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PROMOTION AND DEVELOPMENT OF
AGRO-RELATED METALWORKING INDUSTRIES (PHASE I)

US/RAS/92/072

SOLOMON ISLANDS

Country Report*

Prepared for the Government of Solomon Islands
by UNIDO in co-operation with RNAM/ESCAP

Based on the work of Reynaldo M. Lantin
UNIDO Expert

United Nations Industrial Development Organization
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SUMMARY

1. INTRODUCTION

The Special Programme for the Industrial Development of Asia and the Pacific, launched by the Third General Conference of UNIDO in 1989, has focused on two industrial subsectors supporting the vital agricultural sector of the least developed countries of the region: agro-related metalworking and food-processing industries. This approach has been endorsed by the policy making organs of UNIDO (GC.4/Res. 8 and 9, GC.5/Res.14) and funds have been allocated from various sources in support of preparatory activities in these fields. The priority areas to be addressed in the agro-related metalworking industries were identified in 1990 through a process of desk research and country consultations and a UNIDO/ESCAP Regional Workshop with representatives from most of the LDCs in the region. Subsequently a project was launched, in close cooperation with the ESCAP-executed Regional Network of Agricultural Machinery (RNAM) in Bangkok, with financial support from Italy and assisted by Associate Experts financed by Germany and the Netherlands, to achieve the following outputs by early 1994:

(a) National Focal Points in participating countries strengthened to be capable of providing a continuous flow of technical information and advice to enterprises in agro-related metalworking industries.

(b) Detailed proposals for **prototype exchanges** and assistance in the establishment of a **service for raw material procurement**, concrete **policy guidelines**, and concrete mechanisms for the **improvement of cottage-scale agro-related metalworking industries**.

(c) Detailed plan for the preparation of technical cooperation project documents in agro-related metalworking industries in areas requested by the concerned governments.

The countries participating in the process are Bangladesh, Bhutan, Cambodia, Lao PDR, Myanmar, Nepal, Solomon Islands and Western Samoa. The UNIDO expert visited all relevant production units, training and support institutions and ministries in these countries and, in addition to providing on-the-spot advisory services, prepared very detailed reports on the state of the industry in each country, constraints, potential areas of development and proposals for regional and national technical cooperation. As a result of this comprehensive analysis involving all relevant parties in the private and public sector, and bearing in mind ongoing and planned activities by the governments and the donor community in the participating countries, a thematic programme was formulated for the further promotion and development of these industries building on the successful implementation of the first phase and fruitful partnership with RNAM and the national focal points.

This Country Report on Solomon Islands is one of the outputs of the UNIDO assisted Project, US/RAS/92/072, Promotion and Development of

Agro-related Metalworking Industries in Least Developed Countries (Phase I). It provides an account of the problems to be addressed, linkages with other programmes to reach the target groups, and a matrix of proposed responses by UNIDO with donor support. The overall objective of this thematic programme is to promote rural development in the least developed countries of Asia and the Pacific through the promotion of indigenous manufacturing of agricultural tools, implements and post-harvest processing equipment thus, providing a subsectoral and technical dimension to national efforts to promote and develop cottage, small- and medium-scale industries.

2. DESCRIPTION OF THE SUBSECTOR

The agro-related metalworking industry subsector in the LDCs of Asia and the Pacific region has merited due attention and priority considerations for development in view of its impact on agriculture and the rural sector communities of these countries. Since agriculture is the mainstay of the LDCs, self-sufficiency in food for the increasing population which brings pressure to the constant land area and the environment, increased productivity of land and labour and hence, of agricultural production and income of farmers, are among the primary development objectives in these countries. The development of an agro-related metalworking industry for the manufacture of hand tools, single-animal-drawn implements and small mechanical powered machinery through developing capabilities of the private sector mainly through provision of institutional support from the public sector, provides a promising growth potential in and supportive role for agriculture and the agro-based processing industries. This is in view of the past neglect resulting from a state enterprise approach in agricultural mechanization which has proven to be unsustainable especially in the socialist countries. Most of the State-owned and large-scale enterprises declined in operation and viability with the collapse of the Council for Mutual Economic Assistance (CMEA). This situation is particularly prevalent in Cambodia, Lao PDR and Myanmar.

All the LDCs have now taken the new approach of letting the private sector take over the former government function of supplying tools and implements to farmers in the current efforts of privatisation of State-owned enterprises along with the adoption of the policy from centrally planned to liberalized market economy. The private sector is therefore, expected to take the initiative and to produce the required tools and implements on a commercial basis. However, due to their lack of experience and prior success cases in the private sector, the hesitation on the part of the private sector needs to be overcome by adequate infrastructure and institutional support with less of government intervention and restrictions but with due encouragement, such as allowing their products to develop a competitive edge over imports during the early stages of the enterprise.

In most of the LDCs the village blacksmiths are the primary suppliers of basic hand tools and animal-drawn implements being used by farmers. In general however, no institutional support has been given to blacksmithing which may be classified as a metalworking cottage industry but which performs an important role in agriculture and rural development. Small-scale entrepreneurs in the LDCs have so far been timid

in investing in agro-related metalworking enterprises, that is, production of more modern, efficient and higher capacity machines than those which can be produced by blacksmiths. Thus, the small-scale enterprises need basic machine tools in their fabrication or foundry workshops as well as technical assistance in product design, manufacturing, quality control and information on business management, including the financial and marketing aspects.

In LDCs where small-scale agro-related metalworking enterprises exist, typical owners are those who have had experience as former workers in other shops and started out to venture on their own. They simply train their own workers initially as apprentices, then given on-the-job training. Very few owners have engineering background and most workshop owners rely on their own creative and mechanical talents to produce machines which they perceive as having some market. Ideas usually come from existing prototypes or commercial machines which are copied or improved. Some medium-scale workshops may have engineers on the staff who would be assets in product development and improvement of machines being copied or adapted from sources abroad, normally as suggested or ordered by some international non-government organizations (NGO) for their projects in the country.

As the governments in the LDCs have adopted the open-market policy, any products to be marketed by the agro-related metalworking industry subsector has to compete with imported counterparts. The tariff structure, in the LDCs where it exists, often favors the imports in that finished goods are less taxed that raw materials.

In accordance with the Terms of Reference (Annex), the UNIDO Expert visited Solomon Islands from 20 January to 4 February 1994 and met with the Government officials concerned. Through the arrangements made by the Ministry of Commerce, Employment and Trade, Industrial Development Division which is the national focal point and the UNIDO project Chief Technical Adviser in Honiara,he also visited relevant institutions, organizations, factories, workshops and farming areas in Solomon Islands. This report contains two project concepts, one regional for eight least developed countries in Asia and the Pacific, including Solomon Islands, and three country-specific for Solomon Islands.

Based on the country reports of the UNIDO Expert for each LDC during Phase I of the project, US/RAS/92/072, Promotion and Development of Agro-related Metalworking Industries in Least Developed countries, the status of the industry and the related agricultural mechanization in Solomon Islands is given below.

The industrial sector comprises a wide range of small- and medium- scale manufacturing and processing enterprises concentrated in the wood, fiberglass and metalworking, vehicle and shipbuilding and repair, light engineering, garment manufacturing, soap and food and drink production. The new brewery is the largest enterprise in the drink production industry.

The enterprises are mostly concentrated in the Kukum and Ranandi Industrial areas close to Honiara, although a small number operate in the other provincial

centres, notably Gizo and Auki. The industrial sector has historically contributed to only 5% of GDP, although there are indications that in recent years this contribution might have increased because of gradual build-up of entrepreneurial skills.

The industry, through the private sector, is basically relied upon to generate employment and absorb the annual increase in labour force. The structural problems identified for this sector are as follows:

(a) Opportunities are limited for having economies of scale in the manufacturing process due to a small and fragmented domestic market;

(b) Equipment and some raw materials have to be imported, thus losing any comparative advantage either in import substitution or in exports;

(c) Limited availability of skilled manpower and indigenous financial and management expertise;

(d) Inadequate infrastructure and services and

(e) Generally low-level of technology in local industry limits the value adding that can be generated from local processing activities.

The metalworking industry subsector is characterized by the following:

(a) Preponderance of sheetmetal working, fabricated structural forms and boat/ship building. These require only simple and basic equipment consisting of sheet metal cutters, benders, rollers as well as welders, power hacksaws, drills and grinders, but not lathes, shapers and milling machines used for precision work.

(b) Metalworking industries are largely managed by expatriates mostly from New Zealand, Australia, Germany and U.K. Only one, among the few existing ones which have relevant activities in the agro-related metalworking, is managed and operated by a local person. The workers have essentially been trained to do specific jobs and therefore, are not as versatile as one who has had formal vocational education or has experience in different workshop enterprises.

(c) Any fabrication work of a fairly complicated agricultural machine would entail a large amount of training time.

(d) Only machines of simple construction and design should be introduced for fabrication during the initial stages of development of the industry and that a prototype should be at hand for copying since there is lack of experience or knowledge of working from drawings.

(e) Scrap iron for blacksmithing work, particularly spring steel from motor vehicles, is available at junk yards. Hence, there is potential for establishing blacksmithing which would be advantageous for remote villages.

(f) Progress being made in the introduction of rice production in at least three provinces through the Agricultural Technical Program of Taiwan is beginning to result in a demand for some types of rice production and processing machinery. These machines include power tiller, row marker, row weeder, hand weeder, sickle, pedal thresher, engine-driven thresher, rice drier and rice mills. However the area planned to be planted to rice is still small. Introduction of labour-saving machines may induce further production of rice.

(g) There is a need for increasing the load-carrying capacity and transport speed in the rural areas. Women would be specifically benefitted if practical and low-cost transport facilities could be made available as women do most of the load carrying and transporting. One means is animal-drawn vehicle. A more advanced one is the motor tricycle or a motorcycle with a side or rear car. If technology could be transferred in the rural areas through local manufacture of carts, wheelbarrows and tricycles, a quantum leap would have been advanced in terms of development. Such lack of facilities, although rudimentary, stems from the undeveloped metalworking industry in the country.

(h) Still, any advancement to solve the problem indicated in item 7 would have limitations because of the mountainous nature of the inland portion of each island. Agricultural activities also occur in the highlands and the transport of loads is even more difficult. A solution would be the installation of light cableways leading to the road heads. They are found to be much cheaper than building roads and very environment friendly. With the facility, one only needs a portable roller device which a blacksmith can make.

(i) Coconuts are still harvested as nuts which have fallen naturally from the tree due to maturity. Research has shown that the oil and cream content of the coconut meat is highest when the nuts are just at the ripening stage. Therefore, as coconuts are way past this optimum age by the time they get detached and fall, with some already germinating, great losses are incurred in terms of oil extracted. An improved system is to harvest the nuts from the tree using a hook knife attached to extendible bamboo poles. The knife can be made by a blacksmith.

(j) SICHE/SID began offering one-year vocational courses in fitting/machining and welding fabrication in 1994. This offering is a milestone in developing human resources in the metalworking industry. They could be taught subjects in business management in preparation for a future engagement in the metalworking industry rather than seeking employment.

In the metalworking industry subsector, there is a preponderance of sheet metalworking, fabrication of structural forms, building of ships and boats and construction of rain water tanks. One factory produces nails and oil drums at a limited rate to conform with the demand. These metalworking industries are owned and managed by expatriates, mostly from New Zealand, Australia, Germany and U.K.

Only two workshops of the metalworking industries have been involved in the fabrication of only one agro-related machinery so far introduced in Solomon Islands. The post-harvest equipment, called the Los Baños drier, was introduced by the Smallholders Development Project, funded by the European Union. The drier has been modified from the original design from the University of the Philippines at Los Baños, Philippines and is being used for drying chilli, cocoa and coconut meat (copra). The two small-scale workshops which have been involved in the project have fabricated more than 1,000 promotion units for distribution to farmers who were assisted in securing loans.

Some small cocoa farm holders modify the drier further according to their resources. They order only the drum which serves as furnace and heat exchange device. They make the wooden frame themselves. In some cases, the structure is crudely made and scrap galvanized iron corrugated sheets are used for sidings of the drier. Their modified drier is effective although not efficient. It is wasteful of heat energy from wood fuel used for heating because of heat losses from the furnace and the heating chamber.

Fabrication of any fairly complicated agricultural machines will entail a large amount of training time and effort. Only machines of relatively simple designs should be introduced during the initial stages of development because of lack of skilled manpower and lack of familiarity with mechanisms for agricultural applications. A prototype of the machines is needed for copying in the fabrication work since there are no experiences yet in working former drawings.

Scrap steel is available at junk yards. They consist of discarded leaf springs of motor vehicles, worn out bulldozer blades and other high carbon steel parts of junked machinery. Hence, blacksmithing is a possibility as far as raw materials availability is concerned.

3. CONCLUSIONS AND RECOMMENDATIONS

A. Promotion and development of small-scale agro-related metalworking industries

The Ministry of Commerce, Employment and Trade/Industrial Development Division (MCET/IDD) may wish to consider the agro-related metalworking industry to be promoted and developed along with other small-scale industries (SMIs). The development of the subsector will impact on agricultural production as tools and machinery become easily available and at low cost. However, given the realities of low purchasing power and a small market, the existing metalworking entrepreneurs may have to be encouraged to engage in the fabrication of selected machinery identified by the Ministry of Agriculture and Lands/Agricultural Research Station (MAL/ARS) or other organizations involved in agricultural and rural development. MCET/IDD can depend upon the strength it has already gained in the promotion and development of small-scale industries through the projects assisted by UNDP/UNIDO.

Metalworking industries in Solomon Islands consist mainly of fabrication of steel structures, water tanks, ships and boats but not moving machinery. Capabilities for building machinery are almost non-existent but can be developed

Blacksmithing

Blacksmithing is an unknown art and technology among the Solomon Islanders. Even the basic hand tools used for farming and gardening are imported.

Developing a blacksmithing industry in the villages will provide convenience of tool procurement, especially for those who have limited access to transportation facilities to the town. Moreover, tools can be made according to the specifications of the farmer-user, especially women, and will therefore increase productivity. Raw materials can be procured by the blacksmiths themselves from the town or by those who seek the blacksmiths' services.

If given proper training in design and heat treatment technology, potential blacksmiths can produce improved tools adapted from designs commonly used by farmers in Asia whose working conditions are similar to those of Solomon Islands.

It is therefore, recommended that blacksmithing technology be introduced by MCET/IDD. For the programme in this area, external technical assistance for training of trainers and provision of catalytic equipment may be sought. A pilot and demonstration blacksmithing shop or smithy may be established at either the National Trade Testing and Training Unit (NTTT) or the Solomon Islands College of Higher Education/School of Industrial Development (SICHE/SID).

Animal draft

Animal-drawn implements are non-existent as animal rearing is not practiced nor have been given serious consideration in previous extension or training of farmers. Promoting cattle rearing may encounter certain cultural barriers which should be overcome.

It is recommended that in promoting cattle rearing and animal-draft training, the sociological aspects should be considered. The joint assistance of a rural sociologist or anthropologist and a livestock specialist is essential in the approach.

Soil conservation tillage farming system

The present subsistence farming level has one advantage, that is, it is appropriate for effective soil conservation because the soil is minimally disturbed and soil plant cover is almost always maintained.

It is recommended that in the introduction of tools, implements and machinery which will inevitably accompany the commercial type of farming, the appropriate soil conservation tillage farming systems should also be introduced and their adoption assured. These farming systems should emphasize soil conservation tillage systems

to avoid the sad experiences in most Asian countries where erosion has caused irreversible soil losses. Fortunately, Solomon Islanders will not have yet to unlearn any poor tillage practices which may be regarded as the scourge of modern tillage farming because of its negative environmental impact.

Rural transport

The lack of internal transportation has limited the productive capacity of the people in the remote villages. Provision of short-distance transport facilities will promote commercial farming as movement of commodities will be easier. It will also promote small-scale food processing industries as supply of raw materials will be more or less assured with proper transport facilities. Roads are not paved in most of the provinces and rugged vehicles are necessary.

It is recommended that metalworking industries be encouraged to fabricate/assemble motorized tricycles or side-cars fitted to commercially available motorcycles. This type of tricycle is versatile and is adaptable to poor road conditions. The side-car tricycle is narrow and is easily maneuverable even along footpaths in the villages or in coconut plantations.

Another vehicle which needs to be promoted is the animal-drawn cart for places where there are no roads at all but passable by carts. They are specially effective in the harvesting system for coconuts where the cart has to reach piles of husked nuts for loading.

It is recommended that metalworking industries be given training for fabricating suitable designs of cart, possibly a kit consisting of rubber-tired wheels and a heavy duty axle. A village craftsman will use the kit to build a cart body out of wood.

However, the pre-requisite to the development of animal-drawn vehicles is a livestock industry, particularly the rearing of cattle. It is therefore, recommended that MAL institute a programme for livestock production and cattle training for draft purposes.

National network

Close collaboration and linkage by MCET/IDD with MAL is crucial to the success of any promotion and development campaign in agro related metalworking industries. Unlike other small-scale industries, however, the agro-related metalworking industry have farmers for clientele who have yet to be convinced of the new and alternative tools which such industry will produce. Farmers are generally conservative and their adoption of agricultural technologies depends upon the effectiveness of the agricultural extension programme of MAL. This unique situation makes the promotion of the agro-related metalworking industry complicated because its success depends upon the development of the agriculture sector. A strategy therefore, is to have an integrated programme wherein the industry and agriculture ministries closely work together on an agro-related metalworking promotion project.

B. Human resources development

Industrial training

SICHE/SID has started offering vocational courses in machining/fitting and fabrication/welding. This course is a starting point for the development of human resources in metalworking beyond sheetmetal and structural fabrication works. However, the trained technicians will not generally be exposed to the business aspects of their vocation and therefore, the tendency is to find jobs rather than start their own metalworking enterprise.

It is therefore, recommended that students be also exposed to business management principles and be given guidelines for establishing small scale enterprises in preparation for a future engagement in the metalworking industry rather than employment. They might as well be the pioneers of the agro-related metalworking industries.

Agricultural training

Agricultural technology should be developed parallel to if not ahead of the agro-related metalworking industries. Farmers and agro-based industry entrepreneurs are the clientele of agro-related machinery. The status of agricultural development determines the demand for agricultural machinery although it is also true that the availability of appropriate machinery will spur development in agriculture.

It is therefore, recommended that in the training of extension workers at the National Agricultural Training Institute (NATI) and of farmers in the provincial farmers' training centres, introduction and demonstration of improved tools and new machinery meant to improve productivity and capacity be integrated with the farming technologies.

Rice production

The Guadalcanal Plains, where a large company once produced rice with tractor mechanization but eventually failed, will be ideal for rice growing on a smallholder basis. The land has been well-developed and adequately irrigated, except for some portions of the irrigation canal which need rehabilitation. The Agricultural Technology Mission of Taiwan (ATMT) has proposed that the government-owned area be utilized for rice growing rather than for any other crop which does not need much elaborate land development unlike rice. For example, the planting of vanilla which grows best in cooler and higher elevation forest areas would not be wisely using the Guadalcanal Plains, especially the developed rice lands in the area.

It is recommended that the former land used for growing rice in the Guadalcanal Plains be devoted for rice cultivation to maximize utilization of already developed land. If any crop, like vanilla is intended to be grown, it would be best to choose another area better suited for the crop or will not compete with the use of the land already developed for rice.

C. Promotion of processing enterprises

The R &R workshop has fabricated three units of manually operated oil expeller based on the one order of a small-scale coconut oil or cream production entrepreneur. Due to lack of promotion, the other two units have not yet been sold, probably because no other entrepreneur desiring to establish a micro-scale coconut oil mill does not know of the existence of the machine.

Instead of villagers transporting coconut or copra, they would get more value for their commodity by processing it themselves. Some metalworking shops might fabricate small-scale oil expellers and filter presses after their workers would have been trained in fabrication work. A foreseen requirement is the supply of suitable oil containers of perhaps 20-litre capacity to facilitate temporary storage, handling and transport of the oil.

The ngali nut has been identified as having potential for export. Needed is a machine for shelling the nut and processing the kernels into oil or confectionery. The shells may be processed into activated carbon.

It is recommended that MCET/IDD include the small-scale coconut oil milling industry as a small-scale enterprise to be promoted. It may coordinate with the Commodity Export Marketing Authority (CEMA) for this purpose.

D. Agro-related machinery prototypes needed

New designs of hand tools, particularly the bush knife, brush knife, hoe, digger, dryland weeder and rice production hand tools are needed for copying by blacksmiths who will yet be trained.

The following are the types of machines which are needed according to the progress of development in agriculture and the capabilities in the fabrication of agro-related machinery. Some may be procured for demonstration or trials in farmers' fields.

Agricultural hand tools

(a) Heavy duty wood knife with sheath;
(b) Curved blade bush knife;
(c) Curved blade brush knife with serration;
(d) Sickle with serrated blade;
(e) Trowel, trough type;
(f) Trowel, flat blade type;
(g) Trowel, claw type;
(h) Taro digger, pointed and flat blades, wood handle;
(i) Hand-pushed weeder for dry land crops and wetland rice
(j) Row-marker for rice transplanting;
(k) Sickle;
(l) Pedal thresher;

(m) Tripod-mounted and portable coconut husker along with accessories;
(n) Coconut harvesting knife complete with extendible bamboo poles;
(o) Coconut meat separator, spoon type;
(p) Coconut meat scraper or grater, rotary type;
(q) Coconut harvester, sickle;
(r) Sugarcane crusher, manual;
(s) Peanut sheller;
(t) Peanut planter and
(u) Ngali nut sheller.

Animal-drawn implements, harness and accessories

(a) Single-ox drawn steel plough;
(b) Single-ox drawn peg-tooth harrows ;
(c) Single-ox drawn inter-row cultivator;
(d) Single-ox drawn carts with steel wheels and axles, rubber tires and wooden bodies and
(e) Horse saddlebaskets.

Mechanical-powered machinery complete with engine or electric motor

(a) Coconut oil expeller;
(b) Oil filter press;
(c) Cocoa grinder;
(d) Hydrotiller;
(e) Rice mill and
(f) Motorized tricycle (motorcycle with side-car).

There are no agricultural machines which can be exchanged by Solomon Islands with other countries.

E. Policies and strategies

Strategy and institutional arrangements

As strategy, new small-scale agro-related metalworking industries, particularly blacksmithing shops in selected villages need to be established. Existing small- and medium-scale metalworkshops should be strengthened to enable them to diversify into fabrication of agro related machinery.

The new management and reporting system introduced by the project on promotion and development of small- and medium-scale industries is being closely monitored by the Director of IDD and the Permanent Secretary of MCET. The IDD officers have acquired the necessary skills and are motivated to sustain the project after UNDP/UNIDO assistance ends.

The Credit Guarantee Scheme established to provide partial guarantees for the Development Bank of Solomon Islands (DBSI) loans to qualified Solomon Islander

entrepreneurs should be sustained. MCET/IDD has already streamlined the procedures for nomination of projects and qualified entrepreneurs as will as the subsequent extension service during the investment and operational phase of such projects.

The MCET/IDD will be the focal point of a project which focuses on promotion of blacksmithing in Solomon Islands. Other ministries (e.g. Ministry of Foreign Affairs and Trade Relations, MAL and the Prime Minister's Office) will also be involved, as appropriate, in the implementation of the industrial development project.

MAL, particularly the research, extension and training units and the training units of the provinces will play a crucial role in the promotion of tools and machinery integrated with the relevant agricultural technology. This will require the inclusion of use of tools and machinery in the training courses conducted by NATI located at Fote in Malaita Province.

Strategy for industrial development

The Solomon Islands is relying on the private sector initiatives to generate employment. Hence, industry and small business, in spite of the many structural problems being faced, need to be developed through the following strategies:

(a) Defining a formal Industrial Development Policy which will provide an investor friendly environment;

(b) Streamlining the investment approval system;

(c) Simplifying the investment incentives to be more focussed and coordinated at the macro level;

(d) Controlling public expenditure to limit budget deficit, reduce domestic inflation and credit costs with a view to creating a stable macroeconomic situation;

(e) Integrating technology and skill transfer with any foreign investment proposal to enhance local skill levels and technology awareness;

(f) Continuing the commercializing and privatizing of process of government owned enterprises to provide an open and competitive environment;

(g) Continuing the support for the development of business advisory services throughout the country and

(h) Narrowing down of the Government's role in agriculture to providing extension services, supporting infrastructure and the policy/regulatory environment necessary to enable smallholders to take advantage of domestic and international market opportunities.

F. Programme for further development of the agro-related metalworking industry sector

Development of agricultural engineers for MAL staff

It is essential that MAL have a staff agricultural engineer to take care of the engineering requirements for agricultural development. Some of the areas of concern are soil and water conservation engineering, watershed development, agricultural mechanization systems for the transition from subsistence to commercial farming, agricultural machinery development, environmental protection, post-harvest technology and processing and others Education and training may be obtained at the University of the South Pacific (USP) or in any developed agricultural universities in Asia. Fellowships for this purpose may be sought from international donors for the development of human resources.

Development of engineers for MCET staff

Engineers are needed as technical support staff of MCET. Education for new engineers may be obtained from established educational institutions in Asia or in the neighbouring countries of Solomon Islands where mechanical engineering degree courses are offered.

LIST OF ABBREVIATIONS

AMITSST	Agro-related Metalworking Industries Technical Support Services Team
ADB	Asian Development Bank
AIDAB	Australian International Development Assistance Bureau
AIT	Asian Institute of Technology
ATMT	Agricultural Technical Mission of Taiwan to Solomon Islands
ARS	Agricultural Research Station
CBSI	Central Bank of Solomon Islands
CEMA	Commodities Export Marketing Authority
DBSI	Development Bank of Solomon Islands
ECDC	Economic Cooperation among Developing Countries
ESCAP	Economic and Social Commission for Asia and the Pacific
FSIB	Federation of Solomon Islands Businesses
GDP	Gross Domestic Product
IDD	Industrial Development Division
LDC	Least Developed Countries
MAL	Ministry of Agriculture and Lands
MCET	Ministry of Commerce, Employment and Trade
NFP	National Focal Point
NGO	Non-government Organization
NTTT	National Trade Training and Testing
PACNATI	Pacific Network for Agricultural Tools and Implements
RNAM	Regional Network for Agricultural Machinery
SICHE	Solomon Islands College of Higher Education
SID	School of Industrial Development
SMI	Small- and medium scale industries
SMWP	Small Mechanics Workshop Programme
SOI	Solomon Islands
TCDC	Technical Cooperation among Developing Countries
TSS	Technical Support Services
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
USP	University of the South Pacific

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INTRODUCTION

A. General

Description of the subsector

Agriculture is the mainstay of the economy of the Solomon Islands. Main exports are copra, cocoa, logs, timber and fish, most of which have undergone only primary processing. Since Solomon Islands' independence in 1978, its economic activity has been done mostly by the public sector. The rural economy has been based on subsistence agriculture on which some 80 per cent of the rural population rely.

For the two-year period, 1992 and 1993, the industrial sector is estimated to have grown beyond its usual 5 per cent contribution to GDP with the establishment of the brewery, garment and other light industries.

The depletion of forest reserves which are mostly privately owned under the customary land tenure system and the ensuing environmental damage due to commercial logging are becoming a major concern by the Government. Measures, such as encouraging timber processing rather than exporting round logs, are being taken to avert further damage, such as soil erosion. However, there appears to be no policy to hold or slow down logging activities as forest products are a main source of foreign exchange revenue.

International trade accounts for 45 to 50 % of GDP. Historically, economic growth grew steadily for the first five years after independence in 1978 by an average of 4.5% increase in GDP per year. However, during 1985 and 1986, this growth declined to only 1.4 % mainly due to the fall of international prices of the country's export commodities and the destruction of cyclone Namu in 1986. There was recovery to 4% per year during the period from 1987 to 1991, partly due to the inflow of assistance for rehabilitation. The boost in logging activities in 1992 brought the GDP growth to about 8.2%. However, in 1993, there were expansion of Government expenditures, a decline of the country's trade terms in the international commodity market and the cyclone Nina which hit the country. As a result, the budget deficit situation again worsened.

The monetized economy plays only a small part in the way of life in the rural areas. This partly monetized economy however, is changing as access to market becomes easier with improving transport infrastructure and as logging activities in the rural areas get intensified with foreign investments. The domestic saving base is limited.

A constraint is the limited and small size of the domestic market preventing the achievement of economies of scale. Industrial activity is constrained by the lack of skilled and trained manpower, although population, estimated at 360,000, is increasing rapidly at 3.5% per year. Approximately 50% of the population are in the 14 years and below age group. As such, pressure on government services, like

education and health, will increase. Those in the age group 15-59, accounted for 136,000 people and belong to 48% of the population in 1986. In 1991, 26,630 people were formally employed and represented 16.5% of the labour force. In 1993, the labour force was estimated at about 173,000.

The provincial government system, wherein the local level involvement in the development process is recognized as the major strength of the system, will be reviewed by the Government. the reason for such review is the lack of financial and institutional resources to make the system fully effective, particularly in terms of clearly defining levels of authority and responsibility.

While the country is well endowed with exploitable natural resources like forests, fertile soil and rich marine and fresh water resources, development has been constrained by the customary land tenure system. A large portion of the land is undeveloped for commercial farming, that is, agriculture beyond subsistence level. Only about 30% of the cultivable area of about 3.4 million hectares are under active cultivation.

B. Policies and strategies

The current national development strategies emphasize the control of Government expenditures and encouragement towards the development of the private sector participation in the economic activities.

The strategy for the development of the agricultural sector will deal on complementary and integrated activities in improving production and productivity. Opportunities for access to both domestic and international markets through transport, infrastructure and market development will be opened.

The strategy also calls for greater emphasis on rendering effective extension services to farmers and providing support in infrastructure as well as the policy/regulatory environment necessary to enable smallholders to take advantage of domestic and international market opportunities. The private sector will be encouraged to become more actively involved in the areas of input supply and in the transport and marketing of produce.

In 1993, the population density was 13 persons/km^2 of the total land area but that translated to 106 persons/km^2 of the cultivable area. In the more densely populated northern part of Malaita province, that was 200 persons/km^2. Thus, if population gets bigger, food security might be threatened unless progressive farming to increase productivity is achieved. Smallholder or subsistence farming had increased by only 2.6% per year compared with the population growth of 3.5%, indicating that there was a decline in agricultural output per capita. The strategy calls for achieving the long-term objectives of raising non-monetary and cash crops to a level exceeding the population growth rate, encouraging consumption of local produce rather than import as well as increasing the output of exportable crops.

The annual growth in formal employment from 1983 to 1991 was 3% per year which was below the 3.5% population growth, resulting in increasing unemployment. Future employment will be provided mostly in the private sector as the strategy is to unload public services as source of employment because of budgetary constraints. Thus, the government will both commercialize and privatize public sector ventures, remove market-distorting regulations and subsidies and streamline the process for investment proposals.

I. GENERAL STATUS OF THE AGRO-RELATED METALWORKING INDUSTRY SUBSECTOR

A. Private sector metalworking industry

The industrial sector comprises a wide range of small- and medium- scale manufacturing and processing enterprises concentrated in the wood, fiberglass and metalworking, vehicle/ship building and repair, light engineering, garment manufacturing as well as soap, food and drink production. The new brewery is the largest enterprise in the drink production industry.

The enterprises are mostly concentrated in the Kukum and Ranandi Industrial areas close to Honiara, although a small number operate in the other provincial centres, notably Gizo and Auki. The industrial sector has historically contributed to only 5% of GDP, although there are indications that in recent years this contribution might have increased because of gradual build-up of entrepreneurial skills.

The private metalworking industry subsector is characterized by the following:

(a) There is preponderance of sheetmetal working, fabricated structural forms and boat/ship building. These industrial activities require only simple and basic equipment consisting of sheet metal shears, benders, rollers as well as welders, power hacksaws, drills and grinders, but not lathes, shapers and milling machines used for precision work. Figure 1 shows the inside of a typical medium-scale metalworkshop at the Ranandi Industrial Estate.

(b) Metalworking industries are largely managed by expatriates mostly from New Zealand, Australia, Germany and U.K. Only one, among the few existing ones which have relevant activities in the agro-related metalworking, is owned and operated by a local person. However, he originated from Fiji. The workers have essentially been trained to do specific jobs and therefore, are not as versatile as one who has had formal vocational education or has experience in different workshop enterprises.

(c) Any fabrication work of a fairly complicated agricultural machine would entail a large amount of training time.

Figure 1. Sheet metal shears found in a typical medium-scale metalworking shop specializing in sheet metal works. This workshop fabricates aluminium water tanks and fishing boats.

(d) Only machines of simple construction and design should be introduced for fabrication during the initial stages of development of the industry and that a prototype should be at hand for copying since there is lack of experience or knowledge of working from drawings.

(e) Scrap iron for blacksmithing work, particularly spring steel from motor vehicles, is available at junk yards. Hence, there is potential for for establishing blacksmithing which will be advantageous for remote villages.

The profiles of the prominent metalworking industries are described below.

Soltrust

Soltrust is an NGO promoting environmental protection, particularly eco-forestry management. It has four forestry officers who were trained in Fiji and who engage in teaching people about forestry aspects particularly in selecting trees to be cut in their customary-owned forest lands.

Soltrust has a small workshop which fabricates portable sawmills to cater to small-scale logging and timber processing activities by the villagers themselves exploiting their own forest resources under customary land ownership. This is a strategy is to promote selective logging which would be more easily controlled with

such a scheme rather than by clear logging as is done by most commercial logging companies. The scheme will not only conserve the forest or slow down its exploitation but also increase the income of the villagers. So far 20 units of portable sawmills have been made in the Soltrust workshop (Figure 2).

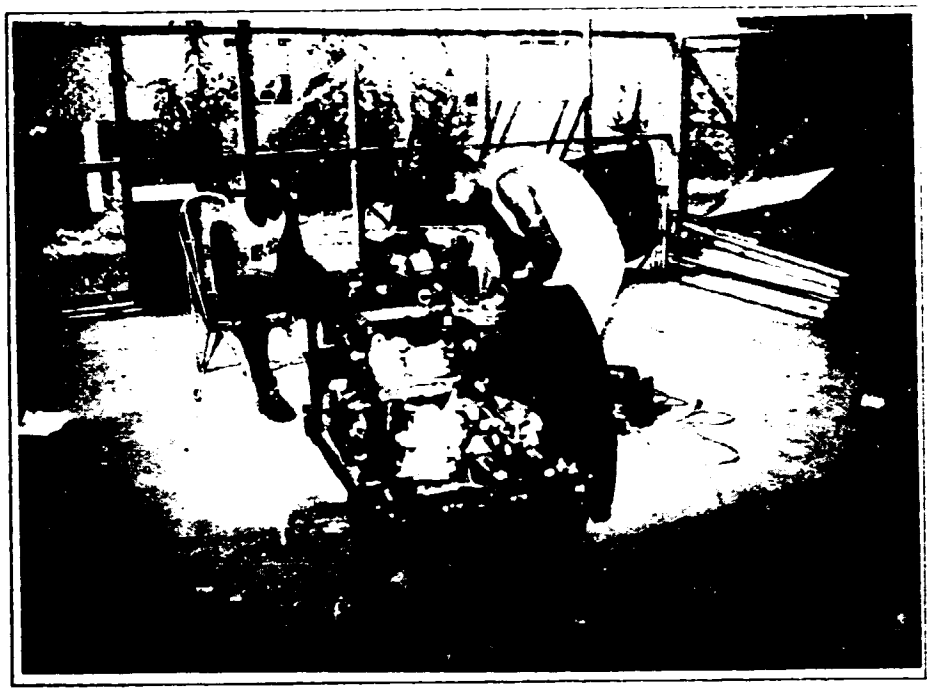

Figure 2. Portable sawmill being fabricated at the Soltrust workshop.

Soltrust has demonstrated its capability to fabricate an agro-related machinery if showed the prototypes to copy. Such machines would support the various livelihood generating enterprises which Soltrust wishes to promote, perhaps with external assistance. Some of these projects are the small-scale production of coconut oil which will need oil expeller and filter press, production of soap which will use coconut oil and soap-making devices and processing of cocoa beans and peanuts which will need grinders.

Soltrust is also engaged in collecting aluminium cans for crushing and exporting. Given technical training in casting it can convert such cans into aluminium household utensils such as pots and pans which should be saleable in rural areas. Such cooking utensils are imported, but if villagers would be given alternative ones at low cost and of comparable quality, aluminium castings would be expected to be in demand. Once it has acquired the aluminium casting technology, Soltrust might branch out to casting propeller blades for outboard motors.

Solomon Islands Steel and Welding Works

This workshop which was established in 1975 by its Fijian owner specializes in structural steel fabrication and pipeline works, including water tanks and fencing for cattle. It utilizes mostly gas and electric arc welding equipment but the workshop has other equipment, like sheet metal roller, power hacksaw, pipe bender, press, drill grinder and hand tools.

The workshop was involved in the fabrication of about 100 units of chilli and cocoa drier prototypes which were being promoted by the Smallholders Development Programme (SDP) assisted by the European Union (EU) from 1988 to 1993. The workshop entrepreneur will be able to make copies if showed the prototypes of agro-related machines, like the oil expeller, oil filter press, cocoa grinder and motorized tricycles.

Tome and Sons Ltd.

This workshop is mainly a joinery or wood furniture enterprise. It has been involved in the fabrication of the wood frame of more than 1,000 units of the modified Los Banos drier. A separate metalworkshop, like the Solomon Islands Steel and Welding Works would fit a standard design of mild steel pipe to serve as furnace and heat exchanger. This complementary fabrication is in connection with the SDP's successful promotion of chilli growing for export which has been institutionally supported also by CEMA. Figure 3 shows the drier wood frames being built at the workshop compound.

Golden Star Metal Manufacturing Ltd.

The entrepreneur of more than 20 years just acquired a second-hand 200-tonne press. Making bush knives will be one of the initial uses of the press. The die has has been made by a die-maker in New Zealand. Steel raw materials for the bush knife will come from Brazil. To promote his products, he has imported 10,000 pieces of bush knives. He estimate the demand to be more than 100,000 pieces per year.

The medium-scale workshop produces nails and 200-litre oil drums. All machines used are automatic but second-hand and with low capacity as specified by the German owner. His reason is that they entail low investment costs and since the demand is limited, there is no need for high capacity and high-output machines. Figure 4 shows one of the 12 workers having just retrieved a finished drum cover from the stamping machine.

The manager plans to maximize utilization of his oil drum-making machines by manufacturing 20-litre capacity cans which would be in demand for transporting water and as containers for coconut oil, cocoa and other seeds. He is looking for a low-capacity but low-cost machine.

Figure 3. Some of the chilli drier wood frames fabricated by a joinery and ready for fitting with metal pipes which will serve as heat exchangers between the furnace and the heating chamber of the drier.

Figure 4. A worker being supervised by the workshop owner in retrieving a piece of oil drum cover from a stamping machine.

R & R Engineering

This medium-scale workshop at the Ranandi Industrial Estate has specialization in aluminium metal works used in fabricating water tanks and fishing boats, mostly. It fabricated three units of manual oil expeller based on the one order by one entrepreneur. Figure 5 shows the two units of the manually operated oil expeller adapted from a design from U.K. Due to lack of promotion, the other two units have not yet been sold, probably because no other entrepreneur desiring to establish a micro-scale coconut oil mill does not know of the existence of the machine.

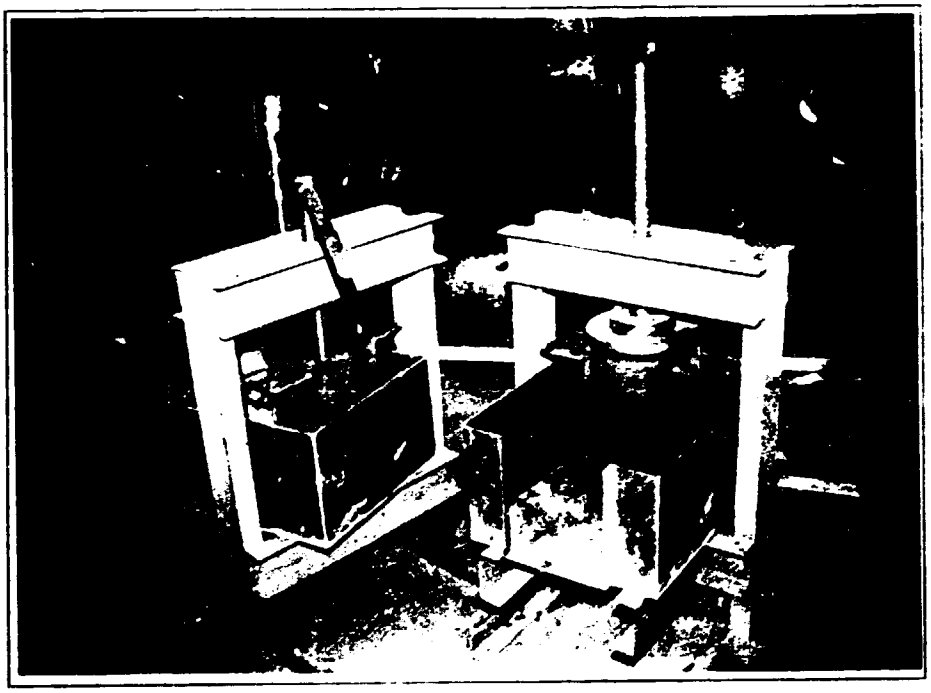

Figure 5. Manually operated coconut oil expellers fabricated by R&R Engineering.

LKP Hardware

This private hardware store imports and distributes several kinds of hand tools, mainly from a company in Australia and one in U. K. The store is located in the commercial district of Honiara. Figure 6 shows one portion of the display panel in the hardware store which is operated semi-supermarket style. It has a large variety of hardware products being sold.

The same owner of LKP has also a small-scale metalworking shop which fabricates water tanks, garbage bins, cake trays and chicken feeders and drinkers. The foreman of the workshop has no formal education but has relied only on experience and mechanical aptitude for accomplishing the work in the workshop.

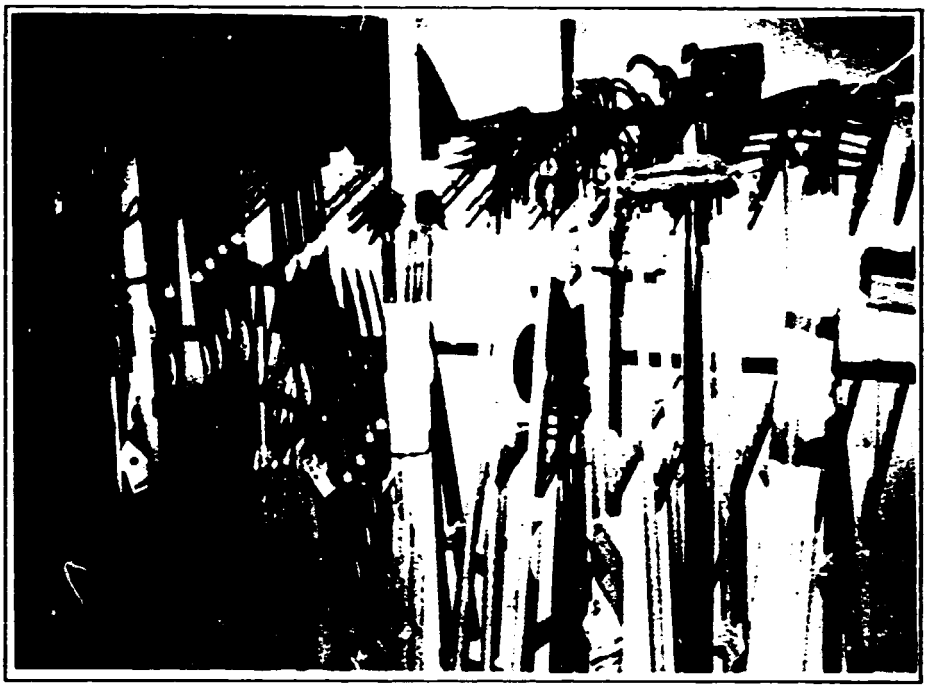

Figure 6. Imported agricultural hand tools displayed at the LKP Hardware in Honiara.

E. T. Sheetmetal Works

This backyard workshop, located at a small village in Bina, is about the only metalworking shop in Malaita province. It fabricates water tanks, an important and necessary water supply facility in the Solomon Islands. It also fabricates garbage bins and water buckets. Galvanized iron sheets are rolled by crude roller contraptions and segments are joined together by double seam and soldering for sealing. A 500-litre water tank can be finished in one day. Only three water tanks are sold per month. Figure 7 shows the product display of the backyard and micro-scale workshop.

Lacking workshop equipment, the backyard workshop which also does vehicle repairs cannot be expected to fabricate even a simple machine. However, the workshop owner also operates a large and mechanized sawmill which means that given technical assistance enough capital can be raised to establish a small-scale metalworking shop. Moreover, a planned Bina Industrial Estate where electricity and other manufacturing facilities will be provided, is expected to boost the metalworking industry in Malaita, the most populated island province in Solomon Islands.

Figure 7. Water tanks made of galvanized iron sheets at the display yard of a sheet metalworking micro-enterprise in Bina, Malaita Province.

CIG

This factory, a subsidiary of a large international company, produces oxygen and acetylene, welding electrodes, metalworking tools and other consumables and supplies for the metalworking industries. It imports some of the products that it distributes to the local metalworking industries.

B. Institutional support

Promotion and development of small- and medium -scale industries

The Ministry of Commerce, Employment and Trade, Industrial Development Division (MCET/IDD) has experience in the promotion and development of small-scale industries. Through the UNDP/UNIDO-assisted project, SOI/90/007, Promotion and Development of Small and Medium-scale Industries, MCET/IDD has been instrumental in establishing and improving small-scale enterprises in several fields and in various provinces in the Solomon Islands. MCET/IDD is committed to continue providing advisory services to small businesses in all aspects of start up, operations and management after the end of the project's Phase II in April 1994. It also supports a network of business development officers in the provinces. However, no agro-related metalworking enterprise has been established yet.

The UNDP/UNIDO-assisted project is the culmination of a total of five years of assistance. The first project (one year) consisted of formulation of policies and strategies. The second and third projects (Phase I and Phase II) consisted of actual promotion and development activities, including strengthening of capabilities of MCET/IDD, in training of prospective entrepreneurs in setting up, operating and managing small- and medium scale industries (SMIs). In the process, linkages of MCET/IDD with other institutions were also strengthened.

Some of the outputs achieved by the three assistance projects are the following:

(a) Some 65 SMI businesses, mostly agro-based but no agro-related metalworking, were established with an additional 20 in the pipeline and expected to be established by April 1994;

(b) Some 60 SMI businesses were strengthened. Over 50 had been receiving regular technical and business management assistance;

(c) Three business associations, one of which is the Federation of Solomon Islands Business (FSIB) were established;

(d) Four technical bulletins on furniture making was produced and distributed;

(e) Two credit guarantee schemes, one for food processing (SI$70,000) and another for furniture making (SI$30,000), were initially established and because of their effectiveness in establishing businesses, the Government injected an additional SI$90,000 to cover all SMI businesses;

(f) An SMI reference manual for business adviser was provided and

(g) A result-oriented monitoring and evaluation system had been developed.

The generally strengthened capabilities of the MCET/IDD staff and the provincial business advisers resulting from the implementation of the project will serve as firm foundation for promoting and developing agro-related metalworking industries. They will also at least stimulate the existing metalworking industries towards diversifying into production of agricultural machinery to support the developing commercial agriculture. Figure 8 shows a recent conference participated in by provincial administration officers to review policies and strategies for the development of SMI's in Solomon Islands.

Figure 8. The Minister of Commerce, Employment and Trade addressing the opening session of the national conference on policies and strategies for the development of small-and medium -scale enterprises.

Promotion of exports

The Commodities Export Marketing Authority (CEMA) of MCET has been playing a significant role in promoting exports of chilli, an introduced crop of which Solomon Islanders themselves are not fond. CEMA and the defunct SDP which had been supported by the European Union, successfully introduced the Los Banos drier from the Philippines in connection with the promotion of production of chilli to farmers. SDP worked with the private sector workshop entrepreneurs in modifying the drier to suit the particular applications. A cylindrical tube made from sheet metal served as furnace to avoid contact of smoke with the product being dried. Firewood instead of charcoal which was perceived by farmers as too laborious to make was used.

CEMA is encouraging entrepreneurs to consider establishing small-scale processing of coconut meat, either by copra or by wet process to produce edible coconut oil for domestic use and for export. The oil can be a raw material for small-scale production of soap.

Instead of villagers transporting coconut or copra, they would get more value for their commodity by processing it themselves. Some metalworking workshops might fabricate small-scale oil expellers and filter presses after their workers would have been trained in fabrication work. A foreseen requirement is the supply of

suitable oil containers of perhaps 20-litre capacity to facilitate temporary storage, handling and transport of the oil.

CEMA is exploring the possibility of exporting the processed ngali nut from trees which grow wild and and are abundant in some provinces, especially Malaita. Possible products are oil, activated charcoal from shells and the kernel which has a distinct taste good for confectioneries.

Credit institutions

A project in the promotion and development of metalworking industries in Solomon Islands will have to involve the country's financing institutions for industrial investments. These institutions comprise the Central Bank of Solomon Islands (CBSI), four commercial banks, four commercial insurance companies, a rural credit movement and relevant government-owned financial institutions, such as the National Provident Fund and the Development Bank of Solomon Islands (DBSI). CBSI has a Small Business Finance Scheme which aims to assist in the development of the business activities by Solomon Islanders by making loans for such projects easy and less costly to obtain. The scheme provides a guarantee as security for loans given by commercial banks and DBSI, assistance by paying part of the interest to the banks on behalf of the borrowers and re-financing of loans made by commercial banks under the scheme.

Credit for industry establishment and operation comes from the CBSI, the commercial banks and through the Small Business Finance Scheme operated by CBSI. Direct support is also available through the Rural Training Centres for trainees who wish to establish small rural enterprises.

Agricultural development

Since the promotion and development of agro-related metalworking industries depends much upon the development of agriculture, institutional support from the Ministry of Agriculture and Lands (MAL) is crucial to its success. The capabilities of MAL's units in research, extension and training in agriculture towards effective adoption of technologies by farmers must be strengthened.

MAL's thrusts in the next four years are the increased production of sweet potato, maize, peanut, vegetables, cassava, yams, pineapple, coconuts and cocoa. The production of chilli for export will also be promoted to more farmers which means that promotion of the chilli drier will be undertaken. New crops such as rice and vanilla will also be promoted.

Beef cattle fattening will be promoted and the assistance of the Australian International Development Assistance Bureau (AIDAB) and the Asian Development Bank (ADB) are being sought. For drying of coconut, cocoa and coffee, the assistance of EU is again being sought. Processing of copra has a target production of 500 tonnes. Pineapple of which Malaita province produces the bulk, needs to be processed perhaps into juice or other preserved state.

The above thrusts have implications of going from subsistence farming to commercial farming and hence, also in the supply of tools and machinery to support the production goals.

(a) Agricultural research

MAL has the Agricultural Research Station (ARS) located at Dodo Creek which is responsible for all research aspects of crops being promoted by the Government. These crops include the staple sweet potato and such other promising ones like, Irish potato, chilli, peanuts and vanilla. As an experiment station as well as producer of seeds for dissemination to farmers, ARS utilizes tools and machinery for its field and experimental production plots. It can observe the performance of any tool or machinery acquired by ARS, mostly through research project grants, with a view to recommending selected ones for local manufacture, if feasible.

The Station does not have an agricultural engineering section but tools and machinery, especially the more useful ones for cultivation and primary processing of crops are being maintained. Thus, ARS informally becomes a testing ground of new tools and machinery. It would be advantageous if this experience is utilized in the metalworking promotion project. Figure 9 shows the peanut huskers acquired by ARS.

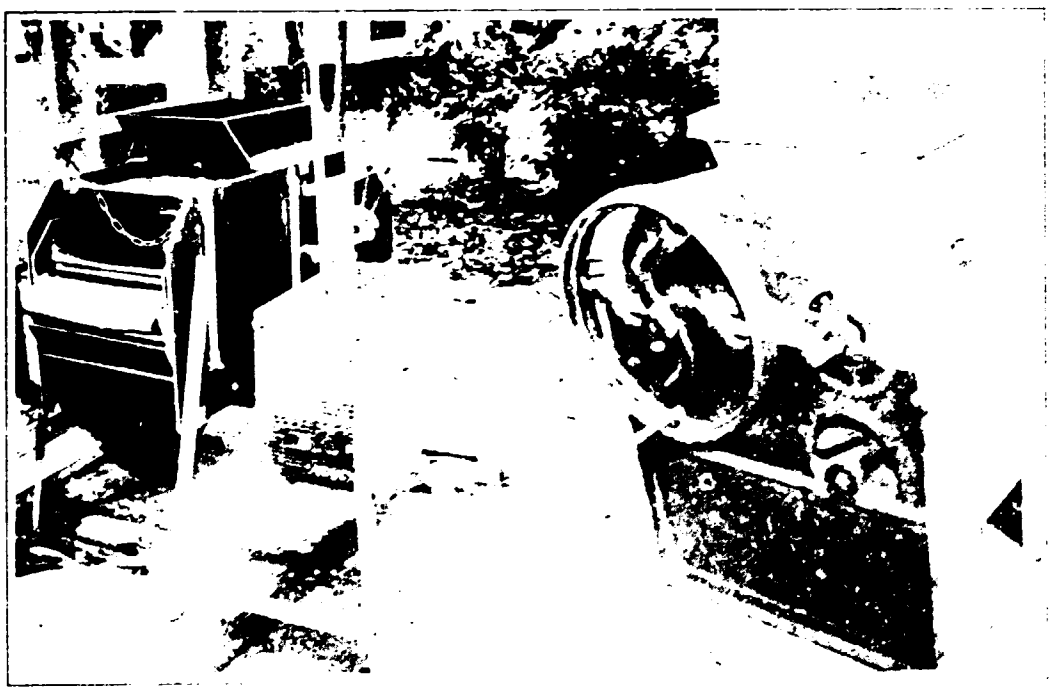

Figure 9. Manually operated peanut shellers or huskers being used by the Agricultural Research Station at Dodo Creek.

(b) Agricultural extension

MAL has an extension section headed by a chief field officer but the staff is small. The provincial extension officers are relied upon to deal with the farmers but funds are not enough to support their activities are small.

(c) Agricultural training

The National Agricultural Training Institute (NATI), located at Fote in Malaita Province, provides training to provincial agricultural extension officers in all aspects of commercial farming. One of the constraints faced by the extension workers is the lack of basic tools, preferably locally made and durable to demonstrate to farmers. Without such tools accompanying the agricultural technology which they are trying to introduce for adoption by the farmers, their clientele cannot be expected to respond. Thus, their extension efforts have not been as effective as desired to be. One of the machines being demonstrated to the extension officers on training is the imported maize sheller, received from a training programme grant. Figure 10 shows the machine.

The Farmers Training Centre at Dala, the Malaita province training unit, has suspended its operations because of lack of funds from the provincial administration. One of the training facilities in the centre is a demonstration of the cocoa bean fermentation tank and drier (Figure 11). Only the field training officer and two field workers are maintaining the centre.

Figure 10. Imported maize sheller used for training at the National Agricultural Training Institute at Fote, Malaita Province.

.Figure 11. Training and demonstration facilities for processing of cocoa beans. Clockwise from left: Three fermentation boxes in cascade arrangement, each box holding kernels for two days or a total of six days fermentation time per batch; grading table and drier. Note the design for downward movement of cocoa beans to facilitate handling.

Industry training

The National Trade Training and Testing (NTTT) unit of MCET's Loan Division offers short-term courses and supervises the national apprenticeship scheme.

The Solomon Islands College of Higher Education/School of Industrial Development (SICHE/SID) provides formal vocational courses and has training programmes in rural areas, the latter through its Rural Services Industrial Training Unit. In February 1994, SICHE/SID began offering a one-year vocational course in fitting/machining and welding/fabrication which will provide the trained human resources long needed by most industries. This offering is a milestone in developing human resources in the metalworking industry. Either NTTT or SICHE/SID could be venues for conducting a training programme in blacksmithing. Figure 12 shows a portion of the training workshop of SICHE/SID for the lathe machining course.

Figure 12. Training workshop in machining and fitting course at the Solomon Islands College of Higher Education School of Industrial Education in Honiara.

C. Projects and on-going programmes

Regional Network for Agricultural Machinery (RNAM)

This project of 11 Asian countries has its headquarters at ESCAP in Bangkok, Thailand. One of its activities is to gather information on machinery designs and mechanization experiences from various sources and disseminate it to the member countries. It promotes TCDC/ECDC in which one of the activities is the holding of regional exhibitions and symposiums, called Agrimach, the latest of which was held in Jakarta, Indonesia in December 1993. The project on promotion and development of agro-related metalworking industry in Solomon Islands may link with RNAM and be benefitted by its database on agricultural machinery and mechanization.

The University of the South Pacific (USP)

The Alafua campus of USP in Western Samoa has a School of Agriculture which consists of one department - agriculture (Figure 13). It caters to higher education in agriculture with some exposure to agricultural engineering and agricultural machinery but limited in scope to selection and general knowledge of mechanization. Fellowships may be sought for qualified Solomon Islanders to study at USP.

Figure 13. The University of the South Pacific, Alafua campus in Western Samoa is an excellent training ground for human resources in agriculture and agro-related machinery development for Solomon Islands.

The agriculture department of USP is divided into six teaching discipline sections, namely, agricultural economics, agricultural engineering, education and extension, animal science, basic science and crop science. It has also the Institute for Research, Extension and Training in Agriculture (IRETA). Among the facilities are two farms, Alafua/Moamoa and Laloanea which are shared with IRETA for research purposes.

The School's programmes related to the agro-related metalworking industry are the Master of Agriculture, Post-graduate Diploma in Agriculture, Bachelor of Agriculture and Diploma in Tropical Agriculture.

The Agricultural Engineering Section has a workshop for teaching basic agricultural engineering courses, farm workshop practice and farm structures. Exposure of the students to farm machinery and mechanization is limited to basic workshop practices and selection, operation and maintenance of basic farm implements. No courses are offered in machinery design or one which would prepare the graduate to engage professionally in agricultural tools and machinery design and fabrication.

The Diploma in Tropical Agriculture is a practical course which aims to prepare students for employment in agricultural and educational services, allied agricultural industries and private agricultural enterprises. A diploma graduate would be qualified to assist in agricultural extension services and yet would have practical knowledge in agriculturai tool and machinery fabrication, operation and maintenance. Such dual skills in both agriculture and industry would be an asset in the promotion and development of agro-related metalworking industry.

The Agricultural Engineering Section has a collection of machinery prototypes some of which have been fabricated at its workshop while others have been procured from other developing countries. Some of the commercial machines are the Asian Institute of Technology (AIT) jab seeder from Thailand, the root crop chipper from India and the vegetable seeder from the U. S. Some of the fabricated machines are the lever-operated peanut sheller and a cabinet type solar drier.

While the machines have been useful for the academic training purposes of the USP School of Agriculture, their practical value to local agriculture has not been exploited as there is no extension programme in this regard. A collaboration programme with MAL will be mutually beneficial. The agricultural engineering courses will have more practical and useful meaning. They will catalyze the establishment of small-scale agro-related metalworking industries in other South Pacific island countries.

The USP/IRETA hosted the FAO Regional Expert Consultation on Agricultural Implements and Tools of the South Pacific Islands during the period 21-24 September 1992. The staff of agricultural engineering was actively involved in its organization and in the conduct of the Consultation.

Following the recommendation of the Consultation, the USP School of Agriculture has agreed to provide secretariat services to the Pacific Network for Agricultural Tools and Implements (PACNATI). The Agricultural Engineering Section has been pursuing the formation of PACNATI through the FAO offices in the Pacific countries.

Promotion and Development of Small and Medium Scale Industries (Phase II, SOI/90/007)

This two-year project, funded by UNDP and executed by UNIDO, will be completed in April 1994. It is sequel to two previous UNDP-funded projects, namely, Indigenous Enterprise Promotion (SOI/84/004) which operated from March 1985 to February 1988 and the Promotion and Development of Small and Medium Scale Industries (Phase I, SOI/88/002) which operated from March 1988 to April 1991. The Indigenous Enterprise Promotion project focussed on providing industrial policy and strategy assistance to the MCET.

These projects, have resulted in the establishment of a number of enterprises, among which are small engine repair, rain catchment or water tank fabrication, peanut roasting, timber milling and fruit drying. Technical advice and training were

provided to existing small- and medium-scale industries. Institutional support through the Industrial Development Division, Technical Support Services Unit (IDD/TSS) of MCET was established to help prospective /existing entrepreneurs start/improve their small- and medium-scale enterprises. The assistance was in the form of training in bookkeeping, marketing, cash budgeting, costing, pricing and financial management. IDD/TSS also assisted entrepreneurs with feasibility studies to determine viability of new businesses. The assistance included sourcing appropriate equipment and supplies, loan proposal preparation, duty remission and tax holiday request.

The project (Phase II) also established the local Food Processing Entrepreneur Development Programme which assisted individuals or groups who had viable food processing business proposals, to have the ability to carry them out and meet other criteria of MCET. It also established the Small Mechanics Workshop Programme (SMWP) in collaboration with the International Human Assistance Programme and the Solomon Islands School of Higher Education (SICHE) to help mechanics establish small engine repair businesses in the provinces. SMWP assisted in the establishment of 11 workshops in 9 urban centres in the provinces. It helped assess the commercial viability of the business, provided business and technical training and a loan guarantee for the purchase of tools and equipment to get the business started. Small engine repair businesses included repair of outboard motors, chainsaws and sewing machines.

MCET/IDD is sustaining the previous activities of the project and plans to continue assisting in the establishment of small and medium-scale enterprises which would include agro-related metalworking industries. It will also assist the existing metalworkshop enterprises in diversifying towards production of agro-related machinery following the usual procedures of feasibility studies and giving the necessary institutional support to the entrepreneurs.

The Agricultural Technical Mission of Taiwan (ATMT) to Solomon Islands.

This programme started in 1982. Since then, it has established and operated a pilot demonstration and training area near Honiara for the small-scale production of vegetable crops. Since 1992, it has successfully demonstrated the production of rice on a scale and system appropriate for smallholders. ATMT is developing an additional 20 hectares of irrigated rice land at the demonstration site to accommodate more trainees.

Progress being made in the introduction of rice production in at least three provinces through the Agricultural Technical Program of Taiwan is beginning to result in a demand for some types of rice production and processing machinery. These machines include power tiller, row marker, row weeder, sickle, pedal thresher, engine-driven thresher, rice drier and rice mills. Introduction of labour-saving machines may induce further production of rice as labour intensive and tedious operations are not generally attractive to the Solomon Islanders.

After undergoing one-season of the one-year rice production training course ar ATMT, 20 farmers from different provinces have already produced rice on their

own efforts but on the demonstration land which is well-developed. Due to their initial success, farmers have already begun inquiring about the sources and costs of tools and engine-powered machinery, especially the power tillers to be used in land preparation, driers and rice mills. Figure 14 shows a group of trainees transplanting rice.

Figure 14. A group of farmer trainees learning transplanting rice at a rice production training course being conducted by the Agricultural Technical Mission of Taiwan to Solomon Islands.

As rice is a staple which is currently imported, the impact of locally producing rice will be high. Smallholder and women farmers who will be actively involved in its production will have a ready market.

The potential for rice production is high, especially in Guadalcanal province where some 1,000 hectares have been developed. The fields have been terraced along contours and a well-developed irrigation system exists. The private company which used to produce the rice on a large scale went bankrupt due to a string of problems, including poor management, high cost of mechanized operations and attack of pests which developed resistance due to heavy use of pesticides. Finally, the cyclone in 1986, which was the last straw, forced the company to fold up the project.

The ATMT project has proposed that the abandoned area in the Guadalcanal Plains, now a pasture for cattle, be revived for rice production but this time to be operated on the basis of a smallholders system. It appears to be an ideal location since it is already a developed area specifically for rice production. It could as well be the rice bowl of Solomon Islands.

II. STATUS OF AGRICULTURE AND AGRICULTURAL MACHINERY USE, NEEDS AND SUPPLY

A. Farming system

Coconut and cocoa are the leading agricultural products in Solomon Islands. They are exported in dried form, that is, copra and cocoa beans. However, during 1990 to 1993, virtually the exports have gone to nil because of the cyclone damage. Production is now recovering and coconut oil may be produced with the rehabilitation of the now privatized oil mill. There is a need to improve the efficiency of harvesting and copra drying technologies to increase the yield of oil. Table 1 shows the production of two major crops and livestock from 1987 to the third quarter of 1992.

Table 1. Production of copra, cocoa and cattle by year, 1987 to Third Quarter 1992 in Solomon Islands.

Product	Production, Metric Tonnes					
	1987	1988	1989	1990	1991	1992*
Cocoa	2,691	2,651	3,299	2,725	2,464	1,153
Copra	27,147	29,272	35,094	31,507	2,577	17,423
Cattle (Head)	1,640	1,354	921	633	303	364

*Up to Third Quarter.
Source: Statistics Office, Honiara.

Agriculture is traditionally at subsistence level. There is need to improve the farming system towards commercial farming. One of such improvements is in the area of tool supply which needs to be integrated with any development efforts in the farming system.

Although the market for agricultural tools and machinery is small, there is a need to develop the local metalworking industry to supply the needed mechanical inputs. MAI has realized that the lack of indigenous tool-making industry is holding back agricultural development. Such a need has not been seriously considered before because of lack of technical assistance in this regard. Much of the knowledge gained by the staff of MAI from their own exposure to technologies abroad could not be applied to agriculture because of the lack of tools and machinery. The types of tools presented in the market are only those that will satisfy the requirements of traditional agriculture.

In the conventional and modern furrow tillage and cultivation system using animals or rotary tilling operation using power tillers or tractors is to be done, adoption of soil conservation tillage systems is necessary. Improved agricultural technology, like strip cropping along contours can make possible the use of modern tools and even create a demand for machines normally used in the more developed countries. Thus, the role of MAI in the promotion and development of the tool and machinery industry as well as the application of agricultural engineering principles is needed. In this regard, technical assistance from FAO as well as from UNIDO will be required

Cultivable land is still plentiful but most are idle grasslands in coconut plantations Some of these grasslands are ideal for pasture. The customary land tenure system is constantly blamed for the underdeveloped agriculture although such consolidated ownership makes it easier for commercial and mechanized farming, unlike in the fragmented land ownership in most countries in Asia. Know-how in agricultural technology and management of commercial farming however, must exist in the clan owning the land. Management training in commercial farming is necessary for some members of the clan.

B Cattle production

Cattle is usually raised in pastures and not reared in backyards as commonly practiced by small farmers in Asia If animal draft power is to be promoted in Solomon Islands, the Solomon Islanders must first learn the techniques of cattle rearing Promoting cattle rearing may encounter cultural barriers as it has never been a part of the Solomon Islanders' way of life. The younger generation may be the target of such introduction.

There had been a significant decrease in the population of cattle from 1987 with 1,640 head to 1992 with only 361 head (Table 1). This drastic reduction has prompted MAI to promote the revival of the cattle industry through extension with focus on cattle rearing instead of the range type of livestock production In a way, if this strategy becomes successful, the use of cattle for draft purposes will follow.

C. Currently used agricultural tools and machinery

Each crop production and processing system uses tools and machinery which may either be common with other crops or specialized for the crop depending upon the operation and the level of technology used. Figure 15 shows a set of hand tools commonly used by farmers.

The following describes the types of tools used for producing or processing each major crop produced in Solomon Islands:

(a) Sweet potato. This staple root crop is grown by planting cuttings on mounds or plots of soil raised manually by means of the hoe and the fork.

Weed control is a problem, especially during the initial stages of growth of the sweet potato. However, the sweet potato vines soon overcome the weeds and almost no further care is needed except for the control of insects and protection from domestic animals.

(b) Coconut. Planting of this crop is occasional and occurs only when there is need for replacing missing hills or old and unproductive coconut trees. The soil digger and the hoe are common planting tools.

In harvesting, naturally fallen, rather than deliberately gathered nuts are collected and transported by human labour using a carrying pole or narrow and flat bamboo slat across the shoulder.

Since the coconuts are not harvested from the tree top, gathering them is time consuming. A disadvantage is that the nuts are gathered and processed during way past their maturity and oil content has diminished. Gathering from the tree top can be done only by climbing as there is no tool available for harvesting the nuts from the ground, like the method used in Asia.

The coconut husker, usually a pointed stick or iron bar stuck into the ground, is used for removing the outer covering or husk. A bush knife is usually used for breaking the coconut shell. Sometimes the unhusked coconut is split directly with an ax. A special coconut knife is used for removing the meat from the shell if the meat is to be dried for copra-making. These processes are shown in Figure 16 for a typical village in Solomon Islands.

The coconut meat drier consists of a rectangular and wood-walled chamber heated by a furnace through a pipe made of 200-litre oil drums welded together end to end. In some designs the exit of the pipe constricts to a 15-cm diameter chimney thus retaining as much heat in the tunnel as possible. The furnace at the mouth of the tunnel is fired by coconut shells or firewood. Wood slats on top of the chamber contain the coconut meat to be dried. No smoke comes in contact with the coconut meat while it is being dried. Figure 17 shows a typical coconut meat drier.

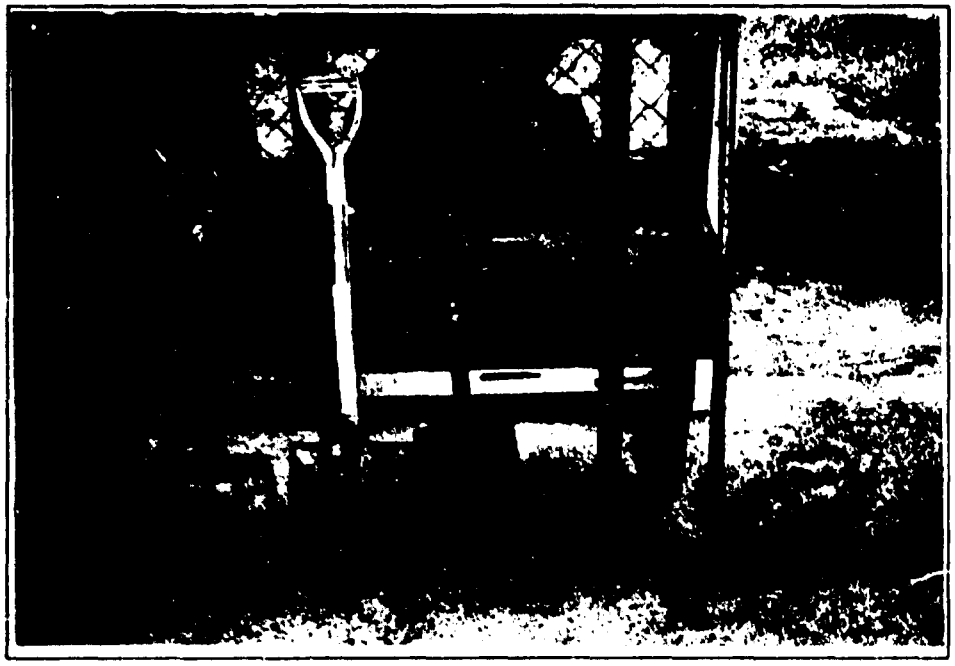

Figure 15. Agricultural hand tools commonly used by farmers. Clockwise from top left: Tillage tools; Brush knife with double edged upward-curved blade end for double-stroke (forehand and backhand) cutting; and Multi-purpose or bush knife with straight and one-sided blade.

Figure 16. Primary operations done on coconut after being collected and prior to drying of the meat. Clockwise from top left: Husking each nut using a pointed steel bar stuck into the ground; Alternate and more direct process - splitting the coconut with an ax without first husking it; note some the germinated nuts indicative of over-maturity at time of collection and extracting the meat from the shell using a copra knife.

Figure 17. Coconut meat drier viewed from the chimney end.

(c) Cocoa. Harvesting cocoa pods and opening them up to get the seeds which are the useful product present no tooling problems. However, to prevent damage to the tree or to the remaining flowers and immature pods, the pod should be cut at the base of the stem with a sharp cutter instead of twisting them by hand or poking them by a stick or pole. A bush knife is used to open the pods. Sometimes a wooden stick is used to break them. The processing equipment which consist of a fermenting box and a drier are mostly wooden.

Fermentation of the fresh cocoa beans takes 6 days. The batch of cocoa beans is stirred every two days. A normal batch for drying consists of 5 sacks of fermented beans with a total weight of about 650 kg. In operation, three persons of family labour work in three shifts to operate the dryer.

The drier usually consists of rectangular heating chamber with walls made out of wood or, in some of the crudely made ones, scrap corrugated galvanized iron sheets. The heater is a 40-cm diameter pipe made from gage 18 mild steel sheet or oil drums connected end to end. One end is the furnace where wood or coconut shells/husks are burned. The other end is constricted by a 5-cm diameter pipe opening welded to the end cover of the heating pipe and serves as the chimney.

This contraption is effective in holding back the heat escaping through the chimney pipe. It is an adaptation of the original design of the drier obtained from the University of the Philippines at Los Banos, College of Engineering and Agro-industrial Technology (UPLB/CEAT). The basic difference is the heater unit which has been changed from charcoal-fired burners inside the heating chamber for

direct heating. In the original UPLB/CEAT design, the charcoal was meant to produce smokeless fire heat but was rejected in Solomon Islands because of the extra labour and the meticulous work involved in making charcoal.

On the top of the drying chamber is the screen surrounded with about 250-mm wide sidings to contain the fermented cocoa beans for drying. Drying takes about 24 hours. Figure 18 shows a cocoa bean drier.

The dried cocoa beans are sold in the market in small or handful size quantities. There is no cocoa grinding industry.

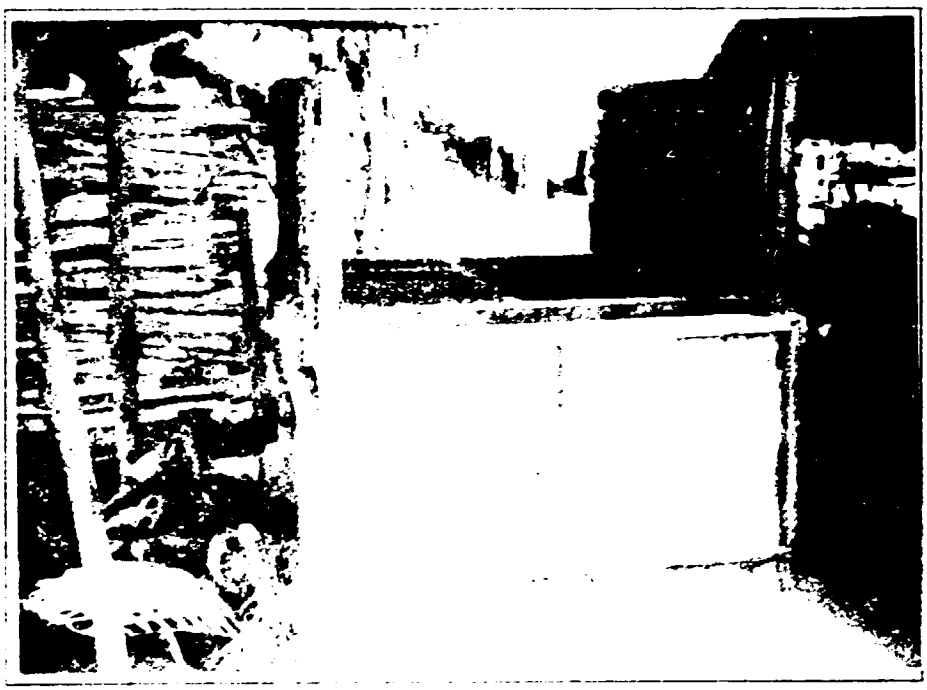

Figure 18. Cocoa or chilli bean drier at Kombeti village, Guadalcanal.

(d) Chilli. This crop, intended for export, has been successfully promoted among farmers. The drier is much the same as for cocoa (Figure 19).

D. Agro-related machinery needed

Under a subsistence level of farming, the demand for agricultural tools and machinery is small. Only the basic hand tools are required, except by a few who are beginning to see the benefits of commercial farming.

Farming systems

Since commercial farming is beginning to emerge, there is an expected demand for tools and machinery. However, unless some intervention is made to introduce animal-drawn implements, the recourse is to use tractors, that is, for those

Figure 19. Chilli or cocoa bean drier. Top: Furnace end of drier; Bottom: Chimney end of drier and drier shed.

who can afford them. During the initial stages of commercial farming development, it is ideal to introduce the soil conservation tillage farming systems. This strategy will mean learning from the sad experiences of most Asian countries where poor tillage practices have caused irreversible soil losses due to erosion. This is because such modern tillage practices, if not accompanied by appropriate soil conservation technology, could be disastrous to the fragile ecology of Solomon Islands. Fortunately, in Solomon Islands, there is only minimal, if any, correction needed because only manual tillage is commonly practiced.

The pressure to cultivate the land is not yet felt in Solomon Islands. The younger generation generally wish a non-farming life style and go abroad. The relatives abroad generally sustain the home family whose members generally see no reason to work hard. But as restrictions to immigration in the favourite countries, namely New Zealand, Australia and the US, get tighter, Solomon Islanders would be forced to stay home and do farming.

Rural transport

There is a need for increasing the load-carrying capacity and transport speed in the rural areas. Women would be specifically benefitted if practical and low-cost transport facilities could be made available as women do most of the load carrying and transporting. The means are the wheelbarrow for domestic use, the animal-drawn cart for in-field and field-to-road use and the motor tricycle or a motorcycle with a side or rear car for inter-village personnel and commodities transport.

Transfer of technology from Asian developing countries is needed towards the development of vehicles in the rural areas.through local manufacture of carts, wheelbarrows and tricycles. A quantum leap would have been advanced in terms of development if such transport equipment were local manufacture. The lack of capabilities to manufacture these vehicles stems from the undeveloped metalworking industry in the country. However, a village craftsman was able to fabricate several units of the wooden wheelbarrow which is much appreciated by the villagers as shown in Figure 20.

Conventional transportation will still have limitations because of the mountainous nature of the inland portion of each island. Agricultural activities also occur in the highlands where transport of commodities is even more difficult. A solution would be the installation of a light ropeway leading to the road head. Ropeways which are used in some commercial banana plantations in other countries are found to be much cheaper than building roads and are environment friendly. With a light ropeway facility, one only needs a portable roller device which can easily be semi-fabricated out of bearings and steel contraption in addition to the basket.

Figure 20. Wheelbarrows. Clockwise from the top left: Imported steel type; Solomon Islander woman demonstrating the wooden wheelbarrow fabricated by a village craftsman and indigenous production.

Coconut harvesting

Coconuts are harvested as nuts which have fallen naturally from the tree due maturity. As coconuts are way past the optimum stage of highest oil content by the time they get detached from the fruit stem, with some already germinating, great losses are incurred in terms of diminished oil extracted. Figure 15 shows that some of the coconuts are already germinating. An improved system is to harvest the nuts from the tree using a curved knife attached to an extendible bamboo pole. The knife can be made by a blacksmith.

E. Supply of agricultural machinery

Apart from the three units of manually operated oil press and some 1,00 units of chilli/cocoa bean drier made by a joinery and a metalworking shop, virtually all agricultural tools and machinery are imported notably from developed countries. Only a few, if any tools or agricultural machines are imported from any developing country, such as that in Asia where the climate and soil conditions as well as the kind of crop grown are similar to those prevailing in Solomon Islands and where more appropriate tools and machinery are likely to have been developed.

The tools and machinery currently sold in the market have been introduced mainly on the basis of commercial decisions as there is no institution which undertakes testing and evaluation of such tools and machinery. The importation of such tools has been mainly done by two hardware stores. Farmers, are constrained to buy whatever is offered by the stores.

Agro-related machinery account for more than one-half of the value of total machinery imports in Solomon Islands in 1988. Table 2 shows the imports of machinery by Solomon Islands (Source: Statistical Yearbook, 1988).

Table 2. Imports of machinery by Solomon Islands during 1988.

Machine	Value, US$
Hand tools, industrial	752,478
Hand tools used in agriculture and forestry	360,399
Motorcycles	7,741
Bicycle	77,976
Machine tools excluding power hand tools	164,537
Grain mills	267,835
Agricultural machinery	222,362
Tillage machinery	116,930
Harvesting/threshing machinery	94,416
Knives and knife blades	83,508
Total	2,148,182

III. ECDC/TCDC POTENTIALS

The following cases are opportunities for cooperation between Solomon Islands and the other developing countries in Asia and the Pacific.

Introduction and production of new models of hand tools

Virtually all the tools used for agriculture in Solomon Islands are imported. The bush knife which is a basic tool and the brush knife, an indispensable one for cutting grass and other weeds which grew luxuriantly under the favourable soil and climate of the Solomon islands, could be substituted or complemented with locally made ones, if facilities and skills could be developed. With an estimated 60,000 households (360,000 people divided 6 people per household) owning at least a bush knife, the indicative market for a substitute, which would be cheaper and more effective than the imported one, would be large enough for a small-scale metalworking enterprise.

The change-over to a new make or model, however, might encounter difficulties and resistance since the current design had been in Solomon Islands since the start of colonial days and work habits had already been developed. Nevertheless, opportunities for achieving better and more work results with new designs are needed to be explored and in the promotion of new models, perseverance would be necessary. The logical source of such tools would be the developing countries in Asia and the Pacific where crop, soil and climatic conditions are similar. Thus, a potential for ECDC/TCDC is first to promote new models of tools for try-out among selected users who could have strategic stature to influence changes should new tools be found better than the traditionally imported ones.

Promoting commercial agricultural system versus the traditional subsistence level system.

The changing of rural economy from the partly to a fully monetized one or from subsistence to commercial agriculture needed technology adoption, which should consider not only the right kind of technology but also the method of introduction to be effective. Although efforts in strengthening the agricultural extension system are being made, there are still several gaps in extension services which need to be filled for effectiveness. Several farmers are being trained in the provincial farmers' training centres which theoretically, would be backstopped by extension workers trained at the National Agricultural Training Institute (NATI). However, farmers are slow in adopting the technologies. One reason perhaps for such slow adoption was the inappropriateness of the technology to the local conditions, lack of sustainability of such technologies and weak human resources capabilities or lack of motivation in extension work.

International technical assistance for inducing farmers to adopt technologies are being given by some countries. For example, the TATM is promoting the production of vegetables and rice. There are volunteers from the US and Japan assigned to rural areas trying to introduce changes. Some of the assistance programmes appeared to be effective but also sometimes not sustained for some reason after withdrawal of the technical assistance.

The transport system for the rural areas needs to be improved to achieve efficiency in the movement of commodities and people. Motor tricycles are a common feature in rural and urban areas of Asia but has not yet gained any foothold in Solomon Islands. A reason perhaps is that nobody among the Solomon Islanders has the training nor the technical and financial capabilities for making one. Introducing motorized tricycles will impact on the livelihood of the people in the rural areas. The lack of transportation is one deterrent for moving from the subsistence to the commercial level of agricultural production.

IV. PROBLEMS AND CONSTRAINTS

A. National Network

MCET/IDD has established, in the course of its activities in the promotion and development of small and medium-scale industries, an informal network or linkages with institutions and organizations directly or indirectly connected with such activities.

This network will be of assistance to the promotion and development of agro-related metalworking industries but will need expanding or further strengthening of linkages with MAL, ARS, SICHE/SID, NGO's and the existing metalworking enterprises.

B. Industrial sector

Industry, through the private sector, is basically relied upon to generate employment and absorb the annual increase in labour force. The structural problems identified for this sector are as follows:

(a) Opportunities are limited for having economies of scale in the manufacturing process due to a small and fragmented domestic market;

(b) Equipment and some raw materials have to be imported, thus, losing any comparative advantage either in import substitution or in exports;

(c) Limited availability of skilled manpower and indigenous financial and management expertise; constant supervision of the semi-skilled workers is required by the management of the metalworking industry hiring; the needed skills have not been developed and the vocational institution appears to have not responded effectively to this requirement by industry;

(d) Inadequate infrastructure and services and

(e) Generally low-level of technology in local industry limits the value adding that can be generated from local processing activities.

Lack of agro-related metalworking industries

The limited number of existing small and medium-scale metalworking industries do not have activities in agro-related machinery fabrication except for three medium-scale workshops. One of such workshops has fabricated a hand-operated coconut oil expeller (3 units made). The other two workshops have fabricated more than 1,000 units of a chilli/cocoa drier with combination wood and metal components, modified from a design obtained from Los Banos Philippines.

This achievement, though small, indicates that existing metalworking industries can diversify from their usual fabrication of structures to that of agro-related machinery. They can, if motivated and given training in fabrication of motorized tricycles which are needed as low-cost transport in the rural areas.

Lack of blacksmithing industry

The lack of a blacksmithing industry for the production of tools, as simple as a bush knife and weeding hoe, has led to a high level of dependence on imports which contribute to the worsening balance of payment deficit of the country. This form of cottage industry is quite appropriate for the widely separated villages. It is a precursor to the more sophisticated metalworking industry. Blacksmithing does not require elaborate equipment and raw materials for fuel are abundant. High-carbon steel, such as the discarded vehicle leaf springs which are also available in the country can be obtained at low costs.

There is potential for blacksmithing as hand tools, like the bush knife, soil digger, coconut grater, hoe head, ax head, rake and trowel can be made from scrap high carbon steel. Discarded vehicle leaf springs are readily available. It would be advantageous if they are recycled into hand tools. Wood charcoal can be made available as wood is abundant. However, blacksmithing must be taught as it is still an unknown art and technology among many Solomon Islanders.

MCET/IDD has already made an impact by being instrumental in the establishment of various small and medium-scale industries and has already the trained manpower capable of sustaining activities for such promotion. However, the agro-related metalworking industry, like blacksmithing has not yet been promoted. One reason for such lack of activity is the underdeveloped nature of agriculture itself. The irony of it is that for commercial agriculture to develop, the necessary tools and machinery must be available as they are crucial capital inputs in agricultural operations.

Inadequate human resources skilled in metalworking and entrepreneurship

Metalworking industrial enterprises are managed by expatriates who had to train their own workers. SICHE/SID has not been able to supply the skilled manpower needed. Only in February 1994 did it offer a one-year course in machining/ fitting and welding/fabrication technology.

C. Agricultural sector

The constraints being faced by the agricultural sector, the growth and development of which determine the extent of supply of inputs, like tools and machinery or vice versa, are as follows:

(a) Poor transport, infrastructure and marketing services which limit smallholders' participation in the economy;

(b) Poor distribution services for agricultural inputs and credit;

(c) Ineffective research and extension services because of poor linkages between the two organizations at the farmers' level;

(d) Limited availability of demonstrations of new technology and other productivity raising opportunities;

(e) Customary land tenure system limits access to and availability of new areas of cultivable land;

(f) Weak institutional arrangements for the sector between central and provincial governments in the planning, implementation and management of sector programmes;

(g) Lack of or inadequate budget, especially for extension and

(h) Exports are concentrated in primary commodities; there is need to encourage greater processing of local produce to add value and create employment in the manufacturing sector.

Lack efficient transport vehicles in the rural areas

Solomon Islands does not have indigenous vehicles for short-distance transportation or movement of commodities. There has been no indigenous cattle raising industry and consequently, no animal-drawn vehicles nor implements. The key to the rural transport and commercial farming, that is, beyond the subsistence level is the provision of low-cost and dual purpose power source - animal draft power. Hand in hand with the smallholder or backyard cattle rearing industry is the development of rural craftsmanship in the area of fabrication of implements and carts combined with blacksmithing. Thus woodcraft, already a fairly developed

industry, may be combined with metalworking to take advantage of the abundant wood resources in the country.

Lack of processing equipment

Many of the produce are brought to the market in raw or as harvested form without any processing. Some products, especially coconut and root crops can be subjected to processing which would increase the value per unit weight or volume and thus, increase the cash income of the processor. Simple tools and machinery could be made by a fairly developed small-scale metalworking enterprise.

V. CONCLUSIONS AND RECOMMENDATIONS

A. Promotion and development of small-scale agro-related metalworking industries

MCET/IDD may wish to consider the agro-related metalworking industry as one among the small-scale industries which need to be promoted and developed along with other SMIs. It is emphasized that a large impact can be attained if such industry is developed as tools and machinery would be available easily and at low cost. However, given the realities of low purchasing power and a small market, the existing metalworking entrepreneurs may have to be encouraged to engage in the fabrication of selected machinery identified by MAL/ARS or other organizations involved in agricultural and rural development. MCET/IDD can depend upon the strength it has already gained through the projects assisted by UNDP/UNIDO.

Metalworking industries in Solomon Islands consist mainly of fabrication of steel structures, water tanks, ships and boats but not moving machinery. Capabilities for building machinery are almost non-existent but can be developed.

Blacksmithing

Blacksmithing, is an unknown art and technology among the Solomon Islanders. Even the basic hand tools used for farming and gardening are imported.

Developing a blacksmithing industry in the villages will provide advantages of convenience of tool procurement especially those who have limited access to transportation to the city or provincial capital. Moreover, tools can be made according to the specifications of the farmer-user, especially women, and will therefore increase productivity. Raw materials can be procured by the blacksmiths themselves from the town or by those who seek the blacksmith's services.

With proper training in design and heat treatment technology, blacksmiths can produce improved tools adapted from designs commonly used by farmers in Asia whose working conditions are similar to those of Solomon Islands.

It is therefore, recommended that blacksmithing technology be introduced by MCET/IDD and external technical assistance for training of trainers and provision of

catalytic equipment be sought. A pilot and demonstration blacksmithing shop or smithy may be established at either NTTT or SICHE/SID.

Animal draft

Animal-drawn implements are non-existent as animal rearing is not practiced nor have been given serious consideration in previous extension or training of farmers. Promoting cattle rearing may encounter certain cultural barriers which should be overcome.

It is recommended that in promoting cattle rearing and animal-draft training, the sociological aspects should be considered. The joint assistance of a rural sociologist or anthropologist and a livestock specialist is essential in the approach.

Soil conservation tillage farming system

The present subsistence farming level has one advantage, that is, it is appropriate for effective soil conservation because the soil is minimally disturbed and soil plant cover is almost always maintained.

It is recommended that in the introduction of tools, implements and machinery which will inevitably accompany the commercial type of farming, the appropriate soil conservation tillage farming systems should also be introduced and their adoption assured. These farming systems should emphasize soil conservation tillage systems to avoid the sad experiences in most Asian countries where erosion has caused irreversible soil losses. Fortunately, Solomon Islanders will not have yet to unlearn any poor tillage practices which may be regarded as the scourge of modern tillage farming because of its negative environmental impact.

Rural transport

The lack of internal transportation has limited the productive capacity of the people in the remote villages. Provision of short-distance transport facilities will promote commercial farming as movement of commodities will be easier. It will also promote small scale food processing industries as supply of raw materials will be more or less assured with proper transport facilities Roads are nor paved in most of the provinces and rugged vehicles are necessary.

It is recommended that metalworking industries be encouraged to fabricate/assemble motorized tricycles or side-cars fitted toe commercially available motorcycles. This type of tricycle is versatile and is adaptable to poor road conditions. The side-car tricycle is narrow and is easily manoeuvrable even along footpaths in the villages or in coconut plantations.

Another vehicle which needs to be promoted is the animal drawn cart for places where there are no roads at all but passable by carts. They are specially effective in the harvesting system for coconuts where the cart has to reach piles of husked nuts for loading.

It is recommended that metalworking industries be given training for fabricating suitable designs of cart, possibly a kit consisting of rubber-tired wheels and a heavy duty axle. A village craftsman will use the kit to build a cart body out of wood.

However, the pre-requisite is a livestock industry particularly the rearing of cattle. It is therefore, recommended that MAL institute a programme for livestock production and cattle training for draft purposes.

National network

Close collaboration and linkage by MCET/IDD with MAL is crucial to the success of any promotion and development campaign in agro-related metalworking industries. Unlike other small-scale industries, however, the agro-related metalworking industry have farmers for clientele who would yet be convinced of the new and alternative tools which such industry will produce and would yet adopt agricultural technologies which depend upon the effectiveness of the extension programme and efforts of MAL. This unique situation makes the promotion of the agro-related metalworking industry complicated because its success depends upon the development of the agriculture sector. A strategy therefore, is to have an integrated programme with the industry and agriculture ministries closely working together on an agro-related metalworking promotion project.

B. Human resources development

Industrial training

SICHE/SID has finally started offering vocational courses in machining/fitting and fabrication/welding. This course is a starting point for the development of human resources in metalworking beyond sheetmetal and structural fabrication works. However, are not generally exposed to the business aspects of their vocation and therefore, the tendency is to find jobs rather than start their own metalworking enterprise. This is of course aside from fulfilling other requirements to prepare them to start such enterprises.

It is therefore, recommended that students be also exposed to business management principles and be given guidelines for establishing small-scale enterprises in preparation for a future engagement in the metalworking industry rather than employment.

Agricultural training

Agricultural technology should be developed parallel to if not ahead of the agro-related metalworking industries. It is the farmers and agro-based industry entrepreneurs who are the clientele of agro-related machinery. The status of agricultural development determines the demand for agricultural machinery although it is also true that the availability of appropriate machinery will spur development in agriculture.

It is therefore recommended that in the straining of extension workers at NATI and of farmers in the provincial farmers' training centres, introduction and demonstration of improved tools and new machinery meant to improve productivities and capacities be integrated with the farming technologies.

Rice production

The Guadalcanal Plains where a large company once attempted to grow rice with mechanization but failed, will be ideal for rice growing on a smallholder basis. The land has been well-developed and adequately irrigated, except for some portions of the irrigation canal which need rehabilitation. ATMT has proposed that the government-owned area be utilized for rice growing rather than for any other crop which does not need much elaborate land development unlike rice. For example, the planting of vanilla which grows best in cooler and higher elevation forest areas would not be wisely using the Guadalcanal Plains, especially the developed ricelands in the area.

It is recommended that the former land used for growing rice in the Guadalcanal Plains be devoted for rice cultivation to maximize utilization of already developed land. If any crop, like vanilla is intended to be grown, it would be best to choose another area better suited for the crop or will not compete with the use of the land already developed for rice.

C. Promotion of processing enterprises

The R &R workshop at the Ranandi Industrial Estate has fabricated three units of manual oil expeller based on the one order by one entrepreneur. Due to lack of promotion, the other two units have not yet been sold, probably because no other entrepreneur desiring to establish a micro-scale coconut oil mill does not know of the existence of the machine.

Instead of villagers transporting coconut or copra, they would get more value for their commodity by processing it themselves. Some metalworking workshops might fabricate small-scale oil expellers and filter presses after their workers would have been trained in fabrication work. A foreseen requirement is the supply of suitable oil containers of perhaps 20-litre capacity to facilitate temporary storage, handling and transport of the oil.

The ngali nut has been identified as having potential for export. Needed is a machine for shelling the nut and processing the kernels into oil or confectionery. The shells may be processed into activated carbon.

It is recommended that MCET/IDD include the small-scale coconut oil milling industry enterprise be promoted. It may coordinate with the CEMA for this purpose.

D. Agro-related machinery prototypes needed

New designs of hand tools, particularly the bush knife, brush knife, hoe, digger, dryland weeder and rice production hand tools are needed for copying by blacksmiths, should there be training to develop them.

The following are the types of machines which are needed according to the progress of development in agriculture and the capabilities in the fabrication of agro-related machinery. Some may be procured for demonstration or trials in farmers' fields.

Agricultural hand tools

(a) Heavy duty wood knife with sheath;

(b) Curved blade bush knife;

(c) Curved blade brush knife with serrations;

(d) Sickle with serrated blade;

(e) Trowel, trough type;

(f) Trowel, flat blade type;

(g) Trowel, claw type;

(h) Taro digger, pointed and flat blades, wood handle;

(i) Hand-pushed weeder for dry land crops and wetland rice

(j) Row-marker for rice transplanting;

(k) Sickle;

(l) Pedal thresher;

(m) Tripod-mounted and portable coconut husker along with husking accessories;

(n) Coconut harvesting knife complete with extendible bamboo poles;

(o) Coconut meat separator, spoon type;

(p) Coconut meat scraper or grater, rotary type;

(q) Coconut harvester, sickle;

(r) Sugarcane crusher, manual;

(s) Peanut sheller;

(t) Peanut planter and

(u) Ngali nut sheller.

Animal-drawn implements, harness and accessories

(a) Single-ox drawn steel plough;

(b) Single-ox drawn peg-tooth harrows;

(c) Single-ox drawn inter-row cultivator;

(d) Single-ox drawn carts with steel wheels and axles, rubber tires and wooden bodies and

(e) Horse saddlebaskets.

Mechanical-powered machinery

(a) Coconut oil expeller;

(b) Oil filter press;

(c) Cocoa grinder;

(d) Hydrotiller;

(e) Rice mill and

(f) Motorized tricycle (motorcycle with side-car).

There are no agricultural machines which can be exchanged by Solomon Islands with other countries.

E. Policies and strategies

Strategy and institutional arrangements

As strategy new small-scale agro-related metalworking industries, particularly blacksmithing shops in selected villages need to be established. Existing small- and medium-scale metalworkshops should be strengthened to enable them to diversify into fabrication of agro-related machinery.

The new management and reporting system introduced by the project on promotion and development of small- and medium-scale industries is being closely monitored by the Director of IDD and the Permanent Secretary of MCET. The IDD officers have acquired the necessary skills and are motivated to sustain the project after UNDP/UNIDO assistance ends.

The Credit Guarantee Scheme established to provide partial guarantees for DBSI loans to qualified Solomon Islander entrepreneurs should be sustained. MCET/IDD has already streamlined the procedures for nomination of projects and qualified entrepreneurs as will as the subsequent extension service during the investment and operational phase of such projects.

The MCET/IDD will be the focal point of a project which focuses on promotion of blacksmithing in Solomon Islands. Other ministries (e.g. Ministry of Foreign Affairs and Trade Relations, MAL and the Prime Minister's Office) will also be involved, as appropriate, in the implementation of the industrial development project.

MAL, particularly the research, extension and training units and the training units of the provinces, will play a crucial role in the promotion of tools and machinery integrated with the relevant agricultural technology. This will require the inclusion of use of tools and machinery in the training courses conducted by the National Agricultural Training Institute (NATI) in Fote, Malaita.

Strategy for industrial development

The Solomon Islands is relying on the private sector initiatives to generate employment. Hence, industry and small business, in spite of the many structural problems being faced, need to be developed through the following strategies:

(a) Defining a formal Industrial Development Policy which will provide an investor friendly environment;

(b) Streamlining the investment approval system;

(c) Simplifying the investment incentives to be more focussed and coordinated at the macro level;

(d) Controlling public expenditure to limit budget deficit, reduce domestic inflation and credit costs with a view to creating a stable macroeconomic situation;

(e) Integrating technology and skill transfer with any foreign investment proposal to enhance local skill levels and technology awareness;

(f) Continuing the commercializing and privatizing of process of government-owned enterprises to provide an open and competitive environment;

(g) Continuing the support for the development of business advisory services throughout the country and

(h) Narrowing down of the Government's role in agriculture to providing extension services, supporting infrastructure and the policy/regulatory environment necessary to enable smallholders to take advantage of domestic and international market opportunities.

F. Programme for further development of the agro-related metalworking industry sector

Development of agricultural engineers for MAL staff

It is essential that MAL have a staff agricultural engineer to take care of the engineering requirements for agricultural development. Some of the areas of concern are soil and water conservation engineering, watershed development, agricultural mechanization systems for the transition from subsistence to commercial farming, agricultural machinery development, environmental protection, post-harvest technology and processing and others. Education and training may be obtained at USP or in any developed agricultural universities in Asia.

Development of engineers for MCET staff

Engineers are needed as technical support staff of MCET. Education for new engineers may be obtained from established educational institutions in Asia or in the neighbouring countries of Solomon Islands where mechanical engineering degree courses are offered.

VI. PROJECT CONCEPTS

A draft proposal was discussed on 4 February 1994 with the Permanent Secretary of MCET, the Director and Deputy Director and Industrial Development Officer of MCET/IDD as well as the Chief Technical Adviser of the UNDP/UNIDO-assisted project, Promotion and development of Small and Medium Scale Enterprises (SOI/90/007). In principle, the proposal was accepted but commented that the final project document should incorporate some degree of flexibility.

A. Regional Asia

BANGLADESH, BHUTAN, CAMBODIA, LAO PDR, MYANMAR, NEPAL, SOLOMON ISLANDS, WESTERN SAMOA

Title: Promotion and development of agro-related metalworking industries in LDCs (Phase II)

Duration: Two years

Total UNIDO budget: US$ 818,000

Government inputs: All governments are expected to provide services, counterpart personnel (including their salaries throughout project duration), office facilities and administrative support in kind. Details will be elaborated in the final project document.

At the end of Phase II, the following are expected:

(a) Each LDC has an effectively operating institutional infrastructure consisting of a national focal point, a national institute with workshop facilities (the two may be combined in some LDCs) with strong linkages with relevant institutions and organizations which through that focal point make active use of the regional project and any country specific project relevant to the promotion and development of agro-related metalworking industry;

(b) Each LDC has a functioning national network (NN) for agro-related machinery with members consisting of institutions and organizations from the above institutional infrastructure, private sector organizations consisting of those of farmers' and manufacturers, cooperative societies, national and international NGOs which have relevant projects or activities, banks and other credit or financing institutions, chambers of commerce and industry, and others. The NN have frequent exchanges of information and notes regarding relevant activities and its functioning depends mostly on the leadership of the national focal point or national institute. Involvement of the NN members in relevant seminar workshops exhibitions and other programmes organized by other members is an indication of a working national network. A NN newsletter (produced by the NFP) exchanges members newsletters among the NN is another indication of an active NN.

(c) Selected agricultural and agro-related machines introduced by the project have been tested, modified, manufactured, demonstrated to farmers and promoted for commercial production and use through credit financing, if necessary to farmers, manufacturers and custom service entrepreneurs.

(d) National focal point or national institute in each LDC is closely linked with RNAM and national focal points regarding agricultural machinery and agricultural mechanization.

(e) Human resources in each national institute and focal point strengthened through human resources development programme of the project.

(f) LDC national institutes have adequate facilities to undertake future development projects with or without external
assistance.

Development objective

The development objective is to support the agricultural production and processing in the participating countries by improving local capabilities and generating a more conducive environment for local manufacture of agricultural tools, implements and machinery including post-harvest and food-processing equipment.

1. Immediate objective 1

Continue strengthening of national focal point linkages through existing network mechanisms.

Background information

Background information is available in the project document for Phase I and programme summary brief document.

Output

National focal points continuously capable of providing a flow a technical information and advice to small and medium scale enterprises in agro-related metalworking industries and initiate and sustain programmes and project in support of those enterprises.

Activities

(a) Continuation of the information dissemination system between RNAM and the focal points;

(b) Continuation of the promotion of links between the national focal points and public private enterprises;

(c) Continuation of ECDC/TCDC promotion within the region and

(d) Continuation of managerial and technical advice to the focal points, enterprises and R&D institutions during field visits;

Inputs

CTA-Regional Adviser	To be provided by ESCAP
2 Associate Experts	To be provided by UNIDO

2. Immediate objective 2

To initiate the establishment of an information database through a database for raw materials demand and supply for the agro-related metalworking industries in Bangladesh, Bhutan Cambodia, Lao PDR, Myanmar and Nepal.

Background information

In the LDCs, most of the raw materials needed for the metalworking industries are imported. The quality of the products put out by the industries depend largely on the quality of raw materials used which at the present open economy at least for Bangladesh, Myanmar and Nepal can now be supplied by the private importers and traders.

Most of the small-scale workshops get their raw materials from the private importers and traders because of the quick response to their needs unlike in government-owned trading corporations which had been established to do bulk importation and distribution primarily to state-owned factories and secondly, to private enterprises. Many small-scale workshops face difficulties in procuring raw materials directly from the state-owned trading corporations.

In the open-market system, there is no systematic method of determining by the importers what and how much to import and supply to the metalworking industries. They estimate by experience but most often, workshops make do with whatever raw materials are best and available. Most of the workshops need assistance in specifying the best type of raw materials needed for their jobs and, even if they know, there is no convenient and effective way for their requirements to reach the importers or traders on a consolidated basis for their necessary action or response.

A database which will get the raw materials requirements and process such data for the information of suppliers will be of great help in achieving efficiency in the raw materials market which redounds to benefit the metalworking industries. Measures will be taken to ensure that accurate data is gathered from both users and suppliers.

Outputs

(a) Database headquarters established at the chamber of commerce and industry (CCI) or manufacturers association's office;

(b) Most small-scale workshops responded to the call to submit data requirements to designated collection points which relayed the data to database;

(c) Private raw materials importers and distributors making use of data in their respective operations network and

(d) Data available for exchange among the countries in the region through regular RNAM channels.

Activities

(a) Development of a database for raw material information and prepare necessary software for this database by an international consultant in one of the countries for replication in the others;

(b) Identification of an organization to manage the database. Normally, the CCI or another association with direct private sector participation would be in a position to undertake the activities of the project as it is to the interest of its members. It may have the option to expand the database to other industry subsectors to utilize excess capacity of the computer facility and staff. The database facility could be made self-liquidating by charging service fees from the users or importers who would like to have access to information. The National Focal Point (NFP) will assist the workshops in making specifications through the R&D member institutions in the National Network (NN) since they have the engineering staff who designed or tested the machines or at least familiar with them. Moreover, they are in a position to best consult and coordinate with the standards agency of the government;

(c) Formulate a strategy for obtaining correct and honest information about raw materials needs from workshops. Data gathering is a time-consuming activity which may be eased through the local business association or cooperative. Since small-scale workshop owners are not usually members of the CCI, they should be encouraged to form their own groups and federate them (refer to Immediate Objective 5). The department of cottage and small-scale industries may spearhead the move in collaboration with the NFP. One benefit to be gained by joining the association is the receipt of information through a newsletter. Workshop owners can also cooperate by returning by mail the canvass form sent by the CCI for the purpose. In return they may receive updated information on the material status over a specified period. Linkages will also be established with statistical services and other relevant databases in the country;

(d) Establishment of the database headquarters. The needed facility includes a personal computer set, a database programme, a printer and a photocopier. Only one staff trained in computer operation is necessary. This may be one of the

secretaries in the CCI office who will be trained to operate the database as one of the office duties. After all, the work only entails data entries which may be done in batches. If the headquarters decide to expand the facility to other types of raw material requirements, it may have to make staff adjustments. Facsimile facilities would be helpful in getting timely data from towns and cities;

(e) Supply of information to interested parties, particularly importers and suppliers as well as government policy and planning offices. The information may be sold at nominal cost to recover the cost of operation. The service may be expanded to other raw materials using the same computer facility and personnel;

(f) Monitoring and evaluation. Random field checking of data gathered will be done to detect spurious data. The database established for all small-scale metalworking workshops will be utilized in the monitoring and evaluation. Benchmark information on problems related to raw materials procurement will be gathered prior to the start of the project or before the effect of the project is felt. Data will again be gathered periodically to detect any changes. Data on how the small-scale workshops have been benefitted or adversely affected by the project will be evaluated.

Inputs

International expert for software development (1.5 w/m)	US$	18,000
One computer expert per country (locally recruited)		10,000
One set of personal computers with printer for each country		30,000
Six photocopiers and facsimile machines		24,000
Miscellaneous		10,000
Component total	US$	92,000

3. Immediate objective 3

To upgrade the skills of blacksmith trainers in all participating countries.

Background information

Village blacksmiths play a major role in the supply of tools and implements to farmers in the LDCs. Most of them learned the trade from their fathers and grandfathers and some skills may have improved or deteriorated along the way. Any improvements in their operations are tied up in the kind and quality of basic blacksmithing equipment they have inherited or added to the modest facility.

There is a need to upgrade both skills and equipment to increase the productivity of blacksmiths. Having skilled blacksmiths who are given access to new technologies, such as improved tools and implements redounds to the benefit of farmers they are serving in the villages, who also need the proper tools and implements to be efficient and productive in their farming activities.

Output

A minimum of ten trainers capable of conducting training courses in each province or district per year in each country to enable participants to manufacture hand tools.

Activities

(a) Adoption of the FAO manual in blacksmithing as syllabus for the training course;

(b) Organization and implementation of training courses by the NFP in cooperation with the Ministry of Industry or Department of Cottage and Small-scale Industries and

(c) Monitoring and evaluation of impact of regional and national training courses.

Inputs

Expert in blacksmithing technology from the region (8 w/m)	US$ 90,000
Equipment - basic blacksmithing sets for selected blacksmiths	25,000
Group training programme	30,000
Miscellaneous	10,000
Component total	US$155,000

4. Immediate objective 4

To promote the production of small-scale machinery for agro-based food-processing light industries in Bangladesh, Bhutan, Cambodia, Lao PDR, Myanmar and Nepal.

This objective includes the following sub-objectives:

(a) To catalyze the development of agro-based food-processing industries by making readily available the machinery required in the processing of food raw materials involved;

(b) To strengthen the capabilities of small- and medium-scale metalworking industries in fabricating machinery required by the agro-based food-processing industries and

(c) To strengthen the comprehensive local machinery and equipment support sub-system for the food industrial system covering that from the production and post-harvest processing of agriculture-sourced raw materials to food-processing, packaging and handling for the market.

Background information

A bottleneck in the promotion of agro-based industries, especially the small-scale ones for the rural areas, is the lack of suitable processing machinery. Most often, the needed machines have to be imported although they are simple enough to be fabricated in local small- and medium-scale workshops especially those having engineering staff and qualified technicians. New entrepreneurs may not be aware of the capabilities of the local fabricators who can satisfy their engineering requirements if given the specifications or requirements.

The cost of machinery for a small-scale agro-based processing enterprise represents a large percentage of the total capital requirements. If such machinery could be made to order locally, the potential entrepreneurs will be encouraged to invest in such industries because of the convenience and perhaps, the reasonable cost and readily available repair services.

UNIDO has made a recent (first half of 1993) report each on the development of food-processing industries in Bangladesh, Bhutan, Cambodia, Lao PDR and Nepal. Eventual responses of the governments will lead to the establishment of new industries, most likely small- and medium scale ones and privately owned. In such food-processing industries, particularly oil, sugar and rice milling as well as dairy and fish processing, special machinery are an important component and in fact, itself a major determinant of the scale of each industry type and the quality of the final products. Special food vessels and containers made of aluminum or stainless steel which can be sterilized using heat, are simple enough to be made by the local industries according to specifications and accepted standards.

In Bhutan and Nepal, fruits, vegetables and spices are grown in mountainous, rugged terrain and remote areas. Transporting the raw materials fresh is often uneconomical and discouraging because of bulk, weight, low value and perishability of the horticultural products. Hence, there is a need to process such food raw materials and increase their value per unit volume or per unit weight. Processing such raw materials will create employment in the remote areas, particularly for women. The hygienic requirements in food processing may be assured through the design of the machine, the process involved and training of the processors and handlers of the raw materials.

The project concept calls for a regional cooperative effort in exchanging machinery design information together with the processing technologies involved. For example, designs of driers of high-valued products, like fish, fruits, vegetables and meat pelletizers and mixers of feed for fish, livestock and poultry, and mills for edible oils exist in some countries which are relatively advanced in some areas. If machine exchange is not possible, information on design will be exchanged and given to machinery manufacturers which have engineering design and construction capabilities.

Outputs

(a) At least one machinery design and technical information on the small-scale food-processing involved for raw materials such as fruit, fish, vegetable, meat, oil, sugar, grain, legume and milk, exchanged among the LDCs and other developing countries or adapted from advanced countries;

(b) At least one medium-scale local metalworking manufacturer assisted by the project resulting in its diversified production of specialized machines for small- and medium-scale food-processing industries and

(c) Strengthened national network.

Activities

(a) Identification of food-processing industries which merit high priority for development on account of highest feasibility considering the most likely sustained production of raw materials, ready market, simplicity of processing technology, low investment requirements, mass-base benefits and other criteria; decision to promote or encourage the establishment of the industry will be made in consultation with the private sector and with support of feasibility studies;

(b) Compilation of information on the food-processing technology, including the machinery requirements and sources of their designs or prototypes, costs and other data;

(c) Establishment of collaboration work with 2 or 3 medium-scale metalworking enterprises having at least one design or production engineer on its staff and with fairly adequate machine tools and fabrication facilities for staff.;

(d) Provision of technical advice to entrepreneurs in food-processing industries and maintenance of collaboration work with them to enhance their productivity, maintain quality control and hygienic production conditions, reduce waste, protect the environment and perform other activities for promoting the food-processing industry in general;

e) Training of trainers in small-scale food processing using the locally fabricated food-processing equipment;

(f) Initiatives by the National Focal Point to maintain constant contact with institutions and organizations for co-ordination activities regarding the sustainability of the food industrial system, e.g. promotion of contract growing among farmers for supply of raw materials for the food-processing plant, giving designs or technical advice/prototypes of agricultural machinery to metal workshops for fabrication or replication and

(g) Organization of a national demonstration workshop for manufactured equipment prototypes to interested entrepreneurs.

Inputs

Expert in food processing equipment manufacture 2 w/m per country x 6 countries = 12 w/m	US$	150,000
National consultants in food-processing to coordinate field activities, 3 w/m x 6 countries		12,000
Preparation of demonstration workshops		12,000
Food processing prototypes		15,000
Materials and supplies for manufacture		15,000
Miscellaneous		5,000
Component total	US$	209,000

5. Immediate objective 5

To promote and develop commercial machinery prototypes for all participating countries.

The immediate objective has the following sub-objectives:

(a) To acquire from LDCs, RNAM member countries and other sources, commercially available machinery identified as needed in the agro-industrial system project for adaptation to local conditions;

(b) To test, modify and replicate the prototypes acquired from other countries and introduce them to farmers, manufacturers and potential entrepreneurs dealing in custom hiring and

(c) To promote the commercial manufacture of the adopted prototype through marketing strategies.

Background information

Often a machine that is suitable for the job in the agricultural production or processing stage in the agro-industrial system is available from other countries. Effort, time and money for R&D to design and develop a machine will be saved if the machine could be acquired through an institutional facility like the Regional Network for Agricultural Machinery (RNAM), a project of 11 Asian countries executed by ESCAP.

The National Focal Point (NFP) in the recipient country turns over the machine to the R&D institution most appropriate for testing, modifying and adapting the machine to work under local conditions. From the experience of RNAM, commercial, rather than experimental prototypes should be exchanged. If no commercial machine is available but R&D efforts have resulted in an experimental prototype, drawings or conceptual designs may be requested as sources of ideas. In all cases of exchanges, proprietary rights have to be respected and permission from

the inventor or designer will be obtained.

Output

Entrepreneurs capable of manufacturing the introduced prototypes in respective countries.

Activities

(a) Machinery demand survey of the machines identified under Phase I. The initial list of hand-operated tools and devices, animal-drawn implements and mechanical powered machinery is included in the detailed report prepared for each country. The prioritization of the final list of machinery is to be done by the NFP in consultation with the leaders of various sub-projects, the R&D institution members of the NN and the agro-industrial machinery expert.

(b) Testing, modification and field or factory trials of the machine by the R&D group in cooperation with one or two manufacturer co-operators and the farmers or the processors depending upon the application of the machine. This activity involves the participation of several persons connected with the agro-industrial system project. The NFP who plays a lead role in the machinery NN will coordinate the activities of all the people involved to ensure success of the sub-project which involves perhaps more than one machine to be developed. Typical assignments are fabrication by a co-operating manufacturer of a modified component or assembly, testing of a part for durability by the engineering laboratory of a university, organizing a discussion group to brain-storm on possible solutions to a technical problem, machinery trials in a farmers field or in a processing plant to demonstrate the superiority of the machine over the traditional or existing ones, replicating the machine in one or more manufacturers' workshops, organizing demonstrations for introducing the machines, conducting trial custom work or renting services in cooperation with an entrepreneur, mapping out strategies with the extension units with technical backstopping by the R&D units, etc. The avenues for collaboration are many.

(c) Monitoring and evaluation by organizing demonstration workshops at the end of the manufacturing process.

(d) Extension and commercialization of the machines. These activities are covered by a strategy suitable for different agro-ecological zones of the country. Farmers, agro-industrial processors, manufacturers and custom work service entrepreneurs are the important targets of the extension activities.

Inputs

Agro-industrial machinery expert from the region (8 w/m)	US$	92,000
National consultants (16 w/m)		30,000
Demonstration workshops		20,000
Procurement of commercial prototypes - At least 3 machines/country x US$ 2,000/ machine for 8 countries		50,000
Replication of prototypes for demonstration		30,000
Miscellaneous		20,000
Component total	US$	242,000

BUDGET SUMMARY	US$
Objective 1 (networking)	
Component total covered by contributions in kind	
Objective 2 (raw material databases)	
Personnel	28,000
Equipment	54,000
Miscellaneous	10,000
Component total	92,000
Objective 3 (village metalworking)	
Personnel	90,000
Training	30,000
Equipment	25,000
Miscellaneous	10,000
Component total	155,000
Objective 4 (food-processing equipment)	
Personnel	162,000
Training	12,000
Equipment	30,000
Miscellaneous	5,000
Component total	209,000
Objective 4 (commercialization of prototypes)	
Personnel	122,000
Training	20,000
Equipment	80,000
Miscellaneous	20,000
Component total	242,000
Common expenses	
Administrative support to RNAM/ESCAP office	30,000
Travel non-UNIDO staff	40,000
UNIDO staff travel	20,000
Equipment for overall project support	10,000
Miscellaneous	20,000
Component total	120,000
Project total	818,000

B. Solomon Islands Country-specific projects

Country project No. 1. Promotion and development of blacksmithing workshops

A. CONTEXT

(a) Description of the subsector

Agriculture is the mainstay of the economy of the Solomon Islands. Main exports are copra, coconut oil, cocoa, logs timber and fish, most of which have undergone only primary processing. Since its independence in 1978, economic activity has been done mostly by the public sector. The rural economy has been based on subsistence agriculture on which some 80 per cent of the rural population rely.

For the two-year period, 1992 and 1993, the industrial sector is estimated to have grown beyond its usual 5 per cent contribution to GDP with the establishment of the brewery, garment and other light industries.

International trade accounts for 45 to 50 % of GDP. Historically, economic growth grew steadily for the first five years after independence in 1978 by an average of 4.5% increase in GDP per year. However, during 1985 and 1986, this growth declined to only 1.4 % mainly due to the fall of international prices of the country's export commodities and the destruction of cyclone Namu in 1986. There was recovery to 4% per year during the period from 1987 to 1991, partly due to the inflow of assistance for rehabilitation. The boost in logging activities in 1992 brought the GDP growth to about 8.2%. However, in 1993, there were expansion of Government expenditures, a decline of the country's trade terms in the international commodity market and the cyclone Nina which hit the country. as a result, the budget deficit situation again worsened.

The current national development strategies emphasize the control of Government expenditures and encouragement towards the development of the private sector participation in the economic activities.

A constraint is the limited and small size of the domestic market preventing the achievement of economies of scale. Industrial activity is constrained by the limited resources of lack of skilled and trained manpower, although population, estimated at 360,000, is increasing rapidly at 3.5% per year. Approximately 50% of the population are in the 14 years and below age group. As such, pressure on government services, like education and health, will increase. Those in the age group 15-59, accounted for 136,000 people and belong to 48% of the population in 1986. In 1991, 26,630 people were formally employed and represented 16.5% of the labour force. In 1993, the labour force was estimated at about 173,000.

The annual formal employment growth from 1983 to 1991 was 3% per year which was below the 3.5% population growth. Thus, increasing unemployment is an expected problem. Future employment will be provided mostly in the private sector

as the strategy is to unload public services as source of employment because of budgetary constraints. Thus, the government will both commercialize and privatize public sector ventures, remove market-distorting regulations and subsidies and streamline the process for investment proposals.

The provincial government system, wherein the local level involvement in the development process is recognized as the major strength of the system, will be reviewed by the Government on account of the lack of financial and institutional resources to make the system fully effective, particularly in terms of clearly defining levels of authority and responsibility.

While the country is well endowed with exploitable natural resources like forests, fertile soil and rich marine and fresh water resources, development has been constrained by the customary land tenure system. A large portion of the land is undeveloped for commercial farming, that is, beyond subsistence level. Only about 30% of the cultivable area of about 3.4 million hectares are under active cultivation.

In 1993, the population density was 13 persons/km^2 of the total land area but that translated to 106 persons/km^2 of the cultivable area. In the more densely populated northern part of Malaita province, that was 200 persons/km^2. Thus, if population gets bigger, food security might be threatened unless progressive farming to increase productivity is achieved. Smallholder or subsistence farming had increased by only 2.6% per year compared with the population growth of 3.5%, indicating that there was a decline in agricultural output per capita. The strategy calls for achieving the long-term objectives of raising non-monetary and cash crops to a level exceeding the population growth rate, encouraging consumption of local produce rather than import as well as increasing the output of exportable crops.

The constraints being faced by the agricultural sector, the growth and development of which determine the extent of supply of inputs, like tools and machinery or vice versa, are as follows:

1. Poor transport, infrastructure and marketing services which limit smallholders' participation in the economy;

2. Poor distribution services for agricultural inputs and credit;

3. Ineffective research and extension services because of poor linkages between the two organizations at the farmers' level;

4. Limited availability of demonstrations of new technology and other productivity raising opportunities;

5. Customary land tenure system limits access to and availability of new areas of cultivable land;

6 Weak institutional arrangements for the sector between central and provincial governments in the planning, implementation and management of sector programmes;

7. Lack of or inadequate budget; and

8. Exports are concentrated in primary commodities; there is need to encourage greater processing of local produce to add value and create employment in the manufacturing sector.

The strategy for the development of the agricultural sector will deal on complementary and integrated activities in improving production and productivity. Opportunities for access to both domestic and international markets through transport, infrastructure and market development will be opened.

The strategy also calls for greater emphasis on rendering effective extension services to farmers and providing support in infrastructure as well as the policy/regulatory environment necessary to enable smallholders to take advantage of domestic and international market opportunities. The private sector will be encouraged to become more actively involved in the areas of input supply and in the transport and marketing of produce.

The industrial sector comprises a wide range of small- and medium- scale manufacturing and processing enterprises concentrated in the wood, fibreglass and metalworking, vehicle/ship building and repair, light engineering, garment manufacturing as well as soap, food and drink production. The new brewery is the largest enterprise in the drink production industry.

The enterprises are mostly concentrated in the Kukum and Ranandi Industrial areas close to Honiara, although a small number operate in the other provincial centres, notably Gizo and Auki. The industrial sector has historically contributed to only 5% of GDP, although there are indications that in recent years this contribution might have increased because of gradual build-up of entrepreneurial skills.

The UNDP/UNIDO project, SOI/90/007, Promotion and Development of Small and Medium-scale Industries completed its Phase II in April 1994. Since then, the Ministry of Commerce, Employment and Trade, Industrial Development Division (MCET/IDD) has continued to provide advisory services to small businesses in all aspects of start up, operations and management and supports a network of business development officers in the provinces. However, no agro-related metalworking enterprise has been established yet.

Credit for industry establishment and operation comes from the Central Bank of Solomon Islands (CBSI), the commercial banks and through the Small Business Finance Scheme operated by CBSI. Direct support is also available through the Rural Training Centres for trainees who wish to establish small rural enterprises.

The industry, through the private sector, is basically relied upon to generate employment and absorb the annual increase in labour force. The structural problems identified for this sector are as follows:

(a) Opportunities are limited for having economies of scale in the manufacturing process due to a small and fragmented domestic market;

(b) Equipment and some raw materials have to be imported, thus, losing any comparative advantage either in import substitution or in exports;

(c) Limited availability of skilled manpower and indigenous financial and management expertise;

(d) Inadequate infrastructure and services; and

(e) Generally low-level of technology in local industry limits the value adding that can be generated from local processing activities.

The metalworking industry subsector is characterized by the following:

(a) Preponderance of sheetmetal working, fabricated structural forms and boat/ship building. These require only simple and basic equipment consisting of sheet metal cutters, benders, rollers as well as welders, power hacksaws, drills and grinders, but not lathes, shapers and milling machines used for precision work.

(b) Metalworking industries are largely managed by expatriates mostly from New Zealand., Australia, Germany and U.K. Only one, among the few existing ones which have relevant activities in the agro-related metalworking, is owned and operated by a local person. The workers have essentially been trained to do specific jobs and therefore, are not as versatile as one who has had formal vocational education or has experience in different workshop enterprises.

(c) Any fabrication work of a fairly complicated agricultural machine would entail a large amount of training time.

(d) Only machines of simple construction and design should be introduced for fabrication during the initial stages of development of the industry and that a prototype should be at hand for copying since there is lack of experience or knowledge of working from drawings.

(e) Scrap iron for blacksmithing work, particularly spring steel from motor vehicles, is available at junk yards. Hence, there is potential for establishing blacksmithing which will be advantageous for remote villages.

(f) Progress being made in the introduction of rice production in at least three provinces through the Agricultural Technical Program of Taiwan is beginning to result in a demand for some types of rice production and processing machinery. These machines include power tiller, row marker, row weeder, hand weeder, sickle,

pedal thresher, engine-driven thresher, rice drier and rice mills. However the area planned to be planted to rice is still small and the target for 1994 is 20 hectares. Introduction of labour-saving machines may induce further production of rice as labour intensive and tedious operations are not generally attractive to the Solomon Islanders.

(g) There is a need for increasing the load-carrying capacity and transport speed in the rural areas. Women would be specifically benefitted if practical and low-cost transport facilities could be made available as women do most of the load carrying and transporting. One means is the animal-drawn cart. A more advanced one is the motor tricycle or a motorcycle with a side or rear car. If technology could be transferred seriously in this area through local manufacture of carts, wheelbarrows and tricycles, a quantum leap would have been advanced in terms of development. Such lack of facilities stems from the undeveloped metalworking industry in the country.

(h) Still, any advancement to solve the problem indicated in item 7 would have limitations because of the mountainous nature of the inland portion of each island. Agricultural activities also occur in the highlands and the transport of commodities is even more difficult. A solution would be the installation of a light ropeway leading to the road head. Ropeways which are used in some commercial banana plantations in other countries are found to be much cheaper than building roads and are environment friendly. With a ropeway facility, one only needs a portable roller device which can easily be semi-fabricated out of bearings and steel contraption.

(i) Coconuts are still harvested as nuts which have fallen naturally from the tree due maturity. As coconuts are way past the optimum stage of highest oil content by the time they get detached from the fruit stem, with some already germinating, great losses are incurred in terms of diminished oil extracted. An improved system is to harvest the nuts from the tree using a curved knife attached to an extendible bamboo pole. The knife can be made by a blacksmith.

(j) SICHE/SID began offering one-year vocational courses in fitting/machining and welding fabrication in 1994. This offering is a milestone in developing human resources in the metalworking industry. Students may be exposed to business management principles in preparation for a future engagement in the metalworking industry rather than employment.

(b) Host country's strategy

The Solomon Islands is relying on the private sector initiatives to generate employment and absorb the some 7,500 young people joining the labour force each year. National development strategy has at this focus otherwise, pressure at the social and economic levels concomitant with increasing unemployment will be a great problem. Hence, industry and small business, in spite of the many structural problems being faced, need to be developed through the following strategies:

(a) Defining a formal Industrial Development Policy which will provide an investor friendly environment;

(b) Streamlining the investment approval system;

(c) Simplifying the investment incentives to be more focussed and coordinated at the macro level;

(d) Controlling public expenditure to limit budget deficit, reduce domestic inflation and credit costs with a view to creating a stable macroeconomic situation;

(e) Integrating technology and skill transfer with any foreign investment proposal to enhance local skill levels and technology awareness;

(f) Continuing the commercializing and privatizing of process of government-owned enterprises to provide an open and competitive environment;

(g) Continuing the support for the development of business advisory services throughout the country; and

(h) Narrowing down of the Government's role in agriculture to providing extension services, supporting infrastructure and the policy/regulatory environment necessary to enable smallholders to take advantage of domestic and international market opportunities.

(c) Projects and on-going programmes

(1) Regional Network for Agricultural Machinery (RNAM)

This project of 11 Asian countries has its headquarters at ESCAP in Bangkok, Thailand. One of its activities is to gather information on machinery designs and mechanization experiences from various sources and disseminate it to the member countries. It promotes TCDC/ECDC in which one of the activities is the holding of regional exhibitions and symposiums, called Agrimach, the latest of which was held in Jakarta, Indonesia in December 1993. The project on promotion and development of agro-related metalworking industry in Solomon Islands may link with RNAM and be benefitted by its database on agricultural machinery and mechanization.

(2) Promotion and Development of Small and Medium Scale Industries (Phase II, SOI/90/007)

This two-year project, funded by UNDP and executed by UNIDO, was completed in April 1994 and had been sequel to two previous UNDP-funded projects, namely, Indigenous Enterprise Promotion (SOI/84/004) which operated from March 1985 to February 1988 and the Promotion and Development of Small and Medium Scale Industries (Phase I, SOI/88/002) which operated from March 1988 to

April 1991. The Indigenous Enterprise Promotion project focussed on providing industrial policy and strategy assistance to the MCET.

These projects, have resulted in a number of enterprises, among which are small engine repair, rain catchment or water tank fabrication, peanut roasting, timber milling and fruit drying. Technical advice and training were provided to existing small and medium-scale industries. Institutional support through the Industrial Development Division, Technical Support Services Unit (IDD/TSS) of MCET was established to help prospective /existing entrepreneurs start/improve their small and medium-scale enterprises. The assistance was in the form of training in bookkeeping, marketing, cash budgeting, costing, pricing and financial management. IDD/TSS also assisted entrepreneurs with feasibility studies to determine viability of new businesses. The assistance included sourcing appropriate equipment and supplies, loan proposal preparation, duty remission and tax holiday request.

The project (Phase II) also established the local Food Processing Entrepreneur Development Programme which assisted individuals or groups who had viable food processing business proposals, to have the ability to carry them out and meet other criteria of MCET. It also established the Small Mechanics Workshop Programme (SMWP) in collaboration with the International Human Assistance Programme and the Solomon Islands School of Higher Education (SICHE) to help mechanics establish small engine repair businesses in the provinces. SMWP assisted in the establishment of 11 workshops in 9 urban centres in the provinces. It helped assess the commercial viability of the business, provided business and technical training and a loan guarantee for the purchase of tools and equipment to get the business started. Small engine repair businesses included repair of outboard motors, chainsaws and sewing machines. Should engine-powered agricultural machinery become popular among farmers, the businesses in their vicinity may serve their owners.

MCET/IDD is sustaining the previous activities of the project and plans to continue assisting in the establishment of small and medium-scale enterprises which would include agro-related metalworking industries. It will also assist the existing metalworkshop enterprises in diversifying towards production of agro-related machinery following the usual procedures of feasibility studies and giving the necessary institutional support to the entrepreneurs.

(3) The Agricultural Technical Mission of Taiwan to Solomon Islands.

This programme started in 1982. Since then, it has established a pilot demonstration and training area near Honiara for the small scale production of vegetable crops. Since 1992, it has successfully demonstrated the production of rice on a scale and system appropriate for smallholders.

After undergoing one year training, 20 farmers from different provinces, where rice is planned by the Provincial Administrators to be produced, have already produced rice on their own efforts but on the demonstration land which is well developed. Due to their initial success, farmers have already begun inquiring

about the sources and costs of tools and engine-powered machinery, especially the power tillers to be used in land preparation, driers and rice mills.

As rice is a staple which is currently imported, the impact of locally producing rice will be high. Smallholder and women farmers who will be actively involved in its production will have a ready market.

The potential for rice production is high especially in Guadalcanal province where some 3,000 hectares have been developed terraced along contours and already has a well developed irrigation system. The private company which used to produce the rice went bankrupt due to a string of problems, including poor management, high cost of mechanized operations and attack of pests. Finally, the cyclone in 1986, which was the last straw, forced the company to fold up the project. The Taiwan Agricultural Technical Mission project has proposed that the abandoned area in the Guadalcanal Plains, now a pasture for cattle, be revived for rice production but this time to be operated on the basis of a smallholders system. It appears to be an ideal location since it is already a developed area specifically for rice production. It could as well be the rice bowl of Solomon Islands.

(d) Institutional framework

The national focal point for this project is the MCET/IDD. This unit is most experienced in the promotion and development of small-scale industries. MCET/IDD has established a track record in stimulating the private sector to establish/improve their small-scale enterprises in several fields and in various provinces in the Solomon Islands.

In this project, close collaboration and linkage by MCET with the Ministry of Agriculture and Lands (MAL) is crucial to the success of any promotion and development campaign in agro-related metalworking industries. Unlike other small-scale industries, however, the agro-related metalworking industry have farmers for clientele who would yet be convinced of the new and alternative tools which such industry will produce and would yet adopt agricultural technologies which depend upon the effectiveness of the extension programme and efforts of MAL. This unique situation makes the promotion of the agro-related metalworking industry complicated because its success depends upon the development of the agriculture sector. A strategy therefore, is to have an integrated programme with the industry and agriculture ministries closely working together on an agro-related metalworking promotion project.

The Agricultural Research Station (ARS) at Dodo Creek is administratively under MAL and is responsible for all research aspects of crops being promoted by the Government. As an experiment station as well as producer of seeds for dissemination to farmers, it makes use of tools and machinery for its field and experimental production plots. These equipment are all imported and some processing machinery have been acquired through grants supporting some research programmes. Thus, the Station itself has wittingly or unwittingly selected the appropriate tools and machinery for production as it would reject or not use those

which are not suitable for its crop production operations. It would be advantageous if this experience is utilized in the metalworking promotion project.

This project will also involve the country's well-developed financing institutions for industrial investments. These institutions comprise the CBSI, four commercial banks, four commercial insurance companies, a rural credit movement and relevant government-owned financial institutions, such as the National Provident Fund and the Development Bank of Solomon Islands (DBSI). CBSI has a Small Business Finance Scheme which aims to assist in the development of the business activities by Solomon Islanders by making loans for such projects easy and less costly to obtain. The Scheme provides a guarantee as security for loans given by commercial banks and DBSI, assistance by paying part of the interest to the banks on behalf of the borrowers and re-financing of loans made by commercial banks under the scheme.

Regarding industrial training, the Trades Training and Testing (NTTT) unit of MCET's Loan Division, provides short-term courses and supervises the national apprenticeship scheme. The SICHE School of Industrial Development (SICHE/SID) provides formal courses as well as training programmes in rural areas, the latter through its Rural Services Industrial Training Unit. SICHE/SID began offering vocational courses in fitting/machining and welding/fabrication which will provide the trained human resources long needed by most industries.

B. BACKGORUND AND JUSTIFICATION

(a) Problem to be addressed and the present situation

This project intends to address the problems related to the lack of small-scale agro-related metalworking industries and of a programme which would aim at promoting and developing them in Solomon Islands. Such industrial activities if developed will contribute to the absorption of labour and will have the effect also of promoting and developing agriculture. The limited number of existing small and medium scale metalworking industries do not have activities in agro-related machinery fabrication except for three medium-scale ones of which one has fabricated a hand operated oil expeller (3 units made) and two have fabricated more than 1,000 units of a chili/cocoa drier with combination wood and metal components, modified from a design obtained from Los Banos Philippines. This achievement, though small, indicates that existing metalworking industries can diversify into fabrication of agro related machinery.

The lack of activities for the production of tools, as simple as a bush knife and weeding hoe which are imported together with other tools used for agriculture, has led to a high level of dependence on imports which contribute to the worsening balance of payment deficit of the country. There has never been any blacksmithing which is a form of cottage industry and quite appropriate for the widely separated villages and usually a precursor to the more sophisticated metalworking industry. Blacksmithing does not require elaborate equipment and raw materials for fuel are

abundant. High-carbon steel, such as the discarded vehicle leaf springs which are also available in the country can be obtained at low costs.

Solomon Islands does not have indigenous vehicles for short-distance transportation or movement of commodities. There has been no indigenous cattle-raising industry and consequently, no animal-drawn vehicles nor implements. The key to the rural transport and cultivation of lands beyond the subsistence level is the provision of low-cost and dual purpose power source - animal draft power. Hand in hand with the smallholder or backyard cattle-rearing industry is the development of rural craftsmanship in the area of fabrication of implements and carts combined with blacksmithing. Thus woodcraft, already a fairly developed industry, may be combined with metalworking to take advantage of the abundant wood resources in the country.

Many of the produce are brought to the market in raw or as harvested form without any processing. Some products, especially coconut and root crops can be subjected to processing which would increase the value per unit weight or volume and thus, increase the cash income of the processor. Simple tools and machinery could be made by a fairly developed small-scale metalworking enterprise.

This project will address the lack of activities in agro-related metalworking by stimulating the private entrepreneurs into producing tools which are normally imported. the project aims at promoting blacksmithing especially in the remote villages which do not have ready access to the imported tools, physically and financially. MCET/IDD has already made an impact by being instrumental in the establishment of various small and medium scale industries and has already the trained manpower capable of sustaining activities for such promotion. However, the agro-related metalworking industry, like blacksmithing has not yet been promoted. One reason for such lack of activity is the underdeveloped nature of agriculture itself. The irony of it is that for commercial agriculture to develop, the necessary tools and machinery must be available as they are crucial capital inputs in agricultural operations.

(b) Expected end-of-project situation

At the end of the project, the following will have been achieved:

1. Three trainers from MCET/NTTT will have been provided fellowships for developing skills in blacksmithing and will have conducted demonstrations in strategic and remote villages in at least four provinces to promote the establishment of smithies (blacksmithing workshops) by village entrepreneurs.

2. Interested village entrepreneurs from remote villages will have been trained in blacksmithing at the blacksmithing pilot and demonstration foundry at MCET/NTTT.

3. At least five blacksmiths trained at MCET/NTTT will have established their own smithies in their respective provinces and will have produced improved hand tools introduced by the project.

4. MCET/IDD will have developed the capability to coordinate the activities of the trainers in blacksmithing with those of MAL/ARS which will have specified the types of tools needed for the promotion of crops and farming systems.

5. MCET/IDD will have coordinated with MCET/NTTT in organizing blacksmithing training courses for interested village entrepreneurs; will have provided assistance to such entrepreneurs in securing loans for buying blacksmithing equipment through establishment of a loan guarantee fund in collaboration with CBSI.

6. MCET/IDD will have established a system of monitoring and evaluation of the activities of the smithies established through assistance of the project. It will also have a continuing assistance programme to the blacksmiths through supply of information on new tool designs which will have been obtained through relevant projects of MAL/ARS, RNAM and possibly the Pacific Network for Agricultural Tools and Implements (PACNATI) with secretariat to be based at the University of the South Pacific (USP) in Apia.

7. MCET/IDD, the national focal point of the project, will have been strengthened further through its activities in promoting, developing, evaluating and monitoring the agro-related metalworking industry while making use of the experiences and strengths gained in the project, Promotion and Development of Small and Medium Scale Industries (Phase II).

8. MCET/IDD will have established close collaboration and linkages with MAL and its Agricultural Research Station and the Extension Office as well as with the Taiwan Agricultural Technical Mission, the relevant NGOs, like Soltrust, Solomon Islands Development Trust and Association of Rural Training Centres.

(c) **Target beneficiaries**

Target beneficiaries will be the small-scale or cottage industry entrepreneurs or craftsmen in the villages of Solomon Islands. Farmers and villagers who will be supplied with the locally made tools, expected at lower cost, easily repaired and more appropriate to their needs than the imported ones, will be also benefitted.

The potential entrepreneurs in blacksmithing will be given special training at MCET/NTTT and will be provided further assistance in establishing their own smithies through technical advice, preparation of loan proposals, provision of loan guarantee fund and promotion of blacksmithing products through MAL extension office and the Provincial Administration. The blacksmiths will have monetary income from the small scale or cottage-type metalworking industry which will cater to the requirements of their own villages but also of the neighbouring villages. As it has been in most developing countries in Asia, blacksmithing technology which will be

acquired with assistance from the project, will be handed down to the next generation and therefore, the benefits will be far-reaching and lasting.

Some staff of the participating institutions will also be benefitted through fellowships in group training programmes.

Smallholders or farmers owning small parcels of land will benefit from the project because of the consequent extension activities in promoting improved tools and machinery. Blacksmiths will be the focal points of MAL extension unit in the villages when doing extension work on agricultural technologies.

Since the farming activities are taken up mostly by women, the tools which could be provided by blacksmiths will be of great value to them. Women who traditionally take a large share of farming activities will be eased of their burden through the use of improved tools suited for their physique and even custom-made for them by village blacksmiths, resulting in greater productivity, efficiency of operations and increased income.

Ultimately, with increased productivity and improved efficiency of operations, the society as a whole will be benefitted.

(d) Project strategy and institutional arrangements

The project strategy is designed to create new small-scale agro-related metalworking industries, particularly blacksmithing shops in selected villages. It is also designed to strengthen existing small- and medium-scale metalworkshops to enable them to diversify into fabrication of agro-related machinery.

As a result of the UNDP/UNIDO-assisted project which was completed in April 1994, an improved institutional capacity in the Government of Solomon Islands through MCET/IDD, has already been achieved. The Director of MCET/IDD and other senior Ministry staff, including the Permanent Secretary, are committed to the sustainability of the project. The new management and reporting system introduced by the project on promotion and development of small and medium scale industries is being closely monitored by the Director of IDD and the Permanent Secretary of MCET. The IDD officers have acquired the necessary skills and are motivated to sustain the project after UNDP/UNIDO assistance ended.

The MCET/IDD will be the focal point of this new project which focuses on promotion of blacksmithing in Solomon Islands. A short-term consultant will be provided to work with the Division. The Under-secretary of MCET/IDD will be designated as the national project coordinator. Other ministries (e.g. Ministry of Foreign Affairs and Trade Relations, Ministry of Agriculture and Lands and the Prime Minister's Office) will also be involved, as appropriate, in the implementation of the industrial development project. MAL, particularly the research, extension and training units and the training units of the provinces will play a crucial role in the promotion of tools and machinery integrated with the relevant agricultural technology.

This will require the inclusion of use of tools and machinery in the training courses conducted by the National Agricultural Training Institute (NATI) in Dala, Malaita.

Provincial development in Malaita Province (Auki-based) and in Western Province (Gizo-based) will be specifically assisted by an Associate Expert. Significant domestic travel will be required for the project staff to assist Provincial institutional capacity development.

Initial technical assistance will be provided by a consultant to train trainers in the area of blacksmithing fundamentals. Consultant services will include a blacksmithing expert for one month.

The project will focus on the development of blacksmithing in the provinces where agricultural tools have large potential as the commercial supply of imported hand tools in remote villages and islands is difficult due to inadequate land and sea transport over wide distances. Commercial, that is, beyond subsistence level production of crops is planned to be promoted by MAL and the provincial administration and for this target, various agricultural hand tools are needed.

Three mobile or roving pilot and demonstration smithies or blacksmithing workshops will be established to promote the industry.in the targeted villages. Each workshop will be operated by a blacksmith trainer who will have been trained abroad for three months under a "master village blacksmith" identified with assistance of the National Institute of RNAM in the country. These three blacksmiths will eventually be trainers of village blacksmiths at the MCET/NTTT in Honiara. They will initially be conducting demonstrations in the Provincial capitals then in the villages.

The attraction of blacksmithing in the village is expected to create awareness of the technology and the hand tool products which may substitute the imported ones. Farmers and users, including women, can give their suggestions for improving each tool which can actually be made to order. After demonstrating in a village which is the centre of a ward, training will be held in that ward with villagers being invited and screened for aptitude or native talent in the art, interest and ability to invest in a blacksmithing equipment set and workshop. The successful candidate in the ward will be trained rigourously together with other candidates at the MCET/IDD. Quality control will be instilled in the mind of each trainee. The ward may sponsor the training of the candidate from their ward through contributions.

Equipment will be provided for use at the Provincial level as follows: motorized tricycles (motorcycles with side-cars) for two Associate Experts. At Honiara, a pick-up truck will be provided for use by the expert and the project staff.

In developing this project document, preliminary discussions were held with the Permanent Secretary, MCET and officers of MCET/IDD, MAL and the Permanent Secretary of Malaita as well as the UN personnel of the current project on promotion and development of agro related metalworking industries.

(e) **Reasons for assistance from UNIDO**

UNIDO is implementing Phase I of the regional project, promotion and development of agro-related metalworking industries in LDCs. Extensive information on the status of such industries in eight LDCs, including Solomon Islands, has already been gathered and the country report forms the basis for formulating this project. Before the implementation of Phase I, preparatory activities were conducted by UNIDO, including the organization of a regional workshop on agro-related metalworking industries in LDCs and production of document PPD/R.47.

The Government of Solomon Islands has considered national execution for the project and has elected agency execution because it does not yet have adequate technical capacities for national execution. Although much have already been gained in the project, promotion and development of small and medium scale industries, under a UNDP/UNIDO-assisted project (SOI/90/007) and prior to that, still were two projects along the same lines, the technical capabilities in the field of agro-related metalworking industries are almost non-existent because of lack of exposure to such basic works as blacksmithing.

It is therefore, proposed that UNIDO continue to be the source of technical expertise for this project. The focus of the project is on areas specific to small industry and agro-based industries in which UNIDO specializes. Furthermore, UNIDO has executed other projects in the Solomon Islands in the areas of wood processing (SOI/86/002), assessment on industrial training needs (SOI/87/204) and small-scale garment factory (SOI/89/801).

(f) Special considerations

The project will promote private sector industrial development and incidentally, also agricultural development. These are high priorities by the Solomon Islands Government which encourages the commercialisation and privatisation of its enterprises. Industry is being promoted to absorb employment and to take opportunities for import substitution.

Agriculture is a major thrust because of the desired progress from subsistence to commercial production levels. In line with this thrust is an aim to increase labour productivity, particularly that of women who do most of the farm work. Blacksmiths can make special tools for them according to their specifications of size, weight and design according to their physique. The availability of suitable hand tools which can be locally made by blacksmiths presents an opportunity for increased production of crops targeted by the Government for export, to substitute for the currently imported tools and increase the productivity of farm operations.

(g) Coordinating arrangements

The national focal point, MCET/IDD, will play an active role in the implementation of activities. The project secretariat joint operation of UNIDO and ESCAP/RNAM, will maintain contact with MCET/IDD. The executing agency, UNIDO, will coordinate and consult whenever necessary.

This project will be integrated with the on-going and future operations of MCET/IDD. In its activities on promotion and development of small and medium scale industries, MCET/IDD will coordinate all other Government bodies, financial institutions and NGOs dealing with activities on farmers training and dissemination of information. In particular, MCET/IDD will be in close collaboration and coordination with MAL and its research, extension and training institutions as well as with the Provincial Administration. It will also coordinate closely with SICHE/SID regarding development of human resources.

(h) Counterpart support facility

The Government will allocate within established procedures and policies, to provide funds for the government project inputs such as counterpart personnel, training facilities, transport and equipment. The specific counterpart arrangements are described in item (d) above.

C. DEVELOPMENT OBJECTIVES

The development objective is to establish policies and programmes for strengthening the agro-related metalworking industry sector, thereby enabling the sector to meet the demand more efficiently than it can at present and to provide the machinery input support to agriculture towards sustained production of food and raw materials for agro-based industries

1. Immediate objective 1

To develop and strengthen the capabilities of MCET/IDD, in collaboration with MCET/NTTT, in providing technical and institutional support in the promotion and development of the blacksmithing industry in Solomon Islands.

1.1. Output 1

Three trainers of blacksmiths from the National Trade Testing and Training unit of the Ministry of Commerce, Employment and Trade, acquired knowledge and skills in blacksmithing as well as know-how in replicating proven agricultural hand tools after having been trained each under a "master blacksmiths" in a developing country in Asia and also became capable of organizing and conducting effective demonstrations and training courses in blacksmithing.

Activities for Output 1

1.1.1. Establish a pilot and demonstration blacksmithing workshop consisting of four sets of equipment, one permanent and three roving, at MCET/NTTT in Honiara.

1.1.2. Organize, in collaboration with FAO, a one-month basic course in blacksmithing with technical assistance of a consultant for the three trainees and other interested persons at MCET/NTT.

1.1.3. Select from among the participants in the course, three most qualified trainees from MCET/NTTT who will be committed to organize and conduct demonstrations and training in blacksmithing in the villages. They will be given fellowships for advanced and practical course as indicated in Activity 1.1.4.

1.1.4. Organize also, in collaboration with RNAM/ESCAP in Bangkok, Thailand and through the National Institutes of the RNAM, three separate 3-month advanced and practical training courses in blacksmithing, one each in India, the Philippines and Thailand. Each trainee will receive practical experience on-the-job under a developing country setting and under the supervision of a "master blacksmith" who is engaged in the production of agricultural hand tools intended to be introduced to Solomon Islands. Thus, the trainee is expected to learn producing the common and popular tools in the country.

The training course will include also learning sessions in demonstration techniques and development of communication skills. It will also include local study tours to observe and learn about farming practices in the host country, especially those needing the use of hand tools and animal-drawn implements which each trainee encounters in the blacksmithing practice. Examples are observations of the coconut harvesting and processing system and the use of animal-drawn implements and carts which may be adapted in Solomon Islands through provision of blacksmith's products.

1.1.5 Immediately after the return of the trained trainers in blacksmithing to Solomon Islands, organize and conduct a two-week workshop by the trained blacksmiths at MCET/NTTT for the purpose of:

(a) Debriefing the MCET/IDD and project staff;

(b) Exchanging among themselves (trainers) the experiences gained and designs of tools acquired from their respective countries of training;

(c) Fabricating samples of such designs for exhibits and for home trials and demonstrations by selected government officials and other persons (Activity 1.1.6.);

(d) Training the trainers further in effective training, communication and demonstration; and

(e) Preparing questionnaires, posters, leaflets and other information materials.

1.1.6. Organize a seminar with demonstration by three blacksmith trainers before invited guests from MCET, MAL, the Provinces, other ministries, farmers groups and other relevant organizations. Distribute tool samples for field trials and get feedback, including suggestions for improvement of the tools, through questionnaires about performance and acceptability. Use the most favoured designs of tools in subsequent introduction during the local training sessions.

1.2. Output 2

Three roving pilot and demonstration smithies established; demonstrations of blacksmithing works covered 100 per cent of all major wards in at least four provinces and at least 50 per cent of the major wards in other provinces. Sample tools tried by some villagers; questionnaires on reactions to the tools given, recovered, analyzed and suggestions considered.

Activities for Output 2

1.2.1. Organize and launch a public demonstration on blacksmithing at the Kukum market in Honiara. Preparatory activities will include, but not limited to the following:

(a) Announcement of the event over the radio, newspapers and by means of posters; include invitation to bring damaged or worn out bush knives or other tools and small pieces of scrap hard steel (leaf spring of motor vehicles) for possible repair, recycling into another tool or making into a tool.

(b) Preparation of information leaflets regarding blacksmithing, its history and role in industrial evolution, benefits to mankind and current status in other countries.

(c) Preparation of brochures on investment opportunities in blacksmithing in the villages to supply tools locally and possibly for export to other South Pacific Islands, if good quality is attained and maintained; and

(d) Making of samples for sale at the demonstration with attached questionnaire regarding their reactions to the tools for the purpose of improving the quality.

1.2.2. Continue the demonstration and sales/services up to a designated period. Then each blacksmithing unit will move separately to the provincial capitals and then to the villages with a view to demonstrating and covering 100 % of all major wards and at least 50% of other wards in four provinces.

1.2.3. During the demonstrations of blacksmithing in the villages, identify potential village entrepreneurs who are interested in establishing their own blacksmithing shops and who have aptitude for the industrial art.

2. Immediate objective 2

To promote the establishment of smithies in the villages to supply the local hand tools.

2.1. Output 1

At least two smithies established by private entrepreneurs in villages where they are considered to be viable; such workshops engaged in the commercial production of tools introduced by the project through MCET/IDD.

Activities for Output 1

2.1.1. Organize at the pilot and demonstration smithy at MCET/NTTT, practical training courses in blacksmithing for interested village entrepreneurs. Training will essentially be conducted by the three trained trainers who have identified potential trainees during their demonstrations in the villages.

2.1.2. Assist each identified entrepreneur in establishing a smithy by specifying equipment; helping in the procuring them; advising on the operation of a smithy; giving training through the trained blacksmith trainers and making available the facilities of the MCET/NTTT pilot and demonstration smithy for agro-related metalworking industry incubator.

2.1.3. Assist blacksmithing entrepreneurs in obtaining financing of equipment and initial operational capital from DBSI, commercial banks, credit unions, government programmes and grants-in-aid schemes, through MCET/IDD.

2.1.4. Monitor the performance of the blacksmiths through visits and assist them further through providing improved tool samples, catalogues of hand tools and ad-hoc technical advice, particularly on quality control. Evaluate the results and document the significant events for use in further promotion programmes.

Inputs

Government inputs

1. Counterparts

(a) Two counterparts will be provided for the Agricultural Machinery Adviser - the Director and the Deputy Director of MCET/IDD. The Government, and in particular, the MCET/NTTT will nominate qualified trainees for training trainers in blacksmithing who will be committed to be full-time trainers and counterparts of the Agricultural Machinery Adviser after having been trained through project fellowships. One counterpart will be provided for the Associate Expert. The Government will pay the salaries and allowances for official travels of the counterparts.

(b) In addition to the above, MCET/IDD will provide an assistant to the blacksmith trainer during his training tour in key villages. Salaries and per diem will be provided to the trainer and his assistant.

2. Secretarial support

The project will have access to the MCET/IDD's typist for all typing and secretarial work.

3. Office Space and facilities

Office space and facilities will be provided by MCET/IDD and MCET/NTTT for the technical advisers and experts. Workshop space will be provided by MCET/NTTT for the pilot and demonstration foundry which will Serve also as the training and incubator facility for blacksmithing.

4. Transport

Transportation costs will be provided for the project personnel in official travel to the villages.

5. Training

MCET/IDD will provide funds for the seminars and demonstrations as well as the logistics for training in blacksmithing in the villages.

UNIDO inputs	US$171,000
1. Personnel	78,000
(a) Agricultural Machinery Adviser, 6 w/m, (3+3)	78,000
(b) One Associate Expert in metalworking, with knowledge of blacksmithing technology, 12 w/m	Nil
2. Training	30,000
Three fellowships for practical skills training in blacksmithing under practicing "master village blacksmiths", 3 months each:	30,000

(i) One fellowship in India;
(ii) One fellowship in Philippines and
(iii) One fellowship in Thailand.

(Note: The training of trainers of blacksmiths is one of the immediate objectives of the proposed regional project in which Solomon Islands is a country participant. The activities and approach for the country project are different from those of the regional project).

3. Equipment	38,000
(a) Blacksmithing	15,000

(i) Three sets blacksmithing equipment, complete with anvil, forge and hand tools;
(ii) Three sets portable blacksmithing shed consisting of a canvas or polyvinyl plastic tent with foldable and light tubular frame; and
(iii) Materials for blacksmithing demonstration and training

(b) Agricultural hand tools	4,000
(c) Motor vehicles	21,000

(i) One pick-up truck with double cab, 4-wheel drive
(ii) Two units motorized tricycles for provincial trainers of blacksmithing

4. UNIDO mission costs	8,000
5. Miscellaneous	5,000
Project total	US$171,000

Country project No. 2. Promotion of local fabrication of agricultural production and processing machinery

A. CONTEXT

(a) Description of the subsector

See Country project No. 1.

(b) Host country strategy

See Country project No. 1.

(c) Projects and on-going programmes

See Country project No. 1.

(d) Institutional framework

See Country project No. 1.

B. BACKGROUND AND JUSTIFICATION

(a) Problem to be addressed and the present situation

See Country project No. 1.

(b) Expected end-of-project situation

At the end of the project, the following will have been achieved:

1. At least two existing private metalworking industries in Guadalcanal will have been actively engaged in fabricating and supplying agricultural machines introduced by the project and identified as needed for producing or processing crops recommended by MAL.

2. MCET/IDD, the national focal point of the project, will have been strengthened further through its activities in promoting, developing, evaluating and monitoring the agro related metalworking industry while making use of the experiences and strengths gained in the project, Promotion and Development of Small and Medium Scale Industries (Phase II).

3. AMITSST, the mechanism for involving the trained technicians in rendering technical services to private metalworkshops in fabrication of coconut processing and rice production machinery will have been active.

4. MCET/IDD will have established close collaboration and linkages with MAL and its Agricultural Research Station and the Extension Office as well as with the Taiwan Agricultural Technical Mission, the relevant NGOs, like Soltrust, Solomon Islands Development Trust and Association of Rural Training Centres, especially in the promotion of machinery introduced by the project.

(c) **Target beneficiaries**

Target beneficiaries will be the small-scale metalworking entrepreneurs in Solomon Islands. Farmers and villagers who raise coconuts and rice will also be benefitted because of the production and processing machines which will be made available to them at least for hire or custom operation, if they do not have the capability to own the machines themselves. There will be greater value adding especially in the case of coconuts which can be processed for oil right in the villages. Women will be especially benefitted by carrying products of higher value per unit weight or volume than in the case of raw coconuts. Ultimately, with increased productivity and improved efficiency of operations, the society as a whole will be benefitted.

Two technicians from the private metalworkshops will be provided training to enable them to produce machines and to serve in the AMITSST.

Smallholders or farmers owning small parcels of land will benefit from the project because of the consequent extension activities in promoting improved tools and machinery.

Rice production will be promoted because of the availability of machinery suited for smallholder operation.

(d) Project strategy and institutional arrangements

The project strategy is designed to encourage existing small-scale metalworking industries to diversify into fabrication of agro-related machinery while strengthening further the institutional capacity in the Government of Solomon Islands, through MCET/IDD. It will coordinate and provide technical advisory services and training to existing entrepreneurs who are interested in participating in the project activities.

The MCET/IDD will be the focal point of the project. A short-term consultant will be provided to work with the Division. The Director of MCET/IDD will be designated as the national project coordinator. Other ministries (e.g. Ministry of Foreign Affairs and Trade Relations, MAL and the Prime Minister's Office) will also be involved, as appropriate, in the implementation of the industrial development project.

Provincial development in Malaita Province (Auki based) and in Western Province (Gizo based) will be specifically assisted by an Associate Expert.

Significant domestic travel will be required for the project staff to assist Provincial institutional capacity development.

Technical assistance will be provided by experts to train entrepreneurs or their workshop supervisors in the fabrication of specific machines. It will include an agricultural machinery fabrication expert for a total of 6 w/m with broken duty durations of 3 months each. An Associate expert will also be posted for one year.

The project will focus on the development of small-scale agro-related metalworking industries in the provinces where agricultural machinery have large potential as indicated by the feasibility of commercial, that is, beyond subsistence level, production of crops to be promoted by MAL and the provincial administration.

Diversified production of agricultural machinery by metalworking industries

The demand for certain types of machinery yet to be promoted in conjunction with the production of crops targeted by MAL/Provincial Administration, will be small. A machine, financed by a custom/hire service entrepreneur (also to be promoted by MCET) may serve a group of villages or ward producing a certain crop, e.g. peanut, in large quantities.

Existing metalworking workshop entrepreneurs/supervisors will be trained to fabricate machines which are likely to be needed based on the popularity of certain crops, including those being promoted by MAL/Provincial administrations. The crops being promoted for production and processing include peanuts, vegetables, rice, potato, coffee, vanilla, chili, ngali nut, cassava. The already popular crops are coconut, cocoa, sweet potato, taro and yam.

The availability of machines for the production and processing of such agricultural products will induce their production as demand for processed products either for domestic consumption, import substitution and export will increase. For example, peanut which has already become a popular produce in Malaita province, is marketed in raw form in Honiara but its demand could be further enhanced through making snack food preparations using peanut as basic ingredient. These processed products will need that the peanut be shelled first, inducing a need for peanut shellers.

Identified workshops will be assisted by provision of prototypes to be copied, technical advice and training abroad of key supervisors or technicians. For example, a technician may be trained in the production of some critically needed rice production equipment, like the hydrotiller, engine-operated thresher and animal-drawn implements, such as ploughs, harrows and carts. The production of rice may be easily adopted if such machinery are available to the farmers.

The Director of MCET/IDD and other senior Ministry staff, including the Permanent Secretary, are committed to the sustainability of the Project. The new management and reporting system introduced by the project on promotion and development of small and medium scale industries is being closely monitored by the

Director of IDD and the Permanent Secretary of MCET. The IDD officers have acquired the necessary skills and are motivated to sustain the project after UNDP/UNIDO assistance ends in April 1994.

Equipment will be provided for use at the Provincial level as follows: motorcycle for one Associate Expert. At Honiara, equipment will be provided for use by the expert and the project staff.

In developing this project document, preliminary discussions were held with the Permanent Secretary, MCET and officers of MCET/IDD, MAL and the Permanent Secretary of Malaita as well as the UN personnel of the current project on promotion and development of agro-related metalworking industries.

(e) Reasons for assistance from UNIDO

See Country project No. 1.

(f) Special considerations

See Country project No. 1.

(g) **Coordinating arrangements**

See Country project No. 1.

(h) **Counterpart support facility**

C. DEVELOPMENT OBJECTIVE

The development objective is to establish policies and programmes for strengthening the agro-related metalworking industry sector, thereby enabling the sector to meet the demand more efficiently than it can at present and to provide the machinery input support to agriculture towards sustained production of food and raw materials for agro based industries

D. IMMEDIATE OBJECTIVES, OUTPUTS AND ACTIVITIES

1. Immediate objective 1

To develop and strengthen the capabilities of MCET/IDD such that, in collaboration with SICHE/SID and MCET/NTT, it can provide technical and institutional support in the promotion and development of the agro-related metalworking industry, particularly the fabrication of machinery for agricultural production and agro based processing industries.

1.1. Output 1

Five technical staff comprising three from MCET/NTTT and SICHE/SID trained in the fabrication of small-scale production and processing machinery, including those for coconut and rice being used in developing countries in Asia.

Activities for output 1

1.1.1. Organize the following group training programmes in collaboration with the National Institute of RNAM in either Thailand or the Philippines through ESCAP/RNAM:

(a) A 3-month practical or hands-on group training programme in fabrication technology of small-scale coconut processing equipment (drier, copra chopper, oil expeller and filter press, storage tank) for three participants. The training programme will be held in a private medium-scale workshop specializing in the fabrication of such equipment and must have an engineer in the staff who can provide technical supervision to the training programme participants. Participants will learn on-the-job and are expected to fabricate parts and assemble them into a functioning machine.

Apart from doing the workshop activities, the participants will spend time to learn about the coconut harvesting and processing system in the country and will also experience the operations as well as study the fabrication requirements of the tools, machinery and transport vehicles needed for the system for possible adoption in Solomon Islands.

The three participants for fellowships in the group training programme will come each from SICHE/SID, MCET/NTTT and a private metalworking enterprise who will be recommended by the Federation of Solomon Islands Businesses (FSIB). Each candidate will be nominated by MCET/IDD based on the qualifications needed for the group training programme and their individual and institutional commitments to provide technical assistance to private metalworkshops trying to fabricate similar machinery. A minimum requirement will be a graduate of a technician course in machining and fabrication and an industrial or related teaching experience.

(b) A 3-month practical hands-on group training programme in the fabrication of basic machinery requirements for rice production and processing for two participants. The training programme will be arranged with the International Rice Research Institute (IRRI) in the Philippines.

Apart from the basic exposure at IRRI, the participants will be assigned to accredited small-scale manufacturers of rice machinery and are expected also to do field operations to have the feel of handling the machines. Thus, they can also relate their on-the-job learning experiences with the field applications where they will get an appreciation of the problems and the solutions which will be essential to their tasks when adopting the technologies back in Solomon Islands.

The two participants for fellowships in the group training programme will come from either SICHE/SID or MCET/NTTT and a private metalworkshop enterprise recommended by FSIB. Each candidate will be nominated by MCET/IDD based on the qualifications needed for the group training programme and their individual and institutional commitments to provide technical assistance to private metalworkshops trying to fabricate similar machinery. A minimum requirement will be a graduate of a technician course in machining and fabrication and an industrial or related teaching experience.

1.1.2. Organize debriefing sessions for the MCET/IDD staff, after the after the return of the participants in the courses.

1.1.3. Organize the Agro-related Metalworking Industries Technical Support Services Team (AMITSST) comprising the successful participants in the group training programmes and headed by the MCET/IDD. The members of AMITSST will be expected to render technical services to private metalworking enterprises regarding the fabrication of machines.

1.1.4. In cooperation with MAL, Soltrust (NGO) and farmer cooperators, conduct demonstrations of harvesting of coconuts and transporting them in horse saddlebaskets with a view to popularizing the technologies and the fabrication of tools and implements demonstrated.

1.1.5. Establish a pilot and demonstration fabrication workshop at SICHE/SID to serve as agro-related metalworking industry incubator for the fabrication of agricultural production and processing machinery particularly for coconut and rice.

1.2. Output 2

At least two metalworkshop cooperators fabricated coconut oil production machinery (drier, copra chopper, oil expeller, filter press) adapted from commercial units introduced by the project.

Activities for output 2

1.2.1. Promote, in collaboration with the Commodities Export Marketing Authority (CEMA), the establishment of small-scale coconut oil processing plants through providing interested entrepreneurs the following:

(a) Technical advice on feasibility studies;

(b) Information on success cases of such enterprises in other coconut producing countries;

(c) Assurance of the availability of the required machinery from local metalworkshops.

1.2.2. Enlist qualified metalworkshops as project cooperators whereby they will be encouraged to accept fabrication orders for machinery by coconut processing entrepreneurs through providing them the following:

(a) Commercial units of the machines (on loan basis) to be replicated;

(b) Technical advice regarding the fabrication technology of the machines;

(c) Assistance in sourcing appropriate finished machine components (e.g., bearings, pulleys, sprockets and chains) if the machine is being fabricated for the first time in the country and

(d) Access to workshop equipment at the pilot and demonstration fabrication workshop, to be established at SICHE/SID (Activity 1.1.5).

1.2.3. Provide ad-hoc technical advice and on-the-job training to metalworkshop entrepreneurs and workers on the fabrication of the coconut drier, copra chopper, oil expeller, filter press and other components of a coconut processing system based on prototypes furnished by the project for adaptation of design.

1.2.4. Advise the entrepreneur of the small-scale coconut processing plant on the installation, operation and maintenance of the machines fabricated by the metalworkshop cooperator.

1.2.5. By arrangement, ensure that the counterpart staff from SICHE/SID, MCET/IDD and the private enterprise technician who have been trained through the project are actively involved in the technical assistance programme. The mechanism is through active membership in the AMITSST, which provides technical assistance in the fabrication work together with the international experts. The purpose of AMITSST is to strengthen local capabilities and to ensure continuing local technical assistance to the metalworkshop industries after the end of the project or after the experts leave.

1.3. Output 3

Similar to Output 2 but enterprises are for small-scale processing of other crops which may produced in large enough quantities to make processing economically viable and to merit establishing the business. Some of the promising crops and the agro-related machines are the following:

(a) Sugarcane - hand-driven sugarcane crusher for juice production, with the juice drink yet to be promoted;

(b) Cocoa - fermentation tank, drier and grinder for chocolate production;

(c) Peanuts - seed planter, inter-row weeder, thresher, drier, sheller, roaster and grinder for peanut butter production;

(d) Rice - hydrotiller, weeder, row-marker, sickle, pedal thresher, rice mill (production of rice by small landholders is being progressively promoted by the Taiwan Agricultural Technical Mission and availability of machines is a bottleneck) and

(e) Other crops which may be successfully introduced by MAL or advised to be developed for export by CEMA (e.g. ngali nut - sheller is needed but this has to be developed yet).

Activities for output 3

1.3.1. Promote the establishment of the agro-processing enterprises through advice on feasibility studies, technical assistance in production and processing and business management as well as assistance with loan guarantee fund and demonstrations of processes using the machines planned for introduction. Similarly, promote also the establishment of custom hiring or operation of machines, like hydrotillers, threshers and rice mills.

1.3.2. Assist the entrepreneur further through local sourcing of the machinery requirements by providing metalworkshop enterprise cooperators with the suitable commercial machinery prototypes to be fabricated under technical assistance of the project. Once a metalworking shop has successfully produced a machine, subsequent technical assistance for the fabrication of the same machine will be minimal due to the experience already gained. Technical assistance may then concentrate on quality control and production cost reduction measures, including modifying the design and testing the new machine.

1.3.3. Repeat the process (Activities 1.3.1 and 1.3.2) for other metalworkshops and for other sets of machinery in integrated or semi-integrated production and processing of crops in season. MCET/IDD will monitor the performance of the metalworkshops and the enterprises which patronized them for their supply of machinery.

The technical staff at SICHE/SID and MCET/NTTT, particularly those who will have undergone training through the project will be constantly involved in the fabrication processes together with the project experts. Through their activities with the AMITSST, they will provide the continuous flow of technical assistance after the end of the project. By that time, through intensive promotion efforts to establish small-scale agro-based processing enterprises, the metalworking enterprises will have the experience and the knowledge in fabricating the required machinery. The enterprises will likely develop further capabilities in fabricating new machines with minimal technical assistance.

1.3.4. Utilize the machinery prototypes introduced by the project for small-scale agro-based processing industry incubators to be located at SICHE/SID. A machine may be pulled out from the workshop by arrangement with MCET/IDD should an inexperienced metalworkshop wish to replicate it. In this case, the technical support staff from SICHE/SID and MCET/NTTT are expected to give technical assistance to the metalworkshop entrepreneur.

Inputs

Government inputs

1. Counterparts.

(a) The Government, and in particular, MCET/IDD, will commit some of its human resources (Director and Deputy Director) in the management of the project;

(b) MCET/IDD will arrange, through a memorandum of agreement, with SICHE/SID regarding the commitment of SICHE/SID's instructors in machining and fabrication to provide technical assistance and on-the-job training services to metalworkshop workers and entrepreneurs trying to fabricate machinery introduced by the project. To upgrade their capabilities and make them appreciate the development objectives of the project, MCET/IDD will ask SICHE/SID to nominate one instructor in machining and fabrication for fellowships for a 3-month training in fabrication of coconut processing equipment. MCET/IDD is also expected to arrange with SICHE/SID to commit the trained instructor to serve as members of the AMITSST which will be headed by a senior MCET/IDD staff.

Similarly, MCET/IDD will arrange with MCET/NTTT for one technical person . Another technical person either from SICHE/SID or MCET/IDD will be nominated for a 3-month training course in fabrication of rice production machinery at IRRI in the Philippines.

(c) Similarly, MCET/IDD will arrange with a private workshop entrepreneur for one technical person to act as counterpart to the project. This technician will be given a fellowship for a 3-month training in the fabrication of machines for the small-scale coconut oil production system. A technician from another private workshop also recommended by FSIB will be given fellowship training in fabrication of rice production machinery. Both trained technicians will also be committed by their respective private metalworkshop entrepreneurs to be a members of the AMITSST after the training programme.

2. Secretarial support

The project will have access to the MCET/IDD's typist for all typing and secretarial work.

3. Office space and facilities

Office space and facilities will be provided for the technical advisers (AMITSST) and experts.

4. Transport

Transport costs and per diems will be provided for the project personnel in official travels to the villages.

5. Seminars, training and national meetings

(a) MCET/IDD will provide funds for the debriefing seminars and logistics for demonstrations, arrangements and other activities peripheral but otherwise essential to the project.

(b) MCET/IDD will provide the logistics for local training of metalworking entrepreneurs in the fabrication of coconut processing machines.

UNIDO inputs	US$287,000
1. Personnel	88,000
(a) Expert in agricultural machinery design and fabrication, 6 (split) w/m	88,000
(b) One Associate Expert in machinery design and fabrication, 12 w/m	Nil
2. Training	51,000
(a) Three training fellowships in practical or hands-on training course in fabrication technology of small-scale coconut processing equipment (drier, copra chopper, oil expeller and filter press, storage tank) for one technical instructor from SICHE/SID, one technician from MCET/NTTT and one technician from a private metalworking enterprise recommended by FSIB, 3 months,	30,000
(b) Two training fellowships in a 3-month practical hands-on group training programme in the fabrication of basic machinery requirements for rice production and processing to be arranged with the International Rice Research Institute (IRRI) in the Philippines.	21,000
3. Equipment	123,000
(Note: To be provided based on progress of development in metalworking capabilities).	
Agricultural tools and machineries	10,000
Workshop equipment	20,000
Power units:	15,000
(i) Single-cylinder engines, 8 -16 hp, 5 units total	
(ii) Electric motors, 1- 5 kW, 2 units	
(iii) Portable electric generator, 3 kva, 2 units	
Audio-visual and other equipment for machinery extension	18,000
One pick-up truck, 4-wheel drive	15,000
Expendable equipment	45,000
4. UNIDO mission costs	10,000
5. Miscellaneous	15,000
Project total	287,000

Project No. 3. Semi-assembly of motorized tricycles for rural transport and introduction of animal-drawn carts and implements along with a soil conservation farming system (joint project between UNIDO and FAO).

A. CONTEXT

(a) Description of the subsector

See Country project No. 1.

(b) Host country strategy

See Country project No. 1.

(c) Institutional framework

See Country project No. 1.

B. BACKGROUND AND JUSTIFICATION

(a) Problem to be addressed and present situation

See country project No. 1.

(b) End-of-project situation

At the end of the project, the following will have been achieved:

1. The national focal point of the project, will have been strengthened further through its activities in promoting, developing, evaluating and monitoring the agro-related metalworking industry.

2. At least two existing private metalworking industries will have been actively engaged in fabricating and assembling motorized tricycles; in fabricating wheel and axle kits for ox-carts as well as in fabricating ox-drawn ploughs, harrows and inter-row cultivators.

3. A pilot and demonstration village for cattle husbandry (PDVCH) will have been established and will have successfully achieved the following:

(a) Cattle husbandry adoption by the villagers following recommended rearing practices;

(b) Use of ox-drawn carts and horses with saddlebaskets in a new coconut harvesting system; also use of such transport facilities in other activities requiring transport of commodities from the farm to the road head;

(c) Use of ox-drawn ploughs, harrows and inter-row cultivators;

(d) Use of tricycles as personnel carrier and for transport of small loads in the rural area; and

(e) Practice of soil conservation tillage system, including sloping agricultural land technology (SALT).

4. At least two village craftsmen will have engaged in the fabrication of wooden cart bodies and assemble them into the wheel and axle kits which will have been fabricated or semi-assembled by metalworkshops in the capital towns.

(c) Target beneficiaries

Target beneficiaries will be the small-scale agro-related metalworking industry entrepreneurs as well as the farmers in Solomon Islands. Farmers and villagers who will have access to the locally made animal-drawn carts and implements as well as to motorized tricycle transportation services at affordable costs will be benefitted. Since the farming activities, including transport of goods from the field to the house and then to the market, are taken up mostly by women, the improved transport facilities and the animal-drawn implements will be of great value to them. Ultimately, with increased productivity and improved efficiency of operations, the society as a whole will be benefitted.

The change-over from hoe-tillage farming to animal-draft tillage farming is a quantum leap in tillage technology and will increase productivity and production capacity even as such change-over will prepare the farmers to yet greater efficiencies using mechanical power. The greatest benefit perhaps will be that soil conservation practices will be instilled from the start, thus, avoiding a situation wherein farmers will have to unlearn environment-damaging tillage practices as is necessary in most developing countries.

A technician from one private metalworking industry recommended by a private sector association will benefit from the group training programme and can apply the newly gained knowledge immediately upon returning to Solomon Islands. A technical staff will also benefit from the same group training programme and will impart his new practical knowledge gained to the students taking courses in fabrication and welding aside from giving technical assistance to private metalworkshop enterprises.

Three staff from government institutions and one private metalworkshop enterprise recommended by a private sector association will also benefit from the study tour and group training programme to be organized by the project. They are expected to multiply their knowledge by providing technical advisory services to metalworkshop entrepreneurs and workers through an institutional support mechanism to be implemented jointly by their respective institutions with the focal point.

The entrepreneurs cooperating in the project will be provided technical and catalytic assistance for start up of fabrication of machines or components for commercial distribution.

Smallholders or farmers owning small parcels of land will benefit from the project because of the consequent extension activities in promoting improved tools and implements. Such promotion will be combined with the agricultural extension work as the project would look at the demand side of the products of the agro-related metalworking industry as an integrated activity, that is, agriculture and industry.

(d) Project strategy and institutional arrangements

The project strategy is designed to encourage existing and potential metalworking industry entrepreneurs to diversify into the fabrication of agro-related machinery. In this case, the machines are tricycles, ox-cart component kits and animal-drawn implements. The focal point will be responsible for establishing an improved and strengthened institutional capacity through effective coordination and provision of technical advisory services and training to prospective and existing entrepreneurs who are interested in participating in the project activities.

The Industrial Development Division, Ministry of Commerce, Employment and Trade, will be the focal point of the project. A short-term consultant will be provided to work with the Division. The Director of IDD will be designated as the national project co-ordinator. Other departments will also be involved, as appropriate, in the implementation of the industrial development projects.

IDD, particularly the research, extension and training units will play a crucial role in the promotion of tools and implements integrated with the relevant agricultural technology.

The project will focus on the development of small-scale agro-related metalworking industries in the provinces where production of tricycles, animal-drawn implements and carts has large potential as indicated by the feasibility of commercial level production of crops promoted by IDD.

Diversified production of agricultural machinery by metalworking industries

The demand for certain types of machinery yet to be promoted in conjunction with the production of crops targeted by IDD will be small. A machine, financed by a custom/hire service entrepreneur may serve a group of villages producing a certain crop in large quantities. Existing metalworking workshop entrepreneurs will be trained to fabricate tricycles, animal-drawn implements and ox-cart components.

Key supervisors or technicians of metalworkshops cooperating with the project will be assisted by provision of commercial machines to be copied, catalytic assistance for start up operations and technical advice in fabricating them. For example, a technician may be trained in the production of some critically needed equipment, like animal drawn implements, such as a steel mouldboard plough and a

peg-tooth harrow. Farmers will easily be motivated in producing rice if such machinery are available to them.

The Director of IDD and other senior staff are committed to the sustainability of the project.

Equipment will be provided for use at the Provincial level as follows: motorcycles/tricycles for the Associate Experts. At Honiara, equipment, including a pick-up truck will be provided for use by the expert and the project staff. Audio-visual equipment will also be provided for use in training and extension especially in the provinces.

(e) Reasons for assistance by UNIDO/FAO

See country project No. 1.

(f) Special considerations

The project promotes technical and economic co-operation among developing countries and addresses the particular problems in Solomon Islands. The introduction of modern tools and machinery will benefit women and in most cases, children who invariably do most of the field work. For example, the introduction of a wheeled load-carrying device for transporting coconuts would not only ease their burden but would also increase their productivity. Such a change may even indirectly cause the empowering of women with sales money and thus contribute to the social uplifting and improved living standards.

(g) Coordination agreements

The NFP or IDD will play an active role in the implementation of activities of the project. The project secretariat, joint operation of UNIDO and ESCAP/RNAM, will maintain contact with IDD and relevant training institutions. The executing agency, UNIDO, will co-ordinate and consult whenever necessary.

The activities requiring the promotion of cattle husbandry in preparation for an eventual introduction of animal-drawn carts and implements will be jointly undertaken with FAO.

IDD will utilize its workshop which shall be developed through the assistance of the project. It will work closely with the private metalworking enterprises as well as with relevant training institutions the design, fabrication, testing of agricultural machinery and utilize its extension services in the promotion of new machines to farmers and agro-based processing industry entrepreneurs.

(h) Counterpart support facility

See country project No. 1.

C. DEVELOPMENT OBJECTIVE

The development objective is to establish policies and programmes for strengthening the agro-related metalworking industry sector, thereby enabling the sector to meet the demand more efficiently than it can at present and to provide the machinery input support to agriculture towards sustained production of food and raw materials for agro-based industries.

D. IMMEDIATE OBJECTIVES, OUTPUTS AND ACTIVITIES

1. Immediate objective 1

To develop and strengthen the capabilities of IDD, so that, it can provide technical and institutional support in the promotion and development of the agro-related metalworking industry, particularly the semi-assembly of motorized tricycles for rural transport.

1.1. Output 1

Two technical instructors from trained in the fabrication of motorized and pedal-driven tricycles, ox-drawn cart and implements as well as horse saddlebaskets and committed to be part of the agro-related metalworking industry technical support services team (AMITSST).

Activities for output 1

1.1.1. Organize, in collaboration with ESCAP/RNAM and the National Institute of RNAM in the Philippines, a 3-month practical training programme for two fabrication and welding trainees in fabrication of motorized tricycle, animal-drawn implements and ox-cart as well as horse saddlebaskets.

1.1.2. Conduct a debriefing session by the two trainees upon their return to Solomon Islands and after their completion of the training course. Officials of IDD, the Manufacturers' Association and the Chamber of Commerce and other persons concerned will be invited to the debriefing. The trainees will appraise them of the activities undertaken and lessons learned during the training course. The presentation will be aided with slides and video tapes. Commercial units of the tricycles which will be provided by the project will be demonstrated.

1.1.3. Organize, under IDD, an agro-related metalworking industry technical support services team (AMITSST) comprising the two trained trainers (1.1. Output 1), the four study tour participants (3.1. Output 1) and other trained staff. AMITSST will be an inter-agency core group for providing technical support to the agro-related metalworking industry as well as monitoring and evaluation their progress.

1.1.4. Monitor the activities of the trainers, evaluate the results and document the significant events using video and film pictures for use in further extension and promotion work.

2. Immediate objective 2

To promote the semi-assembly of motorized tricycles among metalworkshop entrepreneurs.

2.1. Output 1

At least two metalworkshops engaged in the semi-assembly of motorized tricycles with technical assistance from the project, particularly from AMITSST.

Activities for output 1

2.1.1. In consultation with the appropriate government body for licensing purposes, loan one of the project demonstration tricycles to an entrepreneur recommended by the Manufacturers' Association or the Chamber of Commerce for doing experimental or pilot transport hire business, initially around Apia and later, in selected villages remote from Apia. The purpose of such experiment is to popularize the tricycle as a utility vehicle and determine actual demand for tricycle transport services.

Encourage entrepreneurs to engage in the fabrication of tricycles through notices placed in the roving tricycle and in the print and broadcast media. Through a survey questionnaire to be distributed and retrieved by the tricycle operator, determine the demand for the transport services as well as the interest among entrepreneurs in the production of motorized tricycles.

Encourage also potential entrepreneurs to engage in the tricycle hire service business in the rural areas to make transport services affordable.

2.1.2. Following positive results of the survey (Activity 2.1.1), promote the semi-assembly of tricycles among interested entrepreneurs and existing metalworkshop enterprises by providing technical assistance in the following:

(a) Conducting feasibility studies;

(b) Managing a small business (bookkeeping, cost analysis,etc.);

(c) Preparing loan proposais; and

(d) Availing of loan guarantees from a scheme established for agro-related metalworking industries.

2.1.3. Provide technical assistance to entrepreneurs in the semi-assembly of tricycles through the AMITSST, utilizing particularly the services of the two trained trainers.

2.1.4. Monitor, through the AMITSST all related activities including buyers and users of tricycles to ensure high quality.

3. Immediate objective 3

To set the stage for introduction of animal-drawn carts and implements by creating awareness among the IDD officials and other institutions concerned about the feasibility of cattle husbandry, including training of animals for draft work, and the need for simultaneously introducing environment friendly and ecologically sound farming systems with the modern line tillage, cultivation and clean culture (weed-free farming) using animal draft or mechanical power.

3.1. Output 1

Four technical staff comprising two senior extension officers familiarized in and got appreciation of the systems of rural transport, animal-drawn implements and vehicles, machinery extension, SALT and coconut harvesting and processing, in Indonesia, the Philippines and Thailand.

Activities for output 1

3.1.1. Organize, in collaboration with ESCAP/RNAM and the respective National Institutes of RNAM in Indonesia, the Philippines and Thailand, a study tour with practical familiarisation training for the following purposes:

(a) To observe small-scale and backyard animal husbandry, viz. cattle breeding, milking, fattening and draft work training as well as home yoghurt making;

(b) To study and get practical training soil conservation tillage, particularly, SALT, including strip cropping and alley farming;

(c) To get practical training in ploughing, harrowing, cultivating and cart pulling using draft cattle;

(d) To observe the coconut harvesting and processing system and get practical training in using coconut harvesting tools, portable coconut huskers, ox-carts, horse saddlebaskets for transporting coconuts and coconut driers;

(e) To observe the small-scale machinery fabrication industries, viz., semi-assembly of tricycles and their usage in the rural areas as well as fabrication of animal-drawn ploughs, harrows, cultivators, carts and horse saddlebaskets and;

(f) To observe agricultural technology extension programmes of the ministries/departments of agriculture and the agricultural machinery extension programmes of the National Institutes of RNAM.

There will be four fellowships to be granted to two senior extension staff of IDD and one each to and agricultural engineer from a training institute, one fabrication technology instructor and one metalworking entrepreneur from the Manufacturers' Association.

3.1.2. Conduct a debriefing session by the participants upon their return to Solomon Islands after completin their study tour and group training programme. The study tour participants will appraise them of the observations made and the lessons learned from their activities. The presentation will be aided with slides and video tapes combined with actual demonstrations of the implements and vehicles of which commercial units will be provided by the project.

3.1.3. Involve the four participants in the study tour together with the two participants in the 3-month training in fabrication (1.1. Output 1) as members of the AMITSST. One of their initial assignments will be the promotion of semi-assembly of tricycles and introduction of improved farming systems, such as SALT and coconut harvesting with emphasis on developing capabilities for the local fabrication of tools, implements and machinery needed.

3.1.4. Monitor all relevant activities, evaluate the results and document using video and film pictures for use in further extension work.

3.2. Output 2

Pilot and demonstration village for cattle husbandry and sloping agriculture technology (PDVCH/SALT) established and most villagers adopted rearing of cattle based on recommended practices.

Activities for output 2

3.2.1. Establish, through IDD and in cooperation with the village head, a PDVCH/SALT.

3.2.2. Develop a strategy for the introduction of cattle husbandry and SALT in the pilot and demonstration village. With advice from an anthropologist, consider the cultural aspects of the village folks. For example, commitments of the elders or the head (matai) of the family clan (aiga) towards a sustained cattle breeding and training programme for draft work will be ensured first before proceeding with further activities. Confidence-building among the young farmers and big children will be conducted. They will be exposed to the recommended handling and caring for animals through training and demonstration sessions in the village and the school. Appreciation of cattle husbandry, particularly, sustaining breeding practices by resisting family pressure to have the breeders slaughtered for celebrations, will be instilled with the family folks.

3.2.3. Use audio-visual aids, practical exercises and other learning motivations in all the training sessions.

3.2.4. Gradually introduce approved practices in cattle husbandry, including animal nutritional and health care, provision of shelter and forage gathering and chopping. In the advanced stage, train owners how to breed cattle, milk the cows and utilize milk for cheese, butter and yoghurt making and the dung for composting or direct use as fertilizer. These products will serve as incentives which will

minimize killing the breeder cows, rather than the other animals for celebration purposes, a common deterrent to sustainability of cattle breeding.

3.2.5. Monitor the activities, give ad-hoc technical advice and evaluate results. Document the significant events by videotapes and photographs for use in future extension work.

3.3 Output 3

At least ten per cent of the oxen in the PDVCH trained and used for pulling carts and tillage implements.

Activities for output 3

3.3.1. At the appropriate stage of development in the PDVCH, initially train the farmers in handling oxen to pull loads, such as small logs or banana trunks. The ox should be able to respond faithfully and quickly to its owner's voice commands and tethering rope signals. The members of the AMITSST, particularly those who have undertaken the study tour in Indonesia, the Philippines and Thailand, should be able to conduct the training.

3.3.2. For the advanced training and familiarisation, progressively hitch a peg-tooth harrow, a cart and finally, a mouldboard plough to the animal. Since among the operations, learning how to plough is the most difficult lesson for both the farmer and the animal, perseverance is necessary. The rewards will be great after the ploughing operation has been mastered as the farming work will be less tedious than using the manual method. This is a quantum leap for increasing the cultivated area.

3.3.3. Continue the training to achieve or exceed the target of 10% of the oxen population as trained. However, the training should not be faster than the achievement of 3.4. Output 4 described below.

3.3.4. Introduce the system of harvesting coconuts at 45-day intervals using a harvesting tool, husking using a portable coconut husker and transporting using the ox-cart or horses with saddlebaskets. All of the tools used can be made by local metalworkshops.

3.3.5. Monitor, evaluate and document by videotape and photographs the training of the farmers and the animals for future use in extension work in other villages.

3.4. Output 4

100% of the farming areas in the PDVCH/SALT practiced SALT using terracing with rock bunds supplemented with vetiver grass rows for soil conservation, strip or alley cropping, hedgerow planting and other cultural practices which do not cause environmental degradation.

Activities for output 4

3.4.1. Promote the SALT farming system where applicable. Use slides and video in the training of farmers. Prepare demonstration areas to illustrate clearly the importance of soil conservation farming. In coordination with WSFSP, introduce the cash crops at PDVCH/SALT. Farmers can compare the results visually between the control and the demonstration areas.

3.4.2. Demonstrate the techniques for laying out contour lines using the A-frame or the transparent tubing filled with water. Contour bunds made of rocks collected from the contour strips (lot between two adjacent bunds) may be unified for the whole village to cover a wide area. Terraced lands offer a scenic view and other farmers may be attracted to follow the technique. In places where land property lines have yet to be demarcated, the rock bunds present ideal permanent markers. Contour strips automatically become land subdivisions suitable for allocation of family lots or for inheritance purposes.

3.4.3. Develop the techniques of collecting the rocks and stacking them up as bunds along contour lines marked by pegs. Since the contour intervals are usually 2 to 4 meters depending upon the slope, the transport distance of a rock will be at most two meters or half the contour interval. Wheelbarrows may be used. Demonstrate also the planting of vetiver grass for more effective soil conservation and of hedgerow crops for forage and other uses.

3.4.4. Test the commercial units of animal-drawn implements (steel mouldboard plough, peg-tooth harrow and inter-row cultivator) in the SALT operations.

3.4.5. Demonstrate and teach ploughing along the contour or parallel to the direction of the contour bund.

3.4.6. Monitor, evaluate and document by videotapes and photographs significant activities for future use in extension work in other villages.

4. Immediate objective 4

To promote the semi-assembly of animal-drawn carts and tillage implements for the SALT farming system.

4.1. Output 1

At least two village craftsmen in the PDVCH/SALT or neighbouring village fabricated at least four ox-drawn cart bodies and assembled them together with the wheel and axle kits semi-fabricated by at least two metalworks enterprises.

Activities for output 1

4.1.1. Adapt the design of a suitable single-ox-drawn cart from other countries, possibly that using parts of discarded motor vehicle rear axle and wheel assembly and wooden body to take advantage of locally available materials.

4.1.2. Provide ad-hoc technical advice to metalworkshop cooperators in semi-fabricating wheel and axle kits for ox-carts out of scrap motor vehicles and to village craftsmen for building ox-cart bodies.

4.1.3. Demonstrate the use of the assembled ox-cart in coconut harvesting and other transport activities, both on and off the road in villages.

4.1.4. Monitor, evaluate and document by videotapes and photographs activities for future use in extension work in other villages.

4.2. Output 2

At least two metalworkshop cooperators fabricated ox-drawn steel mouldboard ploughs, peg-tooth harrows and inter-row cultivators.

Activities for Output 2

4.2.1. Promote the fabrication of animal-drawn implements to metalworkshop cooperators.

4.2.2. Provide ad-hoc technical advice in the fabrication of animal-drawn implements, the commercial units have been successfully tested and promoted among the farmers in PDVCH/SALT.

4.2.3. Monitor, evaluate and document by videotapes and photographs all significant activities for future use in extension work in other villages.

E. INPUTS

I. Government inputs

1. Counterparts

(a) The Government, and in particular IDD, will commit some of its human resources (two senior extension officers) to the project to effect efficient coordination in the implementation of the PDVCH/SALT. They will be given fellowships for a

group study tour in Indonesia, the Philippines and Thailand, after which they will provide the leadership in the AMITSST, to be formed. Another IDD staff with background and training in cattle husbandry, will serve as counterpart to the project particularly for implementing the PDVCH.

(b) IDD will arrange for instructors in machining and fabrication to provide technical assistance and on-the-job training services to metalworkshop workers and entrepreneurs trying to fabricate machinery introduced by the project through IDD. To upgrade their capabilities and make them appreciate the development objectives of the project, IDD will initially ask a training institution to nominate two instructors in machining and fabrication for fellowships of which one will be for a 3-month training in semi-assembly of motorized tricycles and the other will be for joining a study tour in Indonesia, the Philippines and Thailand. IDD is also expected to arrange with a training institution to commit the two trained instructors to serve as members of the AMITSST which will be headed by a senior IDD staff.

(d) Similarly, IDD will arrange with the Manufacturers Association for one metalworking entrepreneur to commit himself as counterpart in the project. This entrepreneur will be given a fellowship for a group study tour in Indonesia, the Philippines and Thailand and will also be committed by the Manufacturers Association to be a member of the AMITSST after the study tour.

2. Secretarial support

The project will have access to the IDD's typist for all typing and secretarial work.

3. Office space and facilities

Office space and facilities will be provided for the technical advisers (AMITSST) and experts.

4. Transport

Transport costs and per diems will be provided for the project personnel in official travels to the villages.

5. Seminars, training and national meetings

(a) IDD will provide funds for the debriefing seminars and logistics for demonstrations, arrangements and other activities peripheral but otherwise essential to the project.

(b) IDD will provide the logistics for local training of metalworking entrepreneurs in semi-assembly of tricycles (motorcycle side-cars) and ox-cart wheel and axle kits as well as in fabrication of ox-drawn implements. Similarly, IDD will provide funds for training village craftsmen in fabricating ox-cart bodies.

II. UNIDO and FAO inputs	US$520,000
1. Personnel	296,000
UNIDO	130,000
FAO	166,000
Expert in Agricultural Machinery and Chief Technical Adviser, 9 w/m (split missions; UNIDO)	130,000
Associate expert in fabrication (UNIDO), 12 w/m	Nil
Expert in livestock production, 6 w/m (split missions; FAO)	84,000
Expert in SALT farming systems, 6 w/m (split missions; FAO)	84,000
Associate expert in rural sociology or anthropology, 12 w/m (FAO)	Nil
2. Training	60,000
Two fellowships for a 3-month practical training programme for one fabrication and welding instructor and for one technician from a private metalworkshop recommended by the Manufacturers Association, in fabrication of motorized tricycle animal-drawn implements and cart as well as horse saddlebaskets (UNIDO)	20,000
Four fellowships for 34-day group study tour with practical training in Indonesia (6 days), Philippines (15 days) and Thailand (6 days), including international air travel (7 days) (FAO)	40,000

3. Equipment	131,000
UNIDO, US$78,500	
FAO, US$52,500	
(i) Five motorized tricycles (motorcycles with side-cars) (UNIDO)	15,000
(ii) Agricultural tools and machineries (UNIDO)	3,500
iii) Two units pick-up trucks with double cab, 4-wheel drive (UNIDO $ 15,000, FAO $ 15,000)	30,000
(iv) 5 units motorcycles, at least 100 cc. engine (UNIDO)	10,000
(v) Audio-visual and other equipment for machinery extension (UNIDO $ 10,000, FAO $ 10,000)	20,000
Expendable equipment (UNIDO US$25,000; FAO US$27,500)	52,500
Joint UNIDO/FAO mission costs	20,000
4. Miscellaneous	11,000
Project total	**US$520,000**
of which, UNIDO - US$244,000 FAO - US$276,000	

REFERENCES

1. National Agricultural Policy Framework (1994-1997), Ministry of Agriculture and Lands

2. National Development Framework, Summary f Key Issues, Constraints and Outline Development Strategies Towards Year 2000, Ministry of Development Planning, Ministry of Finance.

3. Solomon Islands Trade Report, 1988. Statistical Bulletin No. 20/91. Statistics Office, Honiara

4. Statistical Bulletin (No, 19/93). Primary production, 3rd Quarter 1992. Statistics Office, Honiara.

5. UNDP/Government of Solomon Islands. Project Document, Promotion and Development of Small and Medium Scale Industries (Phase II), SOI/90/007.

ANNEX

TERMS OF REFERENCE

JOB DESCRIPTION
US/RAS/92/072/11-01

Post title: Expert in Agro-related Metalworking Industries

Duration: 10 m/m

Date required: 1 March 1993

Duty station: Bangkok/Thailand, with travel to selected LDC's of Asia and the Pacific Region

Purpose of project:

The purpose of the project is to provide assistance to the Least Developed Countries in the Asia and Pacific Region in terms of technical support to agro-related metalworking industries through fuller utilization of existing networks, technology exchange and promotion of TCDC. Preparation of detailed technical cooperation programmes in the areas of raw material procurement and cottage industries is also envisaged.

Duties:

The duties of the expert will be as follows:

- o collect data on ECDC/TCDC potential through visits to member countries.
- o provide ad hoc technical advice to enterprises and R&D institutions during field visits.
- o identify concrete prototypes needed in the participating countries.
- o establish the final list of prototypes to be exchanged.
- o undertake a preliminary review of needs, in the countries expressing interest, in the following areas:

  1. Raw materials procurement;
  2. Support services for cottage industries;
  3. Concrete programme for the development

- o identify constraints in the agro-related industries, and suggest possible

remedies, including technical assistance projects.

o suggest projects to be formulated by UNIDO, and prepare some project concepts for further development by UNIDO.

Qualifications:

A mechanical engineer with extensive experience in metalworking, specifically related to the production of agricultural equipment, as well as production techniques.

Language: English

Background information: Refer to the project document.