

CLASSIFICATION
PROJECT EVALUATION SUMMARY (PES) – PART I

Report Symbol U-447

1. PROJECT TITLE Rwanda Food Storage and Marketing Project			2. PROJECT NUMBER 696-0100	3. MISSION/AID/W OFFICE USAID/Rwanda
			4. EVALUATION NUMBER (Enter the number maintained by the reporting unit e.g., Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY) <u>696-82-</u>	
			<input checked="" type="checkbox"/> REGULAR EVALUATION <input type="checkbox"/> SPECIAL EVALUATION	
5. KEY PROJECT IMPLEMENTATION DATES A. First PRO-AG or Equivalent FY _____ B. Final Obligation Expected FY <u>82</u> C. Final Input Delivery FY _____		6. ESTIMATED PROJECT FUNDING A. Total \$ <u>2,900,000</u> B. U.S. \$ <u>2,900,000</u>		7. PERIOD COVERED BY EVALUATION From (month/yr.) <u>12/74</u> To (month/yr.) <u>12/81</u> Date of Evaluation Review <u>December, 81</u>

8. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

A. List decisions and/or unresolved issues; cite those items needing further study. (NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., airgram, SPAR, PIO, which will present detailed request.)	B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
Evaluation was undertaken just prior to completion of project and served as basis of phase II of the Rwanda Food Storage and Marketing Project.	N. Olsen	PACD 12/31/82

9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS <input type="checkbox"/> Project Paper <input type="checkbox"/> Implementation Plan e.g., CPI Network <input type="checkbox"/> Other (Specify) _____ <input type="checkbox"/> Financial Plan <input type="checkbox"/> PIO/T <u>Project completed 12/82</u> <input type="checkbox"/> Logical Framework <input type="checkbox"/> PIO/C <input type="checkbox"/> Other (Specify) _____ <input type="checkbox"/> Project Agreement <input type="checkbox"/> PIO/P	10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT A. <input type="checkbox"/> Continue Project Without Change B. <input type="checkbox"/> Change Project Design and/or <input type="checkbox"/> Change Implementation Plan C. <input type="checkbox"/> Discontinue Project
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11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles) Norman L. Olsen AAO/Rwanda	12. Mission/AID/W Office Director Approval Signature _____ Typed Name <u>Eugene R. Chiavaroli</u> Date <u>June 24, 1982</u>
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Evaluation Report

Rwanda Food Storage and Marketing Project

Project 696-11-234-100

I. Introduction

The Food Storage and Marketing Project (FSM) was begun in 1975. It has been revised once, based upon an evaluation of progress to that date and a PP amendment. A thorough evaluation was again completed in 1978. The project assistance completion date was recently extended to the end of 1981 to permit the completion of construction of warehouses financed by the project and to continue technical assistance to the project while the analysis for a Phase II of the FSM project is completed.

The purpose of the present evaluation is to:

determine the Project's effectiveness and continued appropriateness.

provide guidance for a possible second phase of the FSM project.

make specific recommendations for current and future planning.

In accomplishing this purpose, AAO/Rwanda believes that the GOR, AID, and other project donors have benefited through an improved understanding of what is expected of the Project.

A. Evaluation Team

The evaluation was a joint effort which included: representatives from the Ministry of Agriculture, the Ministry of Economy and Commerce, the World Food Program, and a team from AID. Additional assistance was provided by staff of the AID-funded Local Crop Storage project and a two-member team of storage specialists from Kansas State University who were conducting a course on grain storage in Kigali during the period of the evaluation.

The AID team, which included an anthropologist from REDSO/E, serving as evaluation coordinator, an agricultural economist from Purdue University, the American Project Manager of the FSM project and an agricultural economist working in the Kigali AID office were responsible for reviewing the analysis, identifying

the critical problem areas, and developing a set of recommendations to address these problems.

B. Methodology

The point of departure for the evaluation was the scope of work included in Kigali 02751 and found in Annex 1. The core team began data collection and analysis during the first week of February 1981. The final review and evaluation writeup was completed in the second week of March. The final evaluation team meeting was held in June. The prime sources of data were project documents and discussions with persons involved in and/or knowledgeable of GRENAWA activities. A number of field trips were taken, and five warehouses were visited. There were nine separate meetings of members of the joint evaluation team.

The evaluation methodology was developed by the entire evaluation team. It was decided that the Project would be examined from six perspectives: institutional, financial, price policy, market prices, technical aspects, and socioeconomic impact. To this end, a series of analysis documents were drafted. The AID team was responsible for the bulk of the data collection and analysis. The analysis were based on personal interviews, field trips, on-site inspections, and Project, GOR and AID records. These documents served as the basis for the team's discussions throughout the evaluation. Through these analyses and discussions, the team was able to: question relevancy of the project; challenge aspects of project design; examine performance of impacts and implementing agents; validate targets; measure progress toward those targets; draw conclusions; and make recommendations regarding current and future planning for the project.

The entire evaluation team was responsible for reviewing the analysis, identifying the critical problem areas, and developing the set of recommendations to address these problems.

II. Summary Conclusions and Recommendations

A. Conclusions

1. Relevancy. Recognizing the continuing pressure of Rwanda's growing population on the land, the limited resources and infrastructure, and the growing problem of increasing the availability of food at reasonable prices, the Project continues to be relevant and appropriate to the development needs of Rwanda. This conclusion is shared by all key figures interviewed, including GOR officials, directors of various Rwandan organizations, and representatives of other donors in Rwanda. The project continues to enjoy a good reputation and is considered to be a major element in the GOR's effort to increase food availability. Both of the

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Project's previous evaluations shared the same conclusion about the Project's relevance.

2. Effectiveness. The FSM project has created a new institution with technical and organizational capabilities which were previously non-existent and presently are not found elsewhere in Rwanda. The institution, the Grenier National du Rwanda (GRENARWA), presently manages a nationwide system of eight strategically located warehouses. GRENARWA, dealing with private traders, cooperatives, and farmers, purchases beans and sorghum at harvest, stores them under controlled conditions and releases them in food deficit areas as demand, evidenced by rising prices, increases. By purchasing at harvest when food crop prices are low and selling when prices are rising, GRENARWA provides the competition needed to induce the private trader to offer a more advantageous price to producer and consumer.

GRENARWA has become the leader in providing storage advice and services to those Rwandan government and non-government organizations involved in food storage. The experience GRENARWA has obtained in the five years of active operations has put it in an excellent position to play a leadership role in dealing with national policy issues in food storage and marketing.

The Project has achieved its first purpose of establishing an efficient food storage and marketing system. GRENARWA's rapid and effective response to a serious regional food shortage in 1980 testifies to its operational capabilities. The Project's second purpose of stabilizing seasonal and regional prices of beans and sorghum has been partially achieved, although it remains difficult to measure. The basic procedures GRENARWA follows in order to stabilize prices are in place and functioning. What remains is to effectively utilize GRENARWA's present physical infrastructure and to refine its price stabilization procedures. The team believes these changes will increase GRENARWA's price stabilization effects and expand them over a wider geographic area. To do so, however, requires further development of GRENARWA's marketing and financial staff, and of the management support systems of data collection and analysis and financial control procedures.

GRENARWA's storage practices utilize the available technology and are satisfactory. They have surpassed the FOPS objective. A specific problem unforeseen when the project was originally designed concerns the effect of long storage on bean cookability and the resulting reduction in potential resale value. After 3-6 months in storage, beans harden and more cooking time is required. Consumers may also perceive a taste difference in stored beans. Also identified in the 1978 evaluation, this problem has not yet been adequately addressed.

The Project's financial viability received a major boost when the FOPS announced its departure from nationwide fixed minimum

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producer, and maximum retail prices to a free market pricing policy. Although the fixed price policy hampered GREMARWA's financial operations, it managed to cover all its costs in 1979 and various financial indicators continue to improve. Preliminary data for 1981 suggest further gains. However, the evaluation team concluded that to expect that GREMARWA will be self-financing in the near future would be overly optimistic.

3. Significance/Impact. The Project has been more successful in reducing consumer prices than increasing producer prices, partly due to the lack of producer organizations to deal with. The impact of GREMARWA's operations on reducing consumer prices is particularly notable in three areas: (i) those consumers who bought directly from its warehouses at lower prices; (ii) those consumers who bought in the markets where GREMARWA released its stocks (GREMARWA sells a portion of its stock to small private traders who, competing amongst themselves, generate downward pressures on bean and sorghum prices); and (iii) non-government (i.e., cooperatives, community centers, schools) and government (i.e., prisons, military) organizations who received lower bids from traders competing with GREMARWA to fill contracts.

Due to the lack of producer organizations through which GREMARWA could deal during the early years of the project's marketing experience (1976-1978) and the prohibitive costs of purchasing the large quantities needed from individual producers, the project purchased a high percentage of its beans and sorghum from private traders. However, since 1980, the project staff have increased trading activities with producer organizations. The evaluation team has concluded that as the number of these consumer and producer organizations increases, efforts to collaborate with them should be expanded to pass more of the Project's potential benefits directly to farmers.

GREMARWA's nationwide impact has been limited due to the small volume handled - i.e., 10% - of the total estimated marketed production in 1980.

(1)

The deleterious effects of fixed market prices . GREMARWA's ability to intervene in the market and on GREMARWA's financial solvency, were thoroughly discussed by the evaluation team. The collaborative mode of this evaluation permitted and required the team members to explore price policy with GOR officials. The team was able, in the course of the evaluation, to recommend this modification in price policy and the GOR responded almost immediately.

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The evaluation team believes that the implementation of the recommendations listed below will make a major contribution toward achieving the project objective of institutionalizing a price stabilization system in Rwanda by, in part, increasing the volume of food crops handled.

It is difficult to estimate the project's impact on the goal of increasing food availability through increased food production. As noted in the 1978 evaluation, this difficulty is a function of the global nature of the project goal. GREANARWA's activities are sufficiently intermeshed with the general process of food crop production, storage, marketing and consumption to preclude their separate measurement.

4. Efficiency. The evaluation team supports the conclusion drawn in the original Project Paper and subsequent evaluations that the establishment of an efficient storage and marketing system and the stabilization of food prices, when combined with programs to develop and extend improved farming practices, with research for improved varieties and techniques, with seed multiplication, etc., is one of the quickest and most efficient ways to increase food availability and increase equity to the farmers. The evaluation team concludes that this Project remains relevant to Rwanda's current development needs.

B. Recommendations.

During Life of Project:

- 1) GREANARWA should continue to place the highest priority on developing close working relationships with the non speculative organizations that

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directly serve the producers and consumers.

GRENARWA's activities have a stabilizing effect on market prices, but this effect is not automatically realized by the producer and consumer, especially when a high volume of GRENARWA's transactions involve traders and

2) GRENARWA needs to secure technical assistance in accounting through to the end of the project. A highly qualified person who can continue to train a Rwandan counterpart is required.

Presently, technical assistance is being provided by an accountant who has implemented an effective accounting system, but this person is leaving the project in the near future. Preferably a replacement should be found who will be available for a longer assignment than through the end of 1981.

3) The co-director of the project should receive training in financial management prior to the departure of the expatriate advisor.

GRENARWA's operations require that the manager possess practical knowledge of management and financial control. This recommendation was made previously, in the 1978 evaluation. The East Africa Management Institute in Arusha may offer a suitable course.

4) The expatriate director should gradually withdraw from day-to-day project management in order to focus on larger issues (e.g., research needs, implementation problems, financial analysis and management information needs, transport/communications policy, coordination with other organizations, developing a sales promotion section in OPROVIA, preparing manuals, etc.). It would be preferable to set up an office away from the GRENARWA office building for this work.

There is need: to ensure a smooth transition of GRENARWA into OPROVIA, to provide for overlap of personnel in view of the anticipated departure of the project manager who specialized in sales promotion and to establish the proposed sales ('promotion') section within OPROVIA on a firm footing.

5) The COR should be requested to consider assigning a Rwandan counterpart to work in the marketing section of OPROVIA. The justification is the same as for #4.

6) If there is sufficient interest, GRENARWA should establish regular communication with prefectural authorities and community leaders to increase the understanding of its objectives.

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At the prefectural level, there appears to be a lack of knowledge of and support for GREMARWA's activities and purposes. Increased involvement among prefectural leadership with warehouse buying, selling, storing and transporting activities should lead to better monitoring and understanding of GREMARWA operations (e.g., warehouse management, price policy problems, etc.).

7) Efforts should be made by GREMARWA management to work with other institutions such as the Institute for Statistics and Applied Economics, funded by OCAM) to assemble and analyze its own and other available grain price data useful for developing recommendations for improvements in the current price policy. Short-term technical assistance may be required.

Virtually every review of grain price policies has called for changes in the current policy. However, GREMARWA's costs and turnover and current grain price and marketing data have not been compiled and analyzed to the extent that they can be used as a basis for informed policy-making.

8) GREMARWA should, with ISAR assistance, begin the process of improving the calibration of the moisture meters and identifying the equipment and personnel required to carry out the long-term research.

There is a lack of accurate information on the condition of the beans in storage.

9) Preliminary research trials addressing the bean quality question should be continued and refined, if possible, by using more precise measuring equipment (e.g., scales and moisture meters). For example, marked sacks containing beans of different humidity levels can be placed in various locations in the sacks, and subsequently examined over various time periods.

The justification is the same as for #8.

10) As soon as possible, GREMARWA management should coordinate with USAID and the Local Crop Storage project to plan a study to examine the relationship between storage conditions and cooking time of beans. The study should provide data to improve storage practices and thus decrease losses due to a decline in the quality of beans.

The justification is the same as for #8.

11) GREMARWA should review, revise where necessary and codify a written moisture content policy for buying, sorting, and storing beans which should be circulated to warehouse managers.

There is need to improve and regularize the bean storage practices aimed at reducing problems associated with the moisture content of beans.

12) GRENARWA should continue to improve the efficiency of field staff supervision, radio communications, trucking of produce, etc. in order to maintain strict control over transport and travel expenses.

Due to a number of reasons (e.g., distance from nearest seaport, unstable political conditions in Uganda, and rising costs of vehicles and petroleum, per cent share of GRENARWA's total costs), transport costs need to be closely monitored and kept to a minimum.

Beyond Life of Project

13) In conjunction with the integration of GRENARWA/OPROVIA, OPROVIA should assume a major leadership role in developing policy and coordinating activities in the areas of storage and marketing of food crops.

There is need for more coordination and leadership within the marketing and storage subsector and there is need for a spokesman vis-a-vis the subsector and the government. OPROVIA will be the logical institution to assume this role, given its government mandate and its expanded institutional base.

14) Technical assistance should be supplied in sales promotion for 1982-1983.

After the integration of GRENARWA into OPROVIA at the end of 1981, the sales promotion section will assume additional responsibilities because GRENARWA/OPROVIA will take responsibility for additional food crops marketing and storage. At that time, a highly qualified technician will be required to strengthen this section. As the FSM project is terminating at the same time and the present project manager (who currently has prime responsibility for GRENARWA sales promotion) will be leaving, technical assistance should be made available at the earliest time possible, and preferably some overlapping of technicians should be arranged.

15) Technical assistance should be supplied in accounting for 1982-1983. If the short-term accountant services are satisfactory, he/she should be retained.

The justification is similar to that of #14, that is, the accounting section will need strengthening during the transition and continuity of technical assistance should be maintained.

16) The Section d'Etudes et Programmes of OPROVIA should be provided with the means to equip and put into operation its information service which

should furnish information to: non-speculative marketing and storage units, the government, and the general population (particularly through radio broadcasts).

There is a serious lack of up-to-date relevant information in all aspects of grain marketing. This type of data is essential to the efficient management of a marketing project and is also important to the government in its determination of a realistic and flexible price policy.

17) A survey to estimate potential grain yields approximately one month before the harvest should be carried out in order to set suitable grain prices. It is understood that the MINAGRI will conduct such a survey; if not, GREMARWA should initiate its own.

The justification is the same as for #16.

18) A commission should be established with representatives of all the organizations concerned, to carry out market surveys and present its recommendations to the government. Based on these recommendations, the price policy may be revised (e.g., to reflect seasonal and regional differences) and broadcast by radio.

GREMARWA has experienced serious financial difficulties due to: a single official fixed price for beans for the whole country, and an insufficient margin (as determined by government price policy) between buying and selling price.

19) GREMARWA should be able to exercise the freedom to establish a buying program based upon market studies and estimates of sales which promote its financial viability.

The obligation to buy large quantities of beans at the request of the government without being guaranteed a market for the purchases can seriously threaten GREMARWA's financial viability.

20) The sales promotion sector should be considered as a priority and should be placed at an appropriate level in OPROVIA's organization.

Sales promotion is absolutely vital to GREMARWA/OPROVIA's success, and its place in the bureaucracy should reflect this.

21) Where appropriate, USAID should take the necessary steps to initiate and coordinate the various research activities cited in this evaluation.

The mission is responsible for such activity as stipulated in the LCS Project and implicitly understood in the case of the FSM project.

III. Institutional Development

A. Background

The Food Storage and Marketing Project (FSM) was designed in 1974 and the ProAg was signed in December 1974. The project was called *Projet d'Entreposage et Commercialisation des Denrées Alimentaires*, or PFCDA. Today it is known as GREMARWA, or the Grenier National du Rwanda. For a time, the project operated under the general supervision of the Secretary General of the Ministry of Agriculture, Livestock and Fisheries (MINAGPI), and the National Council for Economic Policy (CNPE). In July 1975, the Rwandan Government (GOR) established the Office Nationale pour le Developpement et la Commercialisation des Produits Vivriers et des Productions Animales (OPROVIA), within whose scope of work GREMARWA fell.

It was not until May 1979 that a procedure for integrating GREMARWA into OPROVIA (as the Service de Production Vivriers--Food Crop Production Service) was completed. As of that time, GREMARWA was responsible to the Director General of OPROVIA, who in turn is responsible to the Administrative Council of which the president is the Secretary General of the MINAGRI. Up until the present, however, GREMARWA has operated relatively independently of OPROVIA. The full integration of GREMARWA into OPROVIA has been approved and is scheduled to be completed by the end of the FSM project, December 31, 1981.

B. GREMARWA.

The management has one expatriate who has been serving as director of the project since July 1978, and a Rwandan with a degree in Agriculture from Belgium, who has been co-manager since early 1977. A second expatriate, an accountant, was hired in July 1980 after the dismissal and prosecution of the former chief accountant and the storage technician for theft of funds, to take responsibility for the accounting system. He also is responsible for preparing an operations manual, with job descriptions.

The general organization of GREMARWA can be grouped into seven categories: management and the six sections identified in the organization chart. Marketing is currently the responsibility of management, with assistance from the storage section. Inventory control is supervised by the storage technician and Statistician/Controller.

C. OPROVIA

OPROVIA was created by the GOR to meet the long-felt need to organize domestic marketing of food and livestock products. The mandate of OPROVIA includes stimulation of production, as well as promotion and marketing at

both wholesale and retail levels, OPROVIA's objectives are relatively ambitious and cover a range of possible activities. Much of its budget comes from outside the structure of the MINAGRI in the form of the funding for development projects. In fact, at present, OPROVIA does not have its own line in the MINAGRI budget.

In the second 5-year plan, OPROVIA's role is defined as promoting food crop production at all levels and assuring distribution and sale to urban centers. For obvious reasons, OPROVIA, having studied its own situation, has decided that it has no direct role to play at the level of the small farmer. They are to be serviced by the Extension Service (MINAGRI), or, at the commune level, by the Cooperatives (MINASOCOOP), and CRS silo organization.

At present, OPROVIA is concentrating its efforts on the sale of local food crops and the distribution of food aid given to Rwanda by several countries and international organizations particularly the European Economic Community (EEC). OPROVIA is also required to supervise a group of small projects dealing with livestock. OPROVIA's role here will be to ensure the organization of activities within the projects and to define project policy. Such projects include cattle ranches, abattoirs, and the national dairies.

When GRENAWA is integrated with OPROVIA, i.e. January 1982, its role will be extended to cover all food crops throughout the country and it will concentrate on promoting increased productivity. Retail activities will be transferred to another division of OPROVIA. OPROVIA is at present studying the new organizational structure which will be required by the integration of GRENAWA and other livestock projects.

Thus, OPROVIA is finding its own niche in the political and administrative framework. It seems that this process has certainly been aided by its relationship with GRENAWA. Indeed, the IBRD agricultural sector review (June 30, 1977, Annex 3, page 9, para 2.7) states that the FSM project in the shape of PECCA "provided an opportunity to put an old idea into practice" in the establishment of OPROVIA.

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D. Relationships with Other Institutions

As an institution within OPROVIA, GRENARWA has the mandate to improve the conditions of the small-holder producer and consumer; it also has the mandate to coordinate its activities with other non-speculative institutions involved in the marketing and storage of food crops. The present GRENARWA management has made strenuous efforts to increase the involvement of cooperatives and other community-based and/or government organizations in both the buying and selling of beans and sorghum handled by GRENARWA. These efforts have included the sending of hundreds of letters to organizations and officials (e.g., to all burgomasters in the country, cooperatives, religious groups, etc.). It has also required extensive travel by project staff to develop contacts and establish trading links.

The success of these efforts has been rather limited to date (see Section VII) but suggests that progress is being made, particularly in the area of consumer prices. This should continue as long as efforts to develop and maintain the necessary contacts are continued and as the informal linkages between the various organizations charged with food marketing and storage are strengthened. The most important linkages in this regard will be between GRENARWA and OPROVIA operating at the regional and national level, and the cooperatives, the CRS-mission silos, the cooperatives who have storage silos, and various area-specific development projects operating at the commune and community levels. Additionally, more effective means for building a network of these institutions include periodic meetings, at the national and prefectural level, and the introduction of improved means of communication, e.g., via radio links.

Efforts are being made to establish a relationship with ISAR, the agriculture research institute, as well as with institutes at the University of Rwanda, on a range of development projects which include applied agricultural research. Progress in the ISAR research effort has been slow, and an effort to gain a better sociological perspective of the project using University resources was less than fully satisfactory on the first attempt. Further efforts will be required to develop links between GRENARWA and the institutions involved in the food crop early warning system being developed in the MINAGRI.

During the final months of this project, and in any follow-on attempt, the systematic development of linkages with other institutions, whether addressing problems in common in marketing and storage, bean research, or surveillance of crop production, should receive top priority.

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E. Warehouse/Prefectural Relationships

An important aspect of the project is the degree to which the GREMARWA warehouses--which are sited according to prefectural divisions--are perceived as being a service having relevance to needs within the prefecture. Although established as components of a national system, it is likely that the system will be run more efficiently, and that the purposes of the system will be achieved more effectively, if there is a degree of community involvement with and commitment to the individual warehouses.

At present, there appears to be a lack of understanding among officials, decision-makers and the public at large of the purposes of GREMARWA and of the financial and operational constraints under which it operates at the national and prefectural levels. There also appears to be a relatively low identification with the project by residents and officials at the regional level; GREMARWA is perceived as belonging to the central government and supported by an outside donor (AID). While this is certainly the case, GREMARWA's warehouses working with local storage units can provide services which will have significant potential for improving incomes and availability of food within the prefecture.

In order to develop this potential along constructive lines, it is recommended that GREMARWA make efforts to establish regular communication with appropriate officials and leaders at the prefecture level. The benefits of such interaction are several. GREMARWA staff (e.g., those conducting price studies) could work with prefectural officials to gain a better understanding of the constraints to a suitable price policy within the prefecture. This information could, in turn, be communicated to the National Price Commission. GREMARWA staff could also work with officials and decision-makers at the prefectural level to improve the efficiency of warehouse operations, by developing buying and selling policies vis-a-vis local storage institutions, and producer organizations and by monitoring sales activities at the warehouse, etc.

There are certain limitations which need to be taken into account when initiating such an approach. GREMARWA is a national system of warehouses and, as such, must operate within a unified framework. The encouragement of participation in GREMARWA activities at the regional level should always be accomplished within the constraints of this national framework, and thus should be carried out with a clear mandate from those responsible for GREMARWA's and OPROVIA's operations.

F. Integration of GREMARWA into OPROVIA

The integration of GREMARWA into OPROVIA was mandated by the 1978 Project Agreement, but the actual form and details of the integration were left to the parties concerned. GREMARWA took the first concrete step

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toward formalization of the integration in October 1978 by presenting to the Director General of OPROVIA a memorandum explaining GREMARWA's viewpoint regarding what were perceived as the major points of the integration.

This memo was thoroughly discussed at a meeting of the Administrative Council of OPROVIA, presided over by the Secretary General of the Ministry of Agriculture. A letter of reply was received from OPROVIA in December of 1978, and after further meetings and discussion, an exchange of letters between the MAO and Director General of OPROVIA in May 1979 formalized an outline of the integration. This exchange constituted an amendment to the Project Agreement and also addressed the questions of price policy (affirming GREMARWA's freedom in setting buying and selling prices) and a revision of the construction plan as set out in the Pro-Ag.

The basic points of the integration plan are as follows:

The integration is to be progressive, and should be complete by the termination of the FSM project in December 1981.

- GREMARWA will function as the Service Produits Vivriers of OPROVIA, will keep the name GREMARWA and will give priority to bean and sorghum marketing.
- The resources of GREMARWA will be managed autonomously during the integration; GREMARWA's resources are to be used uniquely for its goals, except in special cases jointly approved by the Director General of OPROVIA and the MAO.
- To respond to the donor requirements, a separation of the accounting and reporting functions will be maintained and GREMARWA's annual report will be a separate section of OPROVIA's.
- Salaries and personnel policies are to be gradually brought in line with OPROVIA's in order to have complete concordance at the end of the project.

Considerable progress has already been made in achieving full integration. This includes:

- The initiation and continuation of a series of formal meetings in which detailed questions of integration are discussed.
- The development of a pattern of frequent, informal contact between GREMARWA and OPROVIA management, to resolve problems, exchange advice, etc. GREMARWA has come to depend on OPROVIA's support in dealing with a number of issues, particularly those having politically sensitive implications.

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- Monthly reports are sent to OPROVIA, broken down into stock movements and balances, administrative points and problems, and the financial situation.
- Significant changes have been made in the GREMARWA accounting system to bring it into line with OPROVIA's. Specific actions include the changing of all account numbers and titles, changing the form of the presentation of financial statements, etc.
- Most salaries and nearly all personnel policies have been brought in line with those of OPROVIA. The creation of job titles and positions has been done in such a way as to reduce the risk of conflict (including the necessity to eliminate jobs) after integration.
- An agreement has been worked out regarding 'reciprocal favors' between the two organizations during integration, including use of warehouse space, sales of produce and sacks, exchange of transport, etc.

Because of the inherent differences in the operations of the two organizations, reconciliation in some areas (such as the overall accounting system) may not be advisable. Areas which require further joint effort to complete the integration include:

- the resolution of personnel issues, such as salary levels, placement of GREMARWA staff within the GOR grades, job positions, etc.
- development of an appropriate organizational chart regarding both the internal organization of GREMARWA and the placement of GREMARWA as a division within OPROVIA, which must be approved by the government.
- completion of formal job descriptions following development and approval of the organizational chart.
- resolution of outstanding operational and financial issues such as the degree of GREMARWA's autonomy in day-to-day management and whether separate bank accounts should be maintained. These issues will require prior agreement regarding the degree of centralization in the future structure of OPROVIA, an issue which has yet to be resolved by current OPROVIA and government leadership.

IV. Financial Analysis

The precarious financial situation of GREMARWA can be illustrated by the fact that from 1976 to 1980 the project made a surplus on its trading activities in only one year--1979. Furthermore, the major part of the surplus in that year was due to large sales of beans which had been in

stock from previous years, and which had been given a book value of 1 Rwf per kilo, but which were sold at from 5 to 20 Rwf per kilo.

The following analysis examines in detail the present financial situation of GREMARWA (including cost structure and control systems) and makes two cash flow projections for 1981 based on 'best case' and 'worst case' commercialization programs. A discussion of future trends and their implications is incorporated towards the end of this chapter.

A. Operating Costs

A time series of GREMARWA's operating costs from 1976 to 1980, as well as a projection for 1981, is presented in Table 1.

Due to the fact that GREMARWA was expanding operations, building new warehouses, and acquiring a vehicle fleet and a greater number of personnel, total costs increased approximately 230% between 1977 and 1980 (36% p.a.). During this same period, the value of purchases increased by 275% (40% p.a.) and the value of sales by 350% (52% p.a.). (See Table 2.) Nevertheless, in 1980 total sales were 4,116 tons, while total purchases were 6,738 tons which resulted in a financial loss of approximately 15 million francs (including depreciation in structures and equipment).

The difficulty GREMARWA has experienced in disposing of its stocks with an adequate trading margin has been and is likely to continue to be a major constraint of its ability to achieve financial viability (see below). The second constraint is the level of operating costs, including the indirect cost of stock losses. The major components of these costs--salaries, transport and travel, depreciation and losses--are discussed below.

(1) Salaries. In 1980 the salaries of head office personnel, plus the salaries of permanent warehouse staff, amounted to 7,746,000 Rwf. In addition to this, 3,105,000 Rwf was paid to temporary laborers. The total wage bill, 10,851,000 Rwf, represented 28% of GREMARWA's total operating costs. In view of the fact that there are at present some vacancies (statistics assistant and warehouse personnel) and, more importantly, taking into account inflation and periodic wage increases decreed by the government, these costs will inevitably increase, probably at an annual rate of not less than 10-15% per annum.

(2) Transport and Travel. Transportation costs (including maintenance, insurance and fuel) in 1980 were 7,808,000 Rwf, representing 20% of total annual operating costs, and an increase of 52% over the 1979

TABLE 1

SUMMARY OF PROJECT OPERATING COSTS
(RWF)

1976 - 81

	1976	1977	1978	1979	1980	Budgeted 1981
Fixed Costs						
1) salaries	2,174,188	3,222,018	3,749,919	6,030,230	7,746,165	9,965,000
2) operating expenditures	154,158	1,282,639	1,312,949	2,696,036 (1,087,000 Rent)	4,362,429 (1294705 Rent)	2,439,000
3) vehicles	385,713	497,810	808,779	1,636,170	3,064,376	7,340,000
4) maintenance	2,830	159,357	71,077	63,450	305,703	250,000
5) office supplies	76,495	120,240	137,817	(under 2)	(under 2)	
6) market studies	-	30,847	13,123	(under 2)	(under 2)	
7) miscellaneous	643,327	326,457	47,313	423,517	1,534,907	228,000
S/Total	3,436,711	5,709,368	6,140,977	10,854,463	17,013,580	20,282,000
Variable Costs						
8) labour	357,850	1,463,332	986,193	2,798,301	3,105,377	4,000,000
9) per diem	15,655	346,501	280,323	168,566 (25%/75% under 2)	183,964 (25%/75% under 2)	181,000
10) interest	200,387	300,144	-	-	-	-
11) transport	-	38,443	176,733	1,436,263	(11-12) 4,743,145	3,000,000
12) transport	1,355,262	1,429,528	244,627	2,830,913		3,000,000
13) storage materials	210,217	807,811	367,854	1,796,836	1,578,230	1,100,000
14) losses	1,046,810	2,041,107	2,931,214	3,167,105	4,929,484	5,200,000
S/Total	3,185,581	7,429,865	6,036,944	11,448,484	14,542,094	16,786,000
Total fixed and variable costs	6,622,292	13,139,234	12,177,921	22,302,887		
Depreciation						
15) warehouses	684,915	1,622,782	1,815,610	1,980,008	1,980,008	3,160,000
16) storage equipment	20,950	377,514	448,186	970,648	1,303,616	2,700,000
17) office equipment	19,303	17,070	18,069	(under 18)	95,217	415,000
18) furniture	44,150	51,661	58,524	39,892	124,473	500,000
19) vehicles	262,092	373,154	195,169	3,461,809 (33% rate)	3,652,082	3,600,000
S/Total	1,031,410	2,342,181	2,535,558	6,452,357	7,154,796	10,465,000
Total Costs	7,653,702	15,481,415	14,713,479	28,755,244	38,710,580	(47,533,000)

Notes

- 1) Salaries include head office and warehouses
- 2) Operating expenditure - rent, utilities, medical, caisses sociale etc.
- 3) Vehicles - maintenance, insurance, fuel for head office transport.
- 4) Labour - temporary staff at warehouses.
- 11) Transport - to and from warehouse.
- 12) Transport - between warehouses. The transfer of '76 purchases took place in '77. To reflect true costs for '77 purchases, 50% of transport cost is allocated to '76.

- 13) Storage materials - insecticides, fumigants.
- 14) Losses - estimated at 5% of inventory.
- 16) Depreciation storage equipment - includes sacks.

Source: ORSARWA financial statements.

TABLE 2Value of Bean & Sorghum Purchases & Sales 1977 - 1980

('000 RwF)

	<u>Purchases</u>	<u>Sales</u>
1977	60,389	34,344
1978	14,377	43,750
1979	104,132	112,433
1980	165,452	121,250
TOTAL	344,350	311,777

figure of 5,153,000 Rwf. This increase can be attributed to three factors:

(i) An increase in the number of vehicles. In 1979, four new vehicles were bought (1 Peugeot in April, 2 trucks in May, 1 truck in October); which were used for a total of 25 vehicle/months transportation in 1979, as opposed to 43 months in 1980. In 1980 a further 2 vehicles were purchased—a Toyota pickup and a Nissan minibus. This increased transportation involved additional costs for insurance, fuel and maintenance.

(ii) In addition to the fact that more fuel was used, the price of fuel was increased several times during 1979 and 1980. The higher price in 1980, combined with the fuel crisis in 1979 which restricted transportation, led to a 101% increase in GREMARWA's fuel bill from 1979 to 1980 (1,235,000 Rwf in 1979; 2,486,000 Rwf in 1980).

(iii) Maintenance costs have increased sharply. Although an increase would be expected in view of the increased use of the vehicles, inflation, and the fact that the vehicles are getting older, the extent of the increase (909,000 in 1979 to 2,453,000 in 1980—a 170% increase) has caused management to investigate the possibilities of maintenance bills having been padded by garage staff in collaboration with GREMARWA transport personnel.

It is important to note that the increase in transportation costs has been more than offset by a decline in the use of outside transport (2,080,000 in 1979 to 1,448,000 in 1980—30% decline) and an increase in revenue from transportation services provided intermittently to W.F.P. (World Food Program) and OPROVIA and for delivery of emergency food for the Ministry for Social Affairs. Changes in transportation costs and revenue from 1979 to 1980 are shown below:

	<u>1979</u>	<u>1980</u>
Transport costs (in million Rwf)	5.2	7.8
Revenue from vehicles (in million Rwf)	-1.3	-5.4
Total Costs	3.9	2.4

Thus, net costs of transportation have actually declined from 3.9 million francs to 2.4 million francs. This decline is not likely to continue in future years, however, as fuel and maintenance costs will rise, and the possibilities for increased revenue from transportation services are limited.

(3) Depreciation. Estimated depreciation for 1980 was 7,154,796 Rwf, 18% of the total operating costs. Over half of this is depreciation of vehicles (3,652,082 Rwf), which is calculated on the basis of a three-year life. If GREMARWA does not replace all its vehicles--using OPROVIA instead--these costs will be decreased. On the other hand, the figure for warehouse depreciation (1,980,000 Rwf) will be increased in 1981 by the addition of two new warehouses plus warehouse extensions, managers' houses and an office building.

(4) Losses. Stock losses for 1980 were valued at 4,929,000 Rwf. Although this represents 13% of total operating costs, it is only 2.9% of the value of 1980 purchases, down from 3.8% in 1979). Up to 5% stock losses are normally considered acceptable for this type of storage project. (The project paper also states that up to 5% is acceptable). This figure, however, represents weight losses from the drying out of beans between the buying and selling season, as well as thefts, spillage, weighing differences, etc. and does not include the quality losses of having to sell beans from previous years at a reduced price because of a decline in their quality and a decline in consumer acceptability (specifically the development of hardshell) after storage over long periods.

Since a decline in the quality of the beans is only one of several possible reasons for having to sell them at a reduced price (other factors being a surplus of beans available, too high a buying price, etc.), it is difficult to make an exact calculation of losses due to quality decline alone.

Table 3 shows the average buying and selling prices and margins of produce turned over within a year, and of produce stored for over a year. For the latter, it is assumed that the difference in price is directly related to the length of time in storage and the consequent decline in consumer acceptability.

In 1978 the average selling price of new beans (1978 harvest) was 25.26 Rwf per kilo. In the same selling season, old beans (over one year in storage) were sold for an average of 22.54 Rwf. The loss from having to sell older beans at a lower price is estimated at 3,099,945 Rwf (i.e., 2.72 x 1,139,686 kgs). Calculated in the same way, the loss for 1979 is 17,222,367 and the loss for 1980 is 3,840,908--giving a total loss of 24,233,220 Rwf for quality losses of beans in storage for more than 12 months.

The losses due to a decline in quality, then, are quite substantial. In view of the uncertain market conditions prevailing in Rwanda, it is likely that a certain quantity of beans will have to be carried over from one year to the next, and thus priority must be given to research on how beans can be stored for long periods without a substantial reduction in quality or consumer acceptability.

TABLE 3 Purchase & Sale Prices of new and old beans 1977 - 1980

<u>Purchases</u>				<u>Sales</u>				<u>Old Stock</u>			
	<u>Quantity</u>	<u>Value</u>	<u>Price/kg</u>	<u>New Stock</u>			<u>Margin</u>	<u>Quantity</u>	<u>Value</u>	<u>Price/kg</u>	<u>Margin</u>
1976	1,163,334	25,368,432	21.81	28,150	691,750	24.57	2.76	-	-	-	-
1977	2,875,594	60,388,874	21.00	1,486,000	34,344,976	23.11	2.11	-	-	-	-
1978	718,939	14,376,700	19.99	697,500	17,619,027	25.26	5.27	1,139,686	25,688,522	22.54 ¹	2.55
1979	3,327,162	72,207,829	21.70	3,167,170	87,140,127.5	27.51	6.81	872,911	6,722,978	7.70	-14.00
1980	4,901,426	134,332,588	27.41	2,922,183	88,455,660.5	30.27	2.86	246,845	3,629,935	14.71	-12.70

Estimated losses on old stocks:

1978	3,099,945
1979	17,292,367
1980	3,840,908

TOTAL 24,233,220

¹ This figure is higher than might be expected because it includes sales to prisons at 25 Rwf/kg and sales to P.A.M. at 24½ Rwf/kg.

B. Control Systems

(1) Inventory Control

An accurate inventory control is a prerequisite for estimating warehouse losses and doing financial analyses. Until 1978, it was not possible to calculate GREMARWA's inventory (unless every single sack was weighed, which was impractical) because sacks were not of a standard capacity. One stack of beans might include 60, 80, and 90 kilo sacks, for instance.

In order to remedy this situation, the 1978 evaluation report recommended that sacks of uniform capacity be used. While it has not been possible for GREMARWA to purchase sacks of all the same size, the problem has been largely solved by the use of sacks of uniform capacity in each stack. Thus, a fairly accurate inventory can be taken by weighing sample sacks from each stack of beans and multiplying the average weight of the sample by the number of sacks in that stack. (Since the outer sacks may be slightly drier, there may be a slight underestimation of weight, giving a slight overestimation of stock losses). Such an inventory is taken weekly and the result is transmitted to the central office which enables a fairly strict control of stock losses to be kept.

GREMARWA has already started some research in the warehouses, experimenting with sacks of beans of different humidity levels, and, in collaboration with ISAR, further research is being designed and the moisture meters (used to measure moisture content of the beans) are being calibrated. Since moisture content of beans is thought to be the most important factor in reducing cooking time, this is an essential prerequisite for efficient quality control of beans in storage.

The crucial factor concerning both quality changes over long periods and consumer acceptability is the length of cooking time required to cook the beans to a certain degree of softness.¹ According to a 1962 study of this problem,² the three most important factors affecting cooking time are:

- i) the moisture content of the beans;
- ii) the temperature of the beans in storage; and
- iii) the duration of storage.

¹Increased cooking time caused a deterioration of protein value and of flavor, according to the study cited below. In Rwanda, the need for more scarce resources (fuelwood and labor) is also a major problem.

²W. H. Morris

The first of these was by far the most important factor.

Another minor problem relating to inventory control was the control of empty sacks, and deposits charged on sacks. This latter required a special fund which had to be audited, and the system has now been discontinued in favor of selling sacks with the product. The sacks may be returned later.

(2) Financial Control

Up to 1980 there was a serious lack of financial control which contributed to considerable financial losses from theft. This situation arose because the system set up by the first accountant attached to the project (from 1976-1978) was not adequate, and a replacement was not found until September 1980.

A major problem in financial control was caused by the fact that buying and selling activities at the warehouses mainly involved cash transactions. Thus, relatively large amounts of cash were carried to and from the warehouses and handled by a number of different people. Cash for salaries was also carried each month by warehouse managers from the central office to the warehouses. The situation was aggravated by the lack of a communications system to transfer information on cash and stock situation between the warehouses and central office. Thus, there was no effective cash control system in place.

While this situation was partly improved during 1979, it was only after the appointment of a qualified accountant to the project in 1980 that a comprehensive system of cash control was established. At present, for example, transactions at warehouses which involve one ton or more require that a deposit be made in the GREMARWA account at the local bank, thus greatly reducing cash handled in the warehouse. Warehouse salaries are now transferred by a bank or post office.

Although the system of financial control has been greatly improved, there is still a need for a trained accountant to supervise and enforce it. When the present expatriate accountant leaves (end of March 1981), the Rwandan counterpart will have had only three months in-service training, and there will obviously be a need for a well-qualified replacement able to give further training to the Rwandan counterpart, as well as assisting with the integration of GREMARWA's accounting system into that of OPROVIA.

C. Commercialization Program and Cash Flow Projections for 1981

GREMARWA's operating costs should, in theory, be covered by the surplus from its trading activities. Prior to the audit report performed

by an AID contract auditor, Richard Quirk, in 1980, there were two separate funds--a buying fund for purchasing produce, which would be reconstituted after sales, and an operating fund comprised of the surplus in the buying fund as a result of GREMARWA's commercialization program. Since this system was ineffective in that the buying fund rarely had a surplus, Quirk recommended the amalgamation of the two funds. This has now been done.

The concept of using the surplus from trading activities to cover operating costs is, of course, still valid, and is essential if GREMARWA is to be financially viable. Since a large percentage of the operating costs are fixed (almost 50% in 1980 with 30% viable costs and 20% depreciation), it is extremely important to have high annual turnovers. On the other hand, since beans stored for over 12 months generally have to be sold at a loss, it is equally important that purchases be kept to the level of anticipated sales. A major constraint in maximizing inventory turnover is the difficulty in finding sales outlets for the beans. (See Section IV which discusses this problem).

The two commercialization programs presented below in Tables 4 and 5 are based on 'best' and 'worst' case projections of GREMARWA's turnover in 1981 under the constraint of limited sales possibilities.

Case 'A' (Table 4)--the 'worst' case scenario--is based on total purchases of 2,500 tons and sales of 3,650 tons, the extra sales being 1150 tons of beans from the previous year's stock. (See Table 6). This case would be probable if GREMARWA failed to get Government contracts for prisons and military camps and failed to get a contract to send beans to Zaire for refugee camps.

Case 'B' (Table 5)--the 'best' case scenario--is based on purchases of 9,000 tons of produce (6,500 beans and 2,500 sorghum) and sales of 10,150 tons (8,150 beans and 2,000 sorghum). This case is possible if GREMARWA is awarded all the contracts mentioned above.

On the basis of the above commercialization programs, two quarterly cash flow projections have been made. (Table 7).

Case A is based on the 'worst case' scenario. At the beginning of the year (January 1, 1981), GREMARWA had cash in hand of Rwf 29,000,000 and receivables of Rwf 12,000,000. After engaging in buying and selling activities and paying operating expenses, it is calculated that cash in hand at year's end (December 31, 1981) will be Rwf 52,492,000. This figure represents an increase of 23.49 million francs in the cash position over the year. While GREMARWA would have no cash flow problem in following this commercialization program (since purchases would be minimal), the net financial position would be a loss of approximately Rwf 23,000,000. (See Table 3).

TABLE 4 CASE A (Worst case) Quarterly Commercialisation Program (tons - MW 000's)

QUARTER	<u>1</u>		<u>2</u>		<u>3</u>		<u>4</u>		<u>TOTAL</u>	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity(tons)	Value(000)
Purchase Beans	500	10,000	500	10,000	500	10,000	-	-	1,500	30,000
Sales Beans	1,000 ¹	-	-	(30,000)	150	(3,300)	1,500	(33,000)	2,650	(66,300)
Purchase Sorghum	-	-	-	-	700	15,400	300	6,600	1,000	22,000
Sales Sorghum	100	(2,000)	800	(16,000)	100	(2,000)	-	-	1,000	(20,000)
Cash outflow (inflow)		8,000		(36,000)		20,100		(26,400)		(34,300)

¹Credit sale-assume cash received in 2nd quarter.

TABLE 5

CASE B (best case) Quarterly Commercialisation Program.

Quarter	1		2		3		4		TOTAL	
	Quantity (tons)	Value (000F)	Quantity (tons)	Value (000F)	Quantity (tons)	Value (000F)	Quantity (tons)	Value (000F)	Quantity (tons)	Value (000 EwF)
Bean Purchases	1,000	20,000	3,000	60,000	2,500	50,000	-	-	6,500	130,000
Bean Sales	1,300	-	1,600	(39,000)	1,750 ¹	(45,500)	3,500 ¹	(91,000) (+39,000) receivable	8,150	175,500
Sorghum Purchases					1,750	38,500	790	16,500	2,500	55,000
Sorghum Sales	200	(4,600)	1,600	(36,800)	200	(4,600)	-	-	2,000	(46,000)
Cash outflow (inflow)		15,400		(15,800)		38,400		(74,500) (+39,000) receivable		(36,500)

¹: partially or wholly credit sales from which revenue will appear in subsequent quarter.

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TABLE 6 Projected Inventory Turnover 1981

CASE 'A' (worst case)

	<u>Stock 1/1/81</u>	<u>Purchases</u>	<u>Sales</u>	<u>Stock 31/12/81</u>	<u>Change in Stock 1/1/81 - 31/12/81</u>
Beans	2,000	1,500	2,650	850	- 1,150
Sorghum	2,000	1,000	1,000	2,000	0
Total	4,000	2,500	3,650	2,850	

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CASE 'B' (best case)

	<u>Stock 1/1/81</u>	<u>Purchases</u>	<u>Sales</u>	<u>Stock 31/12/81</u>	<u>Change in Stock 1/1/81 - 31/12/81</u>
Beans	2,000	6,500	8,150	750	- 1,650
Sorghum	2,000	2,500	2,000	2,500	+ 500
Total	4,000	9,000	10,150	2,850	

TABLE 7

FINANCIAL PROJECTIONS - 1981

CASE "A"	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Beginning balance	29,000.000	22,294.250	56,588.500	31,403.750
+ Sales	2,000.000	46,000.000	5,300.000	33,000.000
+ Receivables	7,000.000	4,000.000	1,000.000	-
+ Divers ¹	250.000	250.000	250.000	250.000
Funds available	38,250.000	72,544.250	63,138.500	63,643.750
- Purchases	- 10,000.000	- 10,600.000	- 25,400.000	- 6,600.000
- Operational Costs				
. fixed	- 4,970.750	- 4,970.750	- 4,970.750	- 4,970.750
. variable	- 985.000	- 985.000	- 2,364.000	- 590.000
Ending balance	22,294.250	56,588.500	31,403.750	51,482.000
CASE "B"				
Beginning balance	29,000.000	14,159.250	48,578.500	- 1,664.750
+ Sales	4,600.000	75,800.000	50,100.000	91,000.000
+ Receivables	7,000.000	4,000.000	1,000.000	-
+ Divers	500.000	500.000	500.000	500.000
+ Donor's contribution		25,000.000		
Funds available	41,100.000	119,459.250	100,178.500	89,835.250
Purchases	- 2,000.000	- 60,000.000	- 88,500.000	- 16,500.000
Operational Costs				
. fixed	- 4,970.750	- 4,970.750	- 4,970.750	- 4,970.750
. variable	- 1,970.000	- 5,910.000	- 8,372.500	- 1,477.500
Ending balance	14,159.250	48,578.500	- 1,664.750	66,887.000

receivable
1st quarter 1982

receivable

N.B. Credit sales are recorded as revenue for the following quarter since they are normally paid in approximately 3 months. Credit sales for fourth quarter 1981 are recorded as receivables.

1. Mainly income from transport services
2. This contribution from the Swiss is counterpart funds - may have been allocated elsewhere by the Rwandan Government.

TABLE 8 Profit /Loss Estimate for 1981 (millions)

<u>Revenue</u>	<u>Case A</u>	<u>Case B</u>
Margin from sales ¹	11.3	13.5 + 39 receivable = 52.5
Other income ²	<u>1.0</u>	<u>2</u>
S/TOTAL	12.3	54.5
<u>Costs</u>		
Fixed	19.8	19.8
Variable	4.9	17.7
Depreciation	<u>11.0</u>	<u>11.0</u>
S/TOTAL	35.7	48.5
Net profit/loss	23.4 loss	6.0 profit

1) Gross Revenue from sales minus 1981 purchases, plus inventory 1/1/81, minus inventory 31/12/81.

2) Mainly from transportation services.

Case B is the most optimistic case, and, starting with a balance of 29,000,000 Rwf in cash, plus 12,000,000 Rwf in receivables, after trading, and a 25,000,000 franc donation from the Swiss Aid program, the end of year cash position is 66,887,000 Rwf, plus 39 million francs receivable. Although the Swiss contribution was agreed to by Swiss Aid, it is counterpart funds and the Rwandan government has not as yet handed it over to GREMARWA. If this contribution is not forthcoming, there will be a serious cash flow problem in the third quarter. Because of a heavy buying program in this quarter (second harvest beans), the net cash position at the end of the quarter will be -1.6 million francs (-26.6 without the Swiss donation). Since GREMARWA cannot buy on credit, it will have to resort to a bank loan (which it has successfully obtained in the past at favorable interest rates) or request further donor assistance. The overall improvement in the cash plus receivables position of GREMARWA for Case B is 64.8 million francs.

The overall profit and loss position as a result of following these buying programs then is a 23.4 million franc loss in the 'worst case' and a 6 million franc profit in the 'best case.' (Table 8).

The above analyses reflect the extreme uncertainty of the conditions under which GREMARWA operates. While GREMARWA does not experience any problems in buying produce, it is virtually impossible to estimate demand.

One of the major reasons for the large differences in the two commercialization programs is that in case 'B' it is assumed that GREMARWA will obtain Government contracts to supply the prisons and military camps (2,000 tons) and a contract from UNHCR to provide 3150 tons of beans for Ugandan refugees in Zaire. These contracts amount to almost 70% of the total estimated bean sales. While it is generally undesirable that GREMARWA should have to rely on two or three large contracts in order to make an operating surplus, or even break even, for reasons explained in the next section, this is at present unavoidable.

D. Problems in Commercialization

(1) Pricing Policy. The difficulties that GREMARWA has encountered as a result of the fixed price of beans at 20 francs are discussed in detail in Section V. However, it is worth noting that GREMARWA's average buying price from 1976 to 1980 was above 20 francs in every year except 1978, when it was 19.99 Rwf. The problem lies in the fact that there are no regional or seasonal variations allowed for in the official policy.

(2) Lack of Production Information. Since no scientific production estimates are made, GREMARWA cannot accurately predict the bean harvest. The ability to forecast harvests is absolutely essential if realistic prices are to be fixed. In 1980, for example, the Ministry of Agriculture, in the belief that the harvest would be very poor and serious food

shortages would result, instructed GREMARWA to buy a large reserve at the prevailing high price of 30 francs a kilo. As it turned out, the harvest was not as bad as predicted, and GREMARWA had to dispose of some beans at a loss, while others remained unsold. If the Ministry of Agriculture had had more accurate yield estimates, this situation would probably not have arisen.

(3) Lack of knowledge of second harvest production and imports. Since the first bean harvest is the main one, GREMARWA is obliged to constitute its stocks at this time (to avoid the risk of a failure in the second harvest). If the second harvest is good, the demand for first harvest beans will be reduced. A related problem which had serious financial consequences for GREMARWA in 1980 was the influx of beans from Zaire during the selling season. This drove down the price of beans which had already been purchased at too high a price because of inaccurate production information.

The case for having accurate production estimates at first harvest is even stronger, given the impossibility of predicting second harvest yields and bean imports from Zaire.

(4) Discussion. On the basis of the foregoing analysis of GREMARWA's financial situation, it is clear that the major components of operating costs (salaries, transport and depreciation) will continue to increase, though probably at a slower rate than in the past, while the possibilities of increasing revenue remain uncertain.

Since revenue is a function of both turnover and the sales margin, it is essential to establish turnover at a margin sufficient to cover costs. Up to 1980, GREMARWA's sales never exceeded 5,000 tons, due to lack of capacity. Maximum capacity is now 10,000 tons, and every effort should be made to increase turnover accordingly. Some of the problems involved in increasing sales have been discussed above, e.g., the uncertainty of obtaining Government contracts and lack of production information which has caused GREMARWA to buy at too high a price. However, a more intensive study of the possibilities for increasing sales, especially with non-speculative organizations, must be made. This could be done by the present expatriate director who is chiefly responsible for marketing. In view of the importance of a successful marketing section to the financial viability of GREMARWA, it would be desirable to have a Rwandan marketing counterpart in place as soon as possible to ensure continuity after the departure of the expatriate director (December 1981).

In addition to maximizing sales, GREMARWA must operate on an adequate sales margin and minimize losses due to a decline in the quality of beans. For the former, more accurate production and marketing data is required, and for the latter, technical research and information is needed. Without this research, it is unlikely that GREMARWA can ever be a financially viable organization.

BEST AVAILABLE DOCUMENT

V. Price Policy

When the FSM project was initiated in 1975, a free market system for both beans and sorghum prevailed. Prices were determined largely by supply and demand. It was clear, however, that private traders held the upper hand due to their knowledge of the market and their ability to mobilize resources (cash, transport) to enter the market at opportune times. It was felt that private traders were holding producer prices unreasonably low. The concept underlying the FSM project, and the creation of GREMARWA, was the establishment of a commercialization agency with the means to intervene in the market, at strategic times and in strategic places, with prices sufficiently high that traders, in free competitions, would be persuaded to pay higher prices to producers. GREMARWA, entering into the market to sell at periods of shortage would have a tempering effect on consumer prices.

The actions of the National Price Commission, in January 1975, which established both farm gate and consumer prices, largely obviated GREMARWA's price stabilization role, assuming that all traders, public and private alike, adhered to the fixed prices. However, while GREMARWA and other quasi-governmental organizations (cooperative and mission silos) are expected to adhere to the fixed prices, private traders cannot be policed to the extent that they, too, buy and sell at the fixed prices.

The result of current practice is that traders continue to operate in a free market. GREMARWA and the silos, however, cannot remain financially viable if they continue to follow fixed prices, especially when, as is the case in 1981, harvests are good. GREMARWA, then, is caught in a dilemma. They cannot buy at the official prices, and still remain solvent. Nor can they publicly enter the market at less than the officially decreed price. Thus, while it is apparent that GREMARWA actions in the market are serving to stabilize prices, the stabilization effect is at the expense of GREMARWA's financial viability. Furthermore, the effect is limited by the necessity to follow fixed prices nationwide, and the inability to broadly publicize different prices, even where they are in effect.

GREMARWA has paid an average (nationwide) price of over 20 Rwf (the minimum buying price) in every year of operation except 1978, when it paid an average of 19.99 Rwf. This year, 1981, may be an exception in view of the very good harvest.¹ However, while the average price has reached 20 Rwf, GREMARWA has paid less in some regions of the country.

¹In response to the exceptionally high bean prices which prevailed in 1980, it appears that farmers have considerably increased the acreage of bean production in 1981. This was probably achieved by planting lands which would have been left fallow, and the farmer may have to pay for this in terms of the reduced fertility, and thus productivity, of this land in the future. Furthermore, if the harvest is good, as it appears to be at this time, the surplus production may drive prices down sufficiently to result in a net reduction in income for the farmers.

From 1977 to 1979, first quarter average market prices (in a sample of 11 markets) were 19, 26 and 21 francs respectively, while fourth quarter average prices were 35, 36 and 31. Thus, in a free market situation, GREMARWA, operating on a 6-franc margin (historically, a 5.6 franc margin has been required to cover operating costs) should have no difficulty in affecting producer and consumer prices, and maintaining financial viability, providing there is accurate and timely information on which to base marketing decisions. By contrast, the difficulty of working with officially fixed prices can be illustrated by the current situation (i.e., first quarter, 1981). Because of the very good harvest, bean prices in some areas of the country are 10 to 12 francs per kilo. Thus traders can buy at 10-12, pay transport and handling costs and still make a profit selling at less than GREMARWA's ultimate selling price.

Large fluctuations in price are undesirable politically and socially. Some degree of price intervention is required, both to increase production and to avoid excessive profits being made at the expense of producers and consumers. However, a complete stabilization of prices via fixed prices, may be undesirable. Complete stabilization can prevent the signal of market shortages (a rise in price) from reaching the producer. In this case, the producer will not respond by increasing production. Producer prices should also be expected to rise over time. The 84% increase in the price of coffee in 1977, for example, led to an increase in the price of banana beer, which should have been accompanied by an increase in the price of bananas. If the price of beans was held constant at this time, there would be a disincentive to increase bean production. A product with a fixed price that does not increase becomes progressively less attractive as a cash crop and production surplus to farmers needs is inhibited.

For these reasons, it should be clear that a complete stabilization of official prices, with a single price over a period of years, for all seasons and in all places, is not desirable and should not be expected to be enforceable. What is desirable and potentially more enforceable is a flexible price policy that is responsive to varying conditions over time. The establishment of local storage points in each commune, the GREMARWA storage system, and a coordinated product exchange among all of these units will provide strong support for a flexible price policy and will also serve to reduce wide price fluctuations.

The fixed price of a commodity will have to be periodically reviewed in relation to other commodity prices and in relation to prevailing market forces. There must also be regional differentials to encourage the flow of beans from surplus to deficit areas, i.e., the regional price differential must be adequate to allow normal profit to be made on this activity by either the private trader or government marketing agencies.

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It is probably not feasible for the Government of Rwanda or donors to continually subsidize GREMARWA. The price policy which is sought, therefore, must be flexible enough to permit GREMARWA to achieve its goals while remaining a financially viable organization. To achieve this end, the Government will need advice, based on careful research as to prevailing and projected prices, and on crop estimates, in different areas of the country. There must also be a good deal of research on the responsiveness of producers to changes in prices.

Since the organizations involved in the commercialization of beans (GREMARWA, cooperatives, missions, etc.) also need this information, it would be beneficial for them to establish a commission to gather the relevant data. This commission would also make recommendations to the Government on seasonal and regional prices that would best fulfill the objectives of inducing increased production and assuring a fair return to the farmer. The possibilities of using an extended radio network to transmit this information should be seriously examined, as should the possibility of publicizing official prices, and GREMARWA buying and selling prices, as a means of influencing the market.

VI. Analysis of Market Prices

A. The data collection system

In view of the unreliability, or in some cases unavailability, of data on market prices and production costs, the 1976 GREMARWA evaluation report recommended the establishment of a data-gathering system "to collect frequent, timely market data in Rwanda and bordering countries in order to:

- (1) aid in price policy recommendations
- (2) measure project effectiveness in influencing free market prices
- (3) assist project management in making operational decisions (arranging transport from surplus to deficit regions, for instance)*

*Ian Pattinson Evaluation Report, 1978.

The existing system of data collection was put into operation in September 1976 and by June 1977 price information was being gathered from 11 local markets. GREMARWA warehouse staff purchases a quantity of beans and sorghum at the local market, and takes them back to the warehouse to be weighed and to allow an exact price per kilo to be calculated. Normally, from three to seven purchases are made each month. The information gathered is forwarded to the central office to be used by project manager in operational decision-making and in estimating project effectiveness.

From August 1979 through most of 1980, however, the collection of price data became very erratic and a system to collect price data on an informal 'word-of-mouth' basis was relied upon. While this system was satisfactory for immediate decision-making purposes, the lack of systematic, recorded data reduces program monitoring capability and prevents economic or statistical analyses being made at a later date. Since October 1980, data on beans and sorghum has been collected on a more systematic basis, and additional data on peas and maize is beginning to be collected in a few areas. No information is available on prices in bordering countries. Production data will begin to be collected, country-wide, beginning in September, 1981, with the AID-financed Ag Sector Survey and Analysis Project. While some production data is currently available, it is sporadic and not reliable.

3. Analysis of bean data

The market information collected by GREMARWA from 1977-1979 for beans is presented in Table 1 and for sorghum in Table 2.

Table 3 presents an analysis of quarterly market average prices, quarterly ranges, and intermarket ranges for beans from 1977-1979.

Finally, a five-year time series for the Kigali markets presents yearly average and range prices and quarterly average and range prices for beans from 1975-1979.

In spite of certain problems with the reliability and completeness of the data, the following observations can be made:

- From 1977 to 1979, the first quarter has consistently represented the lowest price range for beans and the lowest quarterly average --a result of the harvesting of the major bean crop from late January to March. (Table 3).

TABLE 1

AVERAGE MONTHLY PRICES FOR BEANS 1977 - 1979
(TO NEAREST FRANC FOR KG)

PROVINCE	MARKET	1977												1978												1979													
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D		
KILALI	NYANGICHE	-	-	-	-	25	25	25	25	25	31	36	36	28	31	27	25	30	32	32	36	34	38	39	46	27	28	29	31	30	36	38	-	-	-	-	-		
	NYAMIRWEO	-	-	-	-	24	26	27	27	28	32	41	40	38	33	27	28	30	30	29	30	30	36	36	42	28	28	28	29	29	30	34	-	-	-	-	-		
	KICHUWIRO	-	-	-	-	24	21	21	23	30	30	32	33	40	28	23	22	22	21	22	23	34	29	31	-	40	-	-	20	26	24	27	33	-	-	-	-	-	
	RYEMBA	-	-	-	-	-	23	25	25	31	30	40	38	30	21	21	20	20	27	24	25	37	35	-	-	-	-	20	-	-	-	-	30	-	-	-	-	-	
KIPURICO	KIPURICO	20	14	19	25	23	17	18	27	30	33	50	43	21	23	28	30	20	18	18	21	21	25	29	41	-	13	14	21	18	19	18	21	21	21	-	20		
	KARUNCHO	-	-	-	-	25	16	21	26	29	39	40	47	24	22	28	30	21	25	19	21	26	-	36	38	14	14	20	16	23	21	24	22	23	-	-	-	-	
GICAROMA	NYANZA	20	24	24	24	20	19	27	24	27	32	36	30	21	21	21	21	20	23	21	27	27	28	35	34	23	23	25	23	25	26	33	36	37	-	-	-	-	
	RUWOME	-	-	-	-	19	19	24	25	26	30	35	31	24	23	25	20	21	25	25	27	-	30	41	38	22	24	19	24	30	31	34	42	39	37	33	33	-	-
	RUWANGO	-	-	-	-	15	21	21	19	27	37	38	29	22	20	19	22	20	29	24	26	31	31	35	34	23	23	25	24	22	29	33	39	35	-	-	-	-	-
RYEMBA	BYEMBA	14	-	-	-	27	23	28	24	22	24	28	-	27	11	14	20	18	21	23	19	19	25	29	-	-	16	18	22	-	-	-	-	-	-	-	-	-	
GICAROMA	KORA	-	-	20	21	21	26	29	25	22	25	-	31	26	20	21	22	23	27	25	26	28	27	40	28	18	20	21	25	26	39	29	31	32	37	38	-	-	

J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

- = no information

Source: GICAROMA

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TABLE 2:

AVERAGE MONTHLY MARKET PRICES FOR SORGHUM 1977 - 1979
(TO NEAREST FRANCS PER KG)

PROVINCE	MARKET	1977												1978																						
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D											
KISUMU	NYAMUNGE	-	-	-	-	25	25	16	15	19	20	20	20	23	22	37	38	43	44	34	29	31	35	34	37	44	35	38	42	39	34	27	-	-	-	-
	NYAMIRUNGO	-	-	-	-	50	67	12	20	-	23	30	35	17	27	47	49	49	60	41	29	32	41	36	42	31	44	47	35	37	35	29	-	-	-	-
	NYAMIRO	-	-	-	-	21	14	19	16	15	13	16	19	18	21	22	24	28	13	15	15	15	-	18	-	-	20	25	24	33	20	-	-	-	-	-
	NYAMIRA	-	-	-	-	21	-	-	11	10	13	16	13	19	20	25	23	23	17	23	14	16	-	-	-	-	20	-	-	-	-	-	-	-	-	-
KIPURONG	KIPURONG	-	-	-	-	17	17	15	17	23	13	19	22	25	29	32	26	25	19	14	17	21	24	26	-	27	28	33	30	34	27	25	19	17	17	22
	KAPURONGO	-	-	-	-	11	12	10	19	-	24	26	22	27	35	26	21	20	19	23	-	24	25	-	27	26	27	32	30	19	20	31	-	-	-	-
GIZABARA	NYANZA	19	18	19	19	19	20	16	14	13	13	16	17	16	18	20	21	22	22	16	16	17	18	18	20	20	21	21	24	24	21	21	23	-	-	-
	SUGOIVE	-	-	-	-	21	20	15	14	14	16	18	18	20	22	24	24	24	17	19	-	19	21	21	22	21	22	23	25	26	23	23	23	26	22	22
	MURUNGO	-	-	18	22	22	23	15	12	17	15	17	15	17	19	23	23	19	26	15	15	17	18	18	17	19	20	23	24	22	27	27	19	21	22	-
BYERBA	BYERBA	-	-	-	-	32	33	21	18	15	18	-	29	27	18	23	26	23	26	18	14	17	24	20	-	20	23	25	-	-	-	-	-	-	-	-
GISURU	KOPA	-	-	18	22	20	26	26	27	17	23	-	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

- = no information

Source: GREMATA

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ANALYSIS OF THREE MONTH MARKET AVERAGE PRICES (SHANG)

NT/73

MARKET	QUARTER 1977				QUARTERLY RANGE	QUARTER 1978				QUARTERLY RANGE	QUARTER 1979				QUARTERLY RANGE
	1	2	3	4		1	2	3	4		1	2	3	4	
MEARUNINGE	-	25	25	34	25-34	29	29	34	41	29-34	28	32	36 ⁺	-	
NYAMIRAMBO	-	25	25	38	25-38	33	29	32	38	29-33	28	29	34 ⁺	-	28-34
KICUMIRI	-	22	26	25	22-25	24	22	29	35	22-29	20 ⁺	26	33 ⁺	-	20-33
BEHERA	-	23	27	36	23-36	24	21	29	35	21-29	20 ⁺	-	30 ⁺	-	20-30
KIBUNGO	16	22	25	42	18-42	24	23	20	32	20-24	14 ⁺	19	20	22	14-22
KARURONDO	-	21	25	42	21-42	33	25	22	37	22-25	17 ⁺	20	23	-	17-23
NYANDA	23	21	26	33	21-33	21	21	24	32	21-24	24	25	35	-	24-35
BUCIGABE	-	19	25	32	19-32	24	22	26	36	22-26	22	28	38	35	22-35
BUNYAGO	-	18	22	35	18-35	20	24	25	33	20-25	24	26	36	-	24-36
BUMBA	14	26	23	28	14-28	15	21	20	29	15-20	19	-	-	-	-
KUBA	20	23	25	28	20-28	22	24	26	32	22-26	20	30	31	37 ⁺	20-37

INNER MARKET

RANGE	14-23	12-25	22-28	28-42	14-42	15-33	21-29	20-34	29-41	15-34	14-38	19-32	20-38	22-37	14-38
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QUARTERLY

AVERAGE	19	22	23	35		24	25	26	34		21	26	32	31	
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⁺ Based on incomplete information - i.e., data for one or two months unavailable

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TABLE 4

ANALYSIS OF THREE MONTH AVERAGE KIGALI MARKET PRICES (BEANS)

(1975/79)

RWF/KG

<u>MARKET</u>	<u>YEAR</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>YEARLY RANGE</u>	<u>YEARLY AVERAGE</u>	<u>4 YEAR RANGE</u>
<u>NYAMIRAMBO</u>	1975	29	35	28	30	29-35	31	
	1976	20	21	27	27	20-27	24	
	1977	-	25	27	38	25-38	30	
	1978	33	29	32	-	29-32+	31	
	1979	28	29	-	-	28-34	31	
QUARTERLY AVERAGE		27	28	29	32		29	20-38
QUARTERLY RANGE		20-33	21-35	27-32	27-38			
<u>NYARUBENGE</u>	1975	26	26	26	30	26-30	27	
	1976	27	25	25	27	25-27	26	
	1977	-	25	25	34	25-34	26	
	1978	29	29	34	-	29-34+	31	
	1979	28	32	-	-		30	
QUARTERLY AVERAGE		28	27	28	30		28	25-34
QUARTERLY RANGE		26-29	25-29	25-34	27-34			
<u>KICUKIRO</u>	1975	24	21	27	29	21-29	25	
	1976	23	20	29	29	20-29	25	
	1977	-	22	28	35	22-35	28	
	1978	24	22	29	-	22-29+	25	
	1979	-	26	-	-			
QUARTERLY AVERAGE		24	22	28	31		26	20-29
QUARTERLY RANGE		23-24	20-26	27-29	29-35			
overall average		26	25	28	31			
OVERALL RANGE		20-33	20-35	25-34	27-38			20-38

-- = not available

+ for 9 months to September 30, 1978

- The highest range for beans is consistently in the fourth quarter.

- The highest average was in the first quarter in 1977 and 1978. (1979 data is incomplete, but the figures available suggest that this would be the case for this year, too). (Table 3).

- The highest monthly bean prices are generally in November. From January through July, prices fluctuate considerably, but from July to November, there is a steady upward trend to a peak in November, and then a decline in December--probably in anticipation of the new harvest coming in. (Table 1).

- Regional price differences for beans are considerable, even for the same month. For example, in November 1977, there was a 17 franc difference between Kicukiro (33 Fwf) and Kibingo (50 Rwf); in January 1978, there was a 27 franc difference between Byumba (11) and Nyamirambo (38); in September 1979, there was an 18 franc difference between Kibingo (21) and Rugoswe (39). (Table 1).

- Prices for sorghum peak in June, and decline quite sharply through July and August. From September to June of the following year, there is generally a fairly steady increase in price. (Table 2).

- As is the case of beans, sorghum prices vary greatly between regions, even for the same month, e.g., June 1977, a 50 franc difference between the price at Kibingo (17) and that at Nyamirambo (67); June 1978, a 39 franc difference between Kabarondo (21) and Nyamirambo (60); January 1979, a 25 franc difference between Ruhango (19) and Nyarugenge (44). These extreme differences are mainly due to the fact that the prices in the Kigali markets (Nyarugenge and Nyamirambo) are much higher than the prices prevailing elsewhere in the country. (Table 2).

- The analysis of the Kigali markets shows that in the two major markets, Nyamirambo and Nyarugenge, there has been a tendency for yearly average prices to increase from 1976-79. This would be expected, given an increase in the urban population and in the wage level. (Table 4).

- For all three Kigali markets, the highest quarterly average was price of beans in the fourth quarter. Somewhat surprisingly for Nyarugenge and Kicukiro, the second quarter average was lower than the first quarter. This may be explained by the high prices in early January before the beans are harvested and transported from the countryside to the city markets. (Table 4).

- Although the data available is not sufficient to indicate trends, it is noteworthy that the yearly runs for 1977, 1978, and 1979 were 36 (14-50), 33 (11-46) and 29 (13-42) respectively. These figures do suggest that there has been some decline in price fluctuation.

C. Discussion

The above analysis suggests that, other things being equal, GREENARWA should do most of its purchasing in the first quarter. However, a large supply of beans is not generally available before March (the beans are harvested and dried in late January and February, and then pass through one or two 'middlemen' before being sold to GREENARWA) and GREENARWA has difficulty in handling more than 300-400 tons a week. Thus it is obliged to make some purchases in the second quarter.

Although it would seem unadvisable for GREENARWA to buy second harvest beans, which are more expensive, consumer preference for these beans is so much greater (due primarily to their freshness) that they can be sold for a higher price and a margin equal or greater than on first harvest beans can generally be achieved.

Since bean prices are usually highest in November, GREENARWA should plan to concentrate its sales in this month, given the constraints of transport cost, handling capacity of the warehouses, etc. For sorghum, sales should be concentrated in June. Since the data suggests there is a relative shortage of sorghum in the two major Kigali markets (Nyamirambo and Nyarugenge), intensified sales efforts should be directed at these markets.

It must be emphasized that the above analysis is based on incomplete and sometimes questionable data. Also, its value is limited in that it does not indicate quantities purchased. Thus, though the price may be very high in a certain market, very few purchases may be made, the consumer preferring to substitute another food item or go elsewhere to make a purchase. However, the overall analysis clearly shows that considerable interregional and seasonal price differences exist, and these would appear to be greater than market conditions (differences in yields, consumer preference, etc.) would warrant. Given that GREENARWA has at present only seven outlets, if it is to be really effective, it must increase its contacts with producers and consumers via cooperatives and other 'non-speculative' organizations. It is recognized that attempts to fulfill the social aims of the project--i.e., raising the producers' price and lowering the consumers' price by reaching them directly--may in some cases be in conflict with the aim of financial viability and a balance must be found between the two.

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VII. Technical Aspects

In this area we profited from the assistance of Drs. Robert Mills and Dansou Kossou from the Kansas State University Grain Storage Staff.

Data were derived from visits to five warehouses (including the recently completed unit at the office headquarters near Kigali) and from interaction with the managers who attended a week-long course on storage practices run by Kansas State in Kigali during the period of the evaluation.

A. Level of training of warehouse managers

In general, the warehouse managers seem to be performing well, although there is considerable variation in the extent of their experience and training. Of the six Rwandans sent for training at Kansas State, only one--the present storage technician-- is still working at GREARWA. Turnover among managers has been high; since November 1978, six warehouse managers and two persons hired as managers have left GREARWA. Two warehouse manager vacancies were filled in mid-February 1981, just prior to the start of the KSU course on storage. Of the 15 GREARWA staff who attended the two-week course on storage practices held in-country in April 1979 by the Tropical Stored Products Center, seven (four warehouse managers, three warehouse assistants) are still with GREARWA. During this period, seven warehouses were in operation most of the time.

Regarding levels of training, the KSU team found that a weeklong course (which included participants from a range of food storage programs in-country) was not of sufficient length to enable the trainers to assess adequately the level of training of warehouse managers. From questions asked and limited discussions with warehouse managers, it is believed that a one-week training program is not sufficient to train warehouse managers to a desired level.

B. Equipment

The equipment in the warehouses is generally suitable, appropriately used, and in good order; but there is some room for improvement. There is a need for a simple means for calibrating scales; the provision of one 50 kg. weight would be useful for more precise calibration of scales. There seems to be a tendency

on the part of warehouse staff to try to use shortcuts in removing the tarpaulins from the stacks after fumigation is over and the storage technician has left. The very costly tarpaulins (about \$2,000 each) thus get torn. In several warehouses, there was a shortage of sandbags holding down the tarpaulins; of those in use, some were of poor quality. New sacks are needed in some warehouses to replace the four-year-old sacks currently in use. Use of malathion appeared proper. Most warehouse workers treating the grain were wearing masks at the time of team visits, and there was an ample supply of masks in stock.

The evaluation team identified lack of equipment to enable accurate measurement of grain moisture content as a critical problem. This is principally due to lack of a 'bean' chart for the moisture meter used. Members of the evaluation team assisted GREMARWA in finding the means to do a preliminary calibration of the meters in-country. A thorough calibration, however, cannot be done immediately. Prior to the KSU course, there was a general lack of understanding of use of moisture meters among most warehouse managers. The course provided instruction in the use of, and limitations of moisture meters for all course participants.

C. Standardization of sacks

Sacks of uniform weight are now seen in each stack with a card carrying the number of sacks and the weight of the lot. An inventory diagram is kept at headquarters and in the warehouse so that the inventory can be regularly checked and carefully retaken at the end of the year. This, as has been explained elsewhere, is the inventory control system and is the job of the statistician. It fits together with the financial control system to make a complete operations control. This fulfills the recommendations of the 1978 evaluation and satisfies one of its major criticisms. Accomplishment of this reorganization is a great achievement.

It is recognized that it would be physically more efficient if all the sacks of one product were of one size. However, new sacks come about 120 lbs for 90% capacity (beans) and old sacks are from 1/3 to 2/3 of this. There is bound to be a turnover of sacks as some product is sold at a price inclusive of sacks (e.g., to public institutions).

The sack loss weight studies described in the 1978 evaluation (page 57, para 6) have been initiated but it is not certain how well

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they working. An examination of bag weights in one stack in the Nyanza warehouse showed that the moisture loss in the test sack of the stack was undetectable after nearly a year of storage. These studies should be pursued to verify the levels of loss from moisture change.

D. Warehouse sanitation, hygiene, and losses

As has been mentioned earlier, the sanitation in the warehouses visited was satisfactory. However, as always, there are minor details that need to be watched, such as broken windows, drain pipes without rodent guards, grain dust on structural members that might attract insects. There was either no trace or little trace of rodents visible; there was no rat bait seen.

Although, in general, insect control appeared satisfactory, there were problems identified at Nyabisindu and Kibungo warehouses, probably originating with field infestation. The question of cross-infestation from previously stored grains was not excluded (perhaps due to improper warehouse preparation). In two warehouses (Nyabisindu and Kora), stacks were found close together (as little as 12") preventing easy cleaning of residues of grain and Phostoxin between them and proper inspection. The reason given for this practice was lack of storage space in the units. There is also the continuing question (raised in the 1978 evaluation) of the degree of effectiveness of the Malathion application upon arrival of the beans at the warehouse. While management believes this to be the most cost effective means to achieve insect attack retardation over the first one-three months prior to fumigation, the gap between the two treatments may be too long, especially for beans bearing high moisture content (which contributes to the breakdown of the Malathion).

At Nyabisindu, beans loaded out at what seemed to be a rather high moisture content, had a musty odor within the stack. This indicated at least a low level of mold activity, not enough to cause any heating or visible damage. At Kora, not far from the Zaire border, members of the evaluation team learned of purchases of beans (reportedly from Zaire) which had high moisture content and significant percentage of immature beans. High moisture content in beans constitutes a potential problem which should be avoided.

An accurate method of measuring the moisture content is needed to ensure that the moisture content is safe for storage to avoid heating, molding, and hardening. Improved means for handling and storing beans identified as having high moisture content is also needed. Encouraging farmers to dry beans, varying prices based on bean quality, and separating 'moist' and dry bean sacks in storage can all help to resolve the moisture problem.

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Invisible losses, mainly caused by loss in moisture content, seem to be of the order of two to three percent. This is naturally lower than in a tropical Sahelian climate, for example. Storage at the Rwandan temperatures (19-21° C range of the average temperature) and relative humidity, appears only to dry out the tops and perhaps sides of the sacks. Weight tests on individual tagged bags need to be made to estimate what the invisible losses are.

Losses occurring because of shell hardening have always been recognized as a serious problem. To provide data on optimum storage conditions, and the effect of different conditions and varying storage times on bean cookability, AID worked out a research program with ISAR. The research was to have begun over 12 months ago but has not yet begun. It is obvious, on the basis of this evaluation, that the research is more urgent than ever, that the scope of the research must be expanded to consider both local and national storage situations, and that both GREMARWA and OPROVIA have to be vitally involved in the research. AID Rwanda is pursuing this question with ISAR.

Immediately, the evaluation team would like to see a stress laid on the reduction of the risk of spoilage and the risk of hard shell by having a calibration chart for beans in the moisture meters. In line with the reports of research on bean hardness from the USDA*, the beans should be stored at a low moisture content, hopefully as low as 11-12% but not over 13%.

E. Communications

The radio network is now in place and seems to be working well. It will be useful in implementing the new system of financial control, for example, in informing the warehouse managers of contract sales which have been paid for at headquarters. It also serves to make a rapid survey of prices and to solve many small administrative problems. It is assumed that the equipment will be relatively free from service and that service, when needed, will be available from the agency from which the radios were purchased. GREMARWA does not have a telephone service, and it is unlikely to be provided with one in the near future.

*Average price for the 742 tons was 5.36 RwF versus 27.26 RwF for the remaining sales.

F. Construction

The REDSO/EA Engineering Division is responsible for monitoring the construction activities of the project. Since the 1978 Evaluation, there have been delays experienced in obtaining the technical plans and bid packages for activities at several warehouse sites. The solution to the delays was to go to the private sector to obtain the plans.

Construction began during 1980 at the Kicukiro, Gikongoro, Byumba, Nyanza, and Kibuye sites. The status of these is as follows:

- Kicukiro (2000-2500 T new warehouse): warehouse now in use: some finishing up work yet to be completed.
- Gikongoro (new storage complex): work completed, warehouse ready to begin operations.
- Byumba (extension to double capacity of present warehouse and other modifications): work nearly complete, warehouse extension already in use.
- Nyanza and Kibuye (managers' houses): both buildings are now complete.

Work undertaken in 1981 and yet to be undertaken is as follows:

- Nyanza roof repairs (replacing the interior gutters on this 33-year old Butler Building): to be completed shortly.
- Kibuye (200 ton extension of warehouse): construction requiring 6-8 months about to begin.
- Rukengeri (relatively minor warehouse repairs): work will require one to two months after contractor selected. To be completed prior to end of 1981.

As the result of a serious automobile accident, the GOR engineer who has been providing assistance to GREMARWA is no longer available. There has been a replacement selected; however, some time may be lost during the transition period in which the "new" engineer becomes familiar with the project.

A recommendation of the 1978 Evaluation was for GREMARWA to build an office building to overcome the crowded working conditions in the town. The warehouse at Kicukiro was remodelled to provide a series of offices, and a new 2000 T capacity warehouse has now been built.

Offices are provided for the Direction, Accountant, Cashier, Secretariat, Storage Technician, Statistics, Duplicating and Copy Machines, Legal Affairs, Personnel Officer and Transport Chief. There is a conference room which can serve as a classroom. A locked storeroom, kitchen and toilets complete the building. There is room for more private offices if the functions of GREMARWA are increased. The office situation is now satisfactory.

VIII. Socio-economic Aspects - Beneficiary Impact

The social analysis for the Project Paper Amendment identified four steps to be taken by the project to reduce the magnitude of benefits to commercants and increase the direct benefits to small farmers. These steps included 1) promoting conditions of competition among commercants (e.g., by limiting the tonnage of bean sales allowed each commercant and by limiting purchases from and sales to commercants); 2) announcing by radio when GREMARWA was buying and selling beans and sorghum, and at what price; 3) conducting studies to improve the knowledge base on which project-related decisions are made, and 4) by expanding GREMARWA's marketing channels beyond commercants.

Regarding steps one and four, considerable progress has been made during GREMARWA's first three years of major trading activity. A breakdown of GREMARWA's commercial transactions by type of client is presented in Table 1. Although three years is an inadequate period for predicting trends, the results of GREMARWA's commercialization programs during this period have generally been in accordance with the socio-economic aims of expanding trading activities with non-commercant and limiting trade with commercants.

From 1978 to 1980, the percentage of bean sales to commercants declines from 32.7% to 14.7%, while the percentage of sorghum sales to them declined from 56% to 51% and the percentage of sorghum purchases from 97% to 81%. However, this trend was partially offset by an increase in bean purchases from commercants from 90.8% to 99.5% of total purchases. The lack of producer organizations which could arrange bulk deliveries is one of the major factors contributing to this situation.

The reduction in the percentage of produce bought from, or sold to, commercants was not entirely, or even primarily, due to increased trading with individuals or non-speculative organizations. For beans, there was an overall increase in the percentages sold to individuals and non-speculative organizations, but for bean purchases, trading with these two categories declined. Sorghum sales to these two groups remained at approximately the same percentage but sorghum purchases from individuals declined, while non-speculative organizations contributed significantly for the first time to GREMARWA's sorghum purchases in 1980 (18.3% of total purchases).

The overall results, then, are very mixed. A major problem for GREMARWA in achieving its socio-economic goals is the fact that the overhead costs of dealing in small transactions are extremely high. Therefore, given the precarious financial situation of GREMARWA, substantial increase in transactions with individuals and non-speculative organizations cannot be expected in the immediate future.

Regarding step two, the progress has been less satisfactory. At several times, announcements have been made over the radio. A clear indication of the effectiveness of these announcements was the considerable number of strong complaints GREMARWA received following the announcements from commercants. Their complaint: that GREMARWA should stop such announcements because they were driving up the farmgate price of beans. Unfortunately, radio announcements have not been continued, as such announcements can only be made when GREMARWA is following the specific terms of the official price policy. As GREMARWA has exercised (with tacit approval) some discretion in buying prices at the warehouse, it has found the use of radio announcements of its prices to be inappropriate. It does, however, announce when it is buying or selling produce and invites prospective clients to contact GREMARWA warehouses or headquarters.

The final step-- the undertaking of three different types of studies-- was discussed in Pattinson's 1978 evaluation, and has been discussed elsewhere in this evaluation. There was a strong feeling among members of the evaluation team that giving (by circumstance) the market price studies component of the project a relatively low priority has resulted in information gaps which will inhibit GREMARWA's effectiveness. These gaps are all the more critical given the number of activities AID is supporting and helping to initiate in the food-crop bean-production, storage and marketing subsector in Rwanda.

Such studies should take high priority in the remaining period of this project, and in any follow-on activity.

	1978		1979		1980		1979 (excluding emergency aid)
Individuals	192	(10.46%)	426	(10.55%)	211	(6.68%)	(12.4)
Non-speculative organizations	156	(8.61%)	315	(7.80%)	230	(7.20%)	(13.6)
Public Services	381	(20.75%)	1,946	(48.18%)	647	(20.42%)	(38.2)
P.A.M.	505	(27.50%)	339	(8.39%)	300	(11.35%)	(21.2)
Emergency aid	-	-	-	-	1,471	(46.43%)	
Commercants	600	(32.68%)	1,013	(25.08%)	242	(7.85%)	(14.7)
	<u>1,836</u>	<u>100%</u>	<u>4,039</u>	<u>100%</u>	<u>3,158</u>	<u>100%</u>	

BEAN PURCHASES

	1978		1979		1980	
Individuals	52	(7.23%)	430	(11.72%)	11	(.22%)
Commercants	653	(90.82%)	3,231	(88.09%)	4,874	(99.45%)
Non-speculative organizations	14	(1.95%)	7	(.19%)	16	(.33%)
	<u>719</u>	<u>100%</u>	<u>3,668</u>	<u>(100%)</u>	<u>4,901</u>	<u>(100%)</u>

SORGHUM SALES (tons)

	1979		1980	
Individuals	314	(37%)	331	(35%)
Non-speculative organizations	27	(3%)	27	(3%)
Public Services	33	(4%)	-	-
P.A.M.	-	-	109	(11%)
Commercants	482	(56%)	481	(51%)
	<u>856</u>	<u>(100%)</u>	<u>948</u>	<u>(100%)</u>

SORGHUM PURCHASES

	1978		1979		1980	
Individuals	29	(3%)	49	(3%)	7	(.4%)
Non-speculative organizations	-	-	-	-	336	(18.3%)
Commercants	830	(97%)	1,572	(97%)	1,494	(81.3%)
	<u>859</u>	<u>(100%)</u>	<u>1,621</u>	<u>(100%)</u>	<u>1,837</u>	<u>(100%)</u>

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ANNEX 1

TERMS OF REFERENCE FOR THE EVALUATION OF THE FOOD STORAGE AND MARKETING PROJECT (Kigali 2751)

The food storage and marketing was begun in 1975. It has been revised once, based on an evaluation of progress to that date, and a PP amendment. A thorough evaluation was again completed in 1978. The project assistance completion date was recently extended to the end of 1981 to permit the completion of construction of warehouses financed by the project and to continue technical assistance to the project while the analysis for a phase II of the Food Storage and Marketing Project is completed.

The purpose of the present evaluation is (1) to update the evaluation of 1978, to determine the extent to which the project purpose and goal are being achieved and to determine if recommendations made in the 1978 Evaluation are being followed, and their results; and (2) to provide guidance on a second phase of the FSM project.

The evaluators will be able to rely heavily on the information provided in the previous evaluations. The base point for the evaluation should be the date of data included in the evaluation of 1978. The revised logical framework, contained as annex B to the project paper amendment of January 1976, will be used to measure progress of the project and achievements of project objectives.

A) In examining the achievement of project objectives, the evaluation should look at:

- Delivery of project inputs and degree to which outputs have been realized.
- Extent to which impact of GREMARWA grain buying and selling operations have been felt. While GREMARWA should be expected to have had an effect within the vicinity of the warehouse sites, did the buying and selling operations with private traders and with cooperatives and missions have a broader effect in achieving the project purpose. To the extent possible, this effect should be evaluated to determine if there has been a reduction in fluctuation of prices of beans and sorghum and an improvement in their supply situation.
- Impact of GREMARWA operations on farm gate prices, on consumer prices, on consumer prices and on stimulation of production.

- Operational viability of GREMARWA. Is GREMARWA sufficiently funded by the donors/Government. Are buying and operating funds adequate to permit them to enter the market, as required, to transport their beans and to adequately store and treat them.
- Extent to which the marketing system is being utilized by the National Government. Identification of Government policies which assist/hinder the adequate functioning of GREMARWA.
- Review the Government's pricing policy in light of recommendations made in the evaluation of 1978 to determine if it is adequate to assure GREMARWA's viability.
- Review other donor contributions and their intentions to continue to support GREMARWA in the future.
- Adequacy of warehouse facilities and management. The report should discuss the siting and timing of construction and their effect on achievement of project objectives: staffing of warehouses and training of staff; financial control of purchases and sales at warehouses; storage practices: stacking; pest control; degree of wastage; warehouse equipment delivery and adequacy and appropriateness of warehouse equipment; stock turnover; etc. GREMARWA headquarters, including staffing appropriateness and completeness; training of staff; supervision provided to warehouse managers; adequacy of facilities and equipment at headquarters; record keeping, including accounting; etc.
- Impact on project beneficiaries. AID/Rwanda has recently had completed a study entitled "Rapport d'Evaluation sociologique du GREMARWA/Silo" (a Sociological Evaluation of the GREMARWA and Silo projects) which will be available to the evaluators. The report was done by a Rwandan sociologist, who will be available to consult and work with the evaluation team. This study should be reviewed by the evaluation team and incorporated into the evaluation report.

B) AID is considering a second phase of the Food Storage and Marketing Project which would provide continued support to GREMARWA, support to OPROVIA in its role as coordinator of food storage and marketing activities, and in the establishment of a food security stock.

In the light of the existing situation at GREMARWA, the evaluation team is to make recommendations, to AID/Rwanda, on the extent of AID required by GREMARWA to strengthen its ability to affect the market through its price stabilization program. It is thought that adequate

warehouse space already exists for this GREMARWA function. The evaluators should look at additional staff training needs, transport and logistics requirements, and the necessity of replenishment of funds.

The evaluation team should consider other efforts at food storage and marketing, particularly those being undertaken at mission and cooperative level (AID is financing three such efforts, through CRS, through a Clusa OPG and through the Local Crop Storage Project), and make recommendations on options available to the OPROVIA and GREMARWA to ensure a linkage between the national and local level storage and marketing systems.

A recent report completed by the FAO Food Security Division has recommended that Rwanda construct a food security stock of approximately 8,000-10,000 tons. The Government of Rwanda had indicated that, in view of the past involvement of AID in the food storage and marketing sector, AID will be asked to contribute financing to the establishment of the food security stock. The evaluation team should provide guidance to AID/Rwanda relative to the nature and extent of AID participation in this undertaking.

C) Evaluation team. The evaluation will be a joint undertaking involving AID and Government of Rwanda officials. World Food Program will be invited to participate as a full member of the evaluation mission also.

The evaluation team will consist of the following members:

- AID: agricultural economist, french speaking, with experience in evaluating similar programs and in the evaluation procedures used by AID.

Food storage and marketing specialist/entomologist, experienced in evaluating similar projects in countries at the same stage of development as Rwanda. (french language not essential.)

Evaluation officer (AID direct-hire), french speaking to serve as team leader and to prepare the evaluation report.

Sociologist, Ndengehejo, Pascal.

- GOR: Project Director, GREMARWA (AID financed technician, Curt Reintsma).

Asst. Project Director, Maniraho Sylvere.

Representative of OPROVIA.

Representative of Ministry of Agriculture.

- WFP: Representative resident in Kigali.

Annex 1 - page 4

The conclusions and recommendations of the evaluation team will be presented to AID and the Government of Rwanda prior to the departure of the team. A draft report will be left with AID/Rwanda by the evaluation team. The final report will be submitted to AID within 30 days after receipt of comments from AID/Rwanda.

Logistics support, in-country, will be provided by AID and by GREMARWA.

Advise if December timing suggested ref (A) possible. Also request you determine availability direct-hire Ag economist Don Brown (late of USAID Senegal) to participate in evaluation as either Ag economist or evaluation officer, or both. Brown was first GREMARWA Project Director in Rwanda and has excellent knowledge of project and setting. Melone.

ANNEX 2

PEOPLE MET

UNDP	M. Ferry
PAM	M. Jo Charriere, Administrative Director M. Bjorkman
FAO, Rome	M. G. Ayih, Desk Officer
MINAGRI	M. D. Nahimana, Director General Agronomy
OPROVIA	Colonel R. Ntiburara M. Mhensekeze, Athanare M. Ndayisaba, Balthazar M. Lajot
Belgian Embassy	M. Neel
Belgian BPRA	M. Delepierre M. Dejaeghen M. Fumemont
ISAR	Director General
INRS	Director General
UNR - Faculty of Agronomy	M. Meach
Groupment scolaire	Director
IBRD	M. Betti
IAMSEA	M. Joseph Laure
MERASODECO (MINISOCOOP)	M. F. Kayinamura, Director Local Crop Storage Project M. Jim Alrutz, Advisor Local Crop Storage Project M. Pascal Ndengejeho, Sociologist

Annex 3

RESPONSE TO RECOMMENDATIONS OF NOVEMBER, 1978 EVALUATION
REPORT

1. RECOMMENDATION:

The project requires the immediate services of technicians in finance and marketing.

Action:

Finance - Short-term financial advice was provided in January 1979 by an American Accountant from REDSO/EA. Efforts were begun by the Project Manager and AAO to identify a candidate for longer term technical assistance immediately after the evaluation, but were unsuccessful. Funding was not available for the position until the new Project Agreement was signed in August, 1979. A PIC/T was then prepared and sent to REDSO/EA, requesting Assistance for both an Audit and longer term T.A., but it was not until May 1980 that an individual arrived in country to do the audit. An expatriate accountant was then hired locally and served from July 1980 through March 1981, during which time he substantially modified and improved the accounting and control system. Another expatriate accountant was hired to replace him in May 1981.

Marketing - The project manager and counterpart have been fulfilling the marketing function with assistance from the storage and statistics/control section heads. It is unclear why the recommendation of the evaluation report first states that a technician is required for marketing, then suggest that the existing Project Director could perform this function.

RECOMMENDATION:

With the exception of the Eutare prefecture, no more warehouse construction should be undertaken following the completion of the second phase proposals for FY 1978.

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No new warehouse construction has taken place beyond that planned for the second phase proposals for FY 1978. Given the OPROVIA presence at Butare, Project management opted instead for expansion of the Kibuye warehouse, as provided for in the justification section of Recommendation 8.

3. RECOMMENDATION:

The Project should persuade GOR to abandon its policy of fixed producer and consumer prices for beans before the next buying season.

Action: - The project made a formal proposal to this effect to the National Price Commission in December 1978, but it was rejected. However, in 1979 the project received permission to practice a more flexible price policy, and the problem was completely solved in 1981 when the National Price Commission officially eliminated fixed prices for food crops, returning to free market pricing.

4. RECOMMENDATION:

The project should immediately introduce the standardization of sack weights.

Action: - Despite some difficulty in obtaining empty sacks of the same dimensions, standardization of sack weights is now practiced in all GRENAWA warehouses. This has become the basis of an effective inventory control system now in place and has resulted in reduced storage losses.

5. RECOMMENDATION:

The statistical section of the project needs to intensify its market data analysis, and project management must use this section to more advantage. The data collection on yields should be abandoned, but information-gathering on production prospects by missions and communes should be intensified.

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Action: - The market price data collection system fell into disuse during the latter part of 1979, and was not fully reinstated until late 1980. This has resulted in unfortunate gaps in the time series data. This situation arose primarily because the statistician was burdened with control and other accounting functions following substantial difficulties encountered in the accounting section. (including the dismissal and prosecution of the project accountant for theft of funds).

Project management now uses the statistics section to better advantage through monthly reports that permit an analysis of the relative efficiency of operations at each warehouse, analyses and breakdowns of purchases and sales, etc. Yield data collection was dropped, and production information is gathered from the sources suggested, as well as other sources, but only on an informal basis.

6. RECOMMENDATION:

Future training of Rwandan warehouse staff should be based on "in post" practice and not on overseas institutions.

Action: - Training since 1978 has been based on in-country courses. Two full-scale, in-country training courses were held, one organized in 1979 with an expert from Tropical Stored Products Centre, and the other held in early 1981 with two experts from Kansas State University. Project management also organized several one to three day refresher seminars.

7. RECOMMENDATION:

Increased donor participation should be sought in '79 to cover anticipated buying funds (Fonds de roulement) necessary to increase inventory in 1980.

Action: - Approximately one million dollars in buying funds was received from the World Food Program in 1978, 1979 and 1980. Additional funds were sought from Swiss aid, and about \$250,000 was promised, but has not yet been received. Further funds will be needed if the project is to operate at full capacity.

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8. RECOMMENDATION:

The 1978 ProAg will require an amendment, and/or the 1979 ProAg will require an amendment to indicate a change in project direction.

Action: - The 1979 ProAg was modified to include all the proposals under this recommendation, with the exception of the supply of additional trucks.

9. RECOMMENDATION:

GREWARWA should increase the quantity of sorghum it markets.

Action: - Sorghum purchases increased from 850 metric tons in 1973 to over 2000 tons in 1980. However, a 50-50 balance between beans and sorghum has not been achieved, and is not considered desirable by project management, given that beans are a much more important staple than sorghum in Rwanda.

10. RECOMMENDATION:

The co-director of the project should receive overseas training in financial management.

Action: - This recommendation was not acted upon, as it was felt that the long-term technical assistant could better provide such training in-country. This course of action turned out to be unsatisfactory, however, with the tardy recruitment of a financial expert, and further out-of-country training is now being considered.

ANNEX 4

Response to Recommendations of the AID Auditor General's Audit
3-696-79-13 of July 26, 1979.

1. Recommendation: AAO/Rwanda take action to remove peas as a target commodity in the project agreement.

Action: Peas had been eliminated as a target commodity from the project in the first PP amendment (3/25/76 p5 para 2 item (i) an initial concentration on the basic food grain, haricot beans, with sorghum being handled only to balance warehouse operations and peas being largely excluded...). As far as the project is concerned, it was operating as specified in the PP amendment; however, the ProAg was not amended at the time. Sorghum is of course, justified as a necessary adjunct to make the bean price stabilization program viable and to reduce costs per ton of beans to equal an acceptable margin (assumed to be 5f/kg).

2. Recommendation: AAO/Rwanda take action to amend the Project agreement to provide an annual financial audit. (Amend when part of OPROVIA).

Action: On May 20, 1980, Mr. F.J. Ouirk presented his audit report on a subcontract to AID.

3. Recommendation: AAO/Rwanda explore with the appropriate GOR officials the possibility of disposing of unneeded equipment and using the proceeds in furtherance of the project objectives.

Action: Three of the surplus grain cleaners were sold to an AID financed project in Somalia. The other three are being held at the request of AAO/Burundi for use there. The sack sewing machine is being used to sew bags of sorghum flour and the generator has been put into use.

4. Recommendation: AAO/Rwanda instruct the project manager to change the procedures for handling cash so as to reduce the possibility of loss.

Action: the cash handling system of the project has been completely revised to reduce the exposure and the possibility of loss of cash.

5. The audit noted that a project vehicle had been wrecked on unauthorized use by the GOR, commenting that the GOR should have the vehicle repaired. This was done.

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ANNEX 5

Response to Report of Audit by R. J. Quirk
Prepared by C. H. Anderson, February 1981

May 20, 1980

The following is a review of progress made by GRENAWA in implementing the recommendations made by Mr. R. J. Quirk in his report of audit. In general, almost all relevant recommendations have been acted upon or are in the process of being completed.

Recommended Actions Completed: (R = Recommendation: A = Action)

- R: Simplification of procedures for making bank deposits.
- A: Booking of cash received at the moment of reception allows for global deposits without specification of the course of funds. Number of deposits has been greatly reduced by increased use of central office cashier.
- R: Assigning a separate and secure area to the cashier, assuring he has a safe and adequate space to operate. Also assure that his office location does not interfere with other operations by blocking access to other offices during peak buying-selling periods.
- A: New headquarters in Kicukiro provide the cashier with a closed compartment in the accounting office, the windows being barred, and access by an inner door of sheet steel. The cashier has a four-drawer safe with combination as well as a padlocked safe like those of the warehouses. The payment window is between the offices of the Direction and Accounting at one end of the building, thus leaving access to other offices open.
- R: Limiting the collection and deposit of funds to the cashier (or his authorized alternate) to the extent possible.
- A: All funds at central office are handled by the cashier or authorized alternate, except for some small amounts received by the secretary, grouped and transmitted to the cashier when convenient.
- R: Increasing the amount of the petty cash fund.
- A: The central office cashier now holds funds for payment of most expenses including salaries and the amount on hand varies between 100,000 and 1,000,000 Rwandan francs. Daily verification of balances is done by the Chief Accountant.

R: Institution of the suggested actions for cash control (see E.5.c. pages 7-8 of Report of Audit).

A: --Suggestions 1 through 8 have been implemented. Suggestion 9 is no longer necessary with simplification of procedures for making deposits and proper booking of receipts.

--CRENARWA now has a register for all numbered documents and permanent filing system at headquarters. Individuals are held responsible for documents signed for in the control register.

--Cash pickups from the warehouses almost never take place since funds are handled by banks as much as possible.

R: Consolidate the two bank accounts at "Banque Nationale du Rwanda".

A: Completed.

R: Open a General Journal.

A: Completed for 1979 and 1980. To be continued in new accounting system starting in 1981.

R: Enter the following (5) transactions into the General Journal.

A: All entries made for 1979.
Further review of property records in process to present in a compatible format with OPROVIA's system.

R: Verify the accuracy of other items such as Stocks, Accounts Payable, Accounts Receivable, etc., through review of the subsidiary files and records.

A: Completed for 1979 to the extent that was possible. In process for 1980 Financial Statements. As of January 1981, subsidiary ledgers established for Accounts Payable, Accounts Receivable, and Advances to Personnel to facilitate verification of accuracy.

R: Prepare a Trial Balance from the General Ledger accounts, and prepare the financial statements.

A: Done for 1979.
For 1980 the Trial Balance was done month by month until the end of December. Adjusting entries are currently being prepared for Financial Statements.

- R: Prepare, as of June 30, 1980, a complete set of Financial Statements so that the Project Director will be able to measure progress being attained to correct existing errors and to clear the work backlog, among other purposes.
- A: Done in rough form by Rwandan trainee for Chief Accountant before his sudden transfer to another government service. Training of another accountant took considerable time and thus caused a slight backlog that is now in the process of being cleared.
- R: Install electricity for physical security of warehouses.
- A: Completed.

Recommended Actions Not Completed:

- R: Preparation of an organization chart and position descriptions.
- A: In process but difficult to fix since discussions are presently being carried on with OPROVIA to determine positions for GRENAEWA personnel once integration is accomplished in 1982.
- R: Review of the format and content of financial statements.
- A: In process for implementation in new accounting procedures as of January 1981.
- R: Review of the Chart of Accounts and preparation of account descriptions and pro forma entries.
- A: In process in preparation of accounting handbook to guide implementation of new system for 1981. Accounts correspond with OPROVIA to facilitate integration.
- R: Preparation of a check list to follow up on action taken by subordinate offices to carry out regular reporting functions to management.
- A: To be included in accounting handbook presently being prepared.

ANNEX 6

Robert B. Mills and Dansou Kossou

February 9, 1981

FSM Storage at Kigali

- a) Excellent new storage, not in full use yet
- b) Doors not rodent proof.

February 10, 1981

FSM Storage at Kibungo

Facility appears generally well-managed

- a) Warehouse perimeter and drainage in good condition
- b) Maintenance of warehouse exterior ok, except drainage tubes open to outside without screens; ventilator at one end of building not screened.
- c) Maintenance of warehouse interior
 - 1) Small amount of grain in lower ventilators which could support insects if it became infested.
 - 2) Overhead structural members could accumulate grain dust which might support an insect population.
- d) Grain storage practices, e.g. stocking, condition of bags, etc., ok.
- e) Insect condition
 - 1) Only 1-2 live moths (perhaps almond moths) were observed.
 - 2) A few dead weevils (probably rice weevils) were on several of the sorghum bags.

Since there were not large numbers of them, they probably were field infestations carried to the warehouse by farmers; the insects were then killed by Malathion, or fumigation.
- f) There appeared to be no rodent or bird problems.
- g) Empty bags were piled against wall in an adjacent room; a good situation for insects to live on nutritious dust and bits of grain. Cleaning along the wall cannot be done.

February 11, 1981

FSM warehouse at Nyabisindu

This is an old storage structure with some inherent problem areas; but again management of the facility is generally good.

- a) Warehouse perimeter excellent: good drainage; no weeds.
- b) Exterior of building has defects :
 - 1) Drainage from roof is to interior troughs which have too little pitch to carry off water.
This is being remedied with new troughs which will drain well.
 - 2) Holes where aluminium siding has corroded and is loose from angle iron at base of wall.
 - 3) Two broken windows would permit entry of birds - although birds do not seem to be a problem.
 - 4) Doors have spaces around them that permit rodent entry.

Note: This building is old and all the defects will be difficult to remedy without great expense. Some major repairs (floors, roof drain) are being done or are scheduled.

- c) Interior - generally clean, except certain inaccessible areas (see below)
 - 1) Floor in poor condition in some areas
 - 2) Accumulations of residue grain and grain dust along walls between corrugations of siding and the angle iron at wall base.
 - 3) Grain residues between stacks too close together to permit cleaning. Residues of grain and Phostoxin between them.
 - 4) Equipment, bags, etc. in corners prevent adequate cleaning there.
- d) Grain storage practices, generally good.
 - 1) Some stacks too close together (as little as 12"): stocking is ok otherwise.
 - 2) Pallets that will raise grain further above floor would be better than present ones. Lumber and cost may be a factor here.
- e) Insect conditions. No live insects were observed: dead lesser grain borers were found on some sacks of sorghum: probably brought in with sorghum and killed by Malathion or Phostoxin.
- f) A few rodent pellets were found on bags, but no chewed bags were seen.
- g) Beans being loaded out had a musty odor (middle of stack) indicating some molding, thus high moisture content. Mold activity was not enough to cause heating or visible damage to beans.

General comments regarding over-all operations:

- 1) Accurate method(s) for determining moisture content of beans is badly needed to be sure moisture content is low enough for safe storage.
- 2) Insect control appears to be good, since virtually no live insects were found.
- 3) Concerns regarding the use of chemicals
Direct contact of workers with Malathion dust (feet and legs particularly) while mixing it with beans should be avoided by either wearing boots, or finding another method for mixing. The workers were wearing dust masks.
- 4) Phostoxin tablets should not be placed in contact with each other: this will retard complete decomposition of the aluminium phosphate.
- 5) Sand snakes (some) were in poor condition and may not satisfactorily seal tarp to floor during fumigation.
- 6) Management generally good given the limitation of resources. The most critical area is moisture testing problem. A laboratory at the Kigali facility could be capable of running at least air oven tests for accurate moisture content determination for checking moisture meters, and of cooking tests.
- 7) Need special storage for unused equipment and empty bags.
- 8) Practical study should be done of stacks of beans, i.e., to determine what happens in various parts of stocks regarding temperature and moisture changes and affect on hardshell. Beans going into storage should be of known moisture content and conditions within the warehouse monitored (temperature and relative humidity).

This study would require a technical person with an understanding of moisture/temperature relationships in stored grains, and certain equipment (thermocouples, hygrothermographs, air oven, analytical balance, standard bean cooking equipment).

The study should determine level of "hard-shellness" occurring in beans of different moisture content and from different parts of the stacks, as well as other factors influencing consumer acceptability.

ANNEX 7

The Strategic Food Reserve (RAO)

A. Background

A strategic food reserve has been under discussion for a long time in Rwanda. The 1974/75 drought and the food emergency it caused provided a further stimulus. A major problem which was manifested then and also in the 1980 alarm is that by the time a donor has decided that help is needed and the help arrives in three to eight months, it is too late and the next harvest has solved the food shortage.

A second problem is the flexibility of the multi-season cropping tends to shorten greatly the period of an emergency. For example, as soon as the peasant in a beans/sweet potato area sees that there will not be enough beans, he or she plants more beans, if possible, and sweet potatoes. So instead of having to wait five or six months from the recognition of the problem, perhaps the delay is only two to three months, or a delay of six weeks after the deficient harvest. Other peasants have manioc in the ground that can be harvested in case of need.

B. FAO Food Security Mission to Rwanda

Introduction

In July 1980, a three-man team from the FAO came to Rwanda for three weeks to analyze the national cereal/pulse stocks, storage and supply problems. Their report was discussed at the PASA/FAO meeting on Food Security in Rome (September 2-12, 1980) with the Rwandan DG Agronomy present. This report now is being considered by the GCR.

The FAO team (July 1980) had the following terms of reference:

- analyze the national food policy
- evaluate storage capacity and management of reserve stocks
- evaluate price support policy to producer and consumer
- evaluate distribution systems having a direct influence on a national food reserve
- identify actions needed to supply such a reserve
- identify actions required to create an early warning system
- provide proposals to improve food policy and early warning system
- recommend storage capacity, management, maintenance location, and stocks (sorghum/beans)
- inventory operational food security projects
- provide other information that is pertinent.

Results of the FAO Mission

1. GREMARWA's effect on price regulation is not significant at the present because GOR price control does not give much scope for GREMARWA and traders do not follow controlled prices. There is some price stabilization around GREMARWA's buying/selling points but there are not enough points. The relationship between GREMARWA and the cooperatives is still weak and so GREMARWA buys and sells most of its stocks with traders. So it is difficult to see how price regulation could be effective.

The National Price Commission should meet as often as possible and base the prices on the real situation of economics and markets and in relation to time and location. GREMARWA could advise on this.

GREMARWA should, within its capabilities, multiply its buying/selling points to approach more closely to the producer. It should also reinforce its communication with the cooperatives and other non-speculative bodies.

2. The food stock should be started with 6000 T of beans and 2000 T of sorghum and the working of this reserve should be studied for the next five years. The GOR should assure the annual costs of management and maintenance. The first purchase should be paid by the donors but there are limits to what the donors will finance at first.

3. GREMARWA has the capacity to manage the stock but the annual maintenance cost of such a stock would be Rwf 112 million (14 f/kg/yr). This is probably nearly twice the actual cost today. The secretary general proposes that donors should be solicited to meet this cost with a revolving fund for maintenance and management of the stocks. Later the GOR should take over financing.

The stock has to be turned over annually, assuming that the beans cannot be kept for over 24 months without excessive loss in value from shell hardening. It should be possible for GREMARWA to accumulate financial reserves in its regulatory activity in good periods of marketing and maintain the reserves out of its revolving fund.*

A national commission should be set up on the RAU, including members from the MINAGRI, MINISCOOP, MINIPLAN, Economics, Trade, Interior, Finance and GREMARWA (GPROVIA) which would supply the secretariat and play a technical role.

*The team must have misunderstood GOR/GPROVIA price policy, which has never enabled GREMARWA to make an appreciable profit.

The RAU should be maintained separate from GREMARWA's price regulating stock to keep a clear physical separation of inventory and finances.

4. The RAU (or at least the bean stock) should be built up over a period of four years and then will be maintained at this level. If distribution is agreed to be necessary, it will be free at least to the stressed part of the rural population and the urban population without income in case of a catastrophic famine. Outside aid will then be provided to rebuild the stock, failing which the GOR must replace it itself.

5. After examining the available storage capacity for food, both statistically and in light of the planned increase in food production, it was decided to propose four new storages: Kora (Gisenyi) 3000 T and Kirambo (Cyangugu) 3000 T, for beans; and another 1000 T each at Kora and at Kibungo for sorghum. The storages for beans on the Zaire/Nile Crest are based on the experience of GREMARWA* showing that low temperature and high humidity are better for long term storage of beans. Ideally, the storages should be located in the production areas or in the deficit areas.

6. The budget will need to provide for building 8000 T** of storage, plus houses, purchasing the stock, three technicians and consultants for training the cadre in GREMARWA, including training costs, which at 1980 prices amounts to Rwf 415 million over four years. The technicians are for financial and accounting roles and so cannot provide technical storage training. Rwandan counterparts will be needed to take over the enterprise when the expatriates leave.

7. The specialist in early warning systems was not available for the mission and so a separate mission is requested.

C. Comments

The action proposed will cost more than outlined because, if the replacement 6000 T stock has to be purchased in the first quarter of year two and the initial stock cannot be sold until the last quarter of year two, there will be a need for storage for 12,000 tons and a purchase fund to buy 12,000 tons. This is not foreseen in the paper. The costs of operation will also be increased with the increase in the ton x year storage.

It would perhaps to be more encouraging to donors if the cost of keeping a strategic food reserve in place were compared to the costs of shipping in food in emergency.

*In fact, the team should have reviewed the USDA research results on bean storage (see Agricultural Production, Storage, and Marketing in Rwanda, Annex II. USAID, Kigali, 1979).

** If the stock has to be turned over, buying in the spring and selling in the fall each year, 200% of capacity is needed.

ANNEX 8

W.H.M. Morris

February 1981

Status of Research Proposed under LCS Project

At the time of the EMS evaluation, a status report on the research proposed under the LCS project seems appropriate.

A. Socioeconomic research.

The Director of INRS, who was asked to contract this research, reported that he has been unable to identify himself or through his ministry any suitable candidates to conduct this research. He stated that he would be glad to be relieved of the responsibility to do this research and for USAID to take it in hand, if possible, or award it to a suitable U.S. contractor.

B. Agronomic research.

1. Study of local storage
 - (a) Inventory methods and conditions found
 - (b) Evaluate quantities stored and losses throughout the year
 - (c) Make recommendations to reduce losses
2. Inventory cultivated varieties and establish regional and local preferences in order to help marketing.
3. Determine the resistance of different varieties to insect attack in storage in order to try to reduce losses in 4-5 month storage.
4. Study the effect of the storage conditions on cooking time of beans to identify the storage conditions responsible for increase in cooking time.
5. Estimation of yields of beans in pure and mixed stands to develop a simple methodology for cooperative managers to use to predict the yield of beans and sorghum in crop mixtures.

The fourth, the cooking study, has been declined due to inability to get a suitable bean cooking tester. However, if a tester were given to PBRA, they would install it at ISAR (phytopathology lab) and learn to use it in their research.

The first three studies and to a lesser extent the fifth have all been tested in a pilot phase. A first report was issued in 1979 and a second on storage methods and their relation to losses has been summarized in English. The French manuscript is in typing at ISAR. All the progress shown is within PBRA since the DG of ISAR has not yet decided what changes, if any, he wants to make to the proposal written by the PBRA personnel and has not forwarded it to USAID/Kigali.

I recommend that, in view of the importance of the work, AAO Kigali write to the DG ISAR, copy to MINAGRI, stating that he accepts the inability to undertake Item 4, but that he is awaiting the proposal on the other items and considers the matter urgent.

Should no action be received by April 1, 1981, the AAO should take the matter in hand, getting FMS or LCS to agree to administer the project and M. Delepierre to direct it, with PBRA collaborating to get the work done. If necessary and acceptable, AAO Kigali could buy one VW 1300 or 1500 (Beetle) for use on this survey and then to be returned to the AAO for storage and subsequent use by the Socio-economic study.

AAO Kigali should consider whether he should engage someone to get bids for building the two models of the bean cooker and supplying them with suitable cooking pots (one for PBRA and one for OPROVIA/ORENARWA).

It is extremely fortunate and very fine collaboration that PBRA has done all the pilot work necessary on Items 1 to 3 and part of it on Item 5 on their own initiative and at their own cost. They deserve a vote of thanks (and perhaps help in typing the document). The PBRA is quite prepared to finish the job in "summer" 1981, given the means.

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ISAR MSS Note Technique n°

Evaluation of storage losses of beans and sorghum on Colline Gatovou
by C. Durnez and V. Dejaegher.

A preliminary study by C. Durnez (ISAR Note Technique n° 2, 1979) showed that the losses in grain storage on farms were not very serious. This is a study in greater depth. Only beans and sorghum are stored for any length of time by all of the peasants in substantial quantity (over 250 kg), other crops only being stored for short periods before they are consumed and rarely having phytosanitary problems.

The study had three objectives:

1. To evaluate the losses of beans and sorghum on Gatovou Colline to see if efforts to reduce the losses are justified.
2. To determine if the traditional storage procedures have an influence on the losses.
3. To develop a general methodology which could be applied on a national scale.

"Losses" here includes all changes during storage in the availability, consumability or the quality of cereal and legume grains which impair their consumption. The loss in weight was used as the sole criterion. The losses were mainly caused by insects and also it is necessary to consider losses due to rejecting grains of too low a quality.

The study started in July 1979 and lasted until June 1980. July was chosen as it is the month of the annual sorghum harvest, when the sorghum is put into storage. The peasants were visited each 30 days and a systematic survey was made and a sample taken. This took two days per month.

It would have been useful to continue the survey beyond June 1980, since the stock of beans harvested in January 1980 was not yet up. However, the enqueteurs were not available (and it was proposed to start the national survey in July 1980).

Twenty households were selected from the forty-one in the preliminary survey. The sample included farmers who were expected to store substantial quantities for long periods and others whose stock was small and quickly exhausted. The three different types

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of storage identified in the preliminary survey were all included, jute sacks, ceramic pots and baskets. Some households were selected who used each of the three preservatives, banana ash, kaolin, and insecticides. Also the three different roofing materials were included, thatch, tiles, and corrugated sheets. We found that the survey reports on containers and preservatives was sometimes not true and the quantities stored were less than expected: in general, it was insufficient to cover the "hungry season."

Monthly samples of about 100 cc were taken to permit the evaluation of losses. The samples were taken from the top of the storage, where the family usually took their product for household use. They were taken in a plastic pot and put into a plastic bag with the number of the peasant attached. The sample was examined the next day. The quantities taken as samples were replaced in like grain.

The samples were first sieved (4 mm for beans and 2 mm for sorghum) to eliminate all insects, protective powder, impurity, small grains, etc. The number and species of living and dead insects was recorded. The number of live insects shows the start and importance of the attack. Dead insects show the effectiveness of the protectant.

The grains were sorted into undamaged and damaged, as follows:

with insect holes	broken (threshing)
chewed (insects, rats)	small
moldy	

Because the number of broken and small grains remains the same throughout the storage, it was not considered in the weight loss. We often found moldy and chewed grains at the beginning of the storage, which shows that the damage is done before the harvest. After several months of storage, it was difficult to say whether the losses were caused before or during storage. Grain damaged before harvest was excluded from the loss calculations.

The percentage of weight lost depended on the attitude of the peasant on the use of damaged grains: sometimes the peasant rejected damaged grain and sometimes it was eaten. In fact, the behavior usually lay between the two extremes: in good years or when stocks are adequate, the damaged grain is not eaten but might be fed to animals. In years of scarcity or when stocks are low, the same grains would be eaten.

We asked the ISAR workers to help sort the damaged grain into that which was edible and that which was not. In this way, we calculated the percentage loss in weight as $100 \times (\text{number damaged grains} \times \text{wt good grains}) - (\text{number good grains} \times \text{wt damaged grains})$ divided by $\text{weight good grains} (\text{number good grains} + \text{number damaged grains})$.

In estimating the losses in storage where the storage is mainly for subsistence, it is necessary to allow for the progressive consumption of the stock with time. To estimate the actual loss, the percentage loss each month is applied only to the estimated amount in the storage. The losses are summed up for the storage period.

Often during the survey, the farmers, if there was a threat of infestation, would sort the grain and treat it again. To estimate this loss, we took the percentage of the weight loss in the last sample before the sorting and applied this loss to the quantity remaining in storage at the moment.

Examples are shown below:

<u>Months in stock</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Amount consumed %	10	10	10	10	10	10	15	25
Weight loss of sample %	1	2	3	5	8	12	18	25
Weight loss as % total stored	0.1	0.2	0.3	0.5	0.8	1.2	2.7	6.25
Cumulative weight loss %	0.1	0.3	0.6	1.1	1.9	3.1	5.8	12.05

So, although there was a 25% loss in the stock remaining for the last month, the total loss was only 12.05% of the total stored.

<u>Months stored</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>Sorted</u>	<u>4</u>	<u>5</u>
Amount removed %	10	20	20	5	20	25
Loss in weight of sample %	1	5	10	100	0	1
Weight loss as % total stored	0.1	1	2	5	0	0.25
Cumulative weight loss % total	0.1	1.1	3.1	8.1	8.1	8.35

The averages for sorghum and first crop beans for the major variables are as follow:

	<u>Sorghum</u>	<u>Beans</u>
No. of people in household	7	7.05*
Total area, ha	1.13*	1.16
Area per head, ha	0.17*	0.18
Amount stored, kg	221	306
Range in amount stored, kg	50-600	10-2000

*Significant relationship with amount stored at approximately 1% level.

Second season beans. Only 13 out of the 20 peasants stored beans from the second harvest. Of the seven who did not store second season beans, five replied to the preliminary survey saying that they did store.

Losses generally averaged 0.25% for four months storage and insect infestation was generally visible after three months. By this time, much of the stock had been consumed.

The most commonly used insecticides were banana ash and Kaolin and receptacles ceramic pots and round baskets, because of the small quantities stored.

Losses in 2nd season beans, 1980

Farm n°	Wt stor. ed kg	Months stored	Container	Protectant	Roof of store	Mo Onset of infestation	% wt loss	Kg wt loss
1	85	5	Metal Drum	Kaolin	Tile	4	0.05	0.0425
3	210	5	Long Bask	Kaolin	Tile	5	0.24	0.504
4	5	5	Round Bask	0	Tile	2	1.0	0.05
6	35	5	Jute sack	Ash+Insect.	Sheet	2	0.17	0.0595
7	10	1	Round Bask	Kaolin	Straw	1	1.0	0.1
8	65	4	Ceramic	Ash	Straw	1	0.6	0.39
9	60	4	Long Bask	Kaolin	Tile	4	0	0
12	50	2	Jute sack	0	Tile	2	0	0
14	50	3	Ceramic	Ash	Straw	3	0	0
15	2	3	Ceramic	Ash	Straw	3	0	0
16	15	3	Ceramic	Kaolin	Straw	1	0.1	0.15
18	25	3	Ceramic	Ash	Straw	2	0.08	0.02
19	12	3	Round Bask	Kaolin	Tile	5	0	0
AV	48	5				+3	0.25	0.090

Effect of different methods and conditions of storage on the losses

A. Quantity stored and length of storage

The amount stored serves as a sort of index of the richness of the peasant, the larger the stock, the richer. Larger stocks are usually stored for longer. This relationship is statistically significant. The quantity of beans stored is not correlated with the losses. However, insect infestation usually starts in about the 3rd month, and one month later the stocks are usually exhausted.

The two farmers who had the highest losses had very small amounts in storage. In the one case 5 kg were stored for 5 months with no protectant and in the other 10 kg were kept for one month without having been sorted before storage.

In sorghum the quantity stored and the length of storage were positively correlated with the losses.

B. Type of storage

The type of storage is largely determined by the amount to be stored. Large quantities are stored in long baskets or jute sacks and small quantities in round baskets or ceramic pots. Sorghum is traditionally mixed with ashes and then usually resorts to insecticides when he sees that the ashes are no longer controlling the infestation of charancon.

First season beans are usually preserved with kaolin; but here also insecticides may be used if the kaolin loses its effectiveness. The peasants seem to understand the effectiveness of insecticides for conservation of grain: almost all who use an insecticide use Sumithion powder at 3%, the material provided by OCIR for use with coffee trees. Fortunately this insecticide gives a minimum danger of poisoning and can be used as a storage insecticide: its recommended use is normally 500-1000 gm/ton for 6-8 months protection, rather than the 3%.

For the second crop beans the peasants use kaolin or ashes and rarely use insecticides because the quantities stored are small and they are generally quickly used up.

To get an idea of the effectiveness of these methods of storage we have used the time of onset of infestation as a criteria. We find that for second crop beans the long basket with kaolin gives the best results with infestation only occurring at about the 5th month. For the first crop beans the long basket, jute sack and ceramic pots with kaolin all have the same onset of infestation, 4 months.

For sorghum the long basket and the ceramic pot with kaolin show an onset of infestation at about 3 months, while the metal drum (1 case) and the jute sacks have an onset at about the 2nd month.

C. Effect of roofing material on losses

This effect was confounded (mixed irretrievably) with the use of insecticide. The two farmers using metal sheet roofs, which lead to higher temperatures in storage and presumably more losses, used insecticides either from the beginning of storage or the beginning of infestation. Only 1 in 5 of the men having straw or tile roofs used insecticide.

Socioeconomic Aspects

The peasants on the Gatovu Colline stored first crop beans starting in February (av. 150 kf) and sorghum, harvested in July-August (av. 250 kg). Second crop bean storage was much less in quantity. In the survey in Butare prefecture we found that first crop bean harvest (127 kg) and the sorghum harvest (153 kg.) were supplemented by purchases of 50 kg of beans and 119 kg of sorghum. About 50 kg of second crop beans were stored in July-August. These small amounts were mostly stored in ceramic pots or round baskets with the addition of kaolin or ashes. The infestation started around the third month but the stocks were usually finished in the 4th month.

So for short storage of beans the low level of losses do not justify the use of measures to reduce them. The situation with long storage is not clear. Fifty percent of the sorghum is generally used by the end of the 4th month and 90% after 6 months although with drawals are quite irregular. The sorghum was usually (60% of farmers) stored in long baskets using ashes. For storing of quantities of the order of 200 kg sorghum it seems that use of 2% Malathion (1% of grain weight) would be profitable especially with a longer storage period. The losses of sorghum not using Malathion are of the order of 1.4% after 4 months, 2.2% after 6 and 5% after 10 months.

ORGANIGRAMME DE L'OFFICE NATIONAL POUR LE DEVELOPPEMENT ET LA COMMERCIALISATION
DES PRODUITS VIVRIERS ET DES PRODUCTIONS ANIMALES "OPROVIA" (AP No. 277/11 DU 08/08/78)

