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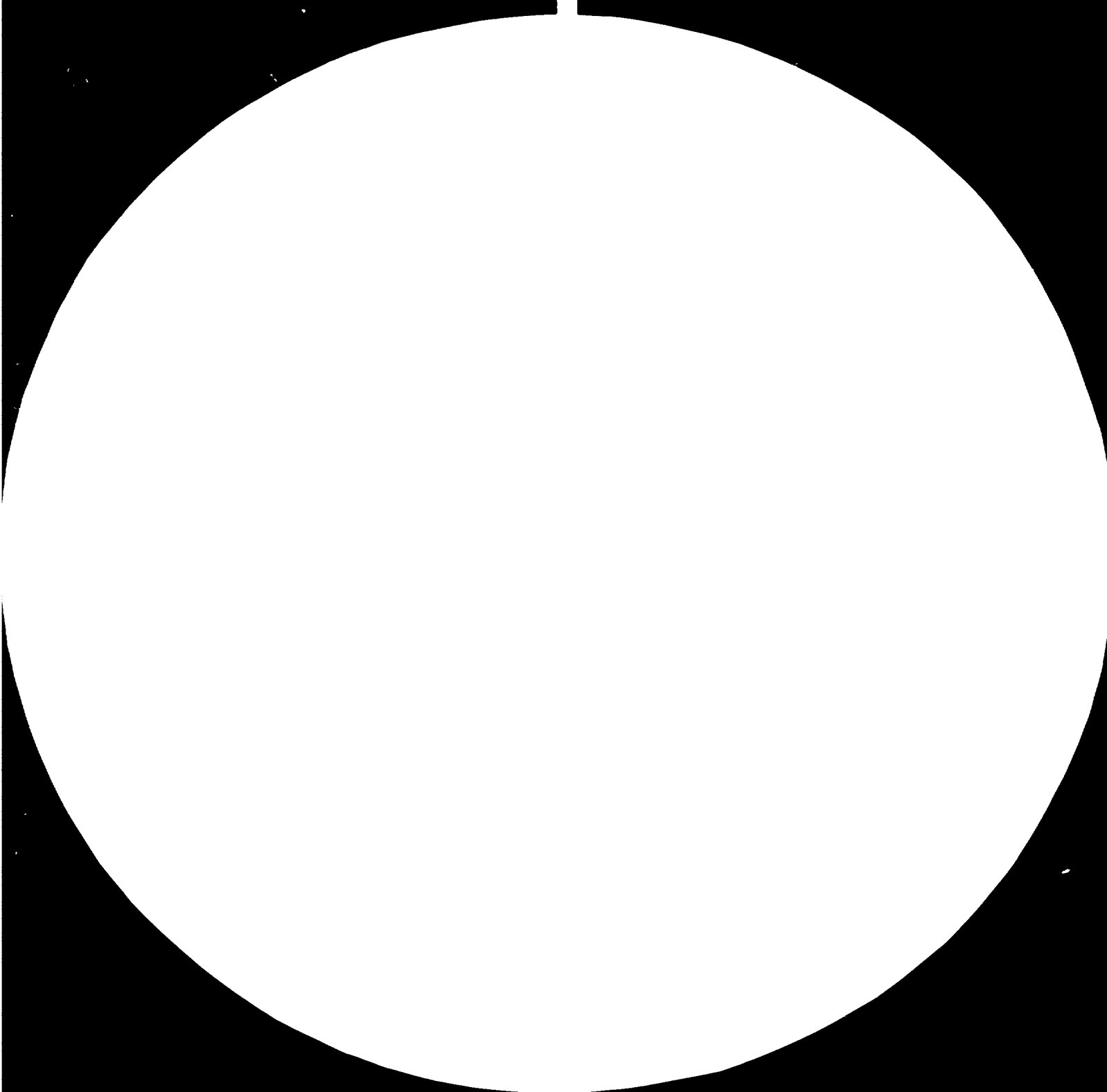

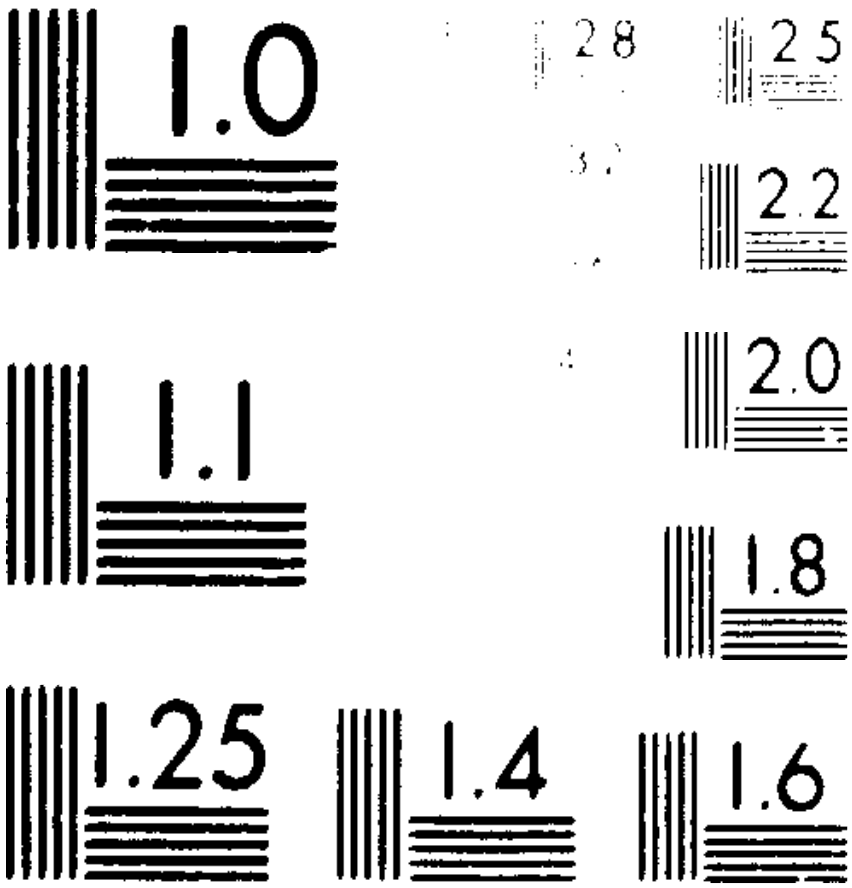
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A PROGRAMME NETWORK ON THE DEVELOPMENT AND PROMOTION OF ENGINEERING AND CAPITAL GOODS INDUSTRIES IN TRINIDAD AND TOBAGO.

Report of a mission to
the Republic of Trinidad and Tobago*

5-11 July 1981

An Engineering analysis of the potential for establishment of appropriate industries, expansion of local production, strengthening/establishment of necessary engineering infrastructure with recommendations on an integrated action programme including the necessary institutional framework

by

Swamy Rao A.A.
Senior Interregional Adviser

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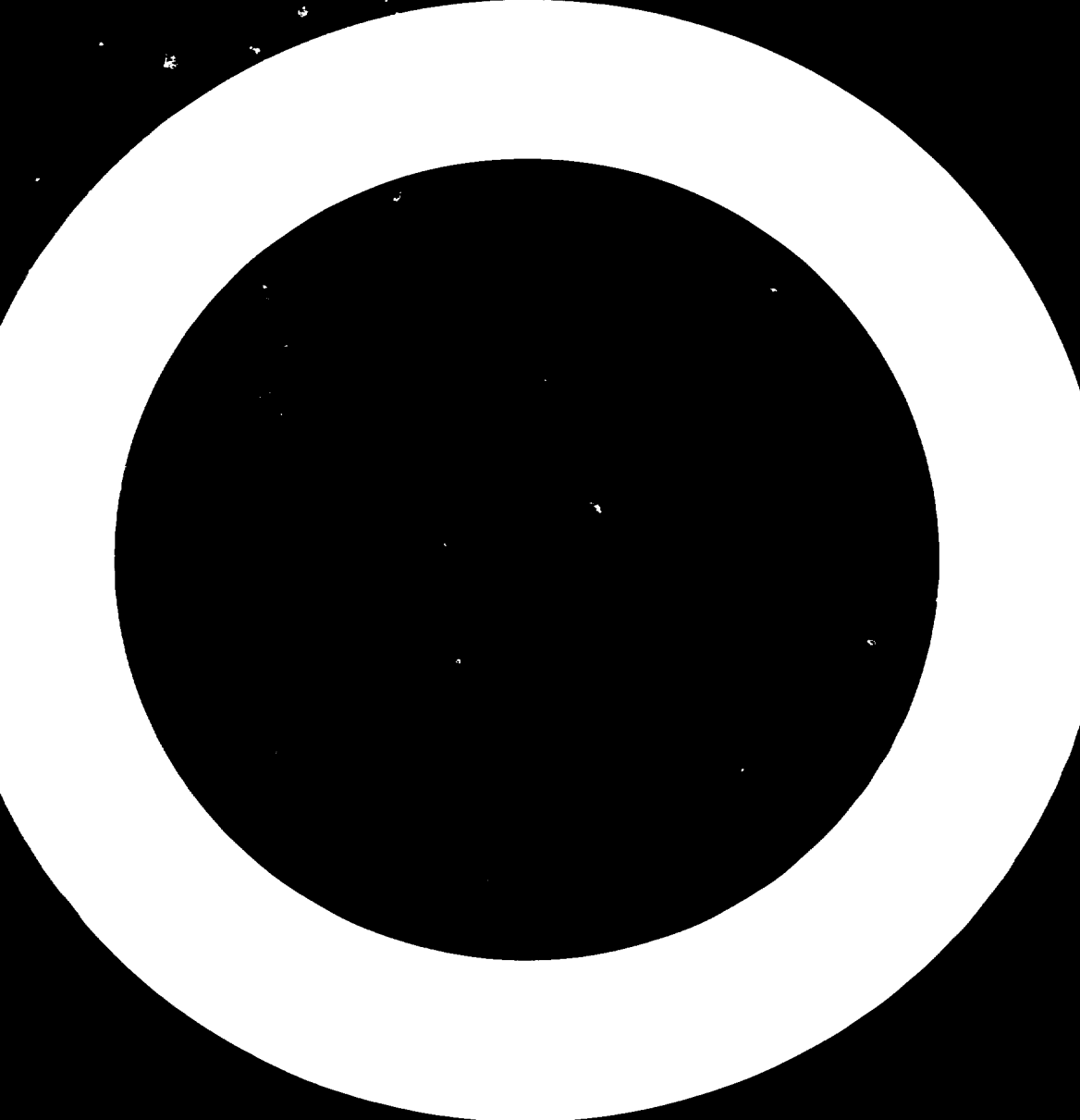
I N D E X



P R E F A C E

1. The scope of this mission report is that it may be regarded as a preliminary basic document which highlights the potential for engineering and capital goods industries in Trinidad and Tobago through an integrated co-operative programme network. This includes establishment of appropriate engineering and capital goods industries, expansion of local production, promotion of interlinked small scale industries and ancillary industries, development of rationalized basic facilities, with due consideration of strengthening and establishment of necessary engineering infrastructure. It summerizes the recommendations on an integrated programme of action including the necessary institutional framework.

2. The term capital goods in this report refers not to a classical definition, but to a practical range of engineering and capital goods products including spare parts and the necessary engineering infrastructure to support the programme of action.

3. The report highlights on a provisional basis the potential for 8 - 10 products with emphasis on export promotion, 4 - 5 products with orientation on import substitution and 8 - 10 products suited to small scale sector promotion and around 4 - 6 basic facilities which may provide an interlinked support.

4. The report details the need for strengthening or establishment of engineering institutional facilities in specialized engineering training, engineering design and development, common engineering services and repair, maintenance and technical services in high technology areas.

5. It also outlines the contribution that may be rendered by the existing institutional facilities in management and technical service, export and international marketing services and capital and financial services.

6. The report analyses the possible contribution of the engineering and capital goods industries to agricultural sector, construction sector, industrial sector, energy sector, transport sector and consumer sector.

7. The provision around 30 product groups recommended for consideration are both export promotion oriented and import substitution oriented with the inbuilt necessary basic criteria for selection. The possible export potential, the flexibility in production techniques, rationalization of investment and creation of employment are taken into account with due consideration to proven designs, stability in technology and alternatives in process planning and production technology.

8. With due consideration to the fact that development of engineering and capital goods industry in Trinidad and Tobago (or as a matter of fact in any developing country) is almost a continuous process of 10-15 years (to master production technology and develop design and development skills, rationalize investment, train man power and fully utilize installed production capacity etc.) an intermediate term programme of 5 years duration for achieving the basic objectives and a 12 months immediate preparatory start up programme is recommended.

9. From a total development of engineering and capital goods sector in Trinidad and Tobago, from a long-term point of view (1982-90s) a minimum capital investment of around US $ 200 - 300 million * (at present day prices) may be required. The provisional estimated potential for technical manpower employment is around 2000 - 3000 persons directly in the industry and around 8000 - 10 000 persons through indirect, auxilliary and supporting sources. It will also create significant employment in engineering institutional infrastructure and thus may contribute to the retarding of "brain drain" of technical personnel of Trinidad and Tobago.

10. The intermediate phase of the programme of 5 years (1982-86) duration will call for an investment of around US $ 50 million by the Government (not including capital and investment costs necessary to establish the actual industries) for implementing a co-operative network programme on development of capital and engineering industries in the country.

11. In order to develop this programme further, a start up preparatory phase of 12 months (1981-82) is recommended to be undertaken by the Government and may cost around US $ 650,000 to US $ 1.0 million.

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* Note: All figures in US Dollars unless otherwise specified.
During first week of July 1981 US $ 1.00 = TT$ 2.40 (Trinidad and Tobago)

12. It is evident that such a co-operative programme network could be effectively developed, rationally implemented and judiciously monitored, only if there is a nucleus or a focal point. It is recommended that the Government may consider strengthening the capabilities of the Industrial Development Corporation (IDC). It is recommended that IDC establish an "Engineering and Capital Goods Development and Manufacturing Cell" (ECGC). It is also recommended that a National Advisory Group consisting of representatives from appropriate ministries, institutions and manufacturing organizations is established by the Government to advise and guide IDC/ECGC on this programme. The details of the institutional framework is included in the mission report.

13. It is to be restated that this mission report is a first step in this direction and will require further work to crystalise the programme of action. The implementation of the preparatory start up phase (1982-82) with a provisional understanding of the magnitude and scope of the programme during the intermediate period (1982-86) and a provisional commitment on the necessary magnitude of finances may be regarded as the two basic actions necessary.

14. The United National Industrial Development Organization (UNIDO) through its activities and within the framework of programmes of United Nations Development Programme (UNDP) will be pleased to be a partner with the Government of Trinidad and Tobago in this endeavour in any phase and magnitude of this programme, if the Government of Trinidad and Tobago so wishes.

SECTION I

INTRODUCTION

A. OBJECTIVES OF THE MISSION:

At the request of the Goverment of the Republic of Trinidad and Tobago in general and that of Industrial Development Corporation (IDC) in particular, and with the concurrence of the Resident Representative UNDP, Mr. Swamy Rao, A.A, Senior Interregional Adviser, UNIDO visited Trinidad and Tobago from 5th to 11th July 1981, with the primary task of providing the engineering input to the Government's Preliminary concepts on the development of the Capital Goods Industry in the country.

B. TERMS OF REFERENCE:

During the first meeting with the Senior official of the IDC on 6th July, 1981, the following terms of reference were elaborated by the Government:

- to undertake a preliminary engineering analysis of the potential for establishment of appropriate capital goods industries including provisional product specification (if possible) for industries with emphasis on export orientation and industries oriented to import substitution.

- to suggest the engineering and technical infrastructure necessary to realise the same with effective mobilization and re-orientation of existing institutional facilities.

- to suggest possible ways and means of strengthening IDC's capability for its role to develop Capital Goods Industry in the country.

- To outline a preliminary plan of immediate and intermediate term of action.

C. WORK PROGRAMME AND ITENERARY:

(i) Mr. Swamy Rao reviewed around twenty (20) documents and literature available on the subject (please see Annex III for the list).

(ii) He held discussions with officials of:-

(a) three (3) corporations - Industrial Development Corporation, National Energy Corporation, Public Transport Service Corporation;

(b) One R & D institution - Caribbean Industrial Research Institute (CARIRI);

(c) two professional organizations- Association of Professional Engineers, Manufacturers Association.

(d) 8 - 10 companies - MIC, Universal Appliance, Universal Metal, Neal and Massy, Caroni Limited, T and TEL, East End Fondry, etc;

(e) Field Engineering Services of the Ministry of Agriculture, and UNDP;

(f) The field visits included trips to the Trincity and Point Lisas Industrial areas, agricultural areas CARIRI and the various factories. (please see Annex IV for list of persons met, and Annex I for highlights and observations on factory/institutions visited).

D. RAP-UP SESSION

An IDC interministerial rap up session took place on 10 July 1981 attended by the Senior Representatives from IDC, Ministry of Agriculture, Ministry of Finance, NEC, CARIRI, MIC and UNDP for discussions on this project. Mr. Swamy Rao presented the "Interim Draft Report" on draft summary of analysis, conclusions and recommendations on engineering and capital goods development in Trinidad and Tobago (please see draft interim report mission report includes the same with due consideration to the observations and views expressed by the participants at the rap up session.

E. ACKNOWLEDGEMENT:

Mr. Swamy Rao wishes to thank the Government of the Republic of Trinidad and Tobago for the invitation, and all co-operation extended. Mr. Swamy Rao is specially thankful to Mr. Eldon G. Warner, General Manager, Mr. Hart Edwards, Deputy General Manager, and Mrs. Annisa Abu Bakr, Director (Ag.) of Economic Studies and Planning Division of the IDC, for their excellent arrangement, co-opeartion and hospitality. Special thanks to Mr. Leonard Houzer, the Resident Representative and Mr. L. Friksen, Deputy Resident

Representative of UNDP for their assistance. Mr. Swamy Rao, in addition, to his thanks to all officials of the Government and factories/institutions who kinldy received him, wishes to extend his appreciation and thanks to Mr. W.A. Murray, Mr. O. Bailey of IDC, Mr. J.W. Mococain, Project Manager UNIDO/UNDP-MIC, and Mr. Klaus Schäfer, JPO - UNDP/UNIDO who accompanied him on various visits and discussions.

SECTION II
SUMMARY OF ANALYSIS:
CONCLUSIONS AND RECOMMENDATIONS

A. CAPITAL GOODS - Definition and Parameters:

1. This mission's parameters for "capital goods" are primarily those products which are (a) "light engineering" in nature (b) call for medium, to lower bracket of high production technology which are generally accepted with mostly general purpose and some special purpose machine tools with none/semi automated labour intensive process planning (c) low to medium investment (d) small to medium in scale of production, and (e) suited to a batch level production techniques with emphasis on flexibility for production expansion based on market development.

2. It includes products (a) which could be locally manufactured only on an economically viable scale of production with inbuilt production quality techniques and which have an export potential to CARICOM and other regions (b) these which will promote import substitution in local engineering assembly industries if the appropriate policy measures are taken (c) those which could be locally promoted in the small scale sector, primarily for domestic consumption.

3. In all the above three categories of products, the criteria on which emphasis is based are (a) opportunity to promote ancillary industries (b) development of interlinked "basic facilities" - forging, foundry, heat treatment etc. and (c) promotion of utilization of local raw material - primarily for down stream side application of ISCOTT's products and (d) catalyze multiplier effect on rational economy - in agricultural, industrial, energy, construction, transport and export

sectors.

4. The promotion of capital goods industry also includes inbuilt and simultaneous upgrading of engineering institutional facilities in the areas of (a) specialized engineering training and service (b) engineering product design, development and technical service (c) common engineering repair and maintenance, spare parts fabrication and service for metal working industry and for electronic industry.

5. Thus, although classical definition of "capital goods" is those machinery and products which produces something close, and contribute to national economy, the mission - within the context of Trinidad and Tobago - has used the term " engineering and capital goods" and has included the products, components, basic facilities and the necessary engineering infrustructure.

B. Trinidad and Tobago's advantages and disadvantages

6. Trinidad and Tobago has following advantages on possible establishment of engineering and capital goods industry:

- cheap energy service
- availibility of locally produced steel
- strategic location
- stability
- relatively good educational standard
- existence of assembly industries which with appropriate policies of the Government has potential to achieve higher level of local content.

- newly established large industries which has potential to promote ancillary industry and basic facilities
- emerging small and medium industries
- existance of institutional/professional infrastructure : IDC, NEC, DFC, ADB, MDC, CARIRI, MIC, EPDC, etc as well as TTMA, APE, TTCC and I etc.

7. The Trinidad and Tobago's disadvantages may be:

- relatively high labour cost
- limited local market for certain products
- recent restrictions by certain CARICOM countries on common market
- lack of knowledge and experience of export markets and product specification
- lack of skilled manpower and training programme.

C. Some Criteria for eventual selection of product groups/products

(a) Interrelationship: Main plant/s and basic facilities

8. It is obvious that the criteria for establishment of basic facilities such as foundry, forge shop, heat treatment, gear shop, electro plating, sheet metal press shop etc, will depend on the basic products selected for local manufacture. It is highly desirable that the plant layout, process planning, and production techniques should be such that the main plants will have a flexibility in production and the common basic facilities are used to a maximum extent. This will promote rationalization in investment and mobilization of technical skills/training in specific production techniques. On the other hand, the main plant will become the focal point for development of basic facilities.

9. It is also highly desirable that the products to be selected for local manufacture (both for export and domestic consumption) should promote at least one basic facility. At the same time such a basic facility plant should have a manufacturing programme for one product group as a "bread and butter line", contributing to around 40-50% installed capacity utilization, and the balance production capacity may be used for subcontract production on a continuous production basis or on batch production or jobbing basis. The above concept could be best amplified by a couple of examples. A baisc if manufacture of pumps is the major activity of a main plant, foundry would be a basic facility. Therefore, an appropriate foundry with significant production capacity oriented to meet the main plants requirements is to be considered. Similary, a quality hand tools manufacturing plant will have a full fledged forge shop which itself is a basic facility. However, by appropriate planning, the quality hand tools factory may be so designed to provide forging facilities for the major product, but also have appropriate spare capacity to produce forged items to other factories. Medium size tight/medium engineering factories are best suited to such interlinekd programmes.

(b) Technology: Product and Production Techniques:

10. Considering the present emerging large scale energy based manufacturing plants, there is a need for effective downstream application of the manufacturing output of such factories - especially iron and steel, and taking into account the lack of (or existence of a weak) interlinked engineering infrastructure in Trinidad and Tobago.

It is highly desirable taht the products to be considered to have a well proved and accepted manufacturing technology in other countries where they are being already manufactured. It is the level of production, appropriate production process planning, selection of most suited machinery and equipment which will generate employment which are to be adjusted to meet the requirements of Trinidad and Tobago. For the next 4-5 years, light and medium engineering industries will provide an opportunity to develop the whole engineering infrastructure and technical manpower in Trinidad and Tobago.

(c) High technology areas: problems and uncertainities:

11. With due consideration to the short span of industrial development experience of Trinidad and Tobago, its limited domestic market and existence of an extensive competition from other known industrialized and selected developing countries, it may not be advisable to embark on a high technology capital goods sector now. The lack of technical skill, export capabilities, lack of organizational and management experience, high local labour cost are major negative elements in this context. The quick, constant and major changes in technologies in this area, the changing trends in consumption pattern, high investment, need for automation and foreign continuous licencing and market uncertainities clearly indicate the need for Trinidad and Tobago not to embark upon a high technology manufacturing area for exports at the present.

(d) Heavy Engineering - need for a cautious approach

12. Although Trinidad and Tobago has an oil industry and energy based industries, the preliminary analysis had indicated the non-desirability of embarking on a heavy engineering (e.g.: heavy structures; fabrication; pressure vessels, large castings and forgings, ship/tanker construction; drilling rigs, etc.) production. The limited market, the lack of local engineering infrastructure, lack of experience in international marketing of specialized engineering products, need for long-term heavy investment are negative points. In addition, such industries will mainly foster foreign licence in manufacture and marketing and will not develop local infrastructure, employment and capabilities at the present.

(e) Technical manpower requirement and training:

13. The need for development of technical manpower capabilities in Trinidad and Tobago can not be overemphasized. Engineering and capital goods local development and manufacture in Trinidad and Togabo can not be achieved, if appropriate training programme are not initiated. In this context, the training programmes will have to include skilled workers, technicians and engineers especially in tool engineering, production technology, machine tools utilization, engineering design and development, factory organization and management and also in marketing and export promotion.

(f) Products with inbuilt flexibility for export markets:

14. Trinidad and Tobago is on the verge of industrialization. Although export oriented energy based large industries have been started, there is a need to follow a different strategy with respect to the engineering and capital goods. In this context, the promotion of import substitution oriented industries will require a different approach and policies and promotion of export

oriented industries will require an entirely different approach.

15. The major criteria for starting export oriented industries are:

(a) identification of export markets - countries, product product specification, demand price, etc;
(b) determination of an economically viable production volume and technology;
(c) incorporation of inbuilt quality to meet the international standards and enduser requirements;
(d) capacity to offer at an international competitive prices;
(e) back up financial support and infrastructure to meet financial obligations to enter and sustain export markets and
(f) development of an export organization.

16. Therefore, as Trinidad and Tobago has no experience in export and international dealings in engineering and capital goods, it is recommended that such an experience is gained step by step.

17. One of the methodology to secure such an experience is to select product which has (a) no continuously changing enduser requirements; (b) not subject to changing high level technology (c) not limited to one or two exports markets only and (d) not geared up to continuously changing production techniques - toolings and process planning.

18. Therefore, it appears that light and medium engineering products may be best suited for a local manufacturing programme oriented to export markets.

19. Although there will be a need for an "export organization" it is recommended that Trinidad and Tobago does not establish a full-fledged engineering and capital goods export promotion unit right away. A 12-18 months preliminary analysis may assist in crystalization of the approach to be taken. (Note: In this context the role of International Marketing Company of Trinidad and Tobago will have to be well defined).

(g) Role of small scale engineering industries:

20. The industrial infrastructure in general and the engineering and capital goods industrial sector in particular in Trinidad and Tobago will only be effective if a large section of the local population is incorporated to participate, play an effective role and contribute to the national development. Such small scale engineering industries will primarily be involved in meeting the requirements at a national level. However, with proper planning, such small scale engineering industries may contribute to the light/medium engineering sector by acting as subcontractors and develop into ancillary industries.

(h) Need to establish interlinks:

21. If integrated programme of action is undertaken by the Government, Trinidad and Tobago has potential to establish export oriented light engineering/capital goods industries, promote higher local content manufacture in assembly related industries, establish small and medium scale industries with emphasis on appropriate products, ancillary industry and basic facilities. However, this will require interlinkage of various type of industries.

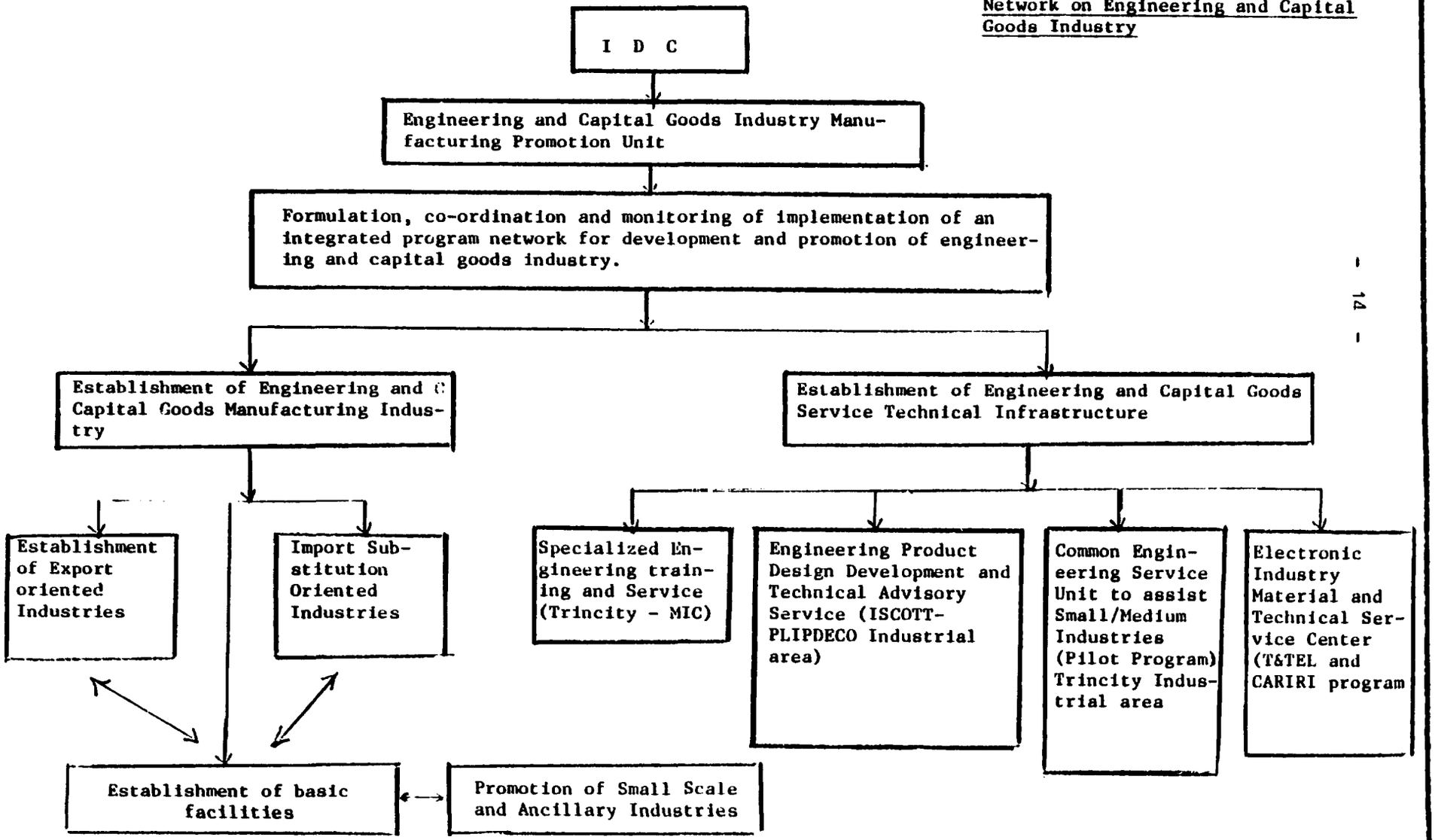
22. In addition it will require appropriate actions to strengthen the existing institutions - in training, design and development, common engineering service and repair and maintenance. However, it is important that the priorities, work programme and immediate objectives of these institutions are so designed to meet the immediate requirements of the proposed industries, and at the same time establish a common base for an intermediate term of action.

D. Recommended programme:

23. Development of engineering and capital goods industry can not be realised through isolated actions. It will require mobilization of resources and existing infrastructure. It also requires a focal point - a co-ordinating institution. It is evident that the industrial development corporation has all the potential to be such a co-ordinating focal point. It is also recommended that I.D.C. develop, private, implement and monitor and "IDC co-operative programme network on development and promotion of engineering and capital goods industry". The obvious co-operating organizations are TTMA, CARIRI, MIC, NEC, (list not necessarily exhaustive). Such a recommended programme is detailed in Chart A. The priority and basic institutional framework at IDC necessary to initiate this co-operative programme is given in chart B. The input and financial details for 12-18 months start up phase is given in chart C.

CHART A

Recommended IDC Co-operative Programme Network on Engineering and Capital Goods Industry



E. Manufacturing promotion

1. Preliminary list or products, and components for consideration for local manufacture, including basic facilities.

(a) Export oriented products

(i) 4 wheel tractor 18.0 HP (2500 RPM)

(diesel water cooled 2 cylinder engine) with P.T.P, hydraulic system (2500 PS1), weight around 1600-2000 lb. Around 40% local content in 4-5 years. Initial production volume around 1000 units (expandable to 2500 units) per year. Engine to be imported or manufactured in a separate factory. Components to be locally made include all castings, (housing, drums etc) selected shafts, axles, 3 point linkage, selected gears, steering, sheet metal items, selected forged items, electrical items etc. Foreign collabration (joint ventures) necessary. Total employment around 250- 350. Investment around US $15.0 million which includes machine shop, tool room, quality control and inspection assembly etc. Outside ancillary industries needed - founding, forge shop, sheet metal and press work and gear shop as basic facilities.

(ii) Fill set of matching basic implements

Mould board plow, Disc harrow, cultivator, Leveller, seed drill and fertilizer distributor, Around 3000 implements per year - batch level production. Product licence coule be bought. Total employment around 50-60 Around 60% local content in 4-5 years.

Selected critical parts to be imported or produced in a separate heavy borge shop. Investment around $5.0 million which includes machine shop, light forge shop, heat treatment, fabrication etc.

(iii) Forged Quality hand tools

Pick ax, shovel, Fork, matchet, sickle, hammer, etc. Initial production shovels around 0.5 million and all other items around 0.5 million units. Purchase of know how necessary. Employment around 50-80 initially. Initial investment around US $ 10.0 million which includes basic forging and heat treatment facilities. Additional equipment could be considered if other components for agricultural implements, tractors, engines, simple machine tools are considered. Thus this factory with appropriate investment and manpower could be considered as a basic facility (forge shop) with hand tools as basic production line, and with subcontract work for other forged components.

(iv) Diesel engines 3-5HP, 8-12 HP and 18-20 HP

For usage with pumps, electric generators, construction equipment, sprayers, stationary application and 18-20 HP for the tractor. Foreign collabration necessary. Modular product systems with batch level production techniques. Production volume around 2500 per year initially. Local content around 50% in 4-5 years. Castings to be imported or produced locally in a separate founding. Critical forged items to be imported initially. Initial investment around $10.0 million with provision for production expansion. Initial manpower around 80.

(v) Irrigation pumps (Centrifugal)

Q = up to 300 c m/h , H = 10 to 20 m
P = up to 10 HP. Batch production. Annual capacity around 2500 units initially to be expanded at a later date. Local content around 90% by 4-5 years. Investment around US $6-8 million. Employment around 120. Foreign licencing necessary.

(vi) Electric motors and generators

Single phase and 3 phase; 2-3 pole 3-15 Hp (1500 - 300 rpm). Capacity around 250 units per year initially. Around 80% local content in 3-5 years. Investment around $ 4.0 million. Housing casting may be produced in a seperate foundry. Employment around 60. Foreign licence necessary.

(vii) Bicycles, 3 wheelers and mopeds

Product mix and production volume to be analysed. May require foreign licencing.

(viii) Micro gasoline engine

1-2 HP Aluminium diecast air cooled engine for knap sack sprayers, paint guns, mopeds etc. Around 15,000 units/year may be viable. Foreign collaboration necessary.

(ix) Sewing machine

Semi automated, primarily for domestic use.

(x) Simple machine tools and equipment

Primarily manualley operated machine tools/equipment and a few simple power equipment. The provisional is as follows:

- hand operated drilling machine
- hand shares
- hand pipe bending machine
- hand press brake
- hand plate bending
- hand sheet metal roller
- hand punching machine
- hand punching machine
- hand universal nibbler, shearing flanging and freming machine
- hand gullotine
- crank press brake
- bench drill 20 mm
- circular saw grinder
- hand boring machine and reamer
- hand hack/saw
- wood working hand tools
- pipe cutter
- bench and machine vice
- small forge/blower
- anvil
- blacksmith tools
- quench tanks etc.
- rural blacksmith and carpenting simple tools and accessories.

(b) PRODUCTS WITH EMPHASIS ON IMPORT SUBSTITUTION

(i) Washing Machines and Driers

Product diversification by existing manufacture. Body to be built locally. All other components imported. Assembly under licence.

(ii) Auto Components

- Uphostery, seat frame and springs, side trimmings, chrom parts, exhaust, gas tank, wiring harness, hardware, (this may increase the present 10% local content by about 6 - 8%)
*Above could be achieved with some adjustment in government policies.

- Gaskets (estimated demand around 200,000 units per year of each gasket), filter elements (175,000 per year)
clutch and brake lining (around 400,000 units per year), shock-absorbers (around 40,000 per year), battery (around 80,000 per year) (Note: This may increase the local content by additional 5 - 8%).
* Above may be achieved if local manufacturing programme is rationalized by the government.

(iii) 80 - 100 Hp 4 wheel agricultural Tractor Assembly

Primarily for local sugar cane cultivation and haulage. Around 300-500 units per year. Local content maximum 15% by 3 - 5 years. Investment around $4 million primarily for assembly operations. Employment around 60 - 70.

(iv) Agricultural implements and Trailer for 80 - 100 Hp Tractor

Plow, ridger, sprayer, semi mechanized loader (each 300 - 500 units/year) local assembly with some local content.

(v) Parts for local oil industry and energy based industry

(For exploration and refinery, as well as for chemical and petro chemical, iron and steel, power generation, cement plants, sugar mills, etc)

- Primarily forged steel parts and cast iron components (some malleable castings in some cases) such as welded neck flanges, socket weld flanges, screwed flanges, blind flanges, slip on flanges, elbows and bends, tees, crosser and other parts.

(vi) Electronic Industry

T and TEL's capabilities to expand from present assembly of Hi-Fi Sterio sets to assembly of videc, entertainment equipment and communication equipment and control instrumentation is to be further explored. The company (IDC owned) has provisional plans. In this area, only assembly is possible at this stage in the country.

(c) PRODUCTS FOR SMALL SCALE INDUSTRY (with foreign licence or through local design, development): to meet local demand only

(i) Hardware. Holts, nuts screws, rivets etc
(ii) Galvanized sheet and allied items
(iii) Hand tools: Screw driver, spanner, box wrench etc.
(iv) Water tanks fabricated items etc.
(v) Sanitary fittings, galvanized pipes, valves, taps etc.
(vi) Construction Scaffholding, telephone and simple electric poles etc. and sports place and recreation outdoor equipment.
(vii) Selected agricultural implements
(viii) Weights and measures, sports/body building equipment

(ix) Garden tools

(x) Simple and intermediate type tool and die manufacture

(xi) Manufacture of trailers

(d) ESTABLISHMENT OF BASIC FACILITIES

Depending upon the finally selected products, production volume and production technology, the three basic facilities that may be required are:

- Foundry
- Forge shop
- Heat treatment shop

and - a gear shop at a later date

2. RECOMMENDED STEPS FOR INVITING NEXT ACTION ON PRODUCT MANUFACTURE

(a) For Export Oriented Products: First step is a prefeasibility study in Trinidad and Tobago, CARICOM and Selected Latin American countries (for example Columbia, Venezuela, Central America, Guyana, Surinam, Equidor, Peru and Brazil). This could be done in 2 ways.

- IDC conducting it independently with external assistance and then embark upon entruprenership development and investment promotion

or conduct the same participation with a local potential entruprener and a potential foreign collaborator. The TTMA's support is highly desirable. Cost involved by local party could be compensated by the Government through income tax concessions. The only assurance to the local party and foreign participant is that if the project materialises, then the two parties will be given preference by IDC.

It is highly recommended that the second alternative with the necessary modification is followed. Then external assistance (UNDP/UNIDO) will consist of assisting a local constituted team (IDC & potential local entrepneuer & foreign potential partner) with international expertise.

Three teams are to cover three product groups as follows:

- 18 Hp Tractor and implements
- Hand tools, Bicycles/3 wheelers/mopped, micro gasoline engine, sewing machine and simple machine tools.
- Diesel engines, irrigation pumps, electric motor and generators.

(b) Products with emphasis on import substitution and small scale industry development

A three expert team for two months may undertake an indepth analysis and formulate project report on

(a) automotive industry including assembly of 80 - 100 Hp Tractor

(b) spare parts for oil industry

and (c) small scale industry development

In this context, the basic step necessary is the analysis of the potential for establishment of (i) export oriented industries as well as (ii) import substitution industries, (iii) small scale industries and (iv) spare parts. It will be then possible to rationalize the findings and develop an appropriate local manufacturing programme with due consideration to possible grouping of products, basic facilities and promotion of ancillary industries.

F: ENGINEERING INSTITUTIONAL DEVELOPMENT

Unless there is a parallel, and inter-related development and promotion of Engineering institutional facilities, there can be no integrated and effective promotion and realization of the engineering and capital goods industry. The following actions are recommended:

(a) SPECIALIZED ENGINEERING TRAINING

(i) The lack of appropriate industrial training facilities and the need to strengthen specialized engineering training especially in tool, engineering (tools, dies, jigs, fixtures moulds etc.) production engineering as well as specialized skilled operation of selected machinery is well realised in the country. The two technical institutions in the country (John Donaldson Technical Institute and San Fernando Technical Institute) are for vocational training only.

(ii) The Metal Industry Company which has excellent training facilities is established as a commercial company and it is reported that its acitvities are neither commercial nor training service oriented to do full justice to its physical facilities and available technical manpower. Although it has around 76 trainees (total manpower 132 including trainees) on a 7 year training programme (Government grant around TT $2.0 million/year, it is the general feeling now that (a) commercialization and training may not go hand in hand (b) Trainees are used for commercial regular production of single/ intermediate at the cost of actual training. Such items may be left to a small scale industry (c) specialized training is not possible at present due to long 7 year programme.

(d) Trainees when completed the course take up jobs which has no relevance to the training (e) present training is not industry oriented and (f) the present commercial activities are marginal in terms of finance, but a major negative element in achieving an effective training programme.

(iii) Therefore there appears to be a thinking in selected technical-policy circles of the government on the reorientation of MIC's activities to achieve desired objectives.

(iv) One of the possible means is to transform the commercial activities (which at present is not really commercial to service activities). Then the Metal Industries Company has to be transformed into a "National Engineering Service and Training Institute" with emphasis on full time specialized training (4 years) in tool production, industrial and workshop engineering and additional 2 years advanced specialized training with specific orientation to the requirements of industry. Such a programme could be developed with necessary modifications as thorough indepth analysis is a prerequisite to launch a full modified programme.

(b) ENGINEERING DESIGN AND DEVELOPMENT

(i) There is no well established engineering design, development and adaptation unit in the country with appropriate facilities for engineering design, prototype fabrication, testing and an inbuilt programme of industrial extension and entrepreneurship promotion especially on products suited to the needs of small medium industries.

(ii) The activities of engineering faculty of the University of the West Indies is academic and educational oriented. The Engineering Division of CARIRI has limited facilities and technical manpower-

(iii) Therefore there is a need to strengthen CARIRI's Engineering capabilities or establish a new unit on "Engineering Design Development and Industrial Extension." Such a unit may be located at PLIPDECO new industrial area which is primarily to promote downstream side of ISCOTT's products. IDC may explore both choices and decide on the best approach.

(iv) The engineering unit may concentrate on agreed upon products (such as simple machine tools, forged items, agricultural implements, specific import substitution etc.

(v) An indepth analysis on this programme is recommended.

(c) COMMON ENGINEERING REPAIR AND MAINTENANCE, SPARE PARTS FABRICATION AND SERVICE

(i) Although a number of industrial areas have been promoted in the country, there is no programme on common engineering services to assist small and medium industries through provision of technical expertise and physical facilities in the areas of:-

* Repair and maintenance
* Spare parts fabrication for critical parts
* Common physical facilities such as heat treatment, material selection, testing, inplant quality control etc.
* Advisory Services on Process Planning, Machine Tools utilization, etc.
* In-plant training.

(ii) Therefore it is highly recommended that such a unit is estbalished as a pilot demonstration activity to be located in Trincity. The activities can at a later date cover the PLIPDECO's new industrial area.

(iii) It is recommended that a full indepth analysis on this programme is carried out.

(d) ELECTRONIC INDUSTRY REPAIR AND MAINTENANCE AND EXTENSION TECHNICAL SERVICE

(i) It is very obvious that the country has no organized service facility in the electronics sector. The repair and maintenance of electronics equipment in the consumer sector and also a programme for assistance, repair and maintenance, inspection and instrumentation and training of electronic equipment of industrial sector is a must.

(ii) CARIRI's Electronic Division is involved in R and D in Micro processor application, Transreceivers, as well as activities in Caliberation, maintenance and material technology. There is a need to strengthen these activities.

(iii) T & TEL company is primarily engaged in assembly of stereo electronic equipment and supply, installation and maintenance of inter-connecting installations in communication field (telephone).

(iv) Therefore an "Electronic Industry repair and maintenance, and Extension technical Service unit" is recommended to be established

(v) Such a unit could be established either (a) as a commercial subsidy of T & TEL Limited with active cooperation of CARIRI or (b) as a Service and development promotion activity of CARIRI.

(vi) An indepth study on this subject is necessary.

2. Recommended Steps for initiating next action on Engineering Institutional Development

It is recommended that an indepth analysis in these 4 areas under a subcontract study and project detailing activity is undertaken.

G. NEED TO STRENGTHEN IDC's CAPABILITIES

(i) The need

(i) With due consideration to the overall responsibilities and the magnitude of the work programme and responsibilities charged to IDC in the industrial sector of Trinidad and Tobago, it is very evident that special priority is to be given to strengthen its capabilities to undertake the above detailed "cooperative network programme in engineering and capital goods."

(ii) This will call for establishment of a "Engineering and cpaital goods development and manufacturing cell" (ECGC) in IDC under the direct supervision of General Manager/Deputy General Manager with a 3 man full time staff (one mechanical engineer-production, one mechanical engineer - Desgin and Development and one industrial economist) on a priority basis as the first step. Such a unit should have full authority on formulation, development, coordination, cooperative implementation and Monitoring of all necessary activity.

CHART B

Recommended Institutional Framework

PHASE-I 1981/82

IDC

A cooperative programme net work on development and promotion of engineering and capital goods manufacturing sector.

IDC
Engineering and capital goods Development and manufacturing cell (ECGC)

3 Full Time local staff and Senior Technical Adviser

Project Execution Team

ECGC Plus 4 Team Leaders of institutional programmes

Cooperative programme network

PLEASE SEE CHART -A

National Advisory Group

IDC, Min of Agri, Min of Finance, CARIRI, Facu. of Eng. UWI, TTMA, APE, CC and I, MDC, ABD, DFC, CARONI sugar and Team leaders of 4 institutions of programme and selected manufacturers

ADVISE & GUIDANCE ON

*PROJECT COORDINATION POLICIES
*REMOVAL OF ALL CONSTRAINTS
*POLICIES FOR INTERLINKAGE
*EQUAL DISTRIBUTION OF RAW MATERIAL
*RATIONALIZATION OF EXTERNAL FINANCES
*LOCAL RAW MATERIAL MANUFACTURE
*PROMOTION
*GUIDANCE, MONITORING OF PROJECT - FOR REALIZATION OF OBJECTIVES
*RECOMMENDATIONS ON NATIONAL POLICIES
*ALLOCATION OR APPROPRIATE PROJECT BUDGET

(ii) Necessary Institutional Frame Work

There is a need to establish a national Advisory Group to guide and advise ECGC on an informal, but on indepth technical basis. A project execution team is to be formulated. The details of institutional framework is detailed in Chart B.

(iii) Steps necessary to initiate next action

- Formulation of IDC - ECGC.
- Appointing an international expert: Senior Technical Adviser
- Establishing a national Advisory Group.
- Organizing a Project Execution Team.

H. Programme and Finances: Phase I (1981/82)

- Annual US $650,000 is necessary for the phase I. The details are highlighted in Chart C. It should be noted that normally an engineering and capital goods manufacturing development programme require at least 10 - 12 years to achieve 80% capacity utilization with due consideration to manpower training, engineering institutional development and technical Engineering Organisational aspects after a firm decision has been taken to establish the specific industries.
- In this programme, a major implementation and realization of the above objectives in 5 - 6 years is endeavoured through a programme net work in phase II (1982 - 86) with emphasis on mobilizing existing resources, manpower and institutional infrastructure.
- Therefore Phase I (1981/82) is very critical and necessary to lay a solid foundation and pave way to the smooth realization of the objectives with short term and intermediate team work programme.

C H A R T C

Phase I (1981/82) IDC Co-operative Programme Network: Provisional Financial Input External in US$

	Activity			
1.	Strengthening of IDC	One Senior Technical Advisor	12 months	US$70,000
2.	Engineering analysis for products with emphasis on export	Sub-contract, 3 teams(Product Groups) 2 persons, 2 months each	12mm	US$225,000
3.	Engineering analysis for products with emphasis on import substitution. Plus small scale industry development	One sub-contract, 3 persons, 2 months	6mm	US$90,000
4.	Engineering institutional development (specialized engineering training, design and development, common engineering services and electronic repair and maintenance	One sub-contract, 3 persons 3 months	9mm	US$150,000

5.	Fellowship and Training Programme abroad	To project execution team plus others	12mm	$40,000
6.	H.Q. Advisory and Assistance Missions	3 missions	1.5mm	$15,000
7.	Miscellaneous	-	-	$60,000
	GRAND TOTAL			US$650,000

I. Some indications on financial magnitude on cooperative programme network implementation Phase II (1982/86): Domestic Resources (Please see "important note" detailed at the end)

- Around US $50.0 million may be necessary, not including capital and investment costs needed to establish engineering and capital goods industry.
- The following figures are given as a rough guide only and could be finalized during phase I.

*	Strengthening of IDC-ECDC	US$3.0 million
*	All steps necessary for establishment of Engineering and capital goods industry	5.0 million
*	Establishment of some basic facilities (foundry, forge, heat treatment) (supplementary activities and balancing equipment/service input - assuming investment costs will be separate.	US$10.0 million
*	Institutional activities (includes capital cost only and not staff and running expenses)	
	- Specialized engineering Training	US $3.0 million
	- Engineering Design and Development	8.0 million
	- Common engineering services	10.0 million
	- Electronic industry, repair and maintenance	4.0 million
*	Unforseen	7.0 million
	Total US	50.0 million**

** IMPORTANT NOTE

1. This is not a figure which represents external aid/assistance in general or UNDP finance in particular. This is just an indication what it may cost the Government if taken up as a national programme.

2. The figures includes a rough estimate on land, building, infrastructure, equipment, training, some operational cost, external expertise etc.

3. This may be taken as a "bench mark" for initial thinking and discussions on the programme and subject to the government's decision on the composition and magnitude of the programme, the UNDP/UNIDO involvement and assistance and the corresponding financial elements are subject to negotiation between the Government and UNDP.

SECTION III

CONTRIBUTION AND MAGNITUDE: ENGINEERING AND CAPITAL GOODS SECTOR (PRODUCTS, INVESTMENT AND EMPLOYMENT)

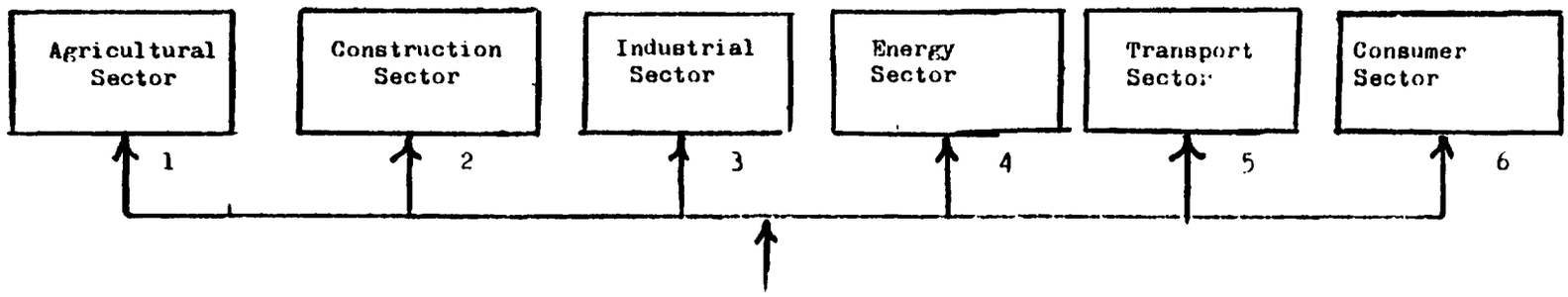
A. The scope and contribution of proposed programme

1. The proposed programme consists of four product groups from a manufacturing point of view. They are (a) export oriented (b) import substitution (c) small scale and ancillary and (d) basic facilities. They are all within "light and medium engineering industries", which can contribute to agricultural, construction, industrial, energy, transport and consumer sectors of not only Trinidad and Tobago but also in neighbouring countries and regional market. The products are so chosen (preliminary selection) that they have a demand within the country as well as in other neighbouring countries and are not being manufactured there.

2. The proposed programme also recommends an engineering and technical support activities in the areas of (a) specialized training (b) design and development (c) commong engineering services and (d) repair and maintenance. It also calls for interlink with existing service.

B. Magnitude and flexibility

The products recommended are generally not subject to frequent design changes (enduser requirements or foreign collaborators programme) and could be taken either on a phased manufacturing programme or as a total entity. The process planning, production facilities, and the overall manufacturing techniques could be so designed as to selected components of main products could be taken up for manufacture on a seperate basis. The products are such that the



CONTRIBUTING TO VARIOUS SECTORS

TRINIDAD AND TOBAGO ENGINEERING AND CAPITAL GOODS SECTOR

(PROPOSED PROGRAMME)

A — EXPORT ORIENTED INDUSTRIES

- 4 wheel tractor 18 HP-1,2,3
- matching implements - 1
- forged hand tools - 1,2,3
- diesel engines 1,2,3,4,5
  3-5, 8-12, 18-20 HP
- electric motors/generators
  up to 12 HP 1,2,3,4,5,6.
- bicycles, 3-wheelers, mopeds 2,4,6
- micro-gasoline engines - 1,3,6
- sewing machine - 6
- simple machine tools - 2,3,5

B — IMPORT SUBSTITUTION INDUSTRIES

- washing machine and dryers - 6
- auto components - 5,6
- 80-100 HP tractor 1,2,3,5
- matching implements and trailer 1,2,5
- parts for oil and energy based industries 2,3,4
- electronic ind - 3,4,6

C — SMALL SCALE AND ANCILLARY IND.

- hardware - 1,2,3,5,6
- galvanized sheets 1,2,3,6
- hand tools 1,2,3,4,5,6
- water tanks, etc. 1,2,3,6
- sanitary fitting 2,6
- const. fabrication -2, 3,6
- agr. implements 1
- weights/measures 1,3,6
- sports eqp. 6
- garden tools 1,6
- tool + die 3,4,5
- trailers 1,2,3,5

D — BASIC FACILITIES INDUSTRIES

- foundry
- forgeshop
- heat treatment
- gearshop
- electro plating etc.
  (all for A,B and C)

CHART - D

Contribution and magnitude of a proposed Engineering and Capital Goods Programme

production could be taken up on a batch level or regular production basis. The products could also be manufactured with appropriate process planning and machinery selection techniques on a modular basis, so that production volume could be increased from initial modest volume to increased volume with pre-planned inputs as adn when the market develops.

C. Magnitude and flexibility (investment adn employment)

On a preliminary basis the following elements are highlighted:

(i) The estimates on initial capital investment could be as follows:

Preliminary estimated capital investment on provisional engineering and capital goods manufacturing programme

	Category	No. of products	initial investment (US Dollars)	employment potential (No. of persons)
(i)	Export oriented products	8 - 10	80-100 million	800 - 1000
(ii)	Import substitution products	4 - 6	30-50 million	300 - 450
(iii)	Small scale industries	8 - 10	4 - 6 million	200 - 300
(iv)	Basic facility industries	4 - 6 (types)	60 - 100 million	600 - 1000
	Total	24 - 34	174-256 million	1900 - 2750

(ii) It is highly desirable that above industries are interlinked so that the capital investment could be rationalized and manpower requirements are integrated. The details are represented in chart D.

(iii) In addition it could be also mentioned that these facilities will also provide employment to many through supporting, ancillary, and allied sources. Assuming a minimum 1:4 ratio, such an employment potential for 8000 - 10,000 additional persons exists in the long run.

(iv) As explained before the engineering and capital goods industry in Trinidad and Tobago could be developed on a healthy basis if necessary engineering infrastructure is strengthened and developed on a parallel basis. The recommended programme on specialized engineering training, design and development, common engineering services and repair, maintenance and technical services (electronic industry) will call for appropriate technical man power requirement and physical facilities. This in turn will create a significant employment potential in the country for technical personnel and will also contribute towards retarding the present "brain drain" trends.

SECTION IV

ENGINEERING AND INSTITUTIONAL INTERLINKS

(A) Need for interlinks

The engineering and capital goods programme of Trinidad and Tobago can be effectively realised only if there is a healthy development and interlink of supporting engineering and institutional infrastructure. The following are the highlights, as represented in Chart E.

(B) Technical and Engineering Services:

The four major areas of activity are

- Specialized Engineering Training (IDC-MIC)
- Engineering Design and Development (IDC/MIC and/or IDC/CARIRI)
- Common Engineering Services (IDC)
- Electronic Industry Repair and Maintenance (IDC/CARIRI/T and Tel)

Note: As none of the above services exists in a way it can be effective and appropriate, there is a need to orient the activities of existing engineering institutions and establish new ones in special cases.

(C) Technical and Management Services

The three existing institutions which will require some reorientation in their programmes to meet the requirements of the engineering and capital goods sector are:

- Management Development Center (MDC):

  MDC is a statutory authority controlled by the Ministry of Industry and Commerce. At present it conducts training programmes in all areas of business management and provides specialized programmes geared towards developing management skills among small business entrepreneurs (Note: (i) In 1980, (January - September) MDC conducted 46 scheduled training programmes with 1218 persons participating in areas such as general management (7), management accounting (2), marketing management (5), personnel management and industrial relations (4), production management (10) and small business management (18). (ii) In 1980, MDC initiated specialized "industry group" courses in the sectors of small contractors, food processors, printing industry,

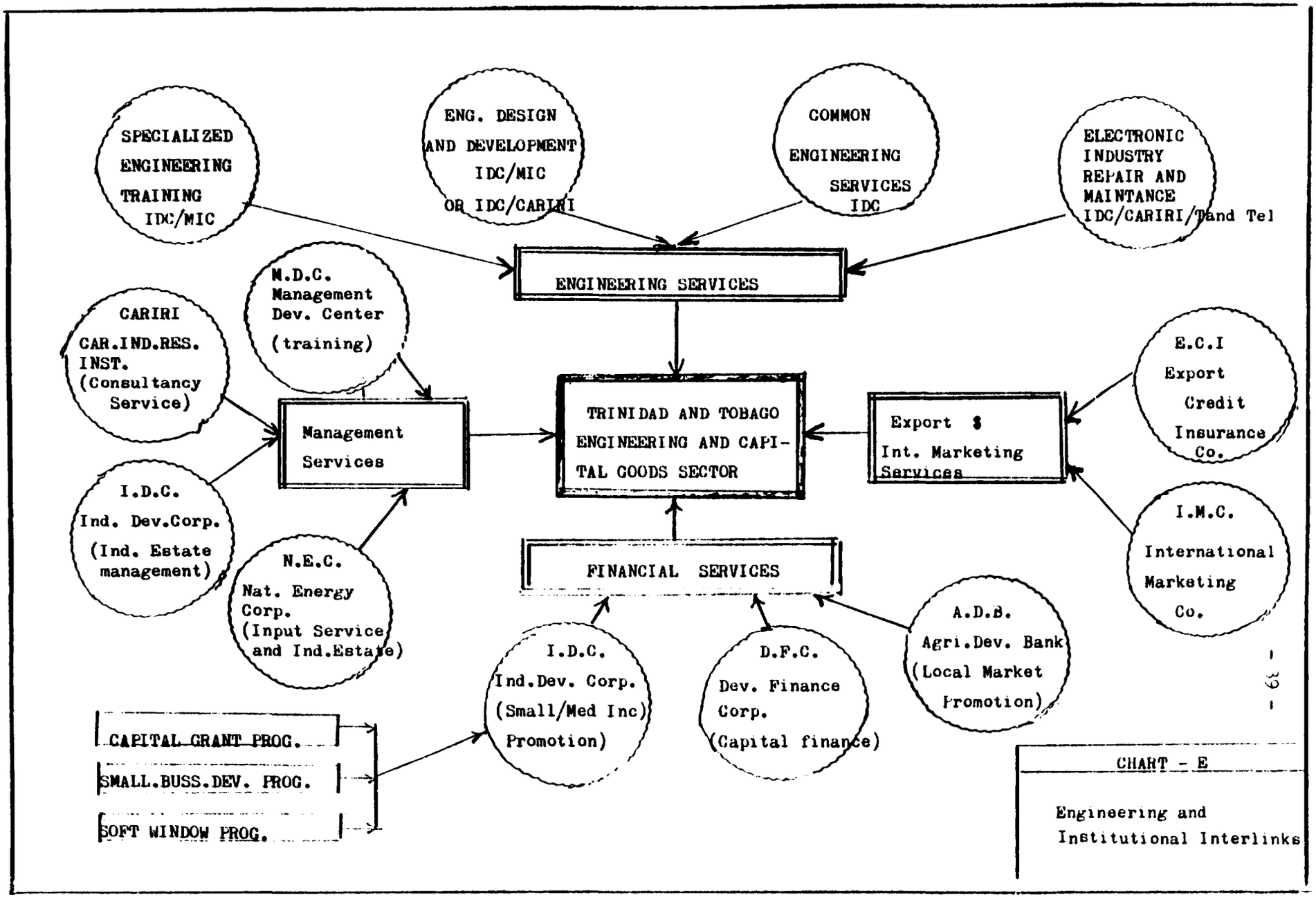


CHART - E

Engineering and Institutional Interlinks

boutiques, tailoring establishments and small garages. (iii) In 1980 (January - October), IDC conducted 37 in-plant training programmes for Government organizations, service organizations, agricultural and marketing enterprises, petroleum sector and banking sector. (IV) MDC offered in 1980, 12 assignments in consultancy services and conducted quality circle programmes.)

- Caribbean Industrial Research Institute (CARIRI):

CARIRI's activities include provision of facilities and technical inputs from the preinvestment stage through implementation of the project in all industrial sectors. (Note: The capabilities are limited at present). One of the important activities is the assistance to small business through 90% financial compensation by IDC.

- Industrial Development Corporation:

Assistance through its operational divisions - Small Business Division, Industrial Estates Division, Industrial Liaison and Extension Services, Economic Studies and Planning, Finance and Accounts Division etc.

- National Energy Corporation (NEC)

Rendering assistance through PLIDECO industrial estate holding company to its planned small industry estate with a view to utilize down stream side products of its energy based industries (iron and steel in this case).

(D) Financial Assistance and Services

- Development Finance Company Ltd. (DFC)

DFC is a private company with majority share participation by the Government of Trinidad and Tobago. It provides medium and long term financing for industrial projects. DFC also participates in equity for some projects being financed. (Note: (1) In 1980 (January - December) DFC approved loans and equity investment totalling TT $ 44 million of which TT $ 3.0 million was in the form of soft loans; TT $ 40 million in long term loans and

$ 1.0 million in equity. It covered mainly service industries, tourism and food and beverage industries.

- Industrial Development Corporation (IDC)

(i) Small Business Development Programme (SBDP): (Loans up to TT $ 200,000 for business units with TT $ 250,000 assets excluding land and building 7.5% interest). In 1980 (year ending August), IDC approved TT $ 16 million loans, the great majority of which was for the manufacturing sector.

(ii) Soft Window Programme (SWP): Introduced in 1978 for small business of high priority (3% interest). In 1980 (January - July) 87 loans for TT $ 5.0 million were approved.

(iii) The Capital Grants Programme (CGP)

Established in 1979, CGP is not yet fully activated, clarification on operational parameters being awaited.

- Agricultural Development Bank (ADB)

ADB is Government owned. It provides loans, credit, supervision and extension services for agricultural, fishing and forestry projects and also for agro industries. In 1980 (January - August) ADB disbursed TT $ 22 million of the TT $ 30 million provided in the 1980 estimates under the Food and Agricultural Fund. These loans were to develop and reactivate the agricultural sector. In addition, ADB in 1980 (January - August) approved 663 loans for TT $ 33 million of which TT $ 31 million were given to individuals and TT $ 2 million were given to 8 agricultural credit services (each 400 members). The principal agricultural activities to which loans were applied were forestry, agro industry and farm structures ($ 7 million), meat, milk and eggs ($ 6 million), farm vehicles, tractors and machinery ($ 5 million) and land acquisition ($ 4 million). (Note: In future ADB activities will influence development of local market for engineering and capital goods products).

(E) Export and International Marketing Services

- Export Services: Export Credit Insurance Co. Ltd. (EXCICO)

provides export credit insurance for manufacturers exporting products made in Trinidad and Tobago.

- International Marketing Company (IMC)

IMC is a private company fully owned by the Government and its goal is to promote internationally the sales of all goods produced in Trinidad and Tobago. The IMC operates under the following functional areas - General Trade Promotion, Tourism and Export Invisibles, Products of Energy Based Industries, Procurement and Shipping, and Information and Reporting. (Note: With respect to engineering and capital goods products, the international export and marketing techniques will require specific capabilities. It will involve techno-economic aspects, engineering aspects, market and competative pricing, quality and requirement, trends etc. on a continuous basis).

SECTION V

INDUSTRIAL SECTOR AND EMPLOYMENT IN TRINIDAD AND TOBAGO

AND IMPORT TO WEST INDIES - 1979

Petroleum Industry

Manufacture of Food, Drink and Tobacco.
Manufacture of Textile, Garments and footwear .
Other manufacturing industries.
Assembly type and related industries (Metal and Electronic/Electrical Industry).
Manufacture of Sugar
Wood and related products.
Pulp and Paper products.
Chemicals and non metallic minerals.
Buildings and contractors.
Pharmaceuticals.

Employment by Sector 1977 - 79

(Mid year Estimates)

SECTOR	1977		1979	
	(000 persons)	% of tot.	000 persons	% of tot.
(i) Agriculture, forestry hunting & Fishing	54.4	14.7	40.6	10.1
(ii) Mining, quarrying, & Manufacturing	72.6	19.6	73.0	18.2
(iii) Contractor Industry (inclu. electricity, generator & water)	58.9	15.9	85.1	21.3
(iv) Commerce	68.4	18.5	76.6	19.1
(v) Transport & Communication	31.1	8.4	29.7	7.4
(vi) Service	85.2	23.0	95.0	23.9
	370.6	100.0	400.0	100.0

IMPORT OF ENGINEERING PRODUCTS AND CAPITAL GOODS

(in West Indies Region - 1978)

1. As per the "Bulletin of Statistics on World Trade in Engineering Products 1978" (UN-ECE 1980), the 1978 import by West Indies region (Antigua, Barbados, Dominica, Grenada, Jamaica, Montserrat, St.Kitts-Nevis-Anguilla, St. Lucia, St. Vincent and the Grenadines and Trinidad and Tobago") - based on total export figures by main exporters by destination - are as follows (million U.S. dollars):

CODE NO.	ITEM	(U.S. DOLLARS IN MILLIONS)
7	Total Engineering Products	561.8
71	Total machinery - non-electric	256.3
72	Total electrical machinery	94.7
73	Total Transport Equipment	208.5

In each of these groups, the following are some of major items.

71	Total machinery non-electric	258.3
711	Power generating machinery	25.4
711.4	Other internal combustion engines	14.8
712	Agricultural machinery	14.6
712.1.2	Agricultural machinery for cultivation of soil	2.8
71.2.5	Tractors	9.3
714	Office Machinery	13.5
714.1	Typewriters	1.3
714.3	Statistical machinery	3.6
715	Metal working machinery	5.6
515.1	Machine tools	3.6
717	Textile machinery and leather machinery	6.2
717.1	Textile machinery	3.2
717.3	Sewing machinery	2.5

718	Special industrial machinery	73.9
	718.3 Processing machinery	12.4
	718.4 Construction machinery	48.0
	718.51 Mineral processing machinery	6.1
719	Other special machinery	119.1
	719.12 Airconditioning machinery	5.3
	719.15 Refrigeration equipment	8.6
	719.2 Pumps and centerfuges	26.9
	719.3 Mechanical handling equipment	23.6
	719.5 Power tools (others)	7.8
	719.62 Packaging machinery	7.1
	719.8.9 Appliances, parts and accessories	29.0
722	Electrical power machinery	21.9
	722.1 Power transforming machinery	8.3
723	Equipment for distributing electricity	6.0
	723.1 Industrial wire and cable	4.1
724	Telecommunication equipment	29.3
725	Domestic electrical appliance	9.6
729	Electrical appliances, other	25.4
	729.1 Batteries and accumulators	2.8
	729.2 Electrical lamps	1.9
	729.3 Valves, Tubes	2.0
	729.4 Automotive electrical equipment	4.3
	729.5 Measuring apparatus	6.8
731	Railway vehicles	2.1
732	Road and motor vehicles	142.7
	732.1 Passenger motor cars	64.8
	732.2.3.4 Buses, Lorries, Trucks	36.0
	732.9 Motorcycles	1.3
733	Road vehicles other than motor	3.3
	733.1 Cycles	1.4
735	Ships and boats	17.3
864	Watches and clocks	4.3

SECTION VI

OIL AND GAS SECTOR

1. Without a brief reference to this very important sector of Trinidad and Tobago's national economy, the engineering and capital goods sector analysis will be incomplete. Therefore the oil and gas sector status is highlighted as a reference.

2. In 1979 crude petroleum production amounted to 12.4 million Cu.m which was 7% below the previous year's level. 7.0 million cu.m. (56% of production) of crude was exported, and balance of 2.7 m cu.met. was locally refined. The production % by companies are as follows: AMOCO (56.3%), Trinidad north areas (20 %), Texaco (8.7%), Trinidad Tesoro (10.0%), TRINTOC (4.2%) and Premier Consolidated oil fields (0.1%). Note: TRINTOC is the national oil company of the Government. The major proportion of domestic crude petroleum production continues to originate from marine wells - AMOCO and Trinidad northern areas.

3. In 1979, the natural gas production was 170 billion cubic feet, which represented 7% over that of 1978 level. The % distribution of production by companies are as follows: AMOCO (71.9%), Trinidad Northern areas (14.3%), Texaco (4.6%), Trinidad Tesoro (5.6%), Trintoc (3.5%), and Premier Consolidated (0.1%). Local Sale of natural gas was 56 billion cubic feet as follows: Trinidad and Tobago Electricity Commission - 38%, Tringen - 28% and Fedchem - 27%. Sales of natural gas are expected to rise significantly towards the end of 1980 as the Iron and Steel Company of Trinidad and Tobago goes into full commercial production.

4. The Petroleum sector continues to dominate the economy of the country. The value of the sector's output increased by 15% to T.T.$4,094 million in 1979 and will increase by over 21% in 1980 to

T.T.$4,934 million. Not withstanding this growth in output, the Sector's contribution to the G.D.P. has been falling since 1977. Its share of the GDP was 43% in 1977, 38% in 1978 and 36% in 1979. It is projected to fall further to 35% in 1980 reflecting the relatively faster growth of the non-oil sectors of the economy.

SECTION VII

ENERGY BASED INDUSTRIES

A. National Energy Corporation

The National Energy Corporation of the Government of Trinidad and Tobago has promoted and is in charge of the following projects:-

i) Urea and Methanol plants:-
capacity 1620T urea/day. Investment US$120m each plant. Man power 200 each. Project signed, design ready and site operations started in April 1981. To be commissioned by end 1982.

ii) Amonia plant, Point Lisas:-
capacity 2000T/day. Joint venture with Amoco (49%). Manpower 350. Investment US$300m. To be commissioned by end 1981.

iii) Amonia plant - TRINGEN:-
capacity 1000T/day. Investment US$100m. Manpower 100. Commissioned in 1977. Joint venture with W.R. Grace of U.K.

iv) Aluminium Smelter:
Project on drawing board awaiting Government decision. Investment US$250m. Manpower 2000. Capacity 240m pounds /year. Joint venture with National Steel and Southwire of U.S.A. Project commissioning 40 months after start-up.

v) Iron and Steel Company of Trinidad and Tobago (ISCOTT):-
capacity 900,000 tons/year. Investment US$400m. Manpower 600. Commissioned in 1980.

vi) TRINTOC Refinery:-
Manpower 500 including field staff. Capacity 60,000 barrels/day. (The company is old B.P which is around 30-40 years old).

vii) Lake Asphalt:
Capacity 150,000T./year. Production 34,000 tons/year. (Market Limitations). Manpower 100. (The company is an old British firm started in around year 1900).

viii) Trinidad Cement Company:
Capacity 300,000T/year (upgraded) Manpower 250. (The factory is old. Bought 10 years ago from British Rugby Portland and upgraded to achieve above capacity). To start upgraded production by 1981.

ix) National Quarries:
Small company. Manpower 30.

x) PILPDECO:
Company for development of infrastructure: factories, harbour road, drainage, etc. Manpower 30.

xi) National Petroleum:
Marketing of oil and gas within the country. Manpower 100.

B. NEC PROPOSAL ON IRON & STEEL DOWNSTREAM UTILIZATION

i) The Iron and Steel Company of Trinidad and Tobago (ISCOTT) buys iron pellets from Brazil and using national gas direct

reduction process manufactures mild steel ingots, billets, flats, bars, wire rods and direct reduction sponge iron. The NEC/ISCOTT will go in for Medivill Carbon Steel and other steel when there is a market demand. At the present, the NEC/ISCOTT has given priority to promote downstream industrial application of its products in the country.

ii) NEC/PLIPDECO Industrial area for downstream application

Therefore NEC/ISCOTT, under PLIPDECO's work plan has a scheme to establish a satelite industrial area with around 200. Small/medium industries to promote ISCOTT product downstream industrial application. The land and site areas have been allocated. The list of products to be manufactured by private small and medium entrepreneurs is not yet detailed. The Government is ready to provide all facilities to the local entrepreneurs to start appropriate industries. There is a need to embark upon a priority programme on identification of products, elaboration of feasibility study and entrepreneurship promotion.

iii) Need for engineering design, development and technical service unit

In order to assist the proposed NEC/PLIPDECO industrial area with planned 200 industries with engineers on downstream utilization of ISCOTT's output, it is recommended that an engineering design, development, adaptation and technical service unit is established. The activities may cover engineering design and development, elaboration of production technology, manufacturing services and technical assistance to the small/medium industries.

SECTION VIII

MANUFACTURING SECTOR

A. General Analysis

1. During 1968-72 the manufacturing sector of Trinidad and Tobago has expanded significantly, especially through generous fiscal incentives, duty free access to imports of raw materials, intermediate and capital goods, as well as provision of fully developed industrial estates, concessionary credits and technical assistance. One of the key incentives for inviting industries and protecting existing "infant" ones has been the policy of quantative restrictions. It is embodied in a "negative list" which contains around 450 categories of commodities. By the end of the last decade (1970's), the share of manufacturing sector in G.D.P. rose to about 10% and it employed around 64,000 workers, or 16% of the labour force.

2. In 1977 the "industry" contributed value added 1,872 million U.S. dollars (62.4%) with a labour force of 158,500 (36.8%) with V.A. per worker of 1,181 dollars (169.7%). "The manufacturing sector" accounted for 16% of total employment.

3. External capital has been a major factor in financing the country's economic development, with direct foreign investment accounting in recent years (up to 1977) for 25% of gross domestic investment. The economy is dependent on imports for almost all of its capital goods, a substantial proportion of its intermediate and consumer goods and food stuffs.

4. Exports of non-traditional products, consisting mainly of processed foods, textiles, other light manufacture and increasingly of machinery and equipment, grew rapidly in the late 1960's and early 1970's. During the past few years, since over half of these

exports have been to the CARICOM market, they have been adversely affected by the recent import restrictions imposed by some larger CARICOM members. In addition, the level reached in 1975-77 by manufacturing industries, have not made an appreciable upward trend in local content during the past few years.

5. Although the Government has promoted a few modern energy based industries, since these large plants are by their very nature highly capital intensive, it is felt that their contribution to the solution of unemployment problems is likely to be minimal. It is recommended - by some international experts - that what is needed, therefore, is an equal thrust in the development of agriculture and in the direction of small to medium scale manufacturing, both of which are relatively labour intensive.

6. Although some progress has been made with respect to small and medium scale industry, it is felt that the industrial incentive policies which stimulated growth of manufacturing may well have outlived themselves, and require some basic adjustments. This is particularly so with respect to favouring capital goods imports.

7. In this context, the observations of a World Financial Institution mission in late 1978 was that if manufacturing is to realize its full potential for generating remunerative employment opportunities through industrial growth, the existing incentive system needs to be rationalized, competition enhanced, cost and prices reduced and economies of scale enjoyed. The suggestions made to achieve above were:- (a) elimination of "negative list" and overly protectionist policies, (b) reducing protective tariffs and offering strong incentives to firms for exporting marginal outputs, (c) enhancement of labour productivity, and (d) granting wage subsidies or tax

rebates to firms which create jobs through exports etc. The main reasons for the above suggestions - as highlighted in their report - are that the generalized fiscal incentives do not appear to be well focused to achieve the objectives of increasing efficiency, expanding exports and creating employment. The incentive system is heavily biased towards import substitution (without adequate concern for economic efficiency) and export incentives are inadequate.

8. The above Mission Report also observed that labourintensive light manufacturing industries are most suitable to the country's resource endowment over the medium term. It is also recommended that given the limited market within Trinidad and Tobago and CARICOM, and the continuing economic problems in some of CARICOM important members, extra-regional export market diversifications should be a major goal of Trinidad and Tobago's manufacturing development strategy.

8. 1980 Review

1. The manufacturing sector has performed only moderately in the period 1978-80. Production in this sector grew by 9% in 1978, but 6% in 1979. The 1980 estimated growth will be 8% more than that of 1979.

2. The assembly type and related industries stagnated during 1979 following a decline in the rates of increase from 20% in 1979 to 13% in 1978. In 1980 the sector is expected to recover.

SECTION IX

THE ENGINEERING/CAPITAL GOODS INDUSTRIES AND ITS STRUCTURE IN THE COUNTRY

(i) Trinidad and Tobago has a very limited engineering/capital goods industries. The 4 major levels may be as follows:

(a) Government investment in commercial enterprises:

- among 33 different type of companies fully owned by the Government, the Trinidad and Tobago electronic industries (under IDC) is an assembly type of engineering industries. The iron and steel company of Trinidad and Tobago (under NEC) is a large scale (800,000 tons/year) company.
- Among 13 Government majority owned companies of different types non are in engineering/capital goods manufacture.
- Among 18 Government minority interest companies of different types, only metal industries company (under IDC) is a "commercial" tool and die company with emphasis on training.

(b) Local conglomorates houses:

There are 4-5 local conglomorates which have different types of activities. The following three are major one:

- Neal and Massey: automotive assembly, foundry, metal products, paper, insurance, custom, retail, etc. This is the only firm involved with assembly type and manufacturing engineering sector
- Kirpalani: chain stores, retial outlet for other and their own manufactured products (shoes, furniture, cloths, etc) NOT involved with capital goods/engineering
- MCEanenery Alstons and Co: Assembly of motor vehicles, timber, light engineering, trade andshipping.

(c) Medium engineering industries:

Mostly in private sector. As registered with the T and T Manufacturers Association, out of around 165 members, around 17 are in the "Assembly - Engineering Industries" field. These may be independent firms or specific establishment of conglomorate houses in the country.

(d) Small business/small scale sector:

(i) There are around 1500 small business units registered with IDC. They are various groups - metal products, quarrying, service, repair and maintenance, food and beverage, paper and plastic, etc. The details of actual units in engineering sector is not known.

(ii) Thus it can be seen that the Engineering/capital goods industry is not yet well developed in the country. Therefore, it is necessary that any policies and actions on development of capital goods industry should promote a healthy interlink among the above 4 sectors.

(iii) The detailed information on metal working industries is not up to date. The 1970 figures indicate that the share of the metal working industry in the total industrial (manufacturing) production of Trinidad and Tobago was 19.9% representing a value of $ 27.9 million. In 1970 there were 61 employment of 5060 persons in the metal working industry. There is a need to undertake an indepth analysis of the existing metal working industry in the country.

SECTION X

METAL WORKING SECTOR

(reference: Annex III List of Documents reviewed No. 5)

The gross fixed capital formation (GFCF) in the manufacturing industry in 1970 was $ 21.7 million of which $ 6.8 million was accounted for by the Metal Working Industries.

In 1970 there were sixty-one (61) establishments in the Metal Working Industry employing over five thousand people.

DISTRIBUTION OF METALWORKING INDUSTRIES IN TRINIDAD AND TOBAGO 1970

	No. of Establishments Units	Employment
Metal Products	26	1220
Machinery Excluding Electrical	7	1290
Electrical Machinery	15	1150
Transport Equipment	13	1400
TOTAL METALWORKING	61	5060
TOTAL INDUSTRY	326	26040

Source : Census of Manufacturing 1969-70

The following review is sourced from the Metal Industries Company Limited (MIC) which is a Product Engineering and Tool Manufacturing Company, and is based on "in-house" information accumulated through continuous contact with clients in the sector. This review will therefore give a broad indication of the existing production facilities in the sector in 1976.

Foundry Facilities

There are six (6) foundries in Trinidad and Tobago which produce 520 tons of ferrous castings and 124 tons of non-ferrous castings per annum of which aluminium castings account for 100 tons and brass castings 24 tons per annum. The following table indicates the size and level of skills within the industry.

SURVEY OF FOUNDRY FACILITIES IN TRINIDAD AND TOBAGO

Floor Area (m^2)	Production of Castings Ton/Annum			Pattern Makers	Mould Makers
	Ferrous	Non Ferrous			
		Al	Brass		
500	100	5	5	2	6
1000	180		5	4	4
480	100	35	5	1	4
180	0	45		0	4
400	90	5	5	2	4
300	50	5	5	2	4
Total 520 tons		95	20		

Within the existing foundries, there are 11 pattern makers and 26 mould makers. Of the pattern makers, 6 contribute 90% of the pattern making jobs in the country. 7 of the mould makers are experienced and direct 80% of the mould making jobs.

In addition to the above there are 2 lead moulding facilities, moulding lead acid battery plates, lugs and terminals. These facilities have automatic machines for moulding plates and metal moulds for moulding lugs and terminals (which are done by hand).

The average production of lead-acid batteries is 40,000 per annum.

The products that are being cast at present are:

(a) Cast Iron: manhole covers, pipe fittings, pumps bases, gears and miscellaneous replacement parts

(b) Aluminium Castings: low cost cookware, simple components

(c) Copper Alleys: bushings, small parts

Level of technology in this industry may be illustrated by following description of the machiney and processes utilised those foundries i.e.

Melting and Baking: Cupolas (maximum capacity 2 tons) and oil fired furnaces.

Moulding: Green sand moulds are usually made from wooden patterns.

Testing: This is commonly done by visual inspection for cracks and process defects. One facility can do X-ray, gamma-ray and ultrasonic testing.

Post heat treatment is generally not applied.

The chemical composition of the melt is generally uncontrolled.

Cleaning of the cast product is usually done with wire brushes files, hand grinders and pedestal grinders.

Forging Facilities

Forgings are done at three shops in the country. Two shops are privately used and the other is a jobbing shop. In each of the privately owned shops, there are two charcoals furnaces and one pneumatic hammer. The only forging personnel available are two blacksmiths in each of the shops. Forgings are done irregularly depending on the availability of jobs. Post heat treatment facilities are not available at any of the shops. Dies are not used, and hence, operations are limited to those which can be accomplished by blacksmiths using hand tools.

Machine Tool Industry

There are no machine tool manufacturers in Trinidad and Tobago. The present limited demand for such tools is being met by imports. However, the demand for machine tools over the period 1970 to 1976 has increased by 62% as detailed in the next table.

CONSUMPTION OF MACHINE TOOLS IN TRINIDAD AND TOBAGO

Year	Quantity (tons)	Value TT$ Million
1973	250	1,708
1974	245	2,130
1975	345	4.284
1976	405	4,090

The UNIDO publication "The Machine Tool Industry" forecasted a demand of TT$ 4.4 million in 1980, based on projections of Gross National product (GNP) and population growth in Trinidad and Tobago, but it is obvious that this figure would be achieved before the given period.

SECTION XI

MANUFACTURING SUB-SECTORS

(assembly related)

A. AUTOMOTIVE INDUSTRY

(a) PARK 1979

1. The total number of automotive vehicles (park) in Trinidad and Tobago - based on motor vehicle Registration in Third Quarter of 1977 is as follows:-

Private Cars	119,918	units
Hire and rental cars	20,811	"
Omnibus	1,210	"
Goods vehicles	30,031	"
Tractors and Trailers	7,411	"
Motorcycles	6,112	"
Non-licensed	2,684	"
TOTAL	190,177	

(b) Local Assembly: Status

(i) This sub-sector is the largest of the assembly industries viz. three (3) main plants assembling CKD kits, imported by motor vehicle distributors.

(ii) As no specific local manufacturing agreements with detailed local phased production scheme, promotion of ancillary industry and appropriate regulations and incentives are yet formulated, the automotive industry many nit reach a higher level of local production in the country.

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(c) Status of Assembly in the Country

(i) In 1966, the automotive industry started in the country with a "pioneer" status, with assembly operations by the auto dealers who - as per the law passed - could only sell locally assembled vehicles. The four assembly operations during 1966-80 are:

- Amalgamated Industry Ltd.: 1968/69 Ford Escort, Cortina plus Reno;
- Amars Ltd: 1972 Toyota;
- H.E. Robinsons Ltd. - Dodge Avenger, etc. In 1979 switched over to Japanese Mitsubishi;
- Neal and Massey 1966: General Motors (U.K/). In 1971 switched over to Japanese cars and pick up trucks.

Note: (i) Reno operations were bought over by Amalgamated.
(ii) Contental Motors Ltd. in 1980 have a licence to assemble Mack Trucks.

(d) The Range of Local Assembly in the Country

(i) Each firm has a programme to assemble three types of cars:

- small 1100 cc;
- medium 1800 - 2000 cc;
- large 2800 - 3000 cc

(ii) In addition those involved with trucks assemble two types of trucks:

- 1 to 2 ton pick up;
- 8 - 12 ton truck.

Thus in the country, roughly around 10-12 models/types of cars and 6-8 model/types of trucks are assembled. With an annual assembly figure of around 16,000 units, it may be assumed that roughly around 800 - 1200 units of each model/type is locally assembled.

(e) Local Assembly 1979

The production of passenger cars and commercial vehicles amounted to 15,247 units in 1979, The details of 1977 and 1970-80 production are as follows:

Local Assembly of Motor Vehicles
1979 and peak year

	1979	Peak 1978
Passenger cars	12,956 units	13,769 units
Commercial Vehicles	2,291 "	2,412 "
TOTAL	15,247 units	16,181 units

Local Assembly of Motor Vehicles
(January 1970 to June 1980)

Passenger Cars	95,398 units
Commercial Vehicles	15,763 "
	101,161 units

(f) Ancillary Industry Development

Batteries, mufflers and tyres are produced locally and this sector grew by 25% in 1979. But all these are for replacement market only (except for tyres) and not for O.E.M requirement. The following are some of the highlights:-

- Dunlop tyres

- Batteries
- Radiator recoring; paragon radiators
- Oil filters from imported material
- Brake and clutch lining: Trinidad Brake and Clutch Products (imported lining)
- Mufflers (Kamus and Company)

It should be noted that O.E.M. has not increased the local content in Trinidad and Tobago.

(g) Some Constraints in ancillary industry development

The present automotive operations are assembly operations. Unless there is a drastic rationalization programme, it is impossible to locally make basic input product such as engine, transmission, etc. Even regarding ancillary components (shafts, ex gears, stampings, exhaust, radiator, battery, harness, upholstery etc.) and about 10-12 fast moving parts (filters, seals, gaskets, nozzles, spark plugs, etc) - even taking into account the present population of automotive vehicles, it will not be possible to locally make some of the components, if some modifications are incorporated by the Government in its policies.

(h) Possible Actions

A full analysis of the automotive industry - after a policy decision is taken - on ancillary components manufacture may be undertaken to formulate local manufacturing programmes. One of the possible ways is to analyse the O.E.M. requirements as well as spare parts requirements for the existing park. An exercise to determine the RTF - "Repalcement Turnover Factor", i.e. the number of times a component is replaced on different type of vehicles during its road worthy life in Trinidad and Tobago may be undertaken. Annex II gives a guideline on RTF in another developing country. A similar exercise in Trinidad and Tobago may be needed as the first step.

B. RADIOS

(i) Local Assembly

There are three (3) (T and Tel, Sylvania, CTC Electronics) plants assembling radio receivers and associated equipment from CKD kits. A part from the local partial production of contents and packaging material. The following are production details:

Local Assembly of Radios 1979 and Peak Year

	1979	Peak year 1976
Local production/assembly	7,991 units	17,676
EXPORTS	NIL	4,631

Total Assembly of Radios - January 1970 - June 1980

Local Production/assembly	136,829 units
EXPORTS	21,457

Note: One comparing (J.G. Singh) assembles a few simple portable radios.

C. TELEVISION

Local assembly is undertaken primarily by one firm C. Sylvania - Sharp and another company, and is limited to local manufacture of sheet metal and plastic casings. All other components are imported. The production details are as follows:-

Local Assembly of Television 1979 and Peak Year

	1979	Peak Year 1973
Local Assembly	10,541 units	15,632 units
EXPORTS	NIL	1,683 "

Local Assembly of Television - January 1971 - June 1980

Local Assembly	15,779 units
EXPORTS	9,840 "

D. GAS COOKERS

There are primarily assembled by one company (Consolidated Appliances) and another two firms. All components are imported. The production details are as follows:

Local Assembly of Gas Cookers 1979 and Peak Year

	1979	Peak Year 1977
Local Assembly	15,254 units	27,071 units
EXPORTS	371 "	2,678 "

Total Local Assembly of Gas Cookers - January 1970 - June 1980

Local Assembly	191,017 units
EXPORTS	82,173 "

E. ELECTRONICS (HI-FI - (ASSEMBLY)

T & TEL assembles around 7,000 units of Hi-Fi stereo sets per year (amplifier, tuner, turntable, receiver, Deck, - Kenwood, NEC. AKAI.

F. REFRIGERATORS

There are three (3) firms (Consolidated Appliances - Kelvinator - Admiral Corporation of U.S.A., the three major manufacturer). All components except Sheet Metal and Plastic Gasings are imported. The details are given below:

In addition, there are 3 - 4 local assembly units for air conditioners for domestic and auto applicators. (Thomas Peak - carrier, (import air conditioners, for cars, climate control, Neal and Massy etc.)

Assembly of Refrigerators
1979 and Peak Year

	1979	Peak Year 1976
Local Assembly	21,124 units	27,838 units
EXPORTS	4,428 "	14,416 "

Total Assembly of Refrigerators
1979 and Peak Year

Local Assembly	223,844 units
EXPORTS	95,470 "

G. OTHER SMALL MANUFACTURER IN METAL WORKING SECTOR

The following are some details:-

- Caribbean Steel Mills:
  Rerolling rods, billets, tubes from imported M. S. billets

- Dan Steel:
  (Presently dealers in steel) has plans to establish rerolling mill to transfer to ISCOTT steel.

- Dan Steel and Thomas Peak:

  Fabricators of water tanks for trucks and other usage.

- Motilal Moonan:

  Truck panel fabricator

- Trinrico Steel:
  Wire Products, chainlinks, fence reinforcing mesh etc.

- Universal Metal Company:

  Office furniture, fence, reinforcement mesth etc.

- Trinidad Nail Products:

  Nail

- Yorke Structures:

  Steel industrial furniture, steel fabricators etc.

- Manufacturers:

  Aluminium Pots and pans

- Kitchen Hand Appliances Manufacturing Limited:

  Blenders, mixers etc.

- Foundries:-

  - Swan Hunter (International Ship repair and maintenance) largest general foundry.
  - Texaco Refinery operation foundry
  - Eastern Foundry (Neal and Massy) for ship repairs, refining, casting, etc. (small and old).
  - Sugar mill casting; (small one)
  - Repair and maintenance shops

    About ten (10) small vehicle and general repair and maintenance shops

SECTION XII

ELECTRONICS INDUSTRIES

(Assembly related)

A. EIDP:

1. The Government of Trinidad and Tobago has established "Electronic Industry Development Programme" (EIDP) and the Government has formulated steps to develop EIDP expertise to provide training, and guidelines on new product development. EIDP has only promotional activities through a steering committee consisting of IDC, UWI, CARRIRI, T and TCI and National Institute for Higher Education (NIHE) of the activities are development of training programmes through NIHE.

B. Local Assembly:

2. Trinidad and Tobago Electronics Ltd. owned by IDC assembles 7,000 units/year Kenwood, NEC and AKAI stereo equipment (amplifier, tuner, turntable, receiver, cassette deck only). The Japanese firms have no financial interest in the capital. The company is also engaged in supply, installation and repair and maintenance of interconnecting communication equipment of local telephone industries.

C. Future of Electronic Industry in the Country:

3. Based on the discussions held with local knowledgable technical experts, the situation is as follows:
   - electronic industry in Trinidad and Tobago can remain only as an assembly industry contributing to the learning process and to start basic electronic skills necessary to effectively assembly, apply and maintain consumer and industrial electronics equipment in the country.

- As consumer electronics is basically a configuration of "kits", it has been possible to negotiate with foreign partner the price, held the price for 12-18 months. This has resulted in locally assembled equipment being cheaper to the consumer than equivalent imported items;

- The problem of export expecially export financing and organizational aspects the need to change the models and high labour wages are some of the major negative factors;

- The economy of Trinidad and Tobago is itself consumer oriented and will require many varieties of articles to meet the domestic requirements. This poses a problem on local manufacture due to low volume of each product/model;

- Due to the high technology nature of the industry, long-term planning, experimental design and competitive ever-changing market conditions, the industrialized countries do not seem to be eager to make Trinidad and Tobago a nucleus for their local manufacturing programme.

4. Thus it can be seen that the scope of electronic industry in Trinidad and Tobago is assembly in nature. However, there is a great need for developing a national infrastructure on repair and maintenance and technical service in this field to meet the domestic consumer and industrial electronic sector.

SECTION XIII

SPARE PARTS FOR ENERGY BASED INDUSTRIES

A. Present Analysis:

1. The National Energy Corporation, the Holding Company for energy based industries is in the process of conducting a preliminary analysis of the total spectrum of the energy based industries. The scope of the report will be to identify services available locally, to examine the structure of the companies, to establish the magnitude of foreign/local input in these companies, to evaluate the necessity of services offered and to identify the services which could be provided by local companies in an effort to create linkages to the energy sector and the energy based industries.

2. Although this analysis, document and information will be of confidential type, it is felt by NEC, that certain information so gathered and analysis, especially in the light of last point in the scope of the report (interlinkage), may serve as a guide to explore the possibilities of local manufacture of necessary spare parts.

3. Therefore, it is recommended that an indepth analysis on possible local manufacutre of spare parts is undertaken, within the framework of this project on capital goods.

B. Some available information (from other sources)

4. The flanges (welded neck, socket weld, screwed weld, blind, slip on) the elbows, bends, fork, tees, are mostly used in this sector.

GENERAL INFORMATION CONCERNING CIF VALUE TRINIDAD OF IMPORTS FOR PIPE FITTINGS IN MILLIONS OF TT DOLLARS FROM 1974 TO 1978 AS TAKEN FROM THE CENTRAL STATISTICAL OFFICE

	1974	1975	1976	1977 1/	1978
Forged Steel 2/	2.7	7.6	9.5	8.1	9.8
Cast Iron 2/	1.7	3.0	3.6	2.6	7.1
Totals	4.4	10.6	13.1	10.7	16.9
Cumulative Total	4.4	15.0	28.1	38.8	55.7

Note 1/ Please note that 1977 figures do not show total imports as some data was lost at a Custom House Fire which took place in October 1977.

Note 2/ Figures shown for forged steel and cast iron fittings do not comprise all diameters indiscriminately ($\frac{1}{8}$" to 24" dia.). More than 60% of all pipe fittings imported are from the USA, 10% from the U.K. and 30% from other countries. Cast iron fittings are used by WASA (Water and Sewerage Authority).

5. It is indicated that the volume machining business was in the area of forged elbows, bends, tees, flanges and crosses in a diameter range up to 4", specially the welding type.

C. Possible Spare Parts Manufacture:

6. It can be noted that Texaco'a local purchase of $ 564,000 is an approxiamte 8% of the total import figures corresponding to imports of forged steel in 1978. Assuming that Texaco (and TRINMAR) use an approximate 50% of all flanges, elbows and bends imported into Trinidad and Tobago in 1978 or $ 564,000, then the approximate total market for 1978 would be approximately $ 1,128,000 or 16% of the total imports for the same year, excluding requirements for petro-chemical industries which remain to be investigated.

7. In addition, the requirements of other types of spare parts for related industries are to be investigated.

SECTION XIV

INDUSTRIAL AREAS AND ESTATES AND SMALL/MEDIUM INDUSTRY PROMOTION

A. INDUSTRIAL ESTATES/AREAS:

(1) Under IDC's jurisdiction there are nine (9) industrial estates in the country. The majority of the Industrial (over 78%) are private, small and medium industries. The following are the highlight ;

(2) Diamond Vale (10 km from Port of Spain): around thirty (30) factories - paper, garments, chemical, chalk, plastics, cosmetics, repair and maintenance, assembly of small appliances etc.;

(3) East Dry River (4 km from Posrt of Spain): 10 - 15 visits - cosmetics, garments, paints, small foundry etc.,

(3) Trincity - 1 (20 km from Port of Spain): 20-30 factories. Metal products, refrigerators, wire products, furniture, PVC, garments, plastics, jigs mixture and dies etc.;

(4) Trincity - 2, Newly planned: For 20 - 30 factories. Products similar to Trincity - 1

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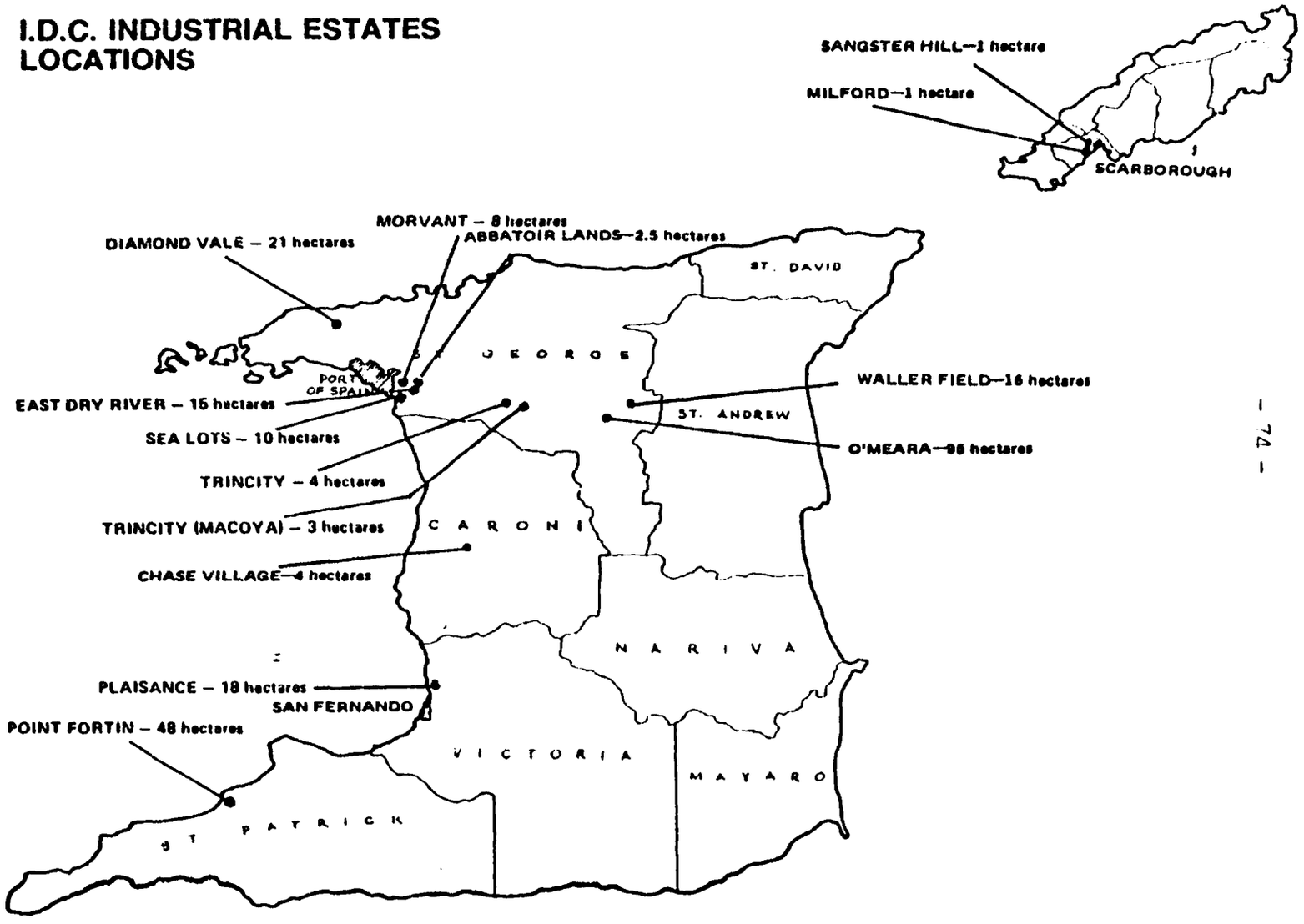
I.D.C. INDUSTRIAL ESTATES LOCATIONS



(5) O'Meara (30 km from Port of Spain):
30-35 factories - Metal working, printing, garments, cosmetics etc.;

(6) Plaisance Park (50 km from Port of Spain):
15 - 20 factories - small aggregates, garments, shoes, paper conversion, small foundry etc.;

(7) Point Fortin (80 km from Port of Spain):
20-25 factories;

(8) Point Lisas: IDC is planning an industrial area.

(9) Tobago: two (2) industrial areas

B NEED FOR COMMON ENGINEERING SERVICES:

It is evident that in order to assist the small and medium industries, there is need to establish a common Engineering Service facilities. On a priority basis, one such visit could be established on a pilot demonstration basis in one of the industrial areas (preferably in Trincity, activites to cover PLIPDECO new industrial area at a later date). Such a Common Engineering Service unit should have the following activities of assistance to small and medium industries:-

- Repair and maintenance
- Spare parts, fabrication for critical items
- common physical facilities such as heat treatment, material selection, testing etc.,
- Advisory Services on Plant layout, Process planning, machine tool utilization
- In-plant training

NOTE:

PLIPDECO PLANNED INDUSTRIAL ESTATE:

NEC/PLIPDECO now allocated land for 200 small/ medium industries for Promotion of downstream application of the output of ISCOTT.

1981-07-08

SECTION XV

CONSTRUCTION SECTOR

1. It is reported that as a consequence of severe building material, managerial and skilled labour constraints, the growth of construction sector has been erratic during 1972-77 and the industry has been unable to respond fully to recent increased demand.

2. It is estimated that the demand for additional skilled labour in the sector will increase by about 20% annually over the next several years, or about 5,000 persons per year. The output of about 2,000 in 1977 and that in recent years fall too short of the requirements.

3. The Government has initiated action to reduce future supply constraints in the construction industry. The expansion of cement factory, increased production of aggregates and bricks manufacture is underway. Planned new steel mill capacity will be more than sufficient to take care of present shortages. (Note: Reinforced bars and structural steel are basic needs for construction industry. Present consumption of steel is around 30,000 Ton/years and will grow with increased construction and manufacturing activity. Currently domestic production is about 7,000 Ton/years of which 50% is reinforcing bars. The Government proposes to build a new steel mill).

4. The construction industry is pivotal in the Government's development programme, accounting to about 50% of public investment expenditures. The construction industry in Trinidad and Tobago is almost entirely comprised of domestic and foreign contractors. The public sector currently accounts for about two-thirds of total construction demand.

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5. Domestic contractors have since the late 1960's grown in relative importance, especially as builders of residential housing and as subcontractors to foreign firms on civil works and highrise buildings,and account for about half of the output of the industry. Foreign firms generally undertake large contracts such as port development, water supply installations, highway construction, large industrial plants and high-rise buildings, for which local contractors find it difficult to compete because of lack of expertise and insufficient financing capacity.

SECTION XVI

AGRICULTURAL SECTOR

A. General Analysis

1. Trinidad and Tobago has an area of 5128.0 sq.km and population is around 1.114 million (mid 1977). Distribution of the Land ownership in 1963 was as follows:

% owned by top 10% of owners	31.1%
% owned by smallest 10% of owners	1.5%

2. Agricultural Sector in 1977 contributed to the national economy 81.1 million U.S. dollars value added (2.9%) with a labour force of 57,600 (13.4%) and value added per worker U.S. dollars 1529.5 (22.0%).

3. The performance of agricultural sector (up to 1977) has not been very bright. Despite concerted efforts by the activities to encourage food production for the domestic market by means of input subsidies and price support policies, it is reported that the success is not significant except in the production of poultry, eggs and pork. In the meantime the growing population and rising incomes, the food imports increased to U.S. $153 million in 1977 from U.S. $53 million at the beginning of 1970's.

4. A similar trend prevailed in the case of export agriculture. Sugar, the single most important crop, which accounts for about half the value added in agriculture, has experienced a steady decline in the output since 1970's.

5. The urban-rural wage differential has reputedly widened and rates of rural to urban migration, already high in the 1960's and early 1970's, are believed to have increased still further. As a consequence, agriculture's share of GDP accounts for only 3% and its employment has declined from 25% of the labour force in 1970 to 15% in 1977/78. Absolute net decline in the rural labour force

has given rise to the serious seasonal labour shortage in agriculture, high urban unemployment and underutilization of land resources.

6. Since 1974, production of traditional agricultural export crops - sugar, cocoa and coffee - has stagnated. Sugar in 1977 accounted for less than 4% of total merchandise exports and cocoa and coffee each represent less than 1.0%.

7. Over the past few years, the Government has introduced new approaches, for agricultural development, which includes conversion of large Government sugar estates into small farms with diversified cropping patterns. Such programmes will require new solutions regarding provision of industrial inputs for agricultural development in general, and appropriate agricultural machinery, implements and tools in particular.

8. In this context the mission of a World Financial Institution in late 1978 observed that at current world prices, large scale government estates production and refining of sugar is being carried out at a loss. The Mission Report states that most of the good land in Trinidad and Tobago is on the Government controlled sugar estates, the opportunities for expansion of family farms units are limited. More intensive cultivation of the best land in high value food crops could increase labour productivity and income from agricultural activities and thus narrow the urban-rural wage differential and migration. The 1978 Mission recommends that assuming that sustained improvement in world sugar prices does not occur, it would appear advisable over the medium term to shift land under sugar cultivation to more intensive cultivation of high value crops with production cooperatives or family farms on the principal units of production.

8. The 1980 Review

1. The performance of the agricultural sector in recent years has been particularly weak as some of the basic problems facing the sector have been intensified. In addition to disease, floods and adverse weather conditions, the labour shortage has become most critical. Mid year estimates of employment indicate that the number of persons employed in this sector declined from 54.4 thousand in 1977 to 40.6 thousand in 1979 or by 25%.

2. The Sugar industry continues to present a depressing picture. Sugar output amounted to 110.3 thousand tonnes which was 21% less than that of 1979 and 45% less than that of 1976. In addition to delay in factory equipment supply, technical and electrical problems, unplanned fires, the labour shortage for field operations has been a major problem. The adverse effects are (a) high imports (8.4 thousand tonnes in 1981 - 400% more than that of 1975) at a cost of U.K. £384 per tonne (£125 in 1978/79), (b) non-fulfillment of Trinidad and Tobago export quota of 74,000 tonnes of raw sugar to EEC market under Lomé Convention and (c) disappearance of CARICOM market exports.

3. The Cocoa production continued to decline during second half of 1970's. The total production in 1979 was 2.6 m.Kg. - 23% less than 1978 level and 1980 production estimates will be far less (around 24% less than that of 1979). Note:- International market price rose by 300% during 1975-77, but declined thereafter. September 1980 price on London Market was £1054 per tonne, which was 33% less than that in 1979.

4. The production of coffee declined. In 1979 it was 2.5 m.Kg. (38% below 1975). 1980 estimates are 12% less than 1979. 55% of

coffee is exported. (Note: International price declined from T.T. $9.42 in 1978 to T.T.$6.88 in 1979).

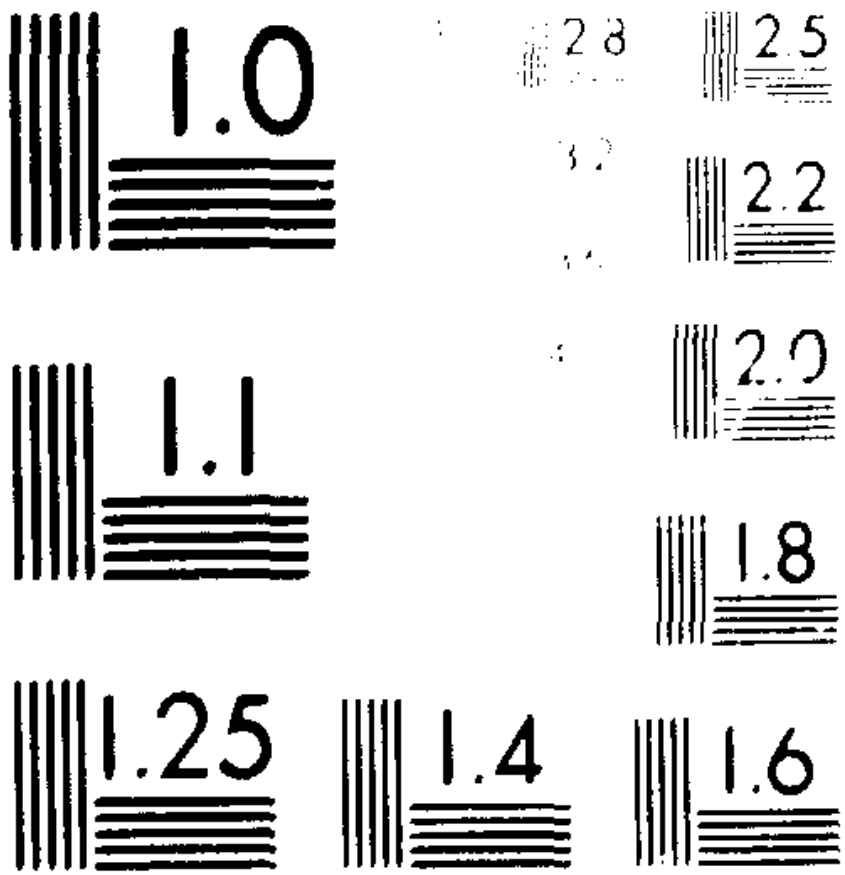
5. The production of citrus and copra has also declined.

6. Tobacco production which was 285 thousand Kg. in 1975 fell by 50% and in 1979, it was 119 thousand Kg.

7. The summary of agricultural production of cash crops in 1979 was as follows:

Production of Agricultural Products - 1979

Sugar	1.43 million Tons
Cocoa	2.628 million Kg.
Coffee	2.497 million Kg.
Citrus	182,000 crates
Copra	68,000 Tonnes
Tobacco	119,000 Kg.


1.0
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SECTION XVII

POULTRY AND LIVESTOCK SECTOR

A. General Analysis

1. Poultry production has grown rapidly in Trinidad and Tobago during 1972-77 as the consequence of promotional activities of the large feed grain companies and the country is now self-sufficient in poultry and egg production.

2. Pig farming is essentially confined to small farmers. Except for seasonal peak demand, the country is virtually self-sufficient.

3. About 70% of beef supplies and all the country's butter, cheese and other processed dairy products are imported. A substantial supply of fresh milk is produced weekly.

4. The major constraints to livestock production are the lack of a low cost supply of livestock feed and, in case of beef cattle, extensive grazing area.

B. 1980 Review

1. The poultry broiler production which expanded at an average rate of 8% in 1975-78 fell sharply in 1979 by 21%. In 1980, moderate recovery is expected. The major constraint in this field is high cost of feed. The 1979 production was 26.7 million Kg. (live weight) and processed broiler was 10.5 million Kg.

2. The 1979 Meat production was 4.5 million Kg. (22% increase over 1978). 1980 projections show 9% fall from 1979 figures.

3. In 1978/79 milk production was recovered. 1979 production was 6.25 million litres.

4. The 1979 production was as follows:

Production of Live Stock Products 1979

Broiler Birds	16,092
Eggs	4.751 million dozen
Meat	4.48 million Kg.
Milk	6.253 million litres
Fish	2.545 million Kg.

SECTION XVIII

SUGAR INDUSTRY

1. Sugar Industry in Trinidad and Tobago provides a base for local manufacture of selected components. Reshelling of rollers and machining of rollers and parts can be undertaken in the country. (Note: Barbados and Jamaica have reshelling facilities, with Barbados being limited to rollers up to 78 inches. Usane Ste Madeleine, for example has 84-inch rollers and these need to be sent to Jamaica for reshelling. For Trinidad and Tobago, about 24 rollers are reshelled per year at an average cost of about US$ 25,000 per piece, i.e. US$ 600,000 annually. The Spence Committee Report on re-organization of sugar industry has recommended upgrading facilities in Trinidad and Tobago to handle reshelling of these rollers.

2. The overall requirements of the sugar mills with respect to spare parts, ancillary components and fabricated items are yet to be analysed in Trinidad and Tobago on a systematic basis and rationalize the engineering production facilities and programmes. This should be undertaken on a priority basis and a forward planning exercise (3 - 4 years) is highly recommended.

3. Regarding sugar cane industrial estate requirements and sugar cane mechanization sector, there are potentials for local fabrication of a few equipment and components. There are discussions of this report in the "Agricultural Machinery and Implements Section".

SECTION XIX

AGRICULTURAL TOOLS, IMPLEMENTS AND MACHINERY

A. Background

1. The Government of Trinidad and Tobago (Industrial Development Corporation) submitted to UNDP/UNIDO in September 1977 a project (TRI/77/002/A/01/37) entitled "Feasibility Study of Assembly/ Manufacture of Agricultural Tractors".

2. The letter dated 11th April, 1978 by the Government clarified the objectives of the project as follows:
"... At this stage, our main concern should be to identify a tractor ideally suited to the needs of Trinidad and Tobago farmers and determine the minimum economic size plant for assembling these tractors if the plant size is too large for Trinidad and Tobago's requirements, then it would be necessary to undertake studies to determine whether export markets are available for this type tractor. If however, sufficient local demand exists for this tractor, then gearing for exports could be the next stage in the development of the project..."

3. Letter dated 11 April 1978 from the Government (Permanent Secretary, Ministry of Finance, Planning and Development to the Resident Representative stated that a prepared on-farm evaluation programme by the Government on 2 J.I case 14Ho tractor is scheduled for the period March - November 1978.

4. As of early 1981, the above project was approved by UNIDO/UNDP for a study on "Low cost agricultural machinery (tractors) and machinery implements suited to small farms (1-9 acres) in Trinidad and Tobago" and agreed upon to conduct a study at a national level (Trinidad and Tobago only) through an international subcontract by UNIDO. However, the project is not implemented yet.

5. Based on information secured by mission in July 1981 on small tractor evaluation programme, the following are the highlights:
   - The Government of Trinidad and Tobago (Ministry of Agriculture) secured in 1977/78, 6 Dong Fen 16 Hp 2 wheel walking tractors (gift from the Government of P.R. China) and similar 6 units were bought by the Government of Trinidad and Tobago. In 1978, 2 J.I. case (4 wheel riding tractors) of 14 Hp and 16 Hp were delivered as a gift by TENNECO of Houston, Texas, USA to the Government of Trinidad and Tobago. These were placed by the Ministry of Agriculture in a few farms and were used. No meaningful evaluation was conducted. The general feeling today is that these tractors are not suitable to Trinidad and Tobago.

B. <u>The major questions</u>

6. The question of agricultural machinery and implements in general and that of tractors in particular for Trinidad and Tobago is to be analysed in the following two contexts:
   - Is it for the localmarket only?
   - Is it for export market with emphasis on CARICOM market as well as international market (primarily Latin American?), but may be suitable to the local requirements also?

7. The basic facyors necessary to decide on a viable action plan are:
   - requirements/specifications;
   - Potential/demand;
   - import/local manufacture alternatives;
   - viability of local manufacture/assembly tvpe operations;
   - export market information;
   - production volume for export/import substitution operations

C. Some information on country's agriculture and mechanization

(i) Holding size and numbers

- Trinidad and Tobago has 531,250 acres of cultivable land. The distribution pattern is as follows:

Holding size	Total no of farms	total acres
1-4 acre	16,650	36,900
5-9	9,210	57,800
10-24	7,542	105,087
25-49	1,403	46,464
50-99	488	33,522
100-999	503	120,333
1000 and above	-	131,351

- 1-10 acreas are considered in Trinidad and Tobago small farms. It constitutes 20% of total number of farms.
- Land under sugarcane is around 90,000 - 100,000 acreas of which around 54,000 acre is under Government owned Caroni Sugarcane Company. The balance of around 45,000 acres are under 7000 private farmers who grow sugarcane and supply to Caroni Sugar Factory.

(ii) Farm size and structure

I Large farms: estate type

sugar cane coffee cocoa	usually 100 acres and above primarily estate owned. constitute around 47% of the land acreage. The total number of farms is around 500 and command around 50,000 acreas.

II Medium farms

sugar cane tobacco fruit orchard some legumes rice vegetables rootcrops	usually between 25-100 acres owned by private farms. Constitute around 15% of the land acreage. The total number of famrs around 1500 and constitutes around 80,000 acreas.

III Small farms

sugar cane tobacco some fruits legumes rootcrops rice	usually of 5-25 acres. Privately owned. Constitutes 30% of land acreage. The total number of farmers is around 9000 with around 150,000 acres.

IV Very small farms

mostly vegetable rice some pulse some fruits	usually 1-4 acres. Privately owned. consittutes around 8% of land acreages. The total number of holding is around 1700 with around 37,000 acreas.

(iii) Farm size and mechanization

I Large/Estate Farms (100 acre and above) - 500 units

These are primarily factory/estate owned and mechanized to a great extent. The farm income is not the only criteria for total estate/factory operations, although higher mechanization trends seem to be the present pattern.

II Medium Farms (25-100 acre) - 1500 units

These are private farmers contributing to estate operations or multi agricultural operations. They may have live stock also and operate a small agro industry. They may use estate agricultural machinery on hire or own their own. The trend is for mechanization.

III The small farms (5-25 acres) - 9000 units

These are private farmers with some farm mechanization. The tractor operations include own farm work, private contract on land and for haulage. These are mostly full time farmers. They may constitute majority membership in farm rehabilitation co-operatives and tractor pools. Some may subscribe to estate operation. The gross family income is around TT$ 3,000 per month.

IV Very Small Farms (1-5 acres) - 1700 units

They are operated by part time farmers who normally has an outside job (unskilled labour TT$ 40/day on public projects or a steady job). An average farmer with around 3 acre holding may grow 2 acre vegetable and 0.5 acre legumes with 0.5 acre fallow. In rainy seasons he will grow 1-2 acre rice. The farm gross income per family (2 adults and 2-3 children) is around TT$ 1000/month, most of the work is done manually.

D. The two consumer groups

The two major consumer groups for agricultural machinery in Trinidad and Tobago are:

- small and very small farms: total potential: less than 25 acres holding size, 33400 units.
  The major potential group around 5-15 acre holdings around 13,000 units, based on following preliminary observations and analysis
  (i) 1-5 acreas holding size partial farmers and will not invest on an immediate basis. They will depend on hiring from outside first whennecessary. Otherwise they will be on a manual basis. Promotion of small tractor (18-20 Hp) pool necessary.

  (ii) 16-24 acre holding size farmers may tend to follow mechanization patterns of medium/large size holdings.

  (iii) Preliminary conclusion: These average 5-15 acre holding size farmers will not prefer 2-wheel walking tractors, and wish to have comfort of 4-wheel riding tractor. Due to nature of cultivation and economic aspects, they prefer to have a small tractor. Around 18-20 Hp may be sufficient for all agricultural and allied operations.

- Medium and large farms: The critical potential 25 above 1000 acres size of holding, total number 2000 units. Maximum potential 16 - above 1000 acreas, 6500 units. The major immediate potential on 16-50 acre holdings, 4500 units based on following preliminary observations and analysis.

(i) The 16-20 acre holding size farms will tend to follow higher mechanization pattern.

(ii) 1000 acre and above will go for full mechanization with following pattern:
Primary tillage - crawler tractor 145-170Hp;
Infield mechanization - 150 - 160 Hp wheel tractor;
Semi mechanized operations - 100 - 120 Hp wheel tractors;
weed control, general - 70 - 80 Hp
haulage and inter wheel
cultivation tractor

(iii) Preliminary conclusion: These average 16-50 acre holding size farmers do not wish to owne the whole equipment range owned by the fully mechanized large farms. They may hire out from them or use tractor pool. However, they will tend to optimize the usage of machinery by rationalizing the range. They will use 80-100 Hp wheel tractors for primary tillage, semi - mechanized operations and weed control, general haulage and inter-row cultivation.

E. Import VS local manufacture choice and potential

The following may be possible choices.

(i) For very small farms less than 4 acre
- import a few 5-8 Hp 2 wheel walking tractors and implements. Recommended to import around 300 units of 2 makes (150 units each) and undertake extensive private farmers acdeptance without undue financial support.
- quality forged hand tools: To be locally manufactured.
- hand sprayers: locally manufactured

(ii) For small farms (5-15 acres)	- local manufacture of small 4 wheel riding tractor (18 Hp) with emphasis on possible export - local manufacture of all matching equipment and implements (for export also) - local manufacture of quality forged hand tools (for export also)
(iii) For large farms (100 acre and above)	- import crawler tractors 145 - 180 Hp - import heavy wheel tractors 150 - 160 Hp - rationalize 80-100 Hp tractor for local assembly - local assembly/with some fabrication of larger implements and equipment (boom sprayers, disc plow, ridger plow, planter, harvester, trailer, etc).

F. Local Manufacture (export oriented) VS local assembly (import substitution)

(a) Local Manufacture: (export oriented)

- Although the following products are for local needs, it appears that there is ane xport potential which may have a significant impact on manufacturing volume.

- Forged Quality hand tools: These are not manufactured in CARICOM countries and a number of neighbouring countries.

- 4 wheel riding tractor (18 Hp); These in Trinidad and Tobago has a total potential of 30,000 units, and effective and viable total potential of 13000 - 15000 units. The annual demand is estimated to be around 1000 units in 1982/83 expanding to 2000 units by 1985/86. There is an export potential for this Hp agricultural tractor as they are not produced in neighbouring countries and are not generally available. (Note: 25 Hp and above range, there will be

serious competition in the international market) the most competitive being 40-65Hp).

- All matching implements: They will have export potential and local demand too.

(b) Local assembly (import substitution)

The following products are primarily for local requirement with no export potential.

- 80-100 Hp 4 wheel riding tractor
  The total potential demand is around 6500 units, the effective/viable total demand is around 5000 units. Estimated annual demand 300 units by 1982/83 and 500-750 units by 1985/86.
- All matching equipment and implements
  except for critical parts, most of the items/components could be locally produced.

G. Recommendations

(a) 18-20 Hp small riding wheel tractor and implements

- preliminary feasibility study in selected Latin American countries and Trinidad and Tobago (market and demand);
- visit of 4-5 men team of Trinidad and Tobago (1 from Ministry of Agriculture, 1-2 from CARIRI, 2 from IDC) to India, Thailand, Italy and France to study available tractors and its production techniques. Preliminary negotiations with manufacturers for local production.
- Import of 25 units of two makes (most suitable plus manufacturer interest to enter into local production collaboration) to Trinidad and Tobago with matching equipment and 1-2 season quick analysis with actual farmers.
- Negotiations with 2 manufacturers and final selection of 1 manufacturer.

(b) 80-100 Hp 4 wheel riding tractor and matching equipment

- A feasibility study in the country;
- Negotiations with interested manufacturers;
- Further action.

(c) Quality forged hand tools

- Feasibility analysis in selected Latin American countries and Trinidad and Tobago (market and demand);
- Negotiations with interested manufacturers;
- Further action.

ANNEX I

HIGHLIGHTS OF SOME OF THE FACTORIES AND INSTITUTIONS VISITED

A. CONSOLIDATED APPLIANCES LTD. TRINCITY AND SOME OBSERVATIONS

(i) This is a private company. It primarily assembles air-conditioners, (kelvenator) - 20 units/day, refrigerators (Admiral Corporation, Westing House) - 160 to 200 units/day, cookers (Bampani Italy) - 130 units/day (with a flexible production programme) are undertaken with foreign collaboartion. The firm has 600 staff. The production is primarily on a single shift basis.

(ii) The future plans of the company is to assemble more cookers, refrigerators and air conditioners and also take up washing machines, dryers, etc.

(iii) All components are imported (compressors, condensors, motor, wiring harness, ice trays etc). The sheet metal and thermo plastic material are imported and the body is moulded here.

(iv) The company appears to be well organized and well run.

B. UNIVERSAL METAL CO. LTD. TRINCITY

(i) This is a private firm. It is a subsidy of Grell a Co. (a local company) which is owned by Neal and Massey, a local holding company. It has 110 workers, 25 office staff, 7 management staff and 2 Engineers. The turnover is 800 - 1.0 million TT/month. It manufacturers metal furniture (office, school) fensing, storage systems, wire mesh for RCC etc. Most of the raw material is imported; except for locally purchased package cartoons (CPI) and plastic bags (polymar).

(ii) The chain link, fencing mesh, linked wire were taken up recently. The new products - slotted angles, filing cabinets were added to production programme through foreign licence on royalty basis (5-7 years).

(iii) The production facilities appear to be fairly modern and the company appears to be well organized and managed.

C. EAST END FOUNDRY, P.O.S.

(i) It is a member of "Neal and Massey" Group. The foundry is small and old. However, it is producing fairly good quality products.

(ii) It has a pattern shop, foundry (C.I - ferrous and a very small brass - non-ferrous), a machine shop (some new equipment) and a structural fabrication shop (will be moved to another place).

(iii) The foundry products (based on analysis of its pattern shop, and may include products from the past 10-12 years) consist of following items (not exhaustive):
gear wheels (for sugar, cement, fedchem. and oil industry), bearings, flanges, valves, chain wheels, impeller core, pulleys, different size of gears, 51 inch dia worm gear, part of pipe bender, hammer, pump housing, impellers, manhole covers, sugar mill pistons, cement mill rollers, etc.

(iv) The production is around 1.5 tons of ferrous per month and 0.5 tons of non-ferrous castings per month. The fabrication work include silo, tanks, etc.

(v) From the type of operations, it is apparent that given proper equipment and training, Trinidad and Tobago has a basic capabilities to produce quality castings.

D. TRINIDAD AND TOBAGO ELECTRONICS LTD. P.O.S.

(i) T and Tel is owned by IDC, a Government undertaking. It has a labour force of 100, turnover of TT $ 7.0 million/year. The market share of T and Tel in Trinidad and Tobago is 100% in video consumer electronics, and around 60% in Hi-Fi etc. The factory was started in 1971. The original manufacturing programme was 10 models of its own design and brand ("METRONICS") of audio equipment (Hi-Fi, Stereo) with 50% local content. However, during 1974/75, the company faced problems in its sales primarily due to its lack of cosmatic features, quality and some technical problems. During 1979/80, the company disbandaned its own brand and started assembly of Kenwood, NEC, Akai stereo equipment. The company also is engaged in communication equipment supply, installation and service to telephone industries. The future plan of the company includes games and possibly expanded technical service (for other detials - see section on electronic industries).

E. METAL INDUSTRY COMPANY (MID) TRINICITY

(i) MIC is under the jurisdiction of IDC. The company was estalbished in mid 1970s. Its present functions are to (a) design and manufacture moulds, dies and new tools in the area of metal mechanics and plastics (b) render technical advise/assistance to industries and various Government agencies (c) impart training.

(ii) The present training programme includes a total staff of 132 including 76 trainees (Government input TT$ 2.0 million/year) with a 7-year training programme.

(iii) The gross income in 1980 by commercial activities was around TT$ 1.1 million.

(iv) As the present activities of MIC are a mixture of commercialization and training, there appears to be a thinking in the Government circles on the need for re-orientation of MIC;such a re-orientation may include:

- emphasis on training;
- possible giving away to small scale industry/ entrepreneur the intermediate level activities in jigs and fixtures;
- less emphasis on commercial activities;
- transformation of MIC into a service organization;
- re-orientation of training programme to meet the immediate and future requirements of industrial sector of the country with emphasis on skilled workers level and engineers level.

F. NEAL AND MASSEY LTD.
(automobile assembly) P.O.S.

(i) Neal and Massey started automotive assembly in 1966. The general motor car models were discontinued in 1970. From 1971, Neal and Massey assembly Nisan, Mazda Japanese cars (small - 1100 cc, medium 1800 cc and large 2800cc), and Iton (1600 cc) Dastus and Mazda pick up vans and General Motor (U.K.),Vauxal trucks 2 ton (J1,J2) and 8-10 tons (J3 and J4) models.

(ii) Like all other automotive assembly operations in the country, Neal and Massey change models as per their overseas suppliers. All critical components (engine, transmission, brake, steering, etc.) are imported as full assemebled kits. The local operation consists of spot welding the body (chasis), anti-corrison treatment, printing and assembly. The body (chasis) welding fixture is locally made based on imported prototype and drawings (3-4 months motice) and used for about 1500-2000 units each.

(iii) The present plant labour force is around 600. The plant will be moving in January 1982 to a new assembly plant located at ARIMA which has a total investment of TT$ 80 million (with conveyor system, EDP painting, etc.)

G. TRINIDAD AND TOBAGO MANUFACTURERS ASSOCIATION (TTMA) P.O.S.

(i) It has a total membership of around 175 of which around 15 are associate members. The membership is divided into 9 groups as follows:

- Agro industries (6 members)
- Assembly engineering industries (17)
- construction and building materials industry (31)
- cosmetics, toiletries and medical products industry (11)
- domestic products industry (12)
- food, beverage and tobacco industry (28)
- paper, printing and packaging industry (17)
- petroleum, plastics and chemical industries (8)
- textiles and apparel industries (29)

(ii) TTMA is willing to participate and co-operate with the Government in any activities involving industrial development and training.

H. PUBLIC TRANSPORT SERVICE CORPORATION (PTSC) P.O.S.

(i) PTSC came into existance after the railway was disbanded in late 1960s. Today it has a fleet of 750 units with 300 staff. However, the total requirement of Trinidad and Tobago at the present is around 375 units only. The corporation caters to the needs of the entire country. It has vehicles from the U.K., USA, FRG, Japan and India. The spare parts annual requirement is 24 million TT. However, PTSC is of the opinion that the components can not be locally produced as they are low in number (each items), and specific in requirements and technology.

(ii) The corporation has a plan to expand the present fleet of 750 units to 1500 units in the next 5 years, with an operational fleet of 1400 units.

(iii) A local consultant is preparing a briefing material for such an expansion. The programme will involve two sets of consultants - one on design of the system and one on design of the details of the facilities. The total cost would be around TT$ 350 million for the physical facilities.

(iv) There appears to be a feeling in the corporation that there is no need to reduce the number of types of vehicles and rationalize the products. This is based on the feeling that any standardization of the fleet will not involve standardization of the model but of a manufacturer. The manufacturer is changing the models frequently.

(v) However, it should be noted that the change in design of commercial vehicles is not frequent and significant as compared to products of high technology. Unless there is a rationalization of products, the possibilities of local fabrication of some spares and automotive ancillary industry development in the country will not be possible.

I. CARIBBEAN INDUSTRIAL RESEARCH INSTITUTE (CARIRI)

(engineering division and electronics division)

(A) The present status

(i) CARIRI was established in 1969. The main objective is to provide scientific and technological services, applied research and development or adaptation of technology as required by Trinidad and Tobago's industrial sector. CARIRI has 7 divisions at the present - food and chemistry, engineering, technial and support service, electronics, economics and system research, materials technology, technical informations services.

(B) Activities of Engineering Division

(i) The Engineering Division's major recent project are Bay oil project, Dual purpose harvester, coconut Dehusker, cinnamon oil and pigeon pea sheller.

(ii) In 1980/81, the proposed programmes are (a) plastic transformation (b) wood processing industries - rationalization (c) sugar factory technology (d) automotive component manufacture and (e) rice industry - post harvest technology.

(iii) The problems of Engineering Division - design and development activities and lack of effective liaison for entrepreneurship promotion are:

- lack of technical personnel;
- lack of physical facilities;
- lack of integrated methodology for identifying appropriate products and design and development problems;
- lack of continuity in approach and systematic transformation into commercialization;
- lack of industrial liaison.

(iv) The following highlights some of the design problems that were undertaken by the Engineering Division and the lack of an appropriate mechanism to identify products and a design, development and industrial extension programme:

(a) Coconut Dehusker: The concept was first thought about by the Agricultural Engineering Section of the Engineering Faculty of the University of West Indes. The CARIRI project was started in 1975 in co-operation with the Coconut Grower Association (CGA of TT) and Lever Brothers. The project cost is TT$ 160,000 (CARIRI $ 100,000 and CGA $ 60,000). The first prototype was made in 1976 and the second in 1978. The capacity is to be 800 coconuts/hours, but the project was disbandoned in 1978 due to lack of funds.

(b) Rice Thresher: From IRRI, drawings were obtained in mid 1980, based on an engineers visit to IRRI in Sept-Dec. 1976. Two prototypes were built by end 1980. (600 kg/hr design capacity, 300 kg/hr actual capacity, THP B and S engine). One prototype was given to the Ministry of Agriculture in end 1980. No report has yet been received. TT$ 100,000 was spent on this R and D project. The estimated price of the thresher is TT$ 700 plus TT$ 700 for engine. Total price may be around TT$ 1500. But the project at the present has no direction, and future is not known.

(c) Pigeon Pea Harvester/Sheller: The University of West Indes had a 10 year legume development programme with USAID assistance. A research grant project on harvesting of legumes was undertaken. A black-eye pea sheller/harvester was purchased from USA. In 1975/76 the project (TT$ 130,000) on pigeon pea harvester engineering desgin was taken up CARIRI. In 1980 some modification were done on imported harvester, to include sorrel harvesting. The results have shown that a combined pigeon pea-sorrel harvester is not efficient. The project is at stanstill now.

Note: (i) The fabrication of dehusker and harvester was done at the Technical Service Division of CARIRI.

(ii) The Faculty of Engineering of UWI has depart of machanical engineering. The Agricultural Engineering Section - with CIDA assistance - and Industrial Engineering Section was started in 1977. As a final year R and D project, a coco podder machine and nut meg seperator has been taken up.

(v) Regarding automotive components, CARIRI with IDC has a technical group to conduct studies on what components can be made locally. However, it should be understood that such a study will be academic in nature if it is not based on various possible/desirable alternative policies of the Government on rationalization of automotive industry.

(C) Activities of Electronics Division

(i) The Electronic Division of CARIRI was established to assist in the development of an electronics industry in Trinidad and Tobago by undertaking Rand D projects and to provide specialized services in the areas of instrument calibration, repair and quality testing for locally manufactured products.

(ii) The R and D programmes in this case may also not necessarily have a national impact. For example it is reported that the division has designed and developed a transreceiver (two way radio) and project stage was completed in 1979 and it is also reported that the commercializationof design equipment is now with the Industrial Development Corporation. Design and development work on microwave processors is also contemplated.

(iii) However, it is yet to be seen the possibility of commercialization at a viable level (especially with due consideration to the "metronics" experience of Tand Tel Ltd.) Electronic industry local manufacturing is only possible if appropriate policy dicisions are taken. Otherwise the R and D work will be normally academic, with training and scientific experience as only two gainful elements. It is strongly recommended that a more co-operataive activities between CARIRI and T and Tel is undertaken.

(iv) One of the useful work programme of CARIRI is the instrument design, calibration and maintenance and training as well as product testing and quality assurance test. It is highly recommended that in co-operation with T and Tel Ltd. a national programme on a well organized commercial level is undertaken to meet the requirement of the domestic sector needs as well as the needs of the industry in electronic sector.

J. INDUSTRIAL DEVELOPMENT CORPORATION (IDC) P.O.S.

(i) Industrial Development Corporation IDC) was established in 1959 to promote and stimulate industrial development and the development of hotels and to act as liaison between the Government and private sector in such matters. IDC, in pursuance of its objectives, administers the Government system of incentives and assist industrialists foreign and local, in utilizing the incentives offered to establish manufacturing plants, hotels, small business and to expand existing ones. The principle areas of activity of IDC are as follows:

- industrial promotional activity;
- industrial liaison activity
- project identification and preparation;
- preinvestment studies;
- small business assistance.

(ii) IDC is in the process of formulating a programme for development and promotion of capital goods industry sector in the country.

A Guide on Spare Parts Requirements: Automotive and Tractor Sector

ANNEX II

REPLACEMENT TURNOVER FACTOR (RTF)

(Frequency of replacement of a Component during a Vehicle's road-worthy life).

(case study - India)

(Each country has to adjust these figures as per local conditions and models).

SL. No.	Nomenclature	Commercial Vehicles Heavy and Medium	Commercial Vehicles Light	Cars and Jeeps	Scooters, Motorcycles and 3-Wheelers	Tractors
1	2	3	4	5	6	7
1.	Pistons	3	2	2	3	2
2.	Piston Pins	3	2	2	3	2
3.	Piston Rings	6	4	4	6	4
4.	Gaskets	10	6	6	10	10
5.	Inlet and Exhaust Valves	4	3	3	3	4
6.	Valve Guides	3	2	2	2	3
7.	Valve Springs	1	1	1	1	1
8.	Valve Tappets	1	1	1	1	1
9.	Push Rods	1	1	1	1	1
10.	Timing Chains	3	1	½	2	4
11.	Carburettors	1/10	1/10	1/10	1/10	-
12.	Fuel Pump (petrol)	1/10	1/10	1/10	-	-

1	2	3
13.	Fuel Injection Pump (multicylinder)	1/20
14.	Fuel Injection Pump (single cylinder)	-
15.	Fuel Injection Pump Nozzles	6
16.	Fuel Injection Pump Nozzle Holders	1/20
17.	Fuel Injection Pump Elements	4
18.	Fuel Injection Pump Delivery Valves	4
19.	Filters (Air, Oil and Fuel)	1/100
20.	Filter Elements/Inserts/Cartridge	15
21.	Flywheel Ring Gear	1/20
22.	Water Pump	1/100
23.	Water Pump Repair Kit	8
24.	Radiator and Cores	1
25.	Silencer Muffler	4
26.	Thinwall Bearings	3
27.	Starter Motors	1/2
28.	Generators	1/2
29.	Voltage Regulators	3
30.	Distributor Assembly	1/2
31.	Condenser, Contact Point, Distributor Rotor	6
32.	Ignition Coil	4
33.	Flywheel Magneto	-
34.	Spark Plugs	15
35.	Steering Wheels	1/20

4	5	6	7
–	–	–	1/20
–	–	–	–
–	–	–	6
–	–	–	1/20
–	–	–	4
–	–	–	4
1/100	1/100	1/100	1/100
8	8	–	15
1/20	1/20	–	1
1/100	1/100	–	1
3	3	–	4
1/20	1/20	–	1
1	1	1/10	3
2	2	–	3
1/100	1/100	–	1/2
1/100	1/100	–	1/2
3	1/40	–	4
1/100	1/100	–	–
6	4	–	–
2	1	1	–
–	–	1/100	–
8	6	8	–
1/20	1/40	–	1/100

1	2	3	4	5	6	7
36.	Steering Gear	1	1/10	1/10	-	1
37.	Tie Rod End	5	3	2	-	3
38.	Drag Link	3	3	-	-	3
39.	King Pins	8	6	-	-	2
40.	Wheels	1/100	1/100	1/100	1/100	1/100
41.	Clutch Assembly	1/10	1/10	1/10	1/10	2
42.	Clutch Plates	8	3	3	2	2
43.	Clutch Linings	6	3	3	-	4
44.	Gear	2	1/2	1/10	1/4	1
45.	Propeller Shafts	1/10	1/20	1/20	-	-
46.	U. J. Cross	6	3	2	-	-
47.	Crown Wheel and Pinion	3	2	1/4	-	1
48.	Rear Axle Shaft	3	1	1/10	-	1
49.	Oil Seals	6	3	3	3	4
50.	Leaf Springs	2	1	1	-	-
51.	Coil Springs	-	-	1	2	-
52.	Shock Absorbers	6	2	2	2	-
53.	Hydraulic Brake Assembly	-	-	-	-	-
54.	Master Cylinder Assembly	1	1/20	1/20	-	-
55.	Master Cylinder Repair Kits	10	6	4	-	-
56.	Wheel Cylinder Assembly	2	1/20	1/20	-	-
57.	Wheel Cylinder Repair Kit	10	6	4	-	-

1	2	3	4	5	6	7
58.	Air Brake	1/100	-	-	-	-
59.	Brake Linings	8	4	4	6	6
60.	Brake Hose	3	2	1	-	-
61.	Brake Drum	2	1/20	1/100	-	1/20
62.	Hubs	1	1/100	1/100	-	1/100
63.	Electric Horns	1/2	1/10	1/10	1/10	1/100
64.	Horn Relay	3	2	2	-	-
65.	Wiper Motor	2	1/20	1/20	-	-
66.	Wiper Arms and Blades	4	4	4	-	-
67.	Head Lamps	1/10	1/10	1/10	1/10	1/10
68.	Flasher Units	6	6	6	-	-
69.	Control Cables	2	1	1/2	1	2
70.	Speedometer	1/10	1/10	1/10	1/20	-
71.	Panel Instrument	1/10	1/10	1/10	-	1/10
72.	Battery	6	4	3	4	4
73.	Tyres	10	6	3	6	4

ANNEX III

List of Documents Reviewed

Trinidad & Tobago 5 - 11 th July, 1981

1. Review of the Economy 1980. Republic of Trinidad and Tobago. GOTT.

2. Economic position and prospects of Trinidad and Tobago Vol 1. The Main Report No. 2218 - TR. Dec. 17, 1978 Agreement of the World Bank.

3. Prime Minister's Export Award Brochure (12th Anniversary) by the Committee 1980.

4. The Report on Reorganisation of Sugar Industry 1978. Spence Committee Report (Extracts).

5. Report on the problems and prospects of developing a capital goods industry in Trinidad and Tobago - by Metal Industries Company (MIC) Dec. 1977.

6. CARIRI Report - 1979

7. Neal & Massy Holding Limited Annual Report 1980.

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8. Report of the Commission of Inquiry into the Structure of Fare charged by Public Service Vehicles in Trinidad and Tobago (Chairman: Dr. Selwyn Ryan) May 1981.

9. Trinidad and Tobago Business Directory and Guide to the Lome Convention: By Trinidad & Tobago Manufacturers Association - 1979.

10. Oil and Food: Basic discussion paper by Government of Trinidad and Tobago January 1975: Chapter on "A proposal for Mechanization of Rice Production and Processing in Trinidad and Tobago.

11. Status of the Project for "on - the - farm" Evaluation and Techno Economic feasibility and Manufacture/Assembly of a Small (5 - 20 Hp) Tractor and matching implements in Trinidad and Tobago by Mr. D. S. Duggal, Agri Engineer, Ministry of Agriculture and Mr. E. Baccus, Director ESPD, IDC, September 1977.

12. Guidelines for Development of the Automotive Industry in the Caribbean by Mr. Michael Paty, ESPD, IDC March 1973.

13. Project File DP/TRI/77/002: Assembly/Manufacture of Small Agricultural tractors and other agricultural machinery, equipment and implements.

14. Project File DP/TRI/81/002/A/01/37: Capital Goods Development Programme.

15. Report of the Mission on Capital goods Development in Trinidad and Tobago. Mr. S. Zampetti 2 - 9th August 1981.

16. Draft Project Agreement - "Capital Goods Development Programme" (UNDP input $107,000 Six months: Prepared by Mr. S. Zampetti.

17. Draft Project Document - "Capital Goods Development" ($107,000 Six months) - Draft of MIC revised by Ms. Bankcraft of UNIDO during her Trinidad mission on June 21, 1981.

18. "Helping industry grow" - Industrial Development Corporation.

19. "Where to find Assistance" - Industrial Development Corporation.

20. Industrial Development Corporation - Assistance for Small Businesses.

21. The Trinidad and Tobago Manufacturers Association - A Profile.

22. Trinidad and Tobago Manufacturers Association - Directory of Members 1980.

ANNEX IV

LIST OF PERSONS MET

(with Swamy Rao's Mission)

I. INDUSTRIAL DEVELOPMENT CORPORATION (IDC):

(1) Mr. Eldon G. Warner
General Manager.

(2) Mr. Hart Edwards
Deputy General Manager (Corporation Activities)

(3) Mrs. Annisa Abu Bakr
Acting Director, Economic Studies & Planning Division.

(4) Mr. William A. Murray
Chemical Engineer, Economic Studies and Planning Division.

(5) Mr. Osric Bailey
Industrial Research Officer.

II. CARIBBEAN INDUSTRIAL RESEARCH INSTITUTE (CARIRI):

(6) Mr. Hollis Charles
Director.

(7) Mr. Liaquat Shah
Chemical Engineer, Head Engineering Division.

(8) Mr. Chandra Dinanath
Mechanical Engineer.

(9) Ms. Shobee Maraj
Information Specialist.

III. METAL INDUSTRIES COMPANY (MIC):

(10) Mr. Stanley Lau
General Manager.

(11) Mr. Vishnu B. Tewari
Project Coordinater.

(12) Mr. J. C. Boney
Senior Training Officer.

(List of Persons cont.)

IV. NATIONAL ENERGY CORPORATION (NEC):

(13) Dr. Clayton A. E. Najab
Corporate Planner.

(14) Mr. Peter Braithwaite

V. PUBLIC TRANSPORT SERVICE CORPORATION (PTSC):

(15) Mr. Cecil St. Hill
General Manager.

VI. MINISTRY OF AGRICULTURE LANDS AND FOOD DIVISION:

(16) Mr. D. S. Duggal
Field Engineering.

VII. INDUSTRIAL ESTABLISHMENTS:

(a) CONSOLIDATED APPLIANCES LTD., TRINCITY (Refrigerator, air conditioners, gas cookers, freezer assembly)

(17) Mr. Horace Alfonso
Engineering Manager.

(b) UNIVERSAL METAL COMPANY LTD., TRINCITY
(subsidy of Grell and Company owned by Neal and Massy Group) (Manufacture of Metal Office Furniture etc.)

(18) Mr. Psadeep Kumar
Production Manager.

(c) NEAL AND MASSY INDUSTRIES LTD. (Automobile Assembly)

(19) Mr. Benard Whiteway
General Manager.

(20) Mr. Rodney Harnarine
Quality Control Manager.

(List of Persons cont.)

VII. INDUSTRIAL ESTABLISHMENTS:

(d) CARONI LIMITED, BRECHIN CASTLE (Sugar Estate and Sugar Mill: Public Sector)

(21) Mr. L. P. Donawa
Agricultural Manager.

(22) Mr. D. A. Buxo
Manager, Agricultural Services (North)

(23) Mr. Ahmed Khan
Works Manager.

(e) EASTEND FOUNDRY LTD. (Casting, Machining, Fabrication)

(24) Mr. Goodridge
Production Manager.

(25) Mr. Samuel
Supervisor.

(f) TRINIDAD AND TOBAGO ELECTRONICS LIMITED
(Assembly sterio systems and communication service

(26) Mr. Dennis R. Bally
General Manager.

(g) POINT LISAS INDUSTRIAL DEVELOPMENT CORPORATION (PLIPDECO) - NEC

(27) Mr. E. Dickerson
Personnel/Administrator Manager.

VIII. PROFESSIONAL ORGANIZATIONS:

(a) ASSOCIATION OF PROFESSIONAL ENGINEERS

(28) Mr. Vincent Bowles
President Elect. (ADB Consultants - Mechanical, Electrical, Structural etc.)

(b) TRINIDAD AND TOBAGO MANUFACTURERS ASSOCIATION

(29) Mr. Clive Teelucksingh
General Manager.

(List of Persons cont.)

IX. UNDP - UNIDO PROJECT OFFICALS:

(30) Mr. J. W. Mococain
UNIDO Project Manager, Metal Industries Company (MIC)

(31) Mr. Erust Schwandimann
UNIDO Metal Product - Die Design Expert (MIC)

(32) Mr. Witold Sienkiewicz
UNIDO Expert - Plastic - Products and Mould Design (MIC)

X. UNDP:

(33) Mr. Leonard Houzer
Resident Representative.

(34) Mr. L. Erikson
Deputy Resident Representative.

(35) Mr. Klaus Schafer
Junior Professional Officer - UNIDO.

(36) Ms. Emanuella Bimini
Junior Professional Officer - UNDP.

XI. At Interministerial Meeting (in addition to others):

(a) Ministry of Finance:

(37) Ms. Arlene McCommie

(38) Mr. Naville Donridge

(39) Mr. Harry Mungalsingh

(b) IDC:

(40) Mr. T.K. Dan,
Engineer