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20395



**Federal Institute of Industrial Research Oshodi**

(Federal Ministry of Industry)

Abuja, Nigeria.

UNIDO CONTRACT NO. 91/04

PROJECT NO. XA/RAF 90/632

Final Report

**Title: Transfer of Technology for Cassava  
Processing**

REPORT OF

Training Workshops

HELD IN

Togo, Cameroun, Ghana, Zaire & Sierra Leone

SUBMITTED BY

**FIRO**

AND

**Dr. O. A. Koleoso**

PROJECT COORDINATOR

April 1993

FINAL REPORT

TITLE: TRANSFER OF TECHNOLOGY FOR CASSAVA PROCESSING

REPORT OF

TRAINING WORKSHOPS

HELD IN

1. TOGO
2. CAMEROUN
3. GHANA
4. ZAIRE
5. SIERRA LEONE

SUBMITTED BY

FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH. OSHODI.  
LAGOS. NIGERIA

AND

DR. O. A. KOLEOSO  
PROJECT COORDINATOR

APRIL. 1993

#### ACKNOWLEDGEMENTS

The Institute acknowledges the contributions of the following to the success of the project: Dr. O. A. Koleoso for over-seeing the preparation of this report; Mr. O. O. Onyekwere - Project Leader/Trainer, for compiling the report; Mr. A. A. Adeagbo - Engineer/Trainer; Messrs I. Kalu and A. Sangonuga for installation of the Cassava Processing equipment and Mr. F. A. Oyewusi, for technical assistance.

## SUMMARY

The training programme was preceded by the visits of the contractor's technicians who installed and commissioned the equipment. In all places where the equipment was not properly installed, such errors were corrected by the contractor's engineer who also utilised such to further train the technicians. The training was conducted by an engineer and a Food Scientist and supervised by the Project Coordinator. In all instances, the participants were first briefed on the history and objectives of the programme before they were split into two groups of technicians/engineers and processors. Where there were a large number of them, they were divided into smaller groups. The technicians were exposed to the components, assembly, maintenance, trouble-shooting and spares of each of the seven units of equipment that make up the cassava processing equipment. The engineering blue-print of the equipment was discussed with them for the purpose of duplicating the equipment locally. The technicians also stayed on throughout the training of the processors to maintain the equipment and to start the diesel engine. The processors were also exposed to the function of every unit of the equipment and after demonstrations they were allowed, under close supervision, to use all the various units to process the three products a few days towards the end of the course. The training was usually rounded up by cooking some of the products made and conducting a palatable test on them.

This was followed by the filling of separate questionnaires by the technicians and processors, singly or in groups. Before the trainers left each country debriefing session was usually held with the UNIDO Country Director or their representatives to discuss the training and their future plans for the project. Samples of the cassava products made at the training were also left with them.

The training was successful in every country despite the problem of breakage of the wooden paddle. In Togo, the absence of engineers in the training gave the training team some concern as to its future. In Togo and Cameroun, the diesel engines developed some fault which was corrected for the training; details of which are discussed.

It was noticed that the large number of women participants in Cameroun thinned down as the training progressed due to other engagements. The FAO representative there agreed to second one of his capable staff who was at the training course to head the project and also to train the women in management and marketing. In Ghana and in Zaire, the high calibre of participants among the technicians was indicative of the possibility of easy replication of the equipment although it is suggested that one of the engineers from Zaire should visit the Federal Institute of Industrial Research to acquaint himself of further improvements in the equipment. Although the fryer/dryer chamber was heated with gas in other places, it had to be converted for the use of charcoal in Sierra Leone because of lack of gas there. The UNIDO representative there has decided to hand over the equipment to a company within a UNIDO Growth Centre because it is claimed that the project would flop if it is handed over to the government.

Although the use of charcoal turned out to be cumbersome, good products were nevertheless obtained. It is concluded that because of the versatility of the equipment in all places it was installed UNIDO should consider extending similar facilities to some other important cassava countries such as Congo, Benin, Cote d'Ivoire, etc. It is also recommended that several other technologies available at the Federal Institute of Industrial Research, Oshodi, Lagos such as bottled preserved palm wine, laundry soap, cosmetics and others be taken up for adoption by other African nations.

From the experience gathered during the training, it is concluded that the performance of the contractor's equipment can be improved by replacing the water-cooled diesel engine with an air-cooled one and by changing the wooden paddles in the fryer/dryer unit to metal.

## TABLE OF CONTENTS

		PAGE
	ACKNOWLEDGEMENT	1
	SUMMARY	2
1.0	Introduction	6
2.0	Preparatory activities	11
3.0	Training Workshops	12
3.1	Training in Togo	14
3.2	Training of the technicians (Togo)	14
3.3	Training of the processors (Togo)	15
3.4	Post-training debriefing (Togo)	15
3.5	Post-training problems (Togo)	16
3.6	Training in Cameroun	21
3.7	Training of the technicians (Cameroun)	21
3.8	Training of the processors (Cameroun)	21
3.9	Problems during training (Cameroun)	23
3.10	Post-training debriefing (Cameroun)	28
3.11	Training in Ghana	28
3.12	Training of the technicians (Ghana)	28
3.13	Training of the processors (Ghana)	29
3.14	Post-training debriefing (Ghana)	30
3.15	Training in Zaire	35
3.16	Training of the technicians (Zaire)	35
3.17	Training of the processors (Zaire)	35
3.18	Post-training debriefing (Zaire)	36
3.19	Training in Sierra Leone	42
3.20	Training of the technicians (Sierra Leone)	42
3.21	Training of the processors (Sierra Leone)	43
3.22	Post-training debriefing (Sierra Leone)	44
4.0	General Observations	49
4.1	- in Togo	49
4.2	- in Cameroun	49
4.3	- in Ghana	50
4.4	- in Zaire	50
4.5	- in Sierra Leone	51
5.0	Recommendations	52
5.1	Togo	52
5.2	Cameroun	52
5.3	Ghana	53

TABLE OF CONTENTS (Contd.)

	PAGE
5.4        Zaire	53
5.5        Sierra Leone	53
6.0        CONCLUSION	55
7.0        FOLLOW-UP ACTION	55
ANNEXES 1 - 9	
1.        Provisional work plan	7
2.        Circular letter	8
3.        Training schedule in various places	11
4a.b.c.   Questionnaire evaluation and photographs in Togo	17
5a.b.c.   Questionnaire evaluation and photographs in Cameroun	24
6a.b.c.   Questionnaire evaluation and photographs in Ghana	31
7a.b.c.   Questionnaire evaluation and photographs in Zaire	38
8a.b.c.   Questionnaire evaluation and photographs in Sierra Leone	45
9a.b.c.   Follow-up action letters	56



## INTRODUCTION

### 1.0 INTRODUCTION

The United Nations Industrial Development Organisation (UNIDO) commissioned in 1987 the Federal Institute of Industrial Research, Oshodi (FIIRO) in Lagos, Nigeria to develop and build a small-scale, low cost, energy efficient equipment for cassava processing into gari and other African food varieties. In collaboration with the African Regional Centre for Engineering Design and Manufacturing (ARCEDEM) Ibadan, Nigeria, a batch-type of the equipment was developed and successfully demonstrated in FIIRO and some rural gari producing places in Nigeria. An improved and continuous version of the fryer and drier was however later developed by FIIRO and used in subsequent processes.

Following the successful completion of the project in December, 1989 UNIDO then commissioned FIIRO in 1990 to:

- i) instal, operate, monitor and demonstrate the technology of cassava processing into various cassava products in five countries - Cameroun, Ghana, Sierra Leone, Togo and Zaire;
- ii) conduct a training workshop for training local experts in the design and local manufacture of the equipment, as well as its operation and maintenance.

To oversee and co-ordinate the training programme, UNIDO appointed Dr. O. A. Koleoso, the then retiring Director of FIIRO, as consultant to the project. Specifically Dr. Koleoso was to:

- i) Assist in elaborating the course outline and course content and in preparing the documentation for the training workshop.
- ii) Organise the training workshop (2 weeks per country) and co-ordinate the inputs of the FIIRO experts participating in the technology demonstration and the training workshop in the selected countries.
- iii) Prepare, in co-operation with participating FIIRO experts a report on the demonstration and training programme in each of the five countries.

ANNEX I

PROVISIONAL WORK PLAN

COUNTRY	TIME FOR INSTALLATION AND TRAINING
Cameroun	January / February, 1991
Sierra Leone	March / April, 1991
Togo	May / June, 1991
Ghana	July / August, 1991
Zaire	September / October, 1991

NOTE: It was not possible to adhere to this plan due to problems discussed in the text.



# Jide Koleoso and Associates

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ANNEX 2

Postal Address

P.O. Box 6096  
Ikeja,  
Lagos,  
Nigeria

Our Ref: JKA/4.21/1/98.

Your Ref:

Date: 26/09/91

Dear Sir,

RE: UNIDO PROJECT NO. XA/RAF/90/632

TRANSFER OF TECHNOLOGY FOR CASSAVA PROCESSING INTO GARI AND OTHER  
AFRICAN FOODS

The United Nations Industrial Development Organisation (UNIDO) has in 1987 commissioned the Federal Institute of Industrial Research, Oshodi (FIIR) to develop and build a small-scale, low cost, energy-efficient plant for processing cassava into gari and other African foods. Following successful completion of this project in 1989, UNIDO embarked <sup>on</sup> ~~as~~ the second phase of the project which is to share the experience acquired in FIIR and in Nigeria through demonstration of the plant in several places there with selected African countries, your country of accreditation inclusive. These countries are to be assisted by FIIR to acquire the expertise and know-how to design locally, manufacture, operate and maintain the plant through installation and demonstration of similar plant in your country of accreditation, and through the organisation of a workshop for training of local experts on the design, manufacture, operation and maintenance of the plant.

I have been appointed by UNIDO as co-ordinator for the training part of the above project. The cassava processing plants have been built and dispatched to various countries, including yours, by the Federal Institute of Industrial Research, Oshodi, (FIIR), Lagos, Nigeria. It is hoped that your office will collect the gari plant from the port to site chosen for installation. It will be appreciated if you will inform the UNIDO country Director in Lagos, Nigeria, or FIIR whose address will be given below, or this office using the address above, as soon as the plant is taken to site and other materials needed for installation, commissioning, and demonstration are bought and taken to site. Once this is done FIIR will



associates

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Ikeja,  
Lagos,  
Nigeria

Our Ref:

Your Ref:

Date:

-2-

dispatch the installation team and this will be followed by the training team.

In selecting the participants for the training, it will very much be appreciated if the right type of people are chosen. Broadly ~~spoken~~ there ~~are~~ ~~two~~ will be two groups of participants. The first group will consist of engineering firms- both public and private companies, organisations or institutions of higher learning with engineering capabilities which can take up the design to be submitted by FIIRO and undertake future fabrication of the plant for entrepreneurs in the country. The second group of participants will consist of processors of cassava into gari or foofoo (cassava flour ). This group will undertake training on the use of the plant. It is expected, however, that the first group will also remain behind to learn more on the operation of the plant.

Thank you and see you later.

Yours faithfully,

Dr. O. A. Koleoso

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Ikeja, Lagos, NIGERIA

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United Nations Development Programme,  
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Freetown, Sierra Leone

The Resident Representative  
United Nations Development Programme  
B. P. 7248  
Kinshasa, Zaire.

## 2.10 PREPARATORY ACTIVITIES

A provisional work plan (as given in Annex 1) which was submitted previously could not be followed because of delays encountered by the various Resident Representatives of the UNDP in clearing the equipment from the ports in the various countries, coupled with political unrests in some of those countries visited.

The coordinator also sent a circular letter (annex 2) to the UNDP Resident Representatives in the five countries informing them of the training programme and requesting them to organise the participants into two groups, namely, the technicians and the processors.

A processing manual had also been prepared by FIRO in English and French along with detailed engineering drawings of all the component machines of the equipment (which is a blue-print to enable the entire equipment to be reproduced in the countries where the equipment is to be installed) for each of the countries.

### Annex 3

#### SITES AND DATES FOR EQUIPMENT INSTALLATION, COMMISSIONING AND TRAINING IN VARIOUS COUNTRIES

Country	Installation site	Installation/ Commissioning Dates	Training Dates
Togo	Institut des Plante a Tubercles (INPT) at Davie near Lome	27 Sept.-11 Oct. 1991	14 Oct. - 26 Oct. 1991
Cameroun	Saba Ndop Village near Bamenda	19 Oct. - 8 Nov. 1991	9 - 22 Nov. 1991
Ghana	Pokuase Cassava Demonstration Centre near Accra	25 Nov. - 6 Dec. 1991	9 - 20 Dec. 1991
Zaire	Programme Nationale Manioc (PRONAM), M'Vuazi, Bas.	21. July - 7 Aug. 1992	11 - 25 Aug. 1992
Sierra Leone	UNIDO Growth Centre at Bo.	7 - 18 Sept. 1992	21 Sept. - 5 Oct. 1992

## 3.10 TRAINING WORKSHOPS

In all cases the training programme was preceded by visits of the technicians and technologists from the Federal Institute of Industrial Research to install and commission the equipment. In places where the equipment was not properly installed, such errors were corrected by the FIIRG Engineer, who also utilized such to further train the technicians. In all places, except in Sierra Leone, the crates of the equipment to be installed were opened by the installation technician himself.

The training periods of two weeks in the different countries (shown in annex 3) generally took place immediately after the equipment had been commissioned. The training team consisted of Mr. O. G. Onyekwere (Project Leader and Food Scientist) and Mr. A. A. Adeagbo (an Engineer on the Project) both from FIIRG while Dr. G. A. Koleoso was the Consultant and Coordinator on the Project. In general, the training team paid courtesy calls to the UNIDO Country Director as well as the Director/Chief Executive of the recipient institution as soon as they arrived in each country for briefing before proceeding to the site of installation of the equipment for the training workshop.

The format of the training in every instance was the same and was as follows:

In each country, the participants were first briefed on the history, aim and objectives of the project before they were split into two groups consisting of processors and the technicians.

The technicians were trained on the characteristics, installation and maintenance of each equipment and were also taken through the engineering drawings of the component machines. They stayed on with the participants being trained on the use of equipment for processing cassava, to start the engine and carry out routine maintenance, and to light the gas burners being used to dry the product in the frier/dryer machine, as well as change the cooling water. The processors were generally briefed on the entire process of producing gari, cassava flour and fufu using each unit equipment. They were then shown how to use each unit machine while every

person in each group tried her/his hand on each of the unit machines as the training progressed. Each group was later given some quantity of cassava to peel and process to gari, flour and fufu. They also weighed, packaged and sealed the finished products in polythene bags provided.

All the participants were taught in simple Pidgeon English and in non-English speaking countries, French-speaking interpreters among the trainees were utilised. The processing manuals prepared were not used as such in the lectures but were handed over to the Director of the Institution prior to the end of the training to enable their supervisors to study the booklets and have opportunity to discuss their contents with the trainers so that they will not have any unanswered question at the end of the programme.

At the end of the training palatability tests were carried out by everyone on the food cooked from the cassava products using soup prepared by the participants. This was followed by the evaluation of the training exercise through questionnaires by the participants to find out the extent of their understanding of -

- i) the use of the equipment for processing
- ii) the quality of the products in the instance of the processors and
- iii) the equipment, for the technicians.

These questionnaires were filled either individually or in groups depending on the number of participants. The average scores for the processors and for the technicians are given in this report, special emphasis being placed on safety and hygiene during the training in order that the habit of good hygiene can be imbibed.

The training was generally concluded by a debriefing session with UNIDO/UNDP authorities in the capital cities. Some processed products (gari, flour, fufu) were left with them as evidence of success of the training programme and the future of the project was always in focus.

The technical (engineering) drawings of the equipment were handed over to the UNDP representative while the process booklets and the diesel engine maintenance manual were



retained by the head of the institution having the equipment. Furthermore, FIIRG trainers signed the warranty papers which they delivered to the UNDP/UNIDO representative, who also received a copy of the interim report of the training programme in the country.

### 3.1 TRAINING IN TOGO

The training team arrived in Lome on 14th October, 1991. After holding a brief discussion with UNIDO Country director, Mr. Vencatachellum as well as the Director of Institut des Plantes a Tubercles (INPT) Lome, Dr. Kodjo Teteri, proceeded to the Davie Station of INPT situated about 30 km outside Lome where the equipment had been installed for the training.

The Davie field station of the Institute is mainly involved in the processing of roots and tubers particularly the processing of cassava into gari and cassava flour using traditional techniques for which it employs the services of some local women on temporary basis.

The Institute however, has some technicians permanently employed to service its farm equipment and generators installed in the station as well as supervising the women processing the cassava. The training activities thus took place under the above setting.

### 3.2 TRAINING OF THE TECHNICIANS (TOGO)

The following technicians who took part in the training were already permanent staff of INPT, Davie.

1. Mr. A. Honsou - Technician (Head)
2. Mr. L. Agba - Technician (Assistant Head)
3. Mr. K. Ahondu - Technician
4. Mr. K. Missindu - Technician
5. Mr. B. Locoh - Fitter
6. Mr. K. Atiegc - Technician

The Coordinator, in an earlier discussion with the Director of INPT, Mr. Kodjo Tetevi, had requested for the inclusion of local fabricators and other engineering companies with capabilities and facilities for interpreting engineering

drawings, in the list of trainees. Although the director promised to contact the relevant companies, none of them showed up before the end of the training.

### 3.3 TRAINING OF THE PROCESSORS (TOGO)

The team of processors consisted of:

1. Madam Alonwa Gbessa
2. Madam Ama Ghanke
3. Madam Ama Tancou
4. Madam Dovi Passah
5. Madam Agbodzinsi Klomega

These were women from the locality employed on casual basis by the Institute to process cassava into gari and cassava flour for export, using traditional techniques of sun-drying for the flour ("Kokonte") and gari.

The summary of the questionnaires completed by the trainees is shown in Annexes 4a and 4b.

### 3.4 POST-TRAINING DE-BRIEFING

A debriefing session was held at the office of the UNIDO Country Director at the end of the course. Mr. Tetevi being also in attendance. At the meeting we were informed that the earlier plan to have the Honourable Minister for Rural Development invited to close the workshop and for the formal transfer of the equipment from UNIDO to his Ministry, could not take place because of his busy schedule.

It was however agreed that UNIDO will forward a letter to the Hon. Minister proposing the formal handing over of the equipment to his Ministry on the 20th November, 1991, which was the "African Industrialisation Day". The need for publicity during the handing over ceremony was stressed to enable as many people as possible to be aware of such facilities in the country and to make use of them.

On local fabrication of the equipment, the Director of the Institute was to contact a quasi-government engineering firm in Togo to study the technical drawings handed over to him for initial production of a prototype with financial assistance from the government of Togo.

The economic advantages of the equipment vis-a-vis the traditional method were also discussed. It was obvious from the discussion that this low-technology mechanised equipment has many advantages over the traditional hand-operated system besides its convenience, time saving and flexibility in making other cassava-based food products, apart from gari. Finally, the technical drawings were handed over to Mr. Tetevi including the warranty paper.

### 3.5 POST-TRAINING PROBLEMS (TOGO)

Barely a month after the departure of the trainers, a letter dated 12 December, 1991 was received from the UNIDO Country Director in Togo that the diesel engine which is the prime mover of the entire equipment had broken down. This engine was extensively test-run for 3 months in our factory at the time we were collecting data on the performance of the cassava processing equipment before it was shipped, and during the entire period of testing, we did not observe any defects. We were, however, very embarrassed when it was reported that it broke down so soon after our departure. The major fault in the engine was the failure of the injector pump.

Although the letter about the breakdown reached the Institute towards the end of December 1991, all the trainers had gone on vacation after completing the training in Ghana just before Christmas, resuming in February, 1992. However, the fitter in INPT, Togo requested for nearly all the major parts of the engine as spares and it took a month to get so many parts together because we were anxious to satisfy them. For these reasons, our engineer and a processing technician could not proceed to Togo until first week in April, 1992.

In order that future problems would not arise through wrong operation of the unit machines, our process technician in the team spent another two days with the processors and technicians in order to further increase their confidence. Other minor complaints about the sifter and the screw press were mainly on aesthetics, and all were taken care of to the complete satisfaction of Mr. Locoh, the fitter.

It was, however, regrettable that the breakdown of the diesel engine disrupted the plan of UNIDO authorities in Togo to hand over the cassava processing equipment to the Government of Togo on the "African Industrialization Day" (i.e 20th November, 1991).

ANNEX 4a

FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH

CONTRACT NO. 21/04

UNIDO PROJECT NO. RA/TAT/60/600

Cassava processing equipment

EVALUATION OF ENGINEERING LECTURES/DEMONSTRATIONS

COUNTRY: TOGO

DATE 25 October 1991

TOPICS	APPRAISAL (Mark 'X' at appropriate column)				
	EXCELLENT	VERY GOOD	GOOD	FAIRLY GOOD	POOR
1. Interpretation and explanation of engineering drawings		X			
2. Explanations of the design principles and parameters		X			
3. Information on the fabrications and assembly of the equipment			X		
4. Installation methods for the gari processing machines		X			
5. Operating Procedures for the equipment			X		
6. Discussions on how to carry out routine maintenance of the equipment			X		
7. How to run and maintain the diesel engine			X		
8. Discussions on major spare parts required and how to keep them				X	
9. Trouble-shooting likely when running the equipment and how to tackle them.				X	
10. Overall assessment			X		

ANNEX 4b

FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH

CONTRACT NO. 91/84

UNIDO PROJECT NO. XA/RAT/90/532

EVALUATION OF CASSAVA PROCESSING LECTURE/DEMONSTRATION/PRACTICALS  
FOR GARI AND CASSAVA FLOUR

TOGO

COUNTRY: .....

DATE: 25 October 1991

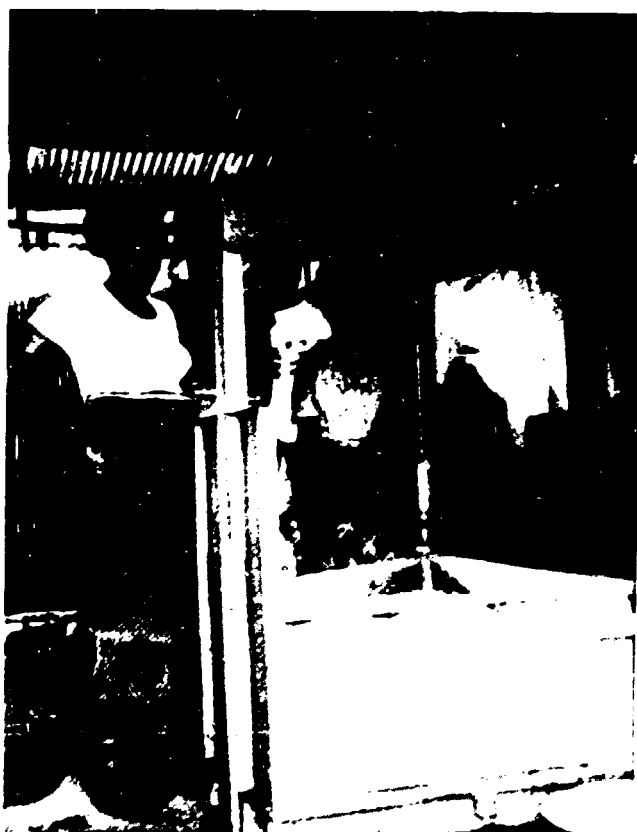
TOPICS	C O L U M N S				
	EXCELLENT	VERY GOOD	GOOD	FAIRLY GOOD	POOR
1. Use and processing with grating machine.			x		
2. Use and processing with screw press		x			
3. Use and processing with garifyer/dryer.			x		
4. Diesel engine operation	Not applicable				
5. Use and processing with the sifter		x			
6. Use and processing with milling machine			x		
7. Discussion and practice of gari processing			x		
8. Discussion and practice of flour procession from cassava			x		
9. Safety precautions for staff			x		
10. Assessment of the gari produced		x			
11. Assessment of the flour produced			x		
12. Score your ability to operate the cassava processing equipment			x		
13. Your over-all assessment of the training			x		



TRADITIONAL ROASTING OF GARI BY WOMEN IN THE INSTITUTE



MECHANICAL FRIER/DRYER AT WORK  
SHOWING ROTATING PADDLES.



MECHANICAL PRESSING OF BAGGED  
CASSAVA PULP



TECHNICIANS MAINTAINING THE DIESEL ENGINE



MECHANICAL SIFTER IN OPERATION.

### 3.15 TRAINING IN CAMEROUN

On arrival in Bamenda, the training team paid a courtesy call and had preliminary discussion with Mr. Aliou Diop - the Chief Technical Officer, UNDP / FAO representative there, before proceeding to Baba Ndop - the venue of the training. Baba Ndop is a farming community where 36 women had organised themselves into a Women Co-operative association, with a President, Secretary and Treasurer. Some of these women own cassava plantations and process their cassava into gari using traditional technology, while others collect the gari produced and sell it in the cities. Even though the officers were literate in English, most of the participants were not but could communicate in pidgeon English.

### 3.7 TRAINING OF THE TECHNICIANS (CAMEROUN)

The technical staff participants consisted mainly of:

- a) Mr. Boniface Wanzie who is a German-trained mechanical engineer presently engaged in production of equipment such as solar heaters, firewood cookers, etc. in Bamenda;
- b) Two artisans - Messrs Abdu R. Punghum and Jonas Yengeh who were operating in the village as automobile mechanics and had earlier assisted with the installation of the equipment. While Mr. Wanzie went through the engineering drawings, the two artisans stayed behind during processing.

### 3.8 TRAINING OF THE PROCESSORS (CAMEROUN)

The 36 women co-operative members were joined briefly by the FAO staff from both Bafoussam and Bamenda to use the equipment for the processing of cassava into gari (white and yellow), cassava flour and fufu.



LIST OF PROCESSORS IN CAMEROON TRAINING FROM THE MEMBERS OF WOMEN  
CO-OPERATIVE ASSOCIATION

GROUP ONE

- |                      |                        |
|----------------------|------------------------|
| 1. Tassima Kife      | 2. Adama Tita          |
| 2. Alina Mbek        | 4. Theresia Repeh      |
| 3. Mochangfor Shetu  | 6. Francisca Nenewo    |
| 4. Theresia Fonwunja | 8. Magret Mafech       |
| 5. Frida Landi       | 10. Celina Mbruwonyidi |
| 11. Mama Paulina     | 12. Samaoyd Mengikog   |

GROUP TWO

- |                    |                      |
|--------------------|----------------------|
| 1. Christina Fonwo | 2. Anasticia Fognjem |
| 3. Roseline Moh    | 4. Elizabeth Tita    |
| 5. Shetu Tita      | 6. Ramafouh Moh      |
| 7. Mariama Moh     | 8. Adama Moh         |
| 9. Ajasa Ngam      |                      |

GROUP THREE

- |                       |                             |
|-----------------------|-----------------------------|
| 1. Victoria Linijeneh | 2. Mariama Yumbock          |
| 3. Allijara Njiewu    | 4. Ramatu Moh               |
| 5. Adija Kewoh        | 6. Helin Titi               |
| 7. Popti Prodenia     | 8. Awa Moh                  |
| 9. Agnes Nisangni     | 10. Francisca Robwondze Moh |
| 11. Elizabeth Tita    | 12. Mariama Moh             |

UNDP/FAO STAFF PARTICIPANTS

- |                     |   |                                      |
|---------------------|---|--------------------------------------|
| 1. Mary Nsam Ngeh   | - | Senior Agric. Technician FAO Bamenda |
| 2. Theophile Tomeba | - | Ing. Agronome B.P. 514 Bafoussam     |
| 3. Martin Tazanou   | - | Ing. Agronome B.P. 514 Bafoussam     |
| 4. Alfred Lounou    | - | Technician d'Agriculture Bamenda     |
| 5. Michiel Abongwa  | - | Technician d'Agriculture Bamenda     |
| 6. Joseph Nongmiya  | - | Village Extension Worker, Ndop       |
| 7. Anna Lafu        | - | Community development Asst. Ndop.    |

In view of the large number of people involved, the women processors were divided into three groups on a daily rotational basis while the FAO staff members were left intact

to attend daily. It is worth noting that, of the FAO group, Mr. Michael Forsuh Abongwa was the most consistent and one that is best placed to take over the leadership of the group after our departure. Each group supplied cassava roots which were processed into gari and cassava flour using equipment after initial demonstration by the trainer.

At the end of the training, questionnaires were given to each of the women groups, including Mr. M. Abongwa (Agricultural Technician from Bamenda), Mrs. Anna Beri lafu (Community Development Assistant), Mr. Joseph Nongmiyia (Village Extension Worker), to Engineer Boniface Wanzie and to the two artisans. The responses from the questionnaires on engineering and processing are given in Annexes 5a, 5b.

### 3.3 PROBLEMS DURING TRAINING (CAMEROUN)

It was discovered during installation of the equipment that the metal dip-stick to the diesel engine sump had got broken into pieces and were swallowed up in the engine oil. Also the casting of the exhaust manifold was cracked, which were indications that the engine might have dropped accidentally in transit. The engineer retrieved the dip-stick pieces and welded them together as well as welding the cracked manifold.

Suspicious of possible damage to the engine were confirmed later when, it developed a strange banging noise suddenly during the training session. When the engine was opened it was discovered that the timing gear broke to pieces into the engine sump and also that the main bearing bushes had developed big clearance as a result of the vibrations. These problems gave rise to stoppages. The faults were eventually cleared by replacing the timing system and the two main bearing bushes including a new set of piston and rings while the old one was kept as spare. Thereafter, the equipment performed satisfactorily to complete the training. However, in order to instil confidence in the operators, a new water-cooled engine was promised by FIIRO and this was air-freighted to UNDP, Younde in March 1992. The repaired one was to be sold locally and the proceeds returned to FIIRO.

## ANNEX 5 a

FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH

CONTRACT NO. 91/04

UNIDO PROJECT NO. XA/DAF/90/600

Cassava processing equipment

EVALUATION OF ENGINEERING LECTURES/DEMONSTRATIONS

COUNTRY: CAMEROUN

DATE 21 November 1991

TOPICS	APPRAISAL (Mark 'X' at appropriate column)				
	EXCELLENT	VERY GOOD	GOOD	FAIRLY GOOD	POOR
1. Interpretation and explanation of engineering drawings		X			
2. Explanations of the design principles and parameters			X		
3. Information on the fabrications and assembly of the equipment			X		
4. Installation methods for the qari processing machines				X	
5. Operating Procedures for the equipment		X			
6. Discussions on how to carry out routine maintenance of the equipment			X		
7. How to run and maintain the diesel engine		X			
8. Discussions on major spare parts required and how to keep them		X			
9. Trouble-shooting likely when running the equipment and how to tackle them.		X			
10. Overall assessment		X			

FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH

CONTRACT NO. 91/84

UNIDO PROJECT NO. XA/RAF/90/633

EVALUATION OF CASSAVA PROCESSING LECTURE/DEMONSTRATION/PRACTICALS  
FOR GARI AND CASSAVA FLOUR

ANNEX 5b

COUNTRY: CAMEROUN

DATE: 21 November 1991

TOPICS	C O L U M N S				
	EXCELLENT	VERY GOOD	GOOD	FAIRLY GOOD	POOR/VERY POOR
1. Use and processing with grating machine.			X		
2. Use and processing with screw press			X		
3. Use and processing with garifyer/dryer.			X		
4. Diesel engine operation	Not applicable				
5. Use and processing with the sifter		X			
6. Use and processing with milling machine			X		
7. Discussion and practice of gari processing		X			
8. Discussion and practice of flour procession from cassava		X			
9. Safety precautions for staff				X	
10. Assessment of the gari produced			X		
11. Assessment of the flour produced		X			
12. Score your ability to operate the cassava processing equipment			X		
13. Your over-all assessment of the training			X		



MANUAL PEELING OF CASSAVA



SIFTING FOR FUFU PRODUCTION



FEEDING THE FRIER FROM THE HOPPER END



PROCESSORS WATCH THE FRIER/DRYER IN OPERATION.

### 3.10 POST-TRAINING DEBRIEFING (CAMEROUN)

A debriefing session was held with Mr. Diop who informed us that FAO intended to extend the training given to the Women Cooperative Association by way of organising a management, costing and marketing training. Mr. Diop also agreed to leave Mr. Abongwa on the project as head in line with the recommendation of the training team. He also promised to introduce to the Association a better variety of cassava, as the variety used would not soften in water easily during fufu preparation in that place. This also explained why the Association concentrated on gari alone. The warranty for the equipment was delivered to Mr. Diop while the processing manual was kept by Mr. Abongwa.

### 3.11 TRAINING IN GHANA

Prior to the training, courtesy calls had been made and discussion held with the UNIDO representative Dr. Thomas Bernklau, the Director of Food Research Institute Mr. Eyeson and the Director of Industrial Research Institute.

The training programme in Ghana took place at Pokuase near Accra from 9th to 20th December, 1991 at a cassava processing demonstration centre jointly set up by the African Regional Centre for Technology based in Dakar, Senegal, the Food Research Institute and the Council for Scientific and Industrial Research Institute. The centre had been provided with a number of unit cassava processing equipment such as graters, presses (screw and hydraulic types), milling and sifting machines all of which were electrically operated, some of which were of smaller capacity while others were of bigger capacity than those supplied by UNIDO through FIIRO. However, the frying of cassava to gari is still being traditionally carried out while the cassava flour (Kokonte) was being sun-dried before milling. In addition, the centre has its own paid staff of processors and technicians.

### 3.12 TRAINING OF TECHNICIANS (GHANA)

The training of engineers and technicians took place simultaneously with that of processors. In line with an earlier letter on the training programme circulated by the coordinator.

the Food Research Institute had invited private engineering companies who sent some of their engineers and technicians to join those of the Food and Industrial Research Institutes. On the whole, fourteen engineers/technicians took part in the training.

#### LIST OF TECHNICIANS/ENGINEERS (GHANA)

1.	Ben Mensah	-	F.R.I. (Food Scientist)
2.	S. K. Darko	-	Agricultural Engineers Ltd.
3.	J. B. Arthur	-	Agbemskod Engineering Ltd.
4.	G. K. Agemenya	-	Agbemskod Engineering Ltd.
5.	Dodji M. Attigbe	-	F.R.I. Accra (Eng.)
6.	W. K. Amca-Awua	-	F.R.I. (Scientist)
7.	John Aryectey	-	F.R.I. Pokoase - Accra (Artisan)
8.	Charles Takiji Yeboh		F.R.I. Accra (Tech)
9.	Joseph L. Lamptey	-	F.R.I. Accra (Technician)
10.	Ernestina Amah	-	F.R.I. Pokoase
11.	Emmanuel Kpogli	-	F.R.I. Accra (Eng.)
12.	David R. A. Hohu	-	F.R.I. Accraz (Tech.)
13.	Kofi G. King	-	Hormeku Eng. Ltd. Tema (eng.)
14.	Adolf Hormeku	-	Ashiaman - Tema

#### 3.13 TRAINING OF THE PROCESSORS (GHANA)

The processors trained on the operation of the equipment were essentially staff of the centre, along with their technicians. They were allowed under supervision to produce gari, flour and fufu and package them using the heat sealer provided. Their responses to questionnaires are in Annex 6a, 6b.

#### LIST OF PROCESSORS (GHANA)

1.	Torgbui Makafui	-	Processor
2.	Innocentia Ayitey	-	Processo
3.	Ernestina armah	-	Processor/Technician Helper
4.	Doris Mienuye	-	Processor
5.	Matilda Serwah	-	Processor
6.	Rose Dornyoa	-	Processor
7.	Gladys Odonkor	-	Processor
8.	Soshie Adjase	-	Processor
9.	Peter Dalabor	-	Electrician



- 10. John Aryeetey - Processor/Technician
- 11. Forster Akplaga - Processor/Diesel eng. Caretaker
- 12. Christopher Sogbey - Processor
- 13. Nuru Adamu - Labour/Processor Helper
- 14. Ernest Abloa - Supervisor

A visit was made to one of the participating privately-owned engineering companies - "Hormeku Engineering Works Ltd." at the request of the Managing Director in Tema. This company was already involved in the manufacture of a number of unit equipment for processing cassava.

The Managing Director of the company was advised to see the Director of Food Research Institute, Accra if he was interested in the cassava processing equipment.

### 3.14 POST-TRAINING DEBRIEFING (GHANA)

A debriefing session was held on December 20, 1991 in the office of the Director, FRI, with some members of his staff in attendance, in addition to the UNIDO country officer - Dr. Bernklau and Mr. S. Ndam, the Head of the UNIDO's African Programme, who happened to be in Accra on another mission at the time. The meeting was briefed about the training held and the various suggestions made during the training. The warranty papers and engineering blueprints were handed over to the UNIDO representative, while the operating manuals were left with the Director of FRI. It was agreed that arrangements be made by Mr. Eyeson and Dr. Thomas Bernklau to arrange formal handing-over ceremony with video recording, to the Government of Ghana. On the release of the blueprint, Mr. Ndam promised to discuss with the UNIDO contract section on conditions for such and transmit same to Dr. Bernklau.

ANNEX 6a

FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH

CONTRACT NO. 94/84

APPROPRIATE NO. FA/PT/199/1007

Passive processing equipment

EVALUATION OF ENGINEERING LITERATURE/DEMONSTRATIONS

COUNTRY: GHANA

DATE 20 December 1991

		APPRAISAL (Mark 'X' at appropriate column)				
TOPIC		EXCELLENT	VERY GOOD	GOOD	FAIRLY GOOD	POOR
1.	Interpretation and explanation of engineering drawings		X			
2.	Explanations of the design principles and parameters	X				
3.	Information on the fabrications and assembly of the equipment	X				
4.	Installation methods for the gari processing machines			X		
5.	Operating Procedures for the equipment		X			
6.	Discussions on how to carry out routine maintenance of the equipment	X				
7.	How to run and maintain the diesel engine	X				
8.	Discussions on major spare parts required and how to keep them		X			
9.	Trouble-shooting likely when running the equipment and how to tackle them.		X			
10.	Overall assessment		X			

FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH

CONTRACT NO. 81/04

UNIDO PROJECT NO. HA/PAT/90/600

EVALUATION OF CASSAVA PROCESSING TECHNOLOGY DEMONSTRATION/PRACTICALS  
FOR GARI AND CASSAVA FLOUR

ANNEX 6b

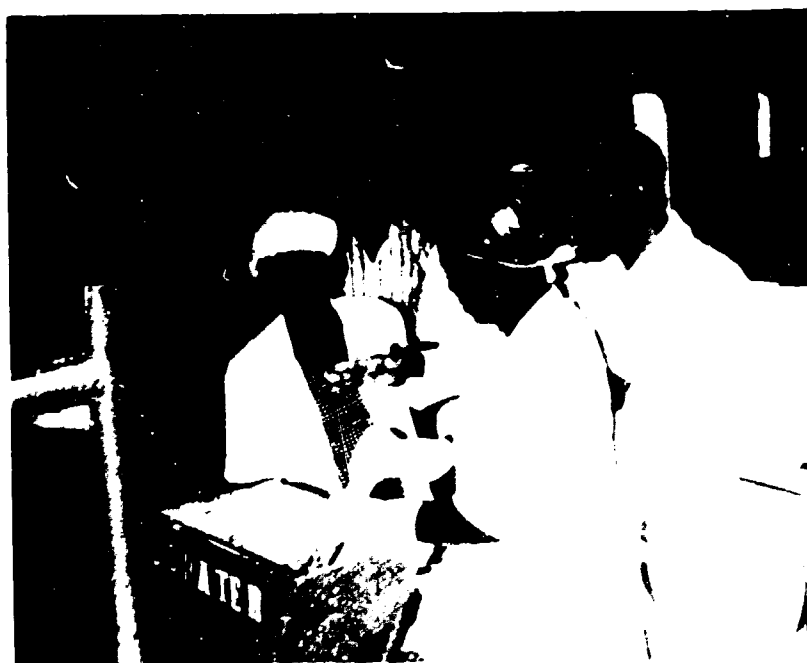
COUNTRY: GHANA

DATE: 20 December 1991

		C O L U M N S					
TOPICS		EXCELLENT	VERY GOOD	GOOD	FAIRLY GOOD	POOR	VERY POOR
1.	Use and processing with grating machine.				X		
2.	Use and processing with screw press			X			
3.	Use and processing with garifyer/dryer.			X			
4.	Diesel engine operation	Not applicable					
5.	Use and processing with the sifter	X					
6.	Use and processing with milling machine				X		
7.	Discussion and practice of gari processing			X			
8.	Discussion and practice of flour procession from cassava			X			
9.	Safety precautions for staff	X					
10.	Assessment of the gari produced			X			
11.	Assessment of the flour produced			X			
12.	Score your ability to operate the cassava processing equipment			X			
13.	Your over-all assessment of the training		X				



PHOTOGRAPH OF PARTICIPANTS AND TRAINERS.



FUNCTIONS OF THE GRATER DISCUSSED



TECHNICIANS ATTENDING TO THE DRYER PADDLES



THE WORKING OF THE MILL (GRADER) IN FOCUS

### 3.15 TRAINING WORKSHOP IN ZAIRE

As usual, courtesy call and preliminary discussion were held with Mr. Ciwela Katunba - Assistant Administrator of Programme and Dr. Muimba Kankolongo - the Director of PRONAM on 12 August, 1992 before the team proceeded to M'Vuazi where the plant had been installed, and commissioned by FIIRO.

The training programme in Zaire took place at the premises of the National Institute for Agronomic Studies and Research (INERA-Institut Nationale Studies et Research Agricole) in M'Vuazi under the National Programme on Cassava (PRONAM - Programme National Manioc).

The training followed the usual format before they were split into two groups of processors and technicians.

### 3.16 TRAINING OF TECHNICIANS (ZAIRE)

The participants were all from INERA and PRONAM, and consisted of the following:

1. Dr. Muimba Kankolongo - Director, PRONAM
2. Dr. Kangolo Nsombi
3. Engr. Bipini Nbula - Chief de Division de  
L'intendance, INERA,  
M'Vuazi
4. Mr. Ntundo N'salambi
5. Mr. Lukumba Mbeyitadila
6. Mr. Mateso Ngombo
7. Mr. Nsiamakato Nkansuka-Mbunolu
8. Mr. Kumbabza Mayiodona
9. Mr. Mupidi Kibeki
10. Mr. Nlandu Lumona

The Director of PRONAM had earlier expressed his wish to replace the diesel engine with an electric motor and the gas with charcoal. The FIIRO engineer, therefore, provided the technical details and drawings for the electric motor and the charcoal boxes needed for the replacement.

### 3.17 TRAINING OF PROCESSORS (ZAIRE)

The processors were also mainly staff of PRONAM and INERA, and consisted of the following:

1. Engineer Lukombo
2. Mr. N'Luta
3. Mr. Nsuanda
4. Mr. Malangu
5. Mr. Bonane
6. Mr. Kivuila

Each of the participants was allowed to try his hand on the use of each of the equipment to ensure familiarisation with them, while following the format already described.

The average assessment of the training by participants (Annexes 7a, b, c) shows that the participants had a good grasp of the use and maintenance of the equipment and liked the products very much.

### 3.18 POST-TRAINING DEBRIEFING (ZAIRE)

A meeting was later held at the office of the Deputy Resident Representative of UNDP in Kinshasa (Dr. Ablasse Ouedraogo) to intimate him on the training programme recently concluded at M'vuazi. Present at the meeting were His Excellency Dr. Ablasse OUDRAOGO, the Deputy Resident Representative, his Assistant Programme Officer, Mr. Ciwela Katumba, Director of PRONAM - Dr. Muimba Kankolongo, and one of his officers - Engineer Lukombo Sing. The meeting was informed of the success of the training programme which was due amongst others to the high calibre of the staff deployed for the training programme, their dedication and to the personal interest of the Director of PRONAM - Dr. Muimba on the project. The area of modification of the plant suggested by the Director on earlier discussion was raised at the meeting. Deputy Resident Representative, while agreeing with the replacement of gas with charcoal, felt that the shortage being experienced then on the supply of diesel was self-induced rather than a permanent problem. The meeting also discussed the need to arrange an official transfer of the equipment to the Government of Zaire by the Resident Representative of the UNDP in Zaire with ample press coverage to create the needed awareness throughout the country. The Director of PRONAM discussed his plans to embark on the training of appropriate

personnel and businessmen on the use of the equipment starting from its immediate neighbours and extending to other parts of the country. The engineering blueprints of the equipment and their component parts were then handed over to the Deputy Resident Representative for release to the Government of Zaire during the handing-over ceremony, while the warrant's form was signed and given to Dr. Muimba.



## ANNEX 7a

FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH

CONTRACT NO. 64/04

UNIDO PROJECT NO. YA/PAT/99/632

Cassava processing equipment

EVALUATION OF ENGINEERING LECTURES/DEMONSTRATIONS

COUNTRY: ZAIRE  
 DATE 22 August 1992

TOPICS	APPRAISAL (Mark 'X' at appropriate column)				
	EXCELLENT (GOOD)	VERY GOOD	GOOD	FAIRLY GOOD	POOR VERY POOR
1. Interpretation and explanation of engineering drawings		X			
2. Explanations of the design principles and parameters		X			
3. Information on the fabrications and assembly of the equipment		X			
4. Installation methods for the gari processing machines		X			
5. Operating Procedures for the equipment		X			
6. Discussions on how to carry out routine maintenance of the equipment				X	
7. How to run and maintain the diesel engine		X			
8. Discussions on major spare parts required and how to keep them				X	
9. Trouble-shooting likely when running the equipment and how to tackle them.				X	
10. Overall assessment		X			

FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH

CONTRACT NO. 91/04

UNIDO PROJECT NO. RA/RAF/90/600

EVALUATION OF CASSAVA PROCESSING LECTURE/DEMONSTRATION/PRACTICALS  
FOR GARI AND CASSAVA FLOUR

ANNEX 7b

COUNTRY: ZAIRE

DATE: 22 August 1992

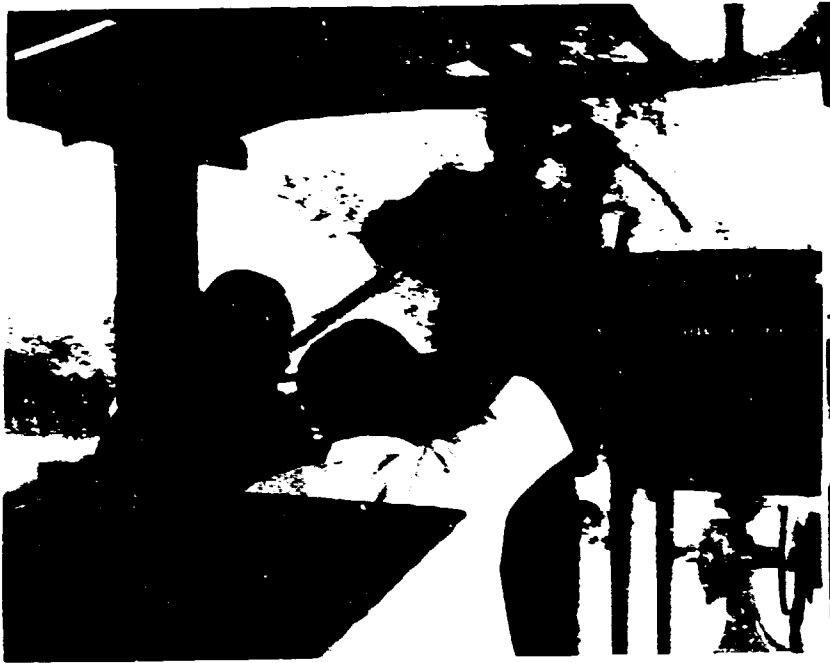
		C O L U M N S					
TOPICS		EXCELLENT	VERY GOOD	GOOD	FAIRLY GOOD	POOR	VERY POOR
1.	Use and processing with grating machine.	x					
2.	Use and processing with screw press	x					
3.	Use and processing with garifyer/dryer.		x				
4.	Diesel engine operation	Not applicable					
5.	Use and processing with the sifter	x					
6.	Use and processing with milling machine	x					
7.	Discussion and practice of gari processing	x					
8.	Discussion and practice of flour procession from cassava		x				
9.	Safety precautions for staff		x				
10.	Assessment of the gari produced		x				
11.	Assessment of the flour produced		x				
12.	Score your ability to operate the cassava processing equipment		x				
13.	Your over-all assessment of the training		x				



PHOTOGRAPH OF PARTICIPANTS AND TRAINERS



GRATING MACHINE IN USE.



CHANGING THE COOLING WATER FOR THE DIESEL.  
1972



PALATABILITY TEST OF COOKED PRODUCTS.

### 3.10 TRAINING PROGRAMME IN SIERRA LEONE

The training team arrived in Freetown on 21st September, 1982. Having had a brief discussion with Mr. Mohammed Hossein Kamali - the UNIDO Country Director for Ghana, Liberia and Sierra Leone as well as Mr. Mika J. Vespalainen - the UNIDO Programme Officer, we proceeded to Bo, a city where the plant had been installed and commissioned by FIRO staff. At Bo, we met the UNDP's Industrial Engineer in charge of the station - Mr. Victor Samarakone and Mr. Abdulai S. Kamara - the Coordinator of the UNIDO-sponsored Growth Centre in Bo - who briefed us on the arrangements made. It was made clear to us that there was no gas in Sierra Leone and hence charcoal would have to be used. Thus, the installation and commissioning technicians from FIRO had already arranged for the fabrication of charcoal pots prior to the arrival of the training team. Consequently, the training programme was conducted using charcoal as a source of energy for the fryer and dryer.

Bo is recognised as the second largest town in Sierra Leone (next to the Capital, Freetown) but more particularly is very reputed as the centre for the production of the "best gari" in the entire country. It was therefore a good decision to site the cassava processing plant in Bo.

The training programme was, as before arranged along two lines - the technicians and the processors.

### 3.20 TRAINING OF THE TECHNICIANS (SIERRA LEONE)

The technicians consisted of five participants, namely:

1. Samuel Abu
2. Braimoh Sharkah\*
3. Francis Batemah\*
4. Musa Teway
5. Samuel Mulai.

All but Mr. Samuel Abu are non-employees of the Growth Centre. The experience gained by the technicians during the operation of the equipment exposed them to the trouble-shooting areas that needed attention. The engineering drawings were discussed with both Mr. Victor Samarakone and Mr. Abdulai Kamara as there were no engineers among the technicians being

trained on the maintenance of the equipment. The two technicians marked with asteriks (\*) were highly recommended for permanent employment.

### 3.21 TRAINING OF THE PROCESSORS (SIERRA LEONE)

The participants were entirely women from Bo and neighbouring villages who have either been engaged in processing of cassava into gari and local fou-fou (cassava flour) using sun-drying traditional methods or younger girls who were interested, and indeed excited by the new mechanised technology and hoping to be employed in the new factory. On the whole, thirty-six (36) women, led by Miss Amie S. Kamara showed up for the training programme. Miss Kamara was previously the trainer in charge at the UNIDO-sponsored Pujehun Growth Centre which was earlier over-run by the Liberian rebel forces led by Charles Taylor.

The participants were divided into four groups to ensure full participation by each participant.

#### LIST OF PROCESSORS LED BY MISS AMIE S. KAMARA

GROUP 1		GROUP 2	
1.	Janet Bassie	1.	Francess Johnby
2.	Isatta Malla	2.	Doris Koi
3.	Helen Sanko	3.	Mamie Foday
4.	Sylvia Koroma	4.	Augusta Johnby
5.	Mariama Krilanda	5.	Hauwa Musa
6.	Mamawa Mansaray	6.	Bendu Vandy
7.	Sadiatu Banguran	7.	Mariama Konsej
8.	Mamawa Pujeh	8.	Augusta Tommy
		9.	Adama Rashidi
GROUP 3		GROUP 4	
1.	Hanna Koi	1.	Theresa Abu-Dingie
2.	Jenneh Turay	2.	Mariama Kallon
3.	Adama Sherifi	3.	Mary Moseray
4.	Elizabeth Kain	4.	Hanna Kaitibi
5.	Jeneba Conteh	5.	Margaret Ngawogia
6.	Victoria Caulker	6.	Alice John
7.	Mabinty Kanu	7.	Regina Junisa
8.	Theresa Kargbo	8.	Eye Lusiani

9. Anqelia Mossiama

10. Mariama Kormoh

The average appraisals by the participants are shown in Annex 8a, b.

### 3.22 POST-TRAINING DEBRIEFING (SIERRA LEONE)

At the end of the training exercise, a meeting was held with Mr. Samarakone to review the training exercise and his plans for the future. Recommendations of possible processors and technicians from among the participants prepared by the coordinator were discussed. On future plans, we were informed that the idea of handing over the cassava processing equipment to the government of Sierra Leone would not work from the experience of UNIDO personnel in that country. This was further collaborated by the UNIDO Country Director - Mr. Kamali at a later meeting. It was learnt that arrangements were on to run the factory under a private company within UNIDO-sponsored Growth Centre being established at Bo. This, notwithstanding, UNIDO would plan for an official opening of the Centre with full press coverage to create the needed awareness. In addition, the possibility of using the equipment for direct processing of cassava to products for sale as well as providing service for current processors of cassava and for future training facilities were discussed.

Similar discussions were later held with Mr. Kamali - the UNIDO country Director and Mr. Mika Vepsalainen - the Programme Officer in Freetown. Samples of the products, engineering drawing and the FIIRO-signed warranty on the equipment were handed over to Mr. Kamali. The processing manuals and manual for the Rex-water cooled engine were earlier on given to Mr. Samarakone's supervising staff at Bo.

## ANNEX 8a

FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH

CONTRACT NO. 91/04

UNIDO PROJECT NO. KAU/TA/90/1001

Cassava processing equipment

EVALUATION OF ENGINEERING INSTRUCTIVE DEMONSTRATIONS

SIERRA-LEONE

COUNTRY: .....

3 October 1992

DATE .....

TOPICS	APPRAISAL (Mark 'X' at appropriate column)					
	EXCELLENT	VERY GOOD	GOOD	FAIRLY GOOD	POOR	VERY POOR
1. Interpretation and explanation of engineering drawings			X			
2. Explanations of the design principles and parameters			X			
3. Information on the fabrications and assembly of the equipment		X				
4. Installation methods for the qari processing machines	X					
5. Operating Procedures for the equipment	X					
6. Discussions on how to carry out routine maintenance of the equipment		X				
7. How to run and maintain the diesel engine			X			
8. Discussions on major spare parts required and how to keep them	X					
9. Trouble-shooting likely when running the equipment and how to tackle them.			X			
10. Overall assessment			X			



FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH

CONTRACT NO. 91/94

UNIDO PROJECT NO. FA/TAT/90/4000

EVALUATION OF CASSAVA PROCESSING TECHNOLOGY DEMONSTRATION/PRACTICE  
FOR GARI AND CASSAVA FLOUR

ANNEX 8b

COUNTRY: SIERRA-LEONE

DATE: 3 October 1992

TOPIC	C O L U M N S				
	EXCELLENT	VERY GOOD	GOOD	FAIRLY GOOD	POOR/VERY POOR
1. Use and processing with grating machine.	X				
2. Use and processing with screw press	X				
3. Use and processing with garifier/dryer.				X	
4. Diesel engine operation	Not applicable				
5. Use and processing with the sifter	X				
6. Use and processing with milling machine		X			
7. Discussion and practice of gari processing	X				
8. Discussion and practice of flour processing from cassava		X			
9. Safety precautions for staff	X				
10. Assessment of the gari produced	X				
11. Assessment of the flour produced	X				
12. Score your ability to operate the cassava processing equipment	X				
13. Your over-all assessment of the training	X				



WEIGHING OF CASSAVA FOR PEELING



LIGHTING THE CHARCOAL TRAYS FOR THE  
FRYER / DRYER



. TECHNICIANS ATTENDING TO THE ENGINE.



HEAT SEALING OF FINISHED PRODUCTS.



PALATABILITY TEST OF COOKED PRODUCTS.

#### 4.0 GENERAL OBSERVATIONS

Because of the frequent breaking of the wooden paddles, it was suggested that a brush system be used to replace the wood. However, the paddles performed better when the springs were removed.

#### 4.1 IN TOGO

The participants were left on their own to start and run the plant for the processing of gari, Konkonte (flour) and fufu during the last few days of the training. These, they performed very well to our satisfaction. At the end of the training programme we were all satisfied that the participants were in a position to service and maintain the smooth running of the equipment as well as use it to process cassava to any of the cassava products. Our only concern was the absence of engineers and fabricators among the participants, who were needed for duplication of the plant in Togo. It was also learnt that the formal handing-over of the equipment to Government on "African Industrialisation Day" was shelved due to the fault in the diesel engine which was corrected later (see 3.5). The processors were generally astonished at the ease with which the equipment performed the various tasks.

#### 4.2 IN CAMEROUN

The equipment performed satisfactorily and gave good products. However, some unusual sounds developed in the diesel engine which gave rise to occasional stoppages (see 3.8).

The problem was traced and repaired. However, in order to re-assure the processors, Mr. Onyekwere on behalf of FIIRO promised to buy a new engine to replace the damaged one, and this has since been done.

It was also noticed that members of the Association cooperated very actively during the first week but the number of participants thinned out to about half in each group during the second week. It was understood later that some of the women felt that the training was robbing them of their farming time and petty trading time. This notwithstanding, those who participated fully were very pleased and grateful to UNIDO for

the rare privilege of having the equipment sited in their area. Of the cassava products tried out on the site only gari was produced without problems. The others presented a lot of problems due to the variety of the cassava and the cool temperature in the area which made the softening of the soaked peeled cassava tubers next to impossible. It is therefore not surprising that the women focus exclusively on gari production in the area.

#### 4.3 IN GHANA

In line with an earlier letter on the training programme circulated by the coordinator, the Food Research Institute of Ghana had invited private engineering companies who sent some of their engineers and technicians to join those of the Food and Industrial Research Institutes. It is likely that the equipment will easily be duplicated once UNIDO releases the blueprints to some of these private engineering firms and the Ghanaians will have the opportunity to try out their suggestion to replace the wooden paddles with a brush system in the frier/dryer.

#### 4.4 IN ZAIRE

The team assembled at M'vuazi was one of the best seen and the infrastructure already available in the Centre will enable them to maintain the equipment in good working condition. The request to change the diesel engine to an electric motor can be taken up by UNIDO or other UN agencies such as FAO, ILO, or the EEC under Lome Convention. It may be necessary for Eng. Lukombo to visit FIIRO at future date to see new development on the equipment with a view to introducing such in their equipment. PRONAM can consult FIIRO if it encounters any difficulty in changing from gas to charcoal. Although the people were only interested in cassava flour (which they called fou-fou), gari process was nevertheless also demonstrated. The cassava flour produced during the training could not meet the peculiar choice of the people until it was

further subjected to milling using a mill at PRONAM to very fine particle size resembling the characteristics of Nigerian Fufu.

#### 4.5 IN SIERRA LEONE

The use of charcoal for heating the frier/dryer, although found cumbersome, was yet appropriate because of absence of cooking gas. This resulted sometimes in the products getting burnt or being partially dried. In addition, the equipment had been installed in a warehouse with no ventilation instead of an open half wall building, to allow for ample ventilation. This was very dangerous to everybody there especially as the use of charcoal could give rise to carbon monoxide poisoning. Consequently, holes had to be made on three sides of the warehouse to permit the circulation of fresh air into the building. It is hoped that proper windows will be made before normal production starts. Furthermore, the diesel engine may have to be re-installed using a more solid foundation.

It is hoped that UNIDO office in Bo will take steps within a couple of weeks to recruit processors and technicians as recommended from among the participants to compliment its present staff of Mr. Kamara, Miss Kamara and Mr. Samuel Abu to keep the equipment running. These participants have been properly trained to handle the processing and the maintenance of the various equipment.

## 5.0 RECOMMENDATIONS

The following recommendations are presented for consideration:

### 5.1 TOGO

- a) That the Institut des Plantes à Tubercles at Davie, with permission of UNIDO, should look for a local engineering firm with qualified mechanical engineers who can interpret the technical drawings and fabricate the components. UNIDO can further assist the government in making the local fabrication of the equipment a reality through sponsoring some of the fabricators to Nigeria.
- b) The casually employed women used in the training be considered for employment by the Institute on full-time basis and be used to continuously run the factory on a semi-commercial scale instead of the traditional process for which the women have hitherto been engaged.
- c) The equipment should be used both for training of those interested in the mechanised process and also as a service centre where the villagers can bring their cassava for processing for a fee.
- d) The government of Togo should consider increasing the budget of the Institute for the running of the cassava processing equipment as part of their input to the success of the project.

### 5.2 CAMEROUN

- a) There is need to have the members of the Women Cooperative better organised through exposure to management and book-keeping as suggested by the FAO/UNDP Representative in Bamenda. We hope this would have been taken up as promised by Mr. Diop.
- b) Even though some of the women have benefited from the training and are capable of running the equipment it will be advisable to retain Mr. Michael Abongwa, an FAO Bamenda Extension Worker, assisted by Mrs. Anna Lafu, Community Development Assistant, Ndop and Mr. Joseph Nongmiyia, Village Extension Worker, Ndop as well as the two artisans who were present throughout installation and

training to run and maintain the equipment for the Association while their salaries are paid from the proceeds of the sale of products.

- c) That the women continue to work in three groups as arranged during the training with each group processing their cassava on designated days while the proceeds be divided into the proportions of raw tubers supplied by individuals in each group after all deductions have been made.
- d) FAO should assist the women by providing the Association with improved variety of cassava.

### 5.3 GHANA

That the Food Research Institute in Accra should take advantage of the interest shown by an indigenous private-owned engineering company (Hommoku Engineering Works, Tema) in the replication of the equipment after due clearance with UNIDO, Vienna on the conditions to be fulfilled before this is made possible.

### 5.4 ZAIRE

The request to change the diesel engine to an electric motor can be taken up by UNIDO, UNDP under Country Programme or any of the UN agencies such as FAO, ILO, or the EEC under Lome Convention. It may be necessary for Engineer Lukombu to visit FIIRO at future date to see new development on the equipment with a view to introducing such in their set up. Programme Nationale Manioc (PRONAM) can consult FIIRO if it encounters any difficulty in changing from gas to charcoal.

### 5.5 SIERRA LEONE

Recommendations of possible processors and technicians from among the participants prepared by the coordinator were discussed with the UNIDO officials. On future plans, we were informed that the idea of handing over the cassava processing equipment to the government of Sierra Leone would not succeed from the experience of UNIDO personnel in that country. For this reason arrangements were being made to run the factory



under a private company within UNIDO-sponsored Growth Centre being established at Bo. This, notwithstanding, it was recommended that UNIDO should plan for an official opening of the centre with full press coverage to create the needed awareness. It was also recommended that in addition to using the equipment for direct processing of cassava for sale, the centre should in addition provide service for current processors of cassava and also for training.

## 6.0 CONCLUSION

The trainers are convinced that the versatility of the cassava processing equipment makes it acceptable in all the places visited and hereby recommend to UNIDO to also consider the possibility of sending similar equipment to Congo, Cote d'Ivoire, Gambia amongst others, which are among important cassava consumers in Africa. To us, this is one of the most appropriate ways to help Africa, and African women in particular, remove drudgery out of food processing, and increase food production using affordable, low-cost, low-technology equipment which can be locally handled. It is our hope that UNIDO will introduce more of this type of technologies in various African countries. The Federal Institute of Industrial Research, Oshodi, Lagos has more of these technologies (soap manufacturing and cosmetics, preserved palm wine bottling, fish smoking kiln, etc.) which can also be disseminated to benefit other African countries.

## 7.0 FOLLOW-UP ACTION

There will be need to follow up on the programme after a period of not less than six months after the training has taken place. To this end the coordinator has sent letters (Annexes 9a - c) to the first three countries (Togo, Cameroun and Ghana) where training had taken place much earlier. Unfortunately there has not been any response from these countries. There may be need for the co-ordinator to visit the beneficiaries after a period of one year to evaluate the performance of the equipment and the trained personnel, provided UNIDO is able to fund such mission.



# Jide Koleoso and Associates

Food and Agro-allied Project Development and Management Consultants

**Office Address**

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Dopemu -- Agege,  
Lagos State, Nigeria

Tel. 921247

ANNEX 9A

**Postal Address**

P.O. Box 6096,  
Ikeja,  
Lagos,  
Nigeria

**Our Ref:**

**Your Ref:**

**Date:** 4-5-92

Mr. Kodjo Tetevi  
Director  
Institut des Plantes a' Tubercules  
B.P.4402  
Lome' Togo .

Dear Sir .

**Re: UNIDO PROJECT .XA/RAF/PO/632- feedback**

**TRANSFER OF TECHNOLOGY FOR CASSAVA PROCESSING**

I wish to recall the visit of the staff of the Federal Institute of Industrial Research Oshodi and my humble self to the Institute des Plantes a' Tubercules at Davie , Togo in October 1991 on the above project to install and train the staff of the Institute in the use of the equipment .

The purpose of this letter is to have a feedback on the performance of the equipment and the trained staff since we left Togo . You will agree with me that eight months are long enough to allow a fair evaluation of the project .

I shall be grateful if you will give me your evaluation on the performance of the equipment , your trained staff , and your future plans on the dissemination of the knowledge on the equipment - local fabrication of the equipment and personnel training on it's use - in your country .

I shall also be grateful if you will send any photographic transparency taken during the installation and training , which can be used in the final report. The transparency will be returned to you after use .

Your early response will be very much appreciated.

Yours Sincerely

Dr. O. A. Koleoso .

Project Coordinator.

cc. Mr. Kadress Vencatachelum  
UNIDO Director for Togo etc.  
UNDP B.P.911 Lome, Togo

Dear Sir, Above is for your information and any comments on the project.



# Jide Koleoso and Associates

Food and Agro-allied Project Development and Management Consultants

**Office Address**

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Dopemu -- Agege,  
Lagos State, Nigeria  
Tel. 921247

ANNEX 9B

**Postal Address**

P.O. Box 6096,  
Ikeja,  
Lagos,  
Nigeria

**Our Ref:**

**Your Ref:**

**Date:** 4-5-91

Mr. Aliou Diop  
Director  
FAO/UNDP Repr.  
P.O.Box 442  
Bamenda Cameroon.

Dear Sir ,

**Re: UNIDO PROJECT .XA/RAF/PO/632- feedback**

**TRANSFER OF TECHNOLOGY FOR CASSAVA PROCESSING**

I wish to recall the visit of the staff of the Federal Institute of Industrial Research Oshodi and my humble self to the Baba Ndop village near Bamenda in November 1991 on the above project to install and train some of your staff and the local women from the village in the use of the equipment .

The purpose of this letter is to have a feedback on the performance of the equipment and the trained women and your staff since we left Cameroon . You will agree with me that six months are long enough to allow a fair evaluation of the project .

I shall be grateful if you will give me your evaluation on the performance of the equipment , your trained women and your staff , as well as your future plans on the dissemination of the knowledge on the equipment - local fabrication of the equipment and personnel training on it's use - in your country .

I shall also be grateful if you will send any photographic transparency taken during the installation and training , which can be used in the final report. The transparency will be returned to you after use .

Your early response will be very much appreciated.

Yours Sincerely

Dr. O. A. Koleoso .

Project Coordinator.



# Jide Koleoso and Associates

Food and Agro-allied Project Development and Management Consultants

Office Address

29 Samuel Street,  
Off Akowonjo Road,  
Dopemu -- Agege,  
Lagos State, Nigeria  
Tel. 921247

ANNEX 9C

Postal Address

P.O. Box 6096  
Ikeja,  
Lagos,  
Nigeria

Our Ref:

Your Ref:

Date: 4-5-92

Mr. K. K. Eyeson

Director

Food Research Institute

P.O.Box M.20

Accra Ghana .

Dear Sir ,

Re: UNIDO PROJECT .XA/RAF/PO/632- feedback

TRANSFER OF TECHNOLOGY FOR CASSAVA PROCESSING

I wish to recall the visit of the staff of the Federal Institute of Industrial Research Oshodi and my humble self to the Cassava Processing Demonstration Center at Pokuase near Accra in December 1991 on the above project to install and train the staff of the Institute in the use of the equipment .

The purpose of this letter is to have a feedback on the performance of the equipment and the trained staff since we left Ghana . You will agree with me that five months are long enough to allow a fair evaluation of the project .

I shall be grateful if you will give me your evaluation on the performance of the equipment , your trained staff , and your future plans on the dissemination of the knowledge on the equipment - local fabrication of the equipment and personnel training on it's use - in your country .

I shall also be grateful if you will send any photographic transparency taken during the installation and training , which can be used in the final report. The transparency will be returned to you after use .

Your early response will be very much appreciated.

Yours Sincerely

Dr. O. A. Koleoso .

Project Coordinator.

cc.

Dr. Thomas Bernklau  
UNIDO Programme officer,  
UNDP, P. O. Box 1423,  
Accra, Ghana  
Dear Sir,

Above is for your information and any comments on the project.