



TOGETHER
for a sustainable future

OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

21886

65 p.
tables
diagram



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

UNDP/UNIDO

FEDERAL MINISTRY OF INDUSTRY
Small & Medium Industries Department

UNDP Assisted Programme for Development of Small & Medium Enterprises in Nigeria
(Project N° DG/NIR/95/039/B/01)

COMMERCIALISATION OF R & D PRODUCTS
OF NATIONAL RESEARCH INSTITUTIONS

I. DE PIERPONT
HEPD/SMI
Industrial Development Officer

P.R. GYSS
Ing. ENSCS, Ing. IFC, CPA
UNIDO Consultant

FEDERAL REPUBLIC OF NIGERIA, ABUJA, JUNE/JULY 1997

<u>1. PRESENT SITUATION AS SEEN THROUGH THIS MISSION.</u>	7
<u>2. PROPOSALS MADE.</u>	8
2.1 WITH REGARDS TO RESEARCH INSTITUTES POLICIES.	8
2.2 WITH REGARD TO MANUFACTURE OF RESEARCH-PRODUCTS.	9
2.3 WITH REGARD TO THE PRIVATE SECTOR.	10
2.4 WITH REGARD TO GOVERNMENT ACTION.	10
<u>3. CONCLUSIONS.</u>	11
<u>4. PRESENT SITUATION.</u>	12
4.1 AS SEEN IN PREVIOUS REPORTS.	12
4.2 COMMENTS ARISING FROM OUR OBSERVATIONS.	12
<u>5. BRIEF OF THIS CONSULTANCY AND RESULTS.</u>	13
5.1 GENERAL	13
5.2 EXECUTION	14
5.3 CONFORMITY WITH TERMS OF REFERENCE.	14
<u>6. METHODOLOGY</u>	15
6.1 DATA ACQUISITION.	15
6.2 INTERPRETATION OF RESULTS.	16
6.3 BASIS OF STRATEGY - PROPOSALS.	16
<u>7. PREVIOUS WORK CARRIED OUT.</u>	16
<u>8. ONGOING ASSISTANCE.</u>	17
<u>9. INVENTORY OF RESEARCH PRODUCTS.</u>	17

	3
<u>10. USEFULNESS OF RESEARCH PRODUCTS.</u>	23
<u>11. EVALUATION OF MARKETABILITY.</u>	23
<u>12. OBSERVATIONS MADE IN THE FIELD OF SALEABILITY.</u>	24
12.1 PRICING OF GOODS.	24
12.2 MOTIVATION OF RESEARCH ACTIVITIES.	24
<u>13. PRESENT METHODS OF COMMERCIALISATION</u>	25
13.1 PRECONDITIONS FOR COMMERCIALISATION.	25
13.2 CONSTRAINTS FACING THE SELLERS, INCLUDING RESEARCH INSTITUTES.	25
13.2.1 AVAILABILITY OF DEMONSTRATION MACHINES.	26
13.2.2 DISTRIBUTION.	26
13.3 CONSTRAINTS FACING THE APPROVED MANUFACTURERS	26
13.3.1 STOCKS OF RAW MATERIALS.	26
13.3.2 STOCKS OF FINISHED PRODUCTS.	26
13.3.3 MANUFACTURING TECHNIQUES.	27
13.3.4 WORKSHOP DRAWINGS.	27
<u>14. PROPOSALS FOR IMPROVED COMMERCIALISATION.</u>	27
14.1 VERY SHORT TERM STEPS.	27
14.2 SHORT TERM STEPS.	27
14.2.1 CONSOLIDATION OF EXISTING RESULTS.	28
14.2.2 RESOURCES ALLOCATION.	28
14.2.3 INTEGRATED APPROACH TO DESIGN OF MARKETABLE PRODUCTS.	30
14.2.4 PRICING.	31
14.2.5 FORMALISATION OF THE APPROVED MANUFACTURERS SCHEME.	32
14.2.6 GREATER INVOLVEMENT OF NGO'S	33
14.2.7 GREATER INVOLVEMENT OF THE TECHNOLOGY BUSINESS INCUBATORS.	33
<u>15. LONG TERM PROSPECTS FOR IMPROVED COMMERCIALISATION.</u>	33
15.1 INDUSTRIAL MARKET SURVEY	34
15.2 TRANSFER OF PILOT PLANTS.	34
<u>16. SELECTION CRITERIA OF PROJECTS FOR MARKETING PLANS.</u>	35
<u>17. PROPOSED MARKETING PLANS.</u>	36

	4
18. INFORMATION.	36
18.1 PRESENT SITUATION.	36
18.2 NARROWING THE INFORMATION GAP.	37
18.2.1 INFORMATION FLOW	37
18.2.2 INFLOW TO INSTITUTES.	37
18.2.3 OUTFLOW FROM INSTITUTIONS.	37
18.2.4 FEEDBACK FROM ENDUSERS.	38
19. CURRENT LINKAGES WITH SME/SMI'S.	38
19.1 SMIS AS APPROVED MANUFACTURERS OF RESEARCH PRODUCTS.	38
19.2 SMIS AS SUBCONTRACTORS TO LARGER FIRMS AND INSTITUTES.	38
19.3 SME'S AS BENEFICIARIES OF RESEARCH.	39
20. SUGGESTED IMPROVEMENTS IN THE ENVIRONMENT.	39
20.1 THE ROLE OF GOVERNMENT IN COMMERCIALISATION.	39
20.1.1 THE NATIONAL MARKETING AGENCY.	39
20.1.2 INNOVATION.	40
20.1.3 FISCAL INCENTIVES.	40
20.2 THE ROLE OF THE PRIVATE SECTOR IN COMMERCIALISATION.	40
20.2.1 RISK CAPITAL	40
20.2.2 SPONSORSHIP	40

ABBREVIATIONS.

ADP	Agricultural Development Project
APDF	African Project Development Fund
ARCEDEM	African Research Centre for Engineering Design and Manufacturing
CHELTECH	Centre for Leather Technology of NARICT
CSU	Crop Storage Unit
FGN	Federal Government of Nigeria
FIIRO	Federal Institute for Industrial Research Organisation
FMI	Federal Ministry of Industry
FMST	Federal Ministry of Science & Technology
HEPD/SMI	UNIDO Human resources development, SMI section
IAR	Institute of Agricultural Research
IARC&T	Institute of Agricultural Research & Training, Obafemi Awolowo University
IBRD	International Bank for Reconstruction & Development (World Bank)
IITA	International Centre for Tropical Agriculture
IRRI	International Rice Research Institute
KACCIMA	Kano Chamber of Commerce, Industry, Agriculture and Mining
MAN	Manufacturers Association of Nigeria
NARICT	National Research Institute for Chemical Technology
NASENI	National Agency for Science and Engineering Infrastructure
NASSI	Nigerian Association of Small Industries
NOTAP	National Office for Technology Acquisition and Promotion
NPRI	National Pharmaceutical Research Institute
RAIDS	Rural and Agroindustrial Development Scheme
RMRDC	Raw Materials Research & Development Council
SEDI	Scientific Equipment Development Institute
SMI	Small & Medium Sized Industries
SMID	SMI department of the FMI
SNO	Standards Office of Nigeria
TBI	Technology Business Incubator
UNIDO	United Nations Industrial Development Organisation
WIPO	World Intellectual Property Office

LIST OF APPENDICES**Appendix N° Subject**

- I Extracts from job description
- II Complete List of projects
- III Completed projects which may be suitable for SMIs
- IV Projects for which additional information has been requested
- V Items examined for possible commercialisation
- VI Proposed commercialisation plans
- VII Suggestions concerning a methodology for consolidating competing designs
- VIII Typical questionnaire to research institutes
- IX Questionnaires to be used at (cancelled) seminar
- X Notes on Site Visits and Meetings
- XI List of persons met
- XII Preliminary Risk Analysis, NARICT essential oils

ACKNOWLEDGEMENTS.

Our particular thanks go to the FMST for having authorised this mission and seen to its very efficient organisation and to the Country Director, JPO, and Programme Officer of UNIDO, who have constantly provided encouragement and logistical support whenever possible under trying circumstances.

We also wish to thank Mr. Emeka Chinalu Orji for his very effective assistance in our field-trips to Zaria and Kano, Mr. Chigbo, National Consultant for his valuable assistance in our field-trip to Enugu as well as the staff of the Research Institutes visited, who gave us much of their time and attention.

EXECUTIVE SUMMARY

1. Present situation as seen through this mission.

It has been ascertained that the main-reasons for poor commercialisation of the research products of many Research Institutes are:

- In the past, Institutes on which information was obtained have almost all centred a large proportion of their research on developing machinery aimed at the same sector of rural micro-enterprises.
- Level of activity and purchasing power of this sector are low and do not justify present intense inter-institute competition for the same market.
- The quality of many of the demonstration machines produced by Research Institutes is below the acceptability threshold.
- Outside of RAIDS and FIIRO, offer of process-lines which would meet the needs of progressive SMI's seems to be near zero among completed projects. It is worthy of note that the two Research Institutes mentioned have by far the best sales-performance, even though the unit value of the lines on offer is relatively high. It is believed that this is due to their policy of selling process lines with integrated technical assistance, instead of single machines.
- Lack of working capital prevents manufacturers of research products from carrying appropriate stocks of metals and consumables; this precludes any best-practice approach and is detrimental to the very necessary trend towards quality improvement and standardisation.
- Lack of working capital prevents approved manufacturers from carrying stocks of finished goods; they lose customers who can buy similar imported goods from distributors' stocks.
- Non standardisation and duplication of designs results in such dispersion of quality-levels and functionality that not anyone of the products reaches the critical sales-level from which a second-hand market would be generated. This means most of the products do not offer acceptable security to financiers.
- The fact that the products of the Research Institutes are not considered to represent adequate security to lenders means that endusers, who have anyhow low purchasing power

and minimal cash-resources, cannot in any way count on loan-financing when purchasing such products.

- Lack of cash-resources means that there cannot be any upward trend from micro-enterprise to SMI - operation. Working capital needed to operate SMI-sized enterprises in the sector under consideration just does not seem to be available under present circumstances. Even owners of RAIDS products, which were purchased in large quantities at SMI levels, are said to have serious working capital problems.

There are indeed also a number of shortcomings in the field of information-flow among the Research Institutes and the users as was observed before; some corrective steps are currently being taken to remedy this, but a major problem not previously identified and which remains unresolved is the fact that Research Institutes visited do not have adequate drawing-office capacities. Current practice is that manufacturers build prototypes from sketches and approximate samples. The preparation and distribution of proper drawings would reduce resources- and materials wastage by eliminating the trial and error approach. The latter also creates a risk of demotivation of manufacturers and buyers if the trial period is too long.

The availability of proper drawings would greatly facilitate standardisation and benchmarking.

2. Proposals made.

The report puts forward suggestions in a number of fields. The major issues are highlighted below. Many of them will require decisions and guide-lines at Government level; others can be implemented by those concerned if they are judged to be useful.

2.1 With regards to Research Institutes policies.

Revive among Research Institutes an information network containing state of the art research information on an international as well at a national level.

Establish a closer working-relationship between the TBI's and the Research Institutes.

Make better use of the information which is available even now and improve exchanges by creation of an intranet.

Re-allocate resources by delegating all prototype-work to those Institutions having appropriate facilities and know-how and make better use of locally available technology and manufacturing facilities.

Make arrangements with Polytechnics and Universities (a) to attract design engineers and draughtsmen to Research Institutions and (b) to let them acquire the required practical experience.

Favour greater participation of the private sector - on the Boards of the Research Institutes - as sources of information and advice on applied research-subjects - as sources of funds.

As far as products aimed at the SMI's are concerned, generalise in all Research Institutes the integrated marketing approach as practised in neighbouring countries and by at least three Research Institutes in Nigeria and train their staff in its practical implementation.

Concentrate on developing process-lines instead of single machines which latter the private-sector manufacturers are as a rule producing to a better standard.

Make sure that approved equipment contains the safety devices which are now mostly lacking.

Extend the terms of reference of the integrated marketing approach to include promotion of the entrepreneur with sources of equity and loans.

Together with professional associations and other bodies, identify means whereby SMI's purchasing the equipment could have access to short term-credit for working capital.

Ensure that the impact of all research products on economic and social development is systematically monitored, reported upon and discussed among Institutes, Ministries, the private sector and financiers.

Make greater use of NGO's not only as a fund-provider but also as an active link between Research Institutes and users in rural areas.

Make greater use of the experience of SEDI in setting and maintaining high quality-standards; this Institute should become the reference institute not only for Nigeria but for the region. It should also be provided with the working capital needed to increase production to optimum-levels.

If necessary, amend the statutes of the Research Institutes in order to enable them (a) in the short term openly to engage in commercial promotion activities (b) later on to enter into joint ventures with the private sector and/or other sources of capital for pilot plant and prototype work.

Cause a high-level market survey to be made with a view to identifying those sectors towards which the bulk of the applied research should be redirected.

2.2 With regard to manufacture of research-products.

Consolidate designs of similar machines now being commercialised in small numbers by various Research Institutes into one single design, standardise the latter and disseminate it with all approved manufacturers.

Consolidate the separate lists of approved manufacturers now being issued by a number of institutes into one common list.

In the longer term, network the approved manufacturers and create a common resources pool to carry stocks of critical raw materials and semi-finished goods enabling better manufacturing practice.

Associate the private sector with institutional sources in financing the common resources pool.

2.3 With regard to the private sector.

Involve the private sector, mainly through existing structures or new sub-structures of existing ones, in the following areas:

- more active role of private sector representatives on the Research Institutes' Boards,
- as a counterpart of this, increased participation of the private sector in financing result-oriented applied research and prototype-work,
- use the associations to instil more quality-consciousness and professionalism and encourage self-control by the members of professional bodies of their quality-standards in respect of durable and of consumer goods alike,
- create within the associations structures capable of managing and dispensing short-term credit (working capital) to members, using their grass-roots knowledge for selecting beneficiaries and their moral influence to recover outstanding debts; these structures should be the operational interface between finance institutions and the traditional credit-structures.
- involve the private sector in the creation and financing of a common-resources pool of critical raw-materials and components from which approved manufacturers can draw those items needed for them to be able to achieve optimum quality and efficiency levels in the manufacture of research products.

2.4 With regard to government action.

Clarify the co-ordinating functions of NOTAP, RMRDC, the IDCs and NASENI respectively; their briefs seem to overlap.

Re-orient the proposed National Marketing Agency towards becoming a facilitator and a liaison-office with the private sector in Nigeria and abroad or confer this role on some existing co-ordinating structure.

Consider the possibility of offering some added fiscal advantages to capital invested in financing of research, including pilot plant and prototype work.

On the basis of the market survey mentioned above, identify those areas towards which applied research should be directed, set objectives, define a strategy, allocate resources.

Assist in refresher-training of Heads of applied research organisations towards a more result-oriented management style.

3. Conclusions.

The situation as seen in this report is at the same time better and worse than could be surmised from previous reports on the subject of commercialisation of research-products.

It is better because operational linkages between Research Institutes and SMI's do in fact exist and are generating a significant volume of sales within the approved manufacturer scheme. Progress has been made or will shortly be made in some areas previously identified as representing serious constraints, such as information flow, for which much remains nevertheless to be done.

One Institute visited displays a high degree of sensitivity to market-niches in innovative, high added value activities and a level of quality which should enable it to claim a position of a reference institute and technology exporter for the region and beyond.

It is worse because some fundamental weaknesses need to be corrected before output of Research Institutes can achieve a further significant impact on the performance of SMI's. Among these quintessential constraints, lack of working capital and profit-oriented management of the Research Institutes and of purchasing power in the target-sector predominate.

None of these weaknesses will prove to be insurmountable if the innate dynamism and business acumen of the Nigerian entrepreneur can be brought to bear on further research- and distribution policies.

4. PRESENT SITUATION.

4.1 *As seen in previous reports.*

Previous reports stated that only a few products of applied research reached the market and more particularly the SME/SMIs. Reasons given for this were:

- Output of public-sector research is small and covers only a fraction of those subjects which the private sector would consider to be of interest.
- Output of private research is applied near-exclusively within the organisation having financed the research.

Some explanations of this state of affairs had been advanced^{i ii}. They were:

- Research Institutes do not receive enough information from potential end-users concerning the real needs in terms of technically innovative products¹.
- Because of this lack of communication, research institutes initiate most of the research from within and tend to concentrate on a few well-worn subjects. Subjects so chosen relate essentially to the needs of (mainly rural) micro-enterprises and beverages production. Subjects relating to more recent technologies as used in medium sized industries are seldom if at all studied².
- The period of maturation of applied research projects is disproportionately protracted in relation to their scope³.
- There are significant shortcomings in the management of the Research Institutes.
- There is no evidence that Research Institutes, with a very few exceptions, include commercialisation among their priorities.
- End users do not trust the quality and reliability of locally developed products.

4.2 *Comments arising from our observations.*

Our investigations confirmed these findings when applied to the products of most but not all Research Institutes.

¹ By product we mean not only tangible goods such as machines or food stuffs but also know-how and service-related items such as computer programmes

² see also SDZ report, p25

³ for inst. 16 (sixteen) years for incomplete development of an induction motor, see TECHNOKONSULT report, p.91

It has also been found that the major constraints to further expansion of commercialisation of research products are shortage of manufacturers' and buyers' working capital, low level of activity in the principal target-sectors, low purchasing power of the potential users and an insufficient number of workshops meeting the approval requirements set by the Research Institutes.

One very major shortcoming observed on all but very few sets of machinery is the lack of even the most elementary safety features such as belt-covers. This needs to be remedied.

Furthermore, our attention was drawn to the following additional constraints:

- absence of drawing office capabilities in all but one of the Research Institutes impairs effective know-how dissemination, manufacturing, maintenance and quality-level.
- lack of funds for publication of Research and University journals,
- shortcomings in the fields of patent-protection,
- limited range of national standards applicable to local products other than building materials and metals,
- the fact that the statutes of the Research Institutes apparently do not allow them to base profit-oriented activities on their research.

On the positive side, a number of successful linkages between Research Institutes and SME's have been identified and investigated. They point the way to further progress and could be improved by greater involvement of the trade-associations such as NASSI and MAN; these associations should play an increasing role both as relays between individual members and the Research Institutes and as providers and managers of credit to members. The account of the NASSI-delegation which recently travelled under UNIDO sponsorship to the Philippines should be closely examined in this connection.

Judging by projects listed as ongoing, the Research Institutes appear to have re-oriented their current research towards more process-research on subjects of greater interest to SMI's. This trend should be comforted by carrying out a formal, quantitative survey of SMI needs in terms of applied research..

Production of manufacturers visited was mostly of an acceptable quality, although many designs did not come from Research Institutes .

5. BRIEF OF THIS CONSULTANCY AND RESULTS.

5.1 General

The brief of this consultancy, as shown in Appendix 1, addresses a few of the problems listed above insofar as they relate to interaction between Research Institutes and SME/SMI's aimed at enhancing the activities of the latter. This report is prepared as a complementary document to previous reports on policy framework for SME, and more particularly those by Mequip

Engineering Services and Ceracom in November 1996 and by Dr. P. Nugawela and Prof. Olatunde Odetula in March 1997.

5.2 Execution

As far as involvement of SMI's is concerned, the following possible scenarii were examined:

- SMIs as manufacturers and/or distributors of the hardware developed by the Institutes.
- SME/SMI's as subcontractors to the Institutes or to larger firms developing/distributing. the plantⁱⁱⁱ⁴.
- SME/SMI's as users of the machinery.
- SME/SMI's as providers of information regarding areas in which research would be cost-effective.

5.3 Conformity with terms of reference.

- *Visit the main-research-centres in Universities and other institutions which started the research work in SME related areas.*

The following centres were visited: FIIRO, IARCT, RAIDS, NIPRID, UNIDO distillation pilot plant, IAR, NARICT, CELCHEM, PRODA, SEDI, UNN, TBI's in Lagos and Kano.

Identify R & D work which can be of potential use to SME and can be adopted by them.

- *Lists of completed projects submitted by the Institutes mainly contained items of interest to micro-enterprises; very few related to activities of the formal SMI sector.*

Eighteen items were identified as being potentially of practical interest to SME's, but of these only 4 stood closer examination as to state of completion and availability. For this reason, one item, which albeit suitable for micro-enterprises only is of great socio-economic importance; a few ongoing projects which seem likely to be completed in the near future were also taken into consideration.

- *Examine the conditions of and recommendations about encouraging research-centres to release in full the R & D results to SMEs*

Conditions were examined and recommendations were made.

- *By organising a dialogue among representatives of a group of research centres and a selected group of entrepreneurs (selection through the Associations of Entrepreneurs), prepare mutually acceptable modalities for transferring R & D results to SME operators and for the payment of such results.*

Dialogue was achieved during field-visits to Institutes, endusers, manufacturers' associations and Technology Business Incubators. Reasons for success and failure and conditions were discussed.

⁴ The potential advisory role of the SME/SMI's in the development phase must not be overlooked either; SME/SMI's have practical knowledge of the application which may be lacking in the Institute
NIR/B1 - P.R.Gyss - Report

- *Also through this dialogue (within a workshop) examine the present situation of the flow of information between research centres (e.g. RMDRC, FIIRO, TRODA) and the modern SMEs, establishing (a) diagnosis of the obstacles and difficulties which hamper the flow.*
The seminar to be held in Kaduna on 14th July jointly with the seminar on agricultural implement manufacture was cancelled by FMST because funds for it could not be mobilised in time.

- *Suggest new ways to make research findings available to SMEs on a timely basis and at reasonable cost.*

Suggestions were made for a short term plan and a long term plan respectively. Action plans were drawn up for four different research products and a preliminary risk-analysis was carried out for one of them.

- *Suggest the type of support which SMEs will need to absorb and adapt R & D results as offered by the research institutions.*

Suggestions were made, particularly in the area of standardisation, corporative working capital, loan-guarantees and tax incentives

- *At the same time, make a preliminary list of requirements by SME's for specific R & D activities not yet carried out and which could modernise their activities (research in one or two subsectors depending on availability of data).*

Data additional to those published in previous reports were difficult to obtain. Some indications were obtained, however, in discussions with private-sector operators. It was hoped to acquire more information during the seminar; Appendix IX shows the questionnaires which were to be used by the working groups.

- *Prepare a final report suggesting a strategy to improve the use of R & D results in SME's, on a general basis and also for the benefit of several subsectors.*

A full report is submitted together with a list of steps to be taken by the Research Institutes, Government and the private sector respectively. It includes proposals for commercialisation of 4 products as examples of what could be encouraged in various subsectors.

6. METHODOLOGY

6.1 Data acquisition.

Data from previous UNDP-sponsored reports was synthesised in order to extract from it avenues of investigation akin to the brief of the present assignment. It was noted that previous work, though highly useful, did not attempt to ascertain endusers' actual requirements in terms of applied research.

Hence, potential endusers, either through direct interviews and site visits or through discussions with representative bodies such as Chambers of Commerce & Industry,

entrepreneurs' associations and women's groups were made the principal target of investigation.

Views of endusers were also to be sought in the course of a one day seminar regrouping Ministries, Research Institutes and endusers' representatives.

6.2 Interpretation of results.

Integration of previous data with current findings showed that users' views recouped, to a very large extent, those of the Research Institutes in terms of need for information flow and participation of endusers in formulation of R & D programmes.

6.3 Basis of Strategy - Proposals.

In accordance with the Guidelines set out by the RMRDC^{iv}, proposals made in the report are aimed at:

- improved information of the Institutes through use of current information-technology,
- maximum user-participation in all phases of R & D, to be favoured by the creation of an intranet connection between the Research Institutes, the Ministries and the users' representatives, in conjunction with the World Bank project;
- minimisation of cost of commercialisation of research-products by early capital inputs from end-users and leveraging of these inputs on the basis of production-sharing agreements whenever possible;
- enhancement of the operational linkages between Institutes and the private sector;
- improvement of the working-capital position of the manufacturing sector destined to be the commercial arm of the Research Institutes

7. PREVIOUS WORK CARRIED OUT.

The Project has so far completed 12 national as well as a number of international consultancies. Of those, reports relevant to the present consultancy and made available by UNIDO Vienna and Lagos respectively were:

A study on R & D results and the preparation of a framework for their commercialisation, MEQUIP Engineering Services.

Policy framework for promotion and development of small and medium sized enterprises in the F.R. of Nigeria, Dr. P. Nugawela and Prof. Olatunde Odetola.

Establishment of a multifoood processing plant at FIIRO, SDZ Nig. Ltd.

Feasibility study & engineering design for electrical motor and transformer pilot plant, TECHNOKONSULT.

Feasibility study for the establishment of a pilot plant at IAR Zaria, Environment Plan, Abuja.

8. ONGOING ASSISTANCE.

The following ongoing project-assistance akin to the present work was identified:

Assistance to SNO - National Standards, ISO 2 000, ISO 9 000

Establishment of a focal point of the INTIB system in an agency yet to be designated, XA/RAF/??.

Establishment of an Intranet within Ministries and Research Institutes, IBRD project in preparation .

Assistance to the CSU, FGN/UNDP project NIR/92/014

DETAILED REPORT.

9. INVENTORY OF RESEARCH PRODUCTS.

The data contained in previous reports, together with the results of numerous visits and interviews conducted for the purpose of the present study (for instance at IITA, which had been omitted from previous reports), was used to analyse the range of products available by type and by destination.

Perusal of the documentation provided by the Institutes and of the list shown in Appendix II, summarised in table 2 below, shows that very few current or completed research-subjects deal with matters of interest to SMI's. The most successful items in terms of volume generated were related to industrial brewing, which concerns mainly large and/or multinational companies. The others concern mostly implements for use in rural micro-enterprises. Notable exceptions seem to be the process-lines developed by RAIDS, for which statistical data were obtained, SEDI, which occupies a unique position, and by FIIRO. Unfortunately, the latter Institute does not appear to have kept records which would enable it to evaluate the extent to which these technologies have in fact penetrated the market⁵.

⁵ A list of FIIRO's major products and of their impact appears, however, in SDZ's report, Table 23. NIR/B1 - P.R.Gyss - Report

Table 2
DISTRIBUTION OF RESEARCH SUBJECTS

<u>Area of research</u>	Number of occurrences	Remarks
Animal	14	Veterinary and husbandry
Building	4	Building Materials only
Cassava	59	Processing only
Chemical Industry	25	Incl. pharmacy & parapharmacy
Cultivation	21	implements/machines
Non Solar Drying	7	
Electromechanical	21	various machines
Fish	6	mainly breeding
Flour/Bakery	5	incl. milling
Food	1	Food Products
Fruit	11	Processing & Drying
Grain	26	Harvesting & grading
Mechanical	7	incl. metallurgy
Minerals	6	incl. ceramics
Oil/Oilseeds	28	overwhelmingly palmoil & Groundnuts
Solar	3	Drying & refrigeration
Sundries	7	
Total	251	

These lists comprise ongoing as well as completed projects. The current status of the projects appears in table 3.

Table 3
Status of Research Projects.

<u>Status</u>	
Completed	184
Ongoing	67
<i>Total</i>	<i>251</i>
<u>Type</u>	
Process	69
Machines	158
Products	24
<i>Total</i>	<i>251</i>

Completed research projects are, generally speaking, concentrated on a very narrow product-platform, see Table 4. Among the Institutes for which data are available, research on cassava machinery alone is spread over at least 11 of them and represents 24% of all projects ; research on oilseed processing (including palmoil and palmkernels) is/has been carried out in at least 9 Research Institutes and represents 11% of the projects see table 4.

Table 4

AREAS OF HIGHEST CONCENTRATION OF RESEARCH SUBJECTS

Area	Numbers	%	Institutes
Cassava			
Machines	54	22%	
Processes	5	2%	
Cassava Total	59	24%	11
Oilseeds			
Machines	27	11%	
Processes	1	0%	
Oilseed total	28	11%	9

These figures highlight the duplication of R & D work among institutes and their competition for research funds and potential buyers of the same products.

Further observations were:

- Most of the completed research- items are aimed at a sector in which current level of activity and purchasing power are minimal.
- None of the current or completed projects relate to rubber, plastics^v, timber technology or effluent treatment (e.g. of tanneries) or other environmental problems; the latter is the more remarkable that SNO is currently engaged in extending the applicability of ISO 2000 and is preparing for introduction of ISO 9000 in the foreseeable future.
- Research projects were mainly aimed at machine-design and fabrication. Scrutiny of the detailed list of research items (Appendix II) and of Table 3 above shows that machine-design and development represents 168 out of 251 research subjects. Most of these projects are aimed at copying items which are available at competitive prices on a world-wide basis but a deliberate option appears to have been taken not to look for purchasing from abroad of know-how or manufacturing rights for even the most common items. The added costs and delays in developing such items from scratch are likely to retard technological development and achievement of an exportable quality level.

This picture appears likely to improve in future; Tables 5 and 6 show that the proportion of process-research to machinery research has increased. **However, it must be noted, when**

analysing these tables, that development work was in fact seen to continue in some Institutes on items previously reported as being completed.

Table 6

SUMMARY OF ONGOING PROJECTS

Ongoing projects on machinery	14
Ongoing projects on processes	31
Ongoing projects on products	22

Table 7 indicates that more current subjects will be of interest to SMI's when completed.

Table 7

ONGOING PROJECTS OF INTEREST TO SMI'S

Items	Numbers
Processes	13
Machines	7
Products	2
Total	22

Table 5

Ongoing Research Projects

Object	Item	Institute	Nature	Suits SMI's
Animal	Small dairy production	NAPRI	P	
Animal	Small fattening scheme	NAPRI	P	
Animal	Combined vaccine	NVRI	O	
Animal	Lumpy skin vaccine	NVRI	O	
Animal	Rinderpest/pneumonia vaccine	NVRI	O	
Animal	Salt lick	NVRI	O	
Animal	Typhoid fever vaccine	NVRI	O	
Cassava	Chicken feed from cassava	FIIRO	P	Yes
Cassava	chips to garri	FIIRO	P	
Cassava	citric acid from gari	FIIRO	P	
Cassava	ethanol from peel	FIIRO	P	
Cassava	mono Na glutamate from cassava	FIIRO	P	Yes
Cassava	Chips drier	RAIDS	M	
Chemical Industry	Fatliquors	FCCLT	P	
Chemical Industry	Tannin extracts	FCCLT	P	
Chemical Industry	Anti sickling drug	IAR	O	
Chemical Industry	Alumn	NARICT	P	
Chemical Industry	Bale	NARICT	P	
Chemical Industry	Battery electrolytes	NARICT	P	
Chemical Industry	Bleaching earth	NARICT	P	
Chemical Industry	Ca -sulphate	NARICT	P	
Chemical Industry	Corn starch	NARICT	P	Yes
Chemical Industry	Essential oils	NARICT	P	Yes
Chemical Industry	Fatliquor	NARICT	P	
Chemical Industry	Hydrated lime kiln	NARICT	M	Yes
Chemical Industry	Lab Reagents	NARICT	P	Yes
Chemical Industry	Papaïne	NARICT	P	Yes
Chemical Industry	Pesticides	NARICT	P	Yes
Chemical Industry	Tannins	NARICT	P	
Chemical Industry	Urea/Formol	NARICT	P	Yes
Chemical Industry	Anti asthma	NIPRD	O	
Chemical Industry	Anti diabetic	NIPRD	O	
Chemical Industry	Anti fungal	NIPRD	O	
Chemical Industry	Anti helminic	NIPRD	O	
Chemical Industry	Anti peptic ulcer	NIPRD	O	
Chemical Industry	Anti sickling drug	NIPRD	O	
Drying	Dehydration fruit/vegetables	FIIRO	P	
Drying	Heating apparatus	NMT	M	
Electro mechanical	Antenna + booster	CAT	O	Yes
Electro mechanical	CAT educational computer	CAT	O	
Electro mechanical	CRD computer assemblies	CAT	O	Yes
Electro mechanical	Light activated control	CAT	M	Yes
Electro mechanical	Light chaser signboard	CAT	O	

Electro mechanical	Printed circuit boards	CAT	O	
Electro mechanical	Telephone billing monitor	CAT	M	Yes
Electro mechanical	Touch alarm	CAT	O	
Electro mechanical	Filling machine	FIIRO	M	Yes
Fish	Data Bank	NIOMR	O	
Fish	Fish seed	NIOMR	O	
Fish	Fishing gear	NIOMR	O	
Flour/Bakery	Yeast	FIIRO	P	
Food	Spices	FIIRO	P	
Mechanical	Foundry castings	FIIRO	P	
Mechanical	Ceramics kiln	PRODA	M	Yes
Mechanical	Diesel	PRODA	M	
Mechanical	Elect. Motor insulation	PRODA	M	Yes
Mechanical	Foundry castings	PRODA	P	Yes
Mechanical	Oil burner	PRODA	M	
Mechanical	Welding transformer	PRODA	M	Yes
Minerals	H.T. refractory bricks	PRODA	P	Yes
Oil/Oilseeds	Benniseed oil	FIIRO	P	Yes
Oil/Oilseeds	PK nuts separator	PRODA	M	
Oil/Oilseeds	Filter press	RAIDS	M	
Oil/Oilseeds	Melon seed sheller	RAIDS	M	
Sundries	Football	FCCLT	P	Yes
Sundries	L.T. Glaze	FIIRO	P	Yes
Sundries	Water filter candle	FIIRO	O	

10. Usefulness of research products.

With a few very notable exceptions, items fabricated in the Institute-workshops do not reach a sufficient quality level to be competitive with the established locally produced or imported goods⁶. Practically none (with the exception of IITA products) have any safety features. Quite apart from the fact that this will disqualify them under ISO 2000, this is serious in a country where many people wear loose garments which are easily caught in uncovered belt-drives or gears; experience shows that this can lead to very serious accidents.

Again, as a result of resources being devoted mainly to import-substitution of machinery, only a few Research Institutes have developed complete and practical process lines which could favour development of SMI activities.

In the immediate future, the one aspect of current policies of Research Institutes likely to generate further SMI activities would be to expand the approved manufacturers scheme. Its impact would be even greater if current marketable research products were standardised on a nation-wide basis with systematic quality-control being imposed on all approved manufacturers on the basis of these standards.

11. Evaluation of marketability.

The following criteria were used to assess the marketability of some applied research products aimed at the SME/SMI sector and for which adequate information could be obtained:

- to fill a well identified need not yet satisfied by other local products,
- to be economical to use,
- to be "better" than other available products in terms of costs and/or benefits
- to be available at a price which the end-user can afford to pay, at a point of distribution as near as possible to him,
- to have a well perceived image, more particularly in terms of:
 - training in use and maintenance of the equipment,
 - spare-parts,
 - repair workshop,
 - endusers are aware of its existence and merits.

⁶ see also SDZ report, p22

12. Observations made in the field of saleability.

Appendix III shows the adequation of some research items with these criteria, as ascertained through interviews with executives of the Research Institutes and endusers⁷, excluding the criterion of SME suitability. None scores full marks.

Questionnaires (see proforma in Appendix IIX) were sent to a number of Research Institutes concerning items which appeared prima facie to justify a marketing exercise. Appendix IV shows the list of projects for which additional information has been requested in writing and from which it was envisaged to select a number of commercialisation proposals. Feedback was, generally speaking, quite disappointing. Out of 4 Institutes questioned, only 2 replied and, with the notable exception of RAIDS, few of the items proved to be of genuine interest to SMI's.

Only RAIDS has supplied information complete enough to warrant analysis. This confirms previous finding concerning the lack of interest shown by most Research Institutes in respect of commercialisation of their products.

Taking into account the results obtained by RAIDS, it is obvious that this Institute has developed its own marketing strategy and that it needs no alternative plans. Commercial development of RAIDS appears to be limited mainly by lack of staff and of promotion-funds.

12.1 Pricing of goods.

A major obstacle to pricing is that most Research Institutes do not appear to have records of the cost of the items they produce, in particular in terms of their own overheads and general consumables. This comment does not apply to IITA, IAR and RAIDS who leave the approved manufacturers free to set their sales prices (which does not appear to hamper sales).

12.2 Motivation of research activities.

Interviews with Institutes' executives produced a fairly unanimous view that research results should be made available free of charge to the end-user. This may be a deliberate policy decision but it is of value only if the products actually reach the beneficiaries. To this effect, they must be actively propagated by the Research Institutes and their networks. Many Institutes currently tend to wait for the potential end-user to come to them rather than going out towards him. A notable exception to this passive stance is provided by those Research Institutes which deliberately set up an approved manufacturers scheme.

Acute shortage of funds, meaning that the Institutes actually could not have financed commercial promotion even if they had wished to do so may be a contributory factor.

⁷ the ARCEDEM hammermill has been excluded from this analysis as it not currently meant to be available on the Nigerian market.

If the policy option is, as it seems to be the case at present, that Research Institutes shall transfer their know-how without remuneration in order to accelerate industrialisation, they must be funded in some other manner.

13. PRESENT METHODS OF COMMERCIALISATION

Rational analysis of the present situation is difficult because of the lack of basic statistical data concerning total demand for a given product as well as current market share taken by the Research Institutes and their subcontractors. However, the few data available show in an intuitive manner that quantities produced and sold by the Institutes represent only a small fraction of both demand and current sales. The latter comprises items produced by local workshops (some of which are of a high quality) and low-grade goods imported more or less legally. The latter create a serious constraint to sales of locally produced goods of whatever design they may be; this can only be overcome (a) by making sure that all locally made products are of a uniformly high quality level (b) that a big and durable effort is made in the field of consumer - information.

13.1 *Preconditions for commercialisation.*

Some relevant aspects of commercialisation have already been listed in paragraph 11

Experience shows that marketing of small agro-industrial machinery arising from applied research is even more demanding than marketing of other brown goods for a number of reasons:

- users generally have a strong brand-loyalty for machinery which they or their relatives had previously found to be satisfactory;
- this brand loyalty is enhanced by the fact that local workshops may have some know-how concerning maintenance of established brands and may even carry some spareparts,
- because of the high impact which the acquisition of the new machinery is likely to have on their way of life and on their social status, they are highly risk-averse in selecting it,

To attract the unsophisticated buyers who are the target-population of the vast majority of current research products requires that the seller should be able to display a properly engineered demonstration machine/plant having all the mechanical and safety features of competing products, and that time of delivery of the goods is as good or better than what the competition can offer. Many competing products are available on the spot.

As far as price is concerned, enquiries show that there is undoubtedly a threshold above which users cannot afford to buy the goods; staying below it is the whole purpose of re-engineering, as successfully practised by some Research Institutes. Below this threshold, no evidence was found that price was an overriding consideration.

13.2 *Constraints facing the sellers, including Research Institutes.*

Field enquiries have brought to light a certain number of constraints facing sellers of current research products, be they the Research Institutes themselves or their agents.

13.2.1 Availability of demonstration machines.

It has been stated above that availability of demonstration machines is indispensable. In practice, only a very few Research Institutes seem to have produced useable demonstration-plant and even fewer complete process-demonstration lines. There are nonetheless notable exceptions to this, such as the ARCEDEM hammermill (which is not earmarked for commercialisation in Nigeria), a number of RAIDS process lines and the IITA demonstration machines.

13.2.2 Distribution.

Most Institutes rely solely on the institutional network (ADP's, NGO's, Government to Government agreements). This is unlikely to benefit national user-SMIs.

A few organisations are applying integrated marketing strategies similar to those which have been shown to be highly effective in neighbouring countries, but their current sales have fallen to a small proportion of the potential market. This appears to be mainly due to the generally low level of economic activity in the areas at which the available research products are aimed and to the absence of any form of short term credit providing potential equipment buyers with the working capital required to start production.

None of the Research Institutes visited makes use of the commercial distribution networks, which competitors from the private sector use to great effect⁸.

13.3 Constraints facing the approved manufacturers

Apart from repeated power-cuts, the major obstacles to effective operation by manufacturing SMI's are related to lack of stocks in at least three ways.

13.3.1 Stocks of raw materials.

To be beneficial to the end-users, materials used must at least conform to the already down-designed standards generally set by the Research Institutes; this means having in stock a number of products (special grades of steel, special electrodes etc.) which are not used in everyday, run of the mill jobs and of which retail-sized quantities can frequently only be found at a high cost in the informal sector. Financing stocks of these materials would impose an unbearable strain on the resources of individual entrepreneurs.

13.3.2 Stocks of finished products.

Only very few approved manufacturers, if any, are in a position of financing stocks of finished machines. They must ask potential buyers to give them time to purchase the raw materials and to manufacture the goods. Irrespective of price, this is likely to discourage the buyers whenever they have immediately available from other sources similar equipment sold under a

⁸ see report by Mr. Barton, UNIDO consultant on agricultural and post-harvest equipment.
NIR/B1 - P.R.Gyss - Report

well known brand-name. Here again, the manufacturers cannot economically tie up their small working capital in financing finished goods stocks.

13.3.3 Manufacturing techniques.

A huge step forward could be taken in many instances without increasing cost of production by using appropriate manufacturing techniques. For instance, screw presses would be more reliable and less costly to make and maintain if the worms were cast instead of being fabricated. But the cost of the initial investment in patterns, dies and semi-finished castings cannot be funded by companies of the size of the approved manufacturers'.

13.3.4 Workshop drawings.

Another retarding factor is that very few, if any, of the Research Institutes visited appear to have adequate drawing-office skills. This means that approved manufacturers waste time and materials on copying/modifying commercially available machines or implements on the basis of sketches giving no engineering details.

14. PROPOSALS FOR IMPROVED COMMERCIALISATION.

This chapter sets out a number of steps which should lead to improved commercialisation.

14.1 Very short term steps.

A number of steps can be taken rapidly to improve short-term perspectives of commercialisation without requiring any fundamental changes. These steps are:

- To train some Institute staff in the approach to and techniques of commercial sales.
- To arrange for Research Institutes to acquire drawing-office capacity, perhaps through a joint experience-building scheme with Universities.
- Whenever possible (some institutes have demonstrated that this is not only possible but highly effective), a maximum number of NGO's should be involved in data gathering as well as in user motivation and training. Members of the NGO's often have special skills in these areas and their collaboration should be actively sought as a matter of priority in any promotional scheme.
- Several indications were obtained that the statutes of the Research Institutes did not allow them openly to engage in merchanting activities; if this is so, directives for the amendment of their statutes are required as a pre-requisite to evolving proper sales policies and - strategies.

14.2 Short term steps.

These proposals are aimed at:

- focusing on a reduced number of products in order to concentrate human and financial resources on the most effective ones, and mainly on process-lines instead of single items of machinery,
- networking of manufacturers in order to enable introduction of appropriate production technology and stock-management to take place,
- introducing an integrated approach combining product- and buyer promotion.

14.2.1 Consolidation of existing results.

Perusal of the list of completed research projects and visits to users and manufacturers has clearly shown that a large number of products which differ only in minor details from each other are competing for practically all common applications in the field of cassava, oilseed and grain processing. This leads to a rather unproductive competition between designs on a narrow market. The Institutes, under the guidance of SON and of RMDRC or another body, in consultation with structures aiming at dissemination of existing technologies such as NOTAP, RAIDS and IITA, should now standardise design of the most commonly used machinery. A suggested methodology is described in Appendix VII.

The expected results are:

- to avoid scattering financial resources available for promotion of mature equipment; the aggregate market share which all the Research Institutes can reasonably expect at this stage is too small to warrant undue competition among products meeting the same demand,
- to free scarce resources from work which only duplicates that completed elsewhere,
- to re-deploy resources which thus become available on new research projects, targeting sectors with a significant purchasing power. Industry as opposed to village and cottage activities which by now appear to be well endowed with mature research projects, should then be able to receive more attention from the Research Institutes.
- to ensure that items chosen for standardisation are not "designed down" to such an extent that cost of maintenance and operation make their use uneconomical in comparison with traditional methods.
- **to create a critical mass in terms of aggregate demand for a given set of machinery, enabling improved manufacturing techniques to be employed, higher quality standards to be achieved in manufacturing and a second-hand market for some of the major items to come into existence⁹.**

14.2.2 Resources allocation.

In terms of machinery, a large number of ongoing and of completed research-projects cannot result in marketable products because the standard of engineering of the demonstration machines is not adequate or their usefulness not obvious. It is important for the future of industrial development and of SMI participation in it that roles be clearly re-allocated to optimise capacity-utilisation at all levels. Our proposals in this respect are set out below.

⁹ this is a pre-requisite to financiers accepting equipment as a valid form of security.
NIR/B1 - P.R.Gyss - Report

- Work on making prototype/demonstration machinery should be concentrated in Institutions having appropriate design and workshop-facilities such as FIIRO, some Polytechnics, AIR, ARCEDEM etc.
- Whenever possible, import-substitution should proceed on the basis of acquiring from foreign sources either license-rights or design packages for local manufacture¹⁰. Development work can then be concentrated on adaptation of the design to local manufacturing - capacity and end-user requirements. Arguments in favour of this policy are:
 - ◊ Commercialisation of products made under license or franchise of a well-known maker is often easier than commercialisation of an unknown brand;
 - ◊ the range of products sold can be widened by commercial partnerships with the license-giver concerning distribution of products made by the latter and not yet made in the local plant.
 - ◊ Local manufacture does not always significantly reduce foreign-exchange outflows; presently, steels, electrical components, industrial plastic parts etc. must be imported. Because of the small size of the orders in comparison with orders from bulk-producers, unit purchase - price and transaction costs will be much higher.
 - ◊ Considerable wastage of imported materials and of other resources occurs during the learning period.
 - ◊ Industrial productivity is lost if production units and more particularly SMI's are supplied with equipment which is less reliable than that purchased on the world market.
 - ◊ Recent reports from OECD^{vi} show that productivity of bought-in technology in most instances is vastly superior to internally-generated technology. The same report also shows that greater productivity increases are obtained from rapid and effective dissemination of technology than from artificially (through subsidies) intensified research.
- **The drive for import-substitution of machinery should not obscure the crying need for supplying the end-user with complete, coherent and economical process-lines.** It would be useful if Research Institutes, once partly freed from work on machinery-making, were to concentrate on process - research and design of complete processing lines. A typical, though very simple, illustration of our suggestion can be found in the technological chain underlying production of market-grade palm-kernels in village-type oil-mills. Research and design of several institutes now concentrates on re-inventing nut-crackers. No one appears to do research on adapting the peripherals such as cleaning, drying and grading of nuts prior to cracking or of kernel separators and -dryers to current requirements in terms of aflatoxine content of the kernels.

¹⁰ A very successful demonstration of this is the transfer of IRRI designs of rice-machinery through IITA and other institutes.

14.2.3 Integrated approach to design of marketable products.

Assuming that the Research Institutes are indeed mandated actively to engage in selling their products, it is recommended that a strategy now practised by a few institutes be generalised. It has proved to be highly successful in neighbouring countries. It requires a multidisciplinary approach and therefore co-operation among a group of experienced staff trained in the relevant techniques; this is, in itself, a plus in terms of capacity building. In essence, the integrated approach (outlined in figure 2) works as follows:

identify through field enquiries, dialogue with users, NGO's and representatives of various professional bodies and interest-groups, a well defined need;

select a solution among the technologies available, in Nigeria or elsewhere;

adapt the manufacturing process, if required, to local circumstances;

prepare workshop drawings and materials specifications for every component of the process - line;

select workshops situated in the areas in which the plant is likely to be used;

train the workshop personnel in making the plant to specifications;

prepare a technical and economic evaluation of the process;

publicise this evaluation;

customise the investment through interviews with potential customers;

train the customers in the use and maintenance of the plant;

provide follow-up and obtain feed back from users.

Within a dynamic economic environment generating risk-taking entrepreneurs, this approach leads to technological innovation and enterprise creation. So far, only a few examples of this dynamism were identified in the target-sector of current applied research. It seems to be necessary to complement the integrated technological approach with fund-sourcing.

The approach consisting in exonerating the entrepreneur from his obligation to contribute a substantial share of permanent funds is to be discouraged because the entrepreneur must have a personal stake in the survival of the enterprise¹¹. It is a well known fact that there is no shortage of money among potential SMI - creators but most of them are not willing to risk in technological innovation funds which are now very profitably employed in trading. However, given the right strategy and incentives, it should be feasible to funnel some of this short-term

¹¹ That this is possible is demonstrated by the success of the TBI schemes
NIR/BI - P.R.Gyss - Report

money into more long-term investments. Investment in SMIs of even a small fraction of the trading-turnover would be of great significance to industrial development¹². A further incentive to investment would be the implementation of a financing and technical assistance structure similar to that outlined by the NASSI delegation on its return from a study trip to the Philippines.

The track-record of RAIDS shows that entrepreneurs can find funds to make substantial investments when the reputation and the performance of a line are good. Appendix IV shows, for instance, that this Research Institute has sold over 2 000 (two thousand) garri making lines at a present day price of Naira 177 000 each.

The following scheme, outlined in figure 3, would be of assistance:

- ⇒ having completed the procedure described above, the Research Institutes guarantee the technological and technical viability of the venture;
- ⇒ the Research Institutes or some well known neutral agency such as APDF or an Association on the lines of Filipino practice or the National Risk Fund plc produces a customised market - study and risk-analysis, delimiting as clearly as is possible the risk taken by the investors and lenders; this should induce some lending institutions to give M.T. loans to the entrepreneur;
- ⇒ Standardise common items at a suitable level of quality so as to bring into existence a significant mass of identical equipment which, in turn, will generate a second-hand market. Liens on process-lines for which there is a potential second-hand market are acceptable security in the eyes of many bankers. Similarly, if the product is made in accordance with Institutes' specifications on the basis of a proper market study, the product-stocks as well as the raw materials stocks will be valid security.

With the help of the International Organisations and of the Government, it should be possible to motivate some banks in "playing the game" on this basis. If additional concessions need to be made to the Banks, a credit guarantee scheme such as that suggested in a feasibility report to the FMI in July, 1993 could perhaps be looked upon as a (remunerated) guarantor for a significant portion of the loan made to the venture.

14.2.4 Pricing.

Assistance should exclude under-pricing of goods sold. Field observations have shown that if the design of a research-product is good and capable of economically meeting an obvious need, it can be sold at commercial prices. Good examples of this are the items purchased by end-users from recommended manufacturers, i.e. mostly SMI's with a profit-motive¹³. Selling below cost as appears to be done at times is not a sustainable alternative for several reasons:

¹² for example, Brazil gave traders the option of deducting from income-tax payments the amounts invested in development-activities.

¹³ vide, for inst. the results obtained by Nova Technologies, Ibadan and some other approved manufacturers.
NIR/B1 - P.R.Gyss - Report

- it dissuades distributors from taking the products into their range, thus minimising its geographical spread and depriving the buyers of the after-sales service which they should expect from distributors;
- the lack of potential profit discourages SMI's from taking up manufacture of such research products; this in turn deprives the country of a major tool for capacity-building, which many studies by ILO, UNDP and others have shown to begin with manufacture of agricultural and agro-industrial machinery.

14.2.5 Formalisation of the approved manufacturers scheme.

This currently appears to be the most effective way of bringing the goods and minimal technical assistance nearer to potential buyers. To make the scheme sustainable, the obligations of the approved manufacturers should be clarified.

They should be put under an obligation¹⁴, prior to being approved and given the drawings, of discussing with the Institutes any downward changes intended to be made to the designs or specifications; this would not be meant to stifle private initiative towards improved designs but simply to prevent an unwarranted downward drift in standards of manufacturing.

Occasional visits should be made by the Institute's representatives to ascertain that standards are maintained in the approved workshops and to give technical advice to manufacturers.

Beneficiaries of the Institutions' approval should report periodically on the number of units produced either directly or through their professional associations, in order to enable the Research Institutes and their governing bodies to gain an overview of progress made in the manufacturing sector.

- Networking approved manufacturers.
- It has been noted that a number of institutes each have their private list of approved manufacturers. This generates unnecessary competition for workshop capacity which could be alleviated by pooling lists among Institutes. This would help to resolve the problem mentioned by some Research Institutes that available workshop capacity limits the extension of the approved manufacturers scheme.

A cost-effective and potentially powerful network outlined in Figure 4 could be created by federating all Institute-approved manufacturers into one professional body with a view to overcoming some of the problems mentioned before. More particularly, the federation could order and stock (possibly on consignment at a stockist's store) special steels, electrodes, fittings etc. Price reductions obtainable for bulk orders will compensate for the cost of financing the stocks.

The federation of approved manufacturers could also finance the patterns, dies and tools, making it possible economically to achieve higher quality levels by employing manufacturing

¹⁴ as is already done by a few institutes
NIR/B1 - P.R.Gyss - Report

techniques which are not feasible at the level of individual approved workshops, see paragraph 13.3

It is worth noting that this approach is in fact already practised on a small scale by some Research Institutes, for instance by getting a major workshop to stamp out perforated sheets for graters or for pin-mills screens which are then re-distributed to approved manufacturers.

If the scheme were to be extended, it is obvious that it would involve, apart from institutional participation, some financial contribution from the private sector, particularly by appointed distributors and stockists but also through a shared contribution of the approved manufacturers as a professional group. Here again, a properly quantified study would undoubtedly show that amounts to be contributed by both the private and public sector are disproportionately small in comparison with the huge marginal benefits to be derived in terms of:

- improved capacity of the manufacturing sector,
- improved quality-awareness of the users,
- improved networking of the profession,
- enhanced contribution of the end-users to the national economy through the use of more productive and less costly to maintain equipment.

HEP Division of UNIDO has as its special objective all forms of networking and clustering; it is believed that their advice would be particularly pertinent in this field.

Adoption of the UNIDOSS system of UNIDO's HEPD would furthermore provide a very suitable basis of capacity identification and -sharing within the federation of approved manufacturers.

14.2.6 Greater involvement of NGO's

NGO's are currently being looked upon mainly as potential providers of funds for purchase of some of the research products. Their expertise and availability in communicating with the population likely to form the bulk of users of the present research products must be put to greater use by systematically involving them in extension work whenever possible.

14.2.7 Greater involvement of the Technology Business Incubators.

TBI's entrepreneurs are, generally speaking, competent, open to innovation and definitely profit-oriented. They use mainly machinery made in Nigeria, including some of that developed by the Research Institutes. Much would be gained by establishing a more intensive two-way exchange between the Institutes and the tenants of the TBI's, mainly in terms of feed-back from the latter to the former.

15. LONG TERM PROSPECTS FOR IMPROVED COMMERCIALISATION.

The following proposals look at some future developments to be considered once the most urgent steps have been implemented.

15.1 Industrial Market Survey

For future research strategy of the Research Institutes to be more effective requires market surveys leading to identification of actual demand from endusers for products other than those now to be consolidated. In particular, sectors having a higher purchasing power¹⁵ should be identified. An informal and qualitative approach to this problem has been attempted in various reports^{vii}. Quantitative data are required and these can only be obtained by employing fully qualified organisations¹⁶ having a proven track record in identifying viable markets for industrial and consumer-goods within the context of a national R & D policy.

Some useful criteria for selection of new applied research subjects are shown below:

- goods equal to or better than the one to be selected are not yet produced in Nigeria or are produced in notoriously insufficient quantities;
- the products resulting from research are capable of economically meeting an obvious need;
- they can be produced in Nigeria at a cost affordable by the users and compatible with the benefit arising from their use;
- a significant number of potential users have or will have in the foreseeable future the resources required to purchase the goods.

15.2 Transfer of Pilot Plants.

In international engineering circles, the term "pilot plant" is meant to describe a small-scale plant simulating the technical requirements of a given process in their most "stripped down" form. It is generally speaking highly instrumented to enable the users to establish the process-parameters and -variables on which to base full-scale design. As a general rule, pilot-plants are unsaleable research-investments, the cost of which may later on be recovered from sale of licences or finished products. Possible exceptions to this arise when potential buyers are few in numbers but sophisticated, for example in pharmaceuticals.

The expense of making and operating a pilot plant should only be incurred in those cases when in-depth engineering studies and drawing board work are not sufficient to move directly from applied laboratory-research to prototype work. Given the relative unsophistication of most current research subjects and the availability for comparative evaluation of well established machinery performing the same duties, it would seem that the pilot plant stage could, in most instances, be omitted in favour of manufacture of prototype/demonstration process-lines.

¹⁵ witness the success of FIRO with soap-making, traditional beverages and brewing technologies.

¹⁶ similar to the "Observatoires Economiques" set up by some regions in France.

Whenever pilot plant operation is unavoidable, the aim should be an increasing separation of fundamental and laboratory research from commercially oriented applied research. Present statutes of the Institutes do not favour this dichotomy. They are aimed at protecting the independence of the Research Institutes in their choice of research subjects and methodology. It is clear that this independence must be preserved in the fields of fundamental and laboratory research. A mechanism needs, however, to be created which formalises transfer of a programme from laboratory research to process development. This transfer implies a fundamental change in both typology of the equipment required and in results-oriented attitude of the staff.

It is considered that the most productive approach likely to bring applied research objectives into focus without interfering with the freedom of the Institutes to decide on their research-policy would be to cause those institutions that have a proven track-record of producing potentially marketable items to create one or several commercial subsidiary(ies) aimed at commercialising a given product in association with relevant professional organisations, firms and other capital-sources such as trust- or research funds.

This would focus development work on demand-driven areas of research and motivate professional associations and other private sector organisations in propagating results of those researches which they have themselves sponsored in parts.

It would also identify a potential point of impact for technical and/or financial co-operation agreements with international and bilateral organisations specifically interested in furthering the development capacity of a given subsidiary.

This proposal has not, at the present time, been worked out in detail. It is clear, however, that the following questions will need to be addressed.

- To amend the Statutes of the Institutes in order to enable them to take a financial stake in the subsidiaries; this would be an extension to and not a fundamental alteration of the Statutes.
- To define the status and conditions of employment of the Institute's staff seconded or transferred to the subsidiaries or hired from the outside and arrange for suitable management and technico-commercial training and professional assistance¹⁷.
- To impose on the subsidiaries the management- and profit obligations of any plc and to give them the freedom to engage in research-contracts with third parties (including with their own mother-structure and foreign structures) and plant hire contracts, e.g. hiring out workshop facilities, doing test-runs for third parties on their pilot plants etc.

16. Selection criteria of projects for marketing plans.

¹⁷ e.g. the other faculties could assist in providing accounting systems and training the subsidiaries' staff in their use, the legal faculty could advise on company structure, composition of the capital and Board structure, insurance requirements arising from the various contemplated activities etc...

Criteria used for identifying from among projects considered to be marketable those for which a marketing-plan should be proposed were as follows:

the overall range of projects selected should cover a wide spectrum of income- and educational level,

socio-economic impact of the product should be significant,

the individual projects selected should either provide an additional link in a product - stream or significantly enhance value added to existing processes or provide a basis of further technological development,

whenever possible the items should foster associative activities, with particular reference to women, and provide employment for several persons in addition to the owner of the device or process,

they should be able to improve performance of SMI's,

the research work on them should be completed.

17. PROPOSED MARKETING PLANS.

In the absence of adequate information concerning most other items at first thought to be appropriate case-studies, commercialisation plans were elaborated for some items not shown in the initial selection but which seemed to hold good potential for different reasons. These proposals are meant to illustrate the concepts enumerated above.

Proposed marketing plans are detailed in Appendix VI for the following items:

- Kuli Kuli preparation, manual and mechanised process respectively.
- NARICT essential oil still,
- NARICT fine chemicals production,

18. INFORMATION.

Information flow has at various times been found to be deficient, particularly from the private sector, including from the TBI's to the Research Institutes. At the present time, the level of communication among information-sources is so low that even readily available information is not being made use of.

18.1 Present situation.

Available documentation shows that several bodies are expected to co-ordinate research-activities, more particularly RMRDC, NOTAP and NASENI. As far as inter-institute information is concerned, the co-ordinating effect of these bodies is not much in evidence; this does not lead to efficient resources management among Institutes.

There is no effective focal point from which Research Institutes and end-users could obtain information concerning available machines, processes and technology. Working arrangements between FIIRO and NOTAP appear to have broken down and have so far not been replaced by another focal point. NOTAP receives from WIPO monthly updates of world-wide patent-abstracts. This information does not appear to be consulted by or distributed to outsiders.

No use is currently made of modern communications technology for acquisition of world-wide information on subjects of interest to them nor for exchanges among Institutes.

A last but very major handicap in formulating any sort of commercial policy is that Research Institutes do not appear to have any information on the size of the actual demand for a given product nor, in many cases, on the quantities sold through traditional circuits.

18.2 NARROWING THE INFORMATION GAP.

18.2.1 Information Flow

Figure 1 shows in simple terms the flows of information required to move from concept to consumer. When trying to apply this diagram to Nigerian circumstances, major shortcomings become immediately obvious in the following areas:

- inflow of information to Research Institutes concerning available processes, technology, plant and products,
- flow of information from Research Institutes to distributors and endusers, with the very notable exception of those promoting approved manufacturers,
- flow of information from users to Research Institutes which is near-non-existent.

18.2.2 Inflow to Institutes.

It would appear to be quite indispensable that Research Institutes should have access on a world-wide basis to all available information concerning contemplated or current research projects. This should be not only through subscriptions to journals and participation in symposia etc. Research Institutes should also be made aware and become routine-users of current information technology. Pending availability of more Information Technology to these centres, UNIDO's INTIB paper-based facilities should be much more widely used in the immediate future.

In the longer run , an intranet configuration specifically connecting all Research Institutes, relevant Authorities and users' representatives should be put in place as soon as Telecoms capabilities permit, probably in association with the project currently being examined by the World Bank.

18.2.3 Outflow from Institutions.

This has been discussed, see paragraph 13.2.2

18.2.4 Feedback from endusers.

This feedback is vital as a basis for further development of the specific research-product as well as for identification of research-subjects in connected fields. Not too much reliance should be placed on spontaneous feedback from endusers. The major source of information will come from field reports by extension-officers and other members of the research-staff.

Institutes should elaborate interview-guidelines relating to each item on which feed back is required and extension-staff should be trained and motivated to carry out this work.

NGOs and other voluntary organisations operating in the vicinity of users' groups should also be implicated in information gathering whenever possible.

19. CURRENT LINKAGES WITH SME/SMI's.

SMI linkages were examined in the following three areas.

19.1 SMIs as approved manufacturers of research products.

Several Research Institutes seem to be implementing a successful policy of SMI - participation in manufacture of the machines developed by them and this approach appears to yield promising results. The number of sales made is increased if it is coupled with professional advice and training of the end-user, as RAIDS' results show. It is unfortunate that not all Research Institutes involved keep track of the numbers of items sold and/or copied, meaning that the relative success of this approach cannot be properly evaluated. Enquiries with approved workshops have indicated that in some instances significant numbers of some research-products have in fact been sold. In many other cases, the total numbers remain small, however, in relation to potential demand.

The scope and the impact of this policy need to be better documented; the approach could usefully be generalised. Safeguards must be found against unauthorised modifications to the design and specifications in order to prevent unwanted drifts in materials specification and/or technology. Typically, design specifications should refer to the Nigerian Standards for metals and metallurgy, which do exist and are enforceable. "Designing down" for the sake of economy and affordability should not be at the expense of a minimum level of engineering quality and safety.

19.2 SMIs as subcontractors to larger firms and Institutes.

It was found that some Organisations resort to subcontract-work for developing pilot-plant equipment, e.g. the RMDRC. This has many advantages:

it enhances the capability of the subcontractor,

it familiarises the subcontractor at an early stage with the intrinsic problems and requirements of the machinery,

it provides direct feedback to the contract-giver with regards to possible manufacturing difficulties and improvements.

On the down-side, early involvement of outsiders may lead to pilfering of intellectual property if patents are not taken out in time and confidentiality agreements may be difficult to enforce.

19.3 SME's as beneficiaries of research.

Because of time- and organisational constraints, not as many contacts as would have been desirable were set up with end-users.

The few interviews that could be conducted principally in the Zaria, Kaduna, Kano, Lagos, Enugu areas showed a relative scarcity of advisory and promotional field service on the part of the Research Institutes. This is said to be due to lack of means of transport and/or the poor condition of the vehicles available to extension-officer. Site visits appeared to indicate that more on the job training would benefit the extension officers and their "clients". The help of NGOs should be enlisted in connection with this training.

20. SUGGESTED IMPROVEMENTS IN THE ENVIRONMENT.

20.1 THE ROLE OF GOVERNMENT IN COMMERCIALISATION.

Previous reports have advocated direct marketing of research products through a Government Agency to be created to that effect. It is believed that, because of the great diversity in marketing approaches required, it is not productive to designate a single governmental marketing channel for all research products. The approaches and channels should be chosen according to the type of product and end-user. It is obvious that vaccines, switchgear and computer programmes need different approaches, channels and logistics. Whilst all need to conform to standards set by the Government, (and confirmed by recognised testing laboratories), it is obvious that the degree of involvement in distribution of Government agencies should be quite different in the various examples shown. Government will probably play, for some time to come, a determining role in distribution of vaccines, whilst there is no real need for it to be involved in commercialisation of the other goods mentioned.

As a counterpart to this, Government should play an increasingly high-profile role in defining and enforcing standards for locally produced capital goods.

20.1.1 The National Marketing Agency.

It may be useful to ascertain whether the creation of a national "Marketing Agency" is indeed a necessity; some of the existing Agencies already have an extensive brief in this field. Irrespective of whether a new or an existing structure assumes promotional responsibilities, its role in marketing of research products should be that of a catalyst, a facilitator and of an information hub. The proposed Agency should be given the same role as ANVAR (Agence Nationale pour la Valorisation de la Recherche) has. This French government-agency

centralises information (voluntarily supplied by Institutions or entrepreneurs) regarding applied research nearing the point of commercialisation. It disseminates this information in daily broadcasts at morning prime-time on the national radio network, specifying the type of contacts the entrepreneur is looking for, e.g. working capital, commercialisation, assistance in up-scaling etc. Furthermore, ANVAR sometimes subsidises the terminal phases of applied research and/or the initial production phase. Some very successful products have been launched in this manner. It may be useful to arrange for discussions with ANVAR representatives.

20.1.2 Innovation.

In some instances, Government may decide to promote, for the sake of national development-strategy, a range of products for which there is no strong demand at the time. It should then initiate and finance the demand-generating operations through its information channels and specialised bodies before handing the development-task to the Research Institutes.

20.1.3 Fiscal Incentives.

A number of financial and fiscal incentives proposed in previous reports should be extended to (or perhaps concentrated on) those entrepreneurs who contribute to financing R & D risks, e.g. full tax-deductibility of amounts devoted to sponsorship of applied research in approved Research Institutes or of investments made in pilot/demonstration plant operation.

20.2 THE ROLE OF THE PRIVATE SECTOR IN COMMERCIALISATION.

20.2.1 Risk Capital

The private sector does not willingly take risks in promoting new products but a certain number of steps can help in overcoming this resistance. The major factor is the degree of involvement of the private sector and, more specifically of the manufacturers and distributors, in the choice of research subjects. It is quite obvious that commercialisation is made much easier if the product is perceived from the outset by the private sector as effectively satisfying a well-identified need. The Institutes should therefore aim at involving the private sector in the early stages of research as a source of information; the private sector and more particularly the SME/SMI's are often well placed to advise on current applied-research needs.

20.2.2 Sponsorship

The Research Institutes should target the private sector as a source of sponsorship revenues for market-studies, for research and for product-tests respectively, as is done now in some exceptional cases in Nigeria but frequently elsewhere. This would not only improve the Research Institutes' finances but also give the sponsors a stake in promotion of the research-products. The possibly predominant role of approved manufacturers having a vested interest in dissemination of research-products has been discussed in paragraph 19.

Steps towards greater involvement of the private sector in research would in any event require that its representation on the Institutes' Boards is increased, even if this means amending the Statutes.

ⁱ Final Report , "A study on R&D results and the preparation of a framework for their commercialisation, MEQUIP & CERACOM

ⁱⁱ Report (not edited) by Prof. Olatunde Odetola and Dr. P. Nugawela

ⁱⁱⁱ ibidem

^{iv}Blue Print on commercialisation of Research Results and Indigenous Inventions through the establishment of

plant projects, RMRDC, 1994

^v Update of Techno-economic survey of the multidisciplinary task force on domestic and industrial plastics, Rubbber and Foam sector, December 1996 p. 3

^{vi} "Technology and Industrial Performance", OECD 1997.

^{vii} Multifood pilot plant for FIIRO, SDZ, 1997.

APPENDICES

	2
APPENDIX I	4
Extracts from job description relevant to terms of reference.	4
APPENDIX II	5
List of research-items extracted from previous reports or newly identified.	5
APPENDIX III	10
"Completed*" projects suitable for SMIs	10
APPENDIX IV	11
Projects for which information had been requested.	11
APPENDIX V	12
Items for which sales plans were suggested.	12
APPENDIX VI	13
Sales plans of projects identified for promotion	13
1) Groundnut extractors, IAR Zaria and NOVA Technology, Ibadan.	13
2) PRODUCTION OF FINE CHEMICALS (NARICT).	16
3) NARICT ESSENTIAL OIL STILL.	17
APPENDIX VII	20
Some methodological suggestions for standardisation of designs.	20
Benchmarking and selection.	20
Specifications and workshop drawings.	20
Cost of the operation.	21
APPENDIX IIX	22
Fiiro garri - line.	22
APPENDIX IX	24
QUESTIONNAIRES TO BE USED AT SEMINAR	24
APPENDIX X	26
SITE VISITS & MEETINGS	26
Visits to Fiiro	26
STANDARDS OFFICE NIGERIA 30/06/97	30
AFRICAN CENTRE FOR ENGINEERING DESIGN AND MANUFACTURING.	31

INSTITUTE FOR AGRICULTURAL RESEARCH & TECHNOLOGY.	3
RURAL AGROINDUSTRIAL DEVELOPMENT SCHEME.	32
IAR ZARIA Engineering Department(10/11/06/97)	33
MISSION BRIEFING 5/06/97.	35
Mission Debriefing.	36
Meeting at RMRDC 6/06/97	38
Meeting at NIPRD 6/06/97	40
VISIT TO NARICT 11/06/97	41
VISITS TO FMST TECHNOLOGY BUSINESS INCUBATOR CENTRES	42
MEETING WITH REPRESENTATIVES OF KANO IDC AND	44
MEETING WITH KANO BRANCH OF MAN, 13/06/97	45
MEETING WITH KACCIMA, KANO, 13/06/97	45
VISITS TO NOTAP.	46
Visits to National Risk Fund p.l.c. 23/6/97	47
Visit to Franco-Nigerian Chamber of Commerce, 23/6.	48
Meeting with NASSI Secretariat.	50
Meeting with NASENI at UNIDO Offices, 2/07/97.	51
Visit to Energy Research Centre, NNU, together with J. van der Ven, JPO	53
VISIT TO PRODA.	54
Visit to SEDI	55
	56
APPENDIX 11	58
LIST OF PERSONS MET	58
APPENDIX XII	60
NARICT ESSENTIAL OIL STILL.	60
Oil Extraction Process.	60
Target Population and Benefits.	60
Preliminary Analysis of crude distillate production and rectification.	61
Funding of investment.	61
PRELIMINARY FINDINGS.	61

Appendix I

Extracts from job description relevant to terms of reference.

.....

1.1.1. Visit the main-research-centres in Universities and other institutions which started the research work in SME related areas.

1.1.2. Identify R & D work which can be of potential use to SME and can be adopted by them.

1.1.3. Examine the conditions of and recommendations about encouraging research-centres to release in full the R & D results to SMEs

1.1.4. By organising a dialogue among representatives of a group of research centres and a selected group of entrepreneurs (selection through the Associations of Entrepreneurs), prepare mutually acceptable modalities for transferring R & D results to SME operators and for the payment of such results.

1.1.5. Also through this dialogue (within a workshop) examine the present situation of the flow of information between research centres (e.g. RMDRC, FIIRO, TRODA) and the modern SMEs, establishing (a) diagnosis of the obstacles and difficulties which hamper the flow.

1.1.6. Suggest new ways to make research findings available to SMEs on a timely basis and at reasonable cost.

1.1.7. Suggest the type of support which SMEs will need to absorb and adapt R & D results as offered by the research institutions.

1.1.8. At the same time, make a preliminary list of requirements by SME's for specific R & D activities not yet carried out and which could modernise their activities (research in one or two subsectors depending on availability of data).

Prepare a final report suggesting a strategy to improve the use of R & D results in SME's, on a general basis and also for the benefit of several subsectors.

Appendix II

Table 1

List of research-items extracted from previous reports or newly identified.

Object	Item	Participants	Nature	Status	Suits
Animal	GRANIFIX kit	ABU	P	C	
Animal	Poultry feed from brewers waste	ABU	P	C	SME
Animal	Breeding rams	NAPRI	O	C	
Animal	Feedlot technology	NAPRI	P	C	SME
Animal	Poultry Layer Strain	NAPRI	O	C	
Animal	Small dairy production	NAPRI	P	O	
Animal	Small fattening scheme	NAPRI	P	O	
Animal	Combined vaccine	NVRI	O	O	
Animal	Lumpy skin vaccine	NVRI	O	O	
Animal	Rinderpest/pneumonia vaccine	NVRI	O	O	
Animal	Salt lick	NVRI	O	O	
Animal	Typhoid fever vaccine	NVRI	O	O	
Animal	Animal feed mill	RAIDS	P	C	SME
Animal	Poultry feed distributor	UNN	M	C	
Building	Indigenous materials	ABU	P	C	
Building	Block making	NBRRRI	M	C	
Building	Madortile	NBRRRI	P	C	SME
Building	Block making machine	NCAM	M	C	
Cassava	Linamarase	ABU	P	C	
Cassava	Chicken feed from cassava	FIIRO	P	O	SME
Cassava	chips to garri	FIIRO	P	O	
Cassava	citric acid from gari	FIIRO	P	O	
Cassava	ethanol from peel	FIIRO	P	O	
Cassava	Fufu production	FIIRO	P	C	
Cassava	Mechanised Garri production	FIIRO	P	C	SME
Cassava	mono Na glutamate from cassava	FIIRO	P	O	SME
Cassava	Sorf Gari	FIIRO	P	C	
Cassava	Sorf Ogi	FIIRO	P	C	
Cassava	Chipper, manual	IITA	M	C	
Cassava	Chipper, motorised	IITA	M	C	
Cassava	Dewatering device, wooden	IITA	M	C	
Cassava	Dewatering device, double screw press	IITA	M	C	
Cassava	Dewatering device, hydraulic press	IITA	M	C	
Cassava	Fermentation rack	IITA	M	C	
Cassava	Grater, manual	IITA	M	C	
Cassava	Grater, motorised	IITA	M	C	
Cassava	Mash sifter	IITA	M	C	
Cassava	Peletting machine	IITA	M	C	
Cassava	Slicing machine, manual	IITA	M	C	
Cassava	Slicing machine, motorised	IITA	M	C	

Cassava	Starch sifter	IITA	M	C	
Cassava	Stove, kerosene	IITA	M	C	
Cassava	Stove, sawdust fired	IITA	M	C	
Cassava	Stove, wood fired	IITA	M	C	
Cassava	Grating machine	KaP	M	C	
Cassava	Slicer	KaP	M	C	
Cassava	Grater	NCAM	M	C	
Cassava	Chipping machine	NRCRI	M	C	
Cassava	Dewatering	NRCRI	M	C	
Cassava	Drier	NRCRI	M	C	
Cassava	Garri	NRCRI	M	C	
Cassava	Grater motorised	NRCRI	M	C	
Cassava	Grater pedal	NRCRI	M	C	
Cassava	Heater mixer	NRCRI	M	C	
Cassava	Pellets	NRCRI	M	C	
Cassava	Cassava depulper	PRODA	M	C	
Cassava	Coal Cooker	PRODA	M	C	
Cassava	Frier	PRODA	M	C	
Cassava	Frier, communal	PRODA	M	C	
Cassava	Frier, mechanised	PRODA	M	C	
Cassava	Gari production plant	PRODA	M	C	SME
Cassava	Grater	PRODA	M	C	
Cassava	Hydraulic/Screw press ??	PRODA	M	C	
Cassava	Peeler	PRODA	M	C	
Cassava	Sieve	PRODA	M	C	
Cassava	Steam Cooker	PRODA	M	C	
Cassava	Washing machine & gari drier	PRODA	M	C	
Cassava	Chips & pellets	RAIDS	P	C	
Cassava	Chips drier	RAIDS	M	O	
Cassava	Frier	RAIDS	M	C	
Cassava	Starch Plant	RAIDS	P	C	SME
Cassava	Frier	UNN	M	C	
Cassava	Gari winnover	UNN	M	C	
Cassava	Garri pulverizer	UNN	M	C	
Cassava	Grating machine	UNN	M	C	
Cassava	Peeler batch	UNN	M	C	
Cassava	Peeler continuous	UNN	M	C	
Chemical Industry	Antisnake from plant	ABU	P	C	
Chemical Industry	Dyes	ABU	P	C	
Chemical Industry	Fatliquors	FCCLT	P	O	
Chemical Industry	Tannin extracts	FCCLT	P	O	
Chemical Industry	Anti sickling drug	IAR	O	O	
Chemical Industry	Alumn	NARICT	P	O	
Chemical Industry	Bale	NARICT	P	O	
Chemical Industry	Battery electrolytes	NARICT	P	O	
Chemical Industry	Bleaching earth	NARICT	P	O	
Chemical Industry	Ca -sulphate	NARICT	P	O	
Chemical Industry	Corn starch	NARICT	P	O	SME
Chemical Industry	Essential oils	NARICT	P	O	SME
Chemical Industry	Fatliquor	NARICT	P	O	
Chemical Industry	Hydrated lime kiln	NARICT	M	O	SME
Chemical Industry	Lab Reagents	NARICT	P	O	SME
Chemical Industry	Papaïne	NARICT	P	O	SME
Chemical Industry	Pesticides	NARICT	P	O	SME
Chemical Industry	Tannins	NARICT	P	O	
Chemical Industry	Urea/Formol	NARICT	P	O	SME
Chemical Industry	Anti asthma	NIPRD	O	O	

Chemical Industry	Anti diabetic	NIPRD	O	O	
Chemical Industry	Anti fungal	NIPRD	O	O	
Chemical Industry	Anti helminthic	NIPRD	O	O	
Chemical Industry	Anti peptic ulcer	NIPRD	O	O	
Chemical Industry	Anti sickling drug	NIPRD	O	O	
Cultivation	Lawn mover	FPB	M	C	
Cultivation	Pedal thresher	FPB	M	C	
Cultivation	Grain planter	IAR&T	M	C	
Cultivation	Fertiliser spreader	NCAM	M	C	
Cultivation	Jab planter	NCAM	M	C	
Cultivation	Lifter Cassava	NCAM	M	C	
Cultivation	Boom sprayer	NRCRI	M	C	
Cultivation	Harvester Cassava	NRCRI	M	C	
Cultivation	Planter, Cassava	NRCRI	M	C	
Cultivation	Stem dipper, Cassava	NRCRI	M	C	
Cultivation	Weevil control, Cassava	NRCRI	P	C	
Cultivation	Egussi pod cutter	UNN	M	C	
Cultivation	Fertiliser spreader	UNN	M	C	
Cultivation	Harvester, Cassava	UNN	M	C	
Cultivation	Lifter, Cassava	UNN	M	C	
Cultivation	Planter, 1 row, Cassava	UNN	M	C	
Cultivation	Planter, 2 row, Cassava	UNN	M	C	
Cultivation	Ridge weeder	UNN	M	C	
Cultivation	Yam planter, 1 row	UNN	M	C	
Cultivation	Yam planter, 2 row	UNN	M	C	
Non Solar Drying	Carrot	ABU	P	C	
Non Solar Drying	Dehydration fruit/vegetables	FIIRO	P	O	
Non Solar Drying	Heating apparatus	NMT	M	O	
Non Solar Drying	Multipurpose drier	NRCRI	M	C	
Non Solar Drying	Hot air drier	RAIDS	P	C	
Non Solar Drying	Batch drier	UAM	M	C	
Non Solar Drying	Grain dryer	UNN	M	C	
Electromechanical	AC Stabiliser	CAT	M	C	SME
Electromechanical	Antenna + booster	CAT	O	O	SME
Electromechanical	CAT educational computer	CAT	O	O	
Electromechanical	CRD computer assemblies	CAT	O	O	SME
Electromechanical	Electrical. Signboards	CAT	M	C	SME
Electromechanical	Equaliser	CAT	M	C	SME
Electromechanical	Film reserved machine	CAT	M	C	
Electromechanical	Light activated control	CAT	M	O	SME
Electromechanical	Light chaser signboard	CAT	O	O	
Electromechanical	Neva Nepa	CAT	M	C	
Electromechanical	Printed circuit boards	CAT	O	O	
Electromechanical	Stereo Amp	CAT	M	C	
Electromechanical	Telephone billing monitor	CAT	M	O	SME
Electromechanical	Touch alarm	CAT	O	O	
Electromechanical	Filling machine	FIIRO	M	O	SME
Electromechanical	Refurbishing sparkplugs	FIIRO	P	C	SME
Electromechanical	Wet sieving machine	KaP	M	C	
Electromechanical	Fish feed pelleting machine	PRODA	M	C	
Electromechanical	Traffic light control	PRODA	M	C	SME
Electromechanical	Potato grading machine	UAM	M	C	
Electromechanical	Hammer Mill	UNN	M	C	
Fish	Smoked fish	FIIRO	P	C	
Fish	Data Bank	NIOMR	O	O	
Fish	Fish fry tank	NIOMR	M	C	
Fish	Fish seed	NIOMR	O	O	

Fish	Fishing gear	NIOMR	O	O	
Fish	Smoking kiln	NIOMR	M	C	
Flour/Bakery	Composite flour	FIIRO	P	C	
Flour/Bakery	Maize flour & grit	FIIRO	P	C	
Flour/Bakery	Yeast	FIIRO	P	O	
Flour/Bakery	Bread Ovens	PRODA	M	C	
Flour/Bakery	Grain milling plant	RAIDS	P	C	SME
Food	Spices	FIIRO	P	O	
Fruit	Jam production	FIIRO	P	C	
Fruit	Fruit juice extractor	FPB	M	C	
Fruit	Melon washer	FPB	M	C	
Fruit	Fruit juice extractor	IAR&T	M	C	SME
Fruit	Plucker citrus	KaP	M	C	
Fruit	Melon washer	NCAM	M	C	
Fruit	Okoro slicer	NCAM	M	C	
Fruit	Fruit Juice extraction plant	RAIDS	P	C	SME
Fruit	Fruit juice expeller	UAM	M	C	
Fruit	Fruit juice extractor	UNN	M	C	
Grain	Combined sheller	IAR&T	M	C	
Grain	Cowpea sheller	IAR&T	M	C	
Grain	Grain cleaner	IAR&T	M	C	
Grain	Maize sheller	IAR&T	M	C	
Grain	Rice thresher	IAR&T	M	C	
Grain	Soybean thresher	IAR&T	M	C	
Grain	Soybean Thresher	IAR&T	M	C	
Grain	Bran remover	IITA	M	C	
Grain	Cleaning blower, manual	IITA	M	C	
Grain	Cylindrical drier & crib	IITA	M	C	
Grain	Dry grinder, motorised	IITA	M	C	
Grain	Flail thresher	IITA	M	C	
Grain	Grain cleaner/sorter	IITA	M	C	
Grain	Grinder, manual	IITA	M	C	
Grain	Huller/decorticator	IITA	M	C	
Grain	Rotary drier	IITA	M	C	
Grain	Sheller, maize, manual	IITA	M	C	
Grain	Sheller, maize, motorised	IITA	M	C	
Grain	stripping device	IITA	M	C	
Grain	Wet grinder, motorised	IITA	M	C	
Grain	Maize Thresher	KaP	M	C	
Grain	Rice parboiler	NCAM	M	C	
Grain	Manual maize sheller	UAM	M	C	
Grain	Corn dehusker	UNN	M	C	
Grain	Egussi sheller	UNN	M	C	
Grain	Grader	UNN	M	C	
Grain	Maize degermer	PRODA	M	C	
Grain	Maize sheller	PRODA	M	C	
Grain	Sieve, 3 stage	PRODA	M	C	
Mechanical	Foundry castings	FIIRO	P	O	
Mechanical	Ceramics kiln	PRODA	M	O	SME
Mechanical	Diesel	PRODA	M	O	
Mechanical	Elect. Motor insulation	PRODA	M	O	SME
Mechanical	Foundry castings	PRODA	P	O	SME
Mechanical	Oil burner	PRODA	M	O	
Mechanical	Welding transformer	PRODA	M	O	SME
Minerals	Burner for ceramics	ABU	P	C	
Minerals	Glasses & Celadon	ABU	P	C	
Minerals	Porcelain	KaP	P	C	SME

Minerals	Solid Mineral processing plant	KaP	P	C	SME
Minerals	Furnace Binder	NMT	P	C	
Minerals	H.T. refractory bricks	PRODA	P	O	SME
Oil/Oilseeds	Benniseed	FIIRO	P	C	
Oil/Oilseeds	Benniseed oil	FIIRO	P	O	SME
Oil/Oilseeds	Mechanised G.N. roasting	FIIRO	M	C	
Oil/Oilseeds	Mechanised G.N. shelling	FIIRO	M	C	
Oil/Oilseeds	Feed mill	IAR&T	M	C	
Oil/Oilseeds	P.K. cracker	IAR&T	M	C	
Oil/Oilseeds	P.K. oil extractor	IAR&T	M	C	
Oil/Oilseeds	Kernel Cracker (screw press)	IITA	M	C	
Oil/Oilseeds	Palm oil centrifuge/digester	IITA	M	C	
Oil/Oilseeds	Palm oil hydraulic press	IITA	M	C	
Oil/Oilseeds	Digester	NIFOR	M	C	
Oil/Oilseeds	Hydraulic press	NIFOR	M	C	
Oil/Oilseeds	Palm fruit processing	NIFOR	M	C	
Oil/Oilseeds	Screw press	NIFOR	M	C	
Oil/Oilseeds	Sterilizer	NIFOR	M	C	
Oil/Oilseeds	Stripper	NIFOR	M	C	
Oil/Oilseeds	Oil processing plant	NMT	P	C	SME
Oil/Oilseeds	Press	NRCRI	M	C	
Oil/Oilseeds	Complete feed mill	PRODA	M	C	
Oil/Oilseeds	Fish feed mixer	PRODA	M	C	
Oil/Oilseeds	PK nuts separator	PRODA	M	O	
Oil/Oilseeds	Filter press	RAIDS	M	O	
Oil/Oilseeds	Melon seed sheller	RAIDS	M	O	
Oil/Oilseeds	Oil extractor	RAIDS	P	C	SME
Oil/Oilseeds	Small scale P.O. Plant	RAIDS	P	C	SME
Oil/Oilseeds	Soy milk Production	RAIDS	P	C	SME
Oil/Oilseeds	Palm fruit digester	UNN	M	C	
Solar	Refrigerator	KaP	M	C	
Solar	Solar drier	NAPRI	M	C	
Solar	Solar drier	NIOMR	M	C	
Sundries	Football	FCCLT	P	O	
Sundries	Adhesives from Gum + Starch	FIIRO	P	C	SME
Sundries	L.T. Glaze	FIIRO	P	O	SME
Sundries	Refining Gypsum	FIIRO	P	C	SME
Sundries	Water filter candle	FIIRO	O	O	
Sundries	Gum Arabic	KaP	P	C	SME
Sundries	Bitter leaf processor	UNN	M	C	

Appendix III

"Completed" projects suitable for SMIs**

Object	Item	Institute	Nature
Animal	Animal feed mill	RAIDS	P**
Animal	Feedlot technology	NAPRI	P
Animal	Poultry feed from brewers waste	ABU	P
Building	Madortile	NBRRI	P
Cassava	mechanised Garri production	FIIRO	P
Electromechanical	Refurbishing sparkplugs	FIIRO	P
Flour/Bakery	Grain milling plant	RAIDS	P
Fruit	Fruit Juice extraction plant	RAIDS	P
Minerals	Porcelain	KaP	P
Minerals	Solid Mineral processing plant	KaP	P
Oil/Oilseeds	Oil extractor	RAIDS	P
Oil/Oilseeds	Oil processing plant	NMT	P
Oil/Oilseeds	Small scale P.O. Plant	RAIDS	P
Oil/Oilseeds	Soy milk Production	RAIDS	P
Sundries	Adhesives from Gum + Starch	FIIRO	P
Sundries	Gum Arabic	KaP	P
Sundries	Refining Gypsum	FIIRO	P
Cassava	Starch Plant	RAIDS	P

* as listed in previous reports

** « P » means «Process »

Appendix IV

Projects for which information had been requested.

Replies to questionnaire are summarised below.

Item	Institute	Sales Price	Numbers Sold
Kuli Kuli device	IAR	3 800	N.A.
Kuli Kuli device	(Nova Technology)	~ 120 000	N.A.
Multicrop thresher	IAR	153 000	N.A.
Garri Plant	FIIRO	N.A	N.A.
Soap Plant	FIIRO	N.A	N.A.
Palm wine pasteuriser	FIIRO	N.A	N.A.
Alcohol still	FIIRO	N.A	N.A.
All available products	PRODA		
Castor Oil plant	RMRDC		
Textured Protein	RMRDC		
Oil extractor	RMRDC		
Gari Plant	RAIDS	177 000	>2 000
Soya Milk Production Plant	RAIDS	207 000	6 ¹
Cassava Starch Plant	RAIDS	470 000	19
Palmoil extraction plant	RAIDS	277 000	47
Fruit Juice extraction line	RAIDS	492 500	20
Grain Milling Plant	RAIDS	250 500	65
Animal feed mill	RAIDS	407 500	37

¹ commercialisation of this has just started

Appendix V

Items for which sales plans were suggested.

Item	Fills a need	Economical to use	Does the job better	Price acceptance	Proximity*	Documentation	Training possibility
AIR Kuli Kuli device, manual	2	2	2	1	0	0	2
NovaTech Kuli Kuli device, Mechanised	2	2	2	?	2	0	2 **
NARICT essential oil still	2	2	2	?	2	0	2
NARICT fine chemicals	2	2	?	?	2	0	2

* of supplier & after sales service.

** NOVATECH co-operates with and sells demonstration plant to NGO's.

Note: 0 = poor/non existent, 1 = average, 2 = good

Appendix VI

Sales plans of projects identified for promotion

1) Groundnut extractors, IAR Zaria and NOVA Technology, Ibadan.

These two devices have the same purpose but differ in size, cost and target population. The simple, Zaria designed device corresponds to the needs of individual housewives, whereas the other, motorised device is aimed at village communities.

Both devices reduce operator-fatigue and time of elaboration of Kuli-Kuli. Production of the latter is entirely at cottage- and village level; it amounts to an estimated 150 000 to 200 000 tons per annum. It concerns millions of households.

Socio-economic impact of Kuli-Kuli production.

It is an exclusively feminine activity which has a high impact on the savings-power of the women because of the traditional mode of financing, whereby the husband purchases a bag of groundnuts from the dealer, the wife processes it into Kuli-Kuli, sells the latter as well as any surplus oil and refunds the cost of the groundnuts to the husband, keeping the gross-margin for current expenditure (including purchase of fuel for roasting the nuts) and savings.

The Kuli Kuli process.

Groundnuts are lightly roasted, husked and ground into a coarse paste.

The latter is stirred (not pounded) for 40 to 60 minutes in a mortar, adding small amounts of water until the oil/water emulsion can be decanted. The remaining paste is then shaped into rolls and fried in the oil/water emulsion, thus releasing more oil. The fried rolls are a tasty and highly nutritious delicacy and the oil (still containing a certain amount of water and groundnut mucilage) serves as a condiment for garri and other carbohydrate-rich pastes as well as for garri- or soy based drinks.

The IAR invention consists of:

a method for holding the mortar in place (it is traditionally held in place by helpers);

a stirring-stick fitted with a ball which in turn fits into a socket clamped to the mortar; the combination of these elements provides a fulcrum around which the stirring action is made much easier and effective;

an improved stirrer-shape which contributes to quicker phase-separation..

The device has been re-designed and improved by Mr. S. Barton, UNIDO consultant on agricultural machinery. It sells at around N3000, i.e. the equivalent of approximately 30 days margin per person after deduction of a standard remuneration of N38/day for labour¹ and all variable costs. In view of the fact that it can be shared among 5-8 women, the device is quite affordable.

NOVA Technology's design relates to a more sophisticated, motorised version, consisting of:

- a fabricated metal frame supporting a prime mover, gear-drive and eccentric operating a swinging shaft with beater-type blades.
- a covered cast aluminium container clamped to a platform also supported on the frame.

The cost of the device should come down when production - sized batches of it can be made; it should then become quite affordable for village-groups.

At present, a small series is being built to fill orders from ADPs and NGO's.

Commercialisation of the devices.

In view of the fact that the devices improve to a varying but in both cases significant extent the working conditions of rural women, all structures dealing with improving feminine condition in rural areas should be fully informed and supplied with the required materials, i.e. a video, brochures and the conditions of availability per area and asked to participate in their propagation.

It is likely that a large number of IAR devices will be sold before the NOVA Technology moves from institutional orders to commercial orders. To this effect, the IAR should decide now on a manufacturing and distribution policy of the invention. Taking into account its possible spread, IAR should

- identify, in a number of strategically chosen areas, manufacturing workshops capable of producing the device at a satisfactory cost and quality level, both to be set by IAR,
- train the staff of these workshops and ensure they hold a sufficient stock of wood and clamps (assuming that the latter would be made on an appropriate production line in a central workshop),
- identify and implicate a NGO or women's organisation in the vicinity of every workshop with a view to getting it to intermediate between potential users and the workshop.

A common strategy should be worked out among NOVA Technology (assisted by IITA) and IAR. This will provide an example of elaboration of a common strategy between Research Institutes and the private sector.

Whilst this strategy is being worked out,

- Identify all international and national projects dealing with women in groundnut-producing areas as potential auxiliaries in promotion of the device.

- conceive and have prepared:
 - ◆ a video detailing the use of both devices, inclusive of animated diagrams showing the fundamental differences of strain on the user's muscular system between the traditional and the improved systems²,
 - ◆ a sufficient number of copies of the video to ensure effective distribution over the whole of the areas traditionally concerned with Kuli Kuli production
 - ◆ a professional - grade brochure clearly setting out the same information in graphical form.

The services of specialists should be enlisted for the elaboration of the media-items and of their distribution pattern.

Funding of the promotional work.

The promotional campaign will be expensive; this is the more reason for simultaneously promoting both devices. Taking into account the community aspect of the project, financial assistance for promotion should be found in the various international projects, such as IBRD/IDA and UNDP projects and more particularly those dealing with the condition of rural women and rural development.

Funding of implementation.

Three aspects have to be envisaged: financing of stocks of the parts made in a central workshop, capital costs (motorcycles and cars) for expansion of the extension-services and increased operating costs of the latter. A great part of these costs is already provided for in current budgets of the Institute; the balance represents a small amount in comparison with the promotional budget.

² Mr. Barton, UNIDO consultant, reports that another UNIDO consultant, Dr Sule Yakubu Bassi, P.O. Box 2976, Minna has done much work on the ergonomics of Nigerian handtools and could be usefully consulted on this matter.

2) PRODUCTION OF FINE CHEMICALS (NARICT).

NARICT has perfected technologies enabling a number of fine chemicals to be prepared to satisfactory standards of purity and reliability in small-scale installations.

The market for these chemicals does exist and their quality-level is easy to monitor in relation to accepted (BSI, BP ...) standards.

The socio-economic impact of initiating their production would be significant: the value added content of the process is very high. Implementation of the project would provide, in their area and at their level of qualification, remunerative self-employment to science graduates and their assistants.

To promote this scheme will require that:

selected science graduates having access to the required amount of capital undergo a complementary short training cycle³ in business management and preparation of a business-plan, quality- and production control as well as an in-depth briefing on the chemical processes and plant involved and assistance in plant-sourcing if required;

the Research Institutes together with the FMST introduce them and their products to the major potential customers: hospitals, research laboratories, industrial users, either directly or through well-established suppliers representatives;

the Research Institutes assist the young manufacturers by carrying out the required analytical control-work at favourable rates.

Investment costs are likely to be small in relation to turnover. With the backing of the Institute, RMRDC and the FMST, the entrepreneurs should be able to obtain a significant amount of loan-capital.

The question could be asked whether these businesses would benefit from being grouped in a small but strategically located "Chemical Science-Park". Synergy thus arising in terms of general services such as steam, generator and maintenance as well as in terms of intellectual exchanges, would probably outweigh the potential risk of corporate elitism.

³ using mainly ABU's and the Institutes own facilities in this respect.

3) NARICT ESSENTIAL OIL STILL.

Reforestation has led to thousands of hectares being planted in the Zaria area with eucalyptus and similar varieties, making available a large reservoir of leaves suitable for extraction of essential oils.

Also, large scale experiments carried out by the NARICT show that lemon-grass grows remarkably well in the Zaria area and produces high yields.

Simple logistics require that the extraction stills to produce the crude oil should be brought as close as possible to the areas in which raw materials are available for collection. This would resolve the problem of transporting very large volumes of leaves or lemon grass to a central extraction plant. Leaves in particular have a very low bulk-density and their transport over long distances would render the process uneconomical.

In view of these considerations, a practical and cheap still producing raw distillate was designed and built at the Institute. Suggested improvements to the design relate to addition of a very basic cooling-water recycling system and mounting the still on a skid and wheels to take it as close as possible to leaf-collection areas⁴.

The rectification of the crude distillates would be carried out either at NARICT or at the UNIDO pilot plant in Abuja.

The Institute has identified a significant Nigerian demand for essential oils and ascertained with potential buyers that the products would be accepted; it is best to rely on local demand until such time that non-tariff barriers to export have been effectively removed.

Oil Extraction Process.

The still pot is stuffed with humid leaves and heated with wood or charcoal embers. The natural water-content of the leaves is sufficient to generate the steam needed for extraction. The steam/oil azeotrope is condensed in a simple, straight-through water cooled pipe. The condensate is left to separate by gravity and the crude oil is collected for delivery to the Institute.

Target Populations and benefits.

Village communities living in or around the reforested areas will earn added income and develop new capacities. Women's participation will be two-fold: as raw materials -gatherers and as users of a fraction of the distillate for preparation of lotions and unguents.

Fairly intensive leaf-collection will help to reduce the fire-risk in the dry season.

⁴ A suggested re-design was prepared and given to NARICT by Mr. Barton, UNIDO Consultant on agricultural and post-harvesting equipment.

Extensive cultivation of lemon grass will provide ground-cover and reduce erosion.

Steps to be taken.

Assuming that the agricultural feasibility of large scale planting of lemon grass has in fact been proven and that large-scale growing is likely, two industrial feasibility studies need to be done: one concerning crude distillate production by the farmer and one concerning rectification and sales of rectified oils. For the latter, two scenarii may have to be examined - rectification in a plant to be set up in Zaria or rectification in the UNIDO pilot plant in Abuja.

Feasibility studies of crude distillate production and rectification.

a) Data required for feasibility study of crude-distillate still.

For each citronella oil and eucalyptus, NARICT should formalise presentation of the information at their disposal concerning:

average yearly quantities of raw material available for extraction and geographical spread of the resource,

estimated cost of the leaves at the collecting point (remuneration of gatherers and cost of delivery),

processing capacity of the proposed NARICT still: quantities of leaves treated per day and of crude distillate produced therefrom,

cost of operation of the still (labour and consumables),

cost of delivery of the crude distillate to NARICT,

specifications of the crude distillates and estimated purchase price from primary producers,

estimated cost of the still when made in a commercial workshop,

description and estimated cost of minimum infrastructure required,

estimated cost of the containers needed to carry the crude to NARICT

estimated charges for training users in operation of the still.

b) Data required for feasibility of distillate rectification.

Total quantities of each type of crude distillate expected at the institute, on a month by month basis,

Yield of rectified oil from crude,

Capacity and installed cost of a suitable rectification still at NARICT,

Cost of operation of the NARICT still or charges likely to be made for use of UNIDO pilot plant, including cost of transport of the crude distillate to Abuja and packaging of rectified oil.

Cost of extension- and follow up services in connection with the project,

Expected sales prices, ex producer's place, of oils, specify packaging.

Funding of investment.

a) Purchase of the still by village-communities.

If the feasibility-study and risk-analysis yield satisfactory results, one or several communities should be identified as likely users.

Sources of permanent funds should be sought in the following areas;

- community savings-structures,
- potential buyers of the rectified oil,
- NGO's
- RMRDC fund
- multilateral funds and projects.

Capacity-building and income generation through the project and the fact that the whole community becomes a pilot project should be highlighted when looking for these funds.

If a sufficient amount (as determined by risk-analysis) of permanent funds can be raised, NARICT should enter into back to back agreements with the villagers and with some major buyer(s) respectively. The second agreement will indicate the sales-prospects of rectified oils. It will thus provide the basis on which NARICT could enter into production-contracts with the villagers.

On the basis of this two-fold contract-structure and with the help, if necessary, of the Authorities concerned, it should be possible to raise loan capital for the balance of investments and working capital.

Appendix VII

Some methodological suggestions for standardisation of designs.

The objective is to reach, on the basis of factual evaluation-procedures, an inter-Institute consensus on selection of one of the designs among those produced by several Research Institutes for identical research-objects (machine or process). To this effect, the design which most suitably fulfils the needs of the endusers needs to be identified.

Benchmarking and selection.

Select one of the designs which is being widely made and sold. In the case of grain-processing lines, it is likely that the designs selected will be adaptations of IRRI drawings as made by IITA or others. In other cases, a desk-study of all designs will need to be made, with the help of a few manufacturers, on the basis of all available drawings⁵.

Conduct a value analysis of the various designs, taking into account, among others, adequation of proposed plant capacity to available quantities of raw materials and market-potential, likely cost of production, ease of operator training, ease and cost of maintenance, productivity, quality and consumer-acceptance of product, operator-safety and impact on environment. Wherever the object is likely to be used mainly by women, conditions of use must take account of the fact that women are not, generally speaking, very adept at maintaining elaborate mechanical devices. For instance, heavy motorisation such as Diesel engines would best be avoided on plant aimed at a feminine population.

Reach a consensus among Research Institutes as to which of the designs or which combination of designs should be retained for standardisation.

Specifications and workshop drawings.

Prepare drawings and specifications. The help of the SNO should be enlisted, to ensure that existing and prospective standards (materials, products, ISO 2000, ISO 9000) are taken into account in the final design.

Once detailed workshop drawings, materials optimisation, materials specification and manufacturing schedules have been prepared for the selected item, check the design work by manufacturing a short run of every item in an approved workshop. When the design has been fully validated in the workshop, make prototypes and display them in strategic locations. Appropriate supporting materials must then be prepared, such as high grade leaflets, video clips and a full documentation setting out the mechanical and economical superiority of the

⁵ see Appendix VI for an outline of a possible selection procedure

object over competing products as well as complete sets of workshop drawings and specifications, maintenance manuals and spare-parts lists.

This documentation should be distributed to Research Institutes, to approved manufacturers and distributors and also to export-promotion authorities and exporters.

Cost of the operation.

The process entails various costs which need to be provided for.

1.1. In order to minimise the effect of inter-institute friction which is bound to arise in the selection process, an international body such as UNIDO or a foreign Research or Standards Institute should be asked to act as a moderator in the examination and selection stages. The cost of this needs to be budgeted, even though it is likely to be funded through an international source.

1.2. Copies of all sets of drawings must be prepared to a standard which actually enables comparisons to be made. This may involve computer-assisted drawing (not design or conception at that stage).

1.3. A value-analyst may need to be hired.

1.4. The estimated cost of making the final drawings and manufacturing the prototype(s) needs to be allowed for.

The cost of designing and printing suitable documentation, specifications, maintenance manuals and user's handbook must be estimated and allowed for. All outputs must be of a high professional quality to maximise their trade-impact.

All media should be enrolled to publicise the result when it becomes available.

APPENDIX IIX

Fiiro garri - line.

N.B. all costs & prices in ₦ @ ₦/\$

ITEM	% Nigerian	Calculated Cost ⁶	Commercial Price
Machine-base & - supports			
Brickwork for gellifier/dryer			
Shafts, bearing & pulleys			
Belts			
Diesel engine ⁷			
Grating machine			
Press			
Gellifying/Non Solar Drying pans			
Pulveriser			
Sundry items (pump for fuel, sacks, buckets, blades ...)			
Participation to R&D cost			
Cost of training			
Estimated cost of plant shed			
Estimated cost of working shed (for washing & peeling)			
Estimated cost of shed for storing sacks			
Estimated cost of water supply installation			
Estimated cost of effluent system			

Comments and notes

⁶ Excluding depreciation of R & D cost.

⁷ ?? H.P.

User profiles

For each of the plant (stills, pasteuriser, garri and soap plant), please indicate:

Number of units made at FIIRO and sold

- to individuals
- to companies
- to Groups/Associations
- to Co-operatives
- to others

Estimated number of SMI's having made their own plant by copying FIIRO design.

Geographical areas showing the greatest frequency of purchases (estimated + recorded).

Which group of users do you think is the most successful in using the plant?

Which group of users do you think has the most problems in using the plant?

Which are the major problems, e.g. commercial outlets and prices, Raw materials quantity/quality, product yield and quality, processing problems, working capital

APPENDIX IX

QUESTIONNAIRES TO BE USED AT SEMINAR

Demand-led Research

To be saleable and therefore cost effective, applied research must be concentrated on subjects which the end-users perceive as being essential. Limited resources for applied research, mainly in funds, also impose severe limitations on diversity and duplication of research at various Research Institutes .

Private sector involvement.

What contributions can be expected from the private sector? - in terms of information concerning actual requirements - in terms of assistance to approved research projects.

What can the Government do in terms of tax - relief on money allocated to research on approved projects in approved Institutes?

Constraints.

Which are the major constraints/limitations to marketing of R& D results, as seen by the end-users and the Research Institutes?

Questions.

Sectors.

In which sector should applied research be conducted, as seen by the private sector?

Please rate from 1 (highest priority) to 3 (lowest priority)

Sector	Priority
Process - technology	
Machinery	
Products.	

Areas.

Which are the specific areas which must be favoured?

Please rate from 1 (highest priority) to 14 (lowest priority)

Area	Priority
Agriculture	
Agro-Industry	
Food	
Building Materials	
Wood & non mineral Fuels	
Textiles	
Alternative energy-sources (solar - wind - heatpumps....)	
Petrochems	
Pesticides	
Pharmaceuticals & para-pharmacy	
Mechanical & Automotive Industry	
Electronics & Electricity	
Services including computer operation & programming.	
Others	

Obstacles.

Which do you think are the principal obstacles to better exploitation by the private sector of R & D results?

Rate from 1 (biggest obstacle) to 7 (smallest obstacle)

Item	Priority
Purchasing power of potential buyers of plant & Machinery	
Purchasing power of potential buyers of products made in the plant	
Image of locally made goods	
Difficult access to Standards and control laboratories.	
Information on available research products	
Lack of dialogue between Endusers and Research Institutes	
Weakness of Patent protection	
Competitiveness	
Others	

APPENDIX X

SITE VISITS & MEETINGS

Visits to Fiiro

On 30/06/97

Attended by: Prof Odunfa	Director
R. O. Sodipe	Assistant Director Information
C. O. Onyekwere	Assistant Director Engineering
A. Oyewusi	Assistant Chief Technical Officer (Food Production)
Dr(Mrs) H. M. Suloman	Chief Research Officer (Analytical Services)

Pierre Gyss & Stewart Barton

REASON FOR TRIP

To investigate the current activities of THE FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH (FIIRO) and determine if any of the products of this institute could be suitable for transfer to SME's

DETAILS OF TRIP

Discussions took place with the persons 2/ to 5/ above which can be summarised as:-
 FIIRO already conducts Promotional workshops to promote the manufacture of their research. The participants pay to attend these workshops although no follow up is conducted the persons spoken with were confident that their products were fabricated and used in various parts of the country. Due to the distances involved and transportation problems it is better to fabricate bulky items where they are to be used.

Technical drawings were said to be available for their products but not seen.

One of the most successful projects has been the production of soap; there are now over 100 manufacturers.

They have supplied Gari processing units to UNIDO for a number of African countries.

The production and pasteurisation of Palm Wine has also been successful.

A licence for the manufacture of their groundnut Sheller was taken up in April.

When food technology is supplied full training is given in food hygiene and they have the right to visit and check the quality of the products.

NAFDAC also does tests on production of the SMI's.

A tour of the laboratories and workshops revealed:-

The buildings were in run down condition.

Much of the equipment was out of service and in need of repair, some of the repairs needed were only minor.

Shielding was not in place on chain and belt drives.

We were shown a small rectifier which been designed and fabricated in their Institute. This was to be used to plate small items; the plan was to market this as a package to include vats and plating solution.

We were also shown a spark-plug reconditioning unit.

A lists of completed and in progress projects of this Institute from another source was checked and said to be correct. Later enquirers showed this list to be incomplete.

FIIRO has had an information agreement with National Office of Technology Acquisition. This is not operative because of lack of telephone lines.

Patent position.

FIIRO does not take out patents and accepts to be copied. This means FIIRO does not know how many items are made and gets no feed back.

FIIRO does not ask for licenses when copying technology.

The FIIRO catalogue was not obtainable.

Subcontracting.

FIIRO fabricates in its workshops - they think 30% cheaper than outside but realise they cannot mass-produce.

They have considerable unused capacity, including very long-bed lathes.

Technology transfer.

Applies to the line only, not to the overall installation & buildings.

On 26/06/97

PURPOSE OF THE SECOND VISIT: to collect and discuss the reply to our questionnaire sent in early June.

Attended by: O.O. Onyekwere
Mr. Onyekwa

Asst. Director, planning & monitoring
Mechanical Engineer.

Pierre Gyss

1. Questionnaires

The FIIRO staff had not seen the questionnaire. When restating the questions to the meeting, I was informed that they were irrelevant. FIIRO considered it as its mission to disseminate technology, not to control it. People were free to copy and to adapt FIIRO equipment as they saw fit. I pointed out the dangers of this practice: likely downward drift of the copies in terms of quality and safety, loss of information through absence of feed-back and inability to quantify the impact of the Institute's actions.

My request for a copy of the FIIRO catalogue was again rejected.

2. Import Substitution.

It was quite clearly stated that, at a comparable quality level, local manufacture was bound to be more expensive than importing. It was also pointed out that the Institute knows of cases when mechanised devices were given up because of their high cost of maintenance and of operation due to excessive designing down. Basic import substitution is nonetheless considered to be an essential aspect of current government policy.

3. FIIRO's mission.

Some members of FIIRO's staff seem to consider that their principal role should be to specify product lines and to locate the most economical solution in regard of each component, including adaptation of imported items where needed. They consider that transfer of technology does not occur with a single item of machinery but through a process-line.

4. Demonstration lines.

FIIRO wishes to have demonstration plants of every one of their line-designs.

Two sound reasons were put forward to justify the need for demonstration lines:

- 4.1. Local capitalists (traders) will not put equity in a SMI intending to install a process-line which they have not seen at work.
- 4.2. Local lenders would be less reluctant to lend to a SMI if they were to be shown that the process works and that the product is saleable.

5. Project development division.

Some members consider that the demonstration lines should be integrated in a development division which would at the same time produce documentation, provide economic and operating data to potential investors and assist them in financial engineering.

It was pointed out that the previous feasibility-study department had been a failure. The explanations advanced for this were plausible:

lack of experience at the time,

lack of ongoing training

inappropriate computer models.

6. Comments.

- The views expressed rejoin to a great extent those that will be recorded in the final report:
- They are also very close to the views expressed by NOTAP.

This refers in particular to the following:

- The need to concentrate on development of process lines instead of on machinery
- The need for retaining a level of technical quality compatible with reasonable costs of maintenance and reasonable quality level of products obtained.
- The need for complete and factual documentation regarding all technical and economical aspects of a given process
- The need for assistance in financial engineering.

There is no doubt that, if these views reflect prevailing policy, they deserve maximum support from UNIDO because they go in the sense of real industrialisation and technology acquisition. It was however ascertained that the views expressed were in fact personal ones, not necessarily representing the Institute's views.

It was also ascertained that those present were not aware of SDZ's report concerning the feasibility of a multifoed pilot plant.

7. Groundnut paste.

The letter to UNIDO on the above subject was mentioned by O.O. Onyekwere. I replied that I was not qualified to comment, other than to point out that, if the line was meant for international distribution, it should include either a HPS belt or a SORTEX machine to eliminate mouldy nuts. Aflatoxine is a sensitive issue and elimination of mouldy nuts indispensable because of this but also because of the organoleptic deterioration caused by the inclusion of mouldy nuts.

STANDARDS OFFICE NIGERIA 30/06/97

Attended by: Mr. SOBOLA, UNIDO project manager.

Pierre Gyss and Stewart Barton.

Purpose of Meeting:

To ascertain the impact of current SON work on SME/SMIs using the Research Institutes products.

AREAS OF WORK

SON concentrates on simultaneously establishing standards and testing facilities. The latter are subordinated to SON and co-operate with a specific laboratory in an industrial country, e.g. UK or Germany.

Because they insist on setting up complete packages before moving to another sector (and also because of lack of funds), only two sectors have been tackled so far, i.e. steel and cement. Standards for safety of electrical goods have been completed and enforced in relation to small section cable and current household fittings. This has resulted in preventing imports of potentially unsafe products from abroad.

When funds permit, work will proceed on textile technology and products (Kaduna textile laboratory) followed by food-safety standards.

IMPACT ON SME/SMI's

Enforcement of electrical standards will protect local producers of similar goods against competition from low-grade imports. In due course, it will be of major relevance for them to gain access to Government and institutional contracts/subcontracts.

It is also hoped that, as and when the ability of some of the Nigerian SME/SMI's consistently to adhere to these standards has been established, a quota of local supplies could perhaps be envisioned in some types of government contracts (e.g. light RC work and housing schemes).

It is obvious that, as far as SME/SMI's are concerned, food safety standards are of capital importance. The absence of standards will undoubtedly hamper large-scale distribution of some novel products now being developed in Research Institutes and elsewhere.

**AFRICAN CENTRE FOR ENGINEERING DESIGN AND MANUFACTURING.
ARCEDEM.**

Date: 2/06/97

Purpose: To ascertain if ARCEDEM is a potential source of manufacturing capability and know-how transfer.

Attended by: Mr. Charles Kateba Abooki, Engineer.

Pierre Gyss and Stewart Barton

ARCEDEM is a regional training centre, EEC financed, in which Project XA/RAF ??, Manufacture of a Hammermill was domiciled in 1995/1996. Its total staff complement at this time is less than 50, including administrative staff.

It conducts training in manufacturing through courses lasting up to 3 months. Students are supplied with sets of drawings and sometimes Jigs and Fixtures.

Good engineering drawings said to be available.

They manufacture to Government and International Agency orders. Products include:-

Hammer mills

Hydraulic Automotive Workshop Cranes (Engine Lifters)

Saw Bench.

Hydraulic press.

Working on long tail boat engines from Thailand

The Centre is not expected to become involved in promotion of research results in Nigeria other than through Government or Institution -sponsored projects.

TECHNOLOGY TRANSFER

Mill packages consisting of an assembled machine, a kdc set and a set of engineering drawings have been supplied to Laos, Western Samoa, Myanmar, Cambodia, Buthan under UNDP-funding.

Some machines also seem to be earmarked for various Nigerian Agricultural Development Projects (ADP).

The Institute is looking for a technology and plant for drying of ginger and cassava-chips.

There is little permanent workshop-staff. They would like to take on jobbing work but cannot do so because of lack of staff. Reliable staff is difficult to recruit on a temporary basis.

INSTITUTE FOR AGRICULTURAL RESEARCH & TECHNOLOGY.

Date: 30/06/97

Attended by: Prof. S.A. Shoyinka, Dy. Director
Prof. E.A. Ogunremi, Agronomist
Dr. A.O. Obajimi (Plant Breeder)
Dr. Mrs O. Omueji (Nutritional Biochemist).

Pierre Gyss and Stewart Barton.

Purpose: to find out if any of the Institute's research is of interest to the objects of this mission.

As far as the brief on commercialisation was concerned, the work of Dr. Omueli seems to be particularly relevant. She works on protein-enhancement of traditional foods; this area appears to be of particular interest because:

it relates to products in which women have a major stake,

it relates to products which have a wide enough appeal to justify progressive transfer from the informal sector to SME/SMI's

it is innovative in that it combines current technology (texturizing) with traditional practices and tastes

capital cost is not excessive in relation to potential turnover

Agenda for a working session on promotion of this is to be submitted. The Faculty should link up with the RMRDC pilot plant in Lagos.

TECHNOLOGY TRANSFER

The level of implementation of prototypes is poor; similar but more satisfactory equipment was developed elsewhere, particularly at RAIDS.

RURAL AGROINDUSTRIAL DEVELOPMENT SCHEME.

Visit on 28/5

Attended by Mr. Akinbolade.
The Engineer

Stewart Barton and Pierre Gyss

This organisation has developed or acquired from other Institutes a number of apparently successful technological lines and manufactures them either in their workshops or at registered sub-contractors. The following lines potentially of interest to SMI's were mentioned:

village palmoil extraction, using hydro-extraction
village groundnut using a mini-expeller
village palmkernel using a mini-expeller
fruit-juice extraction and centrifugation
starch production from garri.

They and their subcontractors are said to have produced several hundred micro-expellers for groundnuts.

Their approach is based on sound principles both in respect of handling subcontractors and in respect of customer-approach.

Subcontractors: Contractors capable of manufacturing the machines to the required standard have been identified in various parts of Nigeria, trained in particular aspects of manufacture and registered with the organisation. Potential end-users are referred to the one nearest or most convenient to them.

Commercialisation.

RAIDS selects technologies from all available sources, adapts them if necessary and packages them into process-lines. This, together with FIIRO, is the only Institute that appears to consider process-lines rather than isolated machinery.

When a process line had been defined, a methodology brought in by IBRD and therefore very close to the PREVISYS approach was applied in the past:

- draw up a flow-sheet and prepare capital-cost and P & L forecast with near-exclusive emphasis on short-term cash position and working capital needs.
- conduct a multivariate sensitivity analysis on these forecasts.
- use the technological data and the financial forecasts to prepare a vulgarisation brochure describing the process, its costs, its advantages and its risks.
- identify and train approved manufacturers in making the equipment.

- interview the entrepreneurs and customise the study, again on the basis of actual working capital needs.

Because the work was done on a 1985 IBM/AT (250K RAM), elaboration of data was cumbersome and partly manual. The AT in question is now, not surprisingly, out of order.

Delays in payment and level of pay have created problems with staff-stability. This is detrimental to the multidisciplinary approach required to apply this methodology.

The combination of the two factors (no computer and staff-shortages) explains why documentation is not up to date. This is deeply regrettable in view of the soundness of the principles involved, as seen below.

User information. RAIDS in fact started as an IBRD project; not surprisingly, their brochures follow IBRD methodology. The brochures are well structured, modestly well presented but totally out of date in terms of capital and P&L estimates. Brochures for the more recent technologies are missing. There is no man-power available to update previous ones or to prepare new ones.

Visit on 19/6

Met: Mr. Akinbolade

Object: Questionnaire, Brochures, Marketing Approach & PREVYSIS.

Questionnaires

The questionnaires had not been completed. Their purpose was clarified and RAIDS was asked to include replies for all items which they think are at the marketing stage, giving approximate sales figures p.a.

Updating and completing the Brochures was discussed. The potential usefulness of PREVYSIS (which supplies all the information required to update the information, including sensitivity analysis), was discussed and a demonstration offer was made.

A further meeting was scheduled to discuss questionnaire and possible application of PREVYSIS.

Meeting with Dr. Akinbolade on 1/07/97 in UNIDO offices, Lagos.

In response to our questionnaire, Dr. Akinbolade supplied complete data on 6 process-lines. This shows at least that replying to the questionnaire was feasible.

They show that relatively large numbers of some lines have in fact been reproduced by approved manufacturers.

The data are analysed in detail in an appendix to the main report.

IAR ZARIA Engineering Department(10/11/06/97)

N.B This note concerns only observations made by Mr. Gyss. Mr. Barton has prepared a full report.

Met: Dr. Suleiman, Director of Engineering.

WORKSHOPS.

Very untidy in layout.

Craftsmanship poor in parts.

Product finish and presentation poor.

Design (as opposed to drawing) capacity appears to be near nil.

PRODUCTS

They produce a noteworthy improved implement for cottage-preparation of Kuli-Kuli.

A list of products was obtained with prices and some characteristics. There are no brochures.

JANI women's group (60 km from Zaria) was visited together with IAR staff to interview a group using the groundnut extractor. No records have been kept since July 95 (sic) and the special device had disappeared after being broken. The grinder is said to work when there is electric current but it could not be viewed. Some women are said to have left the association and purchased their own device for use in their farm. The group now uses traditional devices.

Business women using a thresher given them by the Ford foundation eight years ago were interviewed in a nearby village. They drew attention of the IAR staff to the need to fit wheels to the thresher to enable it to be moved around the village without having to load it on a van.

IAR staff did not seem to be aware of this request. The last visit seems to have taken place some considerable time ago.

MISSION BRIEFING 5/06/97.

Held in the old building of the Ministry of Industry.

Chaired by Eng. M.T. Ahmed, Director, Technology Acquisition & Transfer, FMST

Attended by:

Name	Position	Attached to
Mr. O.G. Olayinka	Assistant National Programme Co-ordinator, in the absence of the Programme Co-ordinator.	FMI
Prof. Mike Kwanashi	Programme management advisor	FMI
Mr. Nnamdi Ekweogu	Programme finance officer	FMI
Mr. Sonie Aruya	Programme Secretary	FMI
Mr. J.M. Kating	Asst. Programme Secretary	FMI
Mr. M.C. Orji	Desk Officer SME	FMST
Dr. C.O. Chigbo	National Consultant	MEQUIP
Mr. A.O. Ajani	Programme Officer	UNIDO
P.R. Gyss	International Consultant	UNIDO
P.G. Barton	International Consultant	UNIDO

The basis of the proposed work-programme was accepted, i.e.

no duplication of work already done

emphasis on bringing in end-users in terms of information and involvement

emphasis on information centre (to be based @ NOTAP, say FMST)

There will be only one seminar in ENUGU - jointly with Barton.

The possibility of displaying exhibits was mentioned.

Meeting on Work Plan, 5/06/97 at FMST

Attended by:

Eng.M.T. Ahmed, in parts	Director, Technology Acquisition & Transfer	FMST
Dr. Suleiman	Director,	IAR, Zaria
Dr. C.O. Chigbo	National Consultant	MEQUIP
Mr. M.C. Orji	Desk Officer SME	FMST
P.R. Gyss	International Consultant	UNIDO
P.G. Barton	International Consultant	UNIDO

The workplan was finalised. I was instructed to include in my programme visits to:

- Notap, Lagos
- NASSI, Lagos
- National Risk Fund Lagos
- NAM Lagos
- NARICI Zaria
- IITA Ibadan
- NOVA technologies, Ibadan
- RAIDS, Ibadan, return visit
- TBI, Kano
- NASSI, Kano
- KACCIMA, Kano Chamber of Commerce, Industry, Agriculture & Mines
- SEDI, Scientific Eqpt. Development Institute, Enugu
- PRODA Enugu

Mission Debriefing.**DEBRIEFING MEETING**

On 17/07/97 at UNDP conference hall.

Purpose: presentation of their findings by the International Consultants.

Chaired by Alh. M.T. Ahmed

Attended by:

Adesoye Moshwa	Senior Analyst	NOTAP
Akinde, Mrs. O.	M.D	Silver Touch Prods. Ltd.,
Arruya Sonne	Programme Secretary	FMI
Bashir Suleiman	Planning/Promotion Officer	TBI, Lagos
Dany Azeez	CEO	Tawfik Chemicals
Ekweogu Nnandi	PFO	NIRB/1 FMI
ESSIEN O.E.	Chief Analyst	NOTAP
Katong J.M.	APS/FMI	FMI
Koyeji	Chief Analyst	NOTAP
Kuteyi D.O.	M.D.	SPECTRA
Kwanashi Prof. M.	Programme Management Advisor	FMST
Momolu, Prince J.S.	CEO	Industrial Machines Fabricator
Obatusin Dr. T.	CEO	Unique Eastwinds Ventures
Okechukwu, Dr.	CSO	NASENI
Okonkwo	Asst. Dir.	NARICT
Okwchine	ACPO	FMST
Olateju, Chief I.O.	Chaiman/CEO	Olateju Antennas Ltd.
Olayinke O.O.	ANPC, SME Prog.	FMI
Onya Obi	CSO	NASENI
Orji M.C.	Desk Officer	FMST, Abuja
Prabhakar T.K.	Design/Design Rotating Machines	UNIDO Consultant, NGEF Ltd.
S. Barton	UNDID International Expert	
Sany Abubaker	CEO	MOMMAR TECSU Ltd.
Shittu Dr. A.	Centre Manager	TBI Agege
Suleiman, Dr. M.L.	Programme Leader	IAR/ABU
van der Ven J.P.	JPO	UNIDO

Official minutes will be issued. In-depth discussion of the executive summary and recommendations did not bring to light any reason for changing or adding to the draft report.

Salient features of the discussion were:

Empirical copy technology should not be considered as research; drawings and know-how should be purchased where it exists and then adapted to local circumstances.

Competing designs from various institutes should be consolidated and standardised in terms of critical dimensions and minimum specifications.

The notion of pooling stocks of critical parts and metals is accepted as a logical consequence of standardisation.

The problem posed by the lack of engineering drawings must be urgently addressed.

An in-depth survey should be made of actual demand for research-products and the Research Institutes' activities re-directed accordingly.

Greater involvement of the private sector is desirable but the private sector seems to want to have more say without financial participation.

It was repeatedly stressed that professional associations should take the initiative of setting and maintaining quality standards in their profession.

Meeting at RMRDC 6/06/97

Visit carried out in the company of Emeka Chinalu Orji, Government counterpart.

Purpose of the meeting: to obtain information on RMDRC role and policies,
to identify research-products to be commercialised

Attended by: Prof. Usman Hassan, Dy. Director.
Dr. (Mrs) Elemo

P. Gyss & S. Barton

The Corporation has no R & D facilities. It finances subcontract manufacture and demonstration of the pilot plants.

Their current pilot plants are:

castor seed oil in Kaduna (not enough raw materials)

extruded soy in Lagos

benni seed oil extraction in Lagos.

I was given permission to visit these plants.

Their main achievement is said to be a composting process with fertiliser addition and pelletization at Ibadan University. They have developed their own pelletizer!

Should send exhibits of their products to Enugu.

Meeting at NIPRD 6/06/97

Visit carried out in the company of Emeka Chinalu Orji, Government counterpart.

Attended by: Dy. Director

Q. Barton & P. Gyss

The Institute currently runs clinical trials on a sickle-cell drug drawn from traditional medicine. They get some assistance from ROCHE, but not enough to maintain the momentum and sample size of the trials. Apart from small contributions from ROCHE, all their funds come from FGN.

The latter finances the construction of a very large laboratory building.

The Institute also houses the UNIDO multi-purpose extractor pilot plant.

The Dy. Director would like to see the Institute gradually taken over by the pharmaceutical profession. To start the process, he recommends strengthening the MAN-PG representation on the Institute's board.

The pilot plant is far from completion in terms of buildings, wiring and piping.

VISIT TO NARICT 11/06/97

Visit carried out in the company of Emeka Chinalu Orji, Government counterpart.

Attended by: Okwonko Dr. E.M., Asst. Director of Research

P. Gyss

Three areas of activity were examined:

- Downscaling of chemical/biochemical production processes to SMI level.
- Practical extraction method and plant for essential oils, particularly citronella and eucalyptus.
- Small scale manufacture of hydrated lime and refractory brick

1. Downscaling of chemical processes.

This is an innovative approach to manufacture of reputedly "heavy" chemicals such as hydrated lime as well as of "fine" chemicals such as dyes, chemical indicators etc. Practical examples shown were malachite green (used in mosquito coils manufacture) and methyl red (used in all school- and research laboratories). These are obvious potential outlets for unemployed graduates.

2. Extraction of menthol and citronella-oil.

Reforestation has led to thousands of hectares being planted with eucalyptus and similar varieties, making available a large reservoir of leaves.

Large scale experiments carried out by the Institute show that lemon-grass grows remarkably well in the Zaria area and produces high yields.

A practical and cheap still producing raw distillate was designed and built at the Institute. Suggested improvements to the design relate to a primitive cooling-water recycling device and mounting the still on a skid and wheels to take it as close as possible to leaf-collection areas in order to eliminate the cost and difficulties associated with transport of large volumes of leaves (which will be a major problem for the UNIDO pilot-still sited in Abuja). Mr. Barton inspected the plant and made a full report on ways and means of improving the still and its auxiliaries.

3) Hydrated lime and refractory bricks.

Quality of construction of the kilns and burners as well as quality of the refractory bricks all appear to be quite satisfactory. The Institute is engaging in commercialisation of the equipment.

The Director emphasised the need for training institutional staff in a market-oriented approach to applied research.

VISITS TO FMST TECHNOLOGY BUSINESS INCUBATOR CENTRES

Visits carried out by Pierre Gyss in the company of Emeka Chinalu Orji, Government counterpart.

Attended by: Abbas M. Sharriff, Manager, Kano Center.

P. Gyss

There are three remarkable features in the concept of TBI as practised by the NMST:

- Entrepreneurs are required to finance their initial investment without financial help from the scheme,
- Many of the tenants take significant risks in terms of technological innovation as well as product design,
- provided the present level of personalised and flexible assistance at all levels can be maintained for a number of years, the rate of wastage will be reduced to a fraction of what it would be in the absence of the scheme.

KANO TBI on 12&13/06/97.

Nearly all tenants were visited. In almost all enterprises visited, technology was ahead of what had been seen in the Institutes and mainly related to fields which have not yet been touched upon by the latter. Some tenants commercialise their technology, for ex. artisanal silk-screen printing on P.E., constant level bottle filling machine, small soap making and -moulding plant.

The following know-how and technology are available at KTBI:

Al - foundry

Iron -foundry (waiting for PRODA crucible)

Light plate-shop

Gear-cutting

Silk - screen printing (device made and commercialised by tenant)

Constant level bottle-filling machine (device made and commercialised by tenant)

Hand-operated soap cutting and shaping machines (device made by tenant)

Cosmetics manufacture

Making of soap & soap-powder

Leather craft

Glassfiber reinforced plastics (car & truck bumpers)

Leather polishing machine (designed and commercialised by tenant)

School chalk

Fruit-based drinks

Stabilised bricks

**MEETING WITH REPRESENTATIVES OF KANO IDC AND
KANO BRANCH OF NASSI (13/06/97)**

Visit carried out by Pierre Gyss in the company of Emeka Chinalu Orji, Government counterpart.

Attended by: Gadza Saidu U Co-ordinator, Kano, IDC
the Chairman, Kano Branch of NASSI

P. Gyss

The chairman of the NASSI pointed out that KANO had always be in the vanguard of technology innovation and transfer, particularly in the fields of leather and dyes.

They have regular contacts with NARICT/CELTECH and consider that their input to CELTECH exceeds the output coming in their direction.

MEETING WITH KANO BRANCH OF MAN, 13/06/97

Visit carried out by Pierre Gyss in the company of Emeka Chinalu Orji, Government counterpart.

Attended by: Borodo Alh. Bashir M, Chairman, Kano Branch
a chapter member

P. Gyss

The Chairman of MAN pointed out that KANO entrepreneurs have become used to relying on their internal resources for development and maintenance, including making spares. Given the extreme difficulties they are confronted with, they do not see any reason for sharing with outsiders knowledge acquired as a means of survival of their business.

He points out that research done by the Institutes is aimed either at the micro-enterprise and mainly agricultural sector or at large multinationals and generally deals with old topics. Subjects of interest to the medium-sized industries represented by MAN are not taken into account, for example plastics technology and effluent treatment. He deplores the absence of consultation of his members in the choice of research subjects and the fact that they are informed only long after completion of the project. He suggests they should be given an opportunity for appraisal of the project at inception.

A chapter-member emphasises these points and deplores the absence of information from the Institutes. He considers that reports on the "finished" research product are not useful because they do not stimulate discussion; applied research projects should be opened for discussion at a very early stage of their conception.

The Chairman's answer to the question whether MAN would be prepared to invest in terms of personnel and hardware in creating a focal point of information was affirmative.

MEETING WITH KACCIMA, KANO, 13/06/97

Visit carried out by Pierre Gyss in the company of Emeka Chinalu Orji, Government counterpart.

Attended by: Ahmed Ibrahim Yakasai, Past President,
Abdu Balarabe, Promotions Officer

P. Gyss

The KACCIMA offered its help in any action to be conducted by FMST; its activity is very strongly if not totally oriented towards trading activities. The past president emphasised the predominant role of Kano as a regional trading-hub. He suggested that Research Institutes should produce sufficient quantities of any new product for the Members to be able to evaluate its market-potential.

VISITS TO NOTAP.

Visit of 16/6/97.

Attended by: Mr Okomo, C.E.
 Alh. Adeoba A.O. Dy. D.G.
 Dr. Essien, Chief Analyst
 Koyejo A., Consultant.

Pierre Gyss

Introductory visit, an agenda will be sent for a meeting on 24/6.

Visit of 24/6

Attended by Dr Essien, in parts
 Koyejo A.

Pierre Gyss

Other members were not able to come to the office because of the fuel shortage.

The relationship between RMRDC and NOTAP appears to be under review; fundamentally, RMRDC deals only with rawmaterials promotion, NOTAP with the other fields of technology.

NOTAP is in favour of importing technology when this is economical; the office has 6 analysts and assists entrepreneurs in licensing and other technology contracts.

NOTAP is concerned about the low level of inventiveness of many Research Institutes and feels that strong Government directions may be needed to orient research.

It subscribes to the W.I.P.O and receives monthly updates of the patent-abstracts of W.I.P.O.

NOTAP organises seminars on technology transfer and patent-right.

They can act as patent agents on behalf of Nigerian inventors. They look forward to a resuscitation of the Intellectual Property Office.

NOTAP is in touch with the INTIB network; the fact was emphasised that INTIB functions very well on a paper-base.

Visits to National Risk Fund p.l.c. 23/6/97

Attended by: Dr. OLANYIN, C.E.
Mr. OBOH Anthony Osa, Head of Operations

Pierre Gyss and Stewart Barton.

Has at present the following private shareholders:

Commerce Bank plc
Cadbury Nigeria plc
Dunlop Industries Nigeria plc
Progress Bank of Nigeria
Continental Merchant Bank plc
United Bank for Africa plc
Union Bank of Nigeria plc
Rims Merchant Bank Nigeria plc
Lever Bros. Nigeria plc
RMRDC

Is looking for more shareholders and International Funds (IFC etc.).

Has started with a \$3 million grant from FGN.

Limits equity participation to a small number of small enterprises at present, because of limited amounts of funds available.

Does not issue guarantees on loans.

Can take participations in order to bolster working capital.

Does not make feasibility-studies but scrutinise those purchased by the entrepreneur.

Nigeria has the same problem as other countries: professional consultants cannot compete with "occasional" consultants, with the usual impact on quality-level of the studies.

NRF has a list of approved consultants and advises the entrepreneur to select one if they present no feasibility studies or bad ones.

Meeting of 3/7 with Mr. OBOH Anthony Osa

PREVISYS risk analysis installed and demonstrated.

Meeting of 21/07 with Mr; OBOH

PREVISYS application to a NRF file; insufficient RAM (only 8 RAM) on their computer to complete. NRF will shortly extend RAM.

Visit to Franco-Nigerian Chamber of Commerce, 23/6.

Met: Mr.Levrel

Has supplied some useful info concerning persons to meet. Also the fact that SCOA - Nigeria has been taken over by FADOUL (Churchgate Group). Restructuration is in progress.

Says the French Commercial Section conducts sectoral studies; the latest is tourism.

The studies are available to the public for about N300.

Meeting with NASSI Secretariat.

Attended by: Dr. M.C. Okonkwo National President
Charles IK Chukwu Administrative Secretary.

P.R. Gyss

Purpose: To discuss observations made during study tour to the Philippines.

General.

The Government has a clear policy of active support of SME/SMI's.

The SME's are organised in Associations, which are interest-groups and sub-groups, somewhat similar to NASSI. Their principal sources of revenue are: spread on on-lending, see below, remuneration for monitoring and members subscriptions. Membership is by co-optation. Subscriptions are used in the same manner as in "tontines" and "KongSi", i.e. the member's loan-limit increases with contribution.

Financing

The lending-scheme was initiated by 6 government-owned banks and existing associations. Its success brought in ADB; this in turn meant the scheme could be expanded.

The major financing channel for SME in the Philippines is as follows: ADB (Manila) lends to Filipino Primary Bank; the ADB loan is guaranteed by the Government. The Bank lends to the Association at preferential rates. The Association on-lends to members with a spread of 3 to 5 percentage points. The resulting interest is still lower than what SMEs could obtain through a direct unsecured bank-loan.

Loan amounts can vary from \$800 to about \$40 000.

The Association's lending decision depends on its assessment of the borrower's character and ability to repay the loan. The Association is, de facto, joint guarantor of repayment and uses all means for recovery (again like KongSi's and tontines).

The Associations are wealthy enough to employ project monitors capable of giving the debtors technical and managerial advice. By this means and by the stringent selection of debtors, they achieve debt-recoveries of 85 to 96%.

Extension services and monitoring are key-factors.

Objectives

Government policy is to encourage quality and provides the required training facilities, together with non-government institutions; they acquire the required know-how through hiring foreign experts whenever necessary. The objective of the drive towards quality is to

make the products fully competitive on the export market, in terms of quality as well as of prices.

An Association for Trade Promotion has been created to help exporting SMEs. This is a private Association largely supported by Government. Subsidies are said to be of the order of \$10 000 for an export fall-out of \$30 000 000.

According to NASSI, it would be possible to instaure similar schemes in Nigeria, once the business climate improves.

NASSI could have two roles: as on-lender and monitor of funds and as intermediary between the research institutions and the members.

Meeting with NASENI at UNIDO Offices, 2/07/97.

Attended by: Dr (Mrs) R.C. Okechukwu, Chief Scientific Officer, NASENI

S.Barton & P. Gyss

Purpose: information of consultants re NASENI's activities & objectives.

NASENI activities and functions are described in a 1992 document "National Policy on Science and Engineering infrastructure, 1992. This document is said to remain valid in toto, although the body is now subordinate to the FMST.

NASENI runs 5 scientific development institutes (SEDI), of which SEDI in ENUGU.

SEDI concentrates on machine and machine-tool fabrication, including a grinding machine for telescope lenses.

The main objective of the centre is said to be to train metal-factory operators.

No research products have yet been sold.

SEDI Enugu will be visited if possible.

NASENI holds regular co-ordination meetings. Barton requested for copies of minutes of some meetings.

The role of NASENI as a co-ordinating agency was questioned in the light of the duplication and redundancies observed in our field-trips. No satisfactory answer was obtained.

Visit to Energy Research Centre, NNU, together with J. van der Ven, JPO

11/07/97

Met: the Director.

Purpose of the visit: to examine some of the projects listed by the Centre in MEQUIP report.

The expose of the Director and a visit to the demonstration equipment indicated that there were no products likely to be commercialised.

The imported Bio-Gas generator is still in crates, the building had been about 20% completed some years ago and then left to decay.

The solar water heating seen was most likely imported.

The maize-drier is in fact a wooden structure similar to that traditionally used in many farms.

Usefulness and reliability of the solar chicken-incubator are questionable.

The Centre does not envisage to purchase know-how from abroad, even of very common items; it prefers to rely on the slow and expensive method of purchasing equipment and then copying it.

The Centre makes no market studies, has no documentation on its products and is passive in terms of commercialisation. It does not consider the possibility of deriving any form of revenue from commercial activities and wishes to continue relying on Government funds.

The machine tools of the workshop appear to be in working order but rarely used; no work is carried out for outsiders.

VISIT TO PRODA.

On 14/07/97, with Mr. Chigbo, National Consultant.

Purpose: to identify commercialisable research products of PRODA

Met: Mr. Nnous, Director.

The following projects were described as being saleable:

Garri Line
Distillation -still
Electrical Isolators, ceramic
Fish feed pelletizer,
Palm oil line.
Water-filters.

No mechanical drawings and specifications were available. Information concerning the technical characteristics of the equipment and products made, their potential market and numbers sold directly or through manufacturers was not obtainable. All items are said to be not quite ready, with a few problems yet to be resolved; the nature of the problems was not clear.

A plastic cap for the candles is to be developed by an Onitsha firm; no injection-facilities were said to be available in Enugu. In actual fact, SEDI (located in the same town) has two injection moulding machines, one of which suited for very large moulds and one medium - sized machine perfectly suited for moulding of the PRODA requirements.

The drawing office is derelict and has quite obviously not been used for a long time.

With the exception of the ceramics section, the workshops are in a poor state of upkeep; so were the machine-tools and implements.

The finish of the products seen was poor.

The specialised consultant will comment on present developments of electromotor imitation technology.

Visit to SEDI

On 14/07/97, with Mr. Chigbo, National Consultant.

Met: Mr. I. I. Nnadi, Director.

Activities are very diverse; the following is an incomplete account:

Scientific glassware, mainly for use in schools, universities and hospitals such as standard volumetric and distillation equipment, thermometers, hydrometers and, accessorially, retort stands and -clamps etc..

Etching facilities and calibration - laboratory for volumetric ware and thermometers.

Lens grinding and polishing, magnifying glasses and microscopes (very good looking with a three-lens turret).

Microscope slides of tissue sections for use in schools and universities.

A photo-slides and silk-screen printing shop.

A foundry with induction and standard crucible-ovens and all required heat-treatment facilities, a pattern and mould-making shop, including a shop specialising in the lost-wax process.

A very well-equipped engineering-workshop capable of industrial production runs of a large range (in terms of size, metals and shape) of items.

A separate workshop housing machine-tools for precision-work.

A mechanical maintenance workshop doing current and preventative maintenance for the Institute and third parties.

An injection-moulding shop including one very large-capacity press, making plastic anatomic models and other teaching aids.

An electrical workshop making simple electrical teaching aids (moving-coil ammeters, Wheatstone bridges etc.) and maintaining the Institute's control and monitoring equipment as well as doing contract maintenance for third parties.

A very complete wood-working section including drying and conditioning kilns and all relevant machinery, including a projected line for mass-production of stabilised wooden rulers.

It is worthy of note that great attention appears to have been paid to the workers' environment: dust and fume extractors have been installed and are operational wherever required.

Specifications and maintenance of equipment seen in all sections stands comparison with the best in Europe. There are no digitally controlled machine-tools nor any CDA/CAM facilities. This is more of an advantage than a disadvantage at this juncture, because it makes for a very flexible and potentially interactive structure, but should be remedied in the near future.

The Institute has a quality-assurance policy and a quality-control structure which reports directly to the Director. The results are there to see: quality level, degree of finish and functionality are at a par with requirements of a fully developed economy.

The objectives of the Institute are manifold:

- to mass-produce those items needed by the schools, universities and scientific bodies which cannot be adequately produced by the private sector.
- to help in training the teachers using these items.
- to develop manufacturing processes for goods having a broadly-based market, for transmission to private-sector operators.
- to assist other public or private bodies in upgrading their technical/technological level.

The Institute has implemented a very pragmatic policy of stock-building wherever possible (e.g. graphite and hardwoods). It nevertheless suffers currently from working-capital shortage which prevents it from optimising machine-utilisation and from extending its market share as it undoubtedly is capable of doing due to its remarkable quality level. As long as it has this problem, SEDI intends a low-profile marketing policy. It has a full workload at the present, taking into account the limitations on working capital from which it suffers.

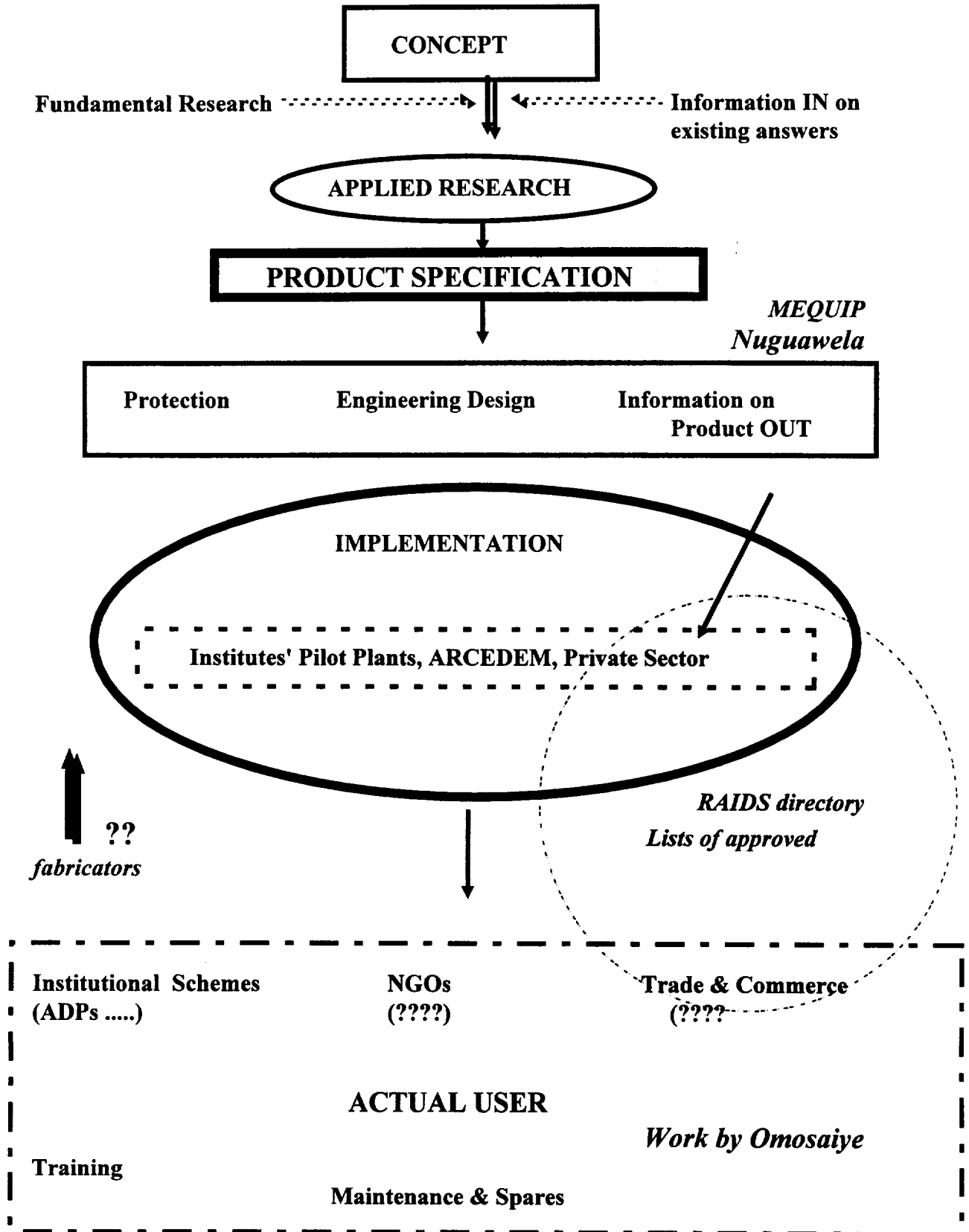
APPENDIX 11

LIST OF PERSONS MET

Name	Position	Organisation	Town
?	Director, Energy Research Centre	NNU	Nsuka
?	Chairman, Kano Branch	NASSI	Kano
Abbas M. Sharriff	Manager	TBI Center	Kano
Abdu Balarabe	Promotions Officer	KACIMA	Kano
Abooki Ch. Kateeba	Production Engineer	ARCEDEM	Ibadan
Abubakar Umar M.	UNDP Programme Director	FMST	Abuja
Adeoba Alh. A.O.	Dy Dir.	NOTAP	Lagos
Adjani		UNIDO	Lagos
Ahmed Alh. M.T.	Director, Technology Acquisition & Assessment	FMST	Abuja
Ahmed Ibrahim Yakasai	Past President,	KACIMA	Kano
Ajani A.O.	Programme Officer	UNIDO	Lagos
Aliyu Dr. Abdullahi	C.E.	RMRDC	Abuja
Anigbogu Fred E.	Analyst	National Risk Fund	Lagos
Aribisala S.A.	Manager	Nova Technologies	Ibadan
Bassey Dr. W. Michael	Director, International Relations	IITA	Ibadan
Borodo Alh. Bashir M.	Chairman, Kano Branch	MAN	Kano
Cadiotti Olivier	Dy Commercial Counsellor	French Embassy	Lagos
Chukwu Charles IK Ekweoguni Nnamdi Elemo Dr. Mrs	Administrative Secretary Programme, Finance Officer Dy. Director	NASSI FMI - SMID. RMRDC, Pilot Plant Division	Lagos Abuja Abuja
Essien O.E.	Chief Analyst	NOTAP	Lagos
Gadza Saidu U.	Co-ordinator, Kano	IDC	Kano/Hadeja
Halos-Kim Miss Leonides	i/c Post-harvest equipment	IITA	Ibadan
Hassan Usman	Dy. Dir.	RMRDC	Abuja
I.I. Nnadi	Director	SEDI	Enugu
Jamiyal Nathan D.	Director	National Risk Fund	Lagos
Koyejo A.		NOTAP	Lagos

Kwanashi Prof. Mike Levrel Nicolas	Programme Management Adviser JPO	FMI - SMID. Franco Nigerian C of C	Abuja Lagos
Mr Nnouse	Director	PRODA	Enugu
Obajimi Dr. A.O. Oboh Anthony Osa	Plant Breeder Head of Operations	AIRCT National Risk Fund	Ibadan Lagos
Odunfa Prof. A.E. Ogazi Dr. Paul Ogunremi Prof. E.A. Okechukwu Dr Mrs R.C. Okechukwu Okomo	C.E. Director Genetics Chief Scientific Officer Director	FIIRO RAIDS IARCT NASENI	Lagos Ibadan Ibadan Lagos
Okwonko Dr M.C. Okwonko Dr. E.M. Olaniyan S.B.	National President Asst. Director, Research M.D. / C.E.	NOTAP NASSI NARICT National Risk Fund	Lagos Lagos Zaria Lagos
Olumeko, Engr. D.O. Omis A.	Nat. Proj. Co-ordinator Cultural & Technical Co-operation	CSU French Embassy	Ibadan Lagos
Omossayie Dr. Olu Omueji Dr. Mrs O. Onyekwere Onyenkwo Orji Emeka Chinalu Oyewusi F. A.	Consultant Nutritional Biochemist Planning/Monitoring Engineer i/c TBI Assistant Chief Technical Officer (Food Production	Omory Ltd. AIRCT FIIRO FIIRO FMST FIIRO	Lagos Ibadan Lagos Lagos Abuja Lagos
Sarbu Anton Shekaru Hajia Fatima	UCD Owner	UNIDO Naffy Fibre Co, (GRP)	Lagos Kano
Shoyinka S.A. Sobola Jiri Sodipe R. O.	Dy. Dir. CTA Assistant Director Information? FIIRO	AIRCT UNIDO/SNO	Ibadan Lagos Lagos
Suleiman Dr. Maiwada Suloman Dr (Mrs) H. M.	Agric. Mechanisation Chief Research Officer (Analytical Services)	IAR FIIRO	Zaria Lagos
Uryio Andrew P.	Collaboration & network programme	IITA	Ibadan
van der Ven Miss Joke	JPO	UNIDO	Lagos

FROM CONCEPT TO END-USER



**WHAT TURNS A RESEARCH PRODUCT
INTO CONSUMER GOODS ?**

The question is not only what can the end-user buy - where?

The questions are also:

WHAT DOES THE USER WANT TO BUY ?

CAN HE AFFORD IT ?

IS IT AVAILABLE AT A CONVENIENT PLACE ?

DOES IT DO THE JOB HE EXPECTS IT TO DO ?

IS IT A REAL IMPROVEMENT OVER PRESENT PRACTICE ?

**To be saleable - a product must generate a positive answer from a
LARGE number of potential buyers**

COMMENTS ON FLOW OF RESEARCH

According to MEQUIP report, the Concept originates mainly within the Research Institutes and revolves substantially around copying/import substitution of existing designs.

There are exceptions which prove that if a product meets popular demand, it sells well:

FIIRO soap plant, still, pasteuriser;
Micro- and mini expellers (e.g. RAIDS).

Some other products ride institutional demand and their originators make little attempt to sell directly to other end-users:

ARCEDEM hammermill,
FIIRO/UNIDO garri plant.
RAIDS fruit-juice extractor & centrifuge.

Many other prototypes remain at the prototype level. Why are there no sales:

does the product effectively meet an existing need at an affordable cost?
does the institutional structure enable commercial/pseudo commercial activities?
does the originator really wish to propagate?
does the originator have budget - resources for doing so?
are there distribution channels?

In other words:

has there been a market study before initiation of the research work?
have potential distributors/End-users been associated with the design and testing?
has there been enough effort in demonstrating the prototype with End-users?
have marketing-channels been identified and contacted?

In more general terms:

Are Applied Research Institutes expected to be partly profit-oriented?

Are their statutes going to be amended to permit them to engage in commercial activities?

Are Research Institutes willing and able to do so?

What do they need to become more profit-oriented?

How can end-users be represented in the Research Institutes' choice of research?

Figure II

INTERACTIVE DESIGN, PHASE ONE

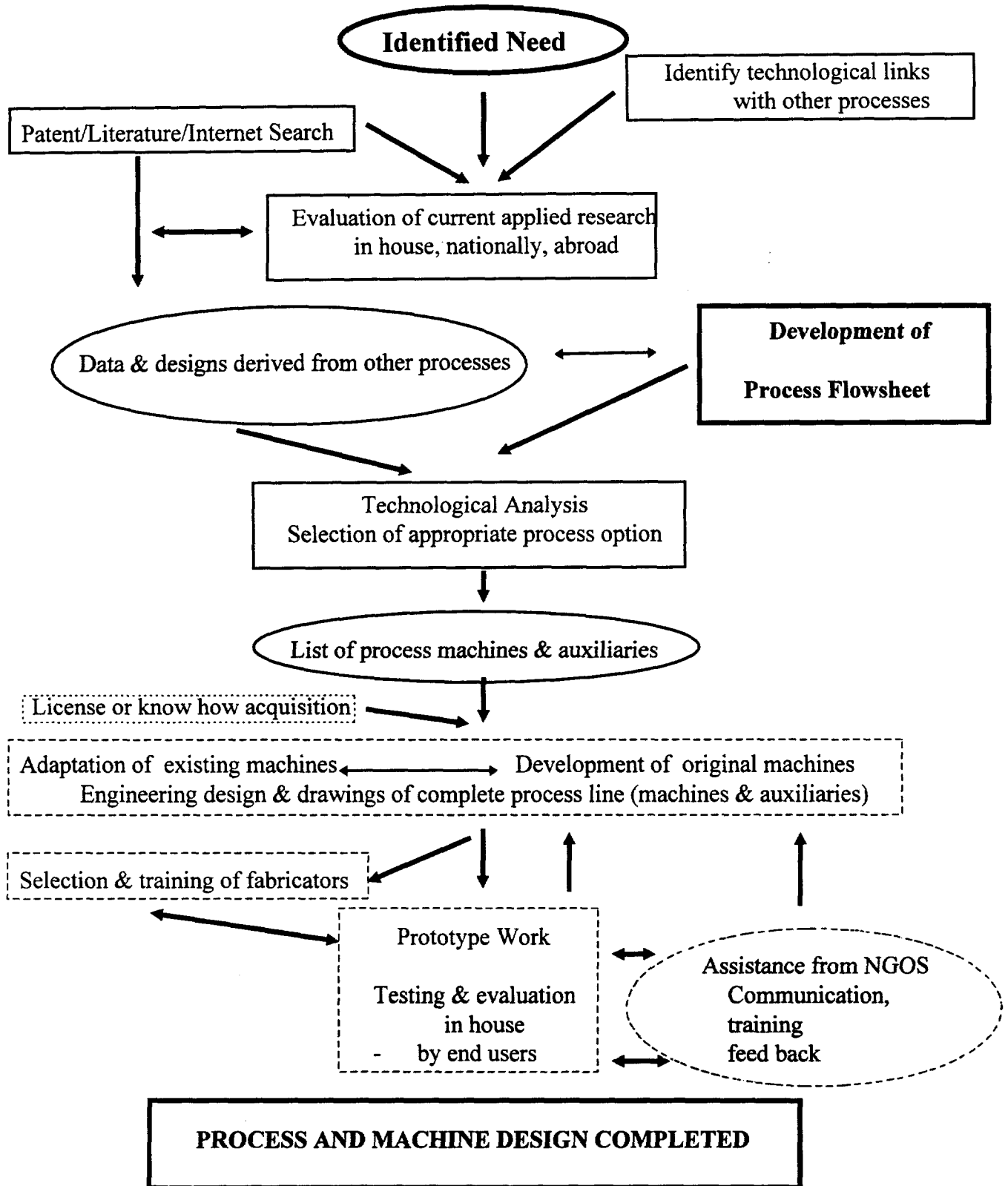


Figure III

INTEGRATED MARKETING SCHEME

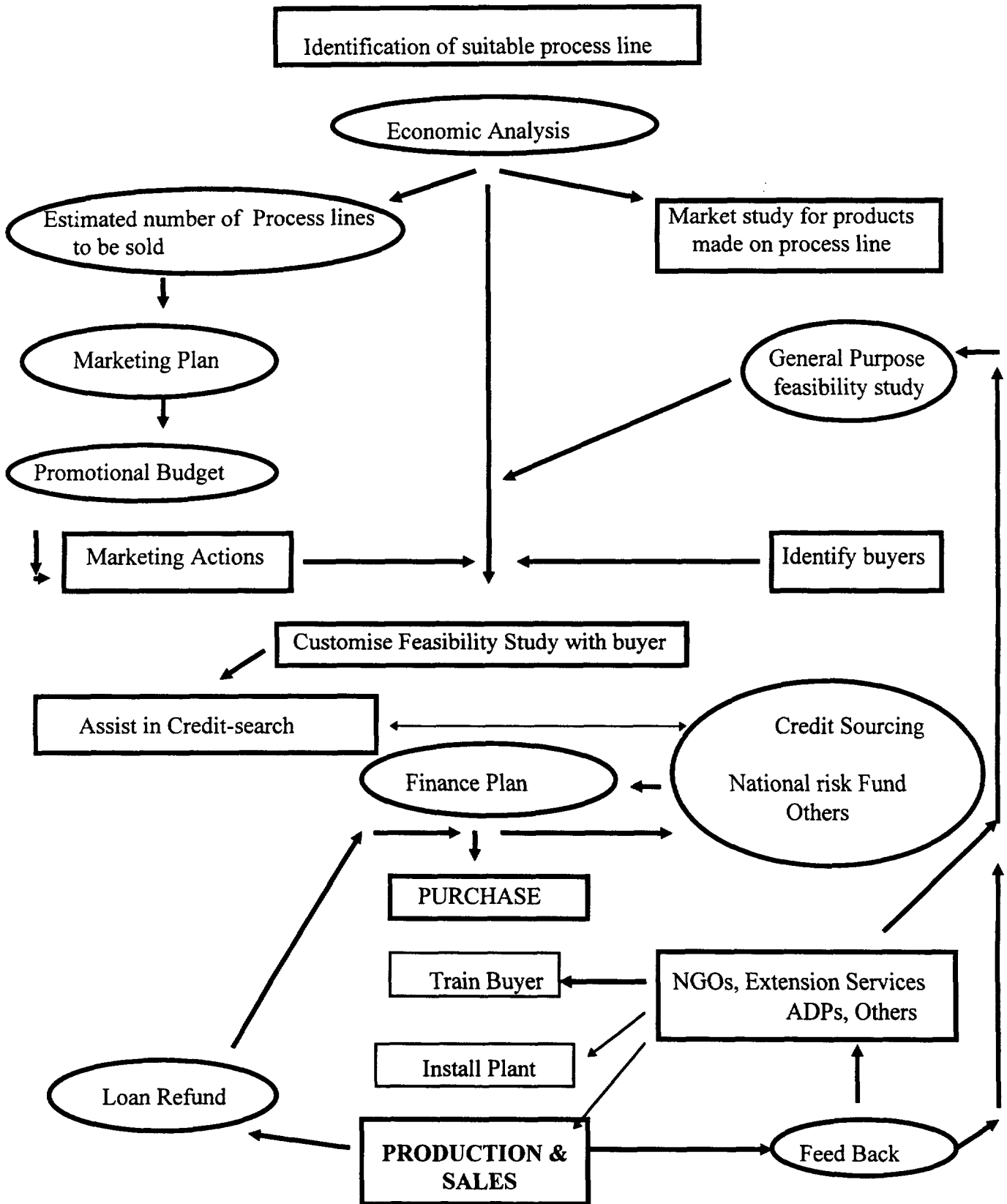


Figure IV

INTERACTIVE DESIGN - PHASE TWO

