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A MODEL SCHEME FOR THE IMPROVEMENT OF RURAL SMALL-CAPACITY COCONUT PROCESSING OPERATIONS*

established in the Republic of Indonesia in co-operation with the Asian and Pacific Coconut Community**

Based on the work of M. Varnakulasingam, chief technical adviser

7/ 3:

* This document has not been edited.

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PREFACE

The technological developments which are being increasingly applied at the macro level in the coconut processing sector have had very little impact on the rural small coconut processing. Traditional and outdated operations are still being practiced resulting in under-utilization of resources and production of poor quality, low-valued products, much to the detriment of the industry and the stagnation of rural incomes.

The project "Setting-up of a rural small-capacity coconut processing model scheme" was conceived and implemented with the objective of stimulating the rural coconut processors to improve their economic and social conditions. It meant not only the introduction of technological know-how but also assistance in the form of equipment and machinery and imparting of organizational and management skills.

The project was implemented in a remote village in West Sumatra, 50 km from Padang, nearest town. This was the first time APCC was associated with an action-oriented field project, different from its previous activities which were mainly in the form of studies, seminars and workshops.

The successful completion of the project was due to the conscientious and combined efforts of the team of experts as well as the co-operation extended by the local processors who were involved in the project.

This project has been much appreciated by the Asian and Pacific Coconut Community (APCC). Thanks go to UNIDO for concepting and implementing it, to the Government of the Federal Republic of Germany for financing it through UNIDO's Industrial Development Fund and to the Government of Indonesia for providing the host facilities.

The APCC Secretariat sincerely hopes that the very positive results of this model scheme have opened the door to an effective improvement of rural small-capacity coconut processing operations in the APCC member countries and worldwide.

C O N T E N T S

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1. SUMMARY

1.1. OBJECTIVE OF THE PROJECT

The aim of this UNIDO project was to set up a Model Coconut Processing Scheme in Sungai Sarik, Pariaman (a sub-district in West Sumatra, Indonesia).

1.2. METHODOLOGY APPLIED FOR ACHIEVING THE OBJECTIVE OF THE PROJECT

1.2.1 To achieve this objective, a total of seven (7) commercial oriented small-scale processors from this area were selected to participate in the UNIDO project. The following were the selected processors:

- C.V. Abadi, Limpato, Tujuh Koto;
- Tunas Mekar, Puneuruyung, Tujuh Koto;
- KSM, Kampung Lombak, Tujuh Koto;
- Harapan, Galoro, Tujuh Koto;
- Karya Baru, Puneuruyung, Tujuh Koto;
- Muda Warna, Padang-Ampalu, Tujuh Koto;
- USP, Limpato, Tujuh Koto.

1.2.2 Initially, all seven processing units were improved and developed simultaneously with UNIDO's assistance, in co-operation with the owners/managers of the processing units. The UNIDO's assistance was in the form of experts' and financial assistance to modify and redesign the plants/equipment.

1.2.3 Secondly, by streamlining the various unit operations, the handling of materials by men were reduced. The main purpose of streamlining was to reduce cost of labour, reductions of wastage due to handling of materials by men and mechanization of the materials handling.

1.2.4 Thirdly, the following services were provided by the UNIDO project

to improve the technical and managerial skills of the participating processors' personnel.

- Mini-laboratory was set up at the office site to conduct quality control and process control from the raw materials stage to the finished product stage and provided training facilities to workers on simple quality and process control tests.

- Mini-workshop was established at the project site and developed and strengthened the practical knowledge and skills of the processors' mechanics. The development training programme included repair and maintenance work of plants and equipment used for Klentik oil manufacture and know-how on how to fabricate some of the plants and equipment used.

- Training Programme for Owners of Processing Units on Organization and Management Aspects. This training was provided to develop organizational and management skills of the owners of processing units and to equip them with a sound knowledge of management techniques necessary to deal with situations which direct their organizations towards its predetermined goals and objectives.

- In-Plant Training/Fellowships for Selected Processors/ Government Officials. Selected owners of processing units were sent to in-plant training in Medan/Surabaya to facilitate transfer of technology. The in-plant training included visits to Klentik oil processors as well as fabricators of plants and equipment for Klentik oil manufacture.

- Marketing Consultant. The project provided the expert assistance of a marketing consultant for a period of one month who assisted the owners/managers of processing units to define a strategy for further development of the market for Klentik oil as well as to arrest the decline in market for Klentik oil in certain market places.

- Coconut Processing Consultant. The services of a coconut processing consultant were provided by the project for a period of one month to assist the processors to develop new products from fresh coconut meat.

1.2.5 Lastly, the setting-up of a demonstration coconut processing unit for the project.

1.3. PROJECT ACHIEVEMENT

1.3.1 Plants and Equipment Modified and Improved

The following plants and equipment were modified and efficiencies improved:

- Coconut Meat Cookers or Pans: were modified to reduce time cycle per batch, to better utilization of heat, prevent over-cooking of the meat or burning of the oil and production of better quality oil with maximum oil yield (Annex 1).

- Fireplace. The fireplace for cookers or pans did not have a chimney in all seven processors participating in the project. The fireplace was redesigned and a chimney was installed to have the following (Annex 2):

  - Complete combustion of the fuel used, e.g. firewood. The chimney allowed the escape of flue gas and in the process draws in fresh air for combustion. Now the processors are using less firewood than before.

  - In certain processors, the two fireplaces were combined to have two pans for heating (earlier two separate fireplaces for each pan). This again reduced the fuel consumption and increased the heating efficiencies as well as the quality of the oil.

Filtering Device. The usual type of filtering device used by the processors before the project started was a 45 gallon drum, partly cut open horizontally and fitted with a wire mesh. The mesh size ranged from 6 mm to 3 mm.

The drawback of this filtering device was that the coarser particles pass through the mesh along with the oil and also due to constant use, the mesh size tended to get bigger in size in certain places and small in other places. In this process, there was no uniformity in mesh size and hence the coarser particles were not fully separated from the oil.

In order to overcome this problem, the project used 2 mm thickness plate with 10 mm x 1 mm slot as the filtering device instead of the mesh. This plate was bolted on to a 2 mm thickness plate made into a shape of a half cut drum with a tap at the bottom for draining the oil (Annex 3 and 4).

1.3.2 Streamlining Production Flow

- The modified and improved plants and equipment were then streamlined to have a smooth production flow. By streamlining the various unit operations, the handling of materials by men were reduced. Thus, there were savings on labour cost, reduction on wastage of raw materials due to handling. The oil transfer was earlier done by using workers by means of a bucket. Currently, it is done using a pump.

- In one processor, C.V. Abadi, screw conveyors were designed, fabricated and installed to transfer fresh meat to cutters or chopper, cut meat to the pans or cookers, brown cake after separating the oil from the filtering device to the first expeller. The chopped meat mixed with expelled oil (to enhance flavour) is now made into a slurry and transferred to the cooking pans using a pump.

- The clarified oil, then pumped into an overhead tank, designed, fabricated by the project to settle overnight and filled in 45 gallon drums, under gravity for the consumer market. The overhead tank was designed in such a way as to allow sediments to stay in the bottom of the tank by having the outlet oil pipe welded to the tank 3 inches above the flat bottom of the tank. A second outlet provided at the centre of the flat bottom to discharge the sediments (Annex 5).

- It was claimed that the quality of the oil for the consumer market was better than what it was before project started.

- The project mechanical engineer and the UNV mechanical engineer provided the expert technical assistance on modifying and improving existing plants and equipment and streamlining their production flow.

1.3.3 Services Provided

The following services were provided by the UNIDO project to improve the technical and managerial skills of the participating processors' personnel.

- Mini-laboratory: was set up at the office site to conduct quality and process control from the raw materials stage to the finished product stage including training facilities to workers on simple quality and process control tests.

  The laboratory was set up by the UNIDO project quality control chemist who also provided the training to the process workers. The quality control chemist's assignment was for a period of three months. He has completed the following jobs during the period of his assignment.

  - Purchased laboratory equipment, glassware and chemicals from local sources and established the mini-laboratory.

- Visited the seven processing units and discussed with the processors on their processing problems, studied their operations and prepared a research and training programme for processors and their trainees in the application of quality control systems on process improvements.

- Selected seventeen trainees from the processing units for ten-day laboratory training. The trainees included one each from the seven participating processors and one each from ten non-participating units around Sungai Sarik and neighbouring villages.

- Laboratory trials and tests were done on both mature and immature coconut meat of varying ages and under varying conditions of storage and processing, to determine the quality and process efficiencies, in order to give advice to the processors for making improvements.

- The results of all trials and tests (some of which were done by the processors in the laboratory) were discussed in detail with the owner/manager of the processing units and the trainees who attended the laboratory training, to give them a logical reasoning in undertaking their processing problems and the methods for making improvements.

- Simple charts were prepared in Indonesian language for the processors explaining the technical and commercial aspects of the process which served as guidelines for the day-to-day operations. These charts were also provided to the processors for information on how they could train their employees on the application of standard controls in making process improvements.

- Good housekeeping or sanitation in the factory units when the project started were far from satisfactory. During laboratory training this was highlighted and explained how good sanitary

conditions in a factory will help to maintain a clean and safe environment for factory operations, manufacture good quality products, cut down production costs and also discipline the workers to become aware of clean habits in processing which would reduce the hazards in their day-to-day operations.

Mini workshop was set up at the project site by the project mechanical engineer and the UNV mechanical engineer with tools and equipment purchased locally in Indonesia. They provided training to seven mechanics from the participating processors to the UNIDO project and to ten mechanics from other processing units from Sungai Sarik and neighbouring villages.

The mechanics working with the processing units who attended the UNIDO project workshop were not trained personnel. The majority of them were school leavers after completing their primary education. They have gathered knowledge in repair and plant maintenance work in the course of their day-to-day work at their respective processing units. In these processing units there were no proper tools for engineering work. Therefore, the workshop organized by this UNIDO project have provided the mechanics on the use of right engineering tools and equipment for the right job. In addition, the training not only provided and strengthened the practical knowledge and skills of the mechanics but also provided know-how on how to fabricate some of the plants and equipment necessary for their processing unit.

When the UNIDO project started, the workshop facilities to repair and fabricate plant and equipment in Sungai Sarik were limited to two. The processors have to depend on these two fabricators for their day-to-day plant maintenance as well as to fabricate new plants and equipment. Their workmanship was very bad due to lack of know-how on modern technology as well as lack of proper tools and equipment for engineering work. Invariably, the processors used the services of well-organized workshops in Padang and Medan but their costs were extremely high and not within the reach of all the processors in Sungai Sarik.

In order to reduce the cost of plant maintenance and plant and equipment fabrication to the processors, the project developed a total of four fabricators in Sungai Sarik. Some of the fabricators' volume of work have increased since the UNIDO project started. Some of them have up-dated their workshops and even purchased new tools and equipment similar to that used in the UNIDO project workshop from their extra income.

Two of the fabricators were trained by the UNV mechanical engineer to make screw conveyors for the project model plant at the processor C.V. Abadi. The screw conveyors were designed by the UNV mechanical engineer and made by the fabricators under his supervision.

Training Programme for Owners of Processing Units on Organization and Management Aspects

This training programme was provided by the project personnel and selected guest-speakers from Padang/Pariaman (three).

The main objective of the training programme was to develop organizational and management skills of the owners of processing units and to equip them with a sound knowledge of management techniques which are necessary to deal with their day-to-day situations.

The topics presented and discussed at the training programme were as follows:

(1) Introduction to Management. The main factors of management, namely organizational structure, the role of a manager, co-ordination in an organization, principles of communication, the role of the production department and service departments, such as engineering, laboratory/quality control, accounting, marketing and reseach and development were the key points discussed.

(2) Job Methods, Instructions, Handling a Problem and Job Safety. A "Handbook" was prepared, presented and discussed with the processors. This Handbook was not intended to be entirely a rule book. It was an informatory document prepared to help processors to increase their knowledge, improve their skills and in the process develop correct attitudes.

(3) Rules and Regulations Governing Hours of Work, Leave, Attendance and Discipline. The operative functions of a manager in charge of personnel were presented in a written form and were discussed with the participants. The discussions mainly focused on the hours of work, rules governing over-time, leave entitlements, procedure for obtaining leave, attendance and discipline expected from all workers and employees. Finally, recommended rules and regulations for all (7) processors participating in the project, based on their culture and environment, were drawn up as a guideline for the owners/managers of the processing units.

(4) Banking/Credit System The main function of a bank, types of services provided for customers, benefits of credit systems in relation to income tax law, types of loans and the procedure for applying for a bank loan were discussed in detail at that session. Finally, under this topic a visit was arranged to the bank and the participants were given the opportunity to meet the majority of the senior officials of the Bank. The main purpose was to encourage the processors to borrow money for their day-to-day operation of their processing units, if necessary.

(5) Co-operative System and How it Benefits Small Processors. The organizational structure of Co-operative system in Indonesia (KUD), types of co-operatives, policies, rules and regulations, facilities provided to the members were presented and discussed in detail.

(6) Feasibility Studies and New Project Evaluation, Product Unit Cost and Cost Centres. Under this topic the important factors to be considered

when setting up a new processing unit, such as raw materials supply, market for finished products, plant location, plant size, selection of plants and equipment, preparing a master schedule for installation, estimated cost of production, cash flow and break-even point for capacity utilization were discussed.

After the above topics were discussed, an evaluation was done to compare the unit cost of production of a new processing plant with that of existing plants (established 5-10 years ago). It was found that it was not feasible to establish a new Klentik oil processing unit, as it takes a very long time to recover the investment.

(7) Cost of Raw Materials and Quality Control. The cost of production of fresh meat and pricing of raw material for the purpose of grading based on quality and other important factors to be maintained in a quality product from the raw materials stage were discussed. The role of laboratory/ quality control and process control was also discussed.

(8) Cash Flow and Advantages of Taking Loan from the Bank/Co- operatives. It was highlighted that the cash flow is an important point to be considered when investing money on a venture. It was possible for any project or venture to run efficiently as far as the men, methods and machinery are concerned but, the project or venture is useless unless the money is utilized efficiently. That is to say that the money should not be tied-up for a long time in raw materials stock and finished products.

(9) Plant Maintenance and Stock Control. During this topic presentation the need for carrying out periodical maintenance of a plant was discussed. A rough estimate of the loss in production time, idle labour, under-utilization of capacities and converted in terms of money was evaluated and presented to the participants.

(10) Programme Evaluation. Finally, an evaluation of the programme was carried out in a questionnaire form, specially prepared and given to the participants. It was unanimously agreed by the participants that

the training programme provided to them was extremely useful for the discharge of their day-to-day duties.

In-Plant Training/Fellowships for Selected Processors/Government Officials

Four selected owners of processing units were sent on in-plant training to Medan (three processors) and Surabaya (one processor). They were accompanied by the National Project Assistant and the UNV mechanical engineer. The in-plant training programme included visits to Klentik oil processors as well as fabricators of plants and equipment for Klentik oil manufacture.

The four processors speak only "Ninang" (a language spoken by the people of West Sumatra). Therefore, the NPA was expected to translate Bahasa Indonesia to Ninang and vice-versa to the processors and Bahasa Indonesia/Ninang to English and vice versa to the UNV mechanical engineer. The UNV mechanical engineer's main function was to discuss on the spot with the processors their views/ observations on the Klentik oil units/fabricators visited in Medan/Surabaya on the technical aspects in order to facilitate transfer of technology.

Five Government officials from Department of Trade (Jakarta - 3 and Padang - 2), who were involved in the project went on fellowship/study tour to the Philippines, Thailand, Malaysia and Manado, Indonesia to study the problems of small-scale coconut oil processors/Klentik oil and to compare the processing units improved by the UNIDO project US/RAS/86/191 in Indonesia with that of the units visited during their study tour. The study tour/ fellowships also helped the Government officials to develop themselves in modern coconut technology, practiced in other countries and to enhance future coconut industry extension service in Indonesia.

Marketing Consultant

The project provided the expert assistance of a marketing consultant

who assisted the owners/managers of processing units in defining a strategy for further development of the market for Klentik oil as well as in arresting the decline in market for Klentik oil in certain market places.

The duration of the assignment of the marketing consultant was for a period of one month. In addition to the above main work, the marketing consultant also completed the following study and presented to the processors with his recommendations:

(1) Reviewed the raw material (fresh coconut) purchase and finished product marketing/distribution system;

(2) Studied the cost of production of Klentik oil and highlighted the areas where costs could be reduced or cut;

(3) Based on the estimated production cost analysis for Klentik oil arrived at a pricing system for purchase of raw materials;

(4) Studied the effects on the small processors of Klentik oil on the marketing of cheaper, substitutable Klentik oil by organized millers.

- Services of a Coconut Food Processing Consultant

This assistance was provided to the participating processors for a period of one month to develop new products from fresh coconut meat. Unfortunately, even though the products were technically viable, none of the products were recommended for commercialization.

- Selection of a Demonstration Processing Unit

Among the seven processors participating in the UNIDO project, the processor who had the best modified pan, fireplace, filtering device, streamlining and satisfactory hygiene or sanitary conditions in the factory was selected to become the demonstration plant for the project. The selection of the demonstration plant was judged by a

panel consisting of the Regional Director, Department of Trade, Padang and the Deputy Regional Director, Department of Trade, Padang/National Co-ordinator for the project in Padang. The panel selected processor : C.V. Abadi, Limpato, Tujuh Koto as the first best processor, followed by processor KSM,Kampung Lambah - second and processor Tunas Mekar, Puneuruyung - third. The selected processors were announced by the District Governor, Col. Anas Malik, Pariaman. The agreement between the processor C.V. Abadi, Limpato, Tujuh Koto and the Government of Indonesia/Asian and Pacific Coconut Community/UNIDO to set up a Demonstration Coconut Processing Unit was signed on 14 September 1989 at the District Governor's Residence in Pariaman (Annex 10 a) and b).

1.3.4 Setting-up of a Demonstration Plant at C.V. Abadi

The following plants and equipment were designed and fabricated or purchased to set up a Demonstration Coconut Processing Plant at C.V. Abadi, Limpato, Tujuh Koto (Annex 6,7,8).

(1) Two expellers: one for first expelling and the other for second expelling;

(2) Chopper: this in addition to the chopper given by the project to processor in Tunas Mekar;

(3) Three cooking tanks with stirrers;

(4) Filter press;

(5) Screw conveyors with bearings and gears for streamlining production flow.

All above units were installed at C.V. Abadi, streamlined, tested for the plants' performance and handed over to the processors C.V. Abadi before the project ended on 7 May 1990.

As per Agreement signed with the processor C.V. Abadi, this demonstration plant is now available for other processors from Indonesia, Malaysia, Thailand, the Philippines, India, Sri Lanka, Papua New Guinea, Solomon Islands, Vanuatu, Western Samoa, Viet Nam and Micronesia to view this plant.

2. CONCLUSIONS

The Tripartite Review Meeting held on 16 February 1990 unanimously agreed that the project was completed very successfully. The processors participating in the UNIDO project also reiterated that they have definitely benefited from the project. And, according to the processors, following were some of the benefits derived from the project which had led to increased income.

2.1 All plants and equipment modified and fabricated by the project (such as pans, fireplaces and filtering devices) were extremely useful to the processors. These modifications have resulted in reasonably good quality oil, reduction in fuel consumption "firewood" and reduction in time cycle per batch.

2.2 STREAMLINING FOR PRODUCTION FLOW.

In this exercise, any bottlenecks in the production flow were eliminated and the flow of materials in the production line was streamlined. The manual handling of the raw materials were reduced by installation of pipelines, pumps to transfer oil from pan to storage tank and from the expeller (the expelled oil) to pans etc. This process not only eliminated the use of large quantitities of drums and improved the hygiene conditions in the factory but also the efficient utilization of men, methods and machinery.

2.3 LABORATORY/QUALITY CONTROL WORK AND TRAINING IN LABORATORY.

The following points were made clear to the processors by the project and they are now aware of the problems.

2.3.1. Due to the poor quality of the raw materials (coconut meat) resulting from the delayed processing of the meat from the time it was supplied to the factory; the quality of the oil was not good and its FFA was high. After the laboratory tests, training and other practical demonstrations, the processors had a clear understanding as how they could reduce microbial spoilage of the meat and FrA. It was recommended to them that better storage conditions such as spreading the meat instead of keeping it in piles could improve the quality.

2.3.2 Cooking of the meat was a drying process to dry the meat from a moisture content of 55 per cent to about 1-3 per cent; for the purpose of expelling the oil using a mechanical expeller. This fact was not clear to them earlier.

2.3.3 The chopped meat which goes for cooking was not uniform in size, some particles were fine and others large as the size of a peanut. This resulted in some particles being overcooked and some undercooked. The smaller particles invariably overcooked and almost black in colour and thus darker coloured oil was produced. This was overcome by the project by redesigning the chopper.

2.3.4 Moisture estimation on mature and immature meat was very convincing for the processors to understand how immature meat reduces the profit of the operation.

Workshop Practice and Training

The processors and other participants were very happy with the workshop practice and training facilities provided to them. It was claimed that the process workers now have the basic knowledge and skills of handling workshop tools and equipment and safety precautions.

Some of the processors have even acquired the knowledge and skills to fabricate plants and equipment. The processors are now in a better position to assess the quality of the work done by the

local fabricators and obtain their services at a reasonable cost.

2.5 TRAINING PROGRAMME FOR OWNERS OF PROCESSING UNITS ON ORGANIZATION AND MANAGEMENT ASPECTS

2.5.1 The programme provided the participants an overall view of the management function and the qualities needed for a good manager.The programme also helped them to understand and appreciate the need for a common administrative structure for all seven processing units in order to maintain an uniformity in their decision making.

2.5.2 Better understanding of the banking system and the advantages and need to obtain loans for operation of their plants more regularly and efficiently.

2.5.3 They were now aware and happy that organizations/departments like UNIDO/APCC/Government of R.I. were willing to help them to upgrade their processing technology and their management capabilities even though they belong to the commercial-oriented sector.

On the other hand, the UNIDO project personnel assessment indicates that except for two owners/managers, all the others would not make as competent and successful managers for the following reasons:

2.5.4 The majority of the owners/managers have reached their retirement age and are not willing to change their traditional habits and attitudes.

2.5.5 Because of their educational background, some of the management subjects presented and discussed were extremely difficult for them, event to understand the basics.

2.5.6 They by nature do not trust their fellow workers, do not delegate work and train them for future responsible positions. These are basic requirements for a good manager.

2.6 IN-PLANT TRAINING FOR PROCESSORS

Particularly the in-plant training in Medan was valuable not only to the processors but also to the project personnel (The UNV mechanical engineer and the National Project Assistant).

The technology used in Medan factories for making Klentik oil was far more superior to that used in Sungai Sarik. The project at the request of the processors participating in the project, have modified some of the plants and equipment available at the model plant at C.V. Abadi to the level of technology, the processors have seen in Medan within the limited time and resources available for the project.

It was claimed that the in-plant training provided to a processor by the project in Surabaya was not at all useful as far as the processing technology was concerned. The visit to the fabricators of plant and equipment for the Klentik oil processing in Surabaya was found to be extremely useful.

2.7. FELLOWSHIP/STUDY TOUR TO THE PHILIPPINES/THAILAND/MALAYSIA/MANADO -INDONESIA BY FIVE GOVERNMENT OFFICIALS

While it was claimed that the study tours have benefited them, the only complaint they had was that the time spent in individual countries was too short.

2.8 MARKETING CONSULTANT

The marketing consultant presented his final report to the processors and following are the conclusions drawn jointly by the processors and the consultant:

2.8.1 A re-organization in the supply of raw materials to the processors is vital for the development of the entire Klentik oil processing industry.

2.8.2 The importance of maintaining sanitary and hygienic standards both in raw material, factory premises and quality standards in the main end product manufactured for human consumption, needs to be more emphasized. In this regard quality standards have to be laid down for reference and given wide publicity.

2.8.3 No marketing strategies have ever been developed for sale of Klentik oil to meet the challenge for competing oils.

2.8.4 The market for Klentik oil is being gradually lost due to poor quality of the product and due to increase in per capita income of the Indonesians who are now looking for more sophisticated products.

2.8.5 On the basis of the feasibility study made, it is totally uneconomical to establish a new Klentik oil processing unit at the present time. The existing processing units are viable because their plants were established a long time ago and the depreciation on plants and equipment have been recovered and present actual value of the plant is zero. (Not the book value for accounting purposes.)

2.9 COCONUT PROCESSING CONSULTANT

While it was agreed that all the products recommended for manufacture by the consultant were technically viable, none of them were commercially viable.

2.10 Finally, it was agreed by all concerned that this project was an action-oriented project, formulated and programmed on the basis of the old Chinese proverb:

> "If you give a man a fish, you feed him for a day, if you teach him how to fish, you feed him for the rest of his days."

3. INTRODUCTION

3.1 PROJECT ORIGIN

3.1.1 The project titled "Setting-up of a Rural Small-Capacity Coconut Processing Model Scheme" in Indonesia - US/RAS/86/191 originated in a request submitted by the Asian and Pacific Coconut Community (APCC) on 19 June 1986 to the United Nations Industrial Development Organization (UNIDO), Vienna. This assistance request was made by the APCC Executive Director following the recommendations made by the APCC/COCOTECH/XXIII meeting held in Colombo, Sri Lanka, 5-9 May 1986. It was also decided at the APCC XXIII session, held in Port Vila, Vanuatu, 20-24 October 1986 that the Government of Indonesia, the Department of Trade and Copra Management of Indonesia, will host the project with Department of Trade, Jakarta as the National Project Co-ordinator, in co-operation with the project counterpart and Liaison officer, the APCC Executive Director.

3.1.2 The project was approved by UNIDO on 2 January 1988 with funds from the Government of the Federal Republic of Germany with UNIDO as the Executing Agency. The project was approved initially for seventeen (17) months and became operational with the arrival of the Chief Technical Adviser on 27 March 1988, to prepare a "Master Plan" for setting-up a "Model Coconut Processing Scheme" in a rural coconut area. The duration of the preparatory phase was for a period of two months.

3.1.3 During the preparatory phase study, a rural coconut area in the sub-district of Padang-Pariaman with Sungai Sarik as the capital was selected as the project location. In addition, seven small-scale coconut processors selected to participate in the project. All seven selected processing units used fresh coconut meat to make Klentik oil. The plants and equipment used in these units were locally fabricated but completely out-dated and production flow not streamlined. None of the seven selected

processors (except one who used an outdated, locally fabricated filter press) had filter presses for further clarification of the oil. Laboratory and workshop facilities were also not available at the processors'units.

3.1.4 A Master Plan with work programme and time schedule for the various project activities were also drawn up during the preparatory phase study. And, finally, the immediate objective of the project was formulated.

3.2 PROJECT IMMEDIATE OBJECTIVE

3.2.1 The immediate objectives of the project as defined in the Preparatory Phase Report were as follows:

- To modify the existing plants and equipment to better their efficiencies;

- To identify bottle-necks in the production flow and streamlining the operations;

- To improve the technical and economic efficiencies of rural small-capacity coconut processing operations for the productions and marketing of quality Klentik oil and their by-products;

- Finally, to select the best modified processing unit among the seven participating processors to this project as the UNIDO Demonstration Processing Unit.

3.3 OFFICIALS ASSOCIATED WITH THE PROJECT

The following were associated in the project implementation, backstopping and support:

Executing Agency

(1) Mr. Horst Koenig, Senior Industrial Development Officer, Agro-based Industries Branch, Department of Industrial Operations, UNIDO, Vienna as project officer and substantive officer;

(2) Mr. G.L. Narasimhan, UNIDO Country Director, c/o UNDP Office, Jakarta.

Counterpart Agency

(3) Mr. P.G. Punchihewa, Executive Director, Asian and Pacific Coconut Community, Jakarta as project counterpart and liaison officer;

Host Government

(4) Dr.A.N. Pantow, Secretary, Department of Domestic Trade, Jakarta, Executive Secretary, Copra Management Board of Indonesia, Jakarta as Project National Co-ordinator (Jakarta);

(5) National Co-ordinating Committee

Dr. A. N. Pantow (Chairman);

Dr. N. K. Sumarsono, Director, Directorate of Supply and Distribution of Agricultural and Forestry Products, Department of Trade, Jakarta (Member);

Dr. Yustian Ismail, Senior Official, Copra Management Board of Indonesia, Jakarta (Member);

Mr. Alberth Yusath Tobagu, Head of Planning and Programming Division, Secretariat of Directorate-General, Domestic Trade, Jakarta (Member);

Dr. Saud P. Saragih, Chief, Administration Section, Directorate of Supply and Distribution of Agricultural and Forestry Products, Department of Trade, Jakarta (Member);

Mr. Locat Rambe, Regional Director, Department of Trade, Padang (Member);

Mr A.W. Situmeang, Deputy Regional Director, Department of Trade, Padang. National Co-ordinator (Padang) and Member.

3.4 PROJECT PERSONNEL

Five international experts, namely a mechanical engineer (6 months), a UNV mechanical engineer (15 months), a quality control chemist (3 months), a marketing consultant (1 month) and a coconut food processing consultant (1 month) were selected and recruited by UNIDO to work under the guidance of the Chief Technical Adviser (CTA) in the project implementation. The Chief Technical Adviser (CTA) was assisted by the National Project Assistant in his day-to-day work.

The following were the UNIDO recruited project personnel:

- Mr. M. Varnakulasingam, Chief Technical Adviser (Sri Lanka);
- Mr. Herman Agusney, National Project Assistant (Indonesia);
- Mr. Pedro C. Catanaoan, Mechanical Engineer (Philippines);
- Mr. Herath M. Piyasena, UNV Mechanical Engineer (Sri Lanka);
- Mr. K. Puraneswaran, Quality Control Chemist (Sri Lanka);
- Dr. (Mrs) S. Sringam, Food Processing Consultant (Thailand);
- Mr. J. Edirisinghe, Coconut Marketing Consultant (Sri Lanka).

4. PROCESSING TECHNIQUES BY THE PROCESSORS PARTICIPATING IN THE UNIDO PROJECT, BEFORE THE PROJECT STARTED IN MARCH 1988

4.1 Almost all the seven Klentik oil processors used the same processing technology. Their process was as follows:

4.1.1 Purchase of Fresh Meat. Fresh coconut meat (kernel removed from the shell) was purchased, delivered to the processing units on a quality basis regularly. There were three different grades of meat purchased. Grading was based on maturity of the fresh meat. The amount paid for the three different grades were as follows:

Grade "A"	Rp 230/kg
Grade "B"	Rp 220/kg
Grade "C"	Rp 220/kg

The grading was done by visual check and the payment was made after weighing using a platform weigh scale locally made in Indonesia. The platform weigh scale was a direct copy of the Avery Platform weigh design, weighing range: 0-500 kg, but less accurate than the Avery Scale.

4.1.2 Fresh Meat Processing. The fresh meat purchased was kept in a heap or pile (without proper ventilation) before it was processed.

The coconut meat was manually elevated to a wooden loading platform above a chopper or a disintegrator which was a direct copy of the Japanese Cecoco Machine and then fed into the machine at a regular rate. The coconut meat coming out of the chopper or the disintegrator was in a form similar to that of a manually grated coconut. But, the particle size of the chopped meat varied widely.

4.1.3 Heating in Pans. About 3 buckets, each weighing 25 kg or a total of 75 kg of the chopped meat was loaded into a pan and heated for one hour to evaporate the water. The fuel used was usually firewood and sometimes coconut shells or husks were used. There was no chimney to the fireplace, therefore all the smoke (due to insufficient air for burning the firewood) came into the heating pan area causing quite a lot of inconvenience to the workers.

During the heating process, the pan was stirred every now and then to prevent burning of the chopped meat. After the water from the meat was evaporated, what was left in the pan was little Klentik oil (approximately 3 per cent extraction) and brown coloured cake. (The colour of the cake was not uniform brown, it was with some black coloured particles.) The Klentik oil obtained at this stage had excellent aroma (burnt coconut oil smell) but the oil was dark in colour. The brown cake was separated from the oil using a strainer made of wire mesh, fitted into a half-cut 45 gallon drum.

4.1.4 Expelling Oil. The cake left on the strainer was taken manually using a bucket and fed into the hopper of an expeller (first expelling) to further extract the oil. The expellers used were either made in Medan or Padang and was a direct copy of the Japanese Hander Machines. The power for driving the expeller and other machines came from a Diesel Engine Power Generator which was actually imported from abroad.

The first expelled oil was usually dark brown in colour and with little aroma or flavour. To enhance the flavour (aroma - burnt taste and smell), the expelled oil was usually cooked with chopped meat, boiled to evaporate water and the process was again repeated. The yield of Klentik oil in the second operation was higher than in the first stage (due to mixing fresh meat with first expelled oil). The brown cake from the second operation was expelled and the process repeated.

4.1.5 Settling Tank. The oil coming from the pan and the expellers were pumped into a settling tank (for blending to enhance flavour) and settled for not less than 24 hours. After settling for 24 hours or more, the finer/coarser cake particles separates from the oil and settles at the bottom. The settled cake particles are drained from the bottom and sent through the expeller to extract more oil (please note there was only one draining pipe which was used for filling into drums also). And this proceses was repeated.

4.1.6 Clarification of the Oil. Further clarification of the oil was not normally done at the majority of the processing units, except one i.e. C.V. Abadi. The filter press used by the processor was not efficient and locally fabricated.

5. WHAT IS KLENTIK OIL AND WHY THE VILLAGERS PREFER THIS TYPE OF OIL

5.1 The oil manufacture, which has now been developed into a semi-organized process of extraction of coconut oil from the cooked fresh coconut meat retaining its original aroma and pale yellow colour with a FFA content not exceeding 0.5% for edible purposes, is now known in Indonesia as the Klentik oil manufacturing process.

5.2 This process of extraction has adversely been affected in more recent years due to the availability of modern technological developments in the extraction of oil from the dried kernel of the coconut called copra. These modern processing units are equipped with further facilities for refining the crude oil at more acceptable levels to the food technologists and elite consumers with more regular and higher income.

5.3 Klentik oil in its natural form does not require any refining process which will take away its uniqueness. When Klentik oil is obtained from fresh coconut meat of proper maturity , it contains only 0.2 to 0.3% free fatty acid. After the filtering process, Klentik oil is supposed to remain in good condition (without being rancid i.e. off taste, bad odour) for at least six months to one year, provided that fresh coconut meat of proper maturity i.e. neither under- nor over-ripe is used and filtered, raw oil is kept in air-tight containers with minimum of air above the oil.

5.4 Rural masses admire the pleasing colour (pale yellow), appreciate the pleasant aroma, palatable taste and use it in the preparation of daily meals. It is a natural product processed to retain its original qualities for consumption purposes without apparent health hazards.

6. QUALITY OF THE KLENTIK OIL MANUFACTURED BY THE PROCESSORS BEFORE THE UNIDO PROJECT COMMENCED

6.1 The erratic supply of raw materials, coupled with its poor quality due to the nuts harvested being immature and delay both in the arrival and processing of raw material, poor sanitary and hygienic conditions in the processing units, cause high bacterial counts and hence leading to high FFA content. This causes immense problems in maintaining the original quality standards for the main finished product - the Klentik oil.

6.2 The supplies of the raw materials for the processors come from small farmers who gather their nuts according to their economic needs, rather than on maturity. They pluck their nuts - both matured and immature. The nuts are then dehusked together to collect a quantity of kernel to make a sufficient load to be carried in gunies (jut bags) on horseback or push bicycle to the processing units. In the case of the brokers who act as agents to the processors, they carry the raw materials in push bicycles or motorcycles. The brokers or agents generally operate in remote villages where transportation of the raw materials from the farm to the processing units are difficult.

6.3 The recovery of the kernel or white meat, its mode of transportation and the unavoidable delay in delivery and processing of the coconut kernel has resulted in a high stage of micro- biological spoilage of the raw materials resulting in poor quality of the main end-product - the Klentik oil.

6.4 The raw material - fresh meat on arrival at the processing units' premises - is left on the processing units floor, aggravating the bacterial contamination process. This situation is further worsened due to unhygienic handling and delay in processing the kernel, resulting in rancidity of the product. The raw material is handled without much consideration to the fact that it is the base for manufacturing an edible cooking oil - a daily need of the consumers spread far and wide across the country.

6.5. Although certain processors take utmost care to keep the FFA content as low and light colour maintaining the coconuts' original freshness and aroma, it was found generally that the FFA content in the oil obtained in most of the processing units sometimes exceed 1 per cent with a very dark brown colour and burnt aroma. This problem is generally due to the technology currently used in the processing units.

6.6. Survival of this industry will depend on its ability to maintain the quality standards of the end-product acceptable to the food technologists and harmless to the millions of consumers.

6.7 With the above objectives, the UNIDO project with a definite work programme has been undertaken and completed successfully, with the co-operation of the participating processors, host government and the project counterpart.

7. THE PERFORMANCE OF THE DEMONSTRATION COCONUT PROCESSING UNIT

7.1 The demonstration coconut processing unit was set up at the processors - C.V. Abadi and the plant consists of a completely redesigned plant and equipment and streamlined using screw conveyors to obtain good quality oil and increased oil yield at a reasonable level of production cost.

The modified and streamlined plants definitely improved the technical efficiencies.The project has also created an impact on the management techniques used by the processors. Now the management of the processing units are utilizing their men, methods, machines and money efficiently.

7.2 The following are some of the modifications and streamlining done to the Demonstration Coconut Processing Unit (Refer Annex 9):

(1) The raw materials: "fresh meat" when delivered to the processing unit is fed into a screw conveyor and fed into the

hopper off the chopper. The chopped meat falls on to a bin at ground level which is the same level as the missing tank.

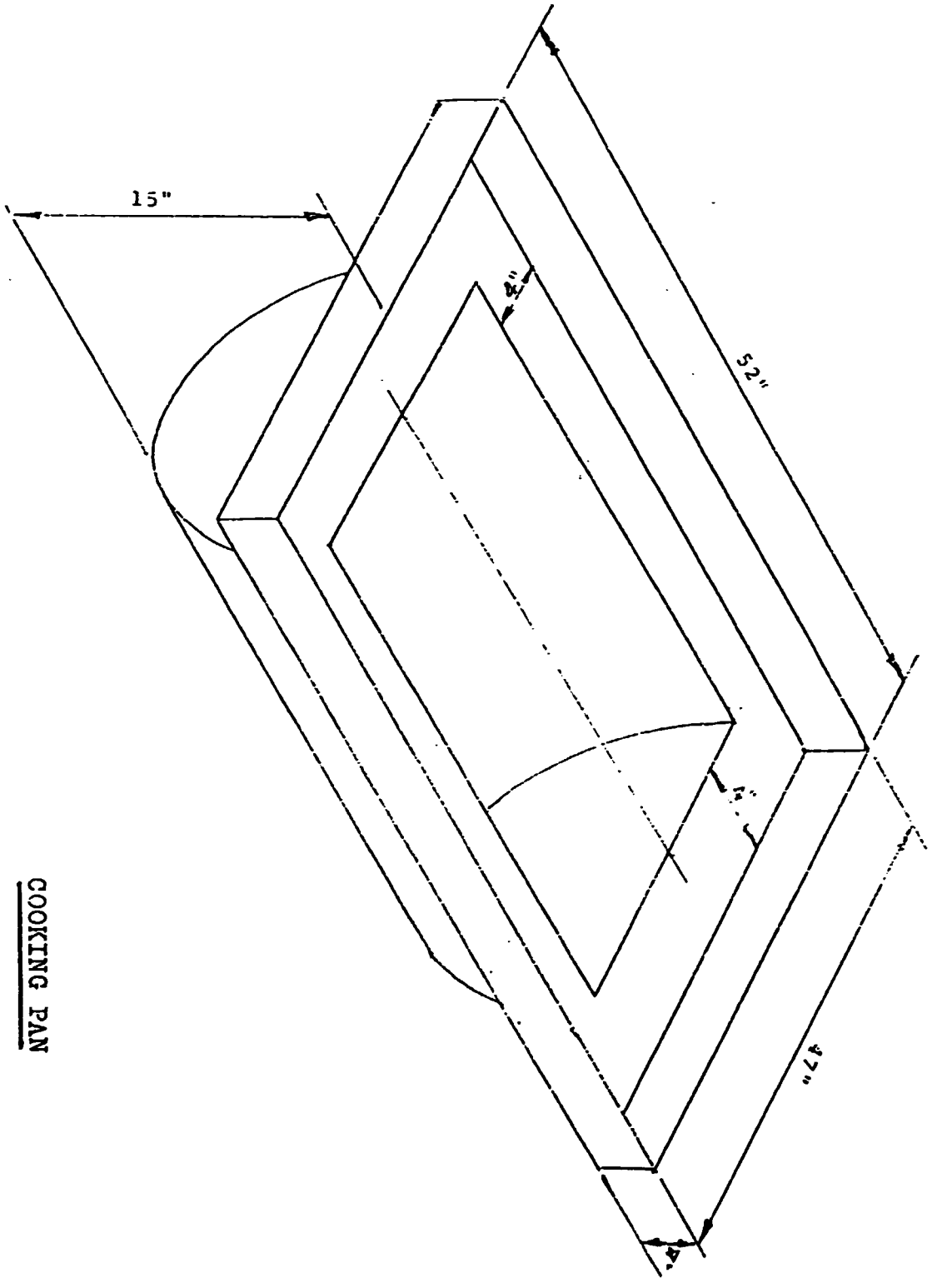
(2) The chopped meat from the bin is pushed into the mixing tank by means of a wood ladle and mixed with previously expelled oil. The purpose of mixing fresh meat with expelled oil is to enhance the flavour of the expelled oil and to prevent burning of the chopped meat at the heating tank. The chopped meat and expelled oil forms a slurry and this slurry is pumped (using a positive displacement pump) into cooking tanks.

(3) After the moisture is evaporated from the slurry (coconut meat and expelled oil) the colour of the slurry turns light yellow and at this stage, the door at the bottom of the cooking tank is opened into the draining tank (a filtering device) to separate the brown cake and the oil. The separated oil is pumped into a settling tank.

(4) The brown cake is taken by means of a screw conveyor and falls into the hopper of the screw press. The expelled oil is then either re-circulated to the mixing tank or pumped into the settling tank. When the settling tank is full, it is settled for 24 hours and filtered using a frame and plate filter and filled into 45 gallon drums for the consumer market.

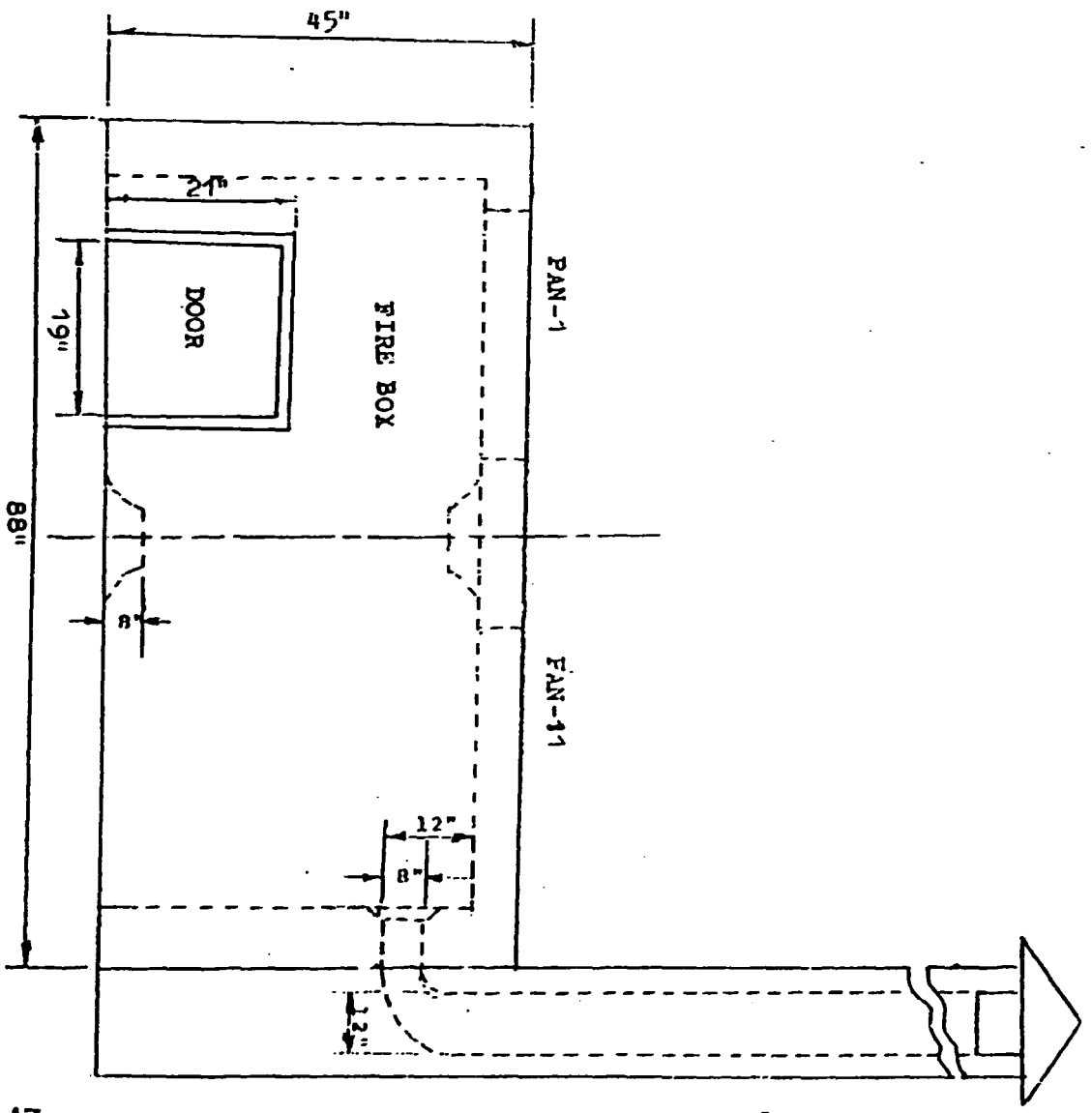
7.3 The end result of this project is that this plant is now producing light coloured oil with low free fatty acid content and better aroma or flavour when compared to what it was before. In addition, the income to the processors were increased through better efficiences and reasonably low cost of production.

Annex.1



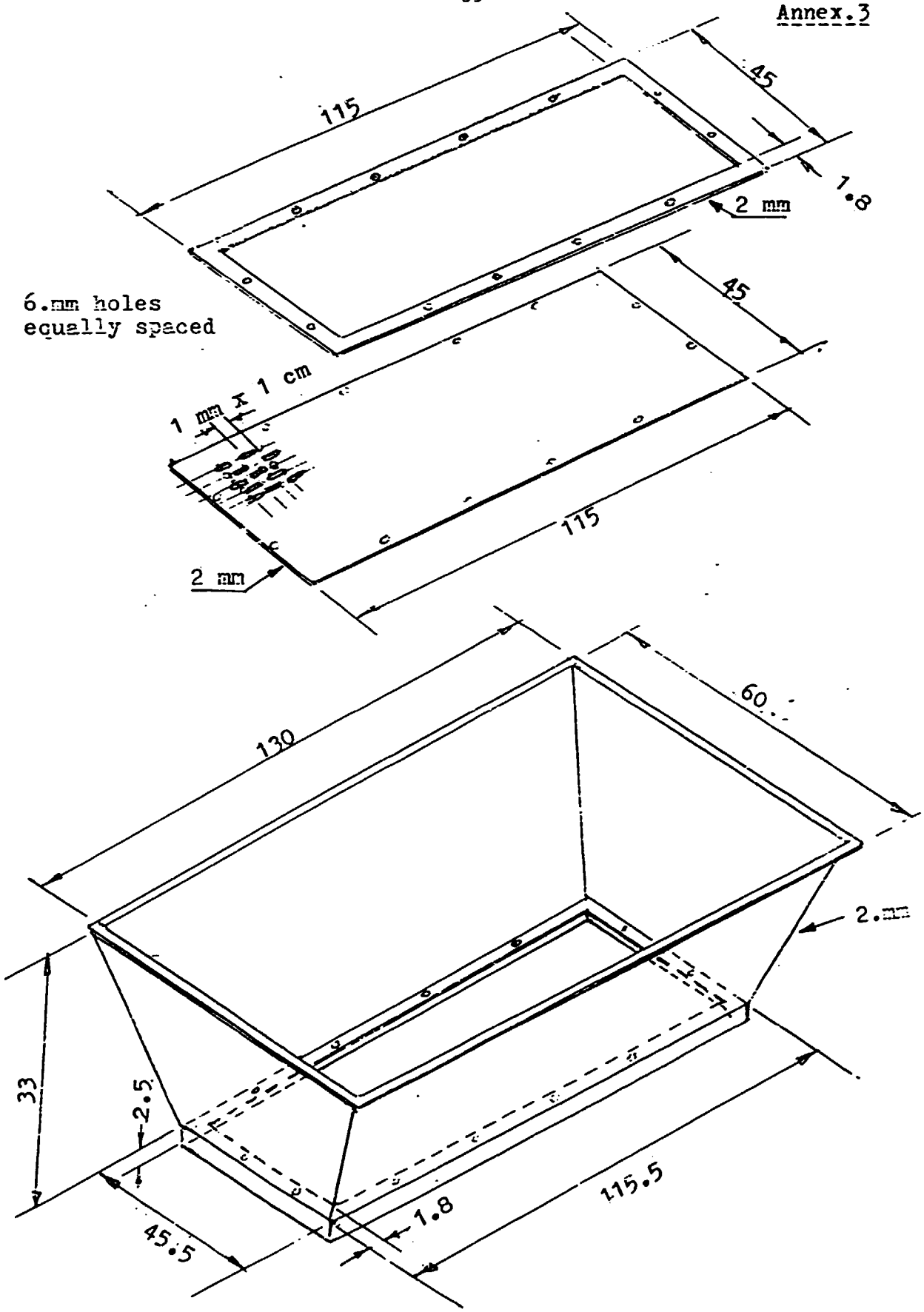
COOKING PAN

Annex 2



MODIFIED FIRE PLACE
(FOR TWO COOKING PANS)

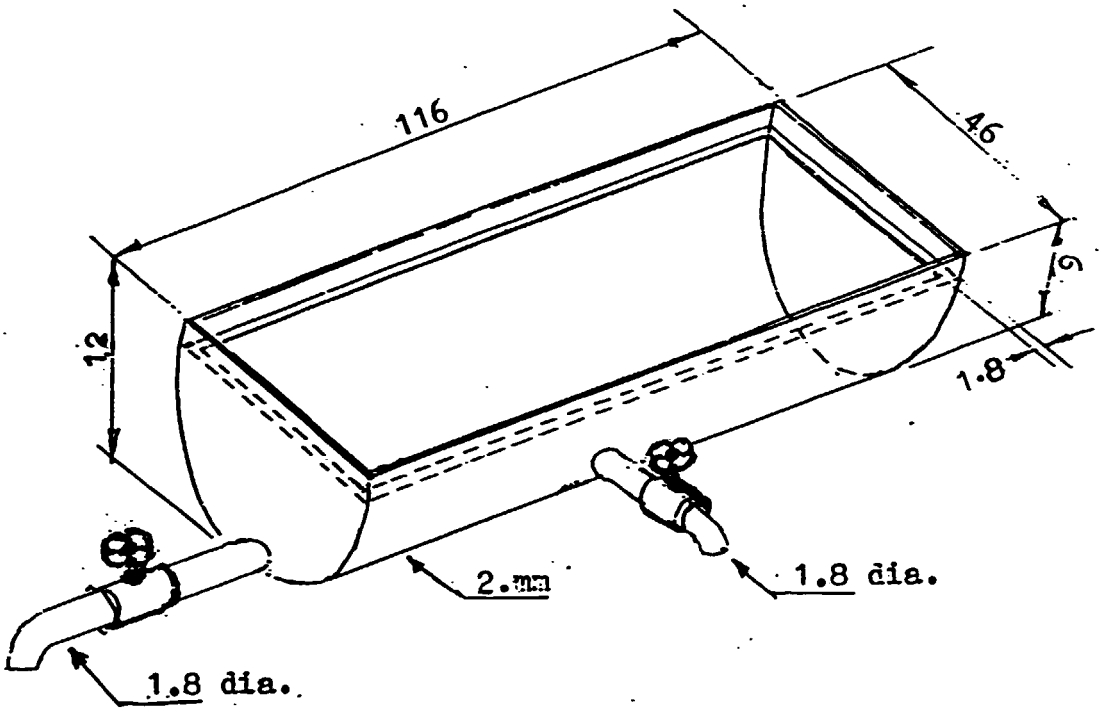
Annex.3



MODIFIED FILTERING DEVICE

(ALL DIMENSIONS ARE IN CM)

Annex. 4

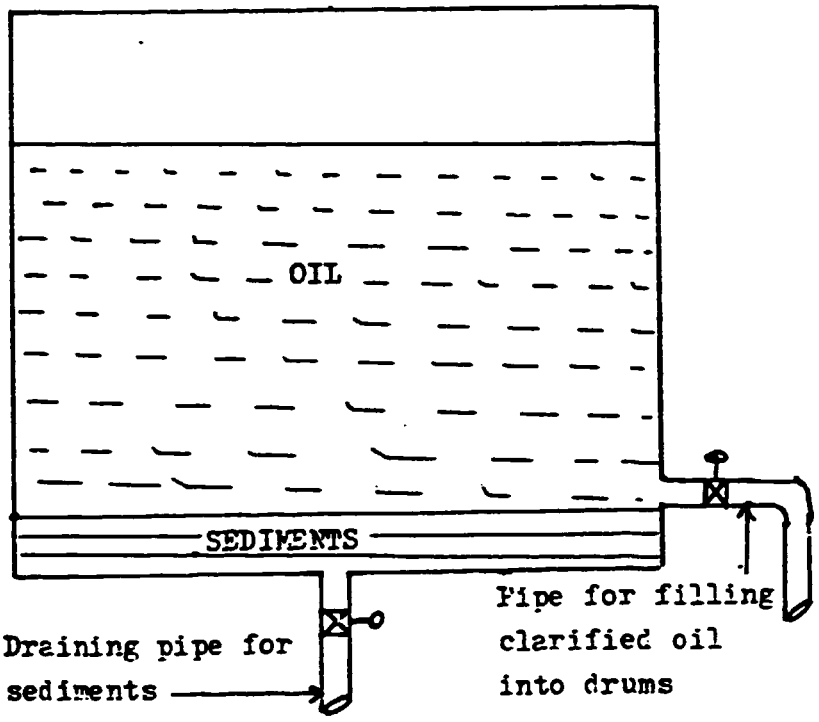


DRAINING PAN FOR THE FILTERING DEVICE

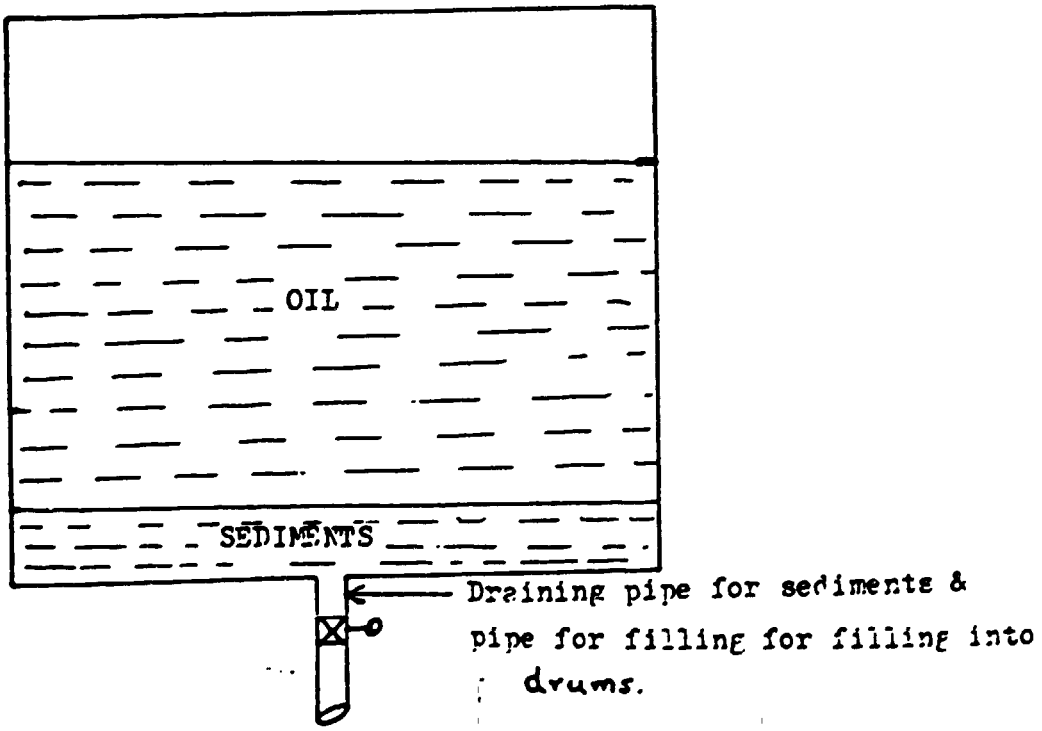
(ALL DIMENSIONS ARE IN CM)

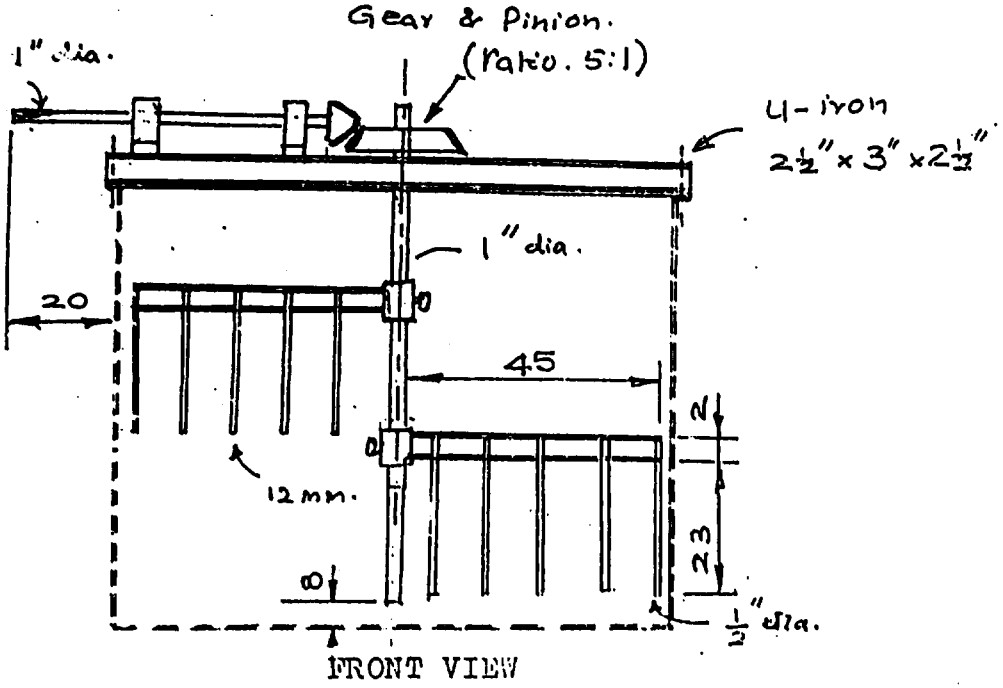
Annex 5

MODIFICATION TO OIL SETTLING TANK
(Cross-Section)

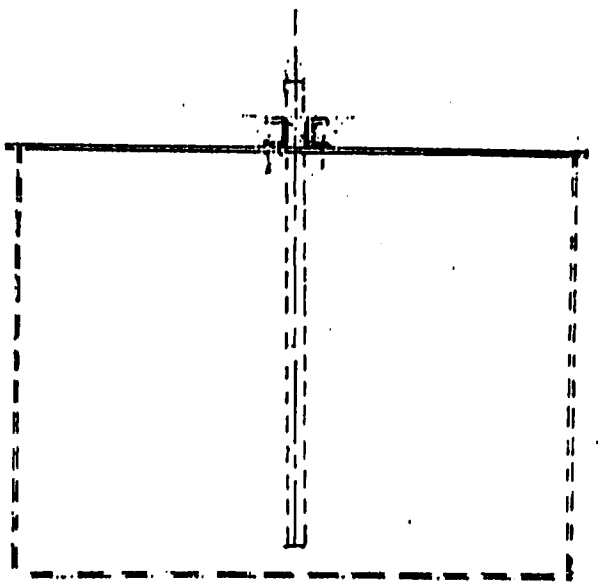


SETTLING TANK BEFORE MODIFICATION
(Cross-Section)





FRONT VIEW

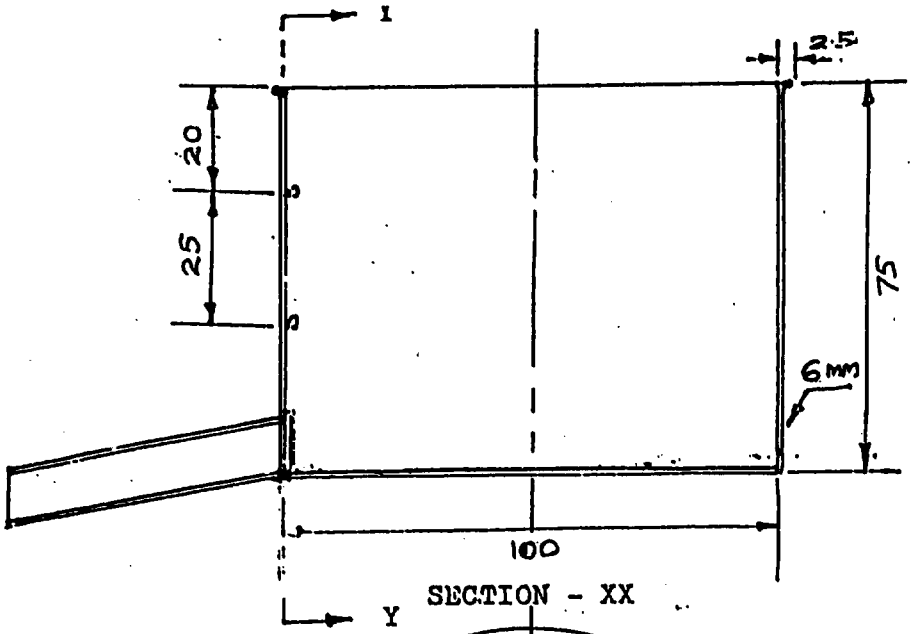


SIDE VIEW

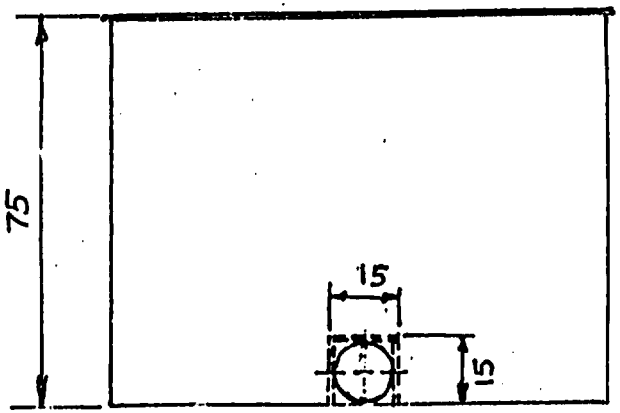
STIRRING UNIT FOR COOKING TANK

(DETAILS NOT SHOWN)

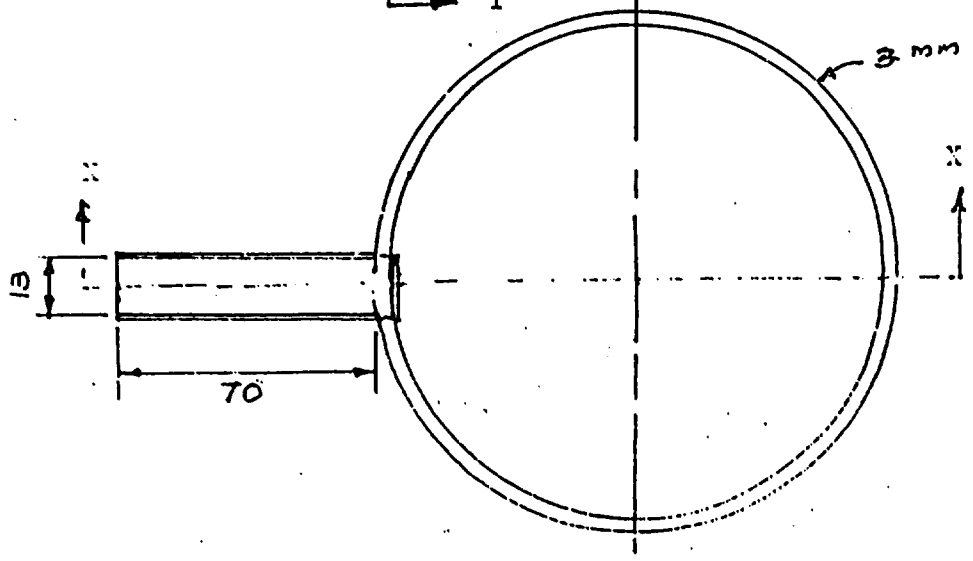
(ALL DIMENSIONS ARE IN CM.)



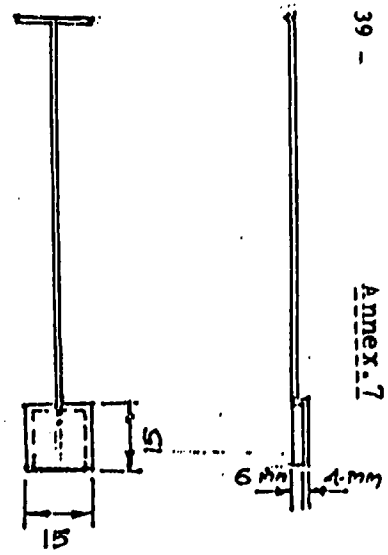
SECTION - XX



SECTION - YY



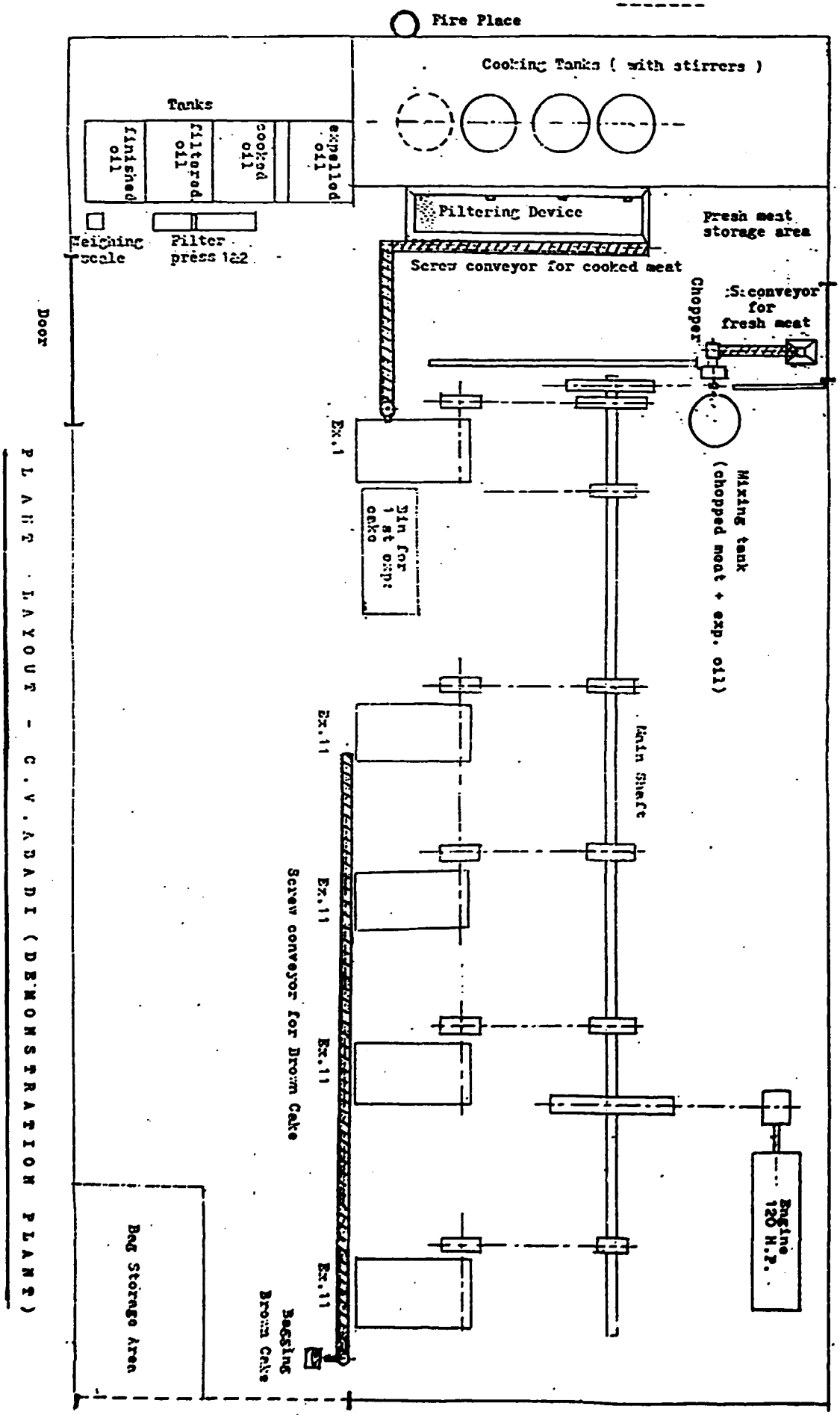
COOKING TANK



DOOR

(ALL DIMENSIONS ARE IN CM.)

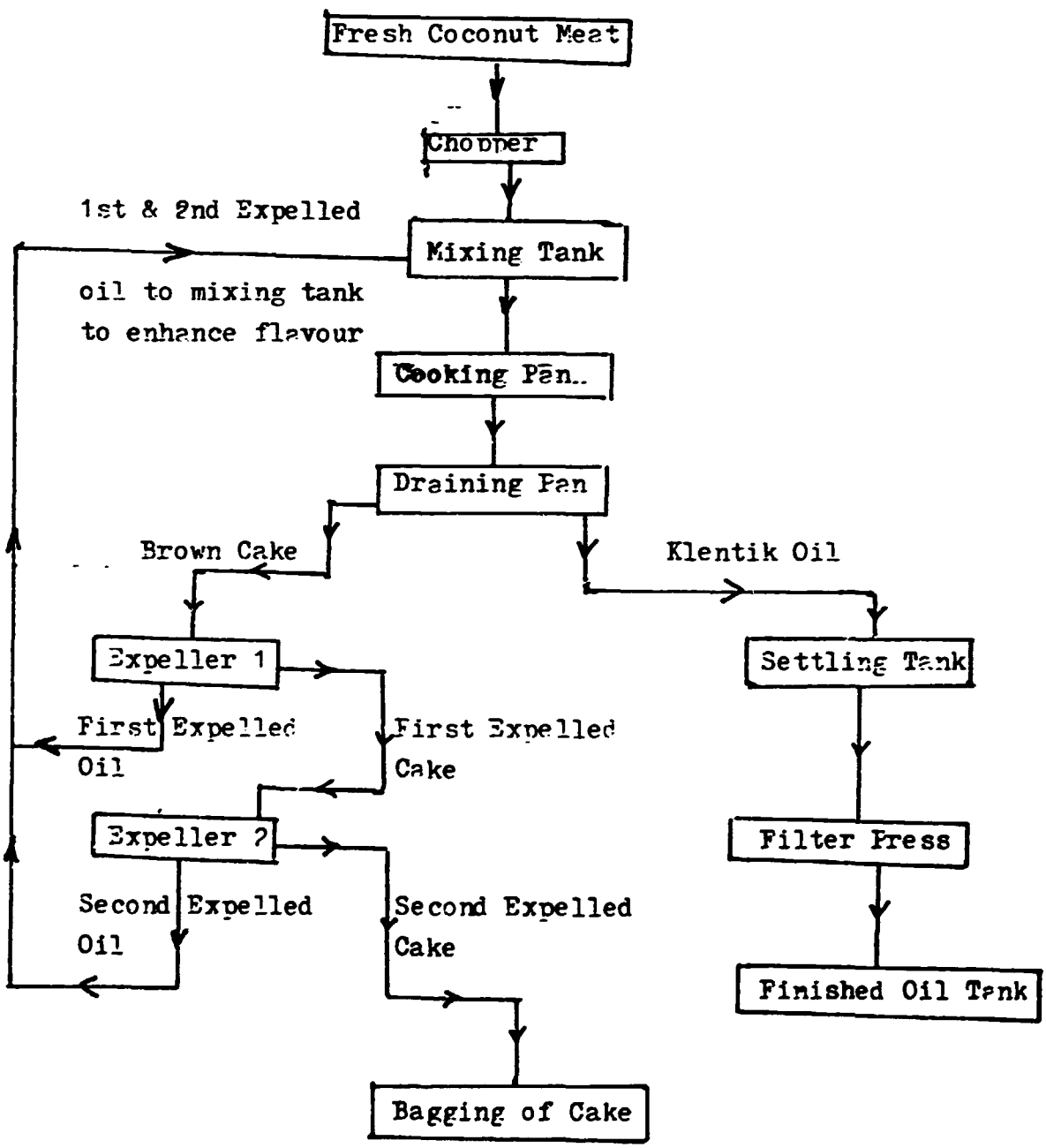
Annex.8



PLANT LAYOUT - C.V. ABADI (DEMONSTRATION PLANT)

Annex 9

METHOD OF HANDLING RAW MATERIALS AND PRODUCTS IN THE DEMONSTRATION PLANT AFTER INSTALLATION OF THE MODIFIED PLANTS AND EQUIPMENT AND STREAMLINING THEIR PRODUCTION FLOW.



Annex.10 (a)

Letter of Agreement

This is to certify that I, BASRI owner/Manager, of C.V.ABADI, Limpato agree to the proposal made by the UNIDO Project : US/RAS/86/191 to set-up my processing unit as the Model Coconut processing plant for the project.

Under the agreement to establish a Model Plant, the UNIDO Project, in addition to all assistance provided to my processing unit, will provide free of charge the following plants and equipment.

(i) One Coconut Chopper
(ii) One Screw Press (Expeller)
(iii) One Plate and Frame Filter Press imported from Japan.

Any installation of the above units and further streamling of the above plants with my existing plants will be on a cost sharing basis, (between my processing unit and UNIDO Project) as discussioned and agreed with the Chief Technical Advisor to the project.

I undertake to complete all work in connection with the Model Plant by latest December 15, 1989.

As an owner of the processing unit, I will not sell or mortgage the plant/equipment provided under the project.

I also agree to permit other processors from Indonesia, Malaysia, Thailand, The Philippines, India, Sri Lanka, Papua New Guinea, Solomon Islands, Vanuatu, Western Samoa, Vietnam and Micronesia to view my plant as a UNIDO Model, when requested by the Government of Indonesia.

IN WITNESS THEREOF, I fix my signature

ABADI

BASRI
Owner/Manager,

Date : September 14, 1989

Agreed by

2. M. Varnakulasingam,
Chief Technical Advisor
UNIDO Project : US/RAS/86/191

Date : 14, September, 8

Col. Anas Malik,
District Governor,
Padang - Pariaman

Date : September 14, 1989

Regional Director, Dept.of Trade, Padang
Representative, Govt. of R.I

Date : September 14, 198

6. Bantow,
Executive Secretary,
Copra Management Board of Indonesia
Representative, Govt. of R.I and
(Project National Co-ordinator)

Date : September 22, 1989

K.G. Punchihewa,
Executive Director,
Asian and Pacific Coconut Community,
(Counterpart to the project)

Date : Sept 29 1989

Annex. 10(b)

Surat Perjanjian

Saya yang bertanda tangan di bawah ini :

Nama : BASRI

Kilang : C.V. Abadi, Limpato, Tujuh Kota.

Menyetujui persyaratan yang ditetapkan oleh Proyek UNIDO : US/RAS/86/191 untuk menjadikan kilang minyak saya sebagai Kilang minyak Percontohan.

Berdasarkan persetujuan untuk menetapkan sebuah Kilang Percontohan, Proyek UNIDO akan memberikan bimbingan-bimbingan serta peralatan mesin-mesin secara gratis, sbb :

(i) Sebuah mesin cencang (chopper)
(ii) Sebuah mesin press (expeller)
(iii) Sebuah Filter Press yang diimpor dari Jepang.

Untuk pemasangan mesin-mesin tersebut diatas dan saluran pipa minyak (Streamlining) akan dibiayai bersama (Pabrik saya dan Proyek UNIDO) berdasarkan permusyawarahan dan persetujuan dengan Chief Technical Advisor.

Saya akan menyelesaikan seluruh pekerjaan,sesuai dengan Kilang minyak percontohan yang di maksud selambat-lambatnya tanggal 15 December 1989.

Sebagai pemilik dari kilang minyak, Saya tidak akan menjual atau menggadaikan peralatan-peralatan yang diberikan Proyek UNIDO.

Saya juga menyetujui untuk membolehkan prosessor-prosessor lain dari Indonesia, Malaysia, Thailand, Philipina, India, Sri Lanka, Papua New Guinea, Kepulauan Solomon, Vanuatu, Samoa Barat, Vietnam dan Micronesia untuk meninjau Kilang saya sebagai sebuah Model UNIDO, setelah disetujui oleh pemerintah Indonesia.

ABADI

1.

Pemilik Kilang Minyak

Tanggal : 14 September 1989

Di setujui oleh

2. Tanggal : September 14, 19

Ir. Varnakulasingam

C/A. UNIDO Proyek: US/RAS/86/191

Tanggal : 14 September 1989

Ir. Koty Anas Malik

Padang - Pariaman

4. Tanggal : 14 September 1989

Kakanwil Dep. Perdagangan,

Padang

mewakili Pemerintah RI

Tanggal : 22 September 1989.

Ir. Soetantow

Sekretaris BAPENGKO

mewakili Pemerintah RI

(Koordinator Proyek Nasional)

Tanggal : Sept 29, 1989

P.G. Punchihewa

Direktur APCC

(Counterpart Proyek)

(This is to certify that, I, Herman Agusney, NPA have translated the original agreement in English to Bahasa Indonesia and have also explained to all concerned on the true translation).

DEMONSTRATION PLANT:- UNIT OPERATIONS.

To have a better understanding of the various operations in the Demonstration Plant as per attached photographs , a summary of the sequence of the operations are given below. :-(Refer Annex.9)

1. Fresh Coconut Meat is transported from the ground level to the hopper of the chopper by means of a screw conveyor.

2. The chopped meat falls into a bin placed at the ground level and close to the mixing tank, which is also at the same level.

3. The chopped meat is pushed into the mixing tank by means of a wooden laddle and mixed with previously expelled oil.(to enhance flavour).

4. The slurry of expelled oil and chopped meat from the mixing tank is pumped into the cooking pans.

5. The moisture is evaporated from the slurry in the cooking pans.

6. The door at the bottom of the cooking pan is opened into the filtering device.

7. The brown cake is retained in the filtering device mesh and the oil flows into the draining pan. And the the oil is pumped to the settling tank.

8. The brown cake is transported by means of a screw conveyor and falls into the hopper of the first expeller. The first expelled oil is circulated to the mixing tank to enhance flavour.

9. The first expelled cake is taken manually and fed into the hopper of the second expeller.

10. The second expelled cake goes for bagging and the second expelled oil recirculated to the mixing tank.

SCREW CONVEYOR

Screw Conveyor transports the fresh coconut meat from the ground floor level to the hopper of the chopper.

SCREW CONVEYOR AND THE HOPPER OF THE CHOPPER

Fresh Meat transported by the screw conveyor falls into the hopper of the chopper.

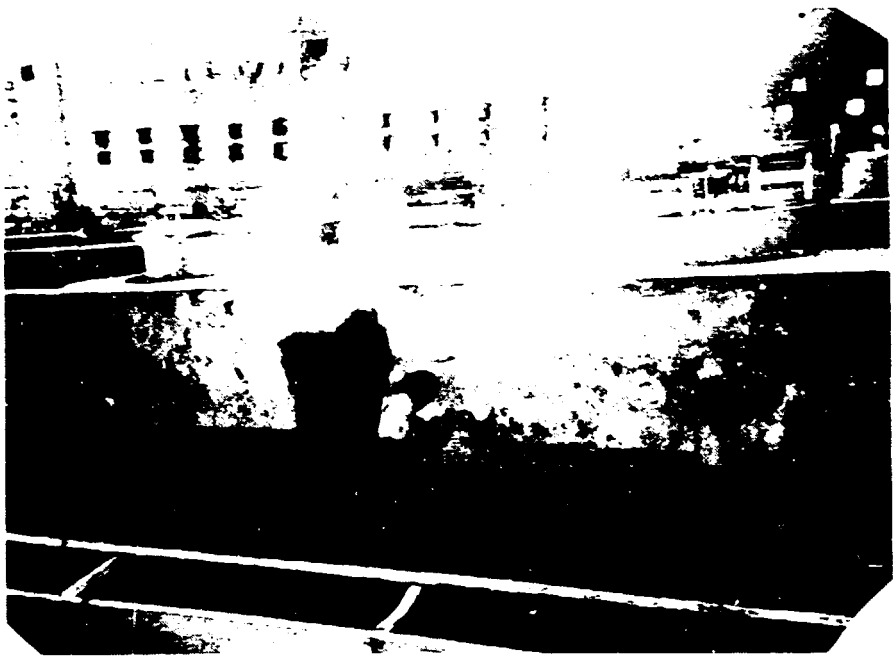
CHOPPER AND THE DRIVING MECHANISM TO THE SCREW CONVEYOR AND THE CHOPPER FEEDING UNIT.

This picture shows the chopper and the driving mechanism to the srew conveyor and the chopper feeding unit.

MIXING TANK

Mixing Tank, installed underground, top tank level same as the ground level and shows the chopped meat and expelled oil being fed in

COOKING PANS



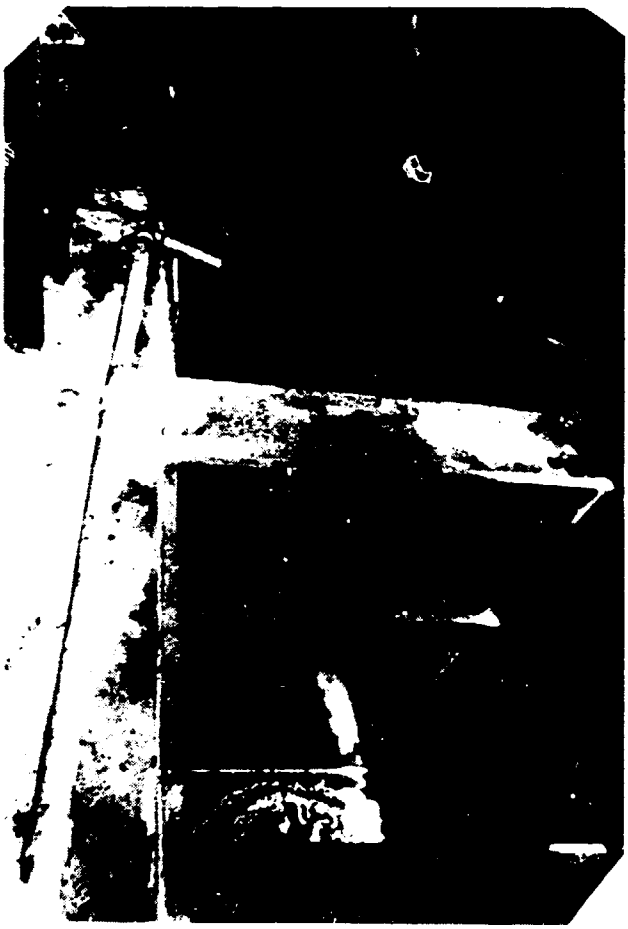
Three circular cooking pans with stirrers, installed approx. 45" above the ground level, with pipes for discharging the oil and cake into the filtering device.

Top-view of the cooking pan

FILTERING DEVICE

Shows the modified filtering device with the discharge pipes for brown cake and oil from the three cooking pans.

KLENTIK OIL

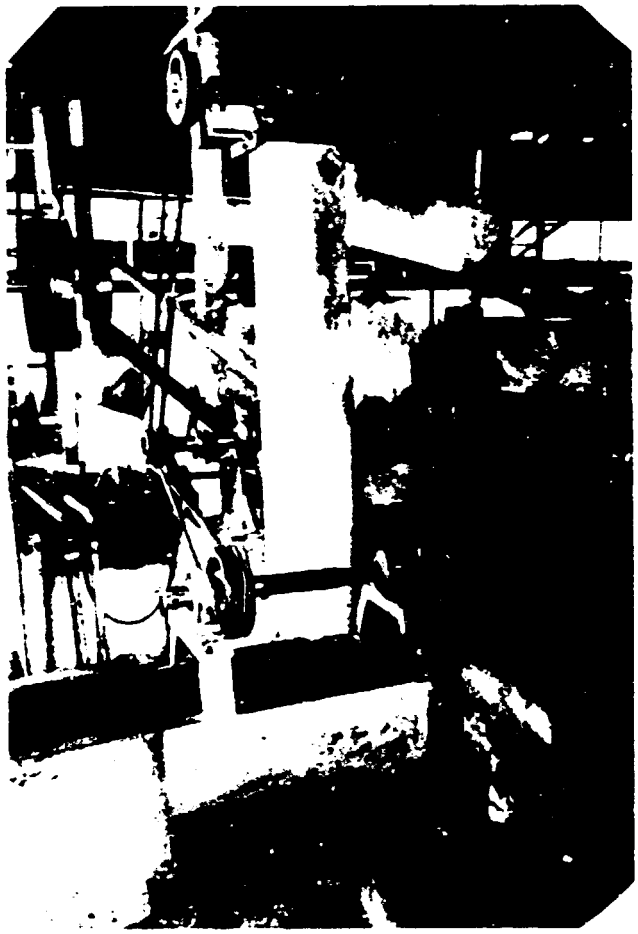


The picture shows the pipe line for klentik oil from the filtering device to the setting tank.

BROWN CAKE

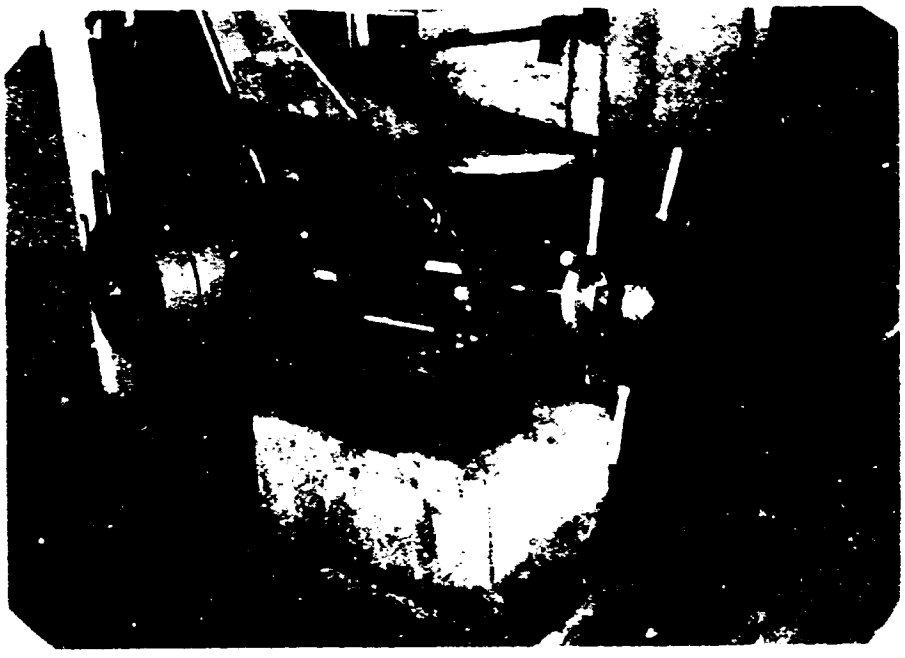
Shows the brown cake on the filtering device, which is to be transported by means of the above conveyors to the hopper of the first expeller.

BROWN CAKE TO FIRST EXPELLER



The photographs above shows the brown cake transported by the screw conveyor falls into the hopper of the first expeller.

FIRST EXPELLED CAKE AND SECOND EXPELLING



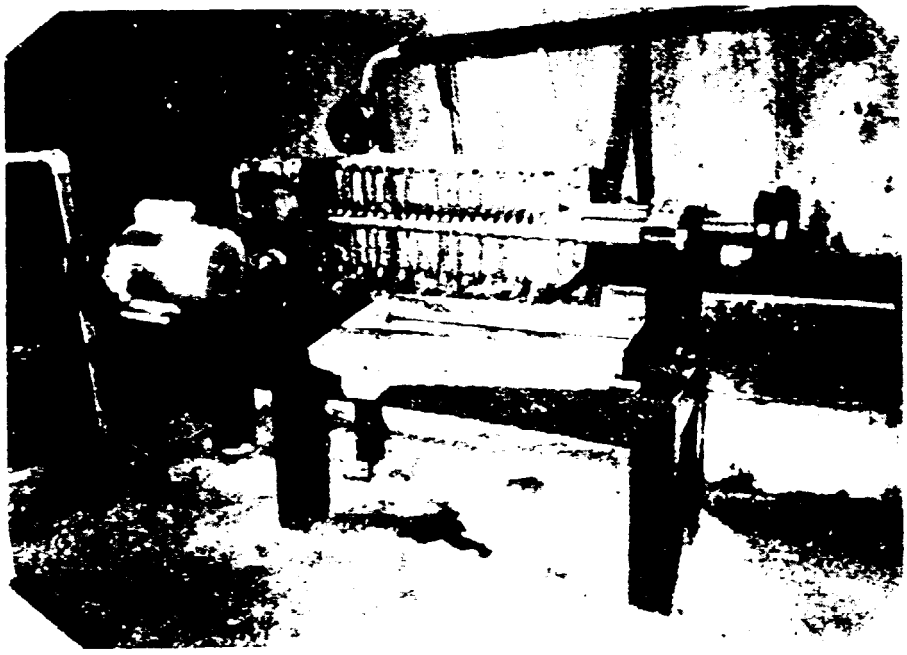
Picture of the second expeller

The first expelled cake is fed into the hopper of the second expeller. The picture shows the second expelled cake being transported by a conveyor for bagging.

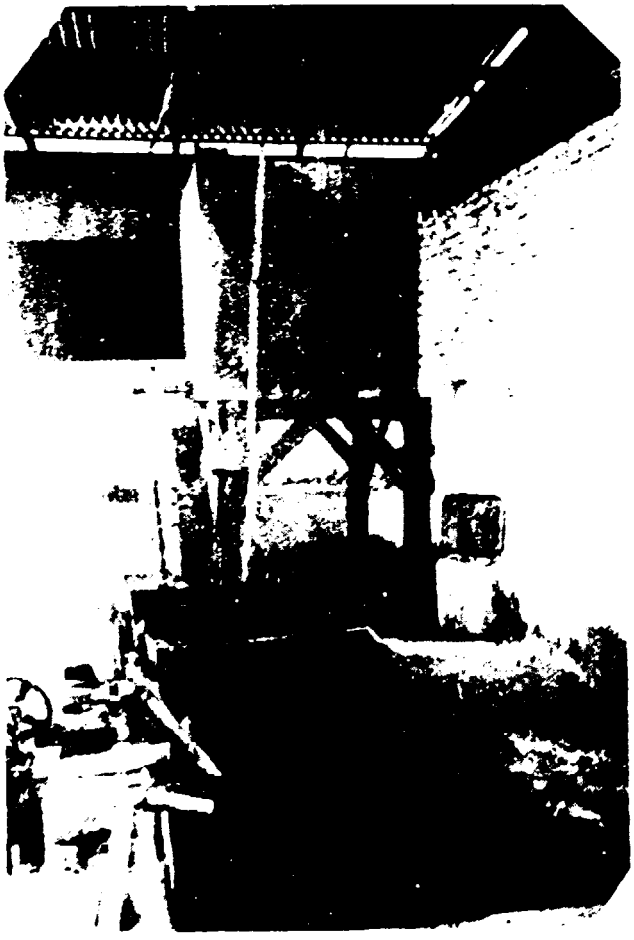
BAGGING OF THE SECOND EXPELLED CAKE

The photographs shows how the second expelled cake is filled into bags.

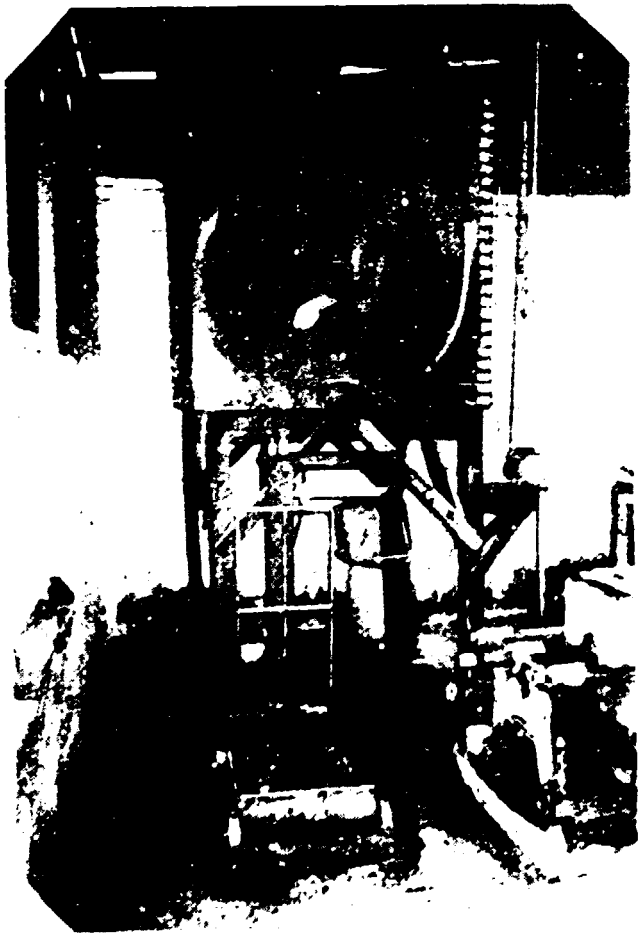
FILTER PRESS, CLARIFICATION OF OIL AND FINISHED OIL TANK



Filter Press imported from Cecoco, Japan.



Crude klentik oil, settled, filtered through filter press and pumped into finished oil tank.



Finished oil tank showing out-let for filling in drums and weighing.