

685-0250

Senegal

Millet Transformation Project

PROJECT PAPER

FY 81

INITIAL ENVIRONMENTAL EXAMINATION

Project Location

: Senegal

Project Title

: Millet Transformation  
(685-0250)

Funding (Fiscal Year and Amount)

: FY 1981-83 \$1.259 million

IEE prepared by

: Paul Rusby/USAID/Senegal

Environmental Action Recommended

: Categorical Exclusion

Concurrences

: Mission Director  
USAID/Senegal

David Shear

*David Shear*  
3/11/81

Bureau Environmental Officer's Decision:

Approve: *David A. [Signature]*

Date: 11-23-81

Disapprove: \_\_\_\_\_

Date: \_\_\_\_\_

Clearance:

GC/AFR

*[Signature]*

Schlesinger  
AFR/DR files

INITIAL ENVIRONMENTAL EXAMINATION

Project Location	: Senegal
Project Title	: Millet Transformation (685-0250)
Funding (Fiscal Year and Amount)	: FY 1981-83 \$1.259 million
IEE prepared by	: Paul Rusby/USAID/Senegal
Environmental Action Recommended	: Categorical Exclusion
Concurrences	: Mission Director USAID/Senegal David Shear

*David Shear*  
3/11/81

Bureau Environmental Officer's Decision:

Approve: \_\_\_\_\_

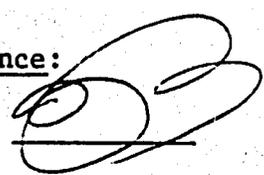
Date: \_\_\_\_\_

Disapprove: \_\_\_\_\_

Date: \_\_\_\_\_

Clearance:

GC/AFR



1. Examination of Nature, Scope and Magnitude of Environmental Impacts

A. Description of the Project

The Millet Transformation Project will (1) demonstrate that Senegal's balance of payments can be improved by substituting millet-based foods for imported wheat and rice, (2) demonstrate that culturally acceptable, technically feasible and economically viable, millet-based foods can be manufactured, and (3) assist the Senegalese to develop a manufacturing/financial/marketing plan for production/distribution of millet-based foods.

The two year project will be directed by the "Institut de Technologie Alimentaire" under the SERST. The project will finance the following inputs:

1. Technical Assistance

To support the Project Manager and Senior Scientist at I.T.A, one Resident Advisor will be provided on a full time basis for two years and 12 man/months of short term consultants in the fields of product development, market research and commercialization will be provided.

2. Training

Senior I.T.A personnel (equivalent to 7 man years) will acquire highly valuable technical on-the-job training through the project.

3. Equipment

Some equipment, including possibly a small food extruder and an agglomerator will be provided to I.T.A to carry out product development modifications indicated by the results of consumer acceptance studies.

## B. Identifications and Evaluation of Environmental Impacts

The activity will have no harmful effects on the environment. The nature of the project is research; as such it will involve data collection and analysis, product development and testing, field and laboratory observation and questionnaires. The project does not involve agricultural development of any kind such as establishment of irrigation networks, use of pesticides or fertilizers, etc.

No buildings or physical infrastructure will be financed under this project.

The beneficial effect of the several studies to be completed will be to show how Senegal's balance of payments position may be improved and to demonstrate cultural acceptability, technical feasibility, and economic viability of producing and selling transformed millet-based foods.

## C. Evaluation of Impacts

### Impact Identification and Evaluation

#### 1. Impact Areas and Sub-areas

##### a. Land Use

##### 1) Changing Character of land through

a) Increasing population

N

b) Extracting Natural resources

N

c) Land clearing

N

d) Changing soil characters

N

##### 2) Altering natural defenses

N

##### 3) Foreclosing important issues

N

##### b. Water quality

1) Physical state of Water

N

2) Chemical and biological states

N

3) Ecological balance

N

- |   |   |
|---|---|
| c. Atmospheric                            |   |
| 1) Air additives                          | N |
| 2) Air pollution                          | N |
| 3) Noise pollution                        | N |
| d. Natural Resources                      |   |
| 1. Diversion, altered use of water        | N |
| 2. Irreversible, inefficient commitments  | N |
| e. Cultural                               |   |
| 1) Altering physical symbols              | N |
| 2) Dilution of cultural traditions        | N |
| f. Socio-Economic                         |   |
| Changes in economic employment patterns   | N |
| g. Health                                 |   |
| 1) Changing a natural environment         | N |
| 2) Eliminating an element in an ecosystem | N |
| 3) Other factors                          | N |
| h. General                                |   |
| 1) International impacts                  | N |
| 2) Controversial impacts                  | N |
| 3) Larger program impacts                 | N |

## 2. Narrative Evaluation of Impacts

- a. Land Use. Within the terms of this study project, there will be no change made in current land-use patterns.
- b. Water quality. The project will have not effect on water quality.
- c. Atmospheric. There will be no atmospheric impacts caused by the project.
- d. Natural resources. The project will no affect the use of natural resources.
- e. Cultural. The project will have no cultural effects.
- f. Socio-economic. The project will produce no direct changes in patterns of economic or cultural life, though the information to be gathered and analyzed within the course of implementing this project, subsequently will be used to create a more favorable economic climate for the rural population of Senegal.

g. Health. There will be no health effects.

h. General: There are no "general" impacts caused by this project, nor any larger program impacts.

A/4

## II. Recommendation for Threshold Decision

On the basis of information contained above, it is ascertained that project consists solely of technical assistance which excludes any activities directly affecting the environment; therefore, this project qualifies for a Categorical Exclusion under Regulation 16, section 216.2 (c) (2) (i).

S E N E G A L

not  
Xerox

MILLET TRANSFORMATION PROJECT

NO. 685 - 0250

USAID/SENEGAL

B.P. 49

DAKAR, SENEGAL

JUNE 1981

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE

**A**  
A = Add  
C = Change  
D = Delete

Amendment Number

INCIDENT CODE

3

COUNTRY/ENTITY **SENEGAL**

BUREAU/OFFICE **AFR**

3. PROJECT NUMBER

**685-0250**

5. PROJECT TITLE (maximum 40 characters)

**MILLET TRANSFORMATION**

PROJECT ASSISTANCE COMPLETION DATE (PACD)

MM DD YY

**09 30 84**

7. ESTIMATED DATE OF OBLIGATION

(Under "B" below, enter 1, 2, 3, or 4)

A. Initial FY **81**

B. Quarter **4**

C. Final FY **81**

8. COSTS (\$000 OR EQUIVALENT \$1 = )

A. FUNDING SOURCE	FIRST FY <b>81</b>			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total						
(Grant)	( 500 )	( )	( 500 )	( 500 )	( )	( 500 )
(Loan)	( )	( )	( )	( )	( )	( )
Other	30		30	30		30
OS P.L. 480 Title III		543	543		543	543
1. At Country		187	187		187	187
Other Donor(s)						
<b>TOTALS</b>	<b>530</b>	<b>730</b>	<b>1,260</b>	<b>530</b>	<b>730</b>	<b>1,260</b>

9. SCHEDULE OF AID FUNDING (\$000)

APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECIL CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
SH	161 B	334		0		500		500	
fn	161 J	334		0		30		30	
<b>TOTALS</b>				<b>0</b>		<b>530</b>		<b>530</b>	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

874

314

332

140

978

312

11. SECONDARY PURPOSE CODE

910 B

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code

RGEN

R/AG

INTR

NUTR

TECH

B. Amount

13. PROJECT PURPOSE (maximum 180 characters)

Demonstrate that Senegal's balance of payments and marketing of agricultural production can potentially be improved through substitution of nutritious millet-based foods for imported wheat and rice; demonstrate their potential for cultural acceptability, technical feasibility, and economic viability; develop illustrative manufacturing/marketing/financial plans; and lay the groundwork for possible investment by a private or public enterprise.

14. SCHEDULED EVALUATIONS

MM YY

MM YY

MM YY

Interim

**04 83**

Final

**09 84**

15. SOURCE/ORIGIN OF GOODS AND SERVICES

000

041

Local

Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a \_\_\_\_\_ page PP Amendment)

17. APPROVED BY

Signature **David Shes**

Title **DIRECTOR, USAID/SENEGAL**

Date Signed MM DD YY

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MM DD YY

ACTION MEMORANDUM TO THE DIRECTOR OF USAID/SENEGAL

TO: David Shear, Director

FROM: Ben Stoner, PDO

SUBJECT: Millet Transformation Project (685-0250)

I. PROBLEM:

Your approval is required to execute a grant of Five Hundred Thousand Dollars (\$ 500,000) from Section 121 of the Foreign Assistant Act, Sahel Development Program (SH), to the Government of Senegal (GOS), for the Millet Transformation Project (685-0250).

II. DISCUSSION:

A. Project Description

This project supports research and development activities that will assist the GOS in one aspect of its national plan of moving toward greater food self-sufficiency: greater substitution of domestic millet products for imported cereal products. The fourfold purpose of the project is:

(1) to demonstrate that Senegal's balance of payments and marketing of agricultural production can potentially be improved through substitution of nutritious millet-based foods for imported wheat and rice;

(2) to demonstrate the potential for cultural acceptability, technical feasibility, and economic viability of producing and selling transformed millet foods;

(3) to assist the Senegalese to develop illustrative manufacturing/marketing/financial plans for production/distribution of millet-based foods; and

(4) to lay the groundwork for possible investment therein by the private sector or a public enterprise.

The project, which will be implemented over a period of three years by the Institut de Technologie Alimentaire (ITA) will produce prototypes of millet-based foods deemed desirable by the target population. All prototypes will be tested for their cultural acceptability, technical feasibility, nutritious quality, and economic viability for production on a commercial basis through a series of interrelated studies/action programs.

MEMORANDUM TO THE DIRECTOR, AID/WASHINGTON

The project fully supports the mutual GOS and AID goals of moving the country toward food self-sufficiency and improving the presently adverse balance of payments situation.

Although the immediate impact of this experimental activity will be limited, the potential benefits arising if the identified products are subsequently commercialized are substantial. These would range from macro-economic support for Senegal's balance of payments, through sectoral assistance to agriculture, down to savings of cooking fuel, and preparation effort for urban households desirous of serving their families such culturally popular dishes as millet couscous, plus the opportunity to obtain new domestically produced foods as both staples and snacks.

B. Financial Summary

Life of project AID funding is \$ 500,000. In accordance with AID OYB/ Allotment procedures, the entire \$ 500,000 will be obligated in FY 81. The project budget is:

	(US \$ in 000's)
1. Technical Assistance	250
2. Commodities	145
3. Inflation and Contingency	105
	<hr/>
Total	500

In addition to direct project financing, AID will provide \$ 30,000 for university support under an AID/Washington Title XII Project.

The GOS contribution will be \$ 187,000 of in-kind support for salaries of ITA employees and indirect operating support costs, and \$ 543,000 for local equipment and operating support in local currency generated under the P.L 480 Title III Program.

C. Summary of Analysis

The project as designed is technically and socio-economically sound.

A Categorical Exclusion of the project from environmental procedures was approved with the PID. No further environmental analysis is required.

D. Project Implementation

The Project Agreement will require, as Conditions Precedent, that the GOS name a Project Director and that an agreement be reached with the GOS on the use of Title III funds for the project.

As Covenants in the Project Agreement, the GOS will agree (1) to establish a Project Advisory Committee, and (2) to develop a financial management plan and procedures acceptable to USAID for the use of Title III funds to support the local costs of the technical assistance contracts.

The GOS implementing agency is ITA (Institut de Technologie Alimentaire).

Standard AID procurement procedures will be followed. No waivers are requested. Technical assistance for preparation of the interrelated studies/action programs of the project will be provided by a U.S. institution chosen under standard AID competitive selection procedure.

E. Committee Action and Congressional Apprisement

A Project Review was held on June 30, 1981. This review requested that GOS concurrence be obtained on use of Title III funds for the project; that the scopes of work, contracting procedures and evaluation criteria for the studies be strengthened, that the budget be better elaborated, and that the life of project be three instead of two years. These changes have all been made in the final Project Paper.

An Advice of Program Change was prepared by USAID to inform Congress of the intention to obligate \$ 500,000 for the project in FY 1981. The project was not included in the FY 81 Congressional Presentation because the activity was developed after submission of that document. The waiting period for the Congressional Notification expired May 22, 1981.

F. Responsible Project Officers

John McMahon, Agricultural Development Office, USAID/Senegal.  
Joel Schlesinger, Project Officer, AFR/DR/SWAP.

III. RECOMMENDATION:

That you sign the Project Authorization and thereby authorize the Millet Transformation Project with planned obligation of \$ 500,000.

S E N E G A L

MILLET TRANSFORMATION PROJECT

NO. 685-0250

TABLE OF CONTENTS

	PAGE NO
I. PROJECT DATA SHEET	1
II. PROJECT AUTHORIZATION	11
III. PROJECT DESCRIPTION	1
A. Summary and Recommendations	1
B. Project Background	3
1. Senegal's Balance of Payments	3
2. Role of Agriculture in Senegal's Economy	3
3. Importance of Millet in Senegalese Agriculture	4
4. Cereals Imports and the Population served by Imports	4
5. Millet Production Potential	5
6. Constraints on Millet Utilization	5
7. Urban Marketing Prospects if Millet is Transformed	5
8. Previous Efforts to Alter Millet	6
9. National Plan Position on Millet	7
10. Regional Implications of Project	7
C. Project Description	8
1. Goal and Purpose	8
2. Project Activities	8
3. Types of Products under Consideration	9
4. Market Testing	10
5. Wrap-Up Studies	11
IV. FEASIBILITY ANALYSES	12
A. Technical Feasibility	12
1. Project Studies/Action Programs	12
2. Product Development Analysis	17
3. Market Development Analysis	23
B. Economic, Social and Beneficiaries Analysis	28
1. Salability of Transformed Millet Products	28
2. Potential Macro Economic Benefits	29

	PAGE NO
3. GOS Investment Policy	29
4. Potential Commercial Viability	30
5. Potential Social Benefits	31
6. Ultimate Beneficiaries	32
C. Environmental Analysis	33
D. Financial Analysis	34
V. IMPLEMENTATION PLAN	35
A. Schedule of Project Activities	35
1. Preliminary	35
2. Implementation	35
B. Project Responsibilities	36
C. Procurement	37
PRE-PROJECT MILESTONE SCHEDULE FIG V. - 1	39
PROJECT IMPLEMENTATION TIME SCHEDULE FIG. V - 2	40
VI. PROJECT EVALUATION PLAN	41
VII. CONDITIONS, COVENANTS AND NEGOTIATING STATUS	42
III. ANNEXES	
A. Logical Framework	
B. Statutory Checklist	
C. # 611 (e) Certification	
D. Technical Aspects of Product Development	
E. Reasons for Failure of Prior Millet Processing Attempts	
F. Technical Advisors' Terms of Reference	
G. PID Approval Cable	
H. Issues	
I. Household Survey Results	
J. Consumer Price: Raw Material Ratios	

PROJECT AUTHORIZATION

name of country : Senegal  
Name of Project : Millet Transformation  
Number of Project : 685 - 0250

1. Pursuant to Part I, Chapter 1, Section 121 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Millet Transformation Project for the Government of Senegal (GOS) involving planned obligations of not to exceed \$ 500,000 in Sahel Development Program funds over the planned life of Project of three years from the date of initial obligation, subject to the availability of funds in accordance with the A.I.D. OYB/Allotment process, to help in financing foreign exchange and local currency costs for the project. It is contemplated that \$ 30,000 in Title XII funds will be used in support of this project through appropriate procedures.

2. The project consists of technical assistance and commodities to assist the GOS through its Institut de Technologie Alimentaire (ITA) to develop and market test nutritious transformed millet foods and demonstrate their commercial potential as partial substitutes for imported wheat and rice. The project will also assist the grantee to develop manufacturing, marketing and financial plans for the production and distribution of millet-based food.

3. A Project Agreement, which may be negotiated and executed by the Officer to whom such authority is delegated in accordance with A.I.D. regulations and delegations of Authority, shall be subject to the following essential terms and conditions, together with such other terms as A.I.D. may deem appropriate.

a) Source and Origin of Goods and Services

Goods and Services, except for ocean shipping, financed by A.I.D. under this project shall have their source and origin in the United States or in Senegal except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing be financed only on flag vessels of the United States.

b) Conditions Precedent

Prior to any disbursement or the issuance of any commitment documents under the Project Agreement, the GOS will appoint a Project Director who shall be responsible for project implementation, and will reach an agreement with A.I.D. committing to project no less than \$ 543,000 worth of local currencies which were generated under the PL 480 Title III Program.

c) Covenants

The GOS will covenant that (1) a Project Advisory Committee will be established; (2) a financial management plan and procedures for the use of Title III funds to support the local costs of the technical assistance contracts will be developed to USAID satisfaction.

4. Clearances:

<u>Name</u>	<u>Office</u>	<u>Date</u>	<u>Initials</u>
A. Paul Rusby	FFP	7/22	<i>[Handwritten initials]</i>
B. Paul Wenger	PDO	7/22	BW for
C. John Balis	ADO	7/22	JB
D. Ray King	RCON	23/7	JK
E. Paul Lacerte	PSO	7/24	PL for
F. Sam Rea	PRM	7/22	<i>[Handwritten initials]</i>
G. Melvin McCaw	DDR	7/31	<i>[Handwritten initials]</i>
H. Belinda Barrington	ARLA/REDSO/WA	7/29	BKB

5. Approval:

David Shear, Director USAID/Senegal

*[Handwritten signature]*  
signature

7/31/81  
Date

### III. PROJECT DESCRIPTION

#### A. Summary and Recommendations

- A. Country: Senegal
- B. Project: Millet Transformation
- C. Funding: \$ 500,000 SR
- D. Life of Project: 3 years
- E. Waivers: None
- F. Conditions: ITA to appoint project manager

This Project Paper is for a grant of \$ 500,000 from the Sahel Development Program Appropriation (SR) to Senegal for the Millet Transformation Project (685-0250). It is contemplated that \$ 30,000 in Title XII funds will be used in support of this project through appropriate procedures.

This is a research and development project which will seek to demonstrate the potential for improving Senegal's balance of payments and agricultural sector marketing capability through development and marketing of nutritious transformed millet foods that can to some degree permit locally grown grains to substitute for imported wheat and rice.

The major elements of the Project will be:

- Identification of specific transformed millet products which have potential as substitutes for imported wheat and rice.
- Development of prototype products and processes suitable for use on a commercial basis and testing for wholesomeness and nutritive value.
- Evaluation of the social and business potential of the products through market tests, examination of millet availability, and by analysis of financial and other business factors associated with development of a new business enterprise.
- Preparation of a pre-feasibility study which can be used by entrepreneurs and financial institutions as a basis for deciding to engage in millet transformation business activities.

The project fully supports the mutual GOS and AID goals of moving the country toward food self-sufficiency and ameliorating the presently adverse balance of payments situation.

Although the immediate impact of this experimental activity will be limited to the people and products involved in the development/testing/study exercise, the potential benefits, if the products developed are subsequently commercialized on a substantial scale, would range from macro-economic support for Senegal's balance of payments, through sectoral assistance to agriculture, down to savings of cooking, fuel, and preparation effort for urban housewives desirous of serving their families such culturally popular dishes as millet couscous, plus the opportunity to obtain new domestically produced foods in both the staple and snack categories.

The only condition precedent is ITA's naming of a project manager.

## B. PROJECT BACKGROUND

### 1. Senegal's Balance of Payments

The national balance of payments is in grave disarray. In 1979, Senegal's current deficit, according to the IBRD Report published in November 1980, was estimated to be \$ 436 million, or 51% of exports. This deficit was due to a drop in earnings from exports coupled with a steady increase in imports, especially petroleum and consumer goods. The drop in exports was due to the failure of rains and a poor peanut harvest that reduced peanut product earnings from \$ 322 million in 1977 to \$ 196 million in 1979. Increased imports were partly the result of the sharp rise in petroleum costs from \$ 92 million in 1978 to \$ 137 million in 1979, but even more largely were due to increased imports of consumer goods, including foods which accounted for \$ 199 million in 1979. The 30% increase in overall imports between 1978 and 1979 was a result of demand fueled by the expansionary policies of the government. The imbalance in current accounts thus reflects both long and short-term factors: high population rates, slow growth, low savings, and a widening resource gap, aggravated by oil price increases and poor crop years. Under their combined impact, the imbalance has been seriously aggravated, from minus \$ 68 million in 1977 to minus \$ 436 million in just two years. By the end of 1979 total public and publicly guaranteed external debt outstanding stood at \$ 1.27 billion. Debt service payment claimed about 20% of the value of exported goods and services.

### 2. Role of Agriculture in Senegal's Economy

The agriculture sector is central to Senegal's economy. Despite poor soils and erratic rainfall, which make agricultural production variable and risky, the rural sector employs over 75% of the labor force. In recent years, some 30-35% of GDP and 60% of export value has originated in the sector. Within the sector, about 78% of output has come from crops and livestock products, 15% from fishing and 7% from forestry. The main cash crops are groundnuts and cotton. Almost 95% of rural output is produced by small-scale farm units from rainfed agriculture; however, there exists much diversity in farm size, labor availability, ownership of agricultural capital, productivity and revenues.

Over the past decade groundnuts and millet/sorghum have taken up close to 90% of the cultivated area (47% and 42% respectively). Since 1974, the major export commodities have been groundnut products (75% of agricultural exports), fish products (14%), and cotton products (7%). On the import side, since 1974, food imports have made up 20-30% of the total merchandise imports; of the total rice has accounted for about 35%, wheat 13%, sugar products 25%, and fruit and milk products 9% each.

The yields of some crops such as groundnuts compare reasonably well, under favorable conditions, with international norms, especially on those farmer fields where better crop husbandry is practiced. However, because of the constraints on the existing farming systems the majority of the farmers do not attain these yields. For the cereal crops, yield lag behind those in other countries and cereal deficits in Senegal are a recurrent feature of the economy. Regular annual commercial cereal imports averaged about 370,000 tons in 1976/77 and 1977/78 with rice accounting for 246,000 tons of this. Additional imports (as food aid) are often made, averaging 40,000 tons.

Rice has become an increasingly important foodgrain in Senegal. With the rapid urbanization in the country, the demand for rice has been rising. In 1974-80 an average of 75% of the rice consumed in Senegal was imported. Thus, even with an annual rate of growth of 6.3% in cereal production and growth of demand of 3.4% per annum, the cereal deficit would be about 283,000 tons by 1985. The rice deficit could also be 140,000 tons. With the need for imports to correct such deficits, Senegal remains highly vulnerable to world market price fluctuations and the foreign exchange commitment for the imports is overtaking the country's export earnings, leading to a seemingly intractable balance of payments deficit.

### 3. Importance of Millet in Senegalese Agriculture

Millet is a crop that is particularly adapted to Senegal's erratic rainfall patterns, due to its ability to withstand two to three week dry periods without major yield reductions. Characteristic of the country's rainfall is a marked variability not only in the amount between years, but in the variability of distribution within years. Therefore, even in a year near average overall rainfall, as in 1980, an erratic distribution may be nearly as devastating to the other crops, especially peanuts and sorghum, as a drought year.

Minimum water requirements of those plants grown under rainfed conditions in the main agricultural areas of Senegal have been determined by CNRA at Bamby to be as follows:

- a. peanuts (110 - 120 day maturity) 550 - 600 mm
- b. sorghum (105 - 110 day maturity) 500 - 550 mm
- c. millet (75 - 90 day maturity) 400 - 450 mm

Corn and wheat are not even in the ballpark for these areas, though they do have some potential elsewhere in the country as part of an irrigated farming system.

Therefore, the food crop that is most adaptable to Senegal's variable rainfall pattern is millet.

### 4. Cereals Imports and the Population served by Imports

Senegal's rural inhabitants, constituting 72% of the country's population, produce and largely self-consume about 66% of the nation's cereals requirements. The cereal requirements for the remainder of the country are met by cereal imports, directed to the cash market urban consumer. Thai and Pakistan 100% broken rice is landed at Dakar at a cost approximating CFA 51,800 per metric ton. 1/ The Government sells the rice at CFA 74,595 per MT making a profit of 22,775 on the sale. Inefficiencies in production and high costs of inputs make the farmgate price of Senegalese rice grown in the Casamance about CFA 79,231 per MT. When the high costs of milling and in-land transport are added in, domestic production is clearly non-competitive with imported Thai and Pakistan rice for the grades the Senegal market handles.

Wheat is not yet grown commercially in Senegal.

---

1/ December 1979 prices; foreign purchases and internal sales are handled by the GOS Caisse de Perequation et de Stabilisation des Prix.

### 5. Millet Production Potential

There is no doubt that, under the right conditions, the Senegalese farmer has the capacity to expand millet production well beyond existing subsistence levels. In the 1978/79 production year, an early announcement of farm-gate prices and a promise to purchase all millet that was offered, together with credit for fertilizer purchases and adequate rains, coalesced to enable Senegalese farmers to produce 110,000 MT surplus millet for central purchase and storage. Beyond that point, however, marketing difficulties were such as to prevent satisfactory utilization of the surplus - and to discourage the GOS from repeating the effort. It is to a portion of the marketing problem, lack of urban demand, that our project is directed.

### 6. Constraints on Millet Utilization

Millet flour is presently the basis for all existing millet foods: couscous (a steamed food similar to corn grits), lakh (heavy porridge or gruel) and rouye (a pap used for feeding weaning age children). The millet seed is traditionally placed into a hollowed log or large wooden bowl and pounded by a long, weighted mallet. The process for making couscous involves: (1) cleaning the grain (2) pounding to remove the pericarp, (3) washing, (4) hand-pounding or machine grinding to produce flour, (5) agglomeration of the flour, (6) steaming to cook (7) adding condiments, and (8) final re-steaming. This total process requires several hours elapsed time and intermediate product such as the flour cannot be stored for longer than 24 to 48 hours because of micro-biological spoilage.

Some machines are available in the villages to grind millet. While machine grinding reduces the drudgery of preparation, it doesn't improve the shelf life of raw millet. Food technologists believe, however, extrusion processing, in-process cooking, separation and other techniques can be employed to eliminate most or all the problems associated with the shelf life of raw millet.

While this regime of daily drudgery is more or less acceptable in rural areas, where large families share the work and small incomes limit the alternatives, it is distinctly unacceptable in the cities. Urban life is characterized not only by participation in the cash economy but also by the frequent breakup of the large joint family, coupled with small and congested living areas, rigid time schedules for attending office and school, and attention of housewives and mothers to activities offered by urban life. In short, neither manpower, facilities nor time permit urban women to cope with demands of millet preparation as practiced in the village. If millet is to supplement or replace wheat and rice in urban areas, it cannot do so in its traditional form which requires extraordinary amounts of labor, time and daily repetition due to limited shelf life.

### 7. Urban Marketing Prospects if Millet is Transformed

Little millet moves in international trade; its production is mostly consumed at home and its cultivation confined largely to semi-arid countries usually requiring supplemental imports. In short, there is little technology

to date on the pre-cooking, molecular change process called millet transformation. Even so, preliminary work to date makes us optimistic that problems of technical feasibility, consumer acceptability and economic feasibility can be solved. The U.S. is a leader in the development and application of food technology and many of these technologies, including certain ones developed by AID, have applicability for producing processed foods from millet. For example, extrusion-cooking, an extremely low-cost method of cooking cereal grains developed in the U.S., might serve to make pre-cooked millet flours for couscous, weaning foods, snacks and breakfast cereals. The U.S. developed agglomeration and "instantizing" technology might be applicable for preparing instant couscous and lakh. The fortification technology from the US might be used to enrich any or all the foods with vitamins and minerals or, if necessary, with protein.

Once these things have been done, millet-based products will be in a position to compete head to head with other grains and their products.

#### 8. Previous Efforts to Alter Millet

There has been some limited experience already in Senegal in producing millet-based foods requiring less time and effort to prepare. Traditionally pre-cooked sun-dried millet couscous has been made through home or cottage industries as a means of shortening the additional hand labor required to prepare couscous. This "instant" couscous has a moderately extended storage life (up to several months) and is simply moistened and steamed for 10 - 15 minutes to prepare it for table use. A pre-cooked couscous had also been made which is not dried and requires only reheating to be table ready, though its shelf life is only a few days. Both of these products are available today through Dakar markets, but they cost about CFA 300 per kg or three times the retail price of raw millet. The volume is quite low, and Ross has estimated that processed couscous represents less than 5 - 10% of millet sales in Dakar.

In the early 1970's a Senegal-based food company, SENTENAC, unsuccessfully attempted to produce and distribute an "instant" millet couscous. The reasons for failure are not clear, but it has been reported that the product was equivalent in quality to normal millet couscous, and that it was priced too high. ITA has had a long standing interest in producing "instant" couscous but has been unable to locate suitable equipment for its manufacture among their traditional European suppliers.

A somewhat similar history exists for lakh and fonde, which are made by cooking millet caraw (millet balls). A dried, shelf-stable caraw is available in the market but at high price, and it apparently is sold in only limited quantities.

The experience with cottage made "instant" couscous and caraw balls is at least partly encouraging in that it indicates that these and perhaps other traditional millet-based foods are technically achievable and can, if properly priced and promoted, gain a place in the consumer food market.

In addition to more convenient and/or longer lived versions of the traditional foods, there are a number of modern foods which can also be made from millet and might also find markets in Senegal. These include snack items similar to the puffed corn-based snacks of the US. or the rice and cassava based snacks in Asia. Breakfast cereals, including flakes, puffed-bits, and hot porridges represent another form in which millet might be marketed. Special nutritionally enriched weaning foods and beverage-bases are yet another possibility.

#### 9. National Plan Position on Millet

In February 1977, the Ministry of Rural Development and Water Resources of the Republic of Senegal issued a document outlining the country's food investment strategy for 1977-78, emphasizing food self-sufficiency. Although greater food self-sufficiency had been a long standing goal of Senegal's national five-year plans, the 1977 reformulation of policy constituted a major step towards goal implementation. The report summarized the new proposals:

"In order to improve the nutritional status of its population and to diminish its dependency on imports, the Government has decided to implement a strategy which aims at import substitution. An important element of this strategy is to promote the consumption of millet, sorghum and maize by modernizing the processing of such staples, and simultaneously to check the increase in domestic demand for rice and wheat by means of price policies."

In 1980, the GOS took the next step and issued the Plan de Redressement (Reform Plan). This plan, inter alia, strongly supports the move towards food self-sufficiency and import substitution; it calls specifically for the encouragement of private enterprise and reorganized cooperatives in the production and marketing of millet. Because the measures include a 15% across-the-board import duty, they move towards creating price relationships favoring millet and millet products against imported cereals.

#### 10. Regional Implications of Project

The development of a family of new millet-based foods is of great potential importance to the entire Sahel where millet has been an accepted staple for hundreds of years. A good percentage of the populations of Mali, Upper Volta, Niger and the Ivory Coast prefer millet to rice; and, in contrast to Dakar, continue to eat millet, even in urban centers. There exists, therefore, a large potential market for the projected foods, both for export from Senegal and for possible new regional factories.

The International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) is now undertaking market research in the Sahel regarding the acceptability of new varieties of millet. Discussions are being initiated with ICRISAT to explore possible tie-ins with this research. A possible advantage of such cooperation could be that varieties more suitable for processing could be bred in Sahelian environments by ICRISAT researchers specifically for products developed under this transformation project.

## C. Project Description

### 1. Goal and Purpose

The goal of this project is to design a program and provide strategies to assist the GOS in one aspect of its national plan of moving toward greater food self-sufficiency: partial substitution of domestic millet products for imported cereals products. If such a goal were achieved, it would tend to reduce the country's dependency on imports of cereals such as rice and wheat and, by increasing production of local cereals and the income of farmers through better marketing, bring about an improvement in rural life. Such a program should also permit an expansion in the capabilities of the food processing industry's market testing and market research organizations and could in turn stimulate investments in new plant facilities.

The purpose of the project is to demonstrate that Senegal's balance of payments and marketing of agricultural production can potentially be improved through substitution of nutritious millet-based foods for imported wheat and rice; demonstrate potential for cultural acceptability, technical feasibility and economic viability of producing and selling transformed millet foods; assist the Senegalese to develop illustrative manufacturing/marketing/financial plans for production/distribution of millet-based foods; and lay the groundwork for possible investment therein by the private sector or a public enterprise.

### 2. Project Activities

The project, which will be implemented over a period of three years by the Institut de Technologie Alimentaire (ITA), will produce prototypes of millet-based foods deemed desirable by the target population. These foods will be formulated and processed as economically as possible to keep the price down and in such a way that the finished products will be wholesome and nutritious. Attempts will be made to produce millet-based staple products as convenient for home preparation as the imported staples, and to provide a shelf-life stability parallel to that of wheat flour or whole rice. Attempts will also be made to devise snack foods competitive with imported snack foods and one or more new weaning foods. All prototypes will be tested for their cultural acceptability, technical feasibility, nutritious quality and economic viability for production on a commercial basis, through a series of interrelated studies/action programs as follows:

- (1) Food habits and attitudes;
- (2) Product development and evaluation;
- (3) Millet supply;
- (4) Product marketing;
- (5) Financial analysis; and,
- (6) Plant location possibilities.

The results of these studies/action programs will be integrated to produce a comprehensive Final Report on the Feasibility of Manufacturing and Marketing Transformed Millet Products in Senegal. Based upon this report, attempts will be made to solicit interest in commercial-scale production and marketing of the products developed and tested under this project.

### 3. Types of Products under Consideration

Three major categories of consumer goods prototypes have been preliminarily identified, pending completion of the Food Habits Study. Several of them are traditional foods consumed almost daily by many urban and rural consumers; others are considered to be entirely new product concepts.

In the first category of staple consumer goods, foods are being identified which are consumed almost daily by the entire family in fairly large quantities. Rice and couscous, for example, fall into this category. It is projected that millet prototypes will be developed which will resemble these food staples. As an illustration, a substitute product for rice may be developed by forming, from millet, rice-like particles which can be prepared in a similar manner and incorporated into traditional midday or evening meals. Similarly, dry precooked "instant" millet couscous might replace rice or imported wheat couscous for lunch, dinner or supper.

In the second category, activities will focus on family foods presently or prospectively consumed either in the morning for breakfast or during the day between meals or for a quick lunch. These prototypes can be typified by individually puffed millet grains consumed as breakfast cereals with cold milk, sweetened or salted fried millet chips sold by street vendors, and puffed millet snacks with different flavors, such as cheeses or condiments, available for sales in restaurants and bars.

In the third group, consideration will be given to developing foods specifically formulated to satisfy the dietary requirements of infants and young children, such as a nutritious, millet-based weaning food prototype. As an illustration, the development of precooked millet caraw balls, fortified with proteins, fats, vitamins and minerals, could serve to replace the traditional caraw balls if it will match characteristic properties of the finished porridge (lakh) and is competitively priced. Another type of infant food could be conceived as a substitute for cereal-based imported weaning food. For example, a blend of dry precooked millet flour, skim milk powder, fat, sugar, vitamins, and minerals may provide when cooked with water, milk, or other foods, a part of the necessary daily requirements of infants or young children.

In a related category, ITA has requested consideration of a geriatric food to help meet the particular nutritional needs of the aged if project funds remain available after development and testing of the above primary products.

The further identification of prototypes of consumer foods pursuant to the Food Habits Study will facilitate the selection of feasible processes.

It can be expected that several related products can be manufactured by each basic process through modification of some of the processing conditions. Since a major goal of the prototype products concept is to provide convenient foods, some of them resembling the traditional foods consumed, and since convenience can be expressed by decreased meal preparation time, and fuel and effort reduction, coupled with an increase in shelf-life stability, processes can be selected providing these parameters. For example, industrial precooking of cereals and other ingredients is one process which will reduce the time, fuel cost and effort of meal preparation. Drying a processed food and correct packaging will usually increase product stability. Additives can also be used to enhance product stability. And additional nutrients or other food elements to meet actual or perceived needs can readily be included.

Many foods are prepared in different forms. Therefore, shaping and forming is another important processing parameter. As an illustration, the preparation of couscous and caraw balls differs primarily in the size of millet balls formed and the quantity of water added to a given amount of millet flour.

Secondarily to the development of consumer goods, consideration could be given to the production and marketing of by-product ingredients, as required for the manufacture of various otherwise unrelated foods. As an example, millet could be transformed into starch which would serve as raw material for the production of "millet syrups". These syrups would be incorporated as sweeteners into any food or beverage which requires such ingredients.

#### 4. Market Testing

The inherent market potential of new products is extremely difficult to predict and can only be assessed reliably in the market place. While there are definite opinions within USAID and ITA on the probability of acceptance of several of the proposed products, it must be recognized that the extent to which individual products will succeed or fail, indeed the extent to which all the products collectively will materially effect demand for millet in Senegal, can only be assessed in the market place. The objective of the first activity, to develop products of good market potential, is only the first step on the route to the stated goal of actual acceptance. The market testing itself is the critical phase, leading to the design of commercial prototype operations and related second generation activities in setting up new foods enterprises.

Senegal offers an interesting example in which a colonial administration changed the eating habits of a population by both providing an imported food (rice) cheaper than people could produce their own (millet) and by creating a social climate that made consumption of the import mark of the "évolué" (participant in French culture and society). After independence, Senegal continued the economic policies of the French regime, and cheap rice imports continued to create the objective conditions for perpetuating rice eating

habits among the urban populations. The notion that rice is believed to be socially more acceptable than millet continues to be maintained by many French expatriates; however, discussions with Senegalese interviewed on their attitude towards rice/millet consumption indicated a strongly positive image of millet.

It is widely believed that rice has to be consumed at midday meals because "it is not heavy and one can work afterwards," but millet is often the preferred dish for evening meals. Many Senegalese will stress with pride the variety of millet meals available, and discuss the appropriate times when these are to be eaten. Preparation cost, including the cost of ingredients, is given as reasons why millet is not eaten more frequently. How often a family can eat couscous per week or month appears to be almost a social indicator of affluence. Moreover, there exist considerable care in the selection of the couscous flour purchased by the head of the household. Several of those interviewed considered that the millet couscous for sale at the market was of an inferior quality, and described how they purchased their weekly requirements by going to the countryside to have it prepared by relatives or friends. Several people stated that to obtain their couscous presented a problem, and that they went to considerable trouble to have it prepared because it was a part of their culture to eat couscous.

The function of the Market Testing Program will be to form a feedback loop between the technicians who want to develop marketable transformed millet products and the consumers who would like to have such products available. Through the interaction of the two groups, it is expected that a viable industry can be created for the production and marketing of transformed millet products.

##### 5. Wrap-Up Studies

Once the transformed millet products have been developed and their degree of market acceptability and price responsiveness demonstrated, the remainder of the project will consist of the consolidation of the key factual information - processes, costs, marketing potential and strategies, supply options, plant location possibilities, potential problems, etc., - into sufficiently comprehensive form to convince one or more private or public sector enterprises that millet transformation was worth intensive investigation based on the particular criteria of each such enterprise. At that point, the role of this project would become secondary, although personnel and facilities would be used to cooperate, to the degree possible, on a non-discriminatory basis, with any enterprise evincing an active interest in the subject.

#### IV. FEASIBILITY ANALYSES

##### A. Technical Feasibility

###### 1. Project Studies/Action Programs

A series of studies/action programs will be undertaken as a major and integral part of the project. The studies are interrelated and will be amalgamated into a final feasibility study to establish the economic, financial, commercial and social viability of manufacturing and distributing transformed millet products.

###### 1) Food Habits and Attitudes Study

A study will be undertaken among potential purchasers of transformed millet products to determine (a) the amount and form of imported rice and wheat products used in the diet; (b) the amount, form, and source of millet in the diet; and, (c) the attitudes toward rice, wheat, millet, and related foods and how those attitudes might be influenced by introduction of transformed millet products. The results of the study will be used (a) to help select and design processed millet products (e.g., to determine preferred characteristics of instant couscous, to suggest forms of weaning foods, to suggest preferred package sizes, potential pricing, etc.); (b) to guide initial market development approaches (including selection of market test areas, advertising claims, promotional approaches, etc.); and, (c) to evaluate potential impact of the project through preliminary estimates of potential volume of transformed millet products which might replace imported rice and wheat.

The study will be undertaken largely among urban population segments in greater Dakar and other selected towns. It will involve administration of a pre-tested questionnaire to 500-1,000 statistically selected households representing potential buyers of processed millet products and subsequently will also include a limited number of in-depth interviews to confirm or explore key issues. Results will be both tabulated and analyzed in terms of the information requirements established by the ITA product development group and marketing interests.

It is expected the study can be undertaken by a Senegalese organization through a contract administered by ITA. Short-term technical advisors supplied through the project (2 man/months) will assist in the selection of the contractor, design of the study, and analysis of the results. The study will be largely completed during the first six months of the project and cost \$ 62,950.

###### (ii) Product Development Action Program

A series of activities will be undertaken by ITA in cooperation with contractors and consultants to identify transformed millet products which have potential to serve the twin objectives of: (1) furnishing

wholesome, nutritious, reasonably priced, processed millet foods; and (2) reducing the importation of rice and wheat through substitution with locally produced foods.

The studies will use a market-oriented product development approach consisting of the following steps:

- a) Conceptualization: The identification of ideas for particular millet-based products based on (a) knowledge of the needs or latent demands of the market acquired through either prior knowledge or the studies in (i), above; (b) technology which is or could be available to transform millet; and (c) the creative output of project personnel.
- b) Preparation of Prototype Products and Initial Testing: Small quantities of millet will be processed, representing prototypes of the products conceptualized during the first step. These materials will be made at ITA or in pilot plants of equipment suppliers or cooperators. The products will be evaluated by experts to determine if they meet the criteria of the concept; i.e. wholesomeness, nutritive values, acceptable organoleptic qualities and reasonable price, and will be modified as required to do so; preliminary manufacturing requirements and cost estimates will be made. If it is the consensus of the experts that any individual product cannot be modified to meet the criteria of the concept, that product will be dropped from further consideration.
- c) Preliminary Consumer Testing: Prototype products will be evaluated through testing by taste panels, in home placement tests, and other methods as appropriate to (a) determine if further product modifications are needed; and (b) assess the market penetration potential. A consensus judgments by the Project Managers and Resident Advisor of product unacceptability will cause it to be dropped.
- d) Development of Preliminary Marketing Concepts: Based on (a) results of prototype testing; (b) available knowledge of the market from project studies and (c) the creativity of project personnel, strategies for packaging, pricing, distribution, advertising and promotion, and related market activities will be developed.
- e) Market Testing: The potential sales, and ultimately the degree of import substitution for the products, will be assessed through market testing of the prototypes within the context of their proposed marketing strategies. Testing might include small - or large-scale sales of the product through commercial outlets or other approaches. The Project Managers on the advice of the Resident Advisor, will determine what level of consumer acceptance is required to keep each product on the project active list.
- f) Final Product Proposal: Products which successfully satisfy the requirements of the project will be described in a Final Product Proposal which will treat (a) technical and economic requirements for manufacturing; (b) verification of marketability and potential for import substitution; (c) proposed marketing plan; (d) costs, prices, margins, and potential profitability; and (e) possibilities for commercializing the product in Senegal.

The actual products might include: (a) an instant couscous; (b) a puffed breakfast cereal; (c) a seasoned or cheese covered chip; (d) a weaning food. It is also expected that certain of the initial product concepts will not result in Final Product Proposals due to failure to achieve satisfactory market testing results, inadequate technology, etc.

Product development will continue throughout the project at an estimated cost of \$ 433,100. ITA will assign senior personnel, technicians, economists, and others as required to undertake the studies and will be assisted by U.S. technical advisors supplied through the project and by contractors as needed to undertake consumer studies, marketing studies, etc. Limited equipment will be purchased by ITA to undertake the development and testing products. Due to the broad range of equipment which might potentially be involved in the studies, much of the processing packaging, and other testing studies are expected to be undertaken in the facilities of vendors or others in the U.S. and in Senegal. The decision on what equipment is to be purchased will be made during the first 6 months of the project by the USAID and ITA project managers on the advice of the Resident Advisor.

#### (iii) Millet Supply Study

A study will be undertaken to examine alternative methods of insuring an adequate supply of millet for the projected need and to recommend a specific method or methods of procurement. The study will take into account (a) the variability in supply caused by rainfall and other natural conditions, (b) relevant government policies and potential changes in those policies, (c) existing infrastructure for millet production and procurement operations <sup>1/</sup> and changes which might be made to facilitate procurement, (d) the long-term changes in millet procurement requirements which might occur, and analysis of the benefits and detriments to the farm sector which might accompany those changes.

The study will be undertaken by a Senegalese organization through a contract administered by ITA. Short-term technical advisors provided through the project (one man/month) will assist in design of the study and analysis of results. The study will cost \$ 26,600.

#### (iv) Marketing Study

A study will be undertaken to generate a strategy for marketing transformed millet products. The strategy will be predicated on consumer desired product attributes, pricing, packaging, and related issues established through test marketing and will take into account distribution channels, and advertising/promotion approaches which are likely to be effective in Senegal.

In addition, the strategy will draw on the under-

---

<sup>1/</sup> Since millet is only harvested once a year, ITA emphasizes the importance of adequate warehouses to hold raw materials, particularly pre-processed millet.

standings of food habits and attitudes in Senegal developed during the project and will provide an integrated approach to marketing the transformed millet products developed through the project. The resulting marketing strategy will include plans for introducing the products including the introductory advertising/promotion campaigns; it will also propose marketing approaches which might be used after introduction is completed and the products have stabilized in a mature market. <sup>1/</sup>

The study can be undertaken by a Senegalese institution through a contract administered by ITA. Short term technical advisors furnished through the project for 2 man/months will assist in selection of the contractor, design of the study and analysis of the results. The study should be undertaken and completed during the last 6 months of the project at a cost of \$ 48,800.

(v) Financial Analysis

A study will be undertaken to assess the potential financial viability of a business enterprise which might be created or adopted in Senegal to manufacture and distribute the processed millet products which will be developed through the project. The study will take into account:

(a) the business and investment climate in Senegal as determined by GOS policies in both theory and practice, labor availability and socio-political receptivity to such an operation;

(b) the potential revenue which might be generated through sales of the product (as estimated in part through test marketing of the products);

(c) the potential costs of operation including manufacturing, selling, and other business expenses; (d) the potential requirements for fixed and working capital and sources of that capital; and (e) profitability, return on investment, and such other indicators of financial attractiveness as are deemed appropriate. The analysis will be of a type and completeness that will make it suitable for use by private entrepreneurs, public sector companies, commercial banks, international development banks, or other investors to use as the basis for conducting further examinations, pursuant to their own particular criteria of financial viability.

This study can be undertaken by a Senegalese institution through a contract administered by ITA. Short term technical advisors furnished through the project for 4 man/months will assist in selection of the contractor, design of the study and analysis of the results. The study should be undertaken and completed during the last 6 months of the project and is estimated to cost \$ 114,200.

(vi) Study of Plant Location and Nature of Processes

Once the types of products, methods and scale of most technically and economically feasible system of processing, size and location of markets, and situation of existing facilities (if any) owned or to be used

<sup>1/</sup> For example, ITA notes that many consumers shop at small stores, hence traditional retailers should be included in the distribution system at the appropriate time.

by the prospective entrepreneur(s) have been determined, a plant location and type study will be contracted with a local firm. To the degree that the determinations of the above factors leave certain realistic alternatives, this study will consider potential jobs and income to be generated for persons in urban and rural areas in the context of possible capital savings technologies for factory and marketing functions within the context of maximizing jobs and income for small operators, with specific consideration for women. The study will take place during the final 6 months of the project and costs \$ 29,000.

(vii) Final Feasibility Analysis

The results of the above studies/action programs will finally have to be pulled together into an analysis of the overall feasibility of a commercial scale operation of a millet products manufacturing and marketing business in Senegal. While much of this material will have been used in some form or other in the Financial Analysis, it is this final feasibility study that will test the validity of the factors considered therein in light of the determinations made in the course of the other studies/action program. This final analysis will be carried out by the AID and ITA project managers in collaboration with the team leaders of the Product Development, Marketing and Financial Analysis teams. Its cost will be subsumed under the contracts of the stated teams.

Additional project expenditures of a nature not specifically allocable to particular studies will be covered in the Financial Analysis.

## 2. Product Development Analysis

The product development analysis breaks down into two principal technical components: (i) elimination of presumed negative characteristics of processed millet; and (ii) development of marketable millet products. We shall consider each:

### (i) Elimination of Presumed Negative Characteristics

Millet flour prepared in the traditional way has been widely reported to have an extremely short storage life, only a day or two. The poor stability seems to be caused by the high moisture content which results from the addition of water during hand pounding. It appears that the moisture content of hand pounded millet flour is around 25%, and that at this level growth of micro-organisms and other processes are initiated which cause rapid deterioration of the flour.

All cereal grain flours deteriorate rapidly when the moisture is this high and it is therefore customary to maintain the moisture of cereal flours at less than about 15%. Accordingly, the products which we hope to develop during the Millet Transformation Project will be designed for low moisture; we can expect them all to dry products having no more than 10-15% moisture. In some cases, such as the snack foods, they will probably even have less than 5% moisture content to assure crisp texture.

When technicians carrying out pre-project studies noticed an off-flavor in products made from the millet flour obtained from the Dakar Mill, it was assumed the flavor was caused by pericarp which had not been properly removed during the milling process. However, scientists at Kansas State University and Texas A & M opined that the flavor might be caused by rancidity resulting from deterioration of the lipids (fats and oils) present in the millet. Earlier work at KSU on whole millet meal had indicated that it became rancid very quickly and therefore they suspected that the millet flour might also suffer from the same problem. In fact, KSU scientists suggested that all millet flours might have limited storage stability because of the difficulties in removing the germ of the millet (which is high in fat) during milling, and because of the high oil content of millet flour. This was the basis for the advice that there might be a limited storage life of millet flour and of transformed millet products.

Because of these statements by KSU, one of the technicians looked further into the issue of storage stability in Senegal last November-December. As a result of his inquiries, he came to the conclusion that millet stability is not likely to pose any special problems for the project. He learned from ITA and from people who use the products, that pre-cooked, instant couscous and caraw balls that have been properly dried have a shelf life of several months; Senegalese people say they procure

well dried couscous and caraw and keep these products in their homes for weeks or months before use and even send it abroad for friends who do not have access to millet products. In addition, ITA's Dr. Thiam stated that millet flour made by the dry milling process has a long storage stability and does not deteriorate quickly as does hand pounded millet flour. As a spot confirmation of this, a gruel made from the ITA millet flour brought back last December (roughly two months old) was tested and showed no evidence of rancidity or off-flavors.

While these reports and observations are not conclusive evidence that transformed millet products will have adequate storage stability, they indicate that we should not expect special stability problems. Proof of stability can only come from tests of the transformed millet products made with the processes and raw materials which will be used in Senegal. If the products should for some reason have poor stability, there are a number of additional possibilities to deal with the problem technically. For example, if the products take up moisture from the atmosphere and deteriorate because of growth of micro-organism and hydrolytic rancidity, we can eliminate the problem through moisture barriers in the packaging. If the products contain unstable fats which oxidize to produce oxidative rancidity, we can add antioxidants, such as BHA and BHT.

In summary, while the technicians can't guarantee stability, it seems unlikely it will be a major problem, and if it becomes a problem, it can probably be solved.

#### (ii) Development of Marketable Products

The process of developing a new food product for wide acceptability is a combination of art and science. The art, as always, is impossible to describe adequately, so we must place our confidence in the people who have made America's food industry one of the world's most creative. However, the science--or, more properly, technology--is more concrete and subject to detailed examination:

Puffing gun process: The first process which will be described combines decortification with pre-cooking of millet.

Cleaned, graded, undecorticated millet kernels are introduced into a puffing gun. The material is exposed to superheated steam and cooked under pressure for a predetermined time. The cooked grains are released abruptly into the atmosphere, the hot kernels expand rapidly rupturing the seed coat which separates from the kernel. By external aspiration, the seed coat can then be removed.

The main product is decorticated, puffed and precooked individual millet kernels much like the familiar puffed wheat. By-products are broken puffs and millet bran. It is usually not necessary to dry the puffed millet kernels further.

The following product prototypes may be identified and evaluated as potentially flowing from the puffed millet:

#### Pre-cooked millet flour

Either the puffed kernels and/or the broken pieces can be ground by roller mills or hammer mills into a couscous or fine flour depending upon subsequent usage.

#### Individually puffed millet grains

Individually puffed millet grains can be packaged and sold as breakfast cereals which can be consumed with cold milk.

#### Weaning Foods:

Pre-cooked fortified caraw balls - The pre-cooked millet flour can be combined with proteins, fats, vitamins and minerals and/or other ingredients and flavors. The blend is moistened with water or other liquids to form a dough which is then passed through a shaping machine to produce caraw balls similar to those obtained by agglomerating raw millet flour with water. The pre-cooked caraw balls will be dried in regular drying ovens at atmospheric pressure or under vacuum. The dried product, when packed in appropriate packaging material, should exhibit the desired shelf life. It should produce a satisfactory lakk when prepared according to the traditional methods used by the Senegalese housewife.

Cereal-based weaning foods similar to imported products - Pre-cooked millet flour is combined with ingredients providing proteins, fats, sugar, flavoring, vitamins and minerals. The homogenous blend is packaged. When prepared as porridge, the dry material is mixed with water or milk to form a smooth paste and cooked to provide a thick porridge which will be spoon-fed to infants as a supplemental food.

Rice-like granules formed from millet - The process is very similar to that described under caraw ball production. The formulation of the dry blend prior to forming the granules will differ somewhat from that used for the forming of caraw balls and the degree of pre-cooking may need adjustment to satisfy the method of preparation used for broken rice, but the basic technological processes will be the same.

Instant couscous - The process described earlier to shape various traditional foods can also be applied to the manufacture of couscous. Several sizes of pre-cooked millet couscous particles can be attempted, separated by screens. The particles are then dried and packaged. For meals preparation the product is rehydrated, steamed once in a couscous steamer and mixed with the traditional meats, fish or other foods.

## Extrusion Process

Another process for pre-cooking millet, described at length in Annex D, consists in subjecting clean decorticated millet grains or millet flour to extrusion cooking. A cooker/extruder consists of a screw which rotates inside of a tightly fitting stationary barrel. Barrel and screw can be heated, if required. When the dry or moistened cereals enter the barrel, the food is compressed and the high pressure creates very high temperatures which cook the cereal. Almost instantaneously the product leaves through a small opening and the hot plasticized dough expands rapidly, forming a rigid, expanded mass. Selected processing conditions can control the degree of expansion and pre-cooking. The millet extrudate can be dried.

The following extrusion process product prototypes may be identified and evaluated:

### Pre-cooked millet flour

A highly expanded or puffed extrudate can be dried and reduced in particle size into coarse and fine flour by roller mills and hammer mills. The products can serve as primary materials for weaning foods, pre-cooked fortified caraw balls, and rice-like granules: preparation methods for these foods are similar to those described in the puffing gun process.

### Puffed millet snacks

Greatly expanded extrudates will form puffed snacks. The hot snacks can be salted, coated in oil and cheese flavors and finally dried before packaging. They can provide a great variety of snacks items to be consumed between meals.

### Fried chips

Slightly expanded millet extrudate will be conveyed to a forming extruder which will compact the precooked material. The material is dried to a very low moisture content and packaged. For making the fried chip, the dry material is introduced into a hot oil bath. During frying the chip will expand. It is removed from the hot oil and excess oil is removed from it. The product can be sold in bulk by vendors or packaged for sales in supermarkets and restaurants.

### Agglomerating and steaming process for dry pre-cooked millet couscous

The starting material for this process is clean decorticated raw millet flour. The flour is introduced into slowly rotating blenders which tumble the material. Water is injected through bars dispersing the water in fine droplets. These droplets wet the flour and form small agglomerates. The wet agglomerates are conveyed into a heated pressure chamber. Steam forms in the

pressure chamber and precooks the agglomerates. After a given period of time, the pressure is released and the slowly rotating vessel is transformed into a vacuum dryer. The agglomerates are dried, screened into various particle sizes for fine or coarse couscous, and packages. The final product is prepared in a manner similar to that discussed earlier (Rehydrating and steaming one time). In addition, the couscous agglomeration process permits coating particles with flavour, sugar syrups, salt and other condiments.

#### Evaluation of prototype products

ITA will evaluate the wholesomeness, nutritious quality, acceptability and shelf-life stability of all processed prototypes. Quality will be determined by analyzing them for physical, chemical, and microbiological characteristics. The results will be compared with specifications set for similar non-millet foods. The analysis will include evaluation of parameters which will affect visual appearance, organoleptic attributes, and the presence of undesirable and harmful micro-organisms. Energy absorption, protein quality and other nutritional properties will be verified, particularly in food designed as nutritional foods. Packaging materials will be studied for their effectiveness in protecting food quality and extended shelf life stability of the prototypes. Finally the effort and fuel involved in meal preparation for traditional foods will be computed with that needed for preparation of prototypes.

An expert taste panel will then review all products to determine if they meet project concept criteria. If it is the consensus of the experts that any individual product cannot be modified to meet the criteria of the concept, that product will be dropped from further consideration. Approved products will next be submitted to small consumer groups chosen from various income levels and different ethnic groups to focus on each product's key characteristics as well as its preparation requirements and recipes for its use. Larger consumer groups will then test further the prototypes for organoleptic attributes, appearance, ease of preparation, packaging, package size, shelf life and price. A consensus judgment by the Project Managers and Resident Advisors of product unsuitability will cause it to be dropped.

A marketing organization will be identified to carry out the field testing under contract with ITA. Results will be tabulated and evaluated for necessary adjustment of prototype foods.

#### Equipment:

Although specific equipment needs have not yet been fully defined, it seems that a puffing gun, a small extruder, a forming machine and a combination agglomerator with pressure and vacuum chambers and air intensifier bars will be required for identifying the most suitable processes. Equipment can either be purchased, rented, or borrowed from various companies. The decision on what equipment is to be purchased will be made during the first 6 months of the project by the USAID and ITA Project Managers on the advice of the Resident Advisor.

Provision will also be made to have local organizations process food prototypes through local contracts for larger consumer and market research tests.

Evaluation and testing of nutritional quality of prototypes may be required by foreign experts toward the end of the project to insure meeting adequate nutritional requirements for products identified to be culturally acceptable and which may have a fair degree of success in the urban market place. Provision is made in the budget for these tests.

#### Packaging materials

Limited capabilities exist in Senegal to produce plastic pouches, particularly polyethylene or polypropylene. Cartons can also be made in Senegal. Additional information will be gathered to determine if packaging material for packing highly hydroscopic snack items could be made available locally.

### 3. Market Development Analysis

#### (1) Market Parameters

The Dakar Metropolitan Area market possesses the following characteristics:

- (a) approximately 1 million inhabitants and 100,000 household units;
- (b) an average age of 35 years;
- (c) eight (8) districts; Medina, Fass, Colobane, Nimzatt, Grand Dakar, Sicap, HLM and Fann/Point E of which at least 39% and possibly as high as 50% represent low income areas,
- (d) Nine (9) ethnic groups of which two, the Wolof and Toucouleurs, summarize 62% of the population. Foreigners, primarily Caucasians, account for approximately 4.5% of the total population or 43,500 people;
- (e) Two-thirds of the households are carraés (compounds) or baraques (shacks),
- (f) At least 34% of the households are classified as very poor;
- (g) A minimum of 30% of the population is illiterate and another 39%, marginally literate. Only 9% of modest income inhabitants completed either primary or secondary school.
- (h) Unemployment approximates 30% and may approach 50%;
- (i) Day workers, craftsmen, fishermen and farmers account for 46% of the workforce, and merchants, managers salaried or hourly wage employees and professionals (2%), 22%.
- (j) 91% of the households own radios; 30% have access to TV programming; 20% some type of powered transportation (autos, motorcycles or motor bikes); 50% running water; and 84% electricity.
- (k) 62% of food is purchased at "Mauritanian boutiques" and 23% in open markets or marchés.
- (l) 43% and 25% of cereal (rice and millet) purchases are made in boutiques and open markets, respectively.
- (m) 21% of household food expenditures represent cereal purchases of which 77% or 16 percentage points is for broken rice.
- (n) The economy is depressed due to the Sahelian drought which has seriously impacted domestic food crop and peanut production.

The aforementioned socio-economic and market data is derived from disparate sources and interpolation. It should be further validated by a probability survey. The GOS does not have hard data beyond the 1976 Census.

(ii) Marketing Phases

The millet transformation marketing program will consist of five phases:

- (a) market research,
- (b) product development and acceptance testing,
- (c) test marketing,
- (d) GOS programs to assure reliable supplies of quality raw material and investment incentives to attract private business or development of a parapublic corporation,
- (e) commercialization.

The market research will consist of:

- (1) Consumer attitude tests and socio-economic measurements,
- (2) Product testing; focus panels and in-home testing.
- (3) Test marketing.
- (4) Commercialization.

(A) Attitude and Socio-Economic Survey

Attitudinal research will determine and measure:

- (1) existing food preferences and usage;
- (2) attitudes towards present foods (likes and dislikes);
- (3) trends in and reasons for millet and rice use and non-use;
- (4) evaluation of existing food preferences and identifying new food concepts;
- (5) attitudes towards convenience foods;
- (6) pricing parameters for new products;
- (7) price elasticity or inelasticity for various food especially rice and millet;
- (8) degree of receptivity of housewives to brand purchase;
- (9) influence of various media, including community opinion leaders and "word of mouth" advertising, in food purchasing and use decisions;
- (10) opinions concerning possible development of foods catering to the preferences, need and purchasing power of the various socio-economic classes;
- (11) appropriate retail outlets by product category i.e. pasta vs. weaning foods or children's unitized snacks;
- (12) classification of respondent households by key socio-economic characteristics such as income, occupation, education, family size and composition, residence (carré, Baraque, SICAF, HLM, Apt. Bldg., house or villa), availability of household equipment and utilities, mode of transportation to and from work and shopping, level of discretionary income, and exposure to media.

Due to budget and time constraints, unimportance of ethnicity in urban food preferences and consumption, and research focus on developing insights to

modify consumer preference for rice and, secondarily, wheat through the development of new products and dietary or menu changes, the need for a probability sample is not imperative. The sample size can range between 100 and 300 household units selected on the basis of the Dakar Metropolitan Area's socio-economic composition.

There is no need to go into the specifics of either sample selection or questionnaire design because satisfactory references exist. These are:

- (1) OCDE, Club du Sahel study, Etude du Marche Urbain Sahelien des Cereales Locales et de leurs Derives, Susceptibles de se substituer aux Importations, July 1980
- (2) Universite de Dakar, Institut Universitaire de Technologie, Division Technique, Etude: Budget de consommation, volumes I & II June 1976.

In addition, a local advertising agency (STP, Mohamed Cisse) has "hands on" experience in consumer attitudinal surveys, panel testing and test marketing. Also, para-governmental organizations such as IFAN, and ENEA can provide assistance. STP appears to be the best qualified to do the market research, focus panel testing and possibly, market testing. The other consulting organizations interviewed have never done consumer food research - SCHAD, ORATEC, IFAN, ENEA and SONEPI.

#### (B) Consumer Panel Tests

The household attitudinal and socio-economic survey will provide the data required to structure the focus panel tests.

The socio-economic composition of the panel will vary according to the product's potential market. Some panels, for example, will reflect the area's overall socio-economic composition whereas others, selective socio-economic groups: A children's snack, for example, will be tested with school children. Instant couscous, simulated rice, etc, on the other hand, although priced for the higher income classes in the traditional 250 gr, 500 gr and 1 kg packages could also be marketed in bulk at a lower price to appeal to all socio-economic segments. Therefore, the consumer panel should reflect as nearly as possible the market's socio-economic characteristics.

The size of the consumer panel will vary according to the socio-economic subgroup tested and the various strata within these subgroups. Whenever possible, it should reflect each group's relative diversity and importance to the total market.

The consumer panel can range from eight to twenty respondents.

The consumer panel test should be supervised by an expert e.g. STP with staff support from preferably ITA, ORANA (Nutritional foods), ENEA or IFAN. A consensus judgment by the project manager and Resident Advisor will be made as to whether development of each specific product should or should not be continued.

### (C) Market Testing

The objective of the test market is to determine:

- (1) if the product will sell at given price;
- (2) the degree to which price variations influence product acceptance or movement;
- (3) appropriateness of package size, and composition;
- (4) effect of store positioning including shelf location and space allocation;
- (5) effectiveness of various promotional media;
- (6) effectiveness of retail outlets selected;

There are seven general types of food outlets used in the Dakar Metro Market:

	<u>% Purchased</u>		
	<u>General</u>	<u>Rice</u>	<u>Millet</u>
- Mauritanian boutiques	43	45	6
- Local including Dakar central city open markets	38	27	74
- Supermarkets (4)	3	6	3
- Small store "supermarkets" }			
- SONADIS (GOS operated)	9	7	1
- CO-OP's	5	15	3
- Village and open markets, and stores outside area	9	-	3

The outlet(s) selected for the test market would vary according to the product's socio-economic group appeal and also, whether or not different priced "brands" are marketed for the same product. The advertising agency recommended against test marketing in Mauritanian boutiques because of the unreliability of their reporting.

Definite information concerning the number and location of the various types of food outlets in the Dakar Metro Area was not readily available. However, this information may be obtained from such wholesale/retail companies as Filfil and SONADIS, and local beverage and dairy manufacturers. The GOS Census Dept. may have the data from the 1976 census.

The test market strategy will be selective, geared to product(s) appeal to particular socio-economic groups. Therefore, the retail outlet mix and numbers used for market tests may vary by product category.

One way to popularize the test market is to concentrate product development on products having universal appeal and/or develop different brands (price ranges and quantities) for the same product. This will also obviate or lessen the necessity for price variation testing. This strategy will also optimize market potential.

Due to the Dakar market's concentration and the absence of seasonal variations in food purchases (unlike the rural areas), the test market period could be abbreviated to three months.

Promotion and advertising should be restricted to in-store and neighborhood (socio-economic) areas. Area-wide mass media promotion is not recommended (Radio, Cinema, Newspapers) because of cost considerations and unavailability of products at all outlets.

The test market promotion may include but not necessarily restricted to:

- (1) In-store Displays;
- (2) Promotional Flyers in French and Arabic (or local languages)
- (3) Caravans - sound trucks touring neighborhoods, usually with local celebrities;
- (4) Free samples;
- (5) Promotion/Samples at Sport Events especially snack items.
- (6) "Cent off" purchase and/or 2 for 1 purchases.
- (7) Use of neighborhood opinion leaders such as Compound President or Chefs, including, possibly, religious leaders.
- (8) Demonstrations at Super-markets and community social centers.

The retailer should be encouraged to "push" the product through discount incentives.

Weekly audits should be conducted to measure product movement and make whatever changes are required in promotion, pricing and merchandising outlet strategy.

If a private or parapublic organization comes into the picture before the products are ready for test marketing, it should assume responsibility for the test and product. If, on the other hand, no company is on the scene, the Project Director should select wholesalers, preferably several of them, to undertake the distribution and in-store promotion of the products with the understanding that the one who performs the best will get the exclusive marketing rights, if he wishes.

The wholesalers understandably prefer to accept the product(s) on a contingency basis.

To improve chances of project success, it is recommended<sup>ed</sup> that attempts be made to form a production/marketing venture after product development and acceptance testing but prior to full scale test marketing. Otherwise, the "time lag" between the market test and actual commercialization may negatively affect the project. Perhaps the best strategy is to test the highest potential product and, if successful, use the market test as a sales tool to create a general production/marketing venture. The Project Managers, on the advice of the Resident Advisor will determine what level of consumer acceptance is required to keep each product on the project active list.

## B. Economic, Social and Beneficiaries Analyses

Since this is strictly a research and development project, the standard economic, social and beneficiaries analyses are neither necessary nor possible. However, insofar as the substantive benefits toward which the present project looks are dependent upon its leading to follow-on transformed millet commercialization, certain sub-questions of economic feasibility and social benefit should be considered here:

### 1. Salability of Transformed Millet Products

Clearly the price as well as the acceptability of the new products must be compatible with their use as replacements for wheat and rice. Price is known to have a significant effect on consumption of food staples in Senegal and although price would not be expected to influence the consumption of specialty foods, such as snacks, to the same extent, it is likely that consumption of all the transformed millet products will be lessened as the price is increased or as the price relative to wheat and rice rises. At the same time, due to the unique nature of the products to be created, it is not essential that the price of processed millet foods be less than wheat or rice products in order to be consumed in significant quantities. Bread, at 240 FCFA per kilo, is the obvious example of the truism that price, however important, is only one factor in determining product marketability.

It is estimated that certain of the processed millet products developed through this project could have retail prices substantially less than the present prices of pre-steamed millet couscous (300 CFAP per kilo). Under large scale commercial operations, a shelf stable, pre-steamed couscous might be retail priced as low as CFAP 140/kg (versus about CFAP 78/kg for rice and CFAP 137/kg for wheat flour. The proposed program will carefully explore the palatability of each experimental food and the uniqueness and convenience values as the consumer perceives it, versus the simple value of competitive grains.

Once a reasonable price differential versus rice is achieved (and 62 CFAP/kg is only 11¢ per pound) for a product as distinctive tasting and culturally familiar as millet, in an urban cash economy where even the numerous poor are at least a modest amount above the starvation line, the human urge for variety makes the prospect for salability good. Nobody here, however low on the socio-economic scale, eats only the cheapest broken rice as the sole element of his/her diet. In Dakar, 53% of the calories consumed come from cereals, 72% of these cereal calories currently come from rice, 22% from sorghum, maize and wheat, and only 6% from millet. Vegetables, fruits, meats, hand pounded millet dairy products and the ubiquitous bread grace all tables, even if rarely for the poorest, and a good transformed millet product would make itself a place as well.

## 2. Potential Macro-Economic Benefits

Assuming success all the way down the line for the Project and follow-on activities, the major macro-economic benefit would be that of reducing Senegal's foreign exchange expenditures by reducing imports of rice and wheat. Foreign exchange earnings could also be anticipated if a market for transformed millet products could be established in the Ivory Coast, Upper Volta, the Gambia, or other millet eating countries.

The price of imported rice CIF Dakar has ranged from \$200-500 per MT. Given a continued expected rise in world food prices, a figure of \$400 per MT has been projected for the near future. Since the long range goals of the project envision a displacement of up to 50,000 MT of rice imports, a foreign exchange savings of \$20 million annually could result. This could be achieved by reducing total rice meals from 8.68 to 7.68 per week for Senegal's 4 million projected urban inhabitants in the year 2000.

Although not clearly quantifiable at this time, pre-cooked millet products will also represent a means of saving energy costs related to cooking. Since most urban Senegalese households cook with either bottle gas or charcoal, a saving of both foreign exchange and forest resources would also be an indirect, long-term result.

On the agricultural production side, at the current official farm-gate price for millet of 40 CFAP per kilo, the projected 50,000 ton market for locally produced millet would result in gross farm income of 2 billion CFAP per year.

## 3. GOS Investment Policy

Whatever doubts may have existed in the past about the GOS policy toward foreign private investment in Senegal have now been effectively answered. We quote in full the relevant paragraphs of the cable "Opportunities for U.S. Business in Senegal" Dakar 02123, dated 19 March 1981:

"The Diouf Government has taken a new, aggressive tack on foreign investment, including the revision of the Code of Investments, extension of tax incentives to companies setting up outside the free trade zone, and the removal of bureaucratic roadblocks to foreign investment. U.S. business is a prime target of GOS interest. For example, in recent months U.S. companies have been contacted for agro-business projects in Soybeans, peanuts, rice, sorghum, and Macadamia nuts. Also free trade zone administrator Zouara Sagna will be visiting the States in early April to stimulate interest among U.S. companies in the zone (reftek).

"The GOS has also made several official requests for USG assistance in the area of industrial promotion. In November, the Ministry of Rural Development requested a mission of experts from the U.S. to look into the potential for agro-business projects. In February a request was forwarded to the U.S. Mission expert who could explore opportunities for Joint Ventures between American and Senegalese companies. We have thus far not been able to respond positively to these requests.

"The U.S. clearly has an interest in encouraging Senegal in its recent policy initiatives toward diversification of markets, emphasis on foreign investment and the importance of the Private Sector Development. Given that interest how can we best take advantage of this new GOS orientation? While USAID/Dakar has been quick in redirecting its development strategy to fit these new developments, other avenues must be explored in addition to AID programs. Stimulation of U.S. corporate activity in Africa is one such activity."

Therefore, if the project achieves its immediate aim of laying the groundwork for transformed millet commercialization, there will be no obstacles interposed by GOS policies to a private entrepreneur, domestic, U.S., or other, from making the investments necessary for such commercialization.

An additional indirect incentive to investment cited in an earlier Embassy communication is a tariff structure imposing a 45% droit fiscal majoré (over-value fiscal tax) on imports competing with the products of local manufacturers. Although this would not apply to such basic food commodity imports as wheat and rice, it would give the snack foods developed under this project an important measure of protection from the imported processed foods that would be competing with them.

#### 4. Potential Commercial Viability

Assuming that transformed millet products are found to have the potential significantly to replace rice and wheat, and have sufficient volume to achieve the goals of reduced grain imports and increased domestic millet production, the question remains as to how business enterprises for the manufacture and distribution of transformed millet can be fostered. Since investments in business enterprises are based on return on investment, degree of risk, and related factors, an additional element of the project strategy is to develop a financial analysis, and such other commercial analyses as would be required by entrepreneurs and financial institutions:

If, in the course of development, the new millet-based product's quality, cost and consumer acceptance objectives have been met, the routes for commercialization could include any of the following options:

a) A new private enterprise company with its own manufacturing and sales/marketing operation.

b) A joint venture with an established Senegalese commodity business (possibility in the flour milling and/or biscuit producing line).

c) A joint venture with a strong agricultural cooperative (capable of intensive millet production with good transport logistics to Dakar).

d) A joint venture with an institutional food supplier to hospitals, military bases and other public sector consumers.

e) A "know-how" licensing company to sell on a non-exclusive basis to regional or local producers.

f) While a private investor or even a cooperative would certainly require a rate of return on a par with alternative investment opportunities, the existence of potential macro-economic and social benefits made it possible that a more or less break-even, or even an unprofitable venture, could be picked up by a public or nonprofit agency.

Differences of opinion exist among economists regarding the market potential for urban consumption of millet and millet products in Senegal. Thus, the project has been designed to resolve as many of these questions as possible.

### 5. Potential Social Benefits

In the absence of more knowledge as to the manufacturing process(es) that will turn out to be technically and economically feasible, it is difficult to speculate on the potential social benefits that might flow from the follow-ons to a successful project. At the very least, however, if the product(s) are to reach a large enough market to justify manufacture, they will have to be sold largely through the country's multitude of small retailers. At best, the most feasible process would lead to small-scale local manufacture as well, on the order of neighborhood bakeries.

From a joint social/economic point of view, potential benefits would be to:

a) Strengthen local value added through the development of fabricated millet products for export and stimulate development of other domestic agricultural and food processing areas, including, specifically, wholesale manufacturing bakeries, convenience and snack food, pasta, nutritional supplement, animal feed and industrial byproduct industries. The increased purchasing power would have a multiplier effect in creating demand for other products and services and, therefore new consumer, industrial and services industries.

b) Modify existing and create new Senegalese food and dietary habits compatible with Senegalese ethnic, and cultural traditions. This realization could materialize into the development of profitable international ethnic/gourmet food, artisan and tourist industries. A residual benefit would be the strengthening of national identity and pride.

c) Provide the foundation for the development of a popular priced fast food industry (pizzas, extruded snacks, etc.) merchandised initially at boutique marché stalls, and street vendors. This development would create employment opportunities for unskilled and functionally illiterate workers.

d) Through the development of fortified foods and snacks improve the nutrition/health of the population, especially children and older people.

e) Improve farmer income and therefore, welfare through increased millet production.

f) Provide Senegalese with new skills in management, technology, marketing, finance, sales and other disciplines, and encourage foreign companies to establish joint ventures in Senegal.

## 6. Ultimate Beneficiaries

The principal beneficiary of the activities that could flow from the project is the GOS by reason of import substitution, foreign exchange savings, and achieving a portion of its goal of domestic production of foodstuff. As a result of the project, the stage will also be set for creating a new demand for millet thereby directly benefiting millet farmers through increased income from additional sales. The successful completion of the project will likewise result in benefits to the consumers of processed millet products who will obtain: (a) a series of wholesome food products derived from locally produced ingredients, including at least some nutritionally fortified products; (b) foods which are convenient to prepare and require less fuel for cooking; and, (c) foods which are supplied at reasonable cost and manufactured under sanitary conditions. While the majority of these consumers are expected to be urban, a part will also be from rural areas. If an acceptable weaning food is developed, special beneficiaries of the project will be weaning age children who might not otherwise have access to nutritionally sound food supplements.

In the most immediate sense of project beneficiaries, it is anticipated that a number of senior ITA personnel will acquire valuable experience through the project which will be equivalent to technical training. Likewise, staff members among ITA contractors who undertake market research, plant studies, etc., will also receive the equivalent of training. As a result, the project will lead to improved technical and other capabilities among Senegalese who could subsequently use those capabilities to help implement follow-on activities, such as technical management of the millet transformation plant or overseeing the marketing program.

C. Environmental Analysis

The project IEE containing an approved recommendation for Categorical Exclusion is in the USAID/Senegal Project Development Office files.

D. FINANCIAL ANALYSIS

(In thousand of U.S. \$ )

	FY 1		FY 2		TOTAL	
	FX	LC	FX	LC	FX	LC
<u>DS - ITA</u>						
Salaries		40		46	-	86
Indirect		48		53		101
Total: GOS-ITA		<u>88</u>		<u>99</u>		<u>187</u>
<u>DS - TITLE III</u>						
Local Contracts		70		175		
Raw materials		10		15		
Vehicles (2)		15				
International Travel (3)		20		20		
Resident Advisor (4)		50		50		
Sub-total		<u>165</u>		<u>260</u>		425
Contingency (10%)		16.5		26.0		42.5
Sub-total		<u>181.5</u>		<u>286.0</u>		<u>467.5</u>
Inflation (10% yr) (5)		18.2		57.2		75.4
Total: GOS TITLE III		<u>199.7</u>		<u>343.2</u>		<u>542.9</u>
<u>USAID</u>						
Equipment and Rentals	100		35			
Materials and supplies	5		5			
International Travel (3)	5		5			
Resident Advisor (4)	70		70			
Short-term Advisor (10 m/m)	24		36			
Strient and Purity Testing			20			
Salutation			20			
Sub-total	<u>204</u>		<u>191</u>		395	
Contingency (10%)	20.4		19.1		39.5	
Sub-total	<u>224.4</u>		<u>210.1</u>		<u>434.5</u>	
Inflation (10% yr) (5)	22.4		42.0		64.4	
Total: USAID	<u>246.8</u>		<u>252.1</u>		<u>498.9</u>	
<u>D/W (TITLE XII) (6)</u>						
Short-term Advisors (2m/m)	6		6		12	
International Travel	6		6		12	
Sub-total	<u>12</u>		<u>12</u>		<u>24</u>	
Contingency (10%)	1.2		1.2		2.4	
Sub-total	<u>13.2</u>		<u>13.2</u>		<u>26.4</u>	
Inflation (10% yr) (5)	1.3		2.6		3.9	
Total: AID/W-TITLE XII	<u>14.5</u>		<u>15.8</u>		<u>30.3</u>	
<u>GRAND TOTAL: A-D (7)</u>	261.3	287.7	267.9	442.2	529.2	729.9
		549.0		710.1		1.259.1

presents existing ITA salaries and overhead redirect to this project.  
 Vehicles may be purchased by USAID project funds if required because of time constraints  
 assumes 80% of travel paid in CFA (U.S. travel and part of international travel paid  
 U.S. \$ (20%)  
 assumes part of expenses payable in CFA (e.g. housing, etc) and part in U.S. \$.  
 cost estimation in January 81 dollars and inflation factor in FY 1 is 10% (for 82)  
 and FY 2 is 20% (for 83).  
 diversity support has been offered and funds are carried in AID/DS/AGR.  
 includes contingency and inflation factors.

RECAPITULATION

PAGE	FY 1	FY 2	FX	TOTAL LC	GRAND TOTAL
1	67,800	93,000	110,200	50,600	160,800
2	84,700	280,800		365,500	365,500
3	396,560	333,300	366,310	363,550	729,860
TOTAL			476,510	782,650	1,259,160

MILLET TRANSFORMATION  
BUDGET RECAPITULATION  
BY SPECIALIZED STUDY

DESCRIPTION	FY 1		FY 2		T O T A L		
	FX	LC	FX	LC	FX	LC	Gd Total
1 FH/A	14,550	48,400	-	-	14,550	48,400	62,950
2 FPD	141,600	60,500	52,800	178,200	194,400	238,700	433,100
3 MS	14,500	12,100	-	-	14,500	12,100	26,600
4 Market	-	-	15,800	33,000	15,800	33,000	48,800
5 Financial	-	-	35,000	79,200	35,000	79,200	114,200
6 Plnt Loc	-	-	15,800	13,200	15,800	13,200	29,000
<b>Sub Total</b>	<b>170,650</b>	<b>121,000</b>	<b>119,400</b>	<b>303,600</b>	<b>290,050</b>	<b>424,600</b>	<b>714,650</b>
7 Vehicle	-	18,150	-	-	-	18,150	18,150
8 Res Advisor	84,700	60,500	92,400	66,000	177,100	126,500	303,600
9 ITA	-	88,000	-	99,000	-	187,000	187,000
10 ITA Travel	6,060	-	3,300	-	9,360	-	9,360
11 Evaluation	-	-	-	26,400	-	26,400	26,400
<b>Sub Total</b>	<b>90,760</b>	<b>166,650</b>	<b>95,700</b>	<b>191,400</b>	<b>186,460</b>	<b>358,050</b>	<b>544,510</b>
<b>Grand Total</b>	<b>261,410</b>	<b>287,650</b>	<b>215,100</b>	<b>495,000</b>	<b>476,510</b>	<b>782,650</b>	<b>1,259,160</b>

**MILLET TRANSFORMATION**

**BUDGET DETAIL - LOCAL CONTRACTS**

Ref: PID Page 23

SERIAL	DESCRIPTION	FY1	FY2	FY 1				FY 2				TOTAL	Gd. TOTAL	
				BASE	CONT	INFL	TOTAL	BASE	CONT	INFL	TOTAL	FX	LC	
1	Food Habits & Attitudes Contract	X		30,000	3,000	3,300	36,300					36,300	36,300	
2	Food Product Development Contracts	X	X X	30,000 <sup>(1)</sup>	3,000	3,300	36,300	20,000 <sup>(2)</sup> 100,000 <sup>(3)</sup>	2,000	4,400	26,400	32,000	36,300 26,400 132,000	36,300 26,400 132,000
3	Millet Supply Contract	X		10,000	1,000	1,100	12,100					12,100	12,100	
4	Marketing Contract		X					15,000	1,500	3,300	19,800	19,800	19,800	
5	Financial Analysis Contract		X					50,000	5,000	11,000	66,000	66,000	66,000	
6	Plant Location		X					10,000	1,000	2,200	13,200	13,200	13,200	
7	Sub Total		X	70,000	7,000	7,700	84,700	195,000	19,500	42,900	257,400	342,100	342,100	
8	Evaluation		X	-	-	-	-	20,000	2,000	4,400	26,400	26,400	26,400	
	<b>TOTAL</b>			<b>70,000</b>	<b>7,000</b>	<b>7,700</b>	<b>84,700</b>	<b>215,000</b>	<b>21,500</b>	<b>47,300</b>	<b>283,800</b>	<b>368,500</b>	<b>368,500</b>	

- (1) Consumer Test
- (2) Nutrient/Purity Test
- (3) Market Test

**MILLET TRANSFORMATION**

**BUDGET DETAIL - SHORT TERM ADVISORS**

Ref : PID Page 23

SERIAL	DESCRIPTION	MAN MONTH		FY1			FY2			TOTAL		Gd To		
		FY1	FY2	BASE	CONT	INFL	TOTAL	BASE	CONT	INFL	TOTAL		FX	LC
1	Food Habits & Attitudes Specialist	2		12.00	1.20	1.35	14.55					14.55		
				10.00 <sup>TR</sup>	1.00	1.10	12.10							
				<u>22.00</u>	<u>2.20</u>	<u>2.45</u>	<u>26.65</u>						12.10	26.
2	Food Product Development Specialist	2		12.00	1.20	1.35	14.55					14.55		
				10.00 <sup>TR</sup>	1.00	1.10	12.10							
				<u>22.00</u>	<u>2.20</u>	<u>2.45</u>	<u>26.65</u>						12.10	26.
3	Millet Supply Specialist	1		6.00	.60	.70	7.30					7.30		
				6.00 <sup>TR</sup>	.60	.60	7.20							
				<u>12.00</u>	<u>1.20</u>	<u>1.30</u>	<u>14.50</u>							14.
4	Marketing Specialist	2					12.00	1.20	2.60	15.80	15.80	13.20		
							10.00	1.00	2.20	13.20				29.
5	Financial Analysis Specialist	4					24.00	2.40	5.30	31.70	31.70	13.20		
							10.00	1.00	2.20	13.20				
							<u>2.50</u>	<u>.25</u>	<u>.55</u>	<u>3.30</u>	<u>3.30</u>			48.
6	Plant Location Specialist	1					6.00	.60	1.30	7.90	15.80		15.	
							6.00	.60	1.30	7.90				
<b>TOTAL</b>		<b>5</b>	<b>7</b>	<b>56.00</b>	<b>5.60</b>	<b>6.20</b>	<b>67.80</b>	<b>70.50</b>	<b>7.05</b>	<b>15.45</b>	<b>93.00</b>	<b>110.20</b>	<b>50.60</b>	<b>160.</b>

TR: TRAVEL

**MILLET TRANSFORMATION**

**BUDGET DETAIL - OTHER EXPENSES**

Ref : PID Page 23

DESCRIPTION	FY 1				FY 2				TOTAL		Gd TOTAL
	BASE	CONT	INFL	TOTAL	BASE	CONT	INFL	TOTAL	FX	LC	
Raw Materials	10.00	1.00	1.10	12.10	15.00	1.50	3.30	19.80		31.90	31.90
Vehicles	15.00	1.50	1.65	18.15						18.15	18.15
Resident Advisor	50.00	5.00	5.50	60.50	50.00	5.00	11.00	66.00		126.50	126.50
ITA Technologist Travel	5.00	.50	.56	6.06	2.50	.25	.55	3.30	9.36		9.36
Sub Total	80.00	8.00	8.81	96.81	67.50	6.75	14.85	89.10	9.36	176.55	185.91
Equipment & Rentals	100.00	10.00	11.00	121.00	35.00	3.50	7.70	46.20	167.20		167.20
Material & Supplies	5.00	.50	.55	6.05	5.00	0.50	1.10	6.60	12.65		12.65
Resident Advisor	70.00	7.00	7.70	84.70	70.00	7.00	15.40	92.40	177.10		177.10
Sub Total	175.00	17.50	19.25	211.75	110.00	11.00	24.20	145.20	356.95		356.95
ITA Sub Total	88.00	-	-	88.00	99.00	-	-	99.00		187.00	187.00
<b>TOTAL</b>	<b>343.00</b>	<b>25.50</b>	<b>28.06</b>	<b>396.56</b>	<b>276.50</b>	<b>17.75</b>	<b>39.05</b>	<b>333.30</b>	<b>366.31</b>	<b>363.55</b>	<b>729.86</b>

GOS

USAID

ITA

## V. IMPLEMENTATION PLAN

### A. Schedule of project activities

#### 1. Preliminary

- a) Preparation and approval of the Project Agreement with the GOS;
- b) Identification and contracting with a US-based contractor to provide the Resident Advisor, short-term advisors, experimental machinery and products, and other foreign inputs to the project;
- c) Organization of a Project Advisory Committee made up of representatives of appropriate USAID, GOS, and outside agencies to oversee and help guide the project--on an advisory, non-control basis--and to provide an interface with industrial, agricultural, regional and other groups interested in the project.

Fig. V-1, the Pre-project Milestone Schedule shows the planned dates for these preliminary project activities.

#### 2. Implementation

The project will consist of six interrelated studies/action programs, to be carried out by the contractors and subs under overall ITA supervision and Project Advisory Committee oversight to produce a seventh comprehensive study: FEASIBILITY OF MANUFACTURING AND MARKETING TRANSFORMED MILLET PRODUCTS IN SENEGAL. The six studies/action programs will include: (1) Food Habits and Attitudes; (2) Product Development and Evaluation; (3) Millet Supply; (4) Marketing; (5) Financial Analysis and (6) Plant Location. A summary description of each study/action program is provided in Section IV. A.1., above, and draft Terms of Reference for the various specialists in Annex F. The project implementation will begin with the arrival of the Resident Advisor o/a January 1, 1982 and continue until September 30, 1984. A time chart reflecting the anticipated scheduling and interrelationship among the six studies is given in Fig. V-2. Great emphasis will be placed at all times on the "Feedback loop" nature of the interrelationship, since it is clearly recognized that the ultimate arbiter of project success is the product consumer.

Quarterly progress reports, ad hoc reports, and final reports for each of the six studies, and the final FEASIBILITY STUDY will be prepared and presented to the Project Advisory Committee by ITA. The Project Advisory Committee will arrange for any special reports and other presentations required by USAID and the GOS in conjunction with periodic evaluation of the project. The USDA has agreed to make backstopping visits to the project as necessary.

As an outcome of the aforementioned studies/action programs, it is anticipated that several millet-based consumer food products will be developed, market tested, and evaluated, and that certain of these products will be found to have sufficient socio-cultural acceptability within a realistic pricing structure to indicate potential commercial viability as partial replacements for and/or supplements to imported wheat or rice products. It is also anticipated that as a result of the activities of the Project Advisory Committee during project implementation, coupled with the indication of business potential, one or more entrepreneurs will wish to engage in pilot or full-scale

millet/transformation and marketing activities as a follow-up on the project thereby utilizing the FEASIBILITY STUDY as an input to the establishment of new or expanded business enterprises. To this end, the FEASIBILITY STUDY will be particularly designed to meet to the greatest degree possible the realistic expectations of a practical potential investor in millet transformation and marketing.

**B. Project Responsibilities:**

During the preliminary activities, USAID and ITA will share responsibility for preparing for implementation of the project. USAID will prepare the GRANT AGREEMENT and, with the cooperation of ITA, will obtain the required approvals of SERST, the Minister of the Plan, and the Ministry of Finance.

Upon execution of the Project Agreement, USAID and ITA will each appoint a project manager whose individual responsibilities will be to manage all subsequent preliminary and project implementation activities on behalf of their respective institutions. The managers will jointly arrange for the preparation of a Request For Proposal (RFP) for potential contractors to provide the various advisors, machines, products, and other US inputs during project implementation. They will arrange for review of bids, selection of the contractor and negotiation with the contractor as to final terms of the Contract. They will also arrange for the preparation of a charter for the Project Advisory Committee identifying the specific functions, memberships and chairmanship of the Committee, including any ex-officio memberships. ITA and USAID will consider representatives of the following organizations for membership on the Project Advisory Committee:

- Directeur: ITA (Institut de Technologie Alimentaire)
- Directeur: USAID (U.S. Agency for International Development)
- Directeur: SONEPI (Economic Studies)
- Directeur: Caisse de Perequation et de Stabilisation des Prix (CPSP)
- Directeur: SONAR (Societe Nationale pour l'Approvisionnement du Monde Rural)
- Directeur: DGPA (Direction Generale de la Production Agricole, Ministry of Rural Development)
- Directeur: SENTENAC
- Directeur: Grands Moulins de Dakar
- Directeur: des Affaires Economiques
- Directeur: du Commerce Interieur
- Directeur: du Controle Economique
- Directeur: Direction de l'Industrie
- Directeur: CILSS
- Directeur: SOFISEDIT (industrial)
- Representant de la Presidence de la Republique
- REDSO
- ECFAO

It is anticipated that ITA will provide a secretariat for the Committee.

During project implementation, ITA and the U.S. contractor, through its Resident Advisor, will share responsibilities for implementing project activities on a day-to-day basis, for preparing periodic and ad hoc project reports, and for keeping other GOS agencies, AID and other legitimately interested parties apprised of progress on the project. Formal responsibility for dissemination of reports and other information will be exercised by ITA.

The Project Advisory Committee will receive and review reports emanating from the project and include its evaluation of such reports, preferably before they are transmitted to AID or ITA. The committee will also be responsible for reviewing overall progress on the project and suggesting to ITA, the US contractor, and USAID ideas and approaches regarding major decisions to be made on the project, such as selection of products to undergo market testing or how consumer reactions can best be factored into the development process. The Project Advisory Committee will have regular meetings at least once each quarter and such other ad hoc meetings as required.

ITA will be responsible for developing and administering contracts for local services (such as the Food Habits and Attitudes Study) and for all other local procurement, subject to USAID approval for authorizations and expenditures. ITA will also be responsible for providing space and support services for all project personnel, including U.S. contractor personnel. This will include office and laboratory space, utilities, and laboratory services for product development activities undertaken within Senegal. ITA will obtain necessary licenses or other legal requirements needed to undertake the project.

The U.S. Contractor will be responsible for (a) recruitment of short-term technical advisors, (b) procurement of imported materials, supplies, equipment, and products, and (c) providing the services of short-term advisors including logistical support of the advisors and (d) sharing with ITA responsibility for managing the day-to-day operation of the project through the Resident Advisor all subject to USAID and ITA approval. USAID and ITA will be responsible for approval of all contractors, including individual U.S. advisors, U.S. subcontractors, and Senegalese contractors and for authorization of all expenditures of contracts funds following procedures already established by the respective governments.

### C. Procurement

Procurement initiated by the contractor or other U.S. personnel for goods, services and vehicles from funds provided by USAID will follow U.S. Government procurement regulations. Suitable advances will be made to the contractor from funds provided by USAID to assure that payments can be made promptly. Procurement initiated by ITA for goods, services, and vehicles using Senegalese funds will follow GOS procurement regulations. Payment for Senegalese goods and services will be made by ITA; suitable advances will be made to ITA by the

Ministry of Finance out of PL 480 Title III to cover all contracts and other purchases (other than payments for ITA personnel and facilities) to assure that payments can be made promptly.

It is anticipated that certain items of laboratory apparatus, food processing equipment, vehicles, materials, and supplies will be purchased under the project. It is also anticipated that certain items of equipment and associated services will be leased or made available temporarily under contract for use either in the U.S. or Senegal in connection with manufacture or testing of transformed millet products.

The selection of one approach rather than another (i.e., purchase versus lease/contract arrangement) will be determined on the basis of incurring least cost to the project within the constraint of time available to accomplish the required tasks. This determination will be made during the first six months of project implementation by the USAID and ITA project managers on the advice of the Resident Advisor.

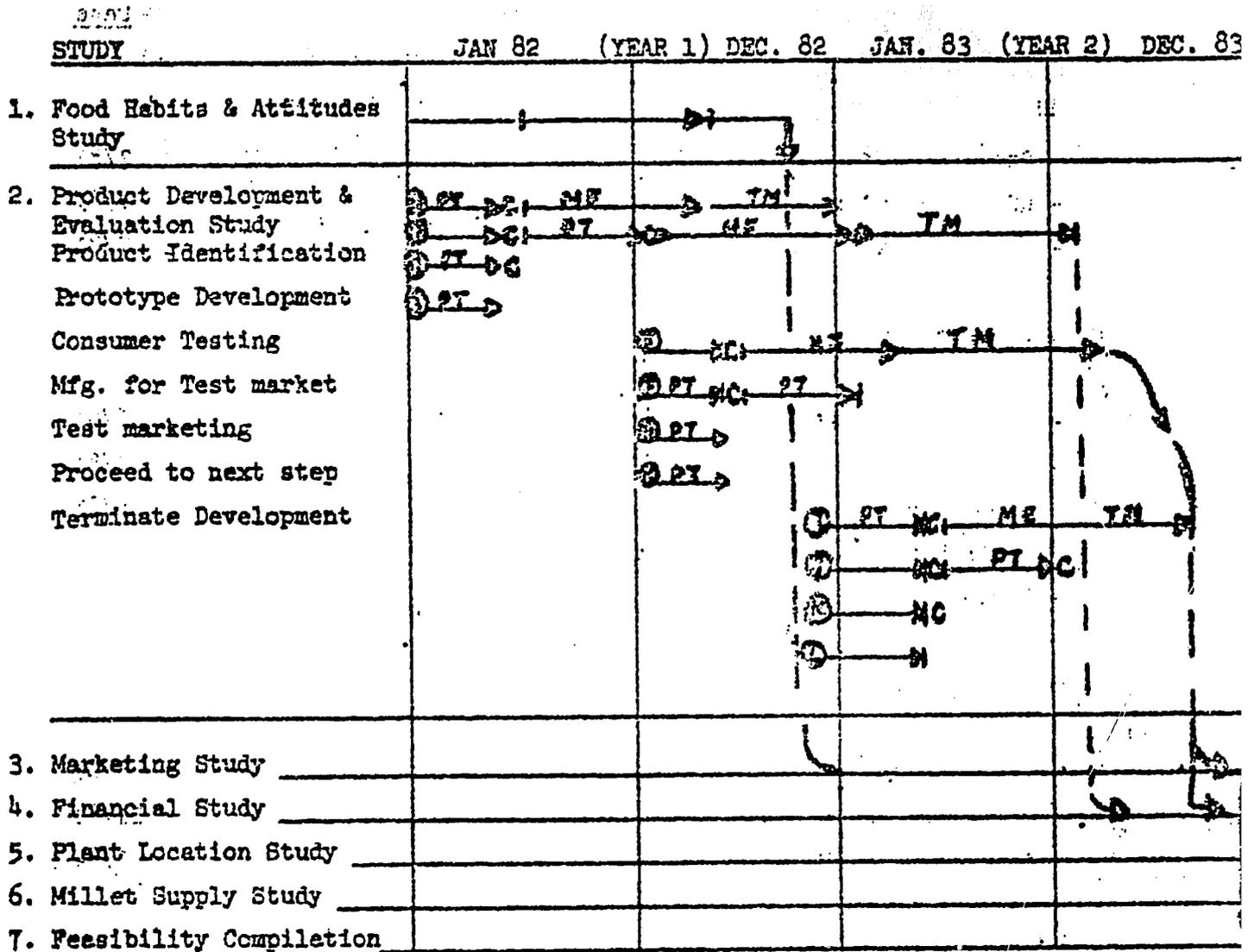
FIG. V - 1

PRE-PROJECT MILESTONE SCHEDULE

<u>Subject: Milestone</u>	<u>Responsibilities</u>		<u>Date</u>
	<u>USAID</u>	<u>ITA</u>	
<u>PROAG</u>			
- Document Complete	X	X	7/81
- USAID Approval	X		7/81
- GOS Approval		X	7/81
<u>U.S. Contract for Services</u>			
- RFP Prepared	X	X	6/81
- BCD Publication	X		7/81
- Proposals Rec'd	X		8/81
- Contractor selected & Approval	X	X	9/81
- Resident Advisor in Senegal	X		1/82
<u>Project Advisory Committee</u>			
- Charter Approved	X	X	8/81
- Membership Selected		X	11/81
- First General Meeting		X	1/82

FIG. V - 2.

PROJECT IMPLEMENTATION TIME SCHEDULE



Note: The number and duration of product development activities in this Figure is illustrative and is not necessary binding as to the number and duration of studies which will actually take place; this may be increased or decreased depending upon the consumer acceptance or lack thereof of early product prototypes.

KEY TO SYMBOLS USED IN THE ABOVE ACTIVITY CHART ARE:

- PT = Prototype Development
- C = Consumer Testing
- MF = Manufacturing
- TM = Test Marketing
- (X) = Product Identification
- = Proceed To Next Step
- ⚡ = Terminate Development

## VI. PROJECT EVALUATION PLAN

There will be two evaluations of this project:

1. An interim evaluation at the end of the first 15 months of project implementation; and
2. A final evaluation upon project completion.

The interim evaluation will be a joint ITA/USAID/USDA examination focussing upon a determination of: (a) the timely furnishing and acceptable quality of project inputs (commodities, services, technical assistance, training, study teams, etc); and (b) the effective functioning of the ongoing activities of the project (processing experiments, market testing, complementary studies, etc..).

While recognizing that it would be premature to seek to make definitive judgements of project accomplishments at that time, the interim evaluation will nevertheless include recommendations for any mid-course corrections in project activities that might appear necessary or desirable.

---

---

The final evaluation will add a private sector consultant to the ITA/USAID/USDA team and will seek to determine the ultimate success of the project in making a clear and convincing demonstration of the feasibility (or absence thereof) of a follow-on commercial-scale pilot project for production and marketing of one or more transformed millet products. This evaluation will cover both the quality and conclusions of the individual studies and, more important, the total effect of all the studies, taken as a whole, in covering the range of questions necessary for determining the feasibility of undertaking follow-on activities.

A secondary aspect of the final evaluation will be the determination of the degree to which the project was designed and implemented in the most effective and efficient manner reasonably possible or whether major improvements could have been made in either design or implementation. Key questions here will be: the survivability of the assumptions upon which the project was based; the focus of diffusion of project endeavors; the timing and funding of the project; the quality of personnel selected and their intensity of effort; and the degree to which the findings of the interim evaluation affected subsequent project activities.

VII. CONDITIONS, COVENANTS AND NEGOTIATING STATUS

a) Prior to any disbursement or the issuance of any commitment documents under the Project Agreement, the GOS will appoint a project director who shall be responsible for project implementation.

b) The GOS will covenant that (1) a Project Advisory Committee will be established; (2) a financial management plan and procedures for the use of Title III funds to support the local costs of the technical assistance contracts will be developed to USAID satisfaction.

c) The Project has been developed in a fully collaborative manner with the GOS and they are ready to enter into the Project Agreement promptly.

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Life of Project :  
From FY \_\_\_\_\_ to FY \_\_\_\_\_  
Total US Funding 0,5 million  
Date Prepared \_\_\_\_\_

Project Title & Number MILLET TRANSFORMATION PROJECT - 665-0250

PAGE 1

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal : The broader objective to which this project contributes :</p> <p>Demonstrate that Senegal's balance of payments and food grain production can be potentially improved through substitution of nutritious, acceptable, reasonably priced millet-based foods for some imported rice and wheat foods.</p>	<p>Measures of Goal Achievement</p> <p>Commitment by qualified investor(s) subject to final feasibility evaluation and GOS permission, to undertake pilot operation of factory (ies) and sale of millet-based foods to be consumed at least partially as replacements for imported rice and wheat.</p>	<p>1. Privately financed final feasibility analyses.</p> <p>2. Application to GOS for investment authorization.</p>	<p>Assumptions for Achieving goal targets :</p> <p>An entrepreneur or public enterprise will take up the plan developed through the project and successfully implement it</p>

Life of Project :  
 From FY \_\_\_\_\_ to FY \_\_\_\_\_  
 Total US Funding 0,5 million  
 Date Prepared \_\_\_\_\_

Project Title & Number : MILLET TRANSFORMATION PROJECT - 435-0250

PAGE 2

INDICATIVE PURPOSE	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Project Purpose :</p> <p>To establish the cultural acceptability, technical feasibility and economic viability of producing and selling transformed millet foods so as to enable development of a manufacturing/marketing/financial plan to help the Senegalese attract investment capital and induce the production and distribution of transformed millet foods.</p>	<p>Conditions that will indicate purpose has been achieved : End of project status :</p> <p>Issuance of an integrated package of feasibility studies to acceptable commercial standards demonstrating on the basis of included action programs that millet-based processed foods are technically sound, can be manufactured and sold profitably, and can significantly replace rice and wheat in the diets of the Senegalese.</p>	<p>Review of the studies by a project evaluation team.</p>	<p>Assumptions for achieving purpose :</p> <p>The potential market for transformed millet products is of substantial size and can be penetrated to an important degree; (e.g. in the volume equivalent of 10% or more of the imports of wheat and rice or up to 50,000 metric tons per year during a period of 10 - 20 years)</p>

## PROJECT DESIGN SUMMARY

## LOGICAL FRAMEWORK

Life of Project :

From FY \_\_\_\_\_ to FY \_\_\_\_\_

Total US Funding 0.5 million

Date Prepared \_\_\_\_\_

Project Title & Number MILLET TRANSFORMATION PROJECT 685-0250

PAGE 3

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Outputs :</p> <ol style="list-style-type: none"> <li>1. Food habits and attitudes leading to the studies themselves.</li> <li>2. Action program to determine potential characteristics of one or more transformed millet products and their manufacturing procedures, and validation of marketability; from which will flow.</li> <li>3. Strategies for marketing and distribution of the products;</li> <li>4. Millet supply feasibility study including procurement strategy;</li> <li>5. Plant location study;</li> <li>6. Financial analysis.</li> </ol>	<p>Magnitude of Outputs</p> <ol style="list-style-type: none"> <li>1. Study/action program on each of the six cited subjects.</li> </ol>	<p>Reviewing the studies.</p>	<p>Assumptions for achieving Outputs :</p> <p>Study methodologies are adequate to produce reasonably significant results in admittedly difficult and uncertain areas.</p>

## PROJECT DESIGN SUMMARY

## LOGICAL FRAMEWORK

Project Title & Number MILLET TRANSFORMATION PROJECT - 685-0250Life of Project ;  
From FY \_\_\_\_\_ to FY \_\_\_\_\_  
Total US Funding 0.5 million  
Date Prepared : \_\_\_\_\_

PAGE 4

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<b>Inputs :</b>	Implementation Target (Type and Quantity) :		Assumptions providing inputs
1. USAID - Technical Assistance Funding	\$498,000 grant for consultant contractor expenses and equipment for ITA, international travel and materials.	Grant document and funding disbursement	1. Availability of AID and GOS fun
2. AID - Title XII millet/sorghum project advisors and services	\$ 30,300 for 2 man/months advisors and associated expenses	TDY records	2. Availability to attract and hol satisfactory personnel
3. GOS - PL. 480 Title III Local costs for procurement of materials and supplies and for study contracts.	\$. 542,900 local currency expenses	PL. 480 Title III disbursement records.	
4. GOS - Product development facilities and personnel and ITA contracting services; ITA overhead expenses.	Scientific and Technical personnel and 24 months use of ITA laboratory facilities: \$ 187,000 direct and indirect costs.	ITA accounting records contracts for studies.	

ANNEX. B.

B - 1

2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects with FAA funds and project criteria applicable to individual fund sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Fund.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE?  
HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PRODUCT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 79 App. Act Unnumbered; FAA Sec. 653 (b); Sec. 654A. (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) Is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that figure)?
  - a) The project was included in the Congressional Presentation for FY 1982 as an AI
  - b) An Advice of Program Change has been submitted to show the change to bilateral fund
  
2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?
 

Necessary plans and cost estimates have been established.
  
3. FAA Sec. 611(a)(2). If further legislative action is required within recipient-country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?
 

N/A
  
4. FAA Sec. 611(b); FY 79 App. Act Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1977?
 

NA
  
5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?
 

No
  
6. FAA Sec. 209: Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.
 

No

Page No. 5C(2)-2	Effective Date June 7, 1979	Trans. Memo No. 3:12	AID HANDBOOK 3, App 5C(2)
---------------------	--------------------------------	-------------------------	---------------------------

B - 2

216

A.

7. FAA Sec. 501(j). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

a) NA

b) - e) This food processing project will assist the stated institutions across the board.

f) NA

8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

US enterprises will be used to the maximum extent possible for providing project goods and services.

9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.

Senegal is financing 15% of the total cost of the project. Local currency operating support for this project are also partially funded by a P.L 480 Title III Project.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

The U.S. does not own excess foreign currency in Senegal.

11. FAA Sec. 601(a). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Yes.

12. FY 79 App. Act Sec. 608. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar, or competing commodity?

The project will try to increase agricultural production through improved marketing so as to help reduce Senegal food deficit. A Food surplus would not be produced by this mean.

**B. FUNDING CRITERIA FOR PROJECT**

**1. Development Assistance Project Criteria**

a. FAA Sec. 102(b); 111; 113; 201a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained

a) Project supported research will address improvements in the marketing and profitability of millet production. This research will help relieve social economic, technical and institutional constraints to development and help to insure wide participation of the poor in the benefits of increase of agricultural production.

8.1.a.

basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

b) The project will address the marketing constraints to improving farmer productivity and profitability and recommend development of institutions as required.  
 c) The project supports initiatives of the COS taken by ITA.

6. FAA Sec. 103, 103A, 104, 105, 106, 107.  
 Is assistance being made available: (include only applicable paragraph which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.)

d) Women will be important project participants and beneficiaries; they now have to pound millet several hours a day or spend scarce money for imported foods.  
 e) The project will encourage greater regional cooperation through research information exchange on the common sahelian cereal, millet.

(1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;

NA

(2) [104] for population planning under sec. 104(b) or health under sec. 104(c); if so, extent to which activity emphasizes low-cost, integrated delivery systems for health, nutrition and family planning for the poorest people, with particular attention to the needs of mothers and young children, using paramedical and auxiliary medical personnel, clinics and health posts, commercial distribution systems and other modes of community research.

NA

(3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;

NA

(4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

NA

(i) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development organizations;

(ii) to help alleviate energy problems;

(iii) research into, and evaluation of, economic development processes and techniques;

(iv) reconstruction after natural or manmade disaster;

PAGE NO. SC(2)-4	EFFECTIVE DATE June 7, 1979	TRANS. MEMO NO. 3:32	AID HANDBOOK 3, App 5C(2)
---------------------	--------------------------------	-------------------------	---------------------------

218

B - 4

8.1.b.(4).

(v) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(vi) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

c. [107] Is appropriate effort placed on use of appropriate technology?

Yes

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

This requirement does not apply to the Sahel Development Appropriation. However, GOS is financing 15% of the total cost of the program.

e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to the Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?

This requirement does not apply to the Sahel Development Appropriation.

f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental and political processes essential to self-government.

The project involves the Senegalese people directly in the market research and uses their perceptions of needs and constraints to guide research; if they don't approve the products the project will have to find products that are acceptable.

g. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase or productive capacities and self-sustaining economic growth?

Yes, through the development of new appropriate agricultural processing technologies.

2. Development Assistance Project Criteria (Loans Only)

a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, including reasonableness of repayment prospects.

NA

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

NA

AID HANDBOOK 3. App '5C(2)	TRANS. URB. VI. 1:32	EFFECTIVE DATE June 7, 1979	PAGE NO. 5C(2)-5
----------------------------	-------------------------	--------------------------------	---------------------

B - 5

219

B.

3. Project Criteria Solely for Economic Support Fund

a. FAA Sec. 531(a). Will this assistance support promote economic or political stability? To the extent possible, does it reflect the policy directions of section 102?

NA

b. FAA Sec. 533. Will assistance under this chapter be used for military, or paramilitary activities?

NA

MISSION DIRECTOR'S 611 (e) CERTIFICATION

I. Project Data:

A. Country : Senegal  
B. Project : Millet Transformation (685-0250)  
C. Funding : \$ 0.5 million  
D. Life of Project : 3 years

II. Justification:

This project will carry out a Research and Development activity seeking to demonstrate the technical, economic and commercial feasibility of transforming locally produced millet into a series of nutritious foods that will partly replace wheat and rice in urban diets, thus potentially benefiting both balance of payments and farm incomes. The GOS has expressed strong support for this project during the collaborative project design effort.

III. Certification:

As the principal officer of the Agency for International Development in Senegal, I affirm that, in my judgement, Senegal has both the financial capability and the human resources to effectively maintain and utilize the goods and services being provided by the Millet Transformation Project (685-0250).

*David Shear* 7/31/81

David Shear,  
Director  
USAID/Senegal

TECHNICAL ASPECTS OF PRODUCT DEVELOPMENT

A major goal for product development is to identify and develop products and processes based on millet or millet cereal blends which will be acceptable substitutes for imported rice and wheat flour used in the daily food preparation of the urban population. In addition to the identification of such foods and their most economical process, a search for new staple foods which will blend with the customs and taste of the urbanites will be carried out. A product profile of such foods should include, in addition to their organoleptic acceptance (pleasant taste, aroma and color), reasonable shelflife stability, easy and fairly rapid preparation of end usage, lowest price possible and sufficient recipe and preparation information to provide diversity and economy in end usages.

Discussions among the USDA, USAID/Dakar, technologists from Senegal and millet experts have provided initial concepts for the identification of products which could be considered as substitutes for rice or foods made from wheat flour. They are:

- i. Instant millet couscous, acceptable to both urban and rural consumers;
- ii. Millet snacks:
  - a. oil sprayed and coated with flavors;
  - b. used as breakfast cereals;
- iii. Weaning foods;
- iv. Pasta Products;
- v. Traditional products Karow and Lah.

For all these products the major raw material is Senegalese millet. It is identified as Pearl Millet or, by its botanical name, *Pennisetum americanum* or *Pennisetum typhoides*.

Groundnut flour and oil - Groundnut flour and groundnut oil are other commodities which can be considered for introduction into selected foods, such as weaning foods, to improve their nutritional quality.

Rice and wheat - The imported commodities, rice and wheat flour, can be incorporated in small proportions into couscous to resemble in appearance and taste products which are consumed by the urban population.

Certain ingredients which have functional characteristics required for certain products, will also be incorporated into the formulation, such as oils, cheese flavors, spices, sugar, salt, required to flavor snacks.

(1) Instant Millet Couscous1. Introduction

Couscous has been selected because it is a commonly used main dish, produced from hand pounded millet in rural areas and wheat semolina in the cities. Wheat couscous is liked by all segments of the population, particularly the urban one which imports instant wheat couscous from the Northern part of Africa and Europe. Millet couscous is liked by the rural population of Senegal and urbanites have indicated agreement save for tediousness of preparation. It has been suggested to develop an instant millet couscous which will be easier to prepare from preprocessed ingredients than from ingredients available on the market at the present time.

## 2. Extrusion Experiments

Experiments have been performed at Northern Regional Research Center to precook a millet flour by means of extrusion and to agglomerate the precooked flour into particle sizes desirable for couscous preparation. Results which were written up in detail indicated that the end product of those particular experiments was not acceptable. The reason was that the agglomerates, when rehydrated prior to steaming, fall apart and did not exhibit the desirable texture of millet couscous. Additional development will be carried out to determine the most appropriate technology required for the manufacture and preparation of instant couscous.

Although major emphasis will be placed on the utilization of millet flour or millet grain as the only cereal components, limited tests will be made with millet/cereal blends such as millet/rice and millet/wheat flour. Addition of rice or wheat may provide desirable functional and textural properties.

Almost all instant cereal products on the world market are produced by processes which precook cereals and then redry them. It is this type of process which will be studied for millet. The following processes are identified as possibilities for making instant couscous:

- Extrusion cooking of cereals or blends
- Use of Bulgur process to parboil cereals or blends
- Forming of cereal analogues by cold extrusion (pasta process) followed by cooking.

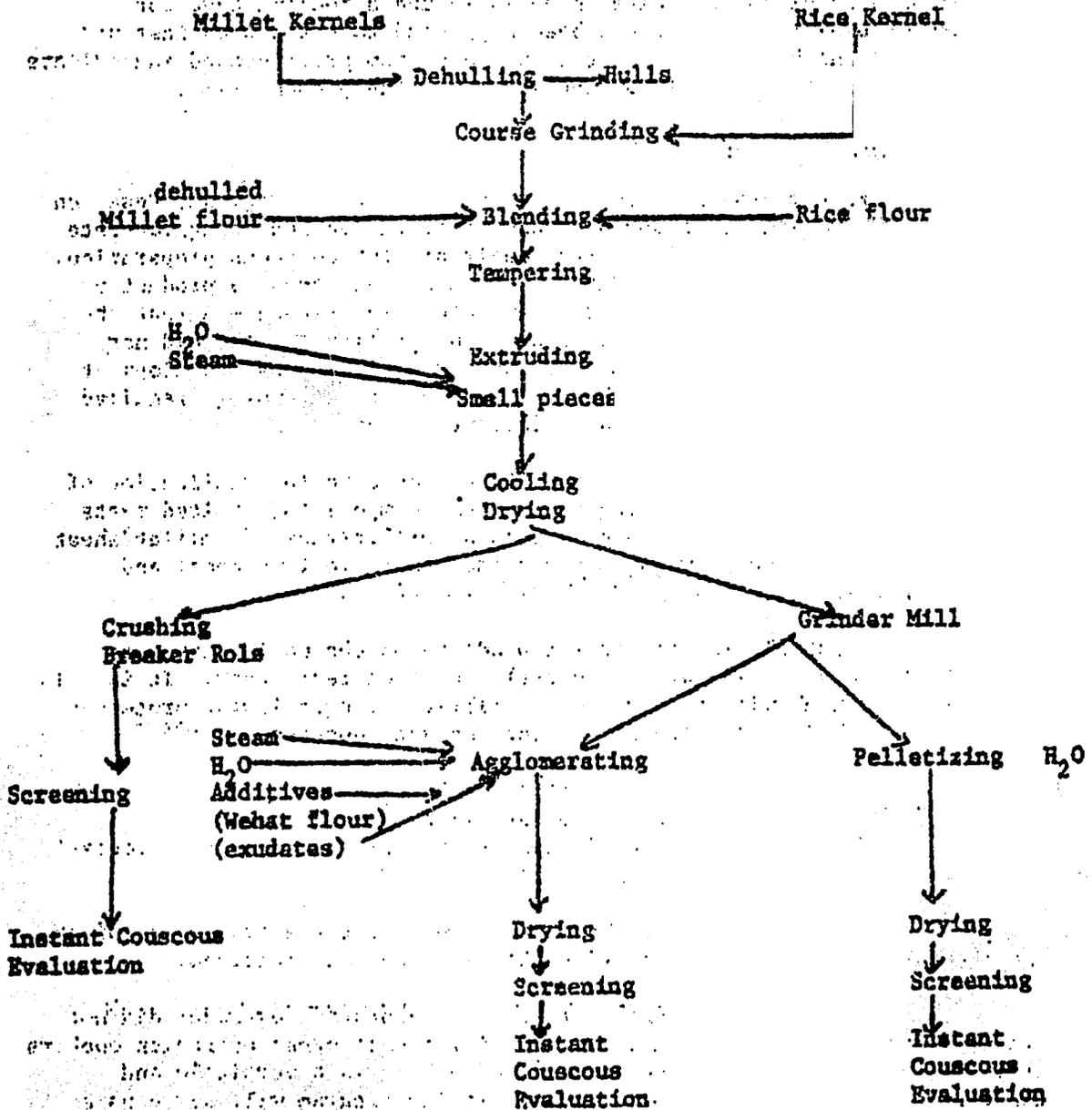
However, it is planned to continue first the evaluation of the extrusion process before investigating the two other alternatives.

Although experiments with the X5 laboratory extruder did not yield a satisfactory end product, the capabilities of other extrusion cookers will be studied extensively since extrusion cooking is a versatile and relatively inexpensive technology. The following diagram will serve as a guide for the proposed development activities.

Suggested Instant Couscous Process

I. Extrusion

Purpose: Partial Precooking of grain for dry instant couscous



The extruder which will next be evaluated is the Bonnot. In the previous activities, the extrudate coming from the X5 extruder always yielded a completely precooked product, regardless of the conditions to which the raw millet flour was exposed during extrusion. It was felt that the limited capabilities of this particular equipment would not yield the range of precooking experiments required for an instant couscous. It was reasoned that a flour which was precooked only partially should yield a more acceptable instant couscous than one prepared from a completely pre-cooked material. Since the extruder manufactured by Bonnot requires smaller quantities of raw materials for limited testing than alternative extruders, it was selected for this next test. Later, if necessary other extruders will be evaluated as well.

Dr. Carl Roseney, Kansas State University, has purchased 1000 pounds of pearl millet produced in the U.S. This material will be used for most of the development activities described in this document. A 50 lb. sample of pearl millet was imported from Senegal and 5 lbs. of this sample were sent to Dr. Roseney for identification and comparison with the U.S. produced millet. Although the results of the analysis are not yet available, it is expected that the U.S. produced cereal will be shown to have similar properties to the imported pearl millet and can therefore be utilized in all the experiments planned in the future. If not, Senegalese millet will be used.

Rice, rice flour, wheat, and wheat flour, will be procured in the U.S. for the tests.

If other additives are identified as essential ingredients in the production of millet couscous, they should be provided as soon as possible. Salt, sugar or other standard materials will be procured locally. Additives recognized to have functional characteristics, such as emulsifiers and stabilizers, will only be tested if their incorporation is needed to alter significantly the physical or chemical properties of couscous.

A request has been made to USAID/Dakar to obtain baobab tree exudate since technical information on this product is lacking, detailed background information on its properties, processing, utilization, etc. have also been requested.

Flavors or colors will be procured in the U.S.

The following raw materials will be tested in the Bonnot extruder.

Cleaned millet grains.  
Dehulled millet grain (75% extraction)  
Ground millet flour

The special conditions required for cleaning and screening will depend on the analysis of the pearl millet procured by KSU.

With respect to dehulling, the report issued by Dr. Shepherd (WREC) suggest an extraction of 75% for a dehulled millet grown in Senegal. It is anticipated that a similar or lower extraction rate will be required for the U.S. grown pearl millet.

To obtain a partially precooked extrudate, a high moisture content of the feed will be required. Therefore the millet will first be tempered to about 25% - 30% moisture. Bonnot Company, the equipment manufacturer, will guide the investigator in selecting the most appropriate manufacturing conditions for the production of a partially precooked millet flour. Theoretically, the temperature of extrusion should be set in such a way that the material exiting from the die shows little or no expansion. This is usually achieved by maintaining a temperature ranging from 180° F to 250° F. Expansion of the extrudate can be observed visually or determined semi-quantitatively by volume measurement.

If the product temperature exiting from the extruder is hot (over 150° F), it may be necessary to cool the product before engaging in the post-processing drying of the extruded particles necessary to reach a final moisture range of 5 - 8%.

During early experimentation it was observed that extruded particles of flour when crushed into sizes acceptable for couscous preparation (-12 US mesh ± 20 US mesh) disintegrated at slower rate, when immersed in hot water, than agglomerated particles of the same size. Consequently, the use of grooved breaker rolls to produce the desired sizes will be investigated and the crushed product will be compared with agglomerates prepared from finely ground pre-cooked flour. To obtain agglomerates which will not disintegrate rapidly, when immersed in hot water, agglomeration techniques will include addition of additives which will promote a densification of the agglomerate.

In addition to agglomeration, methods of pelletizing and compression may be investigated if small pelletizing machines are available at Bonnot or other locations where the experiments are conducted.

### 3. Evaluation

All end products will be evaluated to determine their ability to produce an acceptable couscous dish.

A semi-quantitative method was devised to determine the rate of disintegration, swelling and consistency of the end use product. 100 g boiling water was poured into a 250/ml beaker, 50 g of the test product, which was previously screened into a given particle size (-12 US mesh ± 20 US mesh) was poured gradually and under stirring into boiling water. The beaker was covered with a watchglass and the rate of water absorption (swelling) and the time of disappearance of the distinct particles into an amorphous mass was recorded. The test product was compared with a sample of instant wheat couscous submitted to identical conditions. Tests show that the wheat couscous particles (-12 ± 20 US mesh) will maintain their particular shape for at least 15 minutes and will absorb water gradually until no supernatant liquid will be observed. The texture of individual particles is soft and pleasant to the palate.

In contrast, crushed material produced from an extrudate prepared on the X5 extruder disintegrated in 4 - 5 minutes and the agglomerates produced from the same extrudate lost their shape in about 2 minutes which indicated that the millet couscous had not attained acceptable textural characteristics.

From the description of the developmental activities, it is apparent that great emphasis is laid on the search for an acceptable textural end product. However, other parameters must also be studied. Evaluation of bitter flavor development in millet flour, undesirable color formation and other organoleptic properties will be undertaken.

The effect of millet/rice and millet/wheat blends on the texture of extrudate will be determined if the experimental data with the Bonnot extruder are promising. At that time additional samples will be extruded which contain 25% and 50% wheat flour and 50% rice.

It is estimated that approximately 100 - 200 lbs of millet grain will be required for the additional experimentation. If the desired textural properties of couscous can be obtained, another 100 lbs of grains will be needed for experimentation to make up blends of millet/wheat and millet/rice.

It is estimated that about 1 - 2 months will be required to determine whether or not a prototype instant couscous can be prepared by using the extrusion process for precooking of millet.

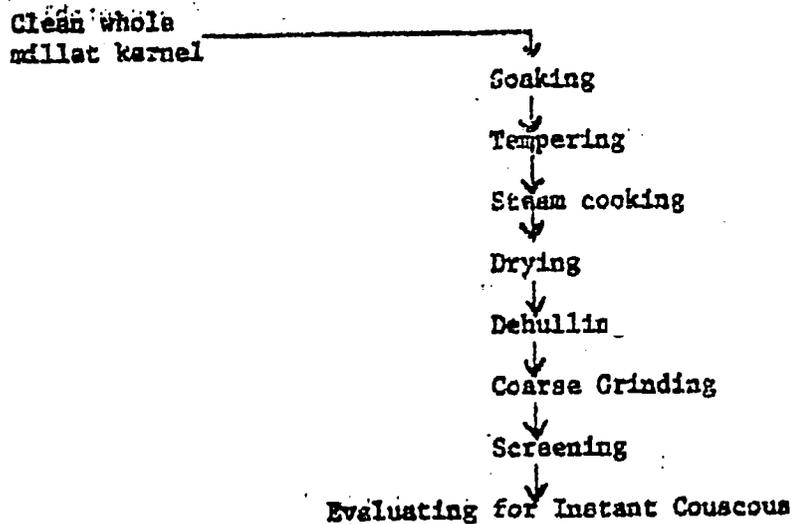
It is difficult to estimate the cost for this phase since staff time allotted to this project will be charged to different accounts. Travel will depend on site selection. The only direct cost identified is for raw material such as rice, additives, etc.

#### 4. Bulgur Process

If it becomes evident that a satisfactory prototype of Instant Couscous can not be produced by extrusion precooking, the second alternative is suggested i.e. precooking of millet using the Bulgur process. The following schematic will show the process in general:

### Suggested Instant Couscous Process

#### Bulgur Process



The Bulgur process has been used for parboiling of wheat and precooking of sorghum. It is not known whether or not its utilization to parboil millet has been studied. Although processing data exist for production of bulgur wheat no such data are apparently available for millet. The reason for selecting this process is that bulgur wheat is often considered to be a substitute for a rice dish and is eaten in the African countries in form of wheat pilaf. It does require some additional cooking for the preparation of a final dish and can therefore be considered to be a partially precooked cereal.

The whole clean millet kernel with hull, would be the most logical raw material for processing. Dehulled millet kernels could stick together during processing which could create processing problems.

In wheat, the moisture of the raw wheat is gradually increased from 11% to about 40% by exposing the kernel to water temperature up to 185°F (85°C) within 90 minutes to three hours. Jacketed screw conveyors or holding tanks are used to permit moisture penetration into the wheat kernel. According to literature, the swelling ratio from raw wheat 1.0 increases to 1.8 after equilibration. The penetration rate of water into millet kernels and moisture equilibrium of the kernel are probably different. The wheat kernel is much larger in size than the average millet (about 3-4 times as large as millet), therefore requiring considerably longer periods of time for the water to penetrate the kernel. Although the data collected for wheat bulgur

processing will be used as guidelines, new information must be found for millet processing.

Atmospheric Steam cookers heating the kernels 15 - 20 minutes at 212°F (100°C) are the most common units for the cooking step. They can consist of conveyors conveying the material over stainless steel mesh through a steam bath or large holding kettle exposing the mass to the temperature for a definite time.

Since surface moisture and internal moisture must be removed, a rotary drier followed by a tower drier may be the most economical way for drying the cereal.

Only the husk is removed in the Bulgur wheat process. It may be desirable, however, to remove the pericarp from millet since it can apparently have a strongly negative effect on the color and flavor of the end product. The process to be used cannot as yet be defined.

WRRC staff has been involved in the developmental stage of the Bulgur Wheat Process and technical assistance from this group on millet bulgur production may be useful. Unfortunately, the laboratory and pilot plant equipment used in this project is no longer available at WRRC.

At this point, it is not known whether KSU or other organizations have special equipment to parboil millet. However, the process is simple enough to use commonly available laboratory equipment. Therefore the unavailability of specialized equipment is not a serious shortcoming.

It is estimated that 50 - 100 lbs of millet should be sufficient to determine the feasibility of this process.

About 2 weeks will be set aside for this activity.

Major costs will be staff time, utilization of laboratories or pilot plants, and travel. Costs for raw materials and ingredients will be limited unless preprocessing such as dehulling must be done outside of the identified institutions.

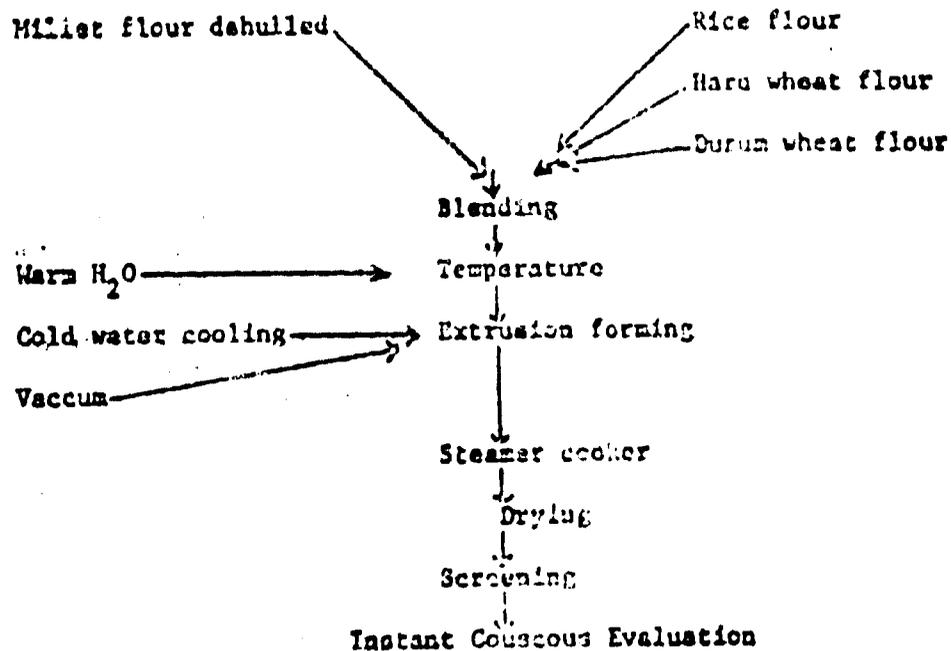
##### 5. Process to form "Couscous Analogue"

The third process considered potentially feasible for the production of acceptable instant couscous particles is based on the forming of a "couscous-like" analogue by a forming extruder. This step is followed by steam-cooking of the analogue. In the process of evaluating a pasta product made from either millet flour or a blend of millet/durum wheat flour, it was observed that macaroni could be formed easily when the flour or cereal blend was extruded through a semi-commercial pasta extruder. It is felt that such a process could be investigated should the two other processes fail to produce an acceptable instant couscous particle.

### Suggested Instant Couscous Manufacture

#### Cold Extrusion and Precooking

**Purpose:** To form simulated millet grains of different particle size and to pre-cook these particles for couscous preparation.



In addition to dehulled millet flour, blends of millet/cereals could be studied to make analogues. The experience gained from the millet pasta evaluation indicated that the addition of ground millet flour darkened the yellow color of the paste produced. Color however does not seem to be a problem in couscous dishes. For this reason, the use of blends of millet seems to be justified.

The blending and tempering can be achieved by adding lukewarm water until a moisture content of about 30.5% is reached. The tempered blend is then introduced into a forming extruder which is water cooled to maintain a temperature of about 100° F (39°C) and operates at a vacuum of approximately 16 inches Hg at varying die temperatures. The extruder product should be cut in such a way that small spherical balls approaching the screen size -14 U.S. mesh ± 20 U.S. mesh will exit from the extruder. The extruded material will be subjected to a steamer-cooker on a tray or belt conveyor. It is hoped that the particles will not stick together during the cooking step. Finally, it is necessary to dry the couscous analogues to a moisture content of about 8 - 10% prior to screening.

The particles which fall between -14 and +20 US mesh will be collected and evaluated in accordance with the directions given earlier for couscous evaluation.

Although the technique for forming pasta products is known, the conditions for the remaining steps are not known. Adhesion of particles to each other can become a serious processing problem.

It is our understanding the KSU has a pasta extruder, so that experiments could be conducted at this location. Personnel will be identified after discussion with Dr. Nowanew. Three weeks will be reserved for this development activity which includes preprocessing and post processing. If expenses for KSU and other organizations staff involvement can be charged to the millet sorghum program, the cost for other services will be relatively small.

#### 6. Conclusions

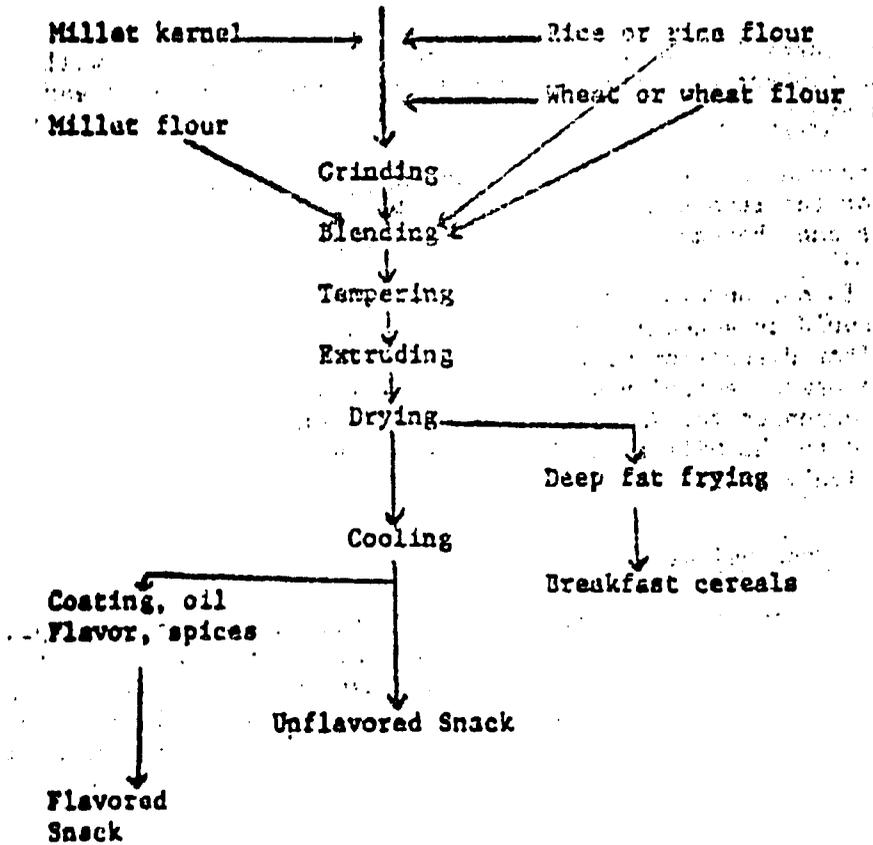
Since the development of an Instant Millet Couscous prototype has not been successful so far, it was felt that identification of three different possible processes and a brief discussion of them would help in obtaining meaningful suggestions which could be incorporated into the planned, present and future development activities. It should be stressed again that the plan is to concentrate on extrusion cooking for the production of millet couscous.

It is estimated that the overall costs for 2-3 months development activities on couscous will probably not exceed \$1,000-\$5,000 if the expenditures for the involvement of the professional staff, utilization of laboratory and pilot plant, identified in this review (KSU, NROC, WARC, Texas A & M, OICD/USDA and others) will be borne by the respective organizations. The money may be required to pay for preprocessing of cereals, transportation of material, storage or other expenses which may occur during the development.

#### (ii) Millet Snacks

The snack food industry promotes many different types of snack foods. One large category includes sweet and salty baked goods, such as cookies, wafers, biscuits and crackers, the other one covers expanded snacks, such as curls, chips and breakfast cereals made from a variety of cereals or cereal blends. This report is limited to the description of expanded foods which are generally prepared by extrusion cooking.

Early experiments with the X5 laboratory extruder produced snacks which were slightly expanded. They were not satisfactory enough in texture and flavor to be shown as prototypes to the GOF. The capabilities of four other extruders will be investigated to determine if puffed snacks can be produced from millet, millet flour and millet cereal blends. The following schematic describes the extrusion cooking process used for production of snack items:



Millet alone or in combination with other cereals is proportioned, finely ground, tempered to about 12-15% moisture (if necessary), and extruded at fairly high temperatures varying from 300° F (175° C) depending upon the cereal blend studied and its oil content. The die selected for these snacks will provide the shape desired by the manufacturer. At the point where the hot expanded material from the equipment, exits, a rotating knife will cut the product into the required length. The snack is cooled, dried to a moisture level of about 8-10%, coated with different coating material, and further dried if required.

The general conditions for highly expanded snacks are low moisture content of the cereal and high extrusion temperatures to obtain an entirely gelatinized product. The finished snack is usually evaluated by the degree of puff and its eating characteristics. A more quantitative method can be used by measuring the volume increase due to expansion. Two extruders will be investigated to prepare this type of snacks. The cooking extruder manufactured by Bonnot Company, and the snack extruder manufactured by Manley, Inc.

In addition to snacks which puff when they exit through the die into the atmosphere as described above, snacks can also be expanded when they are introduced into a hot oil bath after being expelled from a forming extruder and dried. The general conditions for obtaining this type of product are: an increase in moisture content during tempering, and lower extrusion cooling temperature to retard any expansion at the die exit.

The materials puffed in hot oil are often used as breakfast cereals. The Bonnot forming extruder will be tested for its capability of making a deep fat fried snack. In the Manley puffer, the tempered kernel expands after having been tumbled for a given period in a rotating drum, the surface of which is heated with gas.

About 100 pounds of millet in form of kernel and flour will be made available to the two equipment manufacturers for production of millet snacks. The manufacturers estimate that 2-4 days will be needed to test their equipment capabilities. However, additional time will be needed if snacks cannot be produced on this equipment.

If equipment capabilities can be defined in short periods of time, 1-2 days (for Bonnot), no pilot plant costs are involved. With respect to Manley Inc., the manufacturer expressed interest in the program and only needs raw materials and ingredients to assist USDA in the development work.

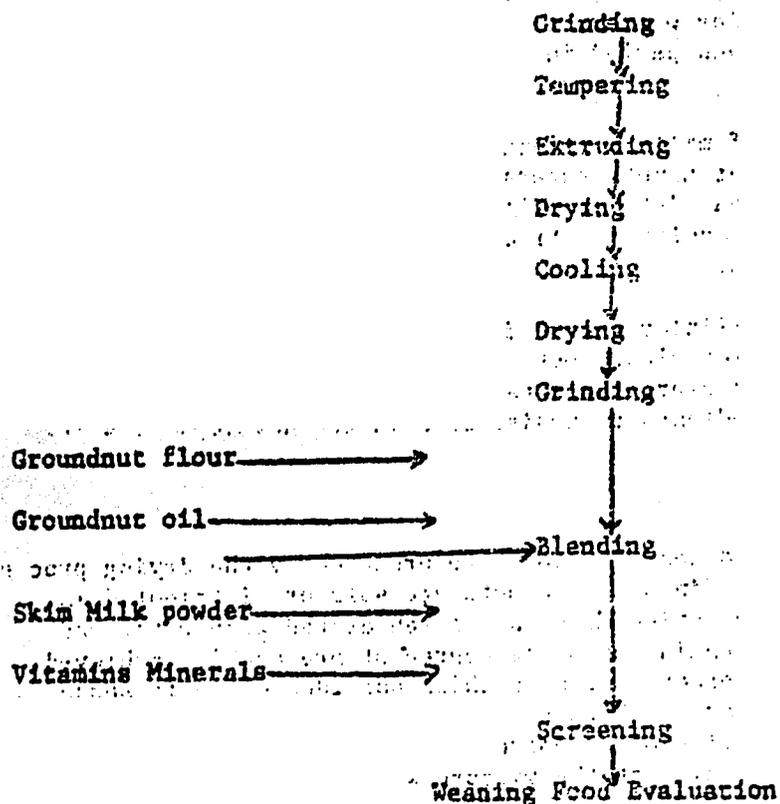
#### (iii) Weaning Foods

Many precooked weaning foods are produced by the drying process or by extrusion cooking. The finished products are sold or distributed in form of flakes or powder. The dried material is rehydrated with water and cooked for a short period depending upon the degree of pre-cooking achieved in the process. The end use product forms a thick porridge which is spoon fed to infants and young children. Both processes produce an almost fully cooked blended food which consist of carbohydrates, proteins, fats, vitamins and minerals mixed in such a way that the mixture will provide a highly nutritious food.

It was suggested to produce a millet-based nutritious weaning food to contain millet as the carbohydrate component, groundnut flour as the protein source, groundnut oil to increase caloric density, a small amount of skim milk powder, and vitamins and minerals.

Since the cereal component is produced by extrusion of a fully precooked flour, the process conditions are identical with those identified in highly puffed snack items. The following schematic diagram describes the various processing steps:

Millet flour  
Millet kernal



The highly expanded and cooled material is ground into a fine powder by a hammer mill and blended with the other ingredients. The powder is screened to reduce the presence of small gritty particles and the finished blend is evaluated for its organoleptic properties.

Usually the dry weaning food blend is dissolved in given proportions of water, cooked for about 3-5 minutes to make a thick porridge, cooled to room temperature, and tested for acceptability (taste, aroma, color, grit). Often sugar is added after cooking to sweeten to taste.

Since small samples can be drawn from acceptable extrudates used for couscous or snacks, no additional raw material will be needed.

1 - 2 days are estimated to be sufficient to provide a prototype for demonstration purposes if the extrudates have the required texture.

Samples for weaning food evaluation can also be taken from extrusion experiments designed to produce an instant couscous since partial precooked and entirely precooked millet flour can be used as ingredients of the weaning food formulation. The formulation will be calculated to contain a total of 20% protein (dry), 8% fat, and the remaining percentages as carbohydrates. No vitamin and mineral premix will be added to the experimental runs. It is estimated that about 5% skim milk powder will be added to peanut flour to provide a fairly balanced amino acid pattern. This blend will be formulated to demonstrate a prototype which can be modified later.

In future work, consideration should be given to extrude a blend of millet and whole dehulled peanuts rather than blending the peanut components, oil and peanut flour into the product. This suggestion will not be carried out at present.

#### (iv) Pasta Products

Experiments for the preparation of pasta products with imported millet flour have shown that an addition of 5% millet flour to 95% semolina produced an unacceptable brown colored macaroni. Color intensity increased with increasing amounts of millet and became the most intense with 50% millet and 50% semolina. When the amount of semolina was reduced to 10%, and 90% of the blend was millet flour, the pasta color became lighter after the product was exposed for 24 hours to a temperature of about 100°F and a relative humidity which gradually decreased from 100% to 65%. The reason for this bleaching action is unknown. It is theorized that enzyme action may be responsible for this phenomenon.

No additional pasta products will be produced until a solution is found to reduce the undesirable color.

#### (v) Traditional Products

The manufacture of Karow dough and lah will depend on the outcome of experiments carried out to produce an acceptable instant couscous.

If a process can be identified to produce couscous particles which will exhibit the required texture, product development activities will be started to make a Karow dough and prepare Lah for evaluation.

#### (vi) Interim Conclusions

In this part of the report the activities were centered around experimental designs to develop prototype foods for Senegal which have acceptable texture characteristics. For this reason, evaluation of the prototype products did not stress other organoleptic attributes which have an enormous effect on consumer acceptance, such as pleasant color and clean flavor.

It has been observed that when millet is a major ingredient in different foods, an undesirable discoloration is present and often a slightly bitter flavor is perceived. In the next segment of this report experiments will be suggested to study discoloration and flavor deterioration of millet and millet-based products.

(vii) Suggested Experiments to Reduce Discoloration of Millet and Rapid Flavor Deterioration

In this part of the report, experiments will be planned to look for answers to problems identified in pearl millet kernels or ground millet flour due to the chemical composition or physical structure, such as the undesirable brown coloration observed in pasta products made from blends of millet and semolina and the bitter taste sometimes perceived in millet flour and millet snacks.

According to the latest information, the presence of color seems to be attributed to pigments present in the peripheral regions of the grain and are, according to Reichert and Young,  $P_H$  dependent. It was suggested to soak flour in a 0.2 N solution of hydrochloric or citric acid to bleach the pigments. In addition to bleaching the acidification will have an effect on the flavor of the end product.

The observation made during pasta production, that a macaroni prepared with 100% millet flour loses part of its brown discoloration during an 18 hour exposure to a temperature of 100°F, cannot be explained. Is this bleaching due to microbial fermentation which may occur during the first 8-10 hours when the macaroni has still a high moisture content and is exposed to a high relative humidity, or is it due to  $P_H$  decrease? It is advisable to repeat this experiment and to make  $P_H$  measurements.

Experiments can be designed to add small amounts of citric acid, buffering agents (citrates and phosphates) or a chelating agent (EDTA) to unshelled and dehusked flour to evaluate flavor and discoloration changes over a given period of time. Attempts should be made to determine how discoloration intensity is affected by the amount of pericarp since it has been postulated that pericarp left in the flour is responsible for color formation. The design of experiments will be discussed with the KSU staff and advice will be requested from other organizations such as WRRRC and NRRC.

KSU has carried out several in depth studies to investigate odor changes of millet flavor during storage at different temperatures for various periods of time. Lai and Varriano-Marston found that slight odor changes of freshly ground millet flour were observed after as little as 12 hours storage at 42°C and 75% RH. At lower temperatures 27° and 19° respectively, storageability of the flour increased to 2 1/2 and 4 1/2 days before odor changes were observed. Thin layer or gas chromatographic analysis, fat acidity and peroxide value determinations were used to follow

changes of free and bound lipids and fatty acid composition during storage. The authors confirm that alternations in lipid components were apparently responsible for the quality deterioration of pearl millet flour.

Other investigators came to a similar conclusion, stating that hydrolytic and oxidative changes were responsible for flavor deterioration, and that their intensity depended on the grade of flour. In another opinion, it was postulated that a quality decrease was due to microbial fermentation.

To retard oxidative rancidity in free and bound lipids of pearl millet grain, it is suggested to incorporate small amounts of selected antioxidants into the flour. Experiments can be conducted in which these compounds were added to freshly ground millet flour which would be stored and periodically analyzed for free fatty acid and peroxide values.

In other experiments, the effectiveness of extrusion cooking on heat labile enzyme systems (i.e. lipase and possibly lipoxidase) and be studied by comparing the storageability of heat-treated flour with an untreated flour.

Since millet grain imported from Senegal is available, it is suggested to use it for these tests and compare the results with data obtained from studies of US grown millet.

The experimental designs will be discussed with the staff at KSU. It is hoped that the experiments on the study of discoloration and undesirable flavor changes can be done concurrently with the development activities undertaken to identify suitable process for manufacturing millet-based foods.

Bitter flavor was perceived in snacks, couscous and weaning foods and its intensity must be reduced to produce foods acceptable to the consumer. Even if color discoloration does not present a problem in millet couscous, it will not be acceptable for pasta products and snacks. For these reasons, research to minimize flavor changes and reduce discoloration is extremely important.

#### (viii) Conclusion

On the basis of this outline, it is hoped that several acceptable millet-based prototypes such as an instant couscous, one or two snack foods and a weaning food can be shown to the GOS not later than September 1981 unless unpredictable difficulties are encountered during the research and development activities. An acceptable pasta product cannot be developed until the intensity of discoloration can be minimized to a satisfactory level.

REASONS FOR FAILURE OF PRIOR  
MILLET PROCESSING PROJECTS.

Background information was collected by interviews with responsible technical and management people to pinpoint the reasons why several of the attempts to produce and sell millet transformation products were not successful.

Several projects were identified:

- Millet flour (Grande Moulins de Dakar, SENTENAC)
- Millet bread (Government Ordonnance - Bakeries)
- Millet couscous (ITA)
- Millet couscous (SENTENAC)
- Ladylac (SENTENAC)
- Cheikh (Thiere) (ITA)
- Diambar

In analyzing the different reasons, 17 categories for failure could be identified. They were tabulated in the attached table. 12 categories for failure were identified for millet bread, 8 for millet couscous which was attempted to be introduced by Sentenac, 7 for millet flour and 1 or 2 for the remaining projects. In our interviews, we concentrated the questions on millet flour, millet bread and millet couscous, and this may be the reason why more background was collected on these subjects than on the other projects. Consequently, more reasons for failure were identified.

For the USAID Millet Transformation Project, its background description, implementation and management, marketing and business chapters have already taken into account all the reasons identified for failure of earlier projects and have made provisions to avoid a repetition of these pitfalls.

The explanation given in the table is self-explanatory.

					X	Government not kept informed
			X			Inadequate Non-Standard Decortication Procedure
					X	Government Ordinance Too Hastily Imposed
				X		Inadequate Market Testing Technique
				X		Insufficient Time to Transfer Technology
			X			Inadequate Shelf-Life
			X			Inadequate Millet Supply
			X	X		Specifications Never Established
			X	X		Poor Millet Quality Poor Flour Quality
						Poor quality End Product
		X		X		Substantial Price Increase in End Product
				X		Inadequate Quality Control
			X	X		Inadequate Cleaning Technology
		X		X		Taste Unsatisfactory
				X		Texture Unsatisfactory
			X		X	Inadequate Quality on Inter-Prod. on Bread Flour
					X	Inadequate Control Finished Product.

There are none of these problems we have failed to plan for in the Millet PP special studies

TECHNICAL ADVISORS' TERMS OFREFERENCEPROJECT RESIDENT ADVISORSCOPE OF WORK

The Resident Advisor will be stationed at ITA-Dakar for a period of not less than two years. At ITA he or she will work with a Senegalese counterpart and report directly to USAID. He must be fluent in French with an FSI Test score of S3-R3 as an absolute minimum. He will work closely with the Director of ITA, the USAID Project Manager, and half a dozen short-term consultants in food habits, product development, marketing, finance, millet supply, and plant location totalling 12 man/months.

BACKGROUND REQUIRED

Must be capable of providing technical and managerial leadership for the project and serve as liaison between ITA, USAID and GOS officials. A business background and ability to deal qualitatively with project tasks and goals are important attributes.

EXPERIENCE REQUIRED

Although the individual will be primarily a manager, it is also desirable that he/she have a background in food technology and marketing, preferably with strength in cereals technology and formulation and processing of products related to consumer goods. He should have prior experience working in Africa. It is highly desirable to have had experience in administration and management of development projects in foreign countries. He must have an understanding of cultural acceptance and methods to transfer traditional technology to industrial scale, coupled with an understanding of the economic and social merits of intermediate technology.

PROFESSIONAL TRAINING

Must have a bachelor degree from a recognized university in physical and/or social science, such as administration and management, interpretation and evaluation of developmental results related to food technology, marketing, and financial analysis.

FOOD HABITS AND ATTITUDES SPECIALISTS

SCOPE OF WORK

The specialists will travel to Senegal before implementation of the study to assist the Resident Advisor, the Project Managers of USAID and ITA and the local organization identified and selected to undertake the work in the planning and strategy of the Food Habits and Attitudes Study. Major inputs will come in the design of the questionnaire, the methods utilized for interviews, and the number of interviews of potential purchasers to obtain meaningful data. Data to be collected will deal with quantity and form of rice, wheat, and millet presently consumed; attitudes of consumers toward these meals, and how these attitudes might be affected by introduction of transformed millet products.

Results of the study will provide profiles of millet products, e.g., the most acceptable "instant" couscous, desirable snack foods, kinds of weaning foods, best packages and package sizes, potential pricing, and possible selection for market tests.

It is anticipated that the Advisor will make at least two trips to Senegal: The first trip to plan implementation and get the study underway and the second trip to analyze and evaluate the results together with the marketing agency.

If the local marketing organization has not previously been identified, the specialist will identify such an organization based on the work of the market research specialist who provided inputs into the project paper, plus additional inputs from ITA, USAID, the Resident Advisor and his own investigations.

FOOD PRODUCTS DEVELOPMENT SPECIALIST

SCOPE OF WORK

The specialist or specialists will travel to Senegal and work with the Resident Advisor, the project manager of USAID and ITA, and the senior scientists of this institute to address question which may be related to product, process, development, or consumer testing. Preliminary testing of product concepts may require additional specialists knowledgeable in certain phases of market research such as interviewing people working in cottage industry on the production of traditional foods with a view to improve and/or scale up this technology. Engineers may be required to assist in special equipment design; economists may be necessary to study engineering economics; specialists in special packaging materials may be required in order to package half-products which will be later produced as fried millet chips. Specialists may be needed to assist in the production of selected products for market testing.

For this reason, it is difficult to determine in advance the specific knowledge required by the food product specialist, other than that he or she is familiar with food technology. What is clear is that both the feasibility of transferring the technology used to Senegal and the need to employ the most effective technology possible are imperatives.

MARKETING STUDY SPECIALIST

SCOPE OF WORK

The specialist will assist USAID and ITA Project Managers, the Resident Advisor and the marketing organization in establishing ground rules for the market test.\* The strategy developed will utilize the results obtained from the food habit and attitude study and will be guided by results from consumer survey studies and in house placement tests to set the stage for introduction of the most acceptable products in the market place. Plans will include establishment of procedures to follow and how to monitor product sales, promotion, advertising, changes in shelflife, information on consumer reactions, eventual recipe development etc. Advertising strategies will be developed together with advertising agencies and effective packaging and labeling will be evaluated. Some data will come from retailers, distributors and wholesalers, other will be received from interviews with the consumer or eventual purchaser. Questionnaires must be designed to obtain raw data.

The specialist will assist in interpreting the results and may plan trips before, during and after the marketing study is completed.

\* The work of this specialist is not to be confused with the test marketing to be carried out in connection with the product development study.

MILLET SUPPLY SPECIALIST

SCOPE OF WORK

The specialist will travel to Senegal and work with USAID, IIA and local institute responsible for carrying out the millet supply study. He must be familiar with millet, its production and procurement, and the related laws and policies affecting millet. The specialist should know factors influencing millet storage conditions and warehouse locations suitable for millet storage. The person should be able to analyse problems related to changes in procurement and storage policies which could have an effect on the farm sector.

Financial Analysis Specialist

Scope of Work

The specialist will travel to Senegal and will assist the Resident Advisor and the project managers of USAID and ITA in the selection of a competent local contractor.

The local contractor should have experience to deal with problems related to the study of financial viability of business enterprises. The study to be conducted will be to estimate the potential cost of all business expenses, the requirement for capital the return on investment and other key factors which are appropriate and required to make a sound business decision. Results of the study and analysis will be evaluated by the advisor and discussed with an explained to organization to permit them to make preliminary assessment of the business opportunities existing in the sales and manufacture of millet transformation products. Recognition must be given to the fact that there are certain feasibility factors of universal interest to any prospective investor and certain other areas in which each entrepreneur is likely to have his own unique business goals and will therefore wish to make his own special analysis.

It is expected that the Advisor will be required to make inputs toward the middle or the end of the second year, when marketing studies of foods will have identified the capability of the developed products to survive in a competitive market and production and capital costs are reasonably predictable.

Plant Location Specialist

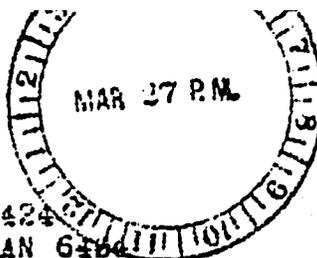
Scope of Work

This person will evaluate, together with engineers, economists and the project management, all the factors required for a suitable plant location.

Questions such as land values, availability of labor and its costs, social factors, close access to roads, railroads or ships, tax factors, closeness to raw materials, government requirements for introduction of industries, must be evaluated. Availability of electricity and other power sources and water must be studied.

This study is scheduled for the latter part of the project toward the end of the second year.

17A 00280753  
NOV 81  
RUTADR/AMEMBASSY DAKAR 3424  
INFO RUIHAB/AMEMBASSY ABIDJAN 6464  
RUIHAB/AMEMBASSY BAMAKO 0830  
RUIHAB/AMEMBASSY PARIS 9842  
RUIHRO/AMEMBASSY ROME 1705



ANNEX G

27 MAR 81  
TOR: 1037  
CN: 08020  
ACTION: AI  
INFO: CH  
DC  
CH  
AC

BT  
UNCLAS SECTION 01 OF 03 STATE 076621

Actual Date: 3/30/81  
Actual Date: (Date)  
Name: [Signature]  
Chief, the [Signature] Administration

AIDAC

E.O. 12065: N/A

TAGS:

SUBJECT: MILLET TRANSFORMATION PROJECT (685-0250); PID APPROVAL

REF: PID OF FEBRUARY 9, 1981

1. AFRICA BUREAU ON FEBRUARY 23, 1981 REVIEWED THE FEB. 9, 1981 MILLET TRANSFORMATION PROJECT IDENTIFICATION DOCUMENT (PID). REVIEW GROUP RECOMMENDED APPROVAL AND ACTING AA/AFR HAS APPROVED PID FOR DEVELOPMENT AS REGULAR A.I.D. BILATERAL PROJECT, TO BE AUTHORIZED BY USAID/DAKAR, WITH FOLLOWING PROVISIONS.

2. FUNDING. FUNDING FOR THIS PROJECT WILL COME FROM SAHEL DEVELOPMENT PROGRAM FUNDS, WITH ADDITIONAL FUNDS FOR CERTAIN TECHNICAL SERVICES SUPPLIED UNDER THE EXISTING DEVELOPMENT SUPPORT BUREAU SORGHUM AND MILLET PROJECT.

3. PROJECT PURPOSE. THE PID PROJECT PURPOSE ON PID PAGE-SHEET SHOULD BE MODIFIED TO MAKE CLEAR THAT THE PROJECT PURPOSE IS LIMITED TO THE PRODUCTION OF ANALYTICAL AND PREPARATORY STUDIES THAT PROVIDE THE BASIS FOR PRIVATE OR PUBLIC ENTERPRISES TO DECIDE WHETHER OR NOT TO CONSIDER VENTURES TO MANUFACTURE AND MARKET NEW PROCESSED MILLET PRODUCTS WITHIN SENEGAL. THE PROJECT ITSELF IS NOT EXPECTED TO INDUCE SALE OF MILLET PRODUCTS OR CAUSE MEASURABLE CHANGES IN IMPORTS OF RICE OR WHEAT. TO THIS END, THE PROJECT PURPOSE STATEMENT COULD BE CLARIFIED BY MAKING THE FOLLOWING SIMPLE CHANGES: (A) AFTER QUOTE CAN UNQUOTE IN FIRST CLAUSE, INSERT QUOTE POTENTIALLY UNQUOTE; (B) AFTER QUOTE DEMONSTRATE UNQUOTE IN SECOND CLAUSE, INSERT QUOTE POTENTIAL FOR UNQUOTE; (C) OMIT QUOTE AN ADEQUATE UNQUOTE IN THIRD CLAUSE AND SUBSTITUTE QUOTE ILLUSTRATIVE UNQUOTE AND CHANGE QUOTE PLAN UNQUOTE TO QUOTE PLANS UNQUOTE. THE REVIEW GROUP RECOGNIZED THE POTENTIAL CONTRIBUTION OF THE PROJECT FOR MACROECONOMIC OBJECTIVES OF SENEGAL'S 1980-81 PLAN WHICH STRONGLY SUPPORTS THE MOVE TOWARD FOOD SELF-SUFFICIENCY AND IMPORT SUBSTITUTION, AND WHICH CALLS SPECIFICALLY FOR ENCOURAGEMENT OF PRIVATE ENTERPRISE AND REORGANIZED COOPERATIVES IN THE MARKETING OF MILLET.

ACTION	
PPP	
INFO	
DIR	<input checked="" type="checkbox"/>
DDIR	<input checked="" type="checkbox"/>
MO	<input checked="" type="checkbox"/>
PHM	<input checked="" type="checkbox"/>
OMV3	<input checked="" type="checkbox"/>
Reg Con	<input checked="" type="checkbox"/>
RPM	<input checked="" type="checkbox"/>
PML	<input checked="" type="checkbox"/>
PMA	<input checked="" type="checkbox"/>
FFP	<input checked="" type="checkbox"/>
RHO	<input checked="" type="checkbox"/>
Ex Sec	<input checked="" type="checkbox"/>
Disp	<input checked="" type="checkbox"/>
TRV	<input checked="" type="checkbox"/>
PDO	<input checked="" type="checkbox"/>
PSU	<input checked="" type="checkbox"/>
Clwan	<input checked="" type="checkbox"/>

ENTREPRENEURS TO DECIDE AGAINST OR DISCONTINUE MILLET PROCESSING ACTIVITIES IN THE PAST. IN ADDITION, PROJECT DEVELOPMENT STUDIES (PP36-39) SHOULD REVIEW CONSTRAINTS, IDENTIFY CHANGES FOR STIMULATING ENTREPRENEURS, AND SUGGEST FINDINGS WOULD BE BROUGHT TO ATTENTION OF SENEGALESE AUTHORITIES.

-- F. PROVIDE THAT INFORMATION ON STUDY CONCLUSIONS REACHED UNDER THE PROJECT WILL BE MADE AVAILABLE TO ENTREPRENEURS AND GOVERNMENT AGENCIES IN SENYAL AND OTHER SAHELIAN COUNTRIES.

-- G. PROVIDE FOR EXAMINATION OF TECHNOLOGIES AND POSSIBLE PROCESSING PLANT SITES TO BE USED IN MILLET PROCESSING AND MARKETING OPERATIONS FROM THE POINT OF VIEW OF POTENTIAL JOBS AND INCOME TO BE GENERATED FOR PERSONS IN URBAN AND RURAL AREAS IN RESPONSE TO INCREASED MARKET DEMAND FOR MILLET. THE PP SHOULD DISCUSS CAPITAL SAVING TECHNOLOGIES FOR FACTORY AND MARKETING FUNCTIONS WITHIN THE CONTEXT OF MAXIMIZING JOBS AND INCOME FOR SMALL OPERATORS, WITH SPECIFIC CONSIDERATION FOR WOMEN.

-- H. IT WAS SUGGESTED THAT AN EXCESSIVELY COMPREHENSIVE FINANCIAL ANALYSIS STUDY (SECTION 6.2.5) MIGHT HAVE LIMITED VALUE TO ENTREPRENEURS WHO CONSIDER INVESTMENT IN MILLET TRANSFORMATION BUSINESSES IN SENEGAL SINCE EACH ENTREPRENEUR IS LIKELY TO HAVE OWN UNIQUE BUSINESS GOALS AND THEREFORE REQUIRE OWN SPECIAL ANALYSIS. ACCORDINGLY, IT WAS SUGGESTED THAT THE PP TEAM AND THE PROJECT IMPLEMENTATION TEAM ATTEMPT TO DEVELOP GUIDELINES FOR THE FINANCIAL ANALYSIS THAT LIMIT ITS SCOPE TO MEASURES OF BUSINESS VIABILITY WHICH ARE OF A GENERAL NATURE. THE FINAL DEFINITION OF SCOPE MIGHT BE ESTABLISHED THROUGH INVOLVEMENT WITH POTENTIAL INVESTORS DURING PROJECT TRACKING AND MONITORING AS CITED IN SECTION 7.3.

-- I. BENEFICIARIES. THE PP SHOULD CHANGE THE DEFINITION OF BENEFICIARIES (P.6) TO A STATEMENT ALONG THE FOLLOWING LINES: QUOTE THE PRINCIPAL BACEFICIARY IS THE GOS BY REASON OF PROSPECTS THE PROJECT OFFERS TO STIMULATE IMPORT SUBSTITUTION, FOREIGN EXCHANGE SAVINGS, AND DOMESTIC PRODUCTION OF FOODSTUFFS IN SUPPORT OF THE 1980 REFORM PLAN. AS A RESULT OF THE PROJECT, THE STAGE SHOULD BE SET FOR CREATION OF NEW ENTERPRISE IN PROCESSED MILLET PRODUCTS, WITH ATTENDANT NEW MARKET DEMAND FOR MILLET. AS ENTERPRISE TAKES OFF, DIRECT BENEFICIARIES WILL BE MILLET FARMERS, PROCESSORS AND MARKETERS WHO SHOULD REALIZE INCREASED INCOME FROM NEW SALES. THE SUCCESSFUL COMPLETION OF FOLLOW-ON ENTERPRISE WILL RESULT IN BENEFITS TO CONSUMERS OF PROCESSED MILLET PRODUCTS. ETC. UNQUOTE. THE BENEFICIARY STATEMENT WILL DEMONSTRATE THAT THE PROJECT CAN STIMULATE ACTIONS THAT WILL HAVE IMPACT FROM FARMGATE TO MARKET TO FOOD CONSUMER.

-- J. WAIVER. IF NON-U.S. SOURCE/ORIGIN EQUIPMENT OR VEHICLES WILL BE PROCURED UNDER PROJECT, INCLUDE APPROPRIATE WAIVERS.

PROJECT PAPER. IN ADDITION TO THE POINTS RAISED IN THE PP, THE PP SHOULD ADDRESS THE FOLLOWING:

- A. PROVIDE INFORMATION ON EXISTING FOOD PROCESSING EQUIPMENT NOW AVAILABLE IN SENEGAL WHICH MIGHT BE PUT IN USE DURING OPERATIONS OF A MILLET PROCESSING PLANT.
- B. PROVIDE THAT PROJECT STUDIES INCLUDE FULL ANALYSES OF PRICING, TARIFF AND SUBSIDY POLICIES WHICH COULD AFFECT PROFITABILITY OF MILLET PROCESSING OPERATIONS, TOGETHER WITH ALTERNATIVE POLICIES WHICH GOVERNMENT OF SENEGAL COULD CONSIDER WITHIN THE CONTEXT OF THE 1980 REFORM PLAN.
- C. PROVIDE THAT PROJECT STUDIES REVIEW WHAT PROCESSORS CAN DO TO SELL MILLET PRODUCTS IN SENEGAL AT CFA 140/KG WHEN PRICE OF RICE IS ABOUT CFA 72/KG AND PRICE OF WHEAT IS CFA 137/KG. (PP SHOULD REPORT SEASONAL PRICES OF MILLET IN DAKAR).
- D. REVIEW ALTERNATIVE ENTITIES THAT WERE CONSIDERED OR COULD HAVE MANAGED THIS PROJECT AND REPORT THE RATIONALE FOR SELECTION OF A GOS AGENCY (ITA) AS IMPLEMENTING INSTITUTION. (IT WAS SUGGESTED THAT THE PRIVATE SECTOR MAY HAVE BETTER CREDENTIALS TO MOBILIZE AND COORDINATE ACTIVITIES IN THE PROJECT. IT WAS ALSO OBSERVED THAT THE PROJECT ITSELF MAY BE A VEHICLE FOR THE GOS TO INVOLVE U.S. COMPANIES IN NECESSARY PREINVESTMENT ANALYSIS, PRODUCT DEVELOPMENT AND MARKET STRATEGY FORMULATION.)
- E. THE REVIEW COMMITTEE ATTACHED CONSIDERABLE IMPORTANCE TO THE LINKAGE BETWEEN SUCCESS OF THIS ACTIVITY AND A FAVORABLE INVESTMENT CLIMATE IN SENEGAL. IT IS CLEAR THAT THERE CURRENTLY ARE SOME DISINCENTIVES TO SYNEGALESE MILLET PRODUCERS AND MARKETERS, E.G., CEREALS PRICING POLICIES, WHICH COULD BE REMOVED OR DIMINISHED. IT IS UNKNOWN TO THE COMMITTEE HOW CRITICAL THESE OR OTHER CONSTRAINTS ARE TO MILLET PROCESSING AND MARKETING OPERATIONS. THE PP SHOULD EXAMINE THESE DISINCENTIVES WITH A VIEW TO IDENTIFYING MEASURES WHICH WOULD IMPROVE THE CHANCES OF MAINTAINING ENTHUSIASM FOR PRIVATE SECTOR INVESTMENT. THE COMMITTEE BELIEVES THAT THERE IS LITTLE REASON TO INITIATE A STUDY TO LAY GROUNDWORK FOR ECONOMIC ACTIVITIES WHOSE SUCCESS WOULD BE COMPROMISED BY HOST GOVERNMENT POLICIES AND/OR OTHER FACTORS, E.G., PREFERENCE FOR PUBLIC RATHER THAN PRIVATE SECTOR OPERATIONS, EXCLUSIONARY PRACTICES IN SELECTION OF BUSINESS LICENSEES, LACK OF SKILLED LABOR, MARKETING CONSTRAINTS, ETC. ACCORDINGLY, THE PP TEAM SHOULD EXAMINE CONSTRAINTS WHICH HAVE CAUSED WOULD-BE

UNCLAS SECTION 02 OF 03 STATE 076621

K. ENVIRONMENT. IEE REVISED IN AID/W TO STATE THAT THERE WOULD BE SECONDARY CULTURAL AND SOCIO-ECONOMIC IMPACTS IF MILLET PROCESSING FOLLOW-ON ACTIVITIES OCCUR. ACCORDINGLY, PP SHOULD DISCUSS CULTURAL AND SOCIO-ECONOMIC IMPACT CONSIDERATIONS OF MILLET TRANSFORMATION AND INCORPORATE THESE CONSIDERATIONS, WHICH INCLUDE WOMEN'S CONCERNS, INTO FINAL RECOMMENDATIONS. IEE FACESHEET REVISED IN AID/W TO INCLUDE NAME OF IEE DRAFTER, SIGNATURE OF MISSION DIRECTOR (IN WASHINGTON FOR CDSS REVIEW), AND PROVISION FOR CLEARANCE BY GC/AFR AND DECISION BY BUREAU ENVIRONMENTAL OFFICER (IN LIEU OF ASSISTANT ADMINISTRATOR). NEGATIVE DETERMINATION AS PROPOSED IS INAPPROPRIATE AND, PER NEW REGULATION 16, SECTION 216.2(C)(2)(III), CATEGORICAL EXCLUSION HAS BEEN APPROVED.

5. PROJECT DESIGN. BITAD/S WILL PROVIDE IN SEPARATE MESSAGE LIST OF UNIVERSITIES THAT MIGHT BE AVAILABLE TO ASSIST IN THIS PROJECT. TECHNICAL ASSISTANCE BUDGET MAY BE LOW AND IF SO AFR/DR/SWAP WILL ADVISE FURTHER BY SEPTTEL. PAUL CROWLEY OF USDA/OICD IS CONTACTING U.S. FIRMS FOR INTEREST IN ASSISTING IN PROJECT DESIGN, AS DISCUSSED WITH USAID AND SEE/CM.

6. PROJECT SCHEDULE. AID/W ACCEPTS PREVIOUSLY PROPOSED

MISSION SCHEDULE IN WHICH PROJECT AGREEMENT IS TO BE SIGNED IN MAY 1981 IN LIEU OF LATER DATE PROPOSED IN FID. WE DO NOT SEE THAT CONTRACT COULD BE SIGNED UNTIL SEPTEMBER 1981. WE ESTIMATE CONTRACT STAFF COULD ARRIVE IN JANUARY OR FEBRUARY 1982. THEREFORE DATE FOR ANNUAL REVIEWS MIGHT NEED TO BE SHIFTED TO DECEMBER 1982 AND 1983.

7. NEXT STEPS. WHILE THIS PROJECT HAS NOT PREVIOUSLY APPEARED IN THE CONGRESSIONAL PRESENTATION (AND ORIGINALLY HAD BEEN PROPOSED AND BUDGETED WITHIN A.I.D. AS AN ACCELERATED IMPACT PROJECT), THE PROJECT PAPER MAY BE PREPARED

UNCLAS SECTION 02 OF 03 STATE 076621

UNCLAS SECTION 03 OF 03 STATE 276621

410AC

G-5

NOW IN ACCORDANCE WITH THE PID AS MODIFIED ABOVE. REVISED  
BILATERAL OYB WILL REFLECT DOLS 500,000 INCREASE FOR  
PROJECT. MISSION IS HEREBY AUTHORIZED TO REVIEW AND  
APPROVE PP. PROJECT AGREEMENT MAY BE SIGNED AFTER MISSION  
IS ADVISED THAT FUNDS ARE AVAILABLE AND CONGRESSIONAL  
NOTIFICATION HAS BEEN PROCESSED. HAIG.

BT

#6621

NNNN  
UNCLAS SECTION 03 OF 03 STATE 276621

## ISSUES

The major issues not dealt with elsewhere in the PP, as raised in the FID approval cable (Annex G) and in general are:

1. ISSUE: Is there existing food processing equipment now in Senegal which could be used for millet transformation?

ANSWER: The Grands Moulins and Sentenac flour mills at Dakar have cleaning, grinding, etc. equipment with which they have participated in various prior attempts to utilize millet:

a. Cleaning Equipment -- A necessary first step in production of flour-- standard equipment is available at Grands Moulins and Sentenac mills.

b. Grinding Equipment - Flour mills can be adjusted to make several qualities of flour from a very fine flour for cakes to a coarse grain semolina. This capacity exists at Grands Moulins and Sentenac.

c. Steaming and Drying Equipment - The Sentenac mill has this capacity.

d. Baking Equipment - There are many small bakeries in Dakar and one or two large ones. Capacity is uncertain at this time and would be thoroughly investigated by the project team if baking emerges as a major requirement for intermediate products.

e. Bottling - Dakar has soft drink and beer bottling facilities. If wet final or intermediate products were to emerge under this project, those bottling facilities are available and are presently operating far enough below capacity to be able to handle any likely need.

f. Packing Equipment - There are plants to produce stocks materials for plastic packaging made from imported polypropylene pellets. The capacity of existing installations must be investigated. Whether pressurized labeling facilities are available is not known and must be investigated. There is also a cardboard box plant. The details of this plant capacities, quality, etc. are presently unknown.

g. Unavailable Equipment - The equipment not available in Dakar and probably essential to the commercialization of millet-based products (depending on those selected) are:

- (i) Adequate decortification equipment
- (ii) Agglomerator
- (iii) Extruder
- (iv) Puffer

This equipment will be either rented or purchased, as discussed above, for project-based product development. Should larger scale production result from the decision of one or more entrepreneurs, purchase of commercial scale versions of such machines would be necessary, depending on the products to be produced and processes to be used.

2. ISSUE: Why was ITA chosen to run the project?

ANSWER: ITA was selected as the counterpart agency for a variety of reasons, the first of which is they have the leadership, incentive, background and experience. Within Senegal ITA is a pioneer in the work on millet utilization. They have a small but trained staff and some of the facilities to carry out the special studies required by this project. Secondly, ITA is the official and only GOS agency for work on cereals utilization, so it is logical we should turn to them. A third major consideration was one of strategy. It is essential we have full GOS support for this project which will raise questions about, and ultimately seek changes in, government pricing policies. With GOS support and participation from the very beginning, and with full knowledge of the work being undertaken, we can hope to get GOS policy support when required. (NOTE: our proposed Project Advisory Committee also has representative from every interested Department of the Government).

Alternatives to ITA were not numerous; there are no national or international alternative agencies who could handle the project. In the private sector, only SENTENAC was considered because of its several early attempts to use indigenous foods. However, in Senegal it is not likely that one private company will work cooperatively with another. Thus, working with a private company, as counterpart would severely limit the local resource capability. With limited time and limited resources to do the project and because we have several products types to develop, the limited company counterpart is much less attractive than ITA.

U.S. Company involvement in the project may come about their engagement to perform one or more of the special studies.

## HOUSEHOLD SURVEY RESULTS

Cited below are key findings from a survey of 100 households in the Dakar Metropolitan Area, conducted during October 1979 on behalf of the OECD and "Club du Sahel". The full document is in the PDO files.

TEST AREAUrban Socio-Economic Characteristics

<u>Residence</u>	<u>% of Total</u>
Compound (Carré)	45
Shack (Baraque)	25
Villa SICAP - Apartment	8
Middle Income House (HLM)	6
Low Income House (SICAP)	5
Apartment Buildings	5
Residence - Individual Home	6

Better Income Class. Income concentration corresponds to World Bank's  
20% have 63% of Income.

<u>Household Equipment</u>	<u>% of Total</u>
Radio	91
TV	30
Refrigerator	35
Automobile	21
Running Water	51
Electricity	84

Number of people in household 10  
Number of people working 1.4

<u>Occupation</u>	<u>% of Total</u>
Professional or Executive	22
Day worker	20
Craftsman	25
Farmer/Fisherman	1
Unemployed	29
No response	3

Age of People Interviewed

18 - 24 years	13
25 - 29	17
30 - 39	30
40 - 54	32
55 plus	10

Education Level

% of Total

No Schooling or Koranic School	74
Some Primary School	11
Completed Primary School	6
Some Secondary School	6
Completed Secondary School	3

Note: 26% "Literate". Koranic School usually fluent in Arabic.

Dates of Study: October 7-18, 1979.

Number of Interviewers: Seventeen (17), two (2) supervisors and one (1) Director. Interviews were carried out in French, Wolof, and Sérér.

Frequency of Consumption

% of Total

	Rice	Bread	Peanuts	Potatoes	Millet	Pâtes (Pasta)
Everyday	95	98	25	8	11	3
Several times a week	5	2	41	52	30	22
At least once a week	--	--	7	22	20	28
Less frequently	--	--	23	15	36	42
Never	--	--	4	3	3	5

Note: Rice use increased 39%; Bread, 37%; Biscuits, 20%; Potatoes, 16%; Pâtes alimentaires (Pasta), 4% in five years. Millet use declined 1.5% in rural areas. Rice used increased 31%; Millet, 21%; Biscuits 20%; Bread, 16%. Potatoes and Sweet potatoes declined 19% and 20%, respectively.

There is no significant variation in the consumption of these products in either the dry or rainy season for either urban or rural consumers.

Rice, Corn, Biscuits, and Pasta are stored or stocked. Bread and Millet are not stocked in urban households. However, millet is stored or stocked in rural households.

There is no great statistical difference in serving millet coucou by either urban or rural families for two seasons.

<u>Purchase from time to time</u>	% of Total	
	Urban	Rural
Rice	100	100
Millet	90	49
Millet flour	64	10
Wheat flour	92	83
Corn	38	20
Corn flour	43	--
Already prepared Couscous	43	10
Moroccan Couscous	63	10
Corn Couscous already prepared	9	--

Low incidence of rural purchase of millet grain compared to urban due to the fact that it is self-grown. Note good percentage for prepared couscous and also, Moroccan couscous (associated with quality) for urban households.

<u>Serve Millet Couscous</u>  (Seasons)	% of Total			
	Urban		Rural	
	Dry	Wet	Dry	Wet
Everyday	12	12	77	77
4-5 times a week	12	13	8	10
2-3 times a week	19	17	9	5
Once a week	17	17	1	--
Less frequent	37	36	4	4
Never	3	5	1	4

METHOD OF PREPARING MILLET

<u>The traditional pounding method</u>	% of Total	
	Urban	ural
Everyday	4	56
Several times a week	13	29
At least once a week	15	8
Several times a month	5	1
At least once a month	3	--
Less frequently	29	5
Never	31	1

<u>End Product Type</u>	<u>% of Total</u>	
	Urban	Rural
Dry millet flour	60	90
Wet millet flour	7	13
Mixed with corn	5	2
Mixed with peanuts	9	19
Mixed with rice	3	--
Mixed with other products	--	2
Never pound millet	31	1

Note: Urban consumers are not predisposed to prepare millet "old fashioned" way. Both urban and rural households prefer dry millet flour versus other forms.

Mechanical method of converting millet

Everyday	6	47
Several times a week	25	30
At least once a week	21	4
Several times a month	8	4
Less frequently	37	13
Never	3	2

End product type

Dry millet flour	12	1
Wet millet flour	90	95
Mixed with corn	6	2
Mixed with peanuts	27	9
Mixed with rice	6	--
Mixed with other products	9	8

Prepared Millet Couscous

Where Purchased:

Open market	40
Other sources	2
Never buy	58

How often:

Several times a week	12	
At least once a week	9	
Several times a month	6	
Less frequently	15	
Never buy	58	<u>Not significant</u>

<u>Moroccan Couscous</u>	<u>% Total</u>
	Urban
<b>Where Purchased:</b>	
Open market	50
Boutique	4
Coop	1
SONADIS	4
Supermarket	1
Other sources	3
Never buy	37

<b>How often Purchased:</b>	
At least once a week	7
Several times a month	11
Once a month	11
Less frequently	34
Never buy	37

Stocking of Cereals

	<u>% Total</u>	
	Urban	Rural
<u>Rice</u>		
Yes	64	33
No	36	67
<u>Millet</u>		
Yes	25	86
No	75	14
<u>Corn</u>		
Yes	2	2
No	98	98

How Millet Flour is Used in Urban Populations

Couscous	77
Fritters, flat bread	6
Liquid porridge (ruy)	37
Heavy porridge (lax)	

Acceptance: 90% - Very Good

Reaction to Millet Flour Quality Used for the Test

Texture

OK	91
Needs change	9

Granulation

OK	83
Needs change	17

Time to cook

OK	92
Needs change	8

Taste

OK	92
Needs change	8

How Millet Flour Sell

<u>Less Costly than your Present Purchase of Millet Flour</u>	<u>% Total</u>
---	----------------

Very well	82
Rather well	18
Rather badly	--
Very badly	--

<u>At the same price as you pay for Millet Flour</u>	
--	--

Very well	18
Rather well	57
Rather badly	25
Very badly	---

<u>More Expensive than your Present Purchase of Millet Flour</u>	
--	--

Very well	4
Rather well	15
Rather badly	50
Very poorly	31

CONSUMER PRICE/RAW MATERIAL  
RATIOS  
OF DIFFERENT MANUFACTURED FOOD PRODUCTS

Enclosed are analyses of the Consumer Price/Raw Material Ratios of five (5) processed food products--all large volume productions--in the U.S. and Brazil:

1.	Tomato paste (Brazil)	100/500
2.	General Foods/Minute Rice	100/463
3.	Bulk Macaroni	100/214
4.	CSM	100/136
5.	G.F. Maxwellhouse Roasted	100/166

The difficulty in making judgment and comparisons is that mark-ups as expressed in % of raw material depend largely on the value of the raw material base, e.g.:

Tomato Paste = low value raw material 100/500

Vacuum Packed Coffee = high value raw material 100/166

**TOMATO PASTE IN 4-OZ. CONSUMER CANS**  
**70,000 TONS TOMATO/YR**  
**BRASCAU-PEIXE**

(2) Raw material	100
Processing (evaporation)	80
Can - Closure - Carton	120
Reject and Return (30%)	9
Cost of inventory in 40% inflation (6 M)	<u>44</u>
Production cost	<u>353</u>
Gross Profit (20%)	71
Av. Freight	10
Wholesaler Mark-up 5%	22
Retailer Mark-up 10%	<u>44</u>
Consumer Price	500

Note: This is a "basic commodity" in Brazil. "Value added" is high because of extensive processing (evaporation from 4% to 28% solids) plus the cost of small cans over an inexpensive raw material. If the raw material is "low cost" than all value added factors (labor, energy, packaging, freight) are high if expressed as percentage of the raw material.

## GENERAL FOOD

## Minute Rice

Raw material	100
Processing	60
Packaging	<u>100</u>
Production cost	260
Gross Profit Margin (40%)	<u>104</u> 364
Wholesaler Margin (12%)	44
Retailer Margin (15%)	<u>55</u>
	463

U.S. luxury-high margin convenience product.

Brand leader.

Low value raw material.

BULK MACARONI  
 MATARAZZO - BRAZIL  
 1971-73

1200 TONS/MONTH SALES  
 (NO. 3 RANKING PRODUCER)

Raw Materials	100
Processing/Labor	12
Bulk packaging	14
Returns	3
	<hr/>
Production cost	129
Average Freight	10
Wholesaler (12%)	16
Retailer (18%)	33
	<hr/>
Consumer Price	188

Note: Basic Manufactured Commodity  
 Large volume production/sale  
 Bulk package (20 lb. bags)  
 Not seasonal raw material - no major inventory cost

**BULK PRODUCTION FOR US GOVERNMENT CCC BIDS**

**(1968-72 estimates)**

**KRAUSS MILLING/LANHOFT**

Raw materials	100
Processing (dry blend)	4
Package (overseas export bag)	20
Gross Profit (5%)	<u>6</u>
Price to Government at factory	130

Competitive bids for US Government who will distribute huge volumes. No marketing expenses.

J 6

G.P.

MAXWELL HOUSE  
VACUUM PACKED COFFEE  
(1 LB. CAN)

Raw material	100
Roasting loss	22
Process	6
Package	8
Production Cost	136
Gross Profit (12%)	16
Wholesaler (4%)	6
Retailer (5%)	8
Consumer Price	166

Note: Market leader, huge volumes, U.S. consumer pack "commodity".  
Raw material "value" is high, thus value added in proportion  
to raw material is low