

PD-AAJ-038

5110451 200 515

ISBN-222

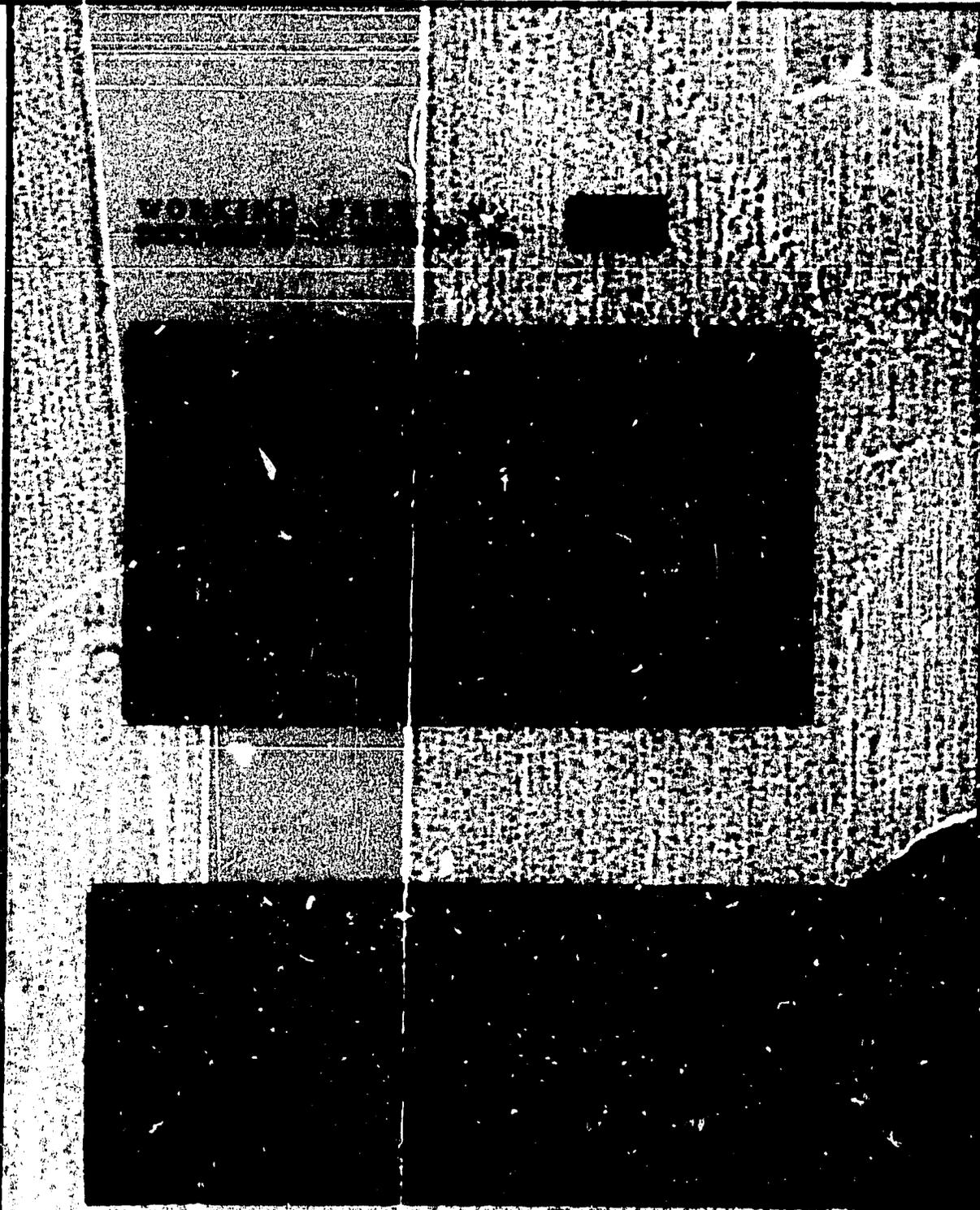
Complete

Jim Riordan

CONSORTIUM FOR INTERNATIONAL DEVELOPMENT



Colorado State University
Oregon State University
Texas Tech. University
University of California
University of Arizona
Utah State University



LA PAZ, BOLIVIA

012/78

SHORT-TERM CONSULTANT REPORT

San Julián Road Clearing Project
Yacuiba Land Clearing Project
Experiment Station Machinery

by

Leeowen Taylor*

Consultant, Heavy Equipment Operation, Maintenance,
and Procurement, Experience Incorporated, Nevada.
Consultant to the Consortium for International
Development (CID), La Paz, Bolivia.

May, 1978

SHORT-TERM CONSULTANT REPORT

SAN JULIAN ROAD CLEARING PROJECT

Mr. "Tex" Taylor arrived in Santa Cruz on April 4, 1978 to observe the road clearing work being carried out in the San Julian Colonization Project.

Mr. Taylor worked closely with Juan Steer, USAID; Victor Heredia, Project Director for INC; Fausto Yugar, INC Project Mechanic; and Harry Peacock, INC Advisor.

1. The Current Road Clearing Program

Mr. Taylor observed road building on a road to a nucleo site. At the time, two 120G Caterpillar motor graders were operating with adequate skill. Two Komatsu 85A bulldozers were observed working on the main road through the project area.

a) Equipment maintenance and repair

Much of the equipment available to the San Julian project at the time of Mr. Taylor's visit was deadlined. Following is a list:

1. D-8 Caterpillar with bulldozer.
2. 85A Komatsu with bulldozer.
3. T D20 International with bulldozer (very old).
4. Truck tractor for low bed trailer.
5. International flat bed truck.
6. John Deere wheel tractor.
7. Fiat wheel tractor.
8. International power unit.

The majority of this equipment was deadlined for lack of oil filters and/or minor repairs.

Lubrication of equipment appears to be carried out in an orderly fashion. The project has a truck mounted lubrication unit, which is excellent. The types and grades of oils and grease used is appropriate.

Mr. Taylor believes that spare parts such as oil filter elements, back-up supplies for the shop, e.g., bolts, washers, mechanic tapes and fuel filter elements, should be available to the project at all times.

b) Maintenance and repair shop

The shop building at San Julian is approximately 40 x 90 feet. At the present time, this building is open on the sides and there is no area to secure tools and spare parts.

Mr. Taylor believes that the shop building should be enclosed with appropriate doors.

A tool room is an absolute necessity so that tools can be safely stored. Mr. Taylor stressed the urgency of this requirement because of the proximate arrival of the new D-7 Caterpillars as well as the 3 excess D-8 Caterpillars.

The spare parts warehouse at San Julian is too small. Its size should be doubles to handle the spare parts now on hand-valued at approximately \$30,000. According to Mr. Taylor, there are sufficient spare parts available from the Caterpillar tractors to be cannibalized to provide sufficient under-carriage parts to operate four units for five years, at 2000 hours per year.

In addition to the hand tools and shop equipment already purchased, the following are required:

<u>Item</u>	<u>Description</u>	<u>Quantity</u>
1	Oxy-acetylene torch	1
2	Trailer mounted arch welder 300 amp. with diesel engine	1
3	Portable surface disc grinder 6 inch diam.	1
4	Power hacksaw 12 inch blade	1
5	Tire demounter up to 20 inch rim	1
6	Tire patching tool for tubeless tires	1

c) Status of excess property caterpillars

Mr. Taylor visited the Caterpillar shop (Internaco) in Santa Cruz to see the tractors required for San Julian through excess property.

	<u>Serial Number</u>	<u>Size</u>	<u>Comments</u>
1.	2U15274	D-8	In Internaco for repair
2.	2U15743	D-8	In Internaco for repair
3.	9A1573	D-8	In Internaco for repair
4.	2U15862	D-8	At San Julian -- should be repaired
5.	2U15475	D-8	Should be dismantled and parts used. (Parts valued at \$30,000).

Mr. Taylor observed that the first four machines listed above were in about 85% new condition. Inspecting the under-carriages, he said that the track rollers have flat spots because they were worked in mud with roller guards in place. In the future, the roller guards should not be installed so that rollers can be cleaned when needed.

The D-8's from excess property were equipped with two cable control power units---a single drum mounted in front and a double drum mounted in the

rear. It was recommended not to repair the front mounted units because they are not needed for the project and because they block a part of the cooling system. With this unit removed, the tractor will operate approximately 15° cooler.

All of the D-8 Caterpillar tractors should be equipped with a safety cab and engine side guards. The D-8's are equipped with swinging draw-bars which would facilitate chain clearing and they have double seats useful for training second operators.

The four units should be repaired and should operate for several years if they are properly maintained.

2. Other Recommendations

a) Chain clearing

The high cost of land clearing on a tree-by-tree basis can be drastically reduced in the San Julian project.

Chain clearing is briefly described in the Yacuiba section of this report (see page 13). Mr. Taylor found some old Caterpillar tracks at the railroad station in Santa Cruz. He suggested that the National Institute of Colonization purchase these and use them in lieu of a chain.

b) Technical assistance

According to Mr. Taylor, USAID has provided some of the best equipment available for the San Julian project. The equipment available can complete the project within the specified time frame only if the equipment is properly maintained and repaired.

To accomplish this, the consultant believes that a qualified technician should be placed on the project whose responsibilities would include the following:

1. Setting up a heavy equipment maintenance program.
2. Training local mechanics and operators.
3. Setting up a record system on each piece of equipment.
4. Setting up a control system on spare parts and emergency spare parts that should be in stock at all times, such as fuel filters, oil filters, fan belts, hydraulic hoses, tires, etc.
5. Training mechanics in adjustments after a unit has worked so many hours, such as valves, cylinder heads, different parts for clearances, etc.
6. Training mechanics in repairs that should be made in the field; in the project shop; those that would be sent to the manufacturing agent, such as power shifts on automatic transmissions.
7. Welding and rebuilding of parts with electric welder and the types of welding rod to use.
8. Using a library to keep all books related to every piece of equipment, such as: operators manual, maintenance manual, parts book, service manual, etc.

As much as possible all literature should be in the Spanish language.

c) Parts identification

The consultant found much confusion in Intermaco, as well as in INC because of old part numbers.

Some of the D-8 tractors were probably built in the 1950's and they were built for the U.S. Military. Much of this confusion could be eliminated by the use of the latest "change-over" manuals available from Caterpillar.

The San Julian project should have change-over catalogs on the following:

1. Oil seals.
2. Fan belts.
3. Air cleaner filters.
4. Oil filters.
5. Roller bearings.
6. Timken bearings.

YACUIBA LAND CLEARING PROJECT

Mr. "Tex" Taylor arrived in Yacuiba on April 8, 1978 to observe the status of the present land clearing program; to obtain a fuller understanding of the entire project area; to advise on the establishment of a permanent workshop; and to comment on the need and role of future, long term technicians.

Mr. Taylor worked closely with Mr. Roberto Vaca, who is project manager of the land clearing project. CODETAR, the Tarija Development Corporation, is the organization charged with the land clearing project.

1. The Current Land Clearing Program

CODETAR will eventually receive 8 new D-7 Caterpillars and other equipment for the land clearing project. At the moment, they have placed several older tractors, including a D-7 Caterpillar, a D-4 Caterpillar, and a D-8 sized Komatsu on the project.

a) Clearing demonstration and soil conditions

Approximately, 50 farmers observed a land-clearing demonstration conducted by CODETAR. Most of the trees were easily removed with their roots and the fallen trees were then pushed to the side of the cleared plot.

This particular plot had been logged off for saw timber. The only possible use of remaining trees might be telephone poles, fence posts and grape stakes. Stumps from the original logging operation were easily removed by the Caterpillar D-7.

b) Tractor operators

Each machine on this land clearing project has two operators. Each operator has a helper.

Each operator works six hours a day for six days each week. Thus, the machines are being used 12 hours each day.

The helpers are operating the machines a part of each day, so that when the new tractors arrive, CODETAR will already have sufficient drivers trained to operate the new equipment.

The operators are doing quite well, but they should receive additional training when the new D-7 Caterpillars arrive. The tractors currently in use have manual shift transmissions while the new tractors will be equipped with power shift transmissions.

c) Tractor maintenance

The mechanic assigned to this project demonstrated a good understanding of daily service and maintenance schedules. This included oil change hours, service of final drives, adjustment of the steering clutch brakes, adjustment of the master clutch and adjustment of the tracks. The mechanic could not adjust the final drive sprocket, but this may have been because he did not have the proper tool for this adjustment.

Tools available to the CODETAR mechanic for adjustment and repair consisted of one box of mechanic hand tools and an air compressor. A few oil filters and fuel filters were available, but there were no reserve supplies of bolts, lockwashers, cotter pins and hydraulic hoses.

The mechanic did not have an electric welder nor an oxy/acetylene torch. He did not have any special maintenance tools. Diesel fuel for the tractors was stored in barrels. Greasing and oiling was being administered from cans. The mechanic also had no access to an operation and service manual in Spanish.

Proper grease and oil were being used.

d) Other equipment needed

Additional equipment is needed by the project to satisfactorily prepare the land for farming.

A heavy disc harrow or some plow is needed to cut up the roots remaining in the soil after trees have been removed. Two passes with this machine would be sufficient.

A root or brush rake is required to gather the roots after the two passes with the disc. One pass would be required with the root rake.

A land plane is needed to level the soil. This machine can be pulled with a 60 to 70 HP tractor. Two passes in different directions would be sufficient.

e) Progress

Using the presently available equipment and with the addition of another D-7 Caterpillar, the project should be able to clear 500 hectares by August, 1978.

The clearing program is located in an area with loose sandy soils and no heavy impact on the machinery is anticipated. Most big timber has already been removed from the land and there are no trees that the available equipment cannot remove.

The entire project can be completed within the time frame projected and the machines, if properly maintained, should have additional use for other projects.

2. Observation of Overall Project Area

a) Soil types

The soils throughout the project area appear to be consistently sandy.

It is the consultant's opinion that this is one of the better land-clearing projects observed around the world.

b) Wood available

Most lumber trees have already been removed from the areas to be cleared. Some trees could be used for telephone poles, grape stakes, fence posts and fire wood.

c) Time available

Due to the soil conditions of the project area, clearing can be carried out during an 11-month period each year. Clearing should go more rapidly in the rainy season because the tractors will have more traction and the tree roots will come out of the ground more readily.

d) Roads needed

Wider roads may be needed in the project area to facilitate the passage of agricultural equipment. Peanut harvesters and disc harrows to be procured later for land preparation and harvesting will require wider roads.

3. Permanent Maintenance Shop

a) Location

Two hectares of cleared land were identified on the outskirts of El Palmar. This site is suggested for the following reasons:

1. High ground, no flooding, and good drainage.
2. Near the main road through the project area.
3. Near railroad track with siding and loading platform.
4. El Palmar has a school for Bolivian staff children.
5. Small hospital is available.
6. Frequent bus service to Yacuiba.

7. Sawmill in operation nearby.
8. Diesel fuel available within 10 Km.
9. Sand and gravel available within 2 Km.
10. Telephone available.

b) Size of maintenance shop

The consultant discussed the design and size of the shop with Milton Yucra, a CODETAR Engineer in Tarija. Buildings to be included are the main workshop, blacksmith and welding shop, paint room, tire shop, grease and servicing ramp, main office, pole storage, watchman's house, toilet and bath, open storage area for large spare parts and foreman mechanic office. An open shed for harvesting and agriculture equipment, as well as fencing and a service station were also included.

Mr. Yucra indicated that drawings for the workshop would be ready within 15 days. Yucra, Vaca and the consultant agreed that the main workshop and the spare parts warehouse were the first priority buildings.

c) Equipment and supplies needed

Approximately 110 pieces of machinery will be maintained at this workshop. Because Yacuiba and the project area are quite isolated, it is important that the workshop be adequately equipped to do all maintenance and minor repairs.

In addition to items already being acquired, the following items are essential:

<u>Item</u>	<u>Description</u>	<u>Quantity</u>
1	Power hacksaw with 12" blade	1
2	Tire demounter for 20" rims	1
3	Electric arc welder with electric drive, 300 amp.	1

4	Oxy/acetylene torch	1
5	Mobile hydraulic crane 5 ton. cap. 4 wheel drive	1
6	Heavy duty valve refacing machine with mounting stand and cabinet	1
7	Torque wrench 1/2" square drive	1
8	Torque wrench 3/4" square drive	1
9	Air impact wrench 1/2" square drive with impact socket set	1
10	Air impact wrench 3/4" square drive with impact socket set	1
11	Universal motor repair stand	1

d) Spare parts control

It is important that the workshop be completed before land clearing equipment and spare parts arrive.

There will be approximately 1,000 line items in spare parts. Spare part bins could be built in a carpenter shop and moved into this workshop when ready.

A kardex control for spare parts should be purchased and ready for use when the spare parts arrive.

4. Project Consultant Needs

a) Maintenance and repair

CODETAR needs assistance in the development of an adequate maintenance and repairs system.

The consultant believes that a technician with a minimum of 10 years experience should be hired. This technician would assist CODETAR in building and organizing the workshop. This would include a training program in maintenance and repair, as well as organization of records.

The technician would assist and advise on repairs that should be made in the field; those that should be made in the workshop and repairs that should be sent to the dealer. This technician should be hired for a minimum of 24 months.

b) Land clearing

The consultant believes that a technician is also required to assist CODETAR in the land clearing program.

At the present time, CODETAR is carrying out land-clearing on a "tree-by-tree" basis. With existing conditions, the consultant believes more efficient and thus, less costly, methods can be used.

A two to three hundred foot heavy anchor chain would probably be the least expensive method. This chain could be pulled by two D-7 Caterpillar tractors. Because this method is unknown in the area at the present time, a short-term technician should be brought in to help test this land clearing concept.

EXPERIMENT STATION MACHINERY

Mr. Taylor visited the experiment stations of San Benito and Toralapa in Cochabamba and Saavedra in Santa Cruz. The objective of his visit was to observe the function of machinery and its maintenance and repair.

1. General Observations

There is no maintenance program or any training program in maintenance and repair on any of the stations at the present time. While CID technicians on these stations have assisted in maintenance of equipment, they have other duties specific to their assignment.

The station shops should all be increased in size, all the repair bays should have concrete floors and all shops should be enclosed. Each shop should have a good tool room.

A technician should be assigned by CID to promote a training program for maintenance and repair. This technician would do such things as the following:

a) Establish files on each item of equipment which would contain lubrication records, oil changes, etc.

b) Determine repairs that could be made in the field, in the shop, and by the manufacturer.

c) Establish items that should be held in stock, e.g., oil filters, fuel filters, fan belts, back-up supplies for the shop, belts, washers, mechanic tape, cotter pins and parts that can be rebuilt such as plow points, etc.

d) The technician would help establish costs of operation for each piece of machinery, so that money would be budgeted for repair and replacement.

e) The technician would set up a library on all equipment on the station, such as spare parts manuals, service manuals, operator manuals, repair manuals,

change-over catalogs on oil seals, fan belts, air cleaners, elements, roller bearings and timken bearings.

The following additional shop equipment should be purchased for each station:

<u>Item</u>	<u>Description</u>	<u>Quantity</u>
1	Power hack-saw with 12 inch blade with electric drive	1
2	Tire demounter up to 20 inch rims	1
3	Portable surface disc grinder 6 inch diameter disc	1

2. Saavedra Experiment Station

Dr. Charles Ward and Tex Taylor visited the Saavedra Station on April 17, 1978.

The workshop is a steel frame covered with tin. The building has 4 bays and each bay is 20' wide. One bay is fenced off for a repair shop. This is very small. The shop should have a minimum of two bays.

The building should be enclosed and general repairs should be made. At the present time, the building is being used for parking vehicles and the area is very dirty.

Before MACA sends new shop equipment, the shop area should be cleaned and enclosed.

A storage shed is available. Unfortunately, many items stored are of little value, such as old tires, old batteries, a pick-up body, etc. This space would better be used for tractors and farm implements.

Many pieces of equipment should be repaired. Various tractors and farm implements will not work another season unless units are repaired.

Mr. Taylor said he saw no records of usage and repair for any vehicles at Saavedra.

3. Toralapa Experiment Station

Dr. James Walker, Tex Taylor and Gonzalo Claire inspected the equipment and maintenance facility at Toralapa on April 24, 1978.

The shop is too small because much of the building is being used to store farm machinery.

The vehicle storage shed should be used for good equipment. At the present time, there is an old useless 1-1/2 ton truck in the storage shed.

The oil and grease storage room has a pile of old scrap tires. This is a fire hazard and should be corrected immediately.

The shop area should be enclosed with access by key. A spare parts warehouse should be built near the shop.

Various pieces of farm equipment need new parts. Parts have been ordered for several months.

The Toralapa Station is isolated and should have a lift for heavy equipment. One of the farm tractors could be equipped with a front loader to serve as a lift.

Mr. Taylor observed that there are at least \$5,000 worth of spare parts at Toralapa, which are not useable for any equipment at that station. The specific equipment referred to is for a David Brown track type tractors with a bulldozer.

A general inventory of spare parts on all stations is required to determine availability and placement.

4. San Benito Experiment Station

Dr. James Walker, Tex Taylor and Jaime Salamanca visited the San Benito Station on April 25, 1978.

The shop is too small because farm machinery is parked in the bays. There is no service ramp.

The spare parts warehouse is sufficient in size but needs a good clean-up.

Maintenance on vehicles, tractors and equipment is poor. No hourly records exist.

A new machine storage shed should be built for agricultural machinery and vehicles. A washing platform should be constructed near the shop to clean tractors and vehicles before going into the shop for check-up on repair. A service ramp should be constructed along side the repair shop.