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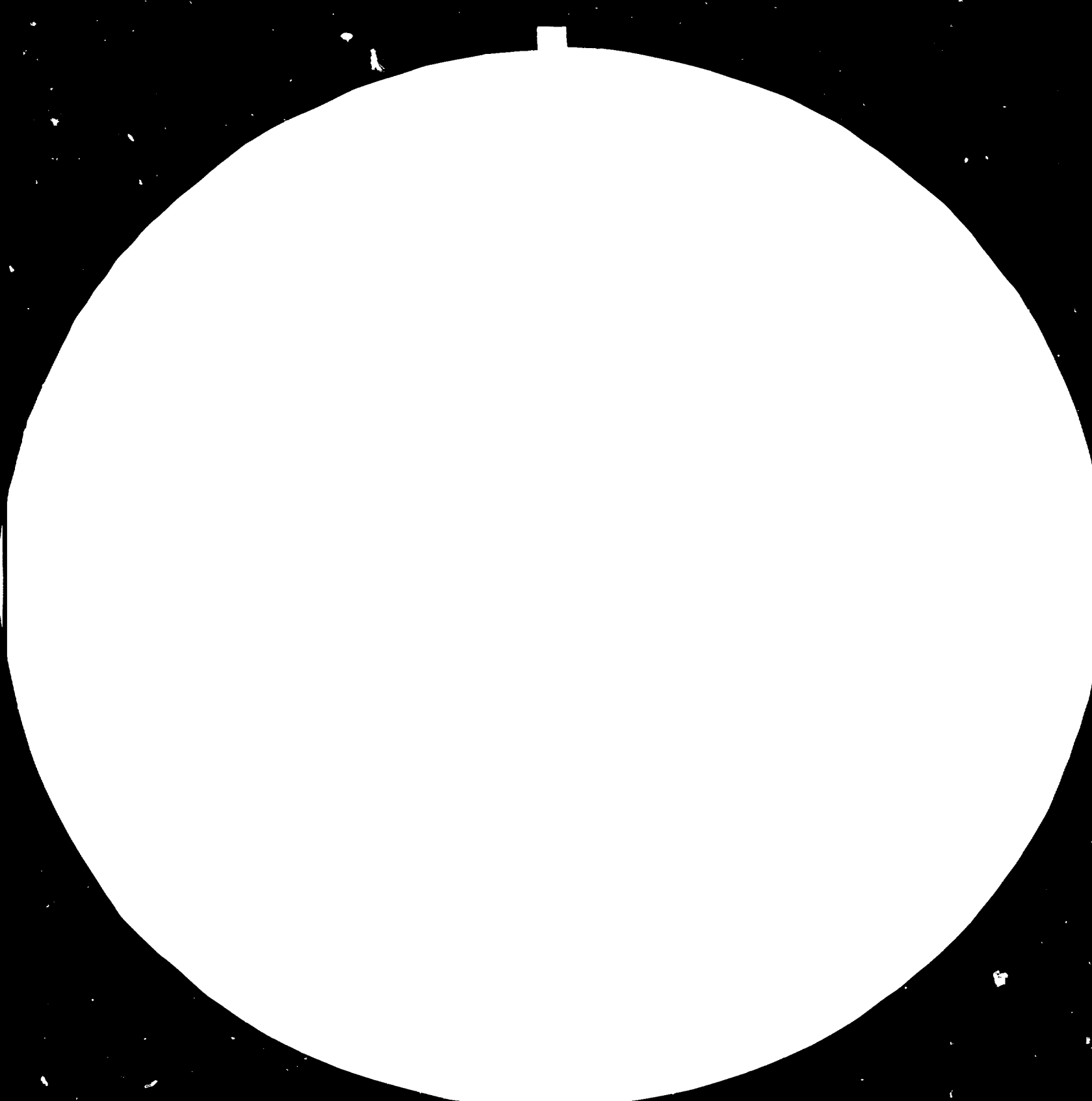

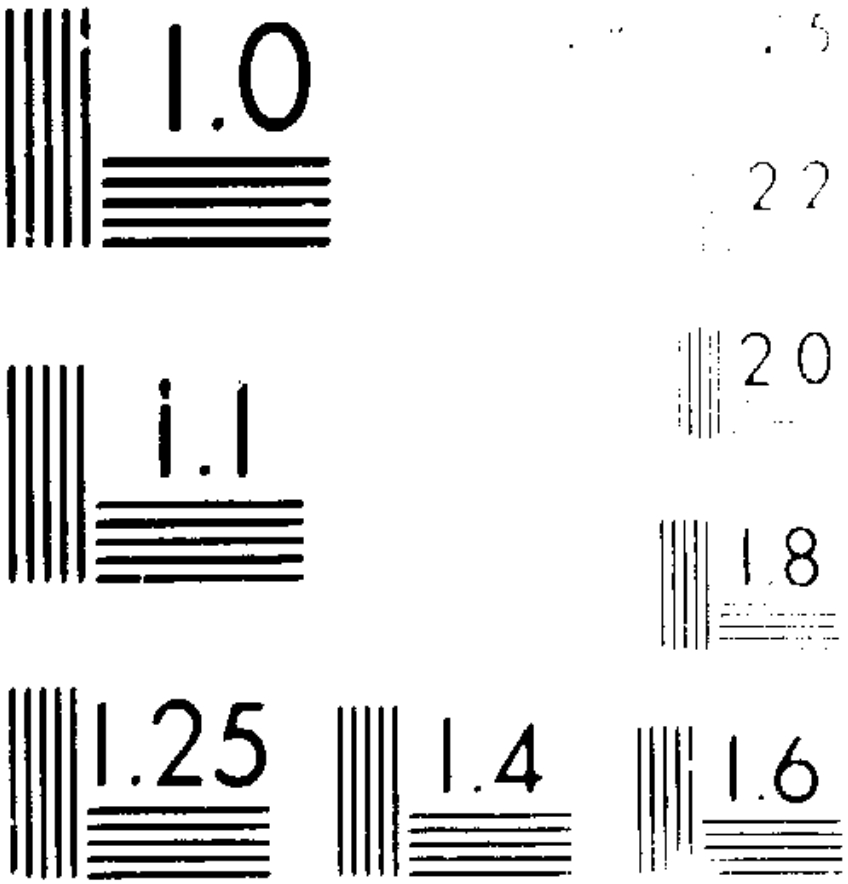
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FREETOWN MAY, 1980

Sierra Leone.

PROJECT PROPOSAL FOR BILETERAL ASSISTANCE

12658

TO

ESTABLISH WORKSHOP TO UPGRADE

TECHNOLOGY AND TO MANUFACTURE

AGRICULTURAL IMPLEMENTS - TOOLS

AND OTHER EQUIPMENTS

GOVERNMENT INPUT Le 45.761 THROUGH FOREIGN ASSISTANCE Le 150.250

PREPARED FOR THE GOVERNMENT OF SIERRA LEONE

BY

A.S. NASIR

INDUSTRIAL EXPERT

UNDER: PROJECT DP/SIL/78/002

Industrial Programming and Project Elaboration

A Project of the United Nations Development Programme

executed by the United Nations Industrial Development

Organisation (UNIDO)

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Background and Justification

1. Sierra Leone is a pre-dominantly agricultural country. A large mass of its people lives in the rural areas and according to 1972 agricultural census, 73% of its population is engaged in agricultural and allied activities. It is because of these conditions that the National Plan (1973/74-1978/'79) assigned a very high priority to the agricultural and rural development. Subsistence farming continues to occupy a prominent place on the agricultural map of the country. There are many as 286,137 small scale crop farmers engaged in the cultivation of 1,286,348 acres (1972 agricultural census). As against this these are only 128 large scale crop farmers with 13,138 acres of land under plough. Th institutional pr public sector agricultural projects hold only 5,668 acres. Thus despite endeavours, mechanised farming is not yet being practised on an extensive scale in Sierra Leone.
Although the size of the mechanised farming is small (if not negligible), the number of tractors in use is around 350 of which almost 50 are in the private sector). The repair, maintenance and service facilities created and existent for the mechanised sector are adequate. There is a large sized workshop at Freetown, with 6 similar large sized workshops and 3 service stations located in the provinces. There is a seperate organisation in the Ministry of Agriculture for the management and workshops establishment for the maintenance of tractors and tractor driven implements as well as transport equipment used on the mechanised farms. This organisation is supported by the technical assistance programme of ODM of UK. Each workshop maintains a store of spares. It is learnt that, in the case of mechanised farming mostly in the public sector, the repair and maintenance cost of equipment per acre comes to Le 150/00. This is apparently too high. The subsistence sector of agriculture offers employment to large census, these are as many as 1,888,125 persons dependent on this sector for their living.
Human power is the main source of energy to till, sow, maintain and harvest the land. There is no bullock or horse power in use and power tillers in use are few.

A break through in the field of agricultural development (on which the growth and expansion of industrial sector) is largely dependent) depends upon the technological evaluation in the subsistence sector and the equipment production facilities needed to support that evaluation. The subsistence sector of agriculture at present uses hand pick axes, shovels and spears. There is enormous scope for power tillers and new implements for harvesting, threshing etc. There is a visible scope for local production of some of the existing implements which are at present imported. There is room for providing repair and manufacturing facilities for tillers and other agricultural implements. If the continuing influx of people from the rural to the urban areas is to be controlled, this is essential that life in the villages is made liveable. There is no workshop in the country which produces the requirements of the farmers for domestic use or for the transport or marketing of his produce. The Ministry of Rural Development has still to initiate its activity in this field.

2. Bilateral Assistance

To achieve a breakthrough it is therefore proposed that initially a community in an agricultural district be chosen and in that community a model workshop be established, The Ministry should consider to assist co-operative division to obtain bilateral assistance preferably from countries like China, The Republic of Korea, USSR. The bilateral assistance may cover not only equipment and knowhow for production but also one skilled man as a manager to establish working principals this would be necessary.

3. Organisational Concept Action at the National Level

It is almost everywhere recognised that one of the most effective instruments of economics uplifting of the rural and urban masses is co-operation. There is also a growing realisation in developing and developed countries that co-operatives can develop and fulfil the larger social and economics aspiration provided they are allowed to properly function and are positively assisted in their efforts.

Experience has also shown that almost every economic or social human need can be satisfied through joint co-operative.
In Sierra Leone, there are already a variety of co-operative enterprises that people are involved in thrift and credit societies, marketing co-operative, consumer co-operatives, fishing co-operatives and many more. But so far there is no Agricultural and Industrial machines, equipment hand tool and for general repair and maintenance co-operatives.
The Department of co-operatives supports this suggestion for pilot project to manufacture identified products in this proposal.
To achieve success it is necessary that the following organisations operating in the rural/agricultural field may pool their resources

(a) Extension Service Department of the Ministry of Agriculture
(b) Ministry of Rural Development and
(c) Co-operative Development of the Ministry of Agriculture.

It will be for the organisations at (a) and (b) to identify items for production and to facilitate their sale to the farmers. It will be for the organisations at (c) above to establish a co-operative of farmers of the area for the creation and subsequent management of the proposed workshop.

4. Objectives of the Project

The accomplishment of which this workshop is being planned are as follows:

(a) Identification of improved tools, implements, appliances and equipment required for agricultural and rural development (inclusive of rural industries).
(b) Procurement of Proto-types, designs, drawings and know how required for the production of identified items
(c) Production of concrete types for experimentation through the Extension Service Department/Ministry of Rural Development to assess their success and prospects of sale
(d) Production of items in regular demand
(e) Provision of repair and maintenance facilities for power tillers and implements in use, as well as transport equipment, furniture and domestic appliances in use.

5. Outputs

This will develop indigenous entrepreneurship and technology in rural areas. It will help to implement to upgrade schemes related to agricultural, social and Industrial projects.
It will increase Sierra Leone self reliance in integrated production and Marketing of Agricultural tools and inplements. It will contribute to an increase in agricultural productivity and rural living standard through wide availability of more and better tools and implements on favourable terms. Primary functions will be of planning for a broad based development and upgrading or rural technologies.

6. Institutional Frame work

In general term workshop is referred to a place where facilities are available to provide maintenance on industrial/agricultural equipment, machinery, motor vehicles, stationery power units and to manufacture simple tools and equipment and implement.

6.1 Proposed areas of activities

I Machine shop
II Sheet metal work
III Welding section
IV Blacksmith
V Carpentary

6.2 Workshop Location

Workshops has to be established in a location to feed of farmers to feed requirements of 30 sq. miles. The government should allot plots of land to co-operative fo the workshop, with supply power and water where supply of power is not available, generator of 3KVA would be adequate to run various kind of machines.

6.3 Workshop Design

The tools recommended are those which would be suitable for general purpose and would be useful to make repair of wide variety of machinery and equipment. Workshop tools are expensive and liable to be stolen and could easily ruined if becomes rusty. Therefore, the proposed

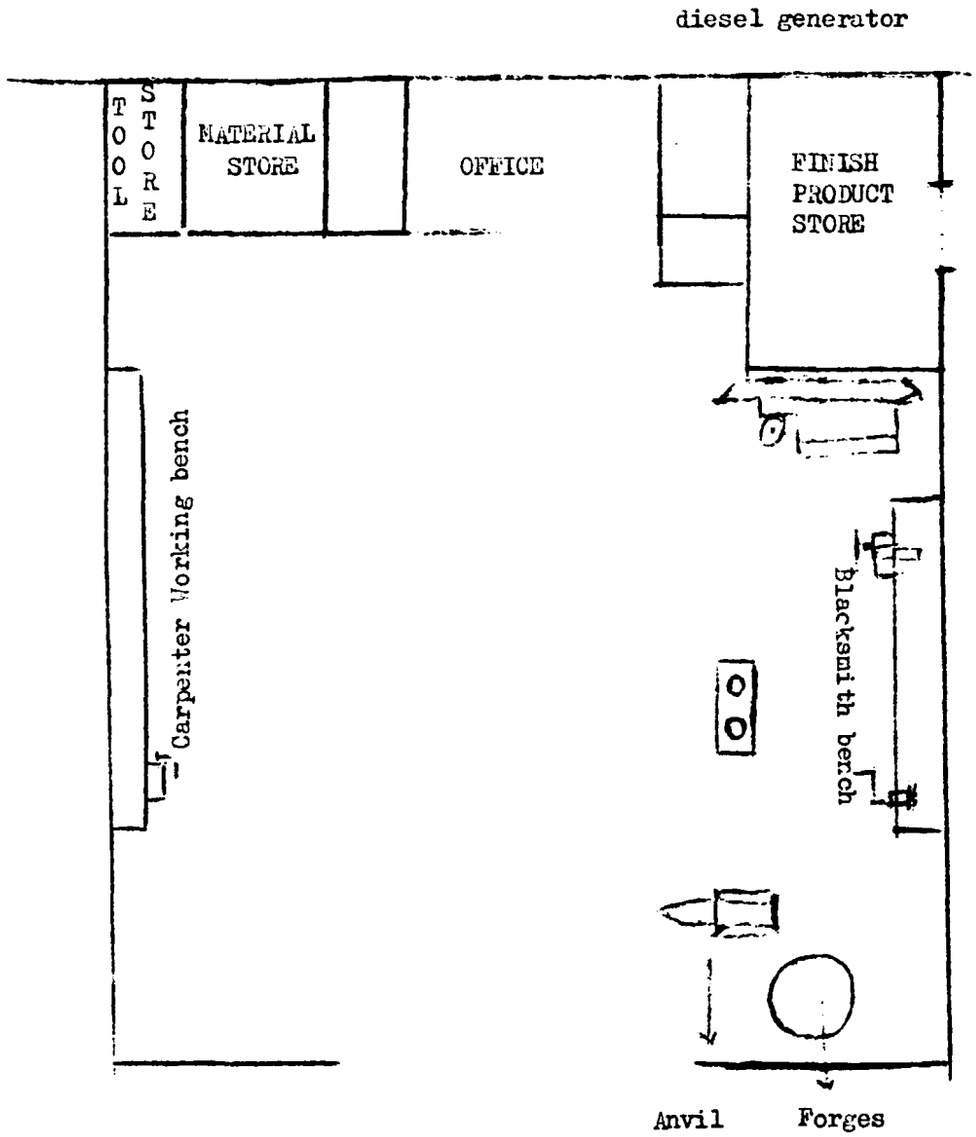
workshop should be with water proof roof and secure against theft. To reduce the construction cost of workshop, it is suggested that only two secure rooms should be provided for tools and materials, and remaining area of sides as well as roof should be of corrugated sheeting and constructed area for two rooms should be of concrete construction.

It is recommended that floor area should be of concrete, it will be easy to keep clean. Toolroom should have tools silhoutte of each tool painted so that necessary tools can be identified immediately. To store timber dry and against tarnish damage racks of 3m to 6m length will be required.

Some important features of workshop are illustrated :-

- Doors 3m wide so that large objects could be made inside the workshop
- The horizontal racks for storing long lengths of wood and metal
- Small tools boards
- Working benches
- Office for manager
- Foundary and Furnace area
- Toilet and wash room

7. Workshop Layout



Equipment and tools for workshop

Annexe I.

8. Manpower and trained staff

The co-operative should obtain list of trained workers from O.I.C. preference should be given to inhabitant of the area, it will help to to develop employment and trained staff will remain with in these area.

Personal Requirement

One workshop manager (international staff)
One workshop manager (counter part)
One turner
two mechanic
one welder
one general purpose filter
one carpenter
two helpers
one store keeper

9. Components and material facilities spares

It is proposed that as an integrated unit of this Project a store of components and spares commonly used in power tillers, tractors and transport equipment in use in the rural areas be established. This will improve the commercial viability of the project and make its use attractive also to large size farming units. The financing and working of this store is proposed as follows:

The Co-operative Bank should consider to establish co-operative spare parts centre not necessary in a village but in a near town, to feed co-operatives workshops. Material/spare parts centre can be establish by providing guarantee by the co-operative bank to suppliers or agents of equipments etc located in Freetown. It will be in the interest of dealers, traders to establish business relations with the bank rather than with an individual member of co-operative - material, equipment etc should be purchased in the name of the bank.

10. Short description of identified equipments/Implements to be manufactured.

With the help of proposed set up it will be possible to manufacture simple small and medium equipment for farmers and for construction works, for home improvement and for many other kind few of them are mentioned below. Detail description of each of them with working drawing, will be available from small scale industries division Ministry of Trade and Industries.

Equipments/Implements and machinery

- Drag grad
- Fresno scraper
- Barrel fresno scraper
- Float with adjustable blade
- Buck scraper
- V-drag
- Multiple Hitcher
- Concrete tile machine
- Seed and weeds chain drage
- Groundnut Huller
- Hoe hand operated, push type
- Block Press
- Rice Huller
- Sand Filter
- Chaft Cutter
- Rice Huller Powered type
- Hand operated Push Type
- Planter Hand operated Job Type
- Shovel two man
- Climax Hand operated Pumping set
- Double Acting lift Pump
- Vehicle, pedal-powered
- African elevating pump
- Coconut cracker (Behusker)

10. A. Drag

This simple metal-edged wooden grader is used with help of bull or horse or/small tractor, to grade dirt or grade road and for clearing ditches.

10. B. Fresno Scraper

This scraper is used for working large amounts or earth from higher parts to low areas. It can be made at low cost by a well equipped blacksmith shop and can be build of sizes.

10. C. Barrel Fresno Scraper

The barrel fresno scraper is a lighter, simplest version of the fresno scraper. It is a low-cost implement to move soil efficiently. The scraper is well adapted to production by a village blacksmith, is made from an old barrel and scrap metal. The scraper is adapted for heavy duty use. A barrel fresno-scraper was built and tested in Afghanistan in 1965. It was found very suitable and it could move approximately twice as much as the shovel.

10. D. Float with adjustable blade

The float is very useful for leveling a field before planting a crop. It can be made by a small carpenter and blacksmith shop with locally available materials. All earth moving operations, where any quantity of soil is moved, leave the land surface in an uneven condition. The float is the best price of equipment for obtaining a smooth even surface before planting the crop.

10. E. Buck Scraper

Buck Scraper is used for leveling small lumps of earth where the land distance is short. It is also very useful for filling ditches and for smoothing border irrigation system. Can be made by carpenter and blacksmith workshop.

10. F. V-Drag

After the desired location has been selected for constructing a levee, or border, the plow may be used to plow down and back twice and throw the soil into the border line. The V-drag can then be used to crowd the soil into a ridge.

When a border irrigation system is constructed in this manner it is necessary to smooth around the border with a buck scraper. If the the hitch on the scraper is shortened on one side it will roll the dirt into the border.

10. G. Multiple Hitches

Multiple hitches are necessary when one animal is used for filing equipment to adapt the proper power to the load and the job.

10. H. Concrete Tile Machine

Steel tile making machine can be made of scrap metal in a welding shop. It will produce 80-100 tiles to a sack of cement. One man can make about 300 tiles in an 8-hour day.

10. I. Seed and Weeds chain drage

An important step for improving crop production is the effective cleaning of crop seeds. The sieves described here have been found effective in many countries.

10. J. Groundnut Huller

This can be build from automobile and truck tire rims. The groundnuts are fed in on top, the hulls are torn open and nuts and broken hulls forced outword toward the edge by centrifug

It will require materials as follows

1 20" (diameter) truck tire rim
1 truck front wheel steering knuckle and spindle assembly with backing plate, bearings, and brake drum
1 17" truck tire rim (holes must be able to fit studs on brake drum)
1 16" automobile tire rim
1 17" automobile tire rim
1 headpan
6 2" heavy flat washers
6 $\frac{1}{2}$"x 6" machine bolts
6 pieces of pipe, $\frac{1}{2}$" inside diameter x 17" long
12 $\frac{1}{2}$" nuts
50 lb clean coarse hard sand (approximate amount)
20lb Portland cement (approximate amount)

10. K. African Elevating Pump

This water pump utilizes continues belt running between the well head and water. The belt is made from a material which absorbs water. At the pump head, the pump is squeezed by passing through the pipes, so that the water it has soaked up is removed. The pump can be fitted with two bundles for manuals drive, alternatively tively it can be driven by animals. There is no limit to the depth of water, and at a rate of operation of 30 turns per minute, output is 3000 litres/hour. If the speed of operation is increased to 60 turns per minute, output will be approximately doubled.

10.L BLOCK PRESS

The CINVA-Ram Block Press is a simple, low-cost, portable machine for making building blocks and tiles from common soil. The press, made entirely of steel, has a mold box in which a hand-operated piston compresses a slightly moistened mixture of soil and cement or lime.

10. M RICE HULLER, TWO-MAN

This small hand huller is of all-metal construction, and is very sturdy. The gearing arrangement permits the internal rollers to turn 3500 to 4000 revolutions per minute. Paddy is instantly hulled, regardless of size and shape, causing no damage to the grains. Output capacity of this machine is approximately 250 kgs of paddy rice per hour with 90 percent or more hulling efficiency. This particular also in hulling buckwheat, ducean grass, sunflower seeds, etc.

10.N. Sand Filter

This device is used for filtering water to remove impurities. It consists of the following parts:

A - Screened entrance to protect pipe from plugging and to extend filter life.

B - Loose-fitting cover to allow air circulation over sand (sheet metal on wood frame)

C - Steel drum

D - Flat stone to prevent water from digging crater in sand

E - Sand - depth 60cm or more

F - 3cm depth of pea sized gravel

G - Overflow to drainage (screened at point of discharge)

H - Outlet to further treatment if necessary, and storage

I - Blocks to allow elevation for pipe (H) exit from drum

J - Nails placed in wood frame to allow air to circulate under cover and over sand.

10.O CHAFF CUTTER (PASTORINIS MODEL)

This model of chaff cutter was invented in the mid 19th century in England during the Agricultural revolution. Many other systems were devised, but this one had the unique feature of having the cutting blades attached at the angle on a pair of cast iron wheels. At the same time that the crank is turned, a set of gears turn the feed-press rollers which draw in the chaff. Different lengths of cuts can be obtained with a combination of gears, or by adding or subtracting blades.

10.P RICE HULLER, JAVA HAND-POWERED TYPE

This small machine is intended for the grower of small quantities of rice paddy and for domestic use. It replaces the paddy pounder. Paddy can be shelled at a maximum rate of about 14 kg per hour, but the capacity may vary considerably depending on the type of paddy and its condition. The machine has three adjustments, controlling the feed, the discharge, and the hulling knife. A perforated plate allows dust to escape, and the machine can be opened easily for cleaning. Strongly made, it weighs 10.5 kg net and is provided with mounting screws and spanners. The hullers are normally packedffor shipment six or ten to a case, but single machines can be dispatched by parcel post in two parcels.

10.Q COCONUT CRACKER (PHILIPPINES)

The traditional method of cracking a coconut to seperate its husk and shell is very primitive and inefficient, even though today the Copra processing industry uses highly technical methods for other operations. In view of this fact a simple tool has been developed by CECOCO. It will crack approximately 100 to 200 coconuts per hour.

The coconut is struck manually against the close-toothed blades. Next the handle is turned around and the cam action snaps the coconut into two pieces. One or two subsequent operations are needed to seperate the core completely.

10.PR HOE, HAND-OPERATED PUSH TYPE

This is used for weeding between rows. The tool has adjustable middle and side scrapers which cut off weeds and crumble the surface of the soil to form a surface mulch. This helps prevent excess evaporation of the soil's water.

10.S. PLANTER, HANDOPERATED JOB TYPE

This hand-operated tool is a simple automatic planter which can be used to plant corn, peas, beans and seeds of similar size. To operate, simply jab the point into the soil and push the handles together. The seed plate is adjustable to control the number of seeds planted.

Note: This corn planter cannot be used in unplowed soil.

10. T SHOVEL, TWO-MAN

This widely used tool serves to prepare alternating ridges and furrows, to form bounds for irrigated crops, and for other shovel work. It consists of a large, slightly concave, flat sided blade with two rings on the inside. The rings hold the ends of a rope. In use, one man pushes and directs the shovel with the long handle, while a second man facing the first, pulls on the rope. When the proper rythm is maintained work is generally faster than two men using two shovels. It is widely used in Arabia, the U.A.R., central and northern Iraq, Iran, Afghanistan, Turkestan, China and Korea.

10.U Climax Hand Operated Pumping Set

This pump is suitable for pumping water from wells up to 30 metres in depth, although pumps fitted with a flywheel and operated by two men can work to greater depths. The pump consists of a suction pipe, brass foot value and strainer. Within the pipe, a rod and valve are fitted which can be withdrawn for maintenance when required. The diameter of the suction pipe varies from 5.7 cm. to 10.56 cm. Output depends on the size of pipe and lift.

10.V Double Acting lift Pump

This hand-operated pump is used to raise water to a height of about 120 cm. from very shallow ponds, or irrigation ditches. Its operating principle is similar to the bellows pump.

(1) Handle
(2) Piston
(3) Under-water inlet with valve
(4) Plunger valve
(5) Water trough
(6) Piston box
(7) Water level

This inplement is an example of rural technology or "Earth Methods" used in China. Self-help leaflets have been distributed widely, and because of their restricted explanatory design notes, much of the innovation is left to the constructor.

10.W. Vehicle, pedal-powered

These drawings show variations of an experimental load carrying vehicle adapted from bicycle parts. The basic unit can be converted to several uses by simple adjustments. For example, the geared power pod is reversible so that the vehicle can be oushed uphill under heavy loads. It can also be adapted to carry long loads, or, with the front end removed, it can be used like a wheelbarrow.

10. X A Multi-purpose hand operated implement

Description: This implement can be constructed very easily according to the drawings given. It consists of a wheel and a handle. Any type of attachment like plough or harrow or seed drill equipment could be attached to this implement. Five different types of attachments have been fitted to meet the various requirements, namely (1) plough, (2) cultivator (rake type), (3) cultivator (sweep type), (4) sweep (harrow type), (5) seed drill. The plough attachment can plough and harrow 6cm. deep and 60cm. wide. Cultivator rake collects grass from the ploughed land and breaks clods satsifactorily. The cultivator (sweep type) has three sweeps and covers 20.5 cm. width. The basic purpose of this cultivator is to break the top crust of land and pulverise it to a depth of about 6 cm. It also cuts grasses in the field. The sweep with its shape like arrow head penetrates into the soil and loosens it very easily and can be used for inter-culture.

11. SUMMARY OF INVESTMENT COSTS — In leones

S. No.	Items of Cost	To be born by S.L. Government	Contribution from donor - country	Total
1.	Site Preparation and Development	7000	-	
2.	Building		50,000	50,000
3.	Machinery, Equip Equipment and tools		40,000	40,000
4.	Transport Equipment (one land-rover)		15,000	15,000
5.	Office Equipment	2500		25000
6.	Subtotal	9500	105,000	114,500
7.	contigency(5%)	475	5250	5,525
8.	Grand total	9,975	110,250	120,225

12. SUMMARY OF OPERATING COSTS

S.NO.	Items of cost	Government Contribution	Donor Contribution	TOTAL
1.	Salaries & wages	17,624	20,000	37,624
2.	Materials	7,000		7,000
3.	Electricity water and fuel	1,000		1,000
4.	Maintenance cost	3,000		3,000
5.	Administrative overheads	1,000		1,000
6.	Miscellaneous	2,000		2,000
7.	Sub-total	31,624	20,000	51,624
8.	Contigency(10%)	3162		162
9.	Grand Total	34,786	20,000	54,786

13. SUMMARY OF WAGES AND SALARIES

	Description of man power	To be borne by Government co-operation	To be proposed through foreign assistance	Total
1.	Manager (Charge man)	Le 1978		
1	Manager Instructor	-	Le 20000	
1	Turner	Le 1622	-	
2	Mechanic	Le 1622 x2	-	
1	Welder	Le 1622	-	
1	Blacksmith	Le 1622		
2	Carpenter	Le 1622 x 2 = 3244		
1	General purpose fiter	Le 1622		
2	Helpers	Le 835 x 2 = 1670		
1	Driver	Le 1000		

ANNEXE I

Equipment and area of activities

- Requirements for each workshop has been assessed and are listed below.

Blacksmith

1.	Forge	-	but must be off the floor
2.	Anvil	-	iron stake in the ground a round head 4" to 6" round or square
3.	Tongs	-	indegenous type
4.	Working bench	-	minimum 4' x 6' x 30' high
5.	Driller	-	hand bench type $\frac{1}{2}$' capacity
6.	Bnech grinder	-	hand powered 5' x $\frac{3}{4}$' wheel
7.	Ounches	-	drift, square, countersink all indigenous t
8.	Hand drill	-	
9.	Open end spanners	-	8 prices $\frac{3}{8}$' to $1\frac{1}{2}$'
10.	Self grip pillers 8"		
11.	Tap and die sit	-	$\frac{1}{4}$' to $\frac{1}{2}$'
12	Drill sit	-	200 cmp oil cooled (if available, fitted with battery charger)
13.	Arc Welder	-	200 cmp cooled (if available, fitted with battery charger)
14.	C clamp	-	2 x 6', 2 x 10'
15.	Pipe wrenches	-	1 x 10' 1 x 18'
16.	Pipe tape and dies	-	$\frac{1}{4}$' to $2\frac{1}{2}$'

Essential equipments for woodworking (workshop)

1	Work bench	-	800mm high 650 wide and 2200mm long
2	Vice	-	Cost iron bench vice with 200mm wide .....
3	Bow type long saw	-	
4	Rip hand saw	-	800mm blade
5	Cross cut hand saw	-	700 " "
6	Temon saw	-	300 " "
7	Compass saw	-	300 " "
8	Bench hook	-	200 " "
9	Mitre box		
10	Felling axe		
11	Hand axe		
12	Jack plane		

13	Adze		
14	wood rasp		
15	square edged chissels		
16	Mortice chisel		
17	claw hammer		
18	Wooden mallet		
19	Pincurs	-	with 150mm long handles
20	g-cramps	-	two 300mm long
21	Bradawl	-	2mm
22	Gimlet	-	3mm
23	carpenters ratchet brace	-	
24	Avger bits	-	5mm, 10mm, 15mm, 25mm
25	Screw drivers	-	150mm long 3mm wide blade
26	Set squares	-	250mm long 5mm wide blade
27	marking guage	-	
28	grinding wheel	-	sand stone wheel
29	carbondum oil stone	-	with coarse and fine grit side
30	Triangular file	-	100mm long

Essential equipment for metal workshop

1	Goggles	for eye protection
2	Gorge	
3	Anvil	minimum
4	Tong	for flat bars up to 25mm thick for round bars up to 25mm diameters
5	sledge hammer	dubble faced 3 kg
6	Ball pein hand hammer	1 kg
7	Cold chisels	flat 10mm wide
8	hammer	" 25 " "
9	Hot chest	sitting chisel
10	Cold "	25mm
11	Hot "	40" with steel rod handle
12	Herdic	40" " wooden handle
13	Hot punches	40" to fit square hole in anvil

14.	Drifts wire frame hack saw	-	
15.	Tin snips	-	standard 300mm, blades
16.		-	straight hade - 200mm
			" " - 300 "
			curvas blade - 200 "
			flat - 250 "
			triangular - 150 " smooth
			half round - 250 " bastard
			round 150 " second cut
17.	Breast Drill		12 mm capacity chunch
18.	Set of twist drill		from 2mm to 12mm diameter
19.	Combination pliers		200mm long
20.	Soldering iron		1 kg straight
21.	Adjustable spanner		250 mm long
22.	Stillson type pipe grip		450 " "
23.	Screw drivers		150mm long 3mm wide
24.			250 long 3mm wide
25.			200 " 3 cross point

OTHER MACHINERY FOR COMMON USE

1. Centre lather one
2. Universal milling machine
3. Surface grinder
4. Shaper
5. Welding equipment
6. A heat treatment Furnace and small forge
7. Desal generate 5 kw/10
8. Spray unit with comprenur

SOME FIGURES
OF THIS DOCUMENT
ARE TOO LARGE
FOR MICROFICHING
AND WILL NOT
BE PHOTOGRAPHED.