This policy of training in and through research is undoubtedly CIRES' most innovative contribution and should be widely adopted throughout Ivory Coast.

CIRES showed much success prior to 1979, when its structural ties to MSR were undone, because all of the educational facets of social science research were placed under the Ministry of National Education.

Financially, CIRES suffered little. With a solid reputation, a high degree of administrative independence, and complete freedom of negotiation within the country and with foreign sources, CIRES was able to garner considerable outside financial support⁸ and thus could expand its scientific staff, increase the number of scholarship holders, and enhance research operations more rapidly. As a result, CIRES became the largest, most dynamic national research institute, with 80% Ivorian staff. It also became the number-one scientific institution for social sciences in francophone tropical Africa. This rapid growth was rather well assimilated, since the main aspects of the former research and information policy were not modified. But the CIRES experience shows the serious shortcomings of excessive financial dependency on foreign technical assistance (administration and finance).

6 Only CIRES involvement in rural economics and sociology will be covered here. An excellent historical and sectional panorama is given in the document "Bilan et perspectives de la cellule agro-économie," CIRES, November 1981. These activities have secured funds to support the development of research in other fields (demography, industry, international economics) which at present occupies 40% of the CIRES research staff.

7 The CIRES document mentioned above contains a list of some 30 student theses prepared under the guidance of the center's scientists, generally with assistance from development agencies.

The first shortcoming is revealed when the foreign technical assistance organizations feel free to choose fields and partners for cooperation on the basis of their own interests (which might, or might not, match those of a specific institution), rather than to satisfy the priority, weighted needs of the recipient countries.

CIRES probably became attractive to these organizations because of the potential influence expected from the social sciences, which certainly merited support in Ivory Coast. But the preferential treatment, or even the exclusive assistance funneled through CIRES, would only be justified if the center were to be responsible for nationwide coordination and furtherance of social sciences. In the game of "open-ended assessment," many disciplines or fields that do not seem to wield influence, or that require heavy financial outlays, might remain outside the flows of aid.

The second shortcoming is shown in the fact that direct cooperation does not always help national multi-institutional and multidisciplinary activities of the type MSR tried to stimulate in the field of social sciences until 1979.⁹ CIRES, thanks to foreign aid, now has nearly all of the facilities it needs, and hence works less and less with other scientific institutions, even those studying production systems, a different priority subject for which a multidisciplinary approach is indispensable. MSR and its scientific institutions strongly feel the need for support from the social sciences (Section 3.4). The long-term outcome may be duplication of efforts in this field.

The third shortcoming relates to the risk of material and, even worse, intellectual, dependency. Nearly all of the researchers being trained spend two or three years in a foreign country. This causes a problem of "scientific in-breeding" and the more general problem of "reintegration" upon return discussed in Section 3.5.1.

One final comment on CIRES: the motivation of the scientists and the flexibility and efficiency of administering resources provided through foreign assistance without intermediaries, clearly illustrate the value of decentralizing scientific technical assistance, which should be done after the substantive issues and the resources have been negotiated, and accepted, by the senior administrative and political authorities.

8 In 1981, 80% of CIRES operating costs (total: approximately 100 million CFAF) were paid out of foreign aid (U.S.A. and Canada) which also provided 35 scholarships for training in North America. Wages for national staff -- 22 scientists of which 12 worked in agro-economics, as against 9 in 1980 -- were paid directly by the Ivorian Public Service.

9 MSR publication, Program Committee, No. 19, 1979. Economic and Social Problems of Rural Development, (in French).

3.2.3 Relatively satisfactory control of the research system

When the programming system had been finalized and then applied by MSR, Ivory Coast was at least able to exercise some degree of control over research conducted within its territory. This policy has been both efficient and realistic, since it has gently but firmly alerted the foreign institutions working in Ivory Coast that were respected for the quality of their work, and appreciated for their significant financial contribution. An evolution of this magnitude is never free of tension or cost, since the procedure always needs improvement (proposals in Section 4.3). This evolution was beneficial, not only for Ivory Coast, but also for all of the research institutions and scientists concerned, as is clearly seen when one looks at their capacity to openly and critically redesign their activities to meet the needs of development and the rigors of science.

Although at times it appeared to be more restricting than encouraging, the programming system has always had a clear-cut educational purpose. It has even had an influence in other countries, through foreign institutions established in Ivory Coast or visiting scientists. The next section presents the effects of programming on the evolution of programs and the gradual emergence of a genuinely national agricultural research program.

3.3 Research Programs: Qualities and Defects

The analysis bears mainly on programs in progress and, whenever possible, refers to past experience (especially programs that have been completed) and to possible future orientations and trends. Since it is not possible to make a systematic examination of each of the programs and research operations, this section is limited to an overall critical analysis that will, of necessity, remain fragmentary, since problems of adaptation and program priorities pari passu, development needs, and available resources, are studied in Section 3.4.2 and Section 3.5.3.

3.3.1 Introductory presentation based on key goals

MSR's constantly stated desire to work on development and, in compliance with the last (1981-1985) 5-year plan, to pay more attention to the savanna zone, the food crops, the farmers, could give the impression that emphases are quite out of balance. This initial impression is heightened by the existence of a multitude of scientific institutions working on industrial and export crops in the forest zone. What is the truth of the matter?

The Thrust of Research Is on the Improvement of Production

Nearly 80% of the research scientists devote their time to improving crops and production systems (Table 8). This indicates the priority given to research directly related to development, as compared with basic studies in the natural environment and in the field of social sciences.

Forest and Savanna

If scientists are listed according to the major ecological zone of their work, rather than according to home base (Table 6), we see that there are 110 for the forest zone, 81 for the savanna, and 17 for the two combined. This is a rather satisfactory breakdown, considering the relative importance of various crops, the potential of these two prime regions of Ivory Coast, and the desire to accelerate development in the less-endowed savanna. The equilibrium achieved during the last 20 years, thanks to the development of research on food crops and sugar, and the expanded efforts of ORSTOM in the north, hides an imbalance within each of the two zones, as will be seen later.

Major Plantations and Farmers

Analysis of agricultural holdings growing specific crops indicates that 68 scientists (including 12 Ivorians) work mainly for the large plantations, and 95 (including 25 Ivorians) for the small farmers¹⁰, who are clearly undervalued, since they generate 75% of the GAP.

Industrial/Export Crops and Food Crops (Table 8)

Ninety-one scientists work on the so-called industrial or export crops, including sugar cane, oil palm, cotton, and to a lesser extent cocoa. A portion of these crops, of course, are intended for domestic consumption as food for people (sugar, oil), or for animals (byproducts), or other uses (textiles, soap, etc.). Fifty-four scientists specialize in animal production (which includes fodder production and fisheries) and food crops. This is not enough, considering the expected growth and the dearth of scientific knowledge. Research on food crops in Ivory Coast began after 1963, when IRAT set up a unit in Bouaké.

3.3.2 Commodity-specific programs occupy 80% of the scientists

Commodity-specific programs are carried out by 165 scientists (Total staff: 207 Ivorians and expatriates -- Table 8). Before describing the three distinct types of programs in terms of their resources, one should consider the characteristics they all have in common:

- * They are run by GERDAT, with relatively substantial ORSTOM inputs,¹¹ and marginal participation by national Ivorian institutions, except as concerns the new "small programs," devoted to food crops, where the participation is better balanced.

10 The large plantations are devoted to: forests, poyo bananas, rubber, oil-yielding plants, sugar. The smallholder farms grow all the savanna crops except sugar cane, forest food crops, plantain bananas, various fruits, coffee, cocoa, kolanut, fish.

Table 6. Agricultural scientists per region studies (1981).

I = Ivorian F = Foreign T = Total I + F	GERDAT			ORSTOM			ENSA-Fac.			CIRES			OTHER (a)			TOTAL		
	I	F	T	I	F	T	I	F	T	I	F	T	I	F	T	I	F	T
FOREST	11	57	68	3	22	25	6	1	7	2	1	3	5	3	8	27	84	111
SAVANNA	11	35	46	5	25	30	1	1	2	2		2			19	61	80	
National or unspecified	-	-	-	1	5	6	1		1	3	1	4	6		6	11	6	17
TOTAL	22	92	114	9	52	61	8	2	10	7	2	9	11	3	14	57	151	208

Sources: Annex Tables 1, 2, 3 and 4
(a): Other institutions: IET, CNF, IGT, Swiss Center

Table 7. Scientists per line of production.

I = Ivorian F = Foreign T = Total I + E	GERDAT			ORSTOM			OTHER			TOTAL		
	I	F	T	I	F	T	I	F	T	I	F	T
FOREST (a)	2	5	7		9	9	5	2	7	7	16	23
Ind./Export crops	11	59	70	2	15	17	3.5	0.5	4	16.5	74.5	91
Food crops (b)	9	18	27	2	16	18	6.5	2.5	9	17.5	36.5	54
TOTAL	22	82	104	4	40	44	15	5	20	41	127	168

Sources: Table
(a): CIFT and Tai forest programs
(b): Food crops, animal and fodder production, fishing

- * Most of them receive support from the GERDAT institutes and the ORSTOM network, composed of permanent installations in France (near Paris and Montpellier, overseas "départements" (French West Indies, Guyana, New Caledonia, etc.)), and in most countries of francophone tropical Africa. The network includes constant contact with French scientific institutions (National Institute for Agricultural Research, universities, etc.) and cooperative efforts with many tropical countries of English-speaking Africa, Latin America, Southeast Asia, and also with international centers for agricultural research. The support provided is scientific (methodology, specific work of concern to Ivory Coast also, short missions, sabbatical year for French researchers to finalize results and publications) and logistic (exchange of plant material, documentation, sophisticated chemical analyses, biometric and technological processing, international publication, and dissemination of results). This makes the scientists more effective in planning orientations, methodologies, data processing, and analysis.

The final result is close to a 100% increase in the scientific potential of GERDAT and ORSTOM scientists working in Ivory Coast.¹²

The Major Programs: In the Vanguard of International Tropical Research

Major programs are focussed on pineapple, poyo bananas, coffee, cocoa, rubber, oil palms, coconuts, cotton, and rainfed rice.

They stand out because of:

- * the large human and material inputs: each engages between 7 and 18 scientists, and together these programs occupy nearly half of Ivory Coast's agricultural scientists (98 scientists, including 63 GERDAT expatriates, 17 ORSTOM expatriates, and 17 Ivorians);
- * the multidisciplinary organization of the teams. Most have "solid nuclei" of people from disciplines such as genetics, plant improvement, physiology, plant protection. The network provides the complementary support for disciplines not represented within the teams. The social sciences are sorely missing; there is no social scientist working on program orientation, implementation, or evaluation;

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- 11 The role of ORSTOM is more important than it seems, since ORSTOM plays a decisive role in developing methodologies for certain disciplines such as genetics, and seconds some 15 scientists to the GERDAT institutes in Ivory Coast, mainly to the "major" programs.
 - 12 There is no happenstance in the suggested 100% potential increase. The explanation is that GERDAT and ORSTOM employ about 2 scientists in France for every three employed abroad. The former work largely for the latter or complete research started abroad prior to reassignment.

Table 8. Research programs and human resources.

I = Ivorian F = Foreign T = I + F	GERDAT			ORSTOM			OTHER INSTITUTIONS			TOTAL		
	I	F	T	I	F	T	I	F	T	I	F	T
Oil-palm	1	15	16		0.5	0.5	1		1	2	15.5	17.5
Cocunut	2	6	8				0.5		0.5	2.5	6	8.5
Rubber		8	8		5.5	5.5	0.5	0.5	1	0.5	14	14.5
Coffee	1	5	6		4	4			0.5	1	9	10
Cocoa	1	8	9				0.5			1.5	8	9.5
Pineapples	1	5	6	1	1	2	1		1	3	6	9
Poyo bananas	1	4	5	1	2	3				2	6	8
Rice	3	7	10	1	3	4				4	10	14
Cotton	1	5	6	1	1	2				1	6	7
1. MAJOR PROGRAMS	11	63	74	3	17	20	3.5	0.5	4	17.5	80.5	98
Forest (CIPT)	2	5	7		1	1				2	6	8
Animal production-rangelands	4	7	11		2	2		1	1	5	5	14
Sugar cane	1	3	4		1	1				1	4	5
2. INTERMEDIARY PROGRAMS	7	15	22		4	4		1	1	7	20	27
Other fruits (a)	2	1	3				1		1	3	1	4
Market crops					3	3					3	3
Fish-farming (b)		1	1				4		4	4	1	5
Tubers and Root crops (c)	1	1	2	1	1	2	1	1.5	2.5	3	3.5	6.5
Other cereals (d)	1	1	2		4	4				4	4	4
Crop production systems		10	10		3	3	0.5		0.5	1.5	4	5.5
					2	2				12	12	12
3. SMALL PROGRAMS	4	14	18	1	13	15	6.5	1.5	8	11.5	26.5	38
4. PROGRAMS PER COMMODITY = 1+2+3	22	92	114	4	34	38	10	3	13	36	129	165
TaI forest				2	8	8	5	2	7	5	10	15
Other inventories (e)					8	10	3		3	5	8	13
5. INVENTORY OF NATURAL RESOURCES				2	16	18	7	2	9	10	18	28
6. RURAL ECONOMY AND SOCIOLOGY (f)				3	2	5	7	2	9	10	4	14
7. OTHER PROGRAMS = 5+6				5	18	23	14	4	18	20	22	42
8. GRAND TOTAL = 4+7	22	92	114	9	52	61	24	7	31	56	151	207

Sources : Annex, Tables 1 to 4

Notes: The word "program" (a more or less coherent combination of operations) is described in the text.
 First col. on the left: the dotted horizontal line separates programs which essentially fall under a single organization, except for the last two intermediary programs and the first three small programs.
 (a) Plantain bananas, citrus fruits, etc.
 (b) CIPT fish-farming and IET hydrobiology
 (c) Yam, cassava, taro
 (d) Maize, millet, sorghum, fonio
 (e) Work on the atmosphere and climate, hydrology, soil sciences, vegetation.

- * the choice position generally reserved for these commodities in the GERDAT and ORSTOM networks. These programs unquestionably give as much, or more, than they take, and enjoy relations with the most respected scientific institutions of the Third World (Brazil, Malaysia, Indonesia, etc.) working on similar commodities, and with international centers for agricultural research, such as IITA and WARDA for rice. The accumulated experience (20 to 30 years of research or even more), the resources deployed, international scientific relations and contexts, have enabled these programs to use or finalize scientific methodologies (especially in genetics and plant physiology) and to obtain scientific and technical results of high international quality.

Noteworthy among these results are:

- * the establishment of outstanding germplasm conditions for the major crops, notably for coffee, cocoa, oil palm, coconuts, cotton, rainfed rice;
- * development of new, high-yielding varieties, or varieties with distinct improvements: Arabusta coffee, glandless cotton, pest and disease resistance in rice, etc. Certain varieties are grown commercially throughout the world (oil palm, coconut, rice);¹³
- * advances in disciplines such as plant protection, and nutrition-fertilization, which make it possible to reduce industrial and labor inputs;
- * the definition of "optimal" cropping parameters, more often than not, as will be seen in Section 3.4, adapted to intensive, modern production methods;
- * numerous publications in specialized scientific periodics, activity reports from GERDAT institutes and ORSTOM in renowned foreign scientific magazines, active participation in international seminars, etc.

For most of the commodities mentioned above, there are a few, mainly private, sophisticated specialized scientific institutions, e.g., research departments of multinational agro-industries, that usually keep their findings confidential. The Ivory Coast programs, by contrast, have become worldwide "public leaders" or "coleaders" and, with consent from MSR, GERDAT, and ORSTOM research centers in Ivory Coast regularly receive large numbers of visitors and trainees from other Third World countries.

13 The IRAT rainfed rice varieties selected at Bouaké have been recognized by WARDA (Activities Report, May 1982) as having "a better capacity to adapt than others, both in the savanna and in the humid zone" of Africa, and have been adopted in other continents also.

The Intermediary Programs: Insufficient Internal Resources

Considering their large research and development requirements, the forest, animal production-rangelands, and sugar cane programs, do not receive adequate resources.

The interdisciplinary team at CTFT (Forestry Center) is far too small to solve the research problems associated with rational harvesting and regeneration of the Ivorian forests now threatened with extinction. Despite the material aid provided by SODEFOR as a development agency, CTFT still has to limit its work to a few high-priority areas. Nothing is done in the field of agroforestry (agroforestry, agro-sylviculture, and sylvopastoral systems). The northern area of the country is totally neglected. And there are no relations with the Taï forest project, conducted in the southwest by 15 national and foreign scientists who are studying the biological aspects of primary forests and forest clearance.

Institutional research on animal and fodder production is concentrated at the Bouaké CRZ. The methodology used in the genetic improvement and evaluation program for the local breed of cattle in its natural environment is interesting, as is the work on fodder development. But only a small part of the needs are satisfied, because animal production development targets are very ambitious: to triple the cattle stock in 20 years, settle animals in the forest zone where there is no CRZ program, satisfy domestic demand for sheep, swine, and poultry products. SODEPRA also works to help meet these targets.

Research on sugar cane is conducted through simple, precise yield-improvement experiments on varieties and agro-technology (fertilization, irrigation) in plantations, together with SODESUCRE. Here again, there is not enough personnel capable of dealing with the difficult problem of establishing an intensive production model (initially favored by the development services) in the six agro-industrial complexes located somewhat distant from each other and outside the boundaries of the ecology plan.

The Small Programs: Traditional Food Crops and Abandoned Production Systems

The title refers to the programs on "other fruits" (including plantain bananas), cereals other than rice (maize, millet, sorghum, fonio), traditional root crops (yam, cassava, taro), market crops (SODEFEL's speciality)¹⁴, fish-farming, agricultural farming, and production

14 Research per commodity covers a wide variety of work: problem detection, experimentation, introduction and creation of varieties (maize, yams), constitution of international and national collections (millet, sorghum, taro, okra, etc.), definition of elementary cropping parameters.

systems.¹⁵ Actually, one cannot speak of a program per se, but rather of recent, isolated research operations usually conducted by two or three research scientists, without formal cooperation between the many institutions that participate.

These small programs generate useful results that can serve as an excellent starting point when more resources become available. But they are woefully inadequate, considering the importance of the commodities involved.

Most food crop research is centered in the savanna zone. Here again it is inadequate, except for rice. But most food crops are grown in the forest zone (85% of the cassava, 71% of the rice, 57% of the yams, 52% of the maize). In the forest zone, the need to develop research on food crops is seen as a priority, since "the stabilization of food crops and their integration into production systems based on perennial crops such as coffee, cocoa, rubber, palm trees, etc., should make it possible to limit the anarchic destruction of the forests, overcome land tenure restrictions in certain zones, and introduce part of the food products into the trade circuits."¹⁶

The institutes located in the coastal area have begun working on this priority, but each tends to limit its experiments to food crops that can be combined with perennial crops, mainly through intercropping, which is profitable for plantations but not sufficiently productive to meet national goals.¹⁷ These experiments may be costly and risky, since they are introduced and adopted by institutes assigned to other specialities.

Usually, when speaking of traditional food crops, reference is actually being made to mixed cropping and complicated production systems, which need to be better understood if they are to be improved. As we have seen, research in these fields is carried out by a handful of scientists working in the savanna zone. The forest zone is neglected and, what is more important, so is the intermediary Guinean savanna, where rainfall is

15 The production and crop systems program is listed under small programs, although it includes 12 scientists. This is because they belong to five different institutions and departments, and work on 14 different research operations ranging from single-discipline research on bioclimatology, soil sciences, agronomy, to more aggregate research subjects such as production and cropping systems; the latter subjects constitute the only justification for attaching the researchers to the particular commodity referred to in the production system research. The production and cropping system program actually only involves 6 research scientists (5 work in the savanna zone, 1 in the forest zone) without counting the 3 "single-discipline" scientists from CIRES (Section 3.3.3).

16 MSR publication: Improvement of production systems in the forest zone, 1981, p. 83, (in French).

17 Food crops can usually only be intercropped in the perennial plants for two or three years, and cannot be grown on more than 10,000 ha to 20,000 ha; this depends upon the frequency of plantations replacement.

bimodal. This research requires an interdisciplinary approach that cannot be developed without substantially increasing the number of economists working with the technical research scientists. At present there are only two for all of Ivory Coast. Yet this research should make it possible to rank development needs and constraints more accurately, and thereby better assess the importance and level of priority programs currently in progress or planned for the future.

3.3.3 The other programs: natural environment and social sciences

Inventories of Natural Resources

ORSTOM has long had a monopoly on research in this field in Ivory Coast. It has accumulated a considerable mass of information, especially in pedology and hydrology.¹⁸ On the basis of work done in Ivory Coast and in other tropical and subtropical¹⁹ countries, ORSTOM was able to develop an international reputation. Research in these disciplines has slowed, however, and now is limited to testing and finalizing new methodologies such as remote sensing for map making and rain simulators for studying runoff and infiltration.

Alongside its single-discipline work, ORSTOM has recently been working, with national institutions such as IET, on multidisciplinary work that serves to acquire global knowledge of the natural environment, e.g., the Tai program, mentioned earlier, which is vital to understanding the dynamics of natural and planted tropical forests. This explains the international interest of the program and the support obtained from UNESCO's MAB (Man and the Biosphere) project.

The Social Sciences

Here again, in the 1960s and the 1970s, ORSTOM pioneered through its historical and anthropological research on economic organization, the social stratification of small regions, transformation of the small regions as a result of the development of the market economy, migration patterns, adoption of innovations, etc. In most cases this work was done through lengthy, individual doctoral theses (thèses d'Etat), which are an accumulation of knowledge of the mode of living, working, and

18 In pedology: inventory, map genesis and evolution of the soils, assessment of fertility and rules on conservation methods, etc.
In hydrology: definition of flow patterns of the country's principal waterways, study of catchment basins, etc.

19 Inventories of resources were made with support from the ORSTOM network, in particular the Bondy-Paris research center, and the associated university laboratories.

evolution²⁰ of certain of the ethnic groups, such as the Baoulé, Senufu, Akié, Guéré, Bété, and Lobi.

These writings should form part of the Ivorian cultural heritage, but they have not been kept, or updated, or used, to provide the profound sociological knowledge needed for formulating development projects.

IGT, GERDAT, and CIRES began working in the rural social sciences later and extended the horizons of knowledge to include studies related directly to rural socioeconomics, focusing on three themes defined in conjunction with MSR²¹:

- * the evolution and transformation of agricultural production structures and systems;
- * the orientation of agricultural production (the market chain, price policies, etc.);
- * the organization of rural development, problems related to agricultural development strategies and methods, including the role of agricultural development agencies, cooperatives, and agro-industries.

Stimulated by MSR, the research institutions began to work more closely with each other (especially CIRES and GERDAT) in their study of production systems. But these relations gradually disintegrated after CIRES was removed from MSR jurisdiction in 1979.

Social sciences applied to rural development got off to a tardy start. The quality of the work was satisfactory, but there was too little of it. Efforts were continued by CIRES, IGT, ORSTOM, and GERDAT, four institutions that improved their institutional relations and then began working with MSR on research, not only specific to the social sciences, but on multidisciplinary work devoted to production systems, the importance and urgency of which was emphasized earlier.

3.4 Variegated Link with "Development"²² and Impact on Production

In Ivory Coast, the organization of agricultural production and marketing varies greatly, depending on the commodity.

20 This work included complete analyses of production systems (before the term became so popular), with an effort to understand techniques and, later, the application of a multidisciplinary approach by social scientists, who were encouraged by the proximity of their technical colleagues.

21 MSR publication: Program Committee, No. 9, 1979: Economic and Social Problems of Rural Development, p. 88, (in French).

For most food crops, liberalism is the name of the game, and in the rare occasions when the state contacts the private sector, it is usually to offer indirect incentives intended to regulate the production and consumption markets, e.g., information, assistance in storage problems, imports (with anticipated impact on prices), some research, etc. Consequently, the state is often involved with the industrial and export crops through state development agencies (SODES) and basic governmental decisions concerning major options, investments, and prices.

Before attempting to assess the impact of research on production, an analysis must be made of the relations between the research institutions and the production "operators," especially those concerned with the various links in the agricultural chain, such as the development agencies.

3.4.1 Links with development: breach of harmony with development agencies (SODES)

Agriculture falls under four ministries: Ministry of Agriculture for Plant Production, the Secretariat of State for the Promotion of Food Crops (recently created), the Ministry of Animal Production, and the Ministry of Waters and Forests. Because field responsibilities overlapped and there was a need for choices and arbitration, the suggestion was made that an interministerial committee on rural development be established, comprising representatives from the above ministries, and from the ministries of Scientific Research and Domestic Trade. The committee was to be placed under the jurisdiction of the Ministry of Planning and the Presidency, but as yet it has not been established.²³

The "SODES" are fully or mainly state-financed development agencies created by the government and placed under the jurisdiction of the most directly concerned ministry. By statute, they function as private companies with great flexibility and independence in their management and actions, within the limits of the directives and orientations stated in the plan which, in any case, they usually have helped prepare. Their relations with research institutes changed considerably at the end of the 1970s when many were liquidated, funding was heavily reduced, and sectorial agencies became regional.

22 By "development" (in quotes) we mean all the public "operators" (ministries, development agencies, national agricultural development bank, etc.) and private "operators" (enterprises supplying factors of production to the producers, or responsible for collecting products or marketing it), and professional "operators" (cooperatives), who play a role in the organization of production and marketing of agricultural products, and in bettering of the living and working conditions of the rural population.

23 For a few years after independence, coordination was provided by the President of the Republic, who was also Minister of Agriculture, and there was one ministry for all lines of production.

Until 1977-1980 Preferred Relations Bound Research
to the Sectorial SODES

Most SODES were created between 1960 and 1973 to develop specific commodities or groups of commodities²⁴ that were selected because they fit in with the sectorial activities of the GERDAT institutes. SAMARCI, for instance, specialized in coffee and cocoa; its counterpart was IFCC. SODEPALM's was IRHO for oil palm, coconut palm, etc.²⁵

This situation, quite naturally, favored the development of close functional and formal relations between these counterparts (animal production is a recent exception). The Board of Directors of each sectorial SODES included a representative of the counterpart research institute, and SODES was a member of each theme-specific program committee of MSR. Furthermore, each SODES had research workers from the counterpart institute seconded to posts that held executive, advisory, or even managerial responsibilities.

Such relations imply ongoing dialogue between research and "development," but further on one will see that this dialogue has not always been efficient or adequate to ensure the best orientation for research or the most efficient dissemination of results to the producers.

Present Transitional Situation: Ill-Defined Relations
with Regional SODES

Significant changes were made in SODES when the new agricultural and rural development policy was put into effect (Section 2.2). Three sectorial SODES were assigned to apply the agricultural policy in the country's three major geographical climatic regions: SODEPALM in Basse Côte (south), SATMACI in Moyenne Côte (center-south), and CIDT in the savanna region. These three SODES, besides their own activities, supervised the other sectorial SODES (SAPH, SODEFEL, SODEFOR, SODESUCRE) in the development of the commodity they covered, and in the promotion of food crops no longer covered by a SODE (SODERIZ, for example had been closed). Their line of action was supposed to have changed gradually, with the main emphasis placed on their technical supervisory capacity which, in the future, was to be directed not to the individual farmer, but to the "cooperative groups" responsible in part for supply, collection, management, and credit.

Actually, development is now at a rather sensitive stage, because of the time required to implement assigned transformations and the drastic savings made necessary because of the "crisis" that directly affected SODES, which previously enjoyed a relatively comfortable existence. This

24 The history of the SODES is rather complicated. The name, numbers, and assignments in general developed throughout the years in keeping with problems encountered, degrees of success, changes in agricultural policy, etc.

25 Two state companies operate at the regional level, viz., ARSO and AVB which are responsible, respectively, for the development of the southwest and the development of Bandama Valley.

means that SODES will have to face their new -- generally expanded -- functions with smaller budgets, less staff (two-thirds less at SATMACI) who maybe less motivated because of wage cuts, concern about their professional future, and inadequate preparation for their new functions. Most SODES, in the light of the above, tend to prioritize their former activities, even if they are to be carried out on a smaller scale.

The relations with research show this clearly. The old, formal ties are now reduced to participation in the new MSR regional research committee (Section 3.2.1). The functional relationships are deteriorating rapidly: resources are short, funds for hiring skilled personnel and for conducting studies, research, and experiments, are seldom forthcoming, etc.

Formerly, cooperation was extensive and marked by mutual confidence. Now there are even signs of competition financed partly through foreign loans.²⁶ Most of these endeavors include a "research-development" phase that SODES prefer carrying out alone, with a minimum of assistance from the research institutions.²⁷ The hazy border between the responsibility of the research institutions and that of the development agencies in the field of research-development is made more so because of the financial difficulties.

This is a very serious problem for the research institutions, for both methodological and financial reasons. Our point of view on the matter is expressed in Section 4.4 ("The interface between research, development, extension, and production").

3.4.2 Impact on production: research seriously underutilized and limited

Good relations with "development" do not guarantee efficient, widespread dissemination of the findings of research. Effective dissemination of research results also depends on the nature of the suggested innovations²⁸ and the degree of their usefulness to the producers.

26 Examples: north, northeast, and center-west projects costed at approximately 20 billion CFAF (over 5 years), cofinanced by the World Bank and French Technical Aid (CCCE -- Caisse Centrale de Coopération Economique).

27 We have seen that this behavior may, on the one hand, be justified because of shortcomings in research observed or purported by development services (absence, insufficiency or impropriety or results) or, on the other hand, be induced by foreign (bilateral and international) financial and technical aid which, in quest of efficiency, all too often tends to give preference or strengthen work carried out by their direct national partners. This in some cases is detrimental to the work done by other national institutions.

28 Agro-ecological environment, land entitlement, and size of production unit, "profile" of the producer (age, educational level, etc.), availability and price of factors of production (labor inputs, fertilizers, equipment, credit), marketing system and opportunities, technical guidance, etc.

A wide variety of innovations produced by research may be selected for adoption because of the great variation in Ivorian production and marketing. There are three major production groups: recently introduced industrial/export crops, traditional export crops (coffee and cocoa), food crops. Technical progress in the three groups, brought about as the result of research, has been, respectively, very significant, fair, and very slight.

Recently Introduced/Export Crops (IEC): Very Significant Progress, Thanks to Research

A distinction should be made between the crops produced on large plantations (palm oil, coconut, rubber, fresh pineapple, export bananas), and essentially on small farms (cotton, pineapple for canning).

Industrial/Export Crops are cultivated on a small number of well-financed and well-staffed public and private plantations²⁹, mostly designed and set up according to recommendations from specialized research institutes, such as IHRO, IRCA, and IRFA, with which close relations have often been maintained either directly or via development agencies, such as SODEPALM, SAPH, SODEFEL. This system has made it possible to improve technical and economic performance through the introduction of more productive, disease-resistant varieties, more efficient fertilization, plant treatment, and collection methods, etc.

One of the main problems facing all of the plantations is that farm prices depend on the international market, which explains current production stagnation and decreases, as well as forecasted growth, except for rubber. Other problems are more specifically related to individual commodities.

Oil palm, coconut, and rubber plantations are usually state owned and employ mainly foreign labor. It seemed socially important to interest national producers in these crops by creating modern village plantations alongside the industrial plantations, which explains the increased prices for producers, the availability of credit facilities, the payment of bonuses and, on the research side, more work on reducing the labor requirements (IRCA developed a new latex collection method which, between 1975 and 1980, reduced the number of tappers per ha from 30 to 8), simplification of cultural techniques, introduction of intercropping with food crops. IRHO even took over a whole village plantation and, with the help of the local population, has been selecting and choosing future planters.

29 Oil palms: some 15 industrial plantations (12 are run by the state through PA/INDUSTRIE) produce 77% of the output; the rest comes from village plantations. Coconuts: 8 industrial state plantations producing 81% of the yield, 12 village plantations. Rubber: 9 industrial plantations (including 1 state and 4 joint ventures, the biggest are run by SAPH), 2% of the output comes from 3 village plantations. Fresh pineapple: 110 private planters (3 or 4 of them produce 50% of the output); small farm production: 10%. Export bananas: 800 private planters (including 4 or 5 companies or groups that produce nearly two-thirds of the output); small farms produce 30%.

Plantations growing fresh pineapples and bananas for export must live up to high standards. Most are in the hands of private planters (individuals or companies). Between 1970 and 1978, plantations grew steadily, encouraged by a bullish foreign market, close cooperation with professional organizations, such as COFRUITEL, which supplied production inputs and marketed the output, SODEFEL which provided technical supervision, and IRFA which provided personnel for COFRUITEL and SODEFEL. The situation deteriorated when problems arose with the export market, job losses, increases in the prices of industrial components, and production inputs (fertilizers, pesticides, hormones) needed for technical and economic reasons, breakdown of group discipline (no bonuses for quality), and the withdrawal of SODEFEL. Plantations are becoming smaller, technically and financially less sound. The benefits accrued may be seriously jeopardized if COFRUITEL does not very quickly resume authority over the planters and provide technical supervision. In the meantime, IRFA's "warning station" at Niéky in the main banana-growing region, which had worked out an interesting analysis-advice system for the planters, will soon have to discontinue its work if it is not taken over by a professional service.

IEC Cultivated Mainly on Small Farms

Seventy-five percent of the pineapple for canning and 100% of the cotton are grown on smallholdings. Both are relatively new crops that must work closely with the processing industry for the provision of plants and seed, production inputs, technical guidance, collection and payment of harvests. In regions where these crops constituted the only possible source of cash income for the farmers, they enjoyed rapid popularity when they were introduced and, improvements through research, spread rapidly.

The success of cotton has continued thanks to relatively high guaranteed prices and efficient help from CIDT, working closely with IRCT (the fiber plants department of IDESSA), which created and multiplied improved seed, carried out multilocation trials (varieties, herbicides, pesticides, fertilizers), tested the quality of the cotton fiber, etc. Through a combination of these efforts, average cotton yields rose from 800 kg/ha on 30,000 ha in 1960-1970 to over 1,100 kg/ha on 110,000 ha in 1976-1981.

Pineapples for canning experienced early success and then ran into difficulties. International competition ("dumping" from Thailand) has had a negative impact on the Ivorian processing industry, forcing producer prices down to a level that disheartened the farmer-planters into forsaking the crop. Here, as with fresh pineapples and bananas, the work done by IRFA, SODEFEL, and the factories that helped production rise spectacularly, is going to be largely lost.

Traditional Export Crops (Coffee, Cocoa): The Slight Effects of Research

Research only had a slight impact here because of the characteristics of both coffee and cocoa, which gained popularity as a result of attractive guaranteed prices and readily available lands. Furthermore, SATMACI intervened little. It provided supervision for 5% of the coffee growing

area (70,000 ha out of a total 1,300,000 ha) and 11% of the cocoa-producing area (110,000 ha out of a total 950,000 ha). On these lands, the divorce between the extensive cultivation practices of the planters, and the norms for intensive cultivation adopted by SATMACI³⁰ seems to be final.

Research carried out by IRCC suggested a few innovations that were recommended by the development agencies (new varieties, sizes, weeding, fertilizers, etc.). They were easy to apply and highly profitable, but the farmers, eager for more land and confronted with labor problems (most labor is foreign, scarce, itinerant, unmotivated), were skeptical. Yields were double those recorded in the traditional coffee and cocoa fields (0.3 t/ha and 0.45 t/ha respectively), but were far below yields obtained in experimental plots (4.6 t/ha and 4.5 t/ha respectively). "As long as there are forest lands to move into, technological changes will not be readily adopted."³¹ The southeast, where land is reaching the saturation point, is the only area where intensification and the adoption of IRCC research has slightly increased output.

Was IRCC research too advanced? Could it have examined the present mode of production and helped the farmers progress gradually? This might have been possible. Research did quite rightly point out the very high opportunity cost of the current land tenure system.

The same line of questioning could be applied to the research program on Arabusta coffee (a cross between Arabica and Robusta), which represents a significant scientific breakthrough, but there is little chance of popularizing it throughout the country. Arabusta could be more widely sold on the market, but since yields are low, total income for the producers would remain unchanged. The cost of treating the berries (wet treatment) is higher. Furthermore, since it is not easy to distinguish between Arabusta and Robusta berries, it would be difficult, if not impossible, to set up a collection and payment scheme for Arabusta in the small production centers.

At best, therefore, Arabusta could be attractive for the large, modern plantations.

Food Crops: Modes of Cropping Continue to be Traditional

Food crops are grown by a large number of producers and on a large part of the agricultural lands, using modes of production that have changed little since independence. Research has limited resources and, working alone, cannot hope to bring about significant change. Even for rice, a

30 de la Vaissière, P., Evolution structurelle 1965-1975 de l'économie de la plantation en Côte d'Ivoire: croissance sans changements techniques, Paris, Economie Rurale, No. 147-148, Jan.-Mar. 1982, pp. 102-110.

31 Affou, Y. "Le changement technologique dans les grandes plantations villageoises est-il pour aujourd'hui?", Paris, Economie.

product that enjoys substantial research facilities, in the absence of good marketing, pricing, and supervision, it will not be possible to spread findings extensively.³²

The Other Commodities: Wood, Sugar, Animal Products

Work done by CTFT and the Tai project has not changed in the least the current tendency to waste the forest lands. For sugar and animal products, modern production installations have been built using technology from abroad, without consulting the local research services which now, at least for sugar, must help find solutions to a multitude of problems.

In sum, and in view of the respective importance of the commodities itemized in Table 2, research has only had an effect on products whose combined value represents about 7% of the GAP, a very limited impact on coffee and cocoa, which account for 30% of the GAP, and practically no influence on the rest. This means that in the past, research has had a rather slight influence on agricultural products, but cannot be blamed, because it was not at all well used in the (too extensive) growth model and had limited opportunity to work on food crops.

3.5 Human, Financial, and Material Resources: Undue Dependency

The human, financial, and material resources applied to agricultural resources in Ivory Coast need to be weighed against development needs.

3.5.1 Human resources: the problem of good quality Ivorianization

A study of structure and programs (Section 3.1 and Section 3.3, Table 5 and Table 6) indicates:

- * that there are too few research scientists to handle the many programs, and in certain disciplines this shortage is aggravated by too many obligations to MSR, development agencies, missions (meetings, trips, visits, etc.);
- * that there is too little participation by national scientists (61 out of 212 research scientists), especially in foreign institutions (31 out of 178) and in the major research programs devoted to industrial and export crops, on the other hand, there is a high Ivorianization rate in new (limited) programs for food crops and in the young national institutions;
- * that the problem of technicians is very serious.

32 In 1975-1976, the producer prices were set high enough to bring about a big -- temporary -- production increase, thanks mainly to an extension of the cultivated lands. Imports were very small.

Of the above three problems, the second is the most serious, since the country will only be able to control its research activities unless scientific leadership is in the hands of Ivorians. One point is important to remember: the national authorities do not want to embark upon hasty, ill-prepared Ivorianization which would compromise the scientific potential. National research personnel should be selected and trained under good conditions, which presupposes a clear understanding of the weaknesses of the present Ivorianization system.

Shared Blame for the Current State of Ivorianization

Reasons underlying the scanty participation of Ivorians in research activities emanate from national causes and from the past behavior of the leading foreign institutes.

National causes. The most important in the past has been that recent graduates were more attracted to development agencies (SODES), which offered more responsibility, more authority, higher salaries, and benefits in kind, than did the scientific institutions. Nothing about research was appealing: the schools devoted little attention to research which, therefore, was not well-known, it was considered as an in-laboratory activity requiring length studies and hard discipline; little support through wages and statutes (there were none). It was seen as an area for people with a special calling or incapable of doing anything else!

During the last few years, the image of research has been improved. Statutes have been established for research workers (but not for technicians), who now have job security, higher wages, and more job offers. These motivations attract young graduates, especially since the SODES are suffering from the economic crisis and have had to reduce salaries, benefits, and staff numbers. Moreover, efforts have been made to teach students about research through information-sensitization courses that will be mentioned in the section on the selection of scientists.

The French GERDAT institutes and ORSTOM openly acknowledge that in the past they did not give enough attention to training national scientists, but during the "fat" years their minds were occupied with the problem of increasing output. Executive, leadership, and key scientific posts (crop improvement, agronomy) were occupied by expatriates. The new Ivorian cadres that were recruited -- and this is still the case -- worked on relatively marginal research themes and were bound by the same job discipline as their foreign colleagues, but did not share the same benefits of experience and expatriation, including participation in national and international meetings, travel, much higher salaries. Many national scientists resigned because of socio-professional marginalization. This probably explains the great attraction to the national institutions and the new programs started in the north, where scientists are quickly given more responsibility and independence.

One considerable Franco-Ivorian obstacle to faster Ivorianization of scientific leadership relates to funding. Operating credits covering research expenses incurred by Ivorian scientists have not been budgeted in Franco-Ivorian assistance agreements.

Training Researchers: MSR Has Little Margin for Initiative

To acquaint students in secondary and advanced educational establishments with research, since 1973 MSR has been organizing information and orientation sessions, intended to be a few weeks of "on-the-job experience under the supervision of a senior scientist. Their assignment is to carry out part of a research operation, as a team member working in the laboratory and in the field."³³

The idea is very appealing, but is scheduled in the summer, when activities have slowed down, and the expatriates are on leave. This often means that the volunteer trainees are assigned uncoordinated, repetitive duties. Despite these deficiencies³⁴ -- which have dissuaded some students -- the information and orientation sessions have been successful (an average of 80 participants per year since 1973), largely because of the attractive pay and reception they received. The system has made it possible to evaluate the behavior of the students, especially those who returned for a second or third year of on-the-job training.

Of course, the information and orientation session cannot compensate for the major obstacle to a good supply of future research scientists, viz., inadequate higher education, especially at ENSA, the main supplier of agricultural research scientists.

This fact has already been mentioned. It should be repeated in order to stress the fact that academic book-learning without room for initiative, individual work, or contacts with reality produces graduates whose profiles do not meet the needs of research. Too little is done to develop the all-important critical judgement, imagination, and aptitude for teamwork. Further, with the increase of enrollment and the decrease in the quality of education and students, selection criteria for research jobs have become too lax (25% of second-year ENSA students were selected this year) and could in the long term jeopardize the possibility of building up high-quality national research. One way to improve selection without lowering the number of "pre-recruited trainees" would be to diversify the original sources, to accept more university graduates. This would also avoid having too many national scientists come out of the same mould.

33 MSR Training Department, Inventory of students, training schedule for 3rd cycle 1981-1982, full study cycles, orientation and aptitude for research, Abidjan, February 1982, p. 19, (in French).

34 A better system would be to include these training sessions in the normal school training program; this option will be presented in Chapter 4 (Proposals: Section 4.5).

Training: The Effort Had Been Large, but Not Large Enough,
Too Imbalanced, and Foreign-Oriented

Since 1979, MSR has offered an average of 20 scholarships in agricultural research each year for studies abroad (France, U.S.A.). The number is impressive, if it is compared with the number of Ivorians now working on research in their country.³⁵ It is less so if one looks at the medium- and long-term future. Actually, if the present pace of pre-recruitment is maintained and even if there are no dropouts later (unthinkable!), research will be only 50% Ivorianized by 1989-1990 (assuming that the number of expatriates remains unchanged); and we will have to wait until 1994-1995 for Ivorians to cover a minimum of the national research demand. At this pace, in the year 2000, Ivorian agricultural research would employ fewer than 400 scientists for a country of 15 million inhabitants, with one-third living directly off of the land. This is alarmingly insufficient to cope with the foreseeable problems associated with intensification and modernization of agriculture.

Scholarships are granted according to an educational planning procedure, applied by an employment-education committee that matches needs for scientists (as identified by the scientific programming system) with the potential number of scientists presently being trained or scheduled to be. This procedure would be ideal in a totally national research system, but has one serious shortcoming: too little attention is given to nationality when evaluating the need for trained scientists. Since new programs are usually entrusted to experienced expatriates, the young nationals more often than not are used as fill-ins for ongoing programs. Training schedules, thus, still tend to meet the need to complete resident teams, rather than to accelerate the capacity for nationals to take over programs.

This is confirmed by the lack of effort to provide training in vital disciplines like agronomy, plant breeding and genetics, social sciences, forestry.³⁶ These are fields that will be controlled by experienced experts for a long time to come and therefore, better than any others, can offer on-the-job training to national scientists (before or after completing their doctorate or an equivalent degree).³⁷

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- 35 In 1982, out of 35 scholarship holders abroad, 29 were to return to Ivory Coast in 1982-1983. Most were to join research services led by GERDAT or ORSTOM in which the number of Ivorian scientists, thus, would be doubled.
- 36 The scholarship holders specializing in agricultural research abroad in February 1982, are divided into the following disciplines: 9 in environmental sciences, 7 in agronomy and genetics, 11 in plant protection, 3 in food technology, and 2 in forestry research.
- 37 This remark needs to be qualified as concerns the social sciences which are badly under-represented in the institutions and programs under the aegis of MSR; CIRES, despite its "youth," should soon be able to train future Ivorian scientists in these disciplines.

The last remark leads us to stress the high cost of studying abroad. First comes the financial cost: of the 35 agricultural scholarships, 31 are financed by MSR. At a rate of 20 scientists per year, this represents an annual outlay of about 60 million CFAF for Ivory Coast.

But the highest "cost" is the risk that long residence abroad shapes attitudes, and hence encourages students to prepare theses that do not fit in with the national needs and programs. MSR is striving to overcome this problem by remaining in contact with the foreign institutions and universities, to ensure that the subjects of the theses more closely respond to Ivorian lines of concern and, whenever possible, will entail a data collection and experimentation phase in Ivory Coast.

There is a high opportunity cost connected to training abroad. The young students are not able to work in teams and programs that could provide the best possible supervision in most of the relevant disciplines and at the same time contribute to furthering research (see proposals in Section 4.6).

Finally, nothing has been done to ensure proper selection of, or training or statutes for technicians, who are at present so few and of such poor quality that they often impede the work of the scientists. Nothing has been done to provide training in research administration for the small number of national scientists who have senior jobs in this field.

3.5.2 Financial and material resources: Too dispersed

Funds for agricultural research in Ivory Coast come from many places: MSR via cofinanced GERDAT institutes and the operations and investments budget, internal budgets of the GERDAT institutes, the ORSTOM budget, the Ministry of Public Service, which pays the salaries of the national scientists. Table 9 shows a total estimate in the form of a consolidated budget for agricultural research.

This table indicates that Ivory Coast financial participation amounts to 39% if only public funds are taken into account (47% if one adds GERDAT's internal research funds to the Ivorian contribution), plus a majority participation of 53% from French technical assistance.

This consolidated budget does not include the total internal resources of the GERDAT institutes, derived from individual conventions (mainly with the development agencies), and even more important, the agricultural experimentation and production activities. These resources amount to 3.96 billion CFAF; the equivalent of the total research budget. They are used to finance research (0.65 billion) and to cover expenses related to contractual services and agricultural activities (there perhaps being a profit forthcoming from the operations side). This overall situation is not representative of the profile of activities and financing of all the institutes.

IRHO alone earns 70% of the internal resources of the GERDAT institutes (2.78 billion). This comes mainly from the sale of products from the

Table 9. Approximate consolidated budget for agricultural research in 1981. In millions of CFAP.

IC : Ivory Coast F : France	IC-F Convention			Operations Investments IC (4)	Internal Resources (5)	GERDAT ORSTOM Budget (6)	Public Service		Grand Total (8)
	Total (1)	F (2)	IC (3)				National cadres & scientists (22)	Cost IC (7)	
GERDAT (a)	3040	1580	1460	330	650	(4020)	(22)	110	4130
ORSTOM (b)	2830	2830	-	80	-	(2910)	(9)	40	2950
Nat. structures (c)	-	-	-	390	-	-	(30)	150	540
MSR (d)	-	-	-	500	-	-	(30)	150	650
Grand total of which IC	5870		1460	1300 1300	650	-		450 450	8270 3210

Sources: * MSR publication "Données chiffrées du MRS," March, 1982

* For national structures: numbers in scientist equivalents (including ENSA and Faculty of Science teachers and CIRES research workers): Table 5

Observations:

- (1) Franco-Ivorian cooperation convention (1962) stipulates that research expenses for GERDAT institutes will be equal shares
(1) = (2) + (3)
- (4) General operating budget (GOB) and special investment and equipment budget (SIEB)
- (5) These are GERDAT's internal resources (special conventions, profits from agricultural plantations) earmarked for research. This figure was obtained by subtracting other resources for research (1) and (4) from the research budget
- (6) Total GERDAT and ORSTOM budget, excluding the expenses for national staff covered directly by the Ivorian Ministry of Public Service (1) + (4) + (5)
- (7) (Very) approximate evaluation of outlay for research personnel paid for by the Public Service at the rate of 5 million CFAP per scientist (including technicians and other personnel)
- (8) = (1) + (4) + (5) + (7)
- (a) GERDAT + IRCPS (sugar plants) now attached to IDESSA: MSR data (aforementioned publication)
- (b) ORSTOM: weighted data covering only agricultural research activities (52 expatriate scientists out of 70)
- (c) Resources (4) cover national structures dependent on MSR and CIRES, weighted to cover only agricultural research activities
- (d) Approximate weighted data

agricultural plantations, the experimental plots, and seed gardens,³⁸ which cover several thousand hectares, and allows IRHO to finance 59% of its research budget.³⁹

There are two other institutes that finance a significant part of their own research: IRCA 17%, IRAT 20%. IRCA obtains funds by selling latex from its plantations, and IRAT obtain funds mainly through special contracts.

IRFA and, to a lesser degree, IRCT and IEMVT (IDESSA) have relatively large resources of their own, which are not provided out of the research budget composed of public funds. As for CTFT, it has minimal resources of its own. The differences in all of these situations reflected in the great differences in systems of managing finances and relations with MSR. Institutes that have substantial internal resources derived from agricultural activities, and can finance part of their research activities, tend to be very independent in decision making and management. This applies to IRHO and IRCA, which explains the relatively large size of the research programs on oil-yielding plants, coconut trees, and rubber, and also the liberal policy for salaries paid to Ivorian scientists (premiums added to the public service salaries, direct recruitment).

MSR guardianship in this case can go no further than providing encouragement, or it could lead to a reduction in public financing, which would have a twofold effect: the first would be to further increase the rate of self-financing for research, and the second would be to place these institutes in an uncomfortable position, since they would have to exercise great discipline to maintain production⁴⁰ levels and cope with

38 The Mé station alone has a turnover figure of 1 billion CFAF, of which 0.6 billion comes from the sale of selected seed in Ivory Coast and some 15 other tropical countries.

39 The concept of self-financing applies here only to the research budget. It is different from the MSR concept (see "quantified date...") which means the internal resources against the total resources (= internal resources + public resources), and shows a self-financing rate of 89% for IRHO and 45% for IRCA and IRFA. This ratio applies to the total activities of the institutes, and could give the impression that "internal resources" are net figures, while actually they are gross products of interest only if -- after subtracting expenses connected to contractual obligations and agricultural activities -- they generate a net product that could contribute to financing research.

40 These production activities, with added compulsory discipline, have good repercussions on research and development, since they lead to the finalization of more effective and often inventive production and processing techniques. IRHO, for instance, builds its own trailers at prices well below the market prices and has made innovative changes in its oil mill. Substantial savings in latex production have added nicely to IRCA's net income, etc.

the capricious changes in prices in the world market rates (e.g., IRCA recruited three new scientists in 1981, which was a "good" year, but now has to face up to budgetary difficulties).

In the past, IRFA experienced a rather similar situation which helped the development of research programs on pineapples and bananas, but because of marketing problems it can no longer generate the surplus from plantation sales to finance its research budget. But the cash flow obtained from production facilitates the financial administration of research activities financed out of public funds.

IRAT finances 20% of its own research budget but is saddled with difficult cash flow problems, because of the considerable delay in the payment of special agreements, which constitute the main source of its internal funds. IFCC has the same cash flow problem, although more of its research budget comes from public funds.

In sum, the fact that the GERDAT institutes administer public and internal resources separately may simplify and activate the management of these funds, but it proves to be somewhat of a handicap to planning well-balanced national research when it helps a program to expand without prior discussion. Or, because of salary differences, it upsets recruitment and assignment schedules (with a risk that scientists will claim higher salaries, which would be impossible for Ivory Coast to satisfy), and when it distracts scientists from their research responsibilities. This problem is worth consideration (Section 4.3) together with the problem of financial contributions to research on commodities mainly produced in large private plantations (bananas, fresh pineapples, forests) and the problem of possible international support for the coconut, Arabusta coffee, and rainfed rice programs that also apply to other countries.

Material Resources

Here again, individual administration of scientific institutions (GERDAT and other institutes) has resulted in a vast dispersal of stations, substations, support units specialized in single products, and the coexistence of separate systems of equipment supply, laboratory products, maintenance, documentation, etc.

Each institution seems to operate smoothly, but at times problems arise, e.g., some laboratories do not make adequate or reliable analyses (problem of technicians), or computer facilities to treat scientific data and accounts are not well enough developed. The French "rear guard" helps out, but MSR and the Ivorian institutes would like these services to become effective within the country as soon as possible.

3.5.3 Resources: too much or too little?

Woefully Inadequate Overall National Resources

Ivory Coast, in comparison with most African countries, has abundant human and material resources for agricultural research. Hence, especially in times of economic hardship, they could be considered

satisfactory, as evidenced by two strong arguments. First, in the past research did not play a very important role in development. But as we saw in Section 3.4, the weakness of the role was caused by an extensive agricultural development policy which made too few demands on the scientific potential.

Second (and this argument speaks louder), research cost 8.3 billion CFAF in 1981, and about 7.5 billion CFAF in 1980. Expressed in budgetary terms, this represented about 1.33% of the GAP (which the plan assessed at 564 billion CFAF in 1980 -- Table 2). Yet, looking only at national public expenses, which cover less than 40% of the total research costs, the former rate is only 0.52%, barely within the range of averages for the Third World countries. Likewise, the number of national scientists (a total of 34 in 1981, including those working at the Center for Technological Research), is extremely low. The envisaged rapid growth in their numbers will, however, slightly increase public expenditure.

The same approach could be used for the commodity programs, the only ones for which the research cost/product value criterion has also been applied.

Little Leeway for Large Production Programs

The data in Table 10 help further assess the research programs (presented in Section 3.3.2) and analyze their impact on production. Attention will only be given to the "large programs," since it is only here that the level of resources can be questioned. Speaking of resources, except for the cotton program, where research is well adapted and results well disseminated, a distinction can be made between programs that are far too big considering national needs and programs that, although adequate, have difficulty in disseminating their findings.

Some research programs seem disproportionately large: coconut trees, oil palms, rubber, and to a lesser degree pineapples and bananas.

Research expenditure on coconut trees seems especially out of line with the present, or foreseeable, value of coconut production in Ivory Coast.⁴¹ This program is self-financed by IRHO, mainly through the sale of plant material (Malayan dwarf coconut varieties crossed with African coconut varieties) to countries such as Indonesia, Malaysia, Philippines and/or Brazil, where cultivation offers more favorable ecological and social conditions (cheap labor).

41 The 1981-1985 plan scheduled a near 300% increase by 1990. This objective is not very realistic, since the government (and SODEPALM) stopped the industrial plantation programs in 1978 and the village plantations in 1981.

Research costs for palm trees and rubber equal 10% of the current value of these two crops. The state provides little funding,⁴² only 2.5%, if the calculation is made on the locally upgraded industrial value of the two products and prospects for production increases (according to the plan, to be multiplied by 1.5 and 3.5 respectively in 1990). These funds cover the cost of research teams that must work nearly alone⁴³ to carry out difficult research assignments, especially the promising, lengthy research on plant improvement and genetics that can produce useful application, at least in the industrial plantations. If the economic situation should deteriorate, or policy decisions should change programs that are to be funded out of the present budget, it would be justified to maintain the present research potential, especially since Ivory Coast claims an international, or inter-regional, leadership capacity in these two fields, and could use its findings to pay for information or assistance in other fields. This line of reasoning will only hold true if, in the future, considerable efforts are made to train and recruit national scientists who can provide the Ivorian input in international relations embarked upon by IRHO and IRCA. It should be recalled that these two programs and these two institutes have the lowest rate of Ivorianization in their research departments.⁴⁴

For pineapple (fresh and canned) and bananas, it has been seen that recent production and commercialization organization failures have led to a decrease in production and less intensive use of some of the production techniques developed by IRFA. Here again, some money might be saved by cutting down on the number of research scientists, especially since the Ivorian participation is fairly good (5 Ivorians for 12 expatriates), but it would seem more advisable to have the professionals (large plantations, cooperatives, factories) face up to their responsibilities, and convince them to provide the funds needed to maintain the present level of research, which is vital to reorganizing production to stand up better to international competition.

The Other Major Programs: Redirecting Research Orientations

Although not lacking in research facilities, the coffee, cocoa, and rainfed rice programs are encountering difficulties in reaching the farmers' fields. The explanation lies in the absence of a more systematic sectorial agricultural policy, as called for in the 1981-1985

42 In 1981, public Ivorian financing only supplied 30% of the IRHO research budget (260 million CFAF out of 850 million CFAF), and IRHO was practically the only company to run palm and coconut programs. Public Ivorian funds supplied less than 30% of the research budget for rubber (IRCA and ORSTOM).

43 Support from the IRHO and IRCA networks is rather slight, since the Ivory Coast installations are by far the biggest.

44 Largely because of lack of applicants who should, after all, be attracted by the possibility of joining international programs and receiving high salaries.

Table 10. Principal research programs by product (1981), total number of scientists, research costs, and value of products.

C and V in billion francs CFA	Number of Scientists (c)			Costs of Research (d)		Value of products (e)		C/V
	Total	Nationals	%	C	%	V	%	
1. Wood (a)	23	7	16	0.59	13.4	92	16.3	0.64
Coconut	8.5	2.5	6.0	0.53	12.1	1.0	0.2	53.0
Rubber	14.5	0.5	10.1	0.39	8.9	3.4	0.6	11.3
Oil palm	17.5	2.0	12.2	0.75	17.1	7.5	1.3	10.0
Poyo banana	8.0	2.0	5.6	0.19	4.3	5.2	0.9	3.7
Pineapple	9.0	3.0	6.3	0.28	6.4	9.5	1.7	3.0
Cotton	7.0	1.0	4.9	0.24	5.5	12.0	2.1	2.0
Sugar cane	5.0	1.0	3.5	0.18	4.1	12.0	2.1	1.5
Coffee	9.5	1.0	6.6	0.39	8.8	74.0	13.1	0.5
Cacao	10.0	1.5	7.0	0.35	8.0	96.0	16.5	0.4
2. Indigenous and export crops	89.0	14.5	62.2	3.30	75.2	220.0	39.0	1.5
Rainfed rice	14.0	4.0	9.8	0.36	8.2	26.0	4.7	1.4
Other cereals	7.5	1.5	5.2	0.20	4.6	17.0	2.9	1.2
Plantain, yam, cassava								
Taro	8.5	3.0	6	0.20	4.6	173.0	30.7	0.1
3. Food crops	30.0	8.5	21	0.76	17.4	216.0	38.3	0.35
4. Animal and forage products	14.0	5.0	9.8	0.33	7.4	36.0	6.4	6.9
5. TOTAL (b)	143	35	100	4.39	100	564	100	0.78

Sources and remarks:

- (a) Program conducted by CTFT and Tai forest program.
 (b) Total does not include fish-farming (product value not available).
 (c) Percentage refers to total number of scientists. Source: Table 7.
 (d) Source: Annex, Tables 4 and 6.
 (e) Source: Table 2.

Note: Number of scientists and research costs refer to beginning 1981; product values refer to 1980. This is not a problem since C and V estimates are approximations; and since the ratio C/V has only an indicative and comparative value. Note that the global C/V ratio refers only to product programs. To this should be added costs pertaining to small programs and to non-product descript programs (65 researchers in total), and general or common expenses not directly attributed to product programs, to be near the C/V values calculated according to the consolidated research budget (1.33).

plan. Does this justify reducing the resources and challenging the programs? Such a reaction would be a serious mistake because all three of these programs:

- * are relatively inexpensive in comparison with the value of the crops and their role in the export/import market, especially for the state, since foreign financing is greater here than for other commodities (8 ORSTOM scientists free of charge, out of a total of 27 expatriates);
- * are of sufficient quality to be able to deal rapidly with new biological problems (diseases, pests) that could cause substantial damage, and to train and improve the skills of national scientists and other specialized Ivorian senior staff who are at present in short supply;
- * give Ivory Coast stature as an international or inter-regional leader and open the way to exchanges (especially for unique varietal collections) and technical assistance;⁴⁵
- * could have a considerable effect on production if a more efficient development policy were applied.

These remarks should not camouflage the partial responsibility that is to be placed on research often too exclusively technical, or too anxious to spread innovations that have not been adapted to the farmers' needs or wishes, or that are difficult to disseminate. The coffee and cocoa research programs, for instance, even when focusing on plant improvement and genetics, should not overlook the fact that most plantations use extensive cultivation methods.⁴⁶ All three research programs (coffee, cocoa, rice) should increase their knowledge of integrated production and of marketing systems. CIRES and ORSTOM social scientists⁴⁷ have begun research on marketing, apparently without the participation or the support of the specialized institutes concerned.

In conclusion, a mere division of research priorities, without changing either human or material resource levels, would probably have little impact. Considering that agriculture, especially food crop cultivation, must be intensified, that higher education may be renovated, and that it may be possible to participate in the formulation of national, regional, and sectorial policies, selective reinforcement of research, as suggested in the plan, seems to be looked upon as a necessity by various national spheres of influence (from decision makers to public opinion).

45 Example: a cooperation agreement was recently signed with the West African Rice Development Association (WARDA), which is setting up a unit at Bouaké with a special facility for research on rainfed rice.

46 Do the criteria on potential varietal yields and results obtained for rice and coffee under the best experimental conditions apply under extensive production conditions?

47 Work by de la Vaissière, Gastellu, Affou, Eponou, etc.

3.6 A General Overview

In the preceding sections, we considered each of the essential elements of the agricultural research system: structures, internal functioning and the role of programming, programs in terms of final objectives, resources and scientific results, variegated links between research, development, production, and human/material resources. All of these elements are interdependent and must be understood, which explains the existence of unavoidable repetition in this brief attempt to give a general overview.

Structures

At present, there are several medium-size institutions, mostly French, that are run according to the terms of bilateral governmental conventions. The situation can be described in the following terms.

- * The structural organization is useful for managing human and material resources within a given institution, but is not satisfactory for administering the total of the national resources because:
 - * institutions that are primarily foreign have their own strategies and resources, and therefore are relatively independent of MSR authority;
 - * transferring scientists to priority programs is difficult or impossible, since this implies change in institution and some degree of interinstitutional relationships, which, until now, has not existed.
- * The structural organization, as concerns management and scientific productivity, is controversial. For large teams, it favors a multidisciplinary approach to problems tackled on a commodity basis, an increased responsibility to research scientists, a cross stimulation between institutions. But it hinders cooperation between institutions, between disciplines (a problem partly overcome through the programming system), and a systems approach to production. The result is that the recommendations made to the farmers, are sometimes contradictory. Similar contradictions can be found in the sector-specific measures suggested to the decision-making bodies (development agencies, ministries, planners) for inclusion in the agricultural policies.

The MSR Programming System

- * The MSR programming system has developed thematic relations between scientific institutions and has led to the creation of IDESSA, which helped strengthen national control over the agricultural research system.

- * It has encouraged the development of new research programs, designed to lessen the inequities between the major areas of focus: forest/savanna, large plantations/smallholdings, industrial-cum-export/food crops. The regional, commodity-specific approach has recently been introduced and is more in line with the new orientations set out in the agricultural policy. But it has not yet been possible to develop two-way communications equal to those enjoyed by institutes and sectoral development agencies prior to 1977-1978, when dialogue ran far deeper than the superficial, formal discussions held during program committees.
- * The MSR programming system is hindered by the fact that certain institutions have their own very substantial resources, that national funds and manpower are scarce, and that many research-development activities escape ministry control.

Programs and Development

- * Emphasis has been placed on the high scientific quality of the research programs, methodologies, and results, especially for the internationally renowned programs devoted to industrial/export crops and rainfed rice. The high quality of the work is the result of experience acquired (largely in Ivory Coast) by ORSTOM and the specialized institutes of GERDAT, with their international network of research, information exchange, and cooperative centers. The problem is that these networks make little use of Ivorian researchers. Further, their work-sharing structure, which provides scientific support and laboratory equipment from France to units operating in Ivory Coast has showed down the national development of certain capabilities (biometry, publications, documentation, accounting, etc.) essential to greater autonomy.
- * In the 1970s, the MSR launched subject- and region-specific programs that alleviated, but did not eliminate, the above-mentioned disequilibria (Table 10).
- * Research on industrial and export crops occupies more than 60% of the scientists and absorbs 75% of the funds earmarked for programs structured on a per commodity basis. It has had considerable effect on large public and private plantations for oil palms, rubber, bananas, export pineapples, and the small-scale production of cotton which, altogether, accounted for about 7% of the value of the GAP, but very little on the small coffee and cocoa plantations (30% of the GAP).
- * Research on forest production and ecosystems, animal production, and social sciences is carried out by various institutions little concerned with their programs and resources which, generally speaking, are insufficient. Forestry research is far from meeting the potential needs of Ivorian forests, but the true importance of research will become visible only when measures have been taken to stop the rapidly-increasing rates of forest depletion.

- * Research on food crops (close to 40% of the GAP), cultivated mainly on smallholdings, occupies only 21% of the researchers and absorbs 17% of the funds earmarked for commodity-specific programs. The most important traditional crops (plantain, yam, cassava, etc., 31% of the GAP) receive only about 25% of the resources.

The rest is absorbed by a large, rainfed rice production program that places excessive emphasis on technical issues and neglects production and marketing problems.

Little research is devoted to smallholder production and marketing systems; both subjects should be part of an effort to define and organize more analytical, single-discipline research. Similarly, little research is done to introduce innovations that could result in large-scale changes in the production units. Such research also constitutes a first-rate source of information to help the Ivorian authorities formulate national development policies. It is unfortunate that the relations that existed before 1979 between CIRES and the institutions under MSR jurisdiction have not been reestablished. These relations could help raise the priority of rural socioeconomic programs.

The close relations that linked the research institutes and the development agencies prior to 1977-1978 have suffered from the regionalization of development work which is now promoted using the scarce resources of the regional development agencies. On the research side, the above changes have led to the creation of IDESSA at Bouaké and the introduction of a planning service structured around major regional production systems. There are many important problems to be solved in the new relations with the development agencies, especially the issue of ensuring sound, balanced, two-way communication with research services, (since research has divided among various institutions that MSR cannot always fully represent alone), and the matter of scope of jurisdiction and funding.

Lastly, both the provisional and the definitive findings of agricultural research are scattered throughout various publications (scientific reports, annual progress reports, specialized magazines) which are not always available in Ivory Coast. Except for the "Cahiers" edited by CIRES, there is no Ivorian scientific publication that describes the scope and inter-regional, even international, significance of agricultural research in Ivory Coast. Documentation is kept within each institute and is difficult to find. One of the weak points in the communication system, which is supposed to ensure the internal and external flow of information, is that there are no joint publication and documentation services.

Labor and Material Resources

The main problem is insufficient Ivorianization of scientific staff, especially in the institutes that are comanaged with France (out of 294 scientists, 31 are Ivorian). There are many explanations, e.g., in the past research was ill-considered on the Ivorian job market, the position of Ivorian scientists in comanaged institutes is slightly marginal, etc.

The fact that more -- although still not enough -- national research scientists are being trained is an indication of the desire to speed up high-quality Ivorianization of research, but there are two impediments: first, the quality of higher education is dropping. MSR levies too little pressure to guarantee high quality, which makes matters worse. And second, complementary academic training abroad is too long and expensive and leads to problems of adaptation when scientists join the Ivorian agricultural research system. Another weak point in the training system has been that, up to the present, the trend has been to use national scientists to round out resident teams, rather than to prepare them for a smooth, early take-over through training in key disciplines and supplementary training in research management.

Outlay for agricultural research amounts to 1.3% or 1.5% of the GAP, depending on whether the figure applies to total outlay or only to Ivorian public outlay, respectively. Specifically Ivorian participation, thus, is still small. As recommended in the plan, it should be rapidly and selectively increased. This means national technicians and scientists should be trained and recruited more quickly, and then preferably assigned to research on traditional food crops, smallholder production systems (including agroforestry) and their environment, disciplines strategic to the large programs and service disciplines such as biometry-computerization, analysis and communications services. This brings up the question of recommendations, the central theme of Chapter 4.

Chapter 4

SUGGESTED IMPROVEMENTS FOR THE AGRICULTURAL
RESEARCH SYSTEM

The preceding sections have described the strong points and the weak points of the very complicated Ivory Coast agricultural research system. An analysis of the system brings out the advantages and shortcomings of certain facets, and shows that the system could be improved through topical or general decisions designed to increase the scientific potential, increase national control over the system, and ensure integration of the system into the most current rural development process.

To be realistic, these decisions should make allowances for the prevailing situation, keeping the good parts, improving whatever can be improved at lowest cost, and should strive to solve the paramount problems through understandable and acceptable measures. This is the spirit in which the following proposals and recommendations, presented step-by-step according to the method used in Chapter 3, have been prepared. They cover structures, program planning, programs, relations with development services, training for scientists, resources, etc. The chapter introducing the proposals and recommendation is followed by a chapter consolidating and prioritizing all of the above.

4.1 Proposals and Structures

The structures recommended by the mission are based on the dynamics and objectives defined by MSR which, through its programming system, has already managed to coax research institutions out of isolation, to garner cooperation from the GERDAT specialized institutes and ORSTOM in studies on individual lines of production, and more recently has gained acceptance for the idea that work must be planned at the regional level (referring to the production systems of the two major zones, forest and savanna, which should receive research support).

When the need for a multidisciplinary scientific approach to regional problems was clearly understood, IDESSA was created to study all the scientific problems inherent in the development of this huge region, where the potential is immense. In the forest zone, MSR has brought together selected institutes to discuss intercropping food crops in plantations. Further contacts and cooperation in fields that have not been well covered, e.g., food crops in general, or production systems, would quite naturally fall under the projected institute for the development of the forest zone, to be called IDEFOR, the forest zone counterpart to IDESSA in the savanna. MSR expects to create IDEFOR in the more or less near future.

These two regional institutes (as IDESSA is already doing), will be expected to develop commodity specializations, promote single-discipline or thematic cooperation, and help create joint services (biometry,

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publications, etc.). The prospects to improve the structures and operations of agricultural research in each of the two zones are very encouraging, although there is a risk of duplication in the scientific activities and services carried out in this bipolar system (separate research on products found in both regions, cooperation within a given discipline of units located geographically apart, etc.).

MSR can of course adapt its programming system, and can become more watchful and active in increasing understanding and coordination between the two institutes. The price would probably be having to strengthen its orientation and control system, and running the risk of confounding research guardianship and research implementation. Such a mixture of functions, and increased bureaucracy, could also discourage scientists from accepting responsibilities.

In view of the current situation, the solution might be that the final step in the development of the structure should be the creation of an Ivorian national institute for agricultural research (INIRA) under MSR. It should be designed as soon as possible and the blueprints should serve as a reference to MSR for all decisions on the agricultural research system during the transitional period, which should last until the official creation of INIRA. The idea is to prepare a precise, perfect project describing the structures and the general operating methods of INIRA, and then work towards implementation of this ideal, according to a master plan organized around a series of decisions. The master plan should be open to revision, if necessary.

4.1.1 The concept of a National Ivorian Institute for Agricultural Research (INIRA)

The organization suggested herein is not hypothetical. It is based on the assessment of advantages derived from changes in structures and systems of operation in many countries, including Ivory Coast. The organizational structure comprises national departments, by commodity and by discipline, (called, hereinafter, for the sake of convenience "sector" and "discipline" departments), plus regional research centers that have their own support network of experiment stations, support units, and observation units. Scientific and technical service should provide support, and a general directorate should shoulder overall responsibility.

"Sector" and "Discipline" Departments

The "sector" departments are to be staffed by scientists conducting research on a specific commodity or a group of commodities. The scientists will have had multidisciplinary training or, even better, experience with special emphasis on plant improvement—genetics and nutrition-physiology.⁴⁸ The other research scientists who are

48 This means rather experienced agricultural scientists, animal husbandry specialists, foresters, etc., with broad horizons and extensive contacts, in the key discipline. For plant production, it is especially important to add "agronomy" (water-soil-plant relations, soil preparation, fertilization, crop rotation, intercropping, etc.).

specialized in a single discipline will be placed in the corresponding "discipline" department, regardless of whether they work on one commodity or several.

With this mixed scientific organization, the sector departments constitute the focal point for research programs that respond to the specific needs of each commodity. To execute these programs will require support from scientists from specific disciplines. The directors of the sector departments will be responsible for coordinating all the interdisciplinary activities required to solve the problems relating to their specific commodities. With this in mind, they should feel free to ask directors of other discipline departments for assistance from department specialists.

These sector departments and their subdivisions could use the same names and assignment structures as those in the specialized institutes in the forest zone and the IDESSA departments. Subjects could be regrouped, or broken down, according to the future development of research on various commodities or groups of commodities. Thought should be given to creating an "applied research department" to study cropping systems, production systems (with the integration of crops, animals, and forests), and the problems of technology transfer (Section 4.3).

Each sector department will have its headquarters in one of the regional centers, selected according to the regional importance of the commodity (see: national vocation of the regional centers). Scientists will be seconded temporarily or permanently to centers according to the requirements of the research projects.

The scientific departments will have two types of activities. The first will be to carry out discipline-specific research programs that cover a certain number of commodities. This research will be carried out in single-discipline laboratories serving the whole country. They should be located according to geographical criteria. The second activity is follow-up scientific support for scientists from the "discipline" departments temporarily or permanently assigned to sectoral or multi-sectoral programs located in regional centers. ORSTOM at present provides this service, and goes even further to provide support for single-discipline scientists working in GERDAT's specialized institutes.⁴⁹

49 This remark is intended to clarify the proposal, but in no way implies judgment of the future presence or role of these institutions in Ivory Coast. MSR strongly favors the principle that these institutions remain in Ivory Coast, as does the mission. The proposal illustrates cooperation between these two institutions, and introduces the possibility for single-disciplinary national or expatriate -- scientists working for GERDAT to be given executive or leadership positions in their discipline at the national level.

Regional Centers and Their Affiliates

The need to regionalize agricultural research has been well understood in Ivory Coast, as is evidenced by the creation of IDESSA and the plans to create IDEFOR. These institutes are to become the main regional centers for the future INIRA, and therefore should be extremely carefully designed and established. During the early phases, IDESSA and IDEFOR should restrict their activities to stimulating voluntary scientific cooperation in new or poorly covered fields, e.g., initiation or development of multi-sectoral research and the creation of joint services for biometry, publications, equipment maintenance, etc. They should gradually expand their activities until they can assume full responsibility and become answerable to MSR and, later, to INIRA officials.

In the long run, if the growth rate is reasonable and human and financial resources are better managed, more thought can be given to regrouping some existing laboratories and scientific facilities. This is the spirit in which the problem of urban growth in Bouaké and the transfer of IRCC should be seen. Again assuming an increase in resources, the number of regional centers might be increased to provide fuller coverage of the main agricultural regions⁵⁰, but such a decision should take at least two elements into considerations:

- * on the one hand, the need to bring together a "critical mass" of scientists in each center to avoid intellectual and scientific isolation, facilitate the creation of multidisciplinary teams for the main regional commodities, and encourage research on production systems;
- * on the other, social and living conditions (education, health) required for the scientists and other personnel.

Another regional center could be established, preferably in the north (perhaps at Ferkessédougou) to cover the following four regions: northeast, dense Korhogo zone, savanna zone with one rainy season, northwest, presently being served out of Bouaké, which implies a lot of

50 The major, rather uniform agricultural regions of Ivory Coast have been identified using the following criteria: rainfall, agro-pedology, risks of erosion (rainfall, slopes), administrative boundaries, SODES-related boundaries (without explicit reference to land tenure and socioeconomic problems which have been more or less covered in the administrative district definitions). 12 regions have been identified: 1. Coastal fringe, 2. Southwest and mountainous southwest zone (Sassandra, San Pédro, Tabou, Soufré, Guiglo, Man, Danané), 3. Southeast zone (Agboville, Abengourou), 4. Center-west zone (Daloa, Gagnoa), 5. West zone (Touba), 6. Center zone (V Baoulé, Bouaké, Toumodi), 7. Savanna zone with bimodal rainfall (Séguéla, Mankono), 8. Northeast zone (Bouna, Bondoukou), 9. Dense Korhogo zone, 10. Savanna zone with one season (Ferkessédougou), 11. Northwest zone (Odienné, Boundiali), 12. Lowlands (in all zones). See MSR: Priority agricultural problems: solutions suggested from an operational, regional vantage point (1980).

travel. And if ENSA is moved to Tombroko, it should be given adequate research facilities to function as a full-fledged regional center or a center affiliated to Bouaké, and able to cope with the difficult problems facing the center regions (Bouaké, Toumodi) and the Guinean savanna, which has a bimodal rain pattern (Séguéla, Mankono).

One characteristic of the regional centers should be clearly described. In order to coordinate center activities, to avoid splintering research, and to avoid repetition at the national level, each regional center (besides its regional responsibility for a whole range of research themes) should have a national responsibility for one or more commodities and disciplines, selected because of their importance to the region.

Each regional center, moreover, should have a network of experiment stations, support units, and observation units, especially in the farming areas. Proper siting should be very carefully studied.

Experimental stations belonging to regional centers should be strategically located to study the problems of the subregion and, at certain times, specific commodities. Each station should have resident technicians to carry out requested trials and should be directed by scientists from the regional centers.

The support units, insofar as possible, should be located on typical agricultural smallholdings to resemble, as much as reasonable, the actual production conditions, with their agro-ecological and socioeconomic constraints.

The pilot units will be agricultural smallholdings that are encouraged to adopt as many as possible of the techniques recommended by research. Follow-up and support by scientists from the "applied research department" (Section 4.4) will make it possible to identify social, economic, and institutional problems connected to agricultural modernization. This information is vital, but it cannot be obtained through work done exclusively in research centers or their affiliates.

Scientific and technical support services (documentation, publications, biometry, maintenance of scientific equipment, etc.) with a national mandate should be located in the regional center that is potentially the biggest user, or preferably in a discipline-specific center: this solution will be especially appropriate for documentation, if the proposal to create "a postgraduate college" at Adiopodoumé is adopted (Section 4.5).

General Management and Its Functions

The General Manager, composed of a Director General and two assistants, one for research and one for administration, will have all the executive, administrative, and managerial authority to carry out the following functions:

- * draw up a comprehensive research program in compliance with the priorities stated in the plan; prepare joint programs with national services for higher education or development, and with foreign or international institutions (international centers for agricultural research), overall control of implementation;

- * prepare and present the program budget (personnel, operations, equipment);
- * recruit, train, and further the careers of scientific, technical, and administrative personnel;
- * relate closely with development institutions and extension services to facilitate final adaptation of the results of research and the efficient transfer of these results to production operations.

To discharge these duties, management should refer to the directors of the departments and regional centers, as well as subdepartments and services specialized in:

- * program planning and implementation, general evaluation of research (comprehensive files should be kept on past and present programs and activities);
- * communications (documentation, publications, and data exchange -- Section 4.5);
- * international relations;
- * administration, finance, and personnel.

The scientists assigned permanently or for a specific research project to one of the centers shall be answerable to the director of the center for administrative matters, and to the head of the department for scientific matters.

All told, the suggested organization seems considerably better than the present organization. It guarantees proper integrated functioning, strengthens the complementarity of approaches to research (national, regional, by sector, by discipline), facilitate relations with development and production services, and sets the stage for more rational, economic administration of human and financial resources.

Concerning the last point, note should be taken of the advantages of the structure of the sector and discipline departments as relates to:

- * flexibility in assigning scientific staff, and the possibility to rapidly change the strengths of the sectoral and multi-sectoral research contingents if circumstances warrant;
- * forecasting the number of national scientists needed (and their working resources), which constitutes the main part of the master plan.

4.1.2 The master plan culminating in the creation of INIRA

Two prerequisites need to be met prior to the establishment of INIRA:

- * minimum diversification in Ivorian research which would justify decentralization of certain functions presently discharged by MSR;

- * a substantial increase in the national contribution to human and financial resources, the only guaranteed way of bringing the agricultural research system under Ivorian control. In the more or less long term, this project will grow to such a size that it must be carefully prepared from the beginning through a "master plan."

This master plan should be thought out by MSR with help from all the scientific institutions and, whenever possible, representatives from other ministries, (Finance, Planning, ministries concerned with related technical issues, etc.).

The master plan should contain a reasonable, realistic, detailed project consistent with national needs and capabilities and the long-term priorities set out in the national development plan. It should build on the "ideal" outlined above, describe measures envisaged to attain the "ideal," and explain the medium- and long-term needs of agricultural research.

After preparation, the basic master plan would be submitted to the national authorities for approval, which will be more readily forthcoming if requirements reflect a justified minimum. With this in mind, the national, human, and financial resources must be calculated on the basis of the minimum number of scientists needed to carry out research activities (national, regional, per sector, per discipline) which require the least possible permanent scientific supervision. Annex 5 proposes a methodology that could be used to make this estimate.

Approving the minimum input plan does not imply that the research must be kept at the lowest level to ensure the permanence of activities considered crucial. Activities could be developed to keep abreast of new needs as they appear. To meet newly expressed needs, if funds are available, the minimum permanent supervisory staff could be enlarged to include mainly foreign scientists, temporarily recruited during their sabbatical leave, or fungeed out of technical assistance contracts. It would only be worthwhile hiring young national scientists if the new needs were considered important enough to fall into the category of essential activities. This type of system would ensure the stability and continuity of permanent research activities, all the while avoiding an unjustified increase in the permanent scientific supervisory staff each time a new project was adopted, a situation which in just a few years would lead to an overstuffed, top-heavy organization. The risk may be remote but cannot be totally avoided.

4.2 Proposals Concerning Programming

There are two types of proposals: the first could be applied immediately to improve the programming process used in the research system now, and the other could be applied in the more or less long term when INIRA has been created. Both types of proposals stem from an analysis of current programming procedures. The former will remain applicable in the long term.

4.2.1 Short-term proposals

Proposals of early applicability have been designed to simplify the current programming procedures used by MSR, and can be summarized as follows:

- * The budget committee should set budgetary limits for the program committee to avoid submission of too many, badly prioritized programs. By setting the ceilings at 20%-25% (in constant CFAF) above the level set the preceding year, the program committee would have adequate leeway and could reallocate funds between committees according to the relative value of their proposals.
- * The research programs should, in general, be approved for a period of three years. It is not realistic to expect significant scientific results to be produced in a shorter time. On the other hand, it is difficult to plan for a longer period of time or predict changes that may become necessary after that period of time. If this principle is accepted, it is neither necessary nor advisable to reevaluate ongoing programs each year. Three years after a program has been started it should be evaluated and a decision should be made either to continue it with or without revision or to terminate it.

Using this system, each year the committees would evaluate a relatively small number of new programs proposed by the scientists and one-third of the programs in progress. The committees thus would save time and could devote themselves more fully to making a thorough evaluation of the program as a whole.

4.2.2 Programming under INIRA

The most important proposals aim at separating political, scientific, and administrative decisions. Political or policy decisions concern the amount of resources, national and foreign, to be allocated to research, and their breakdown (commodities, major regions, percentage for personnel, operations, equipment).

The scientific and administrative decisions concern the choice of research programs, considering political priorities and research implementation problems.

In principle, these functions are to be kept separate and are covered by a complete linear diagram, clearly shown in the following illustration, and explained more fully in Annex 5. There are two new components:

- * a general interministerial research committee or, if possible, a special subcommittee for agricultural research that brings together representatives from MSR and other ministries concerned (planning, finance, etc.) and the Presidency;
- * an INIRA scientific committee composed of general management, department and center directors, chairmen of program committees. The scientific committee would be free to change the number and composition of its group.

In practice, there would be two mutually dependent but distinct circuits for research operations. One circuit would be for the Ivorian administration's normal annual "preparation-negotiation-decision" process for preparing the budget. This would be an intense, brief process in which MSR would be a compulsory avenue between the interministerial committee and the INIRA General Management. Discussions and negotiations between these three partners on preparatory work by INIRA would lead to the formulation of first step directives, and then budgetary decisions in keeping with the final decisions on the budget taken at the national level.

The other circuit is shown in the lower box of the diagram. It would be primarily internal to INIRA, except for the program committees, which would continue to include representatives from technically-oriented ministries and from other users (development agencies)⁵¹. Applications for new programs and programs in progress that have reached the above-mentioned three-year mark, would be put through this circuit. Finally, it would lead to the preparation of a preliminary budget document for the following year and an annual progress report on the preceding year's activities.

Another proposal aims to avoid limiting the agricultural research activities to the most pressing problems, when urged in this direction by other ministries and users. INIRA should also concentrate on medium- and long-term problems, bearing in mind expected scientific, technical, socioeconomic and biological evolution, plot new paths, and opening new horizons. This is the goal of exploratory, preventive⁵², and formative research (Section 4.4) which should receive a percentage, perhaps 20%, of the research funds. These funds, rather than being administered by the program committee, should be spent at the discretion of General Management and the INIRA scientific committee.

4.3 Proposals Related To The Programs

These proposals are the natural follow-up to the critical observations set out in Section 3.3, Section 3.4.2, and Section 3.5.3. On the one hand, they aim at developing intradiscipline contacts in research

51 These representatives should be officially responsible for research problems in their ministry or institution (Section 4.4.1).

52 "Exploratory" research focusses on original, unusual approaches and concepts that have to be studied for a certain time before showing -- or not showing -- promise. This original exploratory work is not only justified but, as part of agricultural research, should be strongly encouraged. The scientists working on this should be given enough time to prove the value of their work, before having to compete with the existing programs. Research tailored towards situation avoidance (an epidemic, for instance) cannot be evaluated on the basis of its potential economic importance since, just like insurance policies, it is carried out in the hope that it will never have to be used.

operations and, on the other hand, at correcting imbalances and shortcomings by gradually strengthening the scientific potential in fields of research hitherto inadequately covered.

4.3.1 Development of intradiscipline contacts

One of the greatest weaknesses in the Ivorian agricultural research system is a lack of intradisciplinary contacts. To remedy this situation, a proposal has been made to create standing national committees of research scientists working in the same discipline or groups of disciplines⁵³. These committees should meet as soon as possible to appoint their officers (chairman, secretary) and define general objectives, which in all cases should include sharing information on the research system, evaluating and recommending programs and research facilities for the present and the future. Each committee should organize a national seminar:

- * to present work in progress, with reference to past work⁵⁴. To progress beyond the stage of information exchange alone and make a critical evaluation, reports should be written and circulated beforehand, and presented orally as an introduction to a discussion which, if possible, has been partly prepared in advance⁵⁵. The papers, a summary of the discussions and a complete bibliography of work carried out in Ivory Coast, would be of great interest to young scientists, teachers, and students, in Ivory Coast and in countries with the same ecological conditions.
- * to propose inter-institutional cooperation in scientific endeavors (new programs) and support services (need to consider the advisability of establishing joint laboratories for plant multiplication, leaf and soil analysis, which could be available to the development agencies and professional production groups, against payment);
- * to prepare a preliminary estimate of the minimum number of national scientists needed to carry out research deemed essential. This will constitute the contribution from the discipline-specific scientists to the preparation of the INIRA "master plan" and will be vital to the establishment of the "postgraduate college" proposed in Section 4.5.2.

- 53 Care must be taken to appoint people from related committees, e.g., plant pathology committee, for instance, should include a specialist in plant improvement and genetics, and vice versa.
- 54 Senior research scientists from GERDAT and ORSTOM who have monitored research programs and worked in Ivory Coast for a long time should be invited.
- 55 After each key paper, two critical comments, prepared in advance, should be read out in order to "get the discussion going."

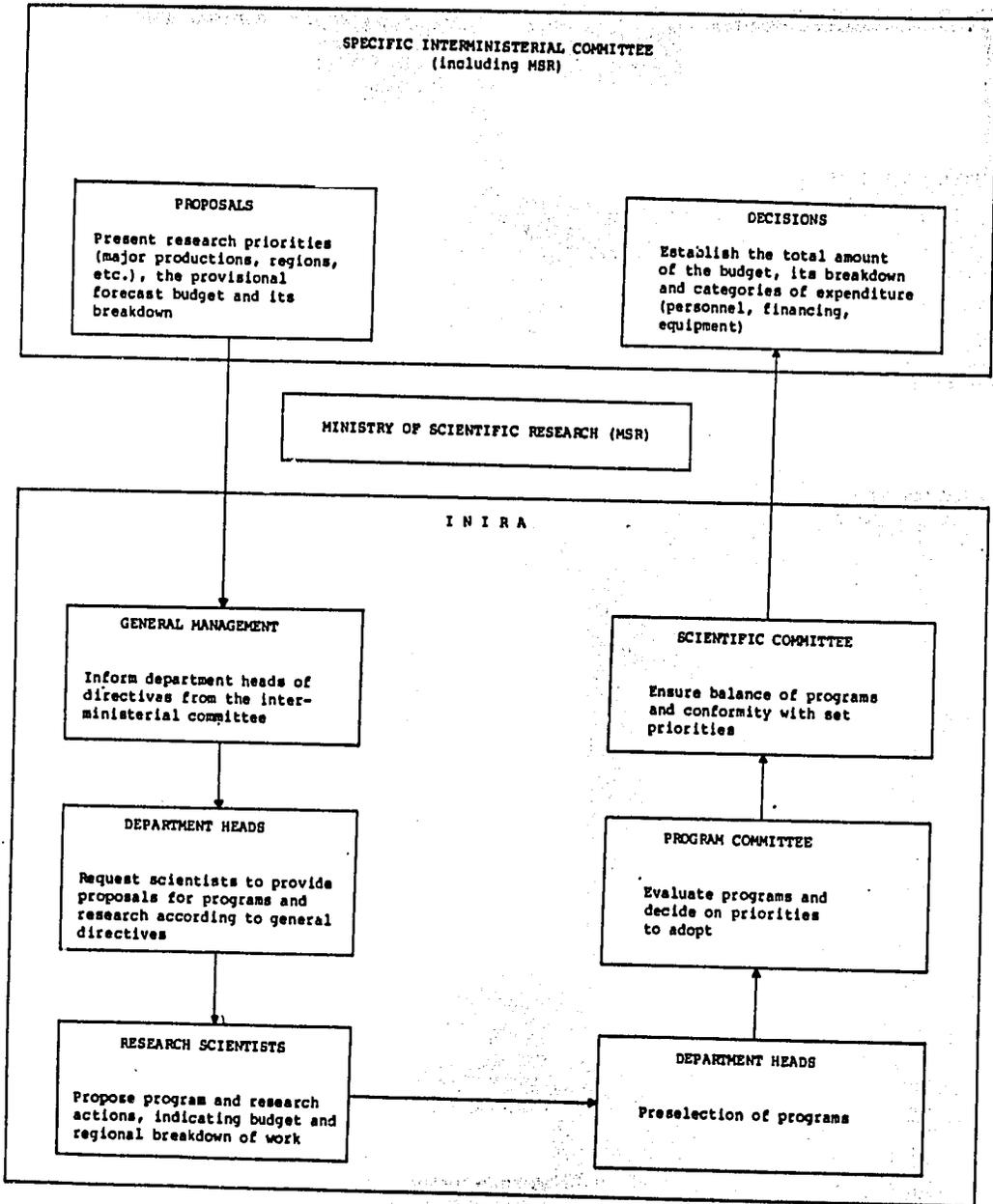


Diagram 1. Theoretical outline for programming agricultural research.

These committees should gradually tend to function like the INIRA discipline-specific departments. In other words, in the long run the service that provides motivation should change into a service that provides management and handles all the duties mentioned above, especially critical evaluation and programming, which apply implicitly to the sectoral programs via the plant improvement-genetic and nutrition-physiology disciplines. For the first few years, however, the committees will be free to decide on the frequency and content of their meetings or seminars, and the degree of outside participation (national officials, foreign scientists). The notion of at least one meeting a year does not seem unrealistic if each scientist agrees to present a scientific paper not more than once every two or three years. During this phase, the committee chairmen could meet personally with laboratories and scientists, and could organize lectures when distinguished foreign scientists are visiting.

4.3.2 What to do with relatively oversized programs?

An earlier analysis led to the conclusion that rather little money could be saved on these programs without jeopardizing their effectiveness, but that they might well be reoriented:

- * for the coastal program: study the possibility of "inter-nationalizing" financing;
- * for the plantation crops and rainfed rice: not increase resources, but consider each commodity separately, e.g.,
 - * the oil palm and rubber: surplus funds generated internally should be used to develop research of value to the village plantations or pertinent to potential intercropping methods. For intercropping, the food crops department should approve the experimental protocols, and the results should be published;
 - * pineapples and bananas: solicit funds for research from the large planters and the processing plants;
 - * coffee, cocoa, and rainfed rice: consider partial reorientation of the programs, in particular through greater involvement in work on production and marketing systems (for rice).

4.3.3 Programs on smallholder production systems and traditional food crops to be expanded first

Research on smallholder production systems and their environment (in particular marketing for traditional animal and plant commodities) should be developed. Research should seek to increase knowledge of the technico-biological situation (counting species and varieties used, crop associations, other agricultural practices) and on socioeconomics (study of land tenure problems, labor, environment, and explanation of the logic of decisions made by the animal and crop producers). The twofold objective would be to enhance understanding of decisions related to the

agricultural policy and, even more important, provide support for sectoral research that is already in progress (better programming, adapting results) and further, help research on the traditional food crops emerge from its precarious position.

To define the priorities of research with greater precision, two highly qualified scientists should be engaged (a general agriculturalist and an agricultural economist/sociologist). Their first assignment would be to recapitulate all the work on this subject conducted previously in Ivory Coast by ORSTOM, GERDAT, CIRES, etc., and, in conjunction with various institutions, draw up a draft research program with suggested priorities.

After the program had been analyzed and revised, the two research scientists would be instructed to carry it out together with other scientists who would be recruited. The total number of scientists working on the program would depend on available national and foreign financing, but at this juncture it seems reasonable to predict a need for at least 7 to 9 specialists (including the above-mentioned two) as follows:

- * For the forest zone, 2 or 3 scientists with the same profile as the above to cover, as priorities, i) the southeast region, where maximum land occupancy has made it necessary to develop stable, more intensive production systems, ii) the southwest region, where lands are still readily available, iii) production systems associated with industrial and village plantations (in blocks). The two scientists would work under IDEFOR (if it is created on time) or at the research-training center at Adiopodoumé. They could have one geographical location, or several, depending on needs, research locations, and available premises.
- * For the savanna zone, 2 agricultural economists and 1 economist specializing in animal productions should be hired to work with the IDESSA agricultural economist, agricultural scientists, and animal husbandry specialists already working on, or interested in, research of a similar nature.

These would be new posts, since transferring scientists presently at work in Ivory Coast would be unwise. It is highly probable, therefore, that Ivory Coast will have to call upon bilateral or international technical assistance for recruiting and partly financing the above-mentioned scientists. Because of the complexity of the research assignment, their commitment would have to be for 3 to 5 years. This would allow enough time to choose and train Ivorian scientists who would take over at the end.

Scientists already on site and new scientists answerable to MSR would form two research units that, for administrative purposes, would be placed under IDEFOR and IDESSA, and for scientific purposes, under the applied research department that will be created. These units should maintain close relations with CIRES.

The number of technician-researchers working on the traditional food crops is amazingly low: 3 on cassava (2 of the 3 are in the savanna), 1 on yams (in the savanna), 1 on taro (in the forest), and 2 on plantain bananas (in the forest). If, as has been loudly proclaimed, priority is

to be given to food crops, at least twice that many will be needed. In other words, 7 highly qualified specialists must be recruited. Their profiles still needs to be worked out, but the prime need is for specialists in plant improvement and nutrition, plant physiology, and agronomy.

This effort should first and foremost benefit the forest zone, which is the least endowed and the most important for these crops. Perhaps a new laboratory could house a research unit on food crops, staffed with at least one specialist for each of the following products: yams, cassava, maize, and plantain bananas. For scientific matters, this unit would belong to the food crops department of IDESSA, which will still be the national coordinator of research on these products, while administratively and geographically it would be attached to IDEFOR. If possible, two research scientists specializing in rainfed rice would be seconded from IDESSA (or from WARDA) to this unit, to handle the local application of national trials.

Most food crop scientists should devote part of their time to research on smallholder production systems. All should be given more sound support from international and bilateral research organizations, especially IITA which is so near and serves as the link to other international centers working on these.

4.3.4 Other proposals

Other proposals concern forestry, the Guinean savanna zone, and social sciences.

Forestry Research

This field has not yet been touched upon. And yet, it is crucial to build up stable forestry, sylvicultural, and sylvopastoral systems since, if adopted, they might slow down the present forest devastation process or protect what remains of the Ivorian forests. These systems could draw upon the few experiences that have been of limited effect, e.g., Zaire before independence, or widespread, e.g., Indonesia. This would entail hiring at least one or two experts who would require support from the specialists now working for CTFT, the Tai forest program, and from the agricultural economist team to work in the southwest.

Research on the Guinean Savanna with Bimodal Rainfall

The problems in the Guinean savanna are complicated by the erratic rainfall pattern. It has been suggested that they be handled by the research center associated with ENSA if it is moved, as scheduled, to Tombroko, near Yamoussoukro. Research could focus on:

- * improving the complex production systems for late-maturing food crops (yams, cassava, etc.) grown locally;

- * experimenting with new production models, with a rotation of annual food legumes (ground nuts, soybeans, etc.) and fodder crops, and with extensive cattle farming. Ivory Coast imports large quantities of meat. Potential production under these conditions is rather good and well justifies related research.

Rural Socioeconomics

The recruitment, as suggested, of an "agricultural economist/sociologist" for research on production systems would be a very small start for the future department of rural socioeconomics. This department can also be expected to develop through research centered on subjects falling under its disciplines, such as production units, their production factors, the environment, the orientation of production (studying product circuits, pricing policies, etc.), and problems of rural development.

Such research is indispensable to a sound evaluation and better orientation of the agricultural policy. CIRES is broaching them with vigor and increasing (too often foreign) resources. The question of whether the contractual relations between MSR and this institution are adequate is still unanswered. If not, either CIRES will have to be placed again, partly or wholly, under MSR jurisdiction or a new -- competitive? -- research unit will have to be set up.

4.4 Proposal on Research-Development-Production Relations

4.4.1 Relations between research and development

The importance of agricultural research for rural development is generally acknowledged, but the problem is to ensure that the ministries in charge of the agricultural sector can effectively participate in designing research policy, win acceptance for their convictions, and obtain assurance that research is correctly carried out consistent with priorities of the plan.

At the same time, considering the limits in human and financial resources, research services should be efficiently organized to avoid duplication, should be qualified to solve the most immediate problems of agriculture, plot new paths, and open new horizons for agricultural development. These objectives cannot be achieved if research is splintered between technically-oriented ministries responsible for various aspects of agricultural development.

The problem is to ensure that technically-oriented ministries control the process for determining objectives and research programs, without interfering with the integrated functioning of the agricultural research system, which will become more tangible through the creation of INIRA as an institute free of ministry attachment and fully responsible for the implementation of the assigned programs.

The solution suggested is to establish a "client" relationship between the ministries and research, in which research supplies the service to the ministries that are the customers. In such a relationship, the two partners are equal and negotiate the division of responsibilities.

This interaction would take place as part of the programming system recommended earlier. Each technical ministry concerned could appoint a duly authorized scientific adviser, whose sole duty would be to represent the ministry in all matters related to monitoring, program implementation, research evaluation, decisions on the dissemination of research results to the production side, the strategy for such dissemination, etc. This adviser should keep special track of the activities of the applied research department and express the point of view of his ministry.

This interaction will also mean obligatory allocation of a set amount of money from each technical ministry, and the large integrated development projects, to research (and, in the long run, to INIRA) for the execution of programs required by the ministries or the development projects.

4.4.2 Research-extension relations: the importance of preextension research

Close contacts between the research scientists and the senior extension workers (encadreurs) are also crucial and can be brought about through "preextension" research.

In this domain, there have been unjustified claims from the agricultural extension services, and a lack of understanding of the true nature of preextension. Some development officers said that they had to retest recommendations from research under real conditions, and in some cases revise them according to results obtained at "observation points" in farmers' fields.

Actually, these trials should be integrated into research work, since they measure the effect of results from in-laboratory and on-station research in actual production conditions. This type of study should be carried out by multidisciplinary teams comprising general agriculturists (agronome de synthèse), economists, sociologists, and other specialists, within a production system, or production systems, in order i) to study the economic and social problems connected to adapting packages of suggested techniques, ii) to alter production systems whenever necessary, iii) to identify facilities that will enable the procedures to adopt the new technology. All of this indicates that this research is very complicated, even when it is well organized, and that it lies well outside the capacities and mandate of extension services.

Furthermore, it seems difficult to accept the idea, especially in a country like Ivory Coast, that an agricultural research institution should consider its work finished when it has solved a problem in a laboratory or an experimental station, leaving it up to the "customer" to adapt the results to the "real" agricultural world. Research should complete its duties by offering a "product" that has proven applicable in the live, rural setting.

Preextension work and experimentation in genuine production conditions of all sorts can bring research and development closer together. With this in mind, scientists in charge of research operations should ensure the participation of extension workers in the multidisciplinary teams working on preextension, and should have the extension workers carry out the on-farm trials.

The last thought concerns the role of research scientists as "consultants" for extension services. Extension workers, whether they be generalists or specialized in a given commodity, will always need the help of specialists to make analyses and offer advice. The long-term solution would be to train specialized extension workers capable of providing these services to the grass-root extension worker.

As a mid-term solution, specialized scientists should answer the call for professional advice from the extension workers, and thereby strengthening the links between research and extension work.

4.4.3 Relations between research and production

The need for frank relations with the producers has been well understood and is becoming more and more routine for the research scientists in Ivory Coast. These relations should be further developed and be viewed, not as a way of bypassing the extension workers, but quite the contrary, as a way of strengthening their inputs and the impact of their work. Preextension research, pilot farms, on-farm trials, and frequent visits by the research scientists to the rural target areas, to make the analyses and offer the counsel requested by the extension workers (see above), should provide ample opportunities for contacts. Other types of relations might be explored, e.g., producers' participation in designing research and extension programs, especially at the local and regional level.

The primary difficulty in establishing and developing relations with the producers is the absence or weaknesses of institutions that are truly qualified to represent the interests of the farmers who constitute such a large majority of the Ivory Coast population. Until the day that cooperatives wield sufficient influence, the only possibility is to choose informal rural "leaders," "vanguard farmers" who are representative of the area because of the size of their holdings, their family, their educational level, and whose prominence is the result of their sense of initiative and openmindedness.

4.5 Proposals for the Evaluation of Research

The main weak point in the present agricultural research system in Ivory Coast is unquestionably (Table 5) the low rate of Ivorianization among senior scientists (61 nationals for 177 expatriates) and the attendant problem, equally serious, of Ivorian technicians (only 15 nationals). MSR's recent effort to train scientists should be enhanced and improved. This would be a central point in the suggested project for the creation of a research-training center, and should also be applied to other

categories of personnel. At the same time, or before work begins on these matters, steps should be taken to improve the use of the available national labor force.

4.5.1 Some preliminary remarks on the management of the labor force

Preliminary remarks concern careers (wages, statutes, promotions) of the whole range of research workers. Some of the scientists' problems have recently been solved, but all will have to be because they are prerequisite to improved selection and greater staff stability.

Here are the issues:

- * the system of career advancement for research scientists. The statutes are not very explicit on this subject and must be made clear as soon as possible. In the most successful scientific institutions, promotions are based mainly on the quality of the research work. During the active Ivorianization phase, national scientists should be promoted rapidly if they:
 - * will accept administrative responsibilities temporarily (for no more than three years, after which they should be entitled to "retraining" within the country or abroad);
 - * will join "strategic" or difficult disciplines (general agriculturist, plant improvement-genetics, biometry, economics) for which selection and training must be very rigorous.
- * professional career problems for production engineers (ingénieur d'application from the Bouaké Institute of Agriculture), technicians, qualified administrative officers, and laborers. The statutes should make it possible for the best employees to benefit from incremental promotions, from technician to engineer, for instance.

Another precondition for improving the selection of scientific and technical staff is improving the quality of courses in advanced agriculture (ENSA) and biology (Faculty of Sciences). MSR could contribute by strengthening research. Secondary school agricultural and technical instruction also needs to be improved in both quality and quantity.

4.5.2 Training for research scientists and other senior personnel: the importance of the research-training center

In the analysis of Section 3.5, emphasis has been placed on efforts to train scientists. It has been pointed out that the usual system of extended studies abroad has produced too few scientists, at very high financial and other costs. The proposal to create a national research-training center results from a recognition of the vital importance of amalgamating research and training, for the benefit of both, and the possibility of some degree of common core training for research scientists and other senior national personnel.

The Crucial Importance of Links Between Research and Training

No one questions the contribution that research can make to improving the quality of schools of higher learning. On the other hand, often nothing is said about the value to research of associating research and education, especially when research is expanding its national senior scientific staff, as should be the case in Ivory Coast. The value is threefold:

- a. Through this associating, good students can be identified and counselled into research, and the term "good" is not necessarily used in the traditional academic sense of the word.
- b. In the long term, this can ensure better two-way communications between research and its future users, viz., the future senior officers of the ministries, development agencies, agro-food enterprises, etc., who have been educated in the research-training centers, acquainted with scientific discipline, aroused to the importance of research for agricultural development. As a result they will be more open to -- and more demanding of -- research, whose expansion they will encourage.
- c. A research-cum-education or education-cum-research institution seems to be better equipped than a specialized research institution to carry out certain work which requires the gathering of large quantities of data, e.g., sectoral inventories or multidisciplinary studies.
 - * Sectoral inventories: under the guidance of experienced scientists, students can learn by doing and at the same time contribute to making soil analyses, systematic recordings of local ecotypes of certain useful species, inventories of plant and animal diseases and their vectors, etc. The more advanced the students, the more reliable and valuable their work.
 - * Multidisciplinary studies: these are technical or economic surveys and analyses of plots, smallholdings, small regions, which should bring out the relationships between various factors of production, the relative importance of factors limiting yields and, more generally, a better understanding of how production systems and units operate. These types of studies are of the greatest importance and should be considered a precondition to all good research programming and the definition of development projects. An education-research institution seems particularly well suited for making such surveys in the rural areas, which constitutes a priority focus in the new Ivorian agricultural policy. Actually, it is very difficult to obtain thorough knowledge of the methods used in the traditional small farms and the farmers' aspirations without building up confidence; we might even say without sharing the farmer's daily existence for a rather long time, which is inconceivable for most specialized research scientists or professional surveyors. The systematic use of well-organized, supervised apprenticeships for the students could produce reliable, low-cost results of value for research (without counting the educational value to the student).

There are now many examples of sectoral inventories and multidisciplinary studies carried out in this manner on a number of developing countries. This system is well adapted to Third World conditions, where there is a dire shortage of qualified scientists and a great need for training. National programming exercises for research should not be limited to considering the use of facilities that have been specially designed for research.

The Proposal to Create a Research-Training Center

The above suggestions might encourage the creation or strengthening of the research laboratories at ENSA and the Faculty of Sciences. This involves very important decisions that affect the quality of the instruction and must be made by the sponsoring authorities, with support from MSR. But because MSR needs quite a number of trained staff itself, it might consider setting up its own research-training center, similar to the "postgraduate colleges" recently created in several countries of Latin America and Asia, to fulfill the need for high level development and research staff.

This center would provide brief third cycle training (2 years) through "education-research units" that emphasize methodology (especially in the first year) and laboratory and field training (especially in the second year). It would offer several majors (including one in development) and would lead to a "master in agricultural sciences" diploma (maîtrise en sciences agronomiques).

The courses would be taught in close cooperation with research. ORSTOM, because of the wide range of scientific disciplines, the quality of its research, its installations at Adiopodoumé (near the Pasteur Institute), GERME, IRFA, and IRCA seems to be the most suitable institute to take in the center and provide support for its activities, especially during the first year. IDESSA and the "forest" institutes (later IDEFOR), working with development agencies, would be directly responsible for most of the training sessions in the laboratory or in the field.

To ensure high-quality training, the research institutes would have to participate, or even better, give total support.

Plans must be made:

- * to offer special studies only in subjects for which there is appropriate scientific supervision, especially during the first year of the cycle. This requires strengthening certain scientific disciplines and assigning new priority to others such as development, statistics, biometry.⁵⁶ For each specialization, there should be an educational director other than the research director for the same field;
- * to include training sessions and course papers (individual or by small groups) in current and future research programs that have been approved by the programming committees;

- * to screen applicants carefully (applicants would include students from ENSA and the university, senior ministry staff, development agencies, businesses, nationals from tropical African countries and elsewhere, students from developed countries who desire advanced training in problems of the tropics);
- * to limit the number of students. There should be no more students than scientists (teachers and research scientists) directly concerned with this training program at Adiopodoumé. A graduating class might be composed of 50-60 students, half of whom should be Ivorians going into research (on the basis of a preselection that is to be confirmed during the training period).

The suggested research-training center would play a role in training national scientists and other personnel, and at the same time would pave the way to good future relations between the two. It would also be the main center for on-going training and information activities intended for both research scientists and other professionals.

Such a project, of course, must be carefully designed. Unwavering support from ORSTOM and other research institutes (at no additional cost to them, however) will be vital. To obtain funds (student housing, classrooms, conference halls, workshops, scientific equipment, wages, operating costs) will require a substantial national effort which could be lightened by transferring savings made by MSR on scholarships abroad, by contributions from Ivorian and foreign institutions interested in upgrading their personnel (participation in the form of fellowships) and also, hopefully, by substantial international aid (bilateral and multilateral) to a project which will, in fact at least interregional in scope.

4.5.3 Other training activities

Other national scientists who are required to accept senior administrative and scientific responsibilities in the research system will have to be given the opportunity to attend short, well-adapted management courses.

For senior administrative officers and research technicians, under present Ivorian conditions, there does not seem to be any alternative to on-the-job training. This will only be satisfactory if criteria for selection can be made much stricter, with more attractive career opportunities (Section 4.5.1).

56 Animal husbandry and social sciences should be offered as part of the training in "development." It will be difficult to begin an animal production option because the corresponding department is located far away, at IDESSA. The study of rural sociology and economics should be prepared in close cooperation with CIRES.

4.6 Proposals on "Communications"

In the field of "communications," which covers all internal flows of information in the research system and all exchanges with outside sources (ministries, development agencies, political authorities, the public at large, foreign financial and scientific institutions), there are a few weak, or especially important, points that require special attention; namely, scientific documentation, publications, and public relations.

4.6.1 The urgent need to create a national service for scientific information and documentation

At present, each research institution has its own documentation and information system. The GERDAT institutes and ORSTOM, moreover, are connected with specialized central services based in France. This essentially vertical, outward-looking structure has serious deficiencies, made even worse by the fact that more foreign scientists, after a short stay in the country, on the one hand exploit or extend work done in Ivory Coast elsewhere and, on the other hand, organize their documentation-information work in Ivory Coast to meet their individual needs in a rather simplistic way. These shortcomings are worth special mention.

First is the loss of information. Ivory Coast does not have access to many scientific documents that were produced in limited quantities, either locally (exposes on methodologies, partial or interim results from experiments, etc.) or in France (theses prepared from work done in Ivory Coast).

Second is the problem of access to existing information, be it through publications on past or current research in Ivory Coast, or publications received to provide scientific information and support for institutions and scientists. The present system in general penalizes national scientists and cannot provide interested readers, in particular teachers, students, development officials, with the services they need.

A national scientific documentation and information service that covers the needs of agricultural research, higher education, and rural development is therefore an urgent requirement. In the suggested organizational chart, this service would be located at the research-training center in Adiopodoumé and would be responsible for:

- * collecting, cataloging, and keeping the written record and the archives of all the publications, reports, and working documents on agricultural research activities in Ivory Coast;
- * building up a specialized central library containing the main reference works, publications, magazines, reviews, and periodicals that relate to agricultural research and the development of agricultural techniques and sciences;

- * organizing a documentation, reproduction, and exchange service (photocopy, microfiche, etc.) within the country; distributing and keeping an up-to-date inventory of the bibliographical documentation that is kept in research stations throughout the country;
- * maintaining an information system on research programs and projects underway in the country as a reference for periodical reports, annual reports, mission reports, and other technical documents generally not published;
- * participating in FAO's AGRIS, CARIS, AFSIS documentation networks and other international, regional, and bilateral networks, and developing contacts and continued exchanges with countries in the same agro-ecological zone;
- * organizing a central computerized service for bibliographical selection and documentation/bibliography service tailored to meet individual user needs.

Before setting up such a national service, information will have to be collected on existing international, regional, and national documentation networks (e.g., Tunisia, Columbia), after which a national project will have to be studied, together with representatives from ministries concerned with rural development.

4.6.2 Publications: inexpensive improvements

In this field, organization is also vertical and outward-looking. Each institution has its own "local" publication system. The GERDAT institutes and ORSTOM also have a collection of special publications, prepared in France for their network, including publications like annual activity reports and specialized scientific reviews.

Considerable improvements could be made at little cost at least for scientific publications. The first improvement would be to try to standardize the presentation of scientific documents put out in Ivory Coast. This would greatly simplify filing and dispatch of individual copies or packages.

The natural next step would be the creation of at least one national agricultural review that should be the first to publish all articles on research conducted in Ivory Coast (which up to now has been published in foreign magazines), or at least enjoy original copublication rights as concerns work done by GERDAT and ORSTOM. This publication would be of obvious value, not only to research and higher education in Ivory Coast, but also to other countries, especially in Africa. CIRES "Cahier" is an example worth following. At a later date, another more appropriate periodical might be published for a broader audience, composed of rural development officers. This project could be studied with other national partners.

These proposals need to be refined by an ad hoc MSR committee composed of representatives from the institution concerned. Joint publication activities should be attached to the national scientific information and documentation service.

4.6.3 The importance of public relations

Allocating ever larger resources to science in a country that is going through tight times is a decision that requires courage and foresight. This explains the great need for research to maintain favorable relations with the "public at large" and the public authorities, through various channels of information or the mass media.

These media should aim at presenting the present and potential importance of agricultural research for development and training, in understandable language. It seems especially important to stress not only the long-term, but also the short- and medium-term usefulness of research, by explaining how it provides analyses and counsel that are used in the formulation of regional and national agricultural policy. It is also important to recognize the limits of research, dictated by the nature of work requiring patience and precision, the obligation to make choices among possible activities, and the need, if optimal benefits are to be obtained, to work in harmony with partners on plotting orientations, evaluating programs, and disseminating results.

MSR is well aware of all this⁵⁷ and its intention to create a press and public relations service seems highly opportune.

4.7 A Recapitulation of Proposals in Order of Priority

The proposals presented in this section, are numerous and cover various structural and functional aspects of the agricultural research system. But they all revolve around two central ideas.

The first is the eventual establishment of a national institution -- INIRA -- which would be responsible for all agricultural research. All measures that are adopted should be gently directed towards this goal. This goal is not irrationally rigid. A single, large institution is not necessarily better than a constellation of small, well-coordinated institutions, and this should be kept in mind in order to avoid excessive centralization, which could cancel out the benefits connected with unity and size:

- * better ability to define a scientific policy with a better balance of orientations and more attuned to the national and regional development priorities; greater efficiency in facing the complicated problems of diversified smallholder production, which surely will be intensified and considerably changed in the future as a result of multidisciplinary research, aimed at improving the orientation of specialized research and at finalizing results that have been tested in actual production conditions;
- * more flexible and efficient administration of human and financial resources, with better career opportunity for national scientists.

57 It is significant that national television recently broadcast a program on "scientific research, the driving force of development," designed for a general audience.

The second central idea is the project, instigated by MSR, to create a research-training center in keeping with a broadened, methodological -- not institutional -- concept of research. Central to this activity is the scientific exactness which must not remain the exclusive characteristic of specialized institutions. Quite the contrary, it should be transmitted as widely as possible to all of the public and private organizations working on agriculture to improve the quality of their service, stimulate contact between them and research, and be of use in work formulating the national agricultural policy. In other words, such a center should not only fulfill the need to train national scientists, but should also cater to the future, senior officers of ministries, and development agencies; and offer ongoing training for resident officers. The center would also be an especially appropriate arena for protracted or brief contacts between nationals exercising responsibilities for rural development.

If the plan to create a center is adopted, everything possible should be done to help it discharge its duties, which would be the function of a national scientific information, documentation, and publication service. Along the same lines, the proposal to strengthen research (which at present is found severely lacking in the field of production systems, food crops, forestry, and the Guinean savanna) has only one goal: to redress imbalances and prepare solutions to the problems of tomorrow. This may mean designing stable, more intensive production models, for instance. Future scientists and national cadres must, through these channels, be involved in new activities that, in the medium-term, will fall within their jurisdiction, despite the fact that experience as instructive as that obtained for the industrial and export crops, does not exist.

RECAPITULATION OF PROPOSALS

Cost (low o medium = high x	Short-term	Medium- and Long-term
STRUCTURES	<ul style="list-style-type: none"> o Formulation of a master plan for INIRA with priority for a study on the minimum numbers of national scientists needed x Creation of a research-training center and a national documentation-information service o Creation of IDEFOR with wider information x responsibilities and creation of research units (programs) 	<ul style="list-style-type: none"> + Gradually establish INIRA + Creation of the north savanna center (Perké) + ENSA-Tombokro center
PROGRAMMING	<ul style="list-style-type: none"> o Simplifying procedures 	<ul style="list-style-type: none"> o Revise procedures (interministerial committee, scientific committee, etc.) at INIRA
PROGRAMS	<ul style="list-style-type: none"> o National committees per discipline o Reorganize major programs per commodity x Develop programs on production systems, food crops + Launch agroforestry, decision on social sciences 	<ul style="list-style-type: none"> + Begin Guinean savanna program at Tombroko
LIAISON WITH DEVELOPMENT AND PRODUCTION	<ul style="list-style-type: none"> o Appoint permanent delegate for research in each ministry concerned with rural development 	<ul style="list-style-type: none"> o Dividing up research-development responsibilities
HUMAN RESOURCES	<ul style="list-style-type: none"> o Complete and refine statutes for personnel x Create the research-training center + Train national research administrators and managers 	
COMMUNICATIONS	<ul style="list-style-type: none"> = Create a national scientific information and documentation service o Standardize scientific publications o Create a national agricultural sciences periodical publication 	

COMPOSITION OF THE ISNAR MISSION

- * Mr. Alexander von der Osten, Economist, Executive Officer,
ISNAR, Head of Mission
14 March - 8 April, 1982
- * Prof. Isaac Arnon, Specialist in Research Organization and
Administration, Former Director of the Volcani Institute, Israel,
ISNAR Consultant
27 March - 6 April, 1982
- * Prof. Arie Beenhakker, Specialist in Agro-industrial Technology,
University of South Florida, Tampa, Florida, USA
ISNAR Consultant
28 March - 8 April, 1982
- * Mr. Joseph Casas, Agroeconomist, Specialist in Research/Training,
INRA Research Scientist, Montpellier, France
ISNAR Consultant
14 March - 8 April, 1982
- * Dr. Rudolf Contant, Geneticist, Specialist in Research and
Training Organization,
Senior Research Officer, ISNAR
14 March - 8 April, 1982
- * Mr. René Devred, Agronomist and Forester, Specialist in
Research Development,
Senior Research Officer, ISNAR
19 March - 8 April, 1982
- * Dr. Juan Carlos Martínez, Specialist in Research on
Production Systems,
International Center for Maize and Wheat Improvement (CIMMYT), Mexico,
ISNAR Consultant
30 March - 5 April, 1982

WORK PROGRAMMonday, 15 March, 1982

- 09.00 Office of the Regional IBRD Mission. Meeting with Mr. Robert K. Ellinger, Head of the Agricultural Division
- 10.00 Meeting at the Ministry of Scientific Research on planning the work of the Mission
- * Mr. Mathias Coulibaly Dognénéna, Director of Research and Programs
 - * Mr. Sic, Assistant Director for Programs
 - * Mr. Jean-Marie Michotte, Technical Adviser (Science Policy)
 - * Mr. N'guetta Bosso, Research Director and Technical Adviser (in charge of strengthening relations between research and development)
 - * Mr. Pierre Roche, Technical Adviser (Planning and Evaluation of Research Activities)
 - * Mr. Jacques Sarraute, Technical Adviser (Evaluations and Financing)
 - * Mr. Noël Kanga, Director of Training
- 13.00 Briefing and studying documentation from the Ministry of Scientific Research
- 16.30 Meeting at the Ministry of Scientific Research on planning work and visits to research institutions in the forest zone:
- * Mr. Mathias Coulibaly Dognénéna
 - * Mr. Jean-Marie Michotte
 - * Mr. Pierre Roche
 - * Mr. N'guetta Bosso

Tuesday, 16 March, 1982

- 08.00 Leave from the Ministry of Scientific Research, with Mr. N'guetta Bosso to Adiopodoumé
- 08.30 Visit of the ORSTOM Research Center at Adiopodoumé
- * Mr. Bernard Pouyaud, ORSTOM Director for Ivory Coast
 - * Mr. Jean Collinet, Director of the Adiopodoumé Center
 - * Mr. Charrier, Head of the Genetics Section
- 14.30 Leave ORSTOM for IRFA
- 15.00 Visit of the IRFA Research Center (Institut de Recherches sur les Fruits et Agrumes)
- * Mr. Charpentier, IRFA Director General, GERDAT representative to Ivory Coast
- 19.30 Return to Abidjan

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Wednesday, 17 March, 1982

- 08.00 Meeting at the Ministry of Scientific Research. Briefing and planning visits to research centers in the forest zone:
- * Mr. Mathias Coulibaly Dognénéna
 - * Mr. Jean-Marie Michotte
 - * Mr. Pierre Roche
 - * Mr. Jacques Sarraute
- 09.00 Meeting with Dr. Balla Keita, Minister of Scientific Research
- 10.00 Continuation of briefing at the Ministry of Scientific Research
- 14.45 Visit to IRCC (Institut de Recherche du Café, du Cacao et d'autres plantes stimulantes) at Bingerville:
- * Mr. G. Caumel, IRCC Director
 - * Mr. Nanga Coulibaly, Director of IRCC Research Center, Bingerville
- 19.00 Return to Abidjan

Thursday, 18 March, 1982

- 07.00 Meeting at the Ministry of Scientific Research, briefing on program of visits to centers
- 08.00 Leave for Lamé
- Visit of IRHO (Institut de Recherches sur les Huiles et les Oléagineux)
- * Mr. De Berchoux, IRHO Director
 - * Mr. Jacquemard, Head of the Selection Service
 - * Mr. Comont, Administrative Director
 - * Mr. Quencez, Head of Agronomy Service

Friday, 19 March, 1982

- 08.45 Visit of IRCA (Institut de Recherche sur le Caoutchouc)
- * Mr. Philippe Boyer, IRCA Director
 - * Mr. M. Kone, Administrative Director
 - * Mr. Ormond, Director of Agronomic Experiments
 - * Mr. Roudeix, Head of Technology Service
- 17.45 Return to Abidjan

18.00 Meeting at Ministry of Scientific Research, planning visits to research centers in the savanna zone:

- * Mr. Mathias Coulibaly Dognénéna
- * Mr. Jean-Marie Michotte
- * Mr. Pierre Roche
- * Mr. N'guetta Bosso

21.00 Arrival of Mr. René Devred, member of ISNAR Mission

Saturday, 20 March, 1982

08.00 Departure Ft. IV 860 to Bouaké

09.00 Welcome at Bouaké airport by:

- * Mr. Jean François Poulain, Director, Food Crops Department, IDESSA
- * Mr. Frering, Administrative Director, IDESSA

10.00 Meeting at IDESSA (Institut des Savanes)
Discussion of work program and visits for the period from 22 to 27 March, 1982

- * Dr. Michel Yao Kouakou, Director, IDESSA Animal Husbandry Research Center (CRZ) and Deputy Director General of IDESSA
- * Dr. Jean François Poulain, Director, Food Crops Department of IDESSA
- * Mr. Frering, Administrative Director, IDESSA
- * Mr. J. L. Messager, Head of Rangelands Division, CRZ, IDESSA
- * Mr. G. Sement, Head of Agronomy Division and Department of Fiber Crops (DCT), IDESSA
- * Mr. Koffi Goli, Head of Plant Improvement Program, DCV, IDESSA

15.30 Tour of Food Crops Department (DCV), IDESSA, discussion of the department's work program:

- * Mr. Jean François Poulain, Director, DCV
- * Mr. Y. Bigot, Economist, Agronomy Division of DCV

Sunday, 21 March, 1982

09.30 Visit to the Department of Fiber Crops (DCT/IRCT) and discussion of the department's work program:

- * Mr. A. Angelini, Director General, IDESSA and DCT Director

13.30 Lunch at the home of Mr. Angelini

- * Mr. Angelini, Director General, IDESSA
- * Mr. Richard, Agronomist, IRCT, Paris
- * Mr. M. Vayssière, Entomologist, CIDT

Monday, 22 March, 1982

- 08.00 Visit to the Department of Fiber Crops (DCT/IRCT), IDESSA
Tour of research facilities and discussion on
research-development program:
- * Mr. G. Sement, Head of Research-Development, Agronomy
Division
 - * Mr. Richard, Agronomist, IRCT, Paris
 - * Mr. M. Deat, Agronomist, Assistant to Mr. Sement
- 10.00 Visit to technology laboratory of the Department of Fiber Crops
(DCT), IDESSA
Discussion with Mr. G. Gawrisiack
- 10.45 Visit to the Entomology Department of the ORSTOM Program in
Ivory Coast
Discussion of the Department's work program with:
- * Mr. P. Cocherau, Research Director, ORSTOM (Entomology)
 - * Mr. Pollet, Entomologist, ORSTOM
- 13.00 Lunch at the home of Mr. Angelini
- 14.30 Visit to CRZ (Animal Husbandry Research Center), IDESSA
Visit to the station and discussion on the CRZ work program with:
- * Mr. J. L. Messenger, Deputy Director, CRZ, Head of Rangelands
Program
 - * Mr. A. Koffi, Rangelands Program
 - * Mr. A. Bigot, Rangelands Program
 - * Mr. E. Landais, Animal Husbandry Program
 - * Mr. C. Hoste, Animal Husbandry Program
 - * Mr. Y. Charray, Animal Husbandry Program
- 17.00 Visit to the ORSTOM Agronomy Department at Bouaké, Discussion
with:
- * Mr. C. Fillonneau, Head of Agronomy Department
 - * Mr. G. Charpentier, Agronomy Department
- 19.00 Meeting at the home of Mr. Messenger, Deputy Director, CRZ, with
Mr. Messenger and his colleagues

Tuesday, 23 March, 1982

- 07.15 Visit to the Food Crops Department (DCV/IRAT) of IDESSA
Discussion on the department's work program with:
- * Mr. Jean François Poulain, Director, DCV/IRAT, IDESSA
 - * Mr. Koffi Goli
 - * Mr. Poisson
 - * Mr. M'di Coulibaly
 - * Mr. Hainzelin
 - * Mr. R. Dumont

- * Mr. Bakary Ouayoguède
 - * Mr. Siband
 - * Mr. Choppard
 - * Mr. Leduc
 - * Mr. Ruf
 - * Mr. Y. Bigot
 - * Mr. Chablain
- 13.00 Lunch
- 14.30 Continuation of visit to DCV/IRAT, IDESSA
Discussion on research-development with:
- * Mr. J. F. Poulain
 - * Mr. Y. Bigot
 - * Mr. Ruf
 - * Mr. Leduc
- 16.30 Visit to CIMA (Centre Ivoirien de Machinisme Agricole) of the
Ministry of Agriculture at Bouaké
Visit of the station and discussion with:
- * Mr. Monnier, Deputy Director of CIMA
- 19.00 Leave for Korhogo
- 23.00 Arrival at Korhogo, Mont Korhogo Hotel

Wednesday, 24 March, 1982

- 08.00 Visit to the Karakoro branch of CRZ
Visit village and cattle corrals in the Korhogo region
Discussion with:
- * Mr. M. L. Messenger of CRZ, his colleagues and a few farmers
- 10.30 Visit to CIDT (Centre Ivoirien de Développement Textile), North
Korhogo Sector Department. Discussion with:
- * Mr. Moustapha Diarrassouba, Director, North Sector
 - * Mr. Ildefonse N'Dabalishye, Head of Research/Development
Department of the North Sector
- 13.00 Lunch with Messrs. Diarrassouba and N'Dabalishye
- 15.00 Group A: Casas and von der Osten
Continuation of discussion at the headquarters of CIDT North
Sector Department
- 19.00 Visit to the Ferkessedougou observation point of CIDT/IRCT for
cotton research and development with Mr. Sement (IRCT)
- 20.00 Arrival at Hotel Hambol, Katiola

15.00 Group B: Contant and DevredVisit to SODEPRA (Société de Développement de la Production Animale)

- * Dr. J. Abosoh, Regional Director, SODEPRA-North
- * Mr. J. Tye, Technical Adviser to the Regional Director
- * Mr. P. Royet, Pastoral Development, SODEPRA-North
- * Mr. A. Escafré, Pastoral Development, SODEPRA-North
- * Mr. De Roche Montez, Head, Cattle Program, SODEPRA-North
- * Mr. J. B. Bonnet, Zebu statistics, SODEPRA-North
- * Mr. N. Bosso, Ministry of Scientific Research
- * Mr. A. Havet, IDESSA
- * Mr. J. F. Poulain, IDESSA/DCV
- * Mr. J. L. Messenger, IDESSA/CRZ
- * Mr. L. Bertaudière, IDESSA
- * Mr. Y. Bigot, IDESSA
- * Mr. J-P. Poivey, IDESSA

18.30 Visit GVC near Korhogo with Messrs. Tye and De Roche Montez (SODEPRA-North)

21.00 Mount Korhogo Hotel, Korhogo

Thursday, 25 March, 1982Group A: Casas and von der Osten

07.00 Visit to the Katiola Sugar Complex of SODESUCRE (Société de Développement de la Production du Sucre) at Marabadiassa
Visit to the research/development trials carried out by IRCPS (Institut de Recherche sur la Canne et les Plantes Sucrières) and discussions on sugar cane research with:

- * Mr. Jules-Serge Gnigou, Deputy Director General, SODESUCRE and Director of the Katiola Sugar Complex, Marabadiassa
- * Mr. G. Diehi, Plantation Director, Katiola
- * Mr. Roger Klaus, Director, IRCPS, Bouaké
- * Mr. Vincent Niagne Agnimel, IRCPS Scientist

13.00 Lunch at the Sugar Complex with Mr. Klaus and researchers from the SODESUCRE Research-Development Department

14.30 Return to Bouaké

15.00 Visit to CTFT (Centre Technique Forestier Tropical) at Bouaké. Discussions with:

- * Mr. Jean-Pierre Hirigoyen, Center Director and Head of Fishery Research Division, Bouaké
- * Mr. M. O. Souvannavong, Head of Forestry Division, Bouaké
- * Mr. Balle Pity, Forestry Division

Group B: Contant and Devred

- 10.00 Visit to the Noroningue Breeding Center (Ngama and Abondance)
- * Mr. De Roche Montez
 - * Mr. Messenger
 - * Mr. Y. Bigot and others
- 11.30 Visit to the CIDT Training and Demonstration Center at Namingue
- 14.30 Lunch
- 15.30 Return to Bouaké

Friday, 26 March, 1982

- 08.00 Visit to IAB (Institut Agricole de Bouaké). Discussions of the Institute's training programs with:
- * Mr. Alphonse Woi M'Esse, Director, IAB
 - * Mr. Kouadio Kouame Bertin, Head of Curricula Coordination
 - * Mr. Kone Doffangui, former student at IAB, employed at IDESSA
 - * Mr. Adou Amalaman, student, IAB
- 10.30 Visit to CIDT (Compagnie Ivoirienne pour le Développement des Textiles), Head Officer at Bouaké. Discussions on research-development with:
- * Mr. Alexis K. Detch, Director General
 - * Mr. Didier Chavatte, Deputy Director General
 - * Mr. L. Seydoux, Director, Research/Development Department
 - * Mr. Bisson, Head of the Research/Development Evaluation Unit
- 14.30 Visit to the Food Crops Department (DCV/IRAT) of IDESSA in Bouaké. Discussions on research/development with:
- * Mr. J. F. Poulain, Director, DCV
 - * Mr. Y. Bigot, Economist
 - * Mr. M. Pouzet, Head of Cassava Project
 - * Mr. Leduc

Saturday, 27 March, 1982

- 07.00 Meeting with Mr. Bisson, Economist in charge of the CIDT Evaluation Unit
- 10.00 Departure by car to Abidjan
- 16.30 Arrival at Tiama Hotel, Abidjan
- 19.30 Arrival of Dr. J. Arnon, member of the ISNAR mission

Sunday, 28 March, 1982

Review

- 17.30 Arrival of Dr. Beenhakker, member of the ISNAR mission (agricultural technology)

Monday, 29 March, 1982

- 08.00 Meeting at the Ministry of Scientific Research
Planning the week's work
- 09.30 Visit to IRHO's Marc Delorme Coconut Station at Port Bouet (Beenhakker and von der Osten)
Visit to the plantation and discussions with Mr. G. de Tiffin de Tilques, Station Director
- 09.30 Visit to CRO (Centre de Recherches Océanographiques) and discussions with Mr. Rotschi, CRO Director (Contant and Devred)
- 09.30 Visit to ORSTOM Center at Pet Bassam (Arnon and Casas)
Discussions on the Center's research program with:
- * Mr. Mersadier, Director of the Center
 - * Mr. Jacoupii, Scientist
- 13.00 Lunch at the home of Dr. de Tiffin (Beenhakker and von der Osten)
- 14.30 Visit to ENSA (Ecole Nationale Supérieure de l'Agriculture)
Discussion on professional training in Ivory Coast with:
- * Mr. Assemien Aoumou, Director of ENSA (Botany)
 - * Mr. Léon Monnet, Animal Husbandry, ENSA
 - * Mr. Orega Youppo, Agricultural Botany, ENSA
 - * Mr. Kone Lacine, Research Unit
 - * Mr. Babagauh K. Boyo, Plant Pathology, ENSA
 - * Mr. Kama Berte, Agro-economy, ENSA
 - * Mr. Marc Demeaux, Food Industry, ENSA
 - * Mr. Jacques Tinturier, Agronomy, ENSA
 - * Mr. Tie Bi Tra, Soil Sciences, ENSA
 - * Mr. K. T. N'Guetta, Soil Sciences, ENSA
- 18.30 Meeting of ISNAR team. Review

Tuesday, 30 March, 1982

- 08.00 Visit to the Secretariat of State for Agriculture in charge of Food Crops. Discussions with:
- * Mr. Gilles-Vally Laubouet, Secretary of State
 - * Mr. Langui, Directeur du Cabinet
 - * Mr. Jean Oulai, Director of Production
 - * Mr. Amani Oka, Director of Research-Development
 - * Mr. Benoît N'Dri Brou, Director, Soybean Project

- 12.00 Meeting of the team (review)
- 14.30 Discussions at the Ministry of Scientific Research (Beenhakker and Contant) on processing of agricultural products, with:
- * Mr. Jean-Marie Michotte, Technical Adviser
 - * Mrs. Diakité Ya, Director of Documentation and Publications
 - * Mr. Kone, Scientist, CIRT (Centre Ivoirien de Recherches Technologiques)
- 15.00 Visit to CIRES (Centre Ivoirien de Recherches Economiques et Sociales) and discussion with Mr. Atsain Achi, CIRES Director (Casas and von der Osten)
- 17.30 Discussion with Mr. P. Rocher, Technical Adviser at MSR on research evaluation (Arnon and Devred)
- 20.00 Arrival of Dr. Juan Carlos Martínez, member of the ISNAR Mission
- 20.30 Meeting of the team (review)

Wednesday, 31 March, 1982

- 08.00 Meeting at the Ministry of Scientific Research (Arnon, Devred, Martínez, and von der Osten). Discussion on the agricultural research policy, programming and evaluation with:
- * Mr. Jean-Marie Michotte
 - * Mr. Pierre Roche
 - * Mr. Jacques Sarraute
- 08.30 Visit to the Ministry of Commerce, Trade Promotion Division (Casas and Contant). Discussions with:
- * Mr. Vivier, Technology
- 14.30 Meeting at the Ministry of Scientific Research. Discussions on the technical, scientific, and financial evaluation of research with Messrs. J. Sarraute and P. Roche

Thursday, 1 April, 1982

- 08.30 Visit to SODEFOR (Arnon, Contant, and Devred)
- * Mr. Konan Soundele, Director General
 - * Mr. François Gonin, Director of Reforestation
- 08.30 Meeting at the Ministry of Scientific Research on professional training (Martínez, von der Osten, and Casas). Discussions with:
- * Mr. N'Gessan Kanga Noël, Director of Training
 - * Prof. N. Allassane, Technical Adviser (International Cooperation)

09.30 Visit to CTFT (Centre Technique Forestier Tropical) (Arnon, Contant, and Devred)

- * Mr. Kamonon Diabate, Director
- * Mr. Bernard Martin, Scientific Adviser
- * Mr. Patrick Durand, Head of the Wood Technology Division
- * Mr. Vincent Beligné, Head of the Forestry Division
- * Mr. Bernard Mallet, Head of the Plant Pathology Division
- * Mr. Y. Guy Bertault, Forester

15.30 Meeting at the Ministry of Scientific Research. Discussions on programming research in Ivory Coast

- * Mr. M. Coulibaly, Dognénéna
- * Mr. J-M. Michotte
- * Mr. P. Roche

Friday, 2 April, 1982

09.00 Meeting at the Ministry of Agriculture. Discussions on research-development with:

- * Mr. Otchoumou Kouame, Directeur du Cabinet
- * Mr. Boa Bouadou, Director General, SODEFEL
- * Mr. Koffi Krou Lazare, Director General, SODEPALM
- * Mr. Joseph Niamke, Director General, SATMACI
- * Mr. Philippe Ouattara Bambala, DPBCG, Ministry of Agriculture
- * Mr. Attah Koffi Nartin, Admin. Sec. Gen., COMACI-CIMA
- * Mr. Toure Abdoulaye, Secretary General, BETPA
- * Mr. Nzari Bernard, Director, BETPA
- * Mr. Kragbé Landry, Director of Information, SAPH
- * Mr. N'Dri Brou Benoit, Project Director, BETPA-SOJA
- * Mr. Ferdinand Sangaret, Secretary General, PALMINDUSTRIE

14.30 Meeting at the Ministry of Scientific Research. Discussions on research programs with:

- * Mr. M. Coulibaly Dognénéna
- * Mr. J-M. Michotte
- * Mr. P. Roche

16.30 Meeting at the Ministry of Scientific Research. Discussions on the research-development link, with:

- * Mr. N'guetta Bosso

Saturday, 3 April, 1982

Review

Sunday, 4 April, 1982

Review

Monday, 5 April, 1982

- 16.00 Meeting at the Ministry of Scientific Research
- 17.00 Meeting with Dr. Balla Keita, Minister of Scientific Research
Presentation of the Mission's conclusions and recommendations:
- * Dr. Balla Keita, Minister of Scientific Research
 - * Mr. Antoine Kouadio Kirine, Directeur du Cabinet
 - * Prof. M. Alassane, Technical Adviser (International Cooperation)
 - * Mr. Jean-Marie Michotte, Technical Adviser (Scientific Policy)
 - * Mr. Jacques Sarraute, Technical Adviser (Evaluations and Finance)
 - * Mr. N'guetta Bosso, Technical Adviser (Strengthening research-development relations)
 - * Mr. Mathias Coulibaly Dognénéna, Director of Research and Programs
 - * Mr. N'Guessan Noël Kanga, Director of Training
 - * Mr. Miezán Kouamé, Head of Mission, Geneticist at ORSTOM

Tuesday, 6 April, 1982

- 06.00 Departure of Dr. Juan Carlos Martínez to Mexico
- 09.00 Visit to SODEFEL (Société de Développement de la Production des Fruits et Légumes)
- * Mr. Boa Bouadou, Director General
 - * Mr. Pointereau, Technical Adviser to the Director General
 - * Mr. Yao Kouassi, Technical Director for Market Crops
- 13.00 Lunch, invitation from Dr. Balla Keita, Minister of Scientific Research, attended by:
- * the Minister of Youth and Sports,
 - * the Permanent Secretary (Directeur du Cabinet) of MSR,
 - * MSR Department Directors
 - * MSR Technical Advisers
 - * the Representatives from the World Bank
 - * the ISNAR Mission
- 16.30 Visit to the Office of the Regional IBRD Mission. Discussions with Mr. Robert K. Ellinger
- 17.30 Review
- 18.30 Departure of Dr. I. Arnon to Israel

Wednesday, 7 April, 1982

- 07.30 Departure to Niéky with Mr. Charpentier, Director General of IRFA
Visit to the Banana Research Station of Niéky
- 11.00 Visit to the IRFA Pineapple Research Station
- 13.00 Return to Abidjan
- 14.00 Review
- 17.00 Meeting with Dr. Balla Keita, Minister of Scientific Research
Presentation of the Mission's conclusions and recommendations on
agro-technological research:
- * Dr. Balla Keita, Minister of Scientific Research
 - * Mr. Antoine Kouadio Kirine, Directeur du Cabinet
 - * Prof. M. Alassane, Technical Adviser (International
Cooperation)
 - * Mr. Jean-Marie Michotte, Technical Adviser (Science Policy)
 - * Mr. Jacques Sarraute, Technical Adviser (Evaluations and
Finance)
 - * Mr. N'guetta Bosso, Technical Adviser (Strengthening
research-development relations)
 - * Mr. Mathias Coulibaly Dognénéna, Director of Research and
Programs
 - * Mr. N'Guessan Noël Kanga, Director of Training
 - * Mr. Miezán Kouamé, Head of Mission, Geneticist at ORSTOM

Thursday, 8 April, 1982

- 07.30 Group A: Contant, Beenhakker, Devred
Visit to PALMINDUSTRIEL agro-industrial complex at Eloka
- * Mr. H. Adou Boa, Head of Plantation
 - * The Director of the Factory
- 07.30 Group B: Casas, von der Osten
Meeting with Mr. J. F. Poulain, Director, Food Crops Department,
IDESSA
- 08.30 Visit to the EEC Delegation to Ivory Coast. Discussion with:
- * Mr. Waffelaert
- 11.00 Visit to FAC (Fonds d'Aide et Coopération) representation in
Ivory Coast
- 12.00 Lunch at the home of Mr. Plateau
- 17.30 Departure of the ISNAR Mission to Europe

Table 1. MSR controlled research program for the forest zone -- Human and Financial Resources.

	I = Ivorian F = Foreign T = Total	in scientists/ months	GERDAT			ORSTOM			ENSA			FAC. SCIENCES			TOTAL			COSTS (millions CFAF)
			I	F	T	I	F	T	I	F	T	I	F	T	I	F	T	
FORESTS (a)			22	45	67		10	10							22	55	77	232
Pineapples			11	52	63	12	11	23	5		5	6		6	34	63	97	283
Poyo bananas			11	38	49									11	38	49	191	
Plantain bananas			11		11						12			23	23	23	75	
Other fruits				10	10								12		10	10		
Virology-nematology						4	7	11							4	7	11	
TOTAL FRUITS			33	100	133	16	18	34	5		5	18		18	72	118	190	598
Coffee			12	47	59		42	42							12	89	101	394
Cocoa			11	77	88				4					15	77	92	347	
Cola			11		11									11		11		
OTHER STIMULANT PLANTS			34	124	158		42	42	4		4			38	166	204	758	
RUBBER			3	80	80		55	55		5	5	5		5	5	140	145	385
Palm trees			11	147	158		5	5				11		11	22	152	174	753
Coconut trees			17	66	83				5					22	66	88	526	
TOTAL OIL-YIELDING PLANTS			28	213	241		5	5	5		5	11		44	218	262	1279	
Food crops (b)						11	3	14				13	5	18	24	8	32	35
Production systems				10	10										10	10	10	84
TOTAL	scientist/months		117	572	689	27	133	160	14	5	19	47	5	52	205	715	920	3372
	equivalent research scientists		11	57	68	2,5	14	16,5	1,5	0,5	2	4	0,5	4,5	19	72	91	

Ref.: MRS -- Improving production systems in the forest zone (pp. 24-42)

- (a) Including two GERDAT scientists (1 I, 1 F) based at Bouaké but working mainly in the forest zone (excluding the Tai forest program)
- (b) ORSTOM scientists work on cassava (Ref. 1981 activities report, pp. 137 and 178), Fac.Sci. scientists work on yams.

Table 2. MSR controlled research program for the savanna zone -- Human and Financial Resources.

I = Ivorian P = Foreign T = Total		GERDAT			ORSTOM			ENSA			FAC. SCIENCPS			TOTAL			COST (millions CFAP)
		I	P	T	I	F	T	I	F	T	I	F	T	I	F	T	
Rainfed rice		33	70	103	11	31	42										
Maize			10	10		22	22	5		5				44	101	145	
Millet		3		3		10	10							5	32	37	
Sorghum, fonio		8		8										3	10	13	
CEREALS		44	80	124	11	63	74	5		5				60	143	203	
Yams						12	12							0	12	12	
Cassava		10	9	19										10	9	19	
ROOT CROPS		10	9	19		12	12							cf. tab. 3	10	21	31
Plant/food crop protection					8	40	48							8	40	48	
COTTON		11	43	54		6	6							11	49	60	
Production systems			104	104		22	22								126	126	
Rangelands		11	30	41		17	17		10	10				11	57	68	
Cattle		22	30	52										22	30	52	
Sheep and goats		11	10	21										11	10	21	
LIVESTOCK PRODUCTION		44	70	114		17	17		10	10				44	97	141	
Market crops						25	25										
Sugar cane		11	35	46		10	10							11	25	25	
OTHER CROPS		11	35	46		35	35	35						11	45	56	
FISH FARMING			15	15											15	15	
TOTAL	scientist/months	120	356	476	19	195	214	5	10	15				144	561	705	
	equivalent research scientists	11	35	46	1,5	20	21,5	0,5	1	1,5				13	56	69	

Table 3. Research programs for inventorying natural resources (1981) -- Data given in scientists/months.

I = Ivorian F = Foreign T = Total	ORSTOM			IET			IGT - CNF			Swiss Center			ENSA-Fac.Sc			Total		
	I	F	T	I	F	T	I	F	T	I	F	T	I	F	T	I	F	T
Forest	0	85	85	43		43	5		5	0	30*	30*	5		5	53	115	168
Savanna	22	21	43										5		5	27	21	48
National or not detailed	0	51	51	40		40	10		10				10		10	60	51	111
TOTAL	22	157	179	83		83	15		15	0	30	30	20		20	140	187	327

*Including 10 months on studying root crops (taro)

Ref.: Data based on MSR publication -- Knowledge, conservation and exploitation of natural ecosystems, 1981 (pp. 17-36)

Table 4. CIRES and ORSTOM rural sociology and economics scientists (1981).

I = Ivorian F = Foreign T = Total I + F	CIRES			ORSTOM			TOTAL		
	I	F	T	I	F	T	I	F	T
Forest	2	1	3	1		1	3	1	4
Savanna	2		2	1	2	3	3	2	5
National or not detailed	3	1	4	1		1	4	1	5
TOTAL	7	2	9	3	2	5	10	4	14

Ref.: Data based on the following publications: ORSTOM 1981. Activities Report, CIRES present position and prospects for the agro-economic unit, Nov. 1981

THE SYSTEM FOR PROGRAMMING RESEARCH

Programming and Its Evolution

There are few developing countries, or developed countries for that matter, that have invested as great an intellectual effort as Ivory Coast in developing a programming system that ensures the compatibility of research orientations with the government's development policy.

Agricultural research organizations differ in spheres of interest, nationality of personnel, or systems of financing. They form independent units with a minimum of contact with each other.

Formerly, the national research program was actually the sum of the individual institute programs, over which MSR had minimum control.

To ensure that the Ivorian government participated in making choices of programs to be carried out within the country, MSR, in 1971, prepared a research programming method that covered both the contents and financing of research activities, and intended to replace the institution-oriented program by a program-oriented financing system.

The Original Concept

Three complementary steps were considered for research programming, i.e., i) standardized identification of research activities, ii) evaluation of the cost of research, iii) study of the choices of research programs and setting priorities. This programming was to use a system of successive advisory meetings to coordinate well-ordered actions.

Study and Choice of Research Programs

Each year MSR convenes and consults a certain number of committees for advice on research priorities.

Programs are studied and selected annually by three committees:

- * The Program Committee, per organization.
- * The Budget Committee, per organization.
- * The "Synthesis" Committee.

The Program Committee. The program committee is responsible for assessing programs in progress, examining the advisability of continuing, redirecting or terminating them, studying and then selecting (according to priorities) new programs, and developing channels of interdisciplinary and interorganization coordination.

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Five categories of participants attend these meetings: scientists from the organization directly concerned, scientists from other organizations familiar with the discipline under discussion and highly qualified users (senior technicians from development agencies and technically-oriented ministries), two representatives from the MSR Department of Scientific Affairs, and one representative from the Ministry of Planning. Each committee meeting brings together 20 to 30 people.

The Budget Committee. The budget committee is responsible for studying budgetary forecasts for the following year in terms of results obtained during the preceding and current financial years. The working budget for the next year is studied from three angles:

- * straight renewal of programs in progress, i.e., maintaining the potential;
- * strengthening programs in progress;
- * introduction of new operations as part of new programs.

At this stage, no funds are committed for reinforcing or introducing new operations. The only figure put forth is that of the maximum rate of increase for expenditure needed to maintain the present potential.

The budget committee has been chaired by the Directeur du Cabinet of the Ministry of Scientific Research, and the meetings have been run by the head of the most directly concerned financial service of the research organizations, representing the Director of Administrative and Financial Affairs.

Budget committee meetings are attended by representatives of the following administration and organizations: Program Research Department of the Ministry of Scientific Research, Department for the General Budget and the Special Investment and Equipment Budget of the Ministry of Economics and Finance, Ministry of Planning, technically-oriented user ministries, development agencies that finance the programs and, lastly, the French Ministry of Technical Assistance, which provides a substantial part of the funds for agricultural research in Ivory Coast.

"Synthesis" Committees. Two "synthesis" committees have been planned, one for agricultural research in general and the other for the Faculty of Science. Their main task will be to balance program financing against available funds. After considering the conclusions of the program, the Training-Employment Committee and the Budget Committee, the "synthesis" committees work on the general financing, bearing in mind the expected levels of funding (from national and foreign resources) and the budgetary choices to be made between reinforcing programs in progress and introducing new activities. Programs and budgets adopted by these committees are then submitted for study by the Ministries of Economics, Finance and Planning, and foreign cofinanceers at bilateral committee meetings.

The Directeur du Cabinet of the Ministry of Scientific Research presides over the "synthesis" committees. The research organizations are not directly represented. The committee is composed of representatives of the technically-oriented ministries that use the outcome of research, the

Ministry of Planning, the Presidency of the Republic, the Department of Scientific, Administrative and Financial Affairs of the Ministry of Scientific Research.

Evolution of the Programming System

Since 1972, when it was first introduced, the programming method has undergone many changes. Experience acquired during the first two years showed that although the quality of the documents presented was good, the scientists and users often had difficulty in establishing their objectives in relation to their colleagues' objectives and also in relation to the national development plan.

To improve the situation, MSR developed a method of ranking choices on graphs that could be used to evaluate the contribution made by the programs to achieving objectives. These graphs were also expected to make it possible to progress from sectoral to regional research programming. It is not worthwhile explaining the graph system in detail, because after an introductory phase, it was abandoned because of the enormous amount of work it entailed and because of the possibility of achieving the same goals using simpler methods.

The program committees were started when programming was still very new. They have been thoroughly changed -- fewer committee meetings and reassigned responsibilities. In 1974 there were 60, in 1975, 46, in 1976, 29, including 18 devoted to agricultural research. In 1976, the institutional program committees were replaced by multiorganization, multidisciplinary theme-specific program committees, focusing on a single research theme with the intention of more directly working towards the major targets of national development.

The program committees for agricultural research cover the following fields:

- * Plant, animal, forestry production, and modernization of the rural areas: 11 committees.
- * Information on protection and conservation of land and aquatic ecosystems: 7 committees.

The system of theme-specific program committees has served to strengthen connections between research organizations, facilitate dialogue with users, and somewhat simplify the preparation and conduct of meetings.

Theme-specific programming has brought out:

- * the need for good coordination between research structures in preparing committee meetings;
- * the need for program committees to devote ample time to a thorough evaluation of the results acquired, even if there is a risk that attention will wander.

This is why it was necessary not only to lighten the committee agendas, but also to decentralize certain responsibilities at the theme level.

Unlike the program committees, the budget committees have not changed assignments over the years, but their number of committees has increased: 8 in 1972, 12 in 1973, and 14 in 1974.

Theme Coordinators and Leaders ("Animateur")

To stimulate the programming committees, MSR appointed a coordinator and a leader for each theme-specific programming committee.

The leader is responsible for the scientific design and evolution of programs, also at the theme level. He usually is not part of the research organization directly involved and has been chosen for his mastery of the field concerned. The coordinator is mainly responsible for ensuring that the programs grouped within a theme are properly carried out.

This responsibility implies:

- * stimulating relations between the various organizations concerned with the theme;
- * supervising the preparation of the program committee meetings and participating in the preparation of the technical committee meetings;
- * monitoring proper allocation and use of resources;
- * in concert with the scientific leader, promoting new programs and operations;
- * ensuring that young national scientists fit in well into teams composed of experienced (foreign) research scientists.

The coordinator is supported by program leaders who work through a coordination unit created for each theme.

In 1981, the system of programming was revised because experience showed that the single-theme approach used since 1976 was not sufficiently flexible or outward-looking to refocus and reinvigorate research activities to meet the main streams of national and regional development.

An integrated, multiorganizational, and multidisciplinary approaches to research activities should be part of a much wider plan that consolidates thoughts and actions, and thus makes them more effective than when isolated themes are adopted, as has been the practice in the past.

Considering the theme-related objectives adopted in the 1981-1985 plan, 7 major committees should be assigned to work on problems directly related to the main priorities for present-day development at both the regional and national levels. There are three that have a direct tie with agriculture:

- * Improving production systems in the savanna zone.
- * Improving production systems in the forest zone.

- * Understanding, conserving, preserving, and exploiting natural ecosystems and man-made inland and marine systems, including the following points:
 - * control of water;
 - * knowledge, preservation, and exploitation of inland and marine systems;
 - * knowledge of the natural environment (optimizing pedological and climatological data);
 - * knowledge, protection, and exploitation of the flora and fauna;
 - * conservation, processing, and maximization of plant and animal products and byproducts.

Methods for making financial evaluations have also improved since 1972. Budget programming is more realistic, thanks to the introduction of analytical accounting processes. Instead of planning finances for individual organizations, financing is now worked out for each program. This not only more fully satisfies the needs of multidisciplinary teams working on a given program, but also makes it possible to decide to cut short certain programs in order to free critical funds for new programs.

Programming Under INIRA

Decision-making

Programming of agricultural research can only be effective and reflective of development targets set by the government in the development plans if decisions on ranking problems for study are taken at two separate levels: at the interministerial level and at the scientific and institutional level.

At the Interministerial Level

It has been suggested that a special interministerial committee for agricultural research be created. Since most of the directives it prepares will relate to policy, the committee should be composed of: a representative from MSR, representatives from technical-oriented ministries, users of the products of agricultural research, the Ministries of Planning, and the Presidency of the Republic.

This interministerial committee should make proposals and decisions concerning the program and budget. After examining the development goals and the expected budget for INIRA, it prepares a forecast budget, based on national and foreign resources, and indicates the breakdown by line of production (food crops, industrial crops, animal products) and, if need be, by region or for special projects considered to be very high priority. After consulting INIRA under the aegis of MSR (see the following section), and considering decisions taken at the national level concerning the budget, the committee should make final decisions to be applied the following year.

MSR, with assistance from INIRA management, will prepare the meetings (logistically and technically) and draft and distribute the minutes.

At the Scientific and Institutional Level (INIRA)

Decisions are to be made by the programming committees and by the supervising scientific committee. The program committees must identify the priorities to be given to the problems arising in each sector of agricultural production.

Problems relating to several (or all) branches of production, such as production systems, social sciences, soil fertility, and irrigation techniques, are brought before one or more special theme-specific program committees, which are to assess the importance of the suggested research themes calculated on the basis of their effects on various branches of production.

Since the program committees are called to make decisions essentially scientific in nature, they should be attended by INIRA research scientists, scientists from other organizations (university, advanced school of agriculture, etc.), and highly qualified users (technicians from technically-oriented ministries, development agencies, representatives of the producers and professional producer groups).

Suggested Procedure for Programming

- * Identification of problems, prioritized according to the objectives of the plan, evaluation of funds to be allocated to agricultural research, and a breakdown by sector (interministerial committee);
 - * Preparation of the national research program for the following year, by the INIRA director general, department directors, and scientists;
 - * Preevaluation of the science, technology, and organization of the proposed program (INIRA scientific committee);
 - * Determination of the high-priority programs (sector and theme-specific committees);
 - * Final synthesis of the program, within the limits of available funds (interministerial committee).
1. The Minister of Research, with the assistance of the INIRA director general if necessary, presents the interministerial committee with a report that includes a statement on research in progress, past results, and a draft program and budget for the following year. This report is to be prepared by INIRA management and MSR's planning and programming service.

On the basis of this report, and bearing in mind the objectives of the plan, the committee gives its recommendations on priorities and the relative importance of various sectors and new research. It passes this information and an estimate of the funds needed for agricultural research (and their general allocation to the various sectors of production and the themes) to INIRA through MSR.

2. The INIRA director general informs the department directors of the criteria established by the interministerial committee and the approximate budget for the department.
3. Each department director instructs his scientists to suggest programs and research related to their professional field, their contacts with specific agricultural sectors, and the general directives from the interministerial committee. The budget and the regional breakdown of operations must be indicated.
4. Each department director makes a preselection from among the programs and actions suggested by the research scientists, bearing in mind the following questions:
 - * Does the subject suggested fit in with the personal skills and duties of the scientists in the research teams, or would the team have to be expanded? In the latter case, the availability of qualified specialists must be ascertained.
 - * Are adequate technical facilities and capabilities (laboratories, equipment, technicians) available?
 - * Is the experiment well designed and amenable to statistical analyses?
 - * Is the regional spread of the operations satisfactory?
 - * Are the cost estimates realistic and compatible with the program implementation facilities available, or which can reasonably be expected?

Research program preevaluation devoted to assessing the scientific, technical, and organizational value is usually done by the department director himself. If he so desires, he may invite comments from other scientists. After preevaluation, proposals can be sent on to be evaluated in terms of priorities, rejected, returned to the authors for improvement, modification, or budgetary revision.

5. The projected research program for a given research department, thus, is composed of all of the approved research actions and programs.

The commissions decide on program priority, in keeping with the estimated budget, and also whether regional programs are well balanced. In some cases, it is necessary to reject a project or change its priority rating, especially when the committee feels that certain specific problems need more attention.

6. All of the recommendations from the sector and theme-specific program committees are to be submitted to the scientific committee of INIRA (composed of the director general, the department directors, and directors of regional centers) to check that the program is well balanced and respects set priorities, and that it is fairly divided between the regions. After evaluation and revision, whenever

necessary, programs are submitted to the interministerial committee which must strive to balance resources needed to implement the highest priority programs against the total resources available to INIRA.

This being the context for each line of research, a series of programs is generally selected because the program committee feels they are of high-priority and do not exceed the budgetary ceiling for the sector. In some cases, examining research proposals brings out the importance of increasing the budget for certain research programs. When this happens, it may prove necessary to seek outside funding or transfer funds from one research theme to another.

The budget estimates adopted by the interministerial committee are ultimately scrutinized by the Ministry of Economic Affairs and the Ministry of Finance and, when outside funding is involved, foreign partners who are consulted, through joint bilateral committees.

EXAMPLE OF METHOD OF CALCULATING MINIMUM
NEEDS FOR SCIENTIFIC STAFF

Before this calculation method can be applied, a chart must be drawn up showing the structure of each scientific (sectoral) department (including divisions and sections) and the regional centers. Each basic research unit is assumed to include two scientists (one senior, one junior) to cover the permanent research requirements.

Example (for illustrative purposes only):

- * Plant Protection Department
 - * Plant pathology division
 - * Fungal diseases section: schedule 3 research units (2 regional centers + research-training center RTC)
 - * Virology section: ditto
 - * Bacteriology section: one unit at RTC
 - * ...
 - * Entomology-zoology division
 - * Biological and integrated control section: 5 units
 - * ...
 - * ...
- * ...
- * Food Crops Department
 - * Cereal division
 - * Rice section: schedule 3 units for rainfed rice in the savanna (IDESSA), rainfed rice in the forest (IDEFOR), and lowland rice
 - * Secondary cereals section: 2 units for maize (forest and savanna), 1 unit for the others (IDESSA)
 - * Tuber plants division
 - * ...
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LIST OF ACRONYMSA. Agricultural Research Institutions in Ivory Coast

CIRES	Ivorian Center for Economic and Social Research
CIRT	Ivorian Center for Technological Research (formerly ITIPAT)
CN	Center of The Netherlands
CNF	National Floristic Center
CS	Swiss Center for Scientific Research
CTFT	Technical Center for Tropical Forestry
DCV	Food Crops Department of IDESSA, formerly IRAT (Institute for Tropical Agricultural Research)
DE	Animal Production Department of IDESSA, formerly CRZ (Animal Husbandry Research Center)
DPT	Department of Fiber Plants of IDESSA, formerly IRCT (Research Center for Cotton and Textiles)
ENSA	National School for Advanced Agronomy (Research Unit)
GERDAT	Joint Group for Studies and Research on the Development of Tropical Agriculture
GERME	Studies and Research Group on the Electronic Microscope
IAB	Agricultural Institute of Bouaké
IDESSA	Institute of the Savanna
IEMVT	Institute for Tropical Veterinary Medicine and Animal Production
IET	Institute for Tropical Ecology
IPCI	Pasteur Institute of Ivory Coast
IRCA	Research Institute for Rubber in Africa
IRCC	Research Institute for Coffee and Cocoa
IRCPS	Research Institute for Sugar Cane and Plants
IRFA	Research Institute for Citrus and Other Fruits
IRHO	Research Institute for Oils and Oil-yielding Plants
MRS	Ministry of Scientific Research
ORSTOM	Overseas Office for Scientific and Technical Research

B. Development Agencies

BCET	Central Bureau for Technical Studies
BETPA	Technical Studies Bureau for Agricultural Projects
CIDT	Ivorian Center for the Development of Textiles
CIMA	Ivorian Center for Agricultural Machinery
COFRUITF	Producers' Cooperative for the Commercialization of Fruits and Vegetables of Ivory Coast
EECI	Electric Power of Ivory Coast
ITT	Ivorian Institute for Tropical Technology
MOTORAGF	State Company for the Development of Agricultural Motorization

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PALMINDUSTRIE	Management Unit for Industrial Palm Tree and Coconut Tree Plantations and the Industrialization of Oil Fat Products
SAPH	African Company for Rubber Plantations
SATMACI	Agricultural Modernization Agency
SODEFEL	Development Agency for Fruits and Vegetables
SODEFOR	Development Agency for Forest Plantations
SODEPALM	Development Agency for Oil Palms
SODEPRA	Development Agency for Animal Production
SODESUCRE	Development Agency for Sugar Cane Plantations, Industrialization and Marketing of Sugar

LIST OF DOCUMENTS CONSULTED1. General References

- AFRIQUE AGRICULTURE. No. 16. Mensuel d'informations agricoles. L'Agriculture Ivoirienne, Décembre 1976, 66p
- AFRIQUE AGRICULTURE. No. 67. L'Agriculture Ivoirienne, Mars 1981, 54p
- DUPREY. P. La Côte d'Ivoire de A à Z, s.d., 128p
- DUTHEIL DE LA ROCHERE. L'Etat et le Développement Economique de la Côte d'Ivoire, Chapitre VI: La Politique Agricole, Paris, Pedone, 1978, p.238-293
- FOUNOU-TCHUIGOUA, B. Quels Changements dans l'Agriculture Ivoirienne -- Africa Development, 4(1) Janvier-Mars 1979, p. 71-78
- FRATERNITE-MATIN: Série d'articles sur la recherche scientifique (15-25 Mars) et sur la production animale (5-10 Avril)
- GUILLAUME, J. C. Le Développement des Cultures Industrielles et d'Exportation en Côte d'Ivoire, Mai 1975, 54p
- LAURET, F. Compte-rendu de mission: orientation des recherches dans le domaine de l'économie des marchés et de la distribution des produits vivriers et alimentaires en Côte d'Ivoire. Montpellier, INRA, Octobre 1977
- MACQUART, D. Programmation de la Recherche. Texte miméo, Juin 1975, 31p
- MAZOYER, M. La Côte d'Ivoire, in "Pauvreté et inégalités rurales en Afrique de l'Ouest francophone. BIT, 1981, p.50-66
- MINISTERE DE L'ECONOMIE DES FINANCES ET DU PLAN. La Côte d'Ivoire en Chiffres, Edition 80-81, Entièrement Remaniée, Les Tout Derniers Chiffres sur tous les Secteurs d'Activité de la Côte d'Ivoire, s.d., 324p
- MINISTERE DU PLAN. Plan de développement économique et social de la Côte d'Ivoire pour la période 1981-85; Chapitre II: les grands problèmes et contraintes du développement agricole et rural. Abidjan, 1980, p. 11-188
- MINISTERE DU PLAN. Plan Quinquennal de développement économique, social et cultural. Politique Sectorielle (1981-1985), s.d., p.485-511
- VENNETIER, P. Les Atlas Afrique. Atlas de la Côte d'Ivoire, s.d., 72p
- PERSPECTIVES INTERNATIONALES. Demain l'Afrique. Préface d'Abdou Diouf, Président de la République du Sénégal, s.d., 195p

2. Ministère de l'Agriculture (Ministry of Agriculture)

AGROEPSU, LTD. Etude sur la Politique des prix aidés et Subventions Agricoles, Rapport Intérimaire, Volume 1, Rapport Principal, Abidjan, Janvier 1982, 54p

AGROEPSU, LTD. Etude sur la Politique des prix aides et Subventions Agricoles, Rapport Intérimaire, Volume 2, Annexes -- Abidjan, Janvier 1982

DIRECTION DES STATISTIQUES RURALES ET DES ENQUETES AGRICOLES. La Cacaoyère et la Caféière Ivoirienne Evolution de 1974 à 1979, Côte d'Ivoire, s.d., 12p

LACOMBE, Ph. La Formation Socio-Economique des Agronomes Ivoiriens -- Compte-Rendu de la Mission effectuée en Côte d'Ivoire du 12 au 24 Mai 1980. Ecole Nationale Supérieure Agronomique de Montpellier, Juillet 1980, 44p

PROJET DE DEVELOPPEMENT AGRICOLE INTEGRE DE LA REGION NORD: Bilan-diagnostic. BETPA. Abidjan, Janvier 1981, 172p

SECRETARIAT D'ETAT A L'AGRICULTURE. Ivoirienne de Technologie Tropicale -- Programme d'Action Triennal 1982, 1983, 1984, Tome 1, I. Présentation Générale, II. Méthode d'Evaluation des Coûts, III. Synthèse du Coût des Programmes, s.d., 49p

3. Ministère de la Recherche Scientifique (Ministry of Scientific Research)

BIGOT, Y., P. MARNOTTE. L'Enherbement des cultures dans la région de Niellé. Enherbement du maïs en culture traditionnelle associée au millet en culture pure avec engrais (Campagne 1980), Document provisoire. Comité Technique des 15-16, Bouaké, Octobre 1981, 2p

BOUCHARD, L., D. CHEVREAU, J. F. POULAIN. Rapports de Synthèse sur les Liaisons Recherche Développement en Zones de Savanes Hors Zones Cotonnières, 1975-1980. Document de Travail Recherche Développement, Mai 1981. Abidjan, s.d., 114p

CENTRE DE RECHERCHE OCEANOGRAPHIQUES. Etude des Lagunes Ivoiriennes. Abidjan, s.d., 12p

CHARTRE FONCTIONELLE POUR MSR. Abidjan, Janvier 1972, 31p

COMITE TECHNIQUE IRHO. La Recherche Scientifique au Service de Développement, Le Palmier et le Cocotier en Milieu Villageois. Abidjan, 23 Octobre 1981, 57p

COMITE TECHNIQUE RESTREINT DE L'IRFA. Abidjan, 26 Novembre 1981, 47p

COMITE TECHNIQUE. Recherche et Développement la Pisciculture en Eau Douce. Abidjan, 30 Octobre 1981, 5p

- COMMISSION DE PROGRAMMES DE RECHERCHES. Thématique 1980. Fruits et Légumes. Institut de Recherches sur les Fruits et Agrumes (IRFA), Office de la Recherche Scientifique et Technique d'Outre-Mer (ORSTOM). Abidjan, 26 Mars 1980, 101p
- COMMISSION DES PROGRAMMES. Thème: Lagune, Pêche, Pisciculture. Abidjan, 13 Avril 1979, 50p
- COMMISSION DES PROGRAMMES 1980. Politique d'Accroissement et de Diversification des Productions Agricoles d'Exportation. Les Forêts et la Production Forestière. Abidjan, Mars 1980, 79p
- COMMISSION DES PROGRAMMES. Thème: Océan et Pêche Maritime. Abidjan, 24 Avril 1980, 34p
- COMMISSION DES PROGRAMMES DE RECHERCHES 1981. Energies et Développement, Coordonnateur: MRS, Abidjan, s.d., 109p
- COMMISSION PROGRAMME No. 1, 1981. Amélioration des Systèmes de Production en Zone de Savanes. Abidjan, 25 Juin 1981, 143p
- COMMISSION THEMATIQUE No. 16, 1980. Systèmes Techniques d'Exploitation, Les Problèmes Economiques et Humains du Développement, Tome 2, Programmes et Opérations 1979-1980, Propositions de Modifications 1980-1981. Abidjan, 10 Avril 1980, 40p
- COORDONNATEUR: IRCA -- Commission des Programmes de Recherches, 1981. Conservation, Transformation et Valorisation des Produits et Sous-Produits Végétaux et Animaux. Abidjan, s.d., 119p
- DIRECTION DE LA FORMATION. Inventaire des étudiants. Plan de Formation 11^è Cycle, Master ET/OU Ph.D., en 1981-1982, Les Cycles d'Etudes Approfondies (CEA), Les Cycles d'Orientation et d'Aptitude à la Recherche (COAR), Commission Emploi-Formation, No. 1 Formation: Renouvellements et Attributions de Bourses de Spécialisation à la Recherche, Abidjan, Février 1982, 20p
- DIRECTION DE LA RECHERCHE ET DES PROGRAMMES. Thèmes et Programmes de la Recherche Scientifique en Côte d'Ivoire. Abidjan, Février 1980, 63p
- FACULTE DES SCIENCES. Fondation Nestlé, Centre Néerlandais. Thématique 1980: fruits et légumes. Abidjan, 101p
- HOUPHCUET-BOIGNY, F. Statuts Particuliers des Personnels de la Recherche Scientifique. 16 Février 1978, 13p
- PLESSIX DU, C. J., G. G. LOHOURY, B. D. DE DINECHIN, C. LAZZARINO. La Programmation de la Recherche Agronomique en Côte d'Ivoire. Communication présentée au 10^e Colloque de l'Institut International de la Potasse. Abidjan, s.d., 14p

SCHEMA SYNOPTIQUE DU SYSTEME IVOIRIEN DE PROGRAMMATION DE LA RECHERCHE.
Abidjan, 1975, 7p

STATUTS PARTICULIERS DES PERSONNELS DE LA RECHERCHE SCIENTIFIQUE. Abidjan,
1978, 13p

TOURE, B., H. RODRIGUEZ, J. F. POULAIN. L'Igname et sa Culture en Côte
d'Ivoire. Abidjan, s.d., 14p

4. Institutions de Recherche (Research Institutes)

CIRES

COMMISSION DES PROGRAMMES No. 19., 1979 (réunion du 26 Mars 1979).
Problèmes économiques et humains du développement rural (thème 6
Novembre), Abidjan, 1979, 88p

LEON, Y. Bilan et Perspectives de la Cellule Agro-Economie. Abidjan,
Novembre 1981, 26p

CTFT

BERTAULT, J. G. Etude d'Aménagement de la Forêt Naturelle, Evolution de la
Surface Terrière et de l'Accroissement de la Circonférence pour
Quatre Essences du Dispositif, SODEFOR de MOPRI, Abidjan, Février
1982, 26p

GOUDET, M., P. DE KIMPE. Compte Rendu Succinct d'Activité de la Division
de Recherches Piscicoles en Côte d'Ivoire en 1981 et Programme
1982. Abidjan, 15 Janvier 1982, 2p

FAITS SAILLANTS 1981. Recherches Forestières, Abidjan, Janvier 1982, 17p

LES RECHERCHES SUR LES PECHEES CONTINENTALES ET LA PISCICULTURE. Rapport
Annuel 1980, s.d., 49p

PROGRAMME POUR L'ANNEE 1982. Les Forêts et la Production Forestière.
Abidjan, Janvier 1982, 17p

PROGRAMME ET OPERATIONS. Les Forêts et la production Forestière. Abidjan,
s.d., 3p

RELATIONS CTFT/SODEFOR, 1976-1981. (Aspects principaux), Abidjan, Février
1981, 10p

GERDAT

DETERMINATION DE MODELES REGIONAUX D'EXPLOITATIONS AGRICOLES MODERNES EN
ZONE DE FORET. 1979, 3p

"ECOLOGIE ET AMENAGEMENT RURAL." Renseignement Généraux. 1981, 12p

IDESSA

- BIGOT, Y., J. F. POULAIN.** Objectifs et Contraintes de Développement des Systèmes de Production en Zone de Savanne. Objectifs et Contraintes pour l'ensemble de la zone de Savannes. Objectifs et Contraintes en Région Nord, Nord-Ouest, Nord-Est., Région Centre: IDEES-FORCE, du Document Présenté à la Commission de Programme No. 1, 1981, Amélioration des Systèmes de production en Zone de Savanes. Département des Cultures Vivrières, 1981, 144p
- BUDGET 1981, PROGRAMME GENERAL.** Prévisions de Dépenses par Programme et Opération, Bouaké, 22 Janvier 1981, 13p
- CHARRAY, J.** Selection et Amélioration des Ovins-Caprins, Rapport Annuel 1980, Bouaké. CRZ No. 4, Zoot, Mars 1981, 65p
- CHEVREAU, B.** Liste des Principales études pédologiques réalisés par l'IRAT en Côte d'Ivoire et réparties en fonction des régions agricoles période 1970-1979. Bouaké, Avril 1980, 8p
- COMITE TECHNIQUE RESTREINT DU DEPARTEMENT ELEVAGE.** Bouaké, 15 Octobre, 1981, 21p
- COMPTE-RENDU DE LA COMMISSION DES PROGRAMMES DU THEME ELEVAGE.** Pâturage, Fourrage du 2 Avril 1980. Abidjan, s.d., 10p
- COMPTE-RENDU DU COMITE TECHNIQUE.** Restreint du 15 Octobre 1981 concernant les Cultures Vivrières des zones de Savanes. Département des Cultures Vivrières, Bouaké, s.d., 15p
- CULTURES VIVRIERES.** Variétés de Maïs Recommandées en Côte d'Ivoire. Abidjan, 1982, 10p
- DEPARTEMENT DE PLANTES TEXTILES, BOUAKE.** Comité Technique Restreint. Bouaké, 15 octobre 1981, 23p
- DEPARTEMENT DES CULTURES VIVRIERES.** Section Manioc. Fiche Technique Manioc, Bouaké, Décembre 1981, 3p
- DEPARTEMENT DES CULTURES VIVRIERES.** Installation Biogaz. Irrigation Prototype Station centrale de Bouaké, s.d., 3p
- DEPARTEMENT DES CULTURES VIVRIERES I.** Proposition de Programme Recherches pour le Développement de la Culture de l'Igname, Bouaké, s.d., 6p
- DEPARTEMENT DES CULTURES VIVRIERES II.** Proposition de Programme Diversification et Intensification des Systèmes de Cultures, Introduction des Légumineuses à Graines dans le Nord recherche de Nouvelles Cultures dans le Centre, Bouaké, s.d., 5p
- DEPARTEMENT DES CULTURES VIVRIERES III.** Amélioration des Variétés et des Techniques de Culture des Mil, Sorgho et Fonio, Bouaké, s.d., 4p

- DEPARTEMENT DES CULTURES VIVRIERES. Divison de Défense des Cultures avec la collaboration de J. Deuse, Chef du Service Phytopharmacie de l'IRAT. Fiches de Traitements Phytosanitaires 1981. Abidjan, Novembre 1980, 15p
- DEPARTEMENT DES CULTURES VIVRIERES. Compte-Rendu de la Séance de travail du 20 Janvier 1982, organisée à l'occasion de la visite du Département des Cultures Vivrières de l'IDESSA par M. G. Laubhouet, Secrétaire d'Etat à l'Agriculture, Abidjan, 20 Janvier 1982, 10p
- DEPARTEMENT EN CULTURE VIVRIERES. Organigramme au 1er Mai 1980. Bouaké, 1980, 8p
- ETUDE ET DEVELOPPEMENT DES PATURAGES. Rapport Annuel d'Activités 1979. Bouaké, Juin 1980, 69p
- ETUDE ET DEVELOPPEMENT DES PATURAGES. Rapport Annuel 1980. Bouaké, Mars 1981, 86p
- GLATTLEIDER, D. L. Rapport Annuel 1976. Opération Caractérisation des Races Bovines de Côte d'Ivoire. Centre de Recherche Zootechniques de Minankro, Bouaké, CRZ No. 6, Zoot, Janvier 1977, 21p
- HAU, B. Avec la collaboration de E. KOTO (IDESSA Dpt. Textiles), J. C. BEGUINOT (TRITURAF), Z. DIALLO (CIDT). 'Le Coton Glandless en Côte d'Ivoire. Etat Actuel des Travaux sur le Coton Glandless et Nouvelles Orientations de Recherche, Evaluation Economique de l'interet d'une extension des superficies de Coton Glandless en Côte d'Ivoire. Département Plantes Textiles, Bouaké, s.d., 32p
- HOSTE, C., L. CLOE, J. P. POIVEY, P. DESLANDES. Résultats Zootechniques d'Enquêtes Menées au Centre d'Embouche Bovine de Ferkéssédougou, Bouaké, CRZ No. 25, Zoot, Décembre 1980, 26p
- INSTITUT AGRICOLE DE BOUAKE. Mémoires de fin d'études: 1. Impact socio-économique d'un complexe sucrier sur les régions environnantes: cas de Ferké 1. Octobre 1981, 5p; 2. Avant-projet de développement agricole de la sous-préfecture de Kong. Octobre 1970, 123p
- KOFFI ATTIEY. Amélioration des Variétés et des techniques de Culture du Sorgho. Département des Cultures Vivrières, Comité Technique, Bouaké, 15-16 Octobre 1981, 2p
- L'AUGMENTATION DE LA PRODUCTION PASSE NECESSAIREMENT PAR L'AMELIORATION DES TECHNIQUES CULTURALES. Comité Technique, Bouaké, 15-16 Octobre 1981, 1p
- LA RECHERCHE SCIENTIFIQUE AU SERVICE DU DEVELOPPEMENT. Propositions Actuelles pour les Cultures Vivrières en zone de Savannas. Comité Technique 1981. Abidjan, 1981, 11p

- LA RECHERCHE SCIENTIFIQUE AU SERVICE DU DEVELOPPEMENT. Recherche et Développement des Cultures Vivrières en zone de Savanes. Comité Technique 1981. Abidjan, 1981, 3p
- LA RECHERCHE SCIENTIFIQUE AU SERVICE DU DEVELOPPEMENT. La Définition de Système de production Agricole, Abidjan, s.d., 1p
- LANDAIS, E., J. P. POIVEY. Etude et Amélioration des Races Bovines en Milieu Traditionnel, Rapport Annuel 1980. Bouaké, CRZ No. 05, Zoot, Mars 1981, 39p
- LE DEPARTEMENT DES CULTURES VIVRIERES DE L'IDESSA. Bouaké, s.d., 2p
- LHOSTE, PH., L. CLOE. Rapport Annuel 1978. CRZ de Minankro. Bouaké, No. 04, Zoot, Avril 1979, 39p
- LHOSTE, PH., L. CLOE. Rapport Annuel Analytique 1977. Opération d'Embouche Bovine. CRZ de Minankro. Bouaké, CRZ No. 04, Zoot, Mars 1978, 71p
- MARCHAND, J. L., E. HAINZELIN. Création et Amélioration de Variétés de Mais. Département des Cultures Vivrières, Bouaké, 15-16 Octobre 1981, 8p
- POISSON, C. La Recherche Rizicole en Côte d'Ivoire hier et aujourd'hui. Acquis et Conseils de la Recherche. Département des Cultures Vivrières. Abidjan, Avril 1980, 26p
- POULAIN, J. F. Directeur du Département des Cultures Vivrières. Réflexions sur les structures, les programmes et les financements de la Recherche et de la Recherche-Développement en zone de savanes. Bouaké, s.d., 12p
- POULAIN, J. F. Premières Journées des Sciences de la terre. Méthodologie du Service de Pédologie de l'IRAT. Département des Cultures Vivrières, Abidjan, 26-31 Mars 1981, 3p
- POULAIN, J. F. Réflexions sur les structures, les programmes et les financements de la Recherche et de la Recherche-Développement en zone de savanes, Abidjan. Bouaké, Avril 1981, 12p
- POULAIN, J. F. Suggestions aux Instances de Programmation de la Recherche et au Développement, Problèmes Agronomiques Prioritaires Propositions pour leur Résolution dans un Cadre Régionalisé et Opérationnel. Bouaké, s.d.
- POULAIN, J. F., P. F. CHABALIER. Fumure des Cultures Rotation, Propositions. Conditions d'Application. Département des Cultures Vivrières, Abidjan, Mars 1980, 18p
- RAPPORT SEMESTRIEL D'EXECUTION TECHNIQUE NO. 5. Recherche d'Accompagnement Manioc, Bouaké, Décembre 1981, 39p
- REGIONS AGRICOLES DE COTE D'IVOIRE. Atelier d'Agronomie. Bouaké, Octobre 1979, 10p

SEMENT, G. L'Expérimentation Multilocale sur le Coton et la Mise au Point de Systèmes de Culture en Zone Cotonnières, Situation en Mars 1980, Bouaké, 31 Mars 1980, 12p

VARIETES DE RIZ RECOMMANDEES EN COTE D'IVOIRE. Bouaké, 1981, 16p

YAO KOUKOU, M. La Recherche Zootechnique au Département Elevage et le Troupeau Bovin de la Station au Mois de Juillet 1981. CRZ de Minankro. Bouaké, No. 12., Zoot, Septembre 1981, 11p

IFCC

CAUMEL, G. Côte d'Ivoire -- IFCC, Abidjan, s.d., p.31-57

RAPPORT ANNUEL 1980, TOME II. Deuxième Partie, Travaux de Recherches. Programmes: Amélioration du Caféier Canephora, Amélioration du Caféier Arabusta, Amélioration du Cola Nitida, Abidjan, s.d., 89p

RAPPORT ANNUEL 1980, TOME III. Deuxième Partie, Travaux de Recherches. Programme: Amélioration du Cacaoyer, Abidjan, s.d., 47p

IRAT

BUANEC LE, B. Essai de classification d'aptitude culturale des sols de plateaux de Côte d'Ivoire pour les cultures annuelles assolées en système mécanisé intensif. s.d., 4p

FOREST, F. Possibilités de l'Irrigation de Complément en Riziculture Pluviale Tropicale de Basse Altitude, s.d., 3p

IRCA

RAPPORT ANNUEL 1980, s.d., 103p

IRHO

DEPARTEMENT ENTOMOLOGIE. Problèmes posés par l'Aceria (Eriophyes Guerreronis) aux Cocoteraies du Sud de la Côte d'Ivoire. Abidjan, Août 1980, 9p

PROGRAMME DES DIFFERENTES CULTURES VIVRIERES A LA ME-CAMPAGNE 82/83. La Mé, 1982, 5p

ORSTOM

ACTIVITES DE L'ORSTOM EN COTE D'IVOIRE. s.d., 64p

FILLONNEAU, C. Place et rôle des enquêtes agronomiques en milieu rural
Bouaké, Avril 1981, 10p

RAPPORT ANNUEL, ANNEE 1980-1981, 1. Partie Scientifique, ORSTOM, Bouake,
1980, 342p

RICHARD, P. La commercialisation devant le problème vivrier en Côte
d'Ivoire. Abidjan, Octobre 1981, 328p

SERRANTIE, G. Les stratégies de production de quelques exploitations
agricoles du Centre de la Côte d'Ivoire: place et rôle de
l'igname et du riz dans ces stratégies. Bouaké, Septembre 1981,
49p

5. Sociétés de Développement (Development Agencies)

ASSOCIATION DES PRODUCTEURS ET MANUFACTURIERS DE CAOUTCHOUC NATUREL. Les
Hévéas; Abidjan, s.d., 24p

SATMACI-DCPFE. Culture du Caféier Robusta Encadre Temps de Travaux
Mensuels, Abidjan, 6 Juillet 1978, 18p

CIDT

COMMISSION PROGRAMME NO. 1. Système d'Exploitation en Zone de Savane,
Proposition de la CIDT sur les Priorités en Matière de Recherche
en zone de Savane, Direction Générale, Bouaké, 23 Juin 1981, 6p

PROGRAMME 1980. 26 Juin, 1980, 50p

PROGRAMME DE RECHERCHE ET DEVELOPPEMENT 1981. 31 Mars 1981, 45p

PROGRAMME 1982. Note de Présentation, Direction Générale Recherche-
Développement, Bouaké, 28 Février 1982, 5p

RAPPORT ANNUEL 1980. Expérimentation Multilocale, Vivriers et Tests
Techniques Culturelles, CIDT, Direction Générale,
Recherche-Développement, Division Expérimentation, Mai 1980, 69p

SATMACI

CONSEILLER TECHNIQUE 2. Compte d'Exploitation d'un Hectare de Cafés,
Abidjan, 25 Février 1982, 5p

SODESUCRE

COMPLEXE SUCRIER DE KATIOLA MARABADIASSA, s.d., 7p

BANQUE MONDIALE (WORLD BANK)

ACCELERATED DEVELOPMENT IN SUB-SAHARAN AFRICA. An Agenda for Action, Washington, D.C., 1981, 198p

ELLINGER, K. R. Ivory Coast, Agricultural Research, Abidjan, s.d., 12p

REPORT AND RECOMMENDATION OF THE PRESIDENT TO THE EXECUTIVE DIRECTORS. A Proposed Loan to the Republic of the Ivory Coast for a Northeast Savanna Rural Development Project. s.d., 9p

REPORT AND RECOMMENDATION OF THE PRESIDENT OF THE INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT TO THE EXECUTIVE DIRECTORS. A Proposed Structural Adjustment Loan to the Republic of the Ivory Coast, November 2, 1981, 47p

STAFF APPRAISAL REPORT. Ivory Coast, Northeast Savanna Rural Development Project. Regional Projects Department, Western Africa Regional Office, February 15, 1980, 62p

TUINER DEN BASTIAAN, A. Ivory Coast, The Challenge of Success. A World Bank Country Economic Report, Abidjan, 1978, 445p