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FINAL REPORT

Fixed Price Technical Services Contract

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PROJECT No.: 660-0077  
PROJECT TITLE: PRONAM  
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I. GENERAL STATEMENT

This report should not be construed as an "evaluation" of project PRONAM. In accordance with contractual terms, however, the contractor took a hard look at the use of the project's agricultural equipment and vehicles. Conceptually and practically, the operation and maintenance of this equipment could very well be the weakest link in what otherwise appears to be a very exciting and potentially productive program. Moreover, the problem is not "C'est l'Afrique." Rather, it is a manifestation of poor planning for the introduction of modern farm equipment and vehicles in the first place, and archaic operational and maintenance procedures in the second -- all being direct responsibilities of foreign expertise and expatriate staff. If the equipment is expected to run its normal course (African bush conditions in mind), changes need to be made. This dilemma is not unique to PRONAM -- most rural development projects attempting to use modern equipment suffer variations of the same plight.

According to project officials, PRONAM (M'Vuazi)\* cultivates approximately 90 hectares (222 acres). To cover this amount of ground, PRONAM operates seven modern farm tractors (all but one in the 3 - 4 plow category or larger). Two tractors, three in the extreme, would be sufficient. Likewise, there are eight three bottom and one four bottom disc plows on hand. Eight of these plows are of the same make and model and six of these have never been assembled -- currently, being cannibalized for parts. Two plows of this type, with sufficient spare parts, are all that is required. There is example after example of unnecessary duplication of expensive farm implements while at the same time, important equipment for a M'Vuazi type operation is not on hand -- such as a land plane, shank and shovel type tool bars, hydraulic front-end loader, and two-way reversible disc or mold-board plows.

Operationally, the equipment fares even worse. Every single piece of equipment in the field, including the tractors are in some state of excessive disrepair. Not one implement had ever been properly field adjusted,

\* Unless otherwise noted, this report only concerns the M'Vuazi operation.

nor prior to this contract, had any tractor drivers ever received formal training or directions at M'Vuazi. Furthermore, the tractors are sent to the field without any tools whatsoever --- no hammers, no wrenches, no pins, no chains, --- a peculiar situation indeed for modern farm implements which require constant mechanical attention. The consequences are that tractors with less than two full seasons, are worn well beyond their years. Some of these tractors have run for more than 1,600 hours to accomplish what should have been done in less than 400 hours of work.

With the exception of the crawler tractor (which is not equipped with hydraulics for implement control), not one tractor had been correctly hitched to its three-point implement -- Category I hitch pins used with Category II hitches and vice versa; inappropriately sized and broken pins; and in some instances, important structural pieces missing. The results are that all tractors and implements in use have excessively worn or completely worn out hitches. In any event, such hitching practices render the hydraulic monitor controls useless. (Note: With one exception, all tractors and implements at M'Vuazi are of the three-point hitch variety and are dependent on hydraulic control.)

The road vehicles are in just as poor a state. Exclusive of a new heavy truck in storage, only two of the 15 or so PRONAM vehicles can be considered truly roadworthy -- the 1982 Chevy pickups operated by the director and co-director. Even both of these vehicles are in need of major repairs --- one has an inoperable 4 wheel drive and the other has severe reverse chatter, probably caused by stretched pinions in the rear differential. Both conditions were more than likely caused by the improper use of the four wheel drive. In fact, since the emergency brake on one of these two vehicles is inoperative, it too could be considered unroadworthy.

Maintenance and repairs are conducted outside in the dirt from a beat-up tool box with a small assortment of inappropriate wrenches and tools. Better equipment is on hand.

Unfortunately, without fundamental project reorientation, these malpractices will probably continue unabated. Unjustifiable costs notwithstanding, the end result of course, is not only broken equipment, but, poorly prepared and eventually destroyed farm ground. Thrown-out fields, center field hard-pan, gullies, ridges, and washouts -- all due to poor farming practices -- are already very much in evidence at M'Vuazi.

The situation described above has been recognized by PRONAM and USAID/KIN officials for some time. More than a year ago, USAID /KIN officials and the PRONAM director expressed many of these same concerns to the contractor. In fact, at the request of the PRONAM director, the contractor, in July 1983, voluntarily helped prepare lists of spare parts (most of which had been requested by the PPS). To date, more than eight months later, the parts have not been ordered. During that same month, at the invitation of the PRONAM director and in preparation for this contract, the contractor made a reconnaissance trip to M'Vuazi.

Likewise, IITA officials have been aware of the situation. In a June 1983 report, the IITA Farm Manager Engineer (Ibadan) pinpointed some of these problems at M'Vuazi and for the PRONAM station at Gandajika, stated "The situation of equipment at the station can only be regarded as desperate." This might be a reasonable assessment for M'Vuazi as well.

Part of the problem appears to be an unrealistic work load placed on the Physical Plant Specialist (PPS). In addition to his responsibilities for the maintenance, repair and dispatch of the project equipment consisting of 15 or more vehicles, seven tractors and dozens of farm implements (under the circumstances, a full time job in itself), the PPS is also responsible for two electric plants, twenty or more buildings and homes (all in various states of decay), machine and parts inventory as well as the fuel and water supplies for the entire PRONAM operation at M'Vuazi. In the execution of all these duties, he is willingly at the beck and call, night and day, of every official, scientist, technician and resident at PRONAM, and often his time is spent satisfying petty requests and whims.

Even if the PPS were well versed in modern farm equipment operation, he simply would not have the time to assist with farming techniques and field training.

Another problem concerns the chain of command -- no one seems to be quite sure to whom he or she is responsible. Commands and counter-commands flow freely and the scientists vie with one another for technical services such as plowing or harrowing. Often drivers arrive at the fields only to find that the work is already under way or even completed. In some cases, such as mowing, they arrive only to find the work being done by hand. The contractor once observed a garage technician receiving three different commands from three different project officials on the same matter over a fifteen minute period. The irony of all this is that most of the scientists complained at one time or another that their requests for support services were going unanswered. It is obvious that with a technical and labor staff exceeding 200 persons, machine intensive and labor intensive chores are confused. This matter needs serious attention.

Intangible as it may be, there is an "attitude" problem on the part of project officials concerning the modern equipment and its role at PRONAM. Comments such as "USAID writes off this equipment in two years anyhow" (in fact, USAID has no such policy) and "I prefer to make repairs in the dirt" (in fact this practice is part of the reason the machinery is in such a poor state), belie an attitude that somehow the modern equipment is an assumed convenience that will take care of itself. The claim that "machinery and vehicles are kept running" is not a valid excuse for conditions at M'Vuazi. It must be noted that most of the equipment is less than three years old, much of it less than two years old and in several cases only a few months old. Tractors, even under severe conditions, are expected to run for twenty years or longer. Indeed, farm tractors are generally amortized over 15 to 25 year periods. Except for low grade fuel and poor maintenance and operating procedures, conditions at M'Vuazi are anything but severe: loose, generally rock free soil and mild year around climate -- no heat, no dust, no cold, no snow. Even the roads are not that bad. And yet, the

fault for the poor condition of the PRONAM equipment is laid at the feet of Africa -- "The chauffers are no good"; "Everyone is lazy"; "They are all thieves". It is this attitude that negates the philosophical underpinnings of development. It must be kept in mind that nearly all of the Zairian PRONAM staff was raised since independence. For most of them, their model, and more than likely their only model, is PRONAM. Concerning the machinery, particularly in the context of American technological know-how and productivity, the model is a failure. More importantly, in the context of Africa, development goals will continue to be elusive.

It also appears that demands on the director are such that a disproportionate amount of his time is required for matters not directly related to project management. He must constantly attend conferences, escort experts, TDY specialists, journalists and other interested parties, and travel to other points both within and outside of Zaire. When he is at post, much of his time is devoted to scientific endeavors. If during his absence, the designee in charge leaves the post, generally no one is left in charge --- at least no one knows who is in charge, and on several occasions the contractor observed arguments among project officials over this matter. Many times these arguments concerned priority use of project equipment.

All this suggests the need for a full time "farm manager" -- a western trained and experienced person who understands modern agriculture from the ground up and has the patience to work with untrained staff and scientists alike. Contrary to popular belief in development circles, competent farm managers are available. It would behoove USAID/IITA to hire such an individual. Such a move would allow the director, scientists and technicians alike more time for their pre-imminent responsibilities while at the same time helping to insure practical, efficient, and productive use of project machinery and equipment.

Be all this as it may, the situation should be kept in perspective. Things are never exactly as they might be, particularly in the difficult realm of African rural development. Nevertheless, it is time to begin improving the equipment maintenance and operation systems at M'Vuazi. As a

result of this contract, a new well equipped workshop is in place, work areas have been reorganized, efficient inventory and record systems have been developed and tractor operators have received some training. These efforts can serve as the catalyst for that beginning. In the meantime, it might be well to remember the advice of a wise old farmer, "If you can't take care of your machinery, don't have it."

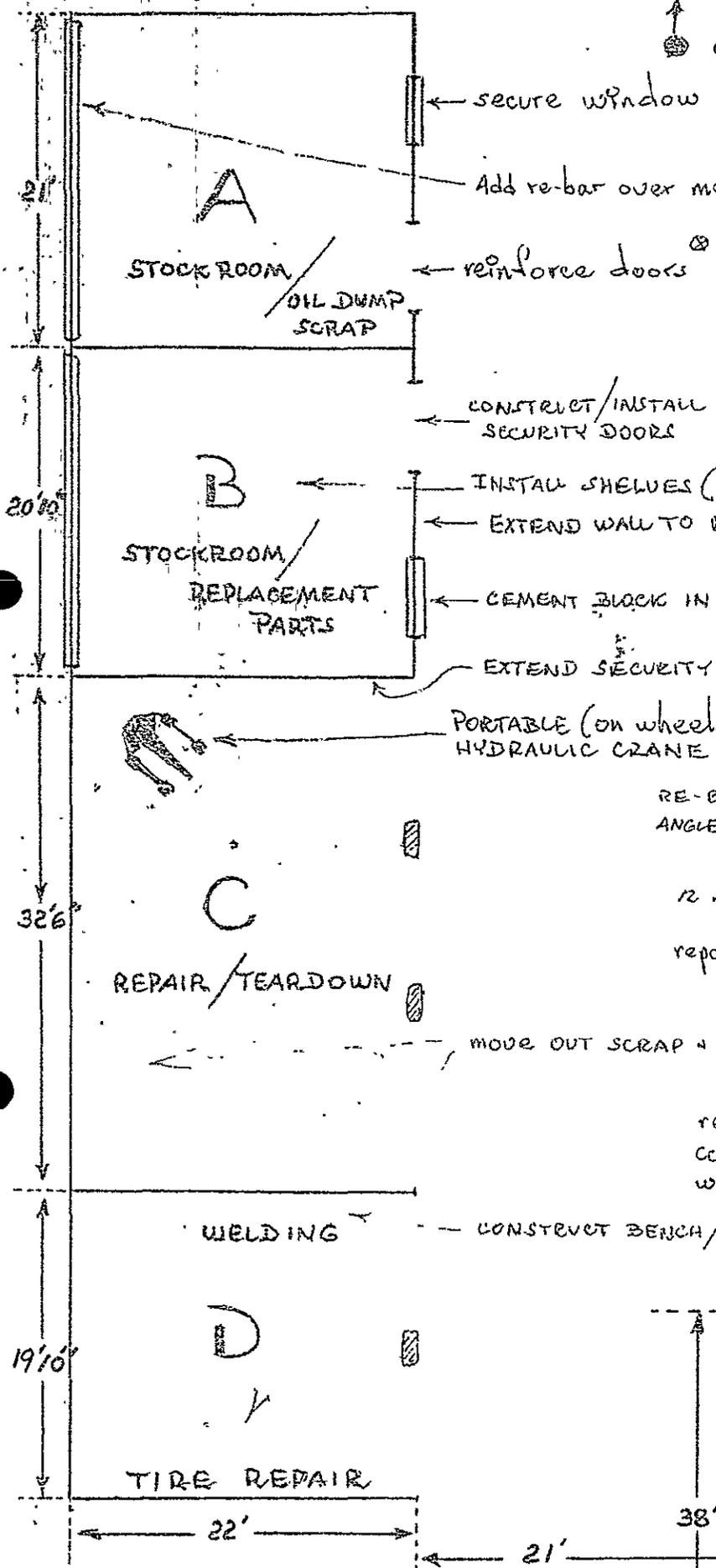
## II. SHOP COMPLEX

### SPACE

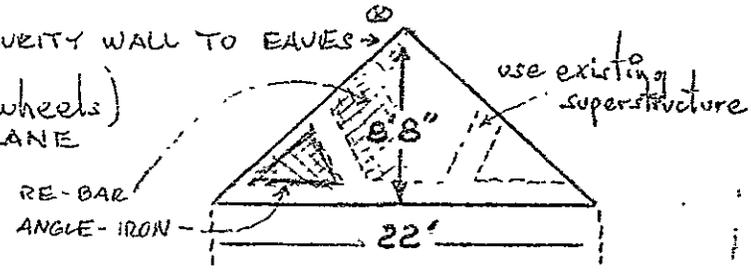
PRONAM has a well equipped, reorganized shop, work areas and storage space. Relatively, this farm shop complex, with 2,700 square feet under cover, is better equipped and has more appropriate floor space than many of the best agricultural research stations and commercial farms in North America. Unfortunately, it is questionable whether or not this shop will be efficiently used. Already, there is evidence of disorganization and malpractice in the use of the new facility. The very competent counterpart/chief mechanic to the PPS has expressed concern over this matter, but, under present organization, his hands are somewhat tied. The presence of a full time farm manager would help correct this situation by allowing the PPS more time to attend to duties directly related to the shop.

In the meantime, two major steps should be taken to improve the situation. First, the floor space should be used as planned. It should be noted that the PPS approved the design and plans for the floor space and its use. The planning sketch and use chart herein can be used as an organizational guide. Due to budget considerations and unavailability of material, the upper security wall between Area B and C has not been completed. This inexpensive partition consisting of 12 mm rebar with 20 cm sq spacing on 4 cm (3 mm guage) angle iron framing, attached to the existing superstructure

PRONAM / M'VUAZI  
 SHOP COMPLEX



NOTE: INSIDE DIMENSIONS  
 IN FEET FOR PLANNING  
 PURPOSES ONLY



12 mm rebar 20 cm sq spacing 4cm angle iron frame  
 repair cement floor F



relocate carpenters from F to INNER side  
 CONSTRUCT CARPENTER BENCH  
 WIRE MESH/RE-BAR OVER WINDOWS F

Note: ⊙ indicates to be completed

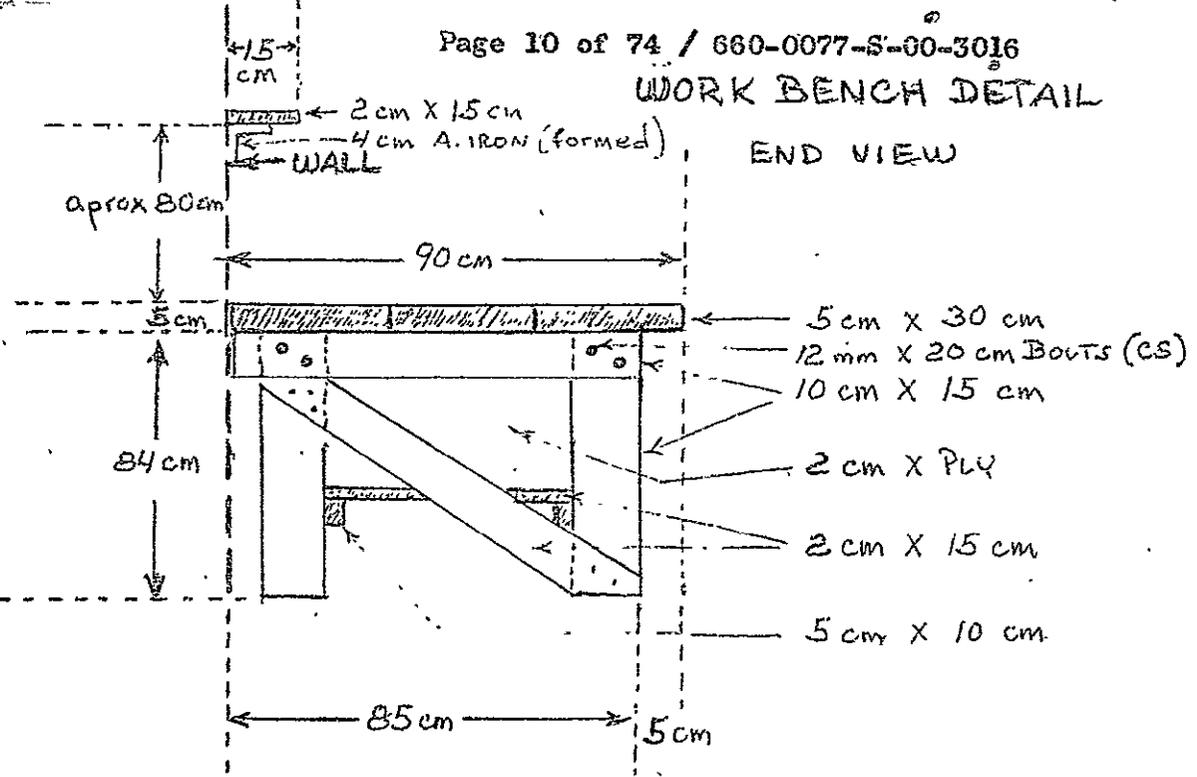
should be installed as quickly as possible. The competent PRONAM welder, as well as the chief mechanic, have been instructed in the methodology for this construction. As soon as the partition is in place, all shelves, parts and stock should be moved to this location. If additional shelving is required, current models on hand can be copied. Five centimeter lips front and rear should be added to the shelves (see diagram). It is also suggested that 12 mm rebar anti-vol be installed over current mesh on North walls of areas A and B.

Second, access to the workshop should be limited to five persons -- the PPS, the chief mechanic, the chief welder, the partsman and a mechanics helper. Anyone else should be admitted only by special permission and only for specified tasks. With a few possible exceptions, no one but the above listed technicians should be allowed to use the power tools. An exception might be made, for example, to the INERA machinist, who is an expert in the use of such equipment. In any event, the current practice of allowing personnel numbering in the dozens plus numerous "hangers-on" to swarm all over should be stopped.

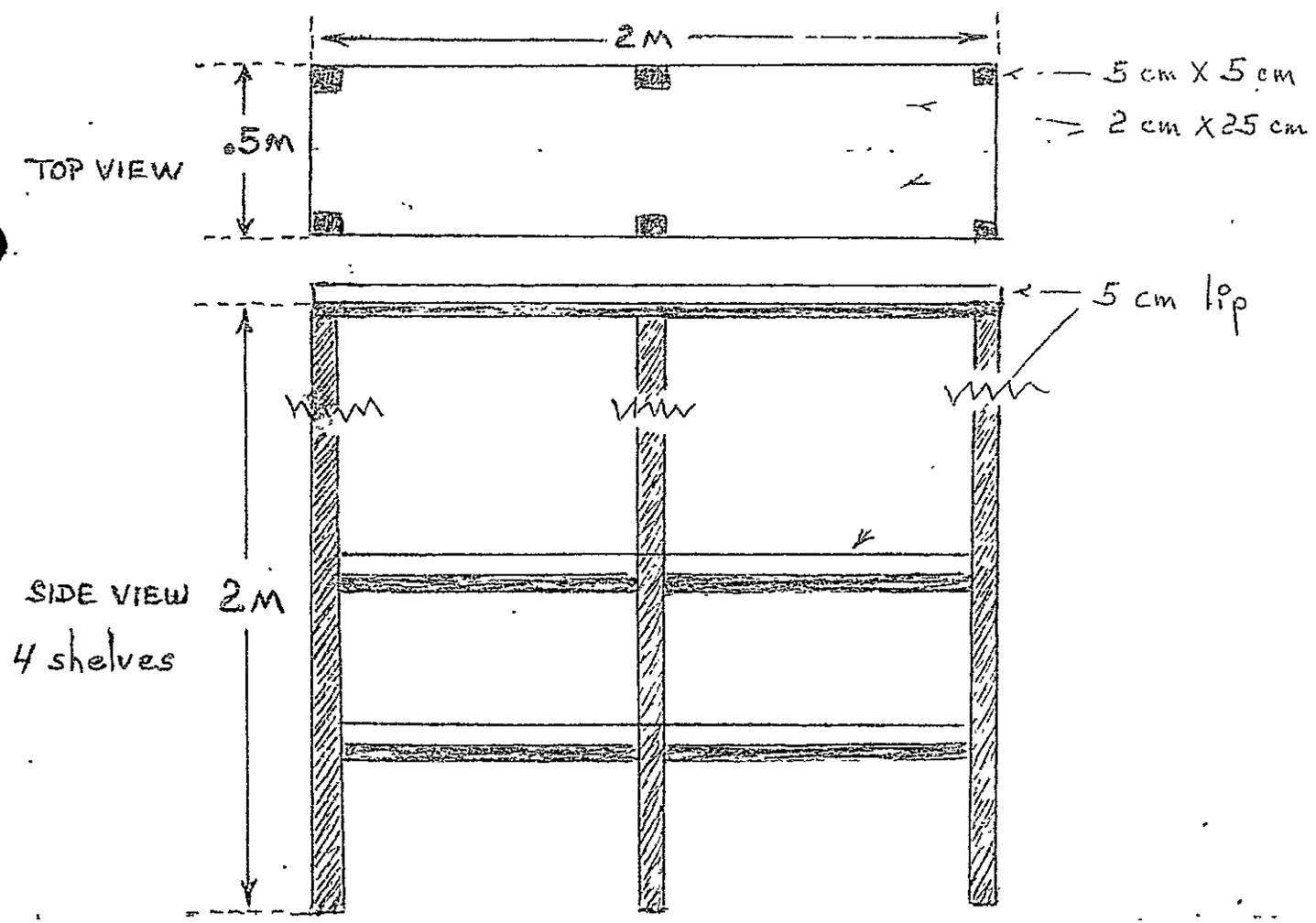
#### TOOLS AND EQUIPMENT

Although the shop is well equipped with specialized equipment and power tools ranging in scope from heavy duty floor jacks to a 25 ton press (see complete list of tools and equipment in Annex A), the basic everyday hand tools and wrenches are left wanting. For example, it was noted during the course of this contract, that such basic tools as functional screw drivers and vice grip pliers were not on hand. With the exception of the arc welder and a few miscellaneous items, the contractor provided his own hand and power tools which were often loaned to the PRONAM garage operation. Even though some of the required tools are currently in stock at M'Vuazi, it is recommended that the project acquire one complete quality master mechanics set of tools (metric and English fit) such as the 805 piece CRAFTSMAN (SEARS) MECHANICS TOOL SET with cabinets, catalog number 96T43402N5 or the SNAP-ON MASTER AUTOMOTIVE SET with cabinets, catalog number 5241A-6S-BB or their

### WORK BENCH DETAIL



### STOCKROOM SHELF DETAIL



equivalent. Once acquired, these tools should be professionally used and cared for. Properly treated, most of the wrenches should last for generations. The cost of these sets is in the \$3,000- \$6,000 range -- a relatively small amount considering the need to service millions of dollars worth of equipment.

A less acceptable option would be the purchase of a smaller set, but it should include a full tap and die set (metric and English fit), "cutting" variety. The set currently on hand is of the "chaser" variety (good for cleaning or repairing threads only) and does not include metric sizes.

It is also recommended that a small electric grinder with a sliding tool guide and clamps such as SEARS catalog number 96T1935C and 96T19595 or equivalent should be purchased for sharpening machetes.

A bit sharpening attachment such as SEARS catalog number 96T6677 or equivalent is needed for the BALDOR industrial grinder.

Oxygen and nitrogen bottles are needed for the new acyethelene torch/welder set on hand.

A heavy duty portable electric drill (5/8 inch chuck capacity) with drill stand is required -- 120 volt to use in conjunction with the portable welder/generator on hand. MILWAUKEE Models 1750-1-REV and 3540 or equivalent are recommended.

Barrel pumps, fast and slow flow spigots and syphoning devices should be acquired immediately for use on the standard 55 gal (200 liter) drums.

It should be pointed out that the Sprunger Model RD33 Precision Radial Arm Electric Drill Press, is of poor quality and has a major manufacturing defect. The roll pin hole in the head does not align properly with the radial arm and it is obvious that the flaw was discovered at the factory -- factory paint covers re-drill points and marks apparently caused by attempting to beat the head in place. The electric on-off switch is located

dangerously close to the drive belt and the drive belt cover does not align with its attachment points. The quill slap is beyond acceptable tolerance at the bottom of its stroke and the depth set locks vibrate loose. None of these faults can be attributed to shipping damage. Had the drill been unpacked and installed and/or inspected in a timely fashion, perhaps the guarantee would have been useful. At this late date, it is doubtful that redress is possible.

The Dake 25 ton press leaks hydraulic oil at the lower seal on the cylinder ram, perhaps due to a dried out seal (the machine sat for many months before installation and oil fill) or perhaps due to the use of an improper grade of hydraulic oil. Although the oil used reportedly corresponds with the manufacturers recommendations, it is suggested that a heavier grade (clear type) be tried.

Many other tools and equipment would be nice, but not essential. Some equipment, such as a power hack saw, could be constructed on site using material on hand and a little imagination.

#### NUTS, BOLTS, WASHERS AND GENERAL SHOP HARDWARE

An exorbitant amount of time is spent looking for the simplest nuts and washers or other minor, but necessary, hardware. It is suggested that a professional repair shop selection of nuts, bolts, cap screws, flat washers, lock washers, roll pins, drift keys, half moon keys and flat key material and other basic hardware should be ordered. It is important to note that such a selection (pre-assembled by supply houses) should include both American SAE fine and Standard fit nuts and bolts as well as Metric fine and course fit nuts and bolts with various lengths in each size from 1/4 inch diameter to 5/8 inch diameter and 5 mm diameter to 15 mm diameter. All nuts and bolts should be of the hex-head (six-sided) machine type.

Note: There is currently a good supply of cotter keys (pins), snap rings, electric terminals, connectors and star washes on hand at M'Vuazi.

In the meantime, all nuts, bolts, washers and useful hardware scattered over the project grounds should be recovered and stocked by category and size.

#### SECURITY.

PRONAM security measures at the shop complex are weak and unrealistic. It implies that thieves are rampant and does nothing about it -- an open door invitation to trouble. The end result is no honor, no discipline; no patrol, no prevention.

Shop hours are from 07 00 hours in the morning to 15 00 hours in the afternoon Monday through Friday. Sentinal services do not begin until 18 00 hours, leaving the area unattended for a three hour period. Likewise, on the weekends, during daylight hours, the shop complex is unattended. Even when the sentinel is on duty, he is unable or unwilling to prevent animals and humans alike from entering the premises for unauthorized purposes.

Until this contract corrected the situation, the doorway to a stockroom was blocked each night by a piece of junked farm machinery. It took several huffing and puffing men to put the machine in place, but, a child could push it over. The irony of this is that the same stockroom wall was always open between the cross joist and peak (refer to West wall of Area B in sketch). As mentioned previously in this report, the wall is still open, leaving areas A and B vulnerable.

Five of the seven tractors and all unassigned road vehicles are parked at the home of the PPS each night. It is estimated that 15 minutes or more per work day are added to each tractor due to this exercise. Since the drivers walk up to get the tractors after the work day has begun, even more time is lost. This parking procedure is a security precaution to prevent theft of diesel fuel, batteries and other easily removed items. Assuming that the sentinel at the PPS's home is honest and competent it would seem reasonable that personnel of the same caliber could be found to guard the garage area.

By the same token the tractors are hot-rodged back and forth to the fields each day (sometimes several times a day) adding another 30 to 45 minutes to the hour meter. To be sure, a service truck would be of questionable value at this time. Nevertheless, better security management would help eliminate wasted time, wear and tear.

It is recommended that the following steps be taken to tighten security:

1. Complete security wall between Areas B and C and hang cabinet doors (already constructed) in Area E.
2. Reinforce and heighten security wall surrounding entire INERA/PRONAM shop complex (garage compound) and hang security gates.
3. Have minimum of two sentinels on duty at all off hour times including weekends. At less than 600 Zaires per month per person, the extra cost for this additional protection would be minimal.
4. Provide basic training to sentinels as to what their duties are and how those duties should be carried out. (Currently, sentinels have only a vague notion of what their job entails and their ability to stop unauthorized intrusions is not viable.)
5. Provide sentinels with necessary equipment such as good flash-lites, batteries, whistles and if necessary, weapons.
6. (Optional) Have daytime gate keeper on duty to help control flow of unauthorized personnel entering the compound.
7. Tools and equipment should be "checked out" and signed for by the assignee or those using them. It could be the partsman's responsibility to control the flow of tools and equipment.
8. Help instill a little pride in the garage technicians by demonstrating the proper use and care of the tools. This step alone might do more good than anything else to stop the alledged disappearance of tools while at the same time easing the work load of everyone concerned. A little respect towards fellow man goes a long way.

### ADDITIONAL SPACE AND STORAGE

The machinery needs more weather protection and several PRONAM technicians requested that a building for this purpose be constructed on the present machinery parking site at the fields. If this spot is free of flooding, it might be a good location to erect a machine storage shed. It is centrally located and has good access from several directions.

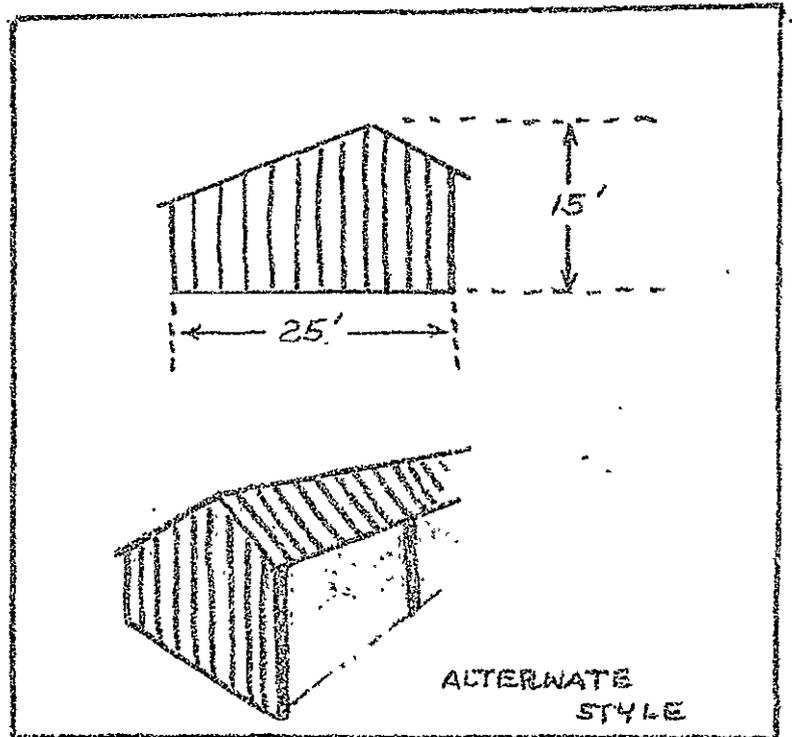
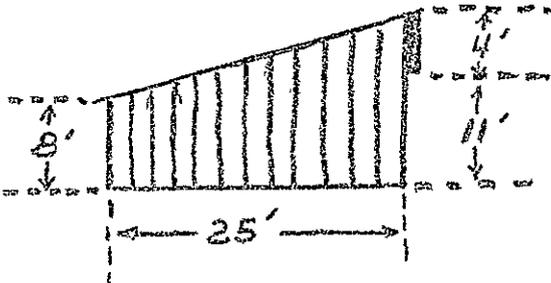
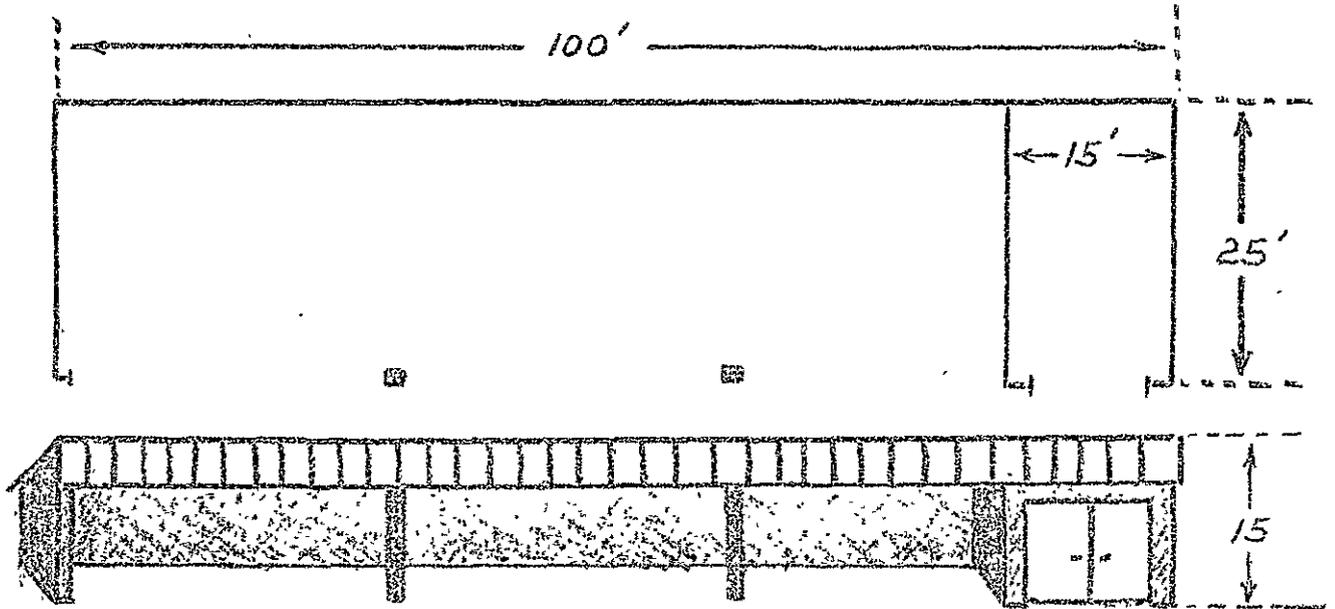
A three-sided shed type building 25 ft. by 100 ft. with a closed 15 ft. by 25 ft. room with large access/security doors at one end should be considered. Another site for such a building (or even a second facility) might be across the road from the garage compound -- next to the grease pit and with the open side parallel to the road.

INERA has such a building located near the large warehouse at the field level. It is currently not in use, or at best, inefficiently used. In lieu of constructing new facilities, perhaps PRONAM could occupy this building.

### III. SAFETY

A straw boss with a lighted cigarette in his hand standing over a fifty-five gallon drum of gasoline being tipped on its side to pour fuel into an open bucket on an oil soaked floor in a closed room pretty well sums up the safety precautions at M'Vuazi. In the entire shop complex (INERA and PRONAM combined) there is only one small hand-held fire extinguisher (dry type). It hangs on the wall in the storage room. Of the forty or so people generally found in and about the shop area, the contractor could find only seven who were aware of its existence and no one had ever received any instruction in its use. There is no running water on the premises, nor is there any first aid supplies.

Mechanics and helpers working under improperly blocked vehicles and equipment, untrained workers operating power tools, power tools being used



PROPOSED MACHINE SHED STYLES

for inappropriate purposes (such as sharpening machetes on industrial grinder, wrecking machetes, grinding wheels and men alike), little or no protective clothing in use, seat belts not in use with roll bar equipped tractors, worn out tires on road vehicles, improperly towed vehicles, welders and other spark and flame producing equipment in close proximity of flammable matter and broken or no seatbelts in the road vehicles are but a few of the more serious safety problems requiring correction at M'Vuazi.

Another serious problem concerns workers and unauthorized riders standing between tractors and corresponding implements, particularly during the hitching process.

The prevalent practice of mouth syphoning leaded fuel and other hydrocarbon products constitutes a severe health hazard. These practices should be stopped immediately. It is interesting to note that as long ago as September, 1981, one of the project scientists wrote a letter to PRONAM officials warning of this and other health hazards at the garage. The letter also proposed a series of sound suggestions for corrective measures. To date, there is no evidence that any of these warnings and suggestions have ever been considered.

The following safety rules are in line with those recommended by farm implement manufactures and rural development specialists such as FORD and ENVIRONMENTAL ECONOMICS, Inc. Project officials should take note of these rules and institute safety procedures at M'Vuazi.

#### SHOP

The first five rules listed below should be considered the five commandments for any farm machine shop.

- No smoking in or around shop and fuel storage areas.
- Always wear required protective gear and clothing:
  - = goggles at grinding and drill press machines;
  - = helmet and eye protection when welding;
  - = gloves when handling sharp, hot or jagged objects.

- Never operate machine tools or equipment without proper guards and shields in place.
- FIRE EXTINGUISHERS AND FIRST AID KITS SHOULD ALWAYS BE WITHIN EASY reach (know how to use them).
- KEEP SHOP NEAT AND CLEAN.
- Never exceed recommended RPM speeds on power tools and accessories.
- Always clamp and/or secure work to machine tool platforms using appropriate vises and chucks. Do not hand hold tooling or stock when using machine tools.
- Never work under raised or jacked vehicles or equipment until securely blocked.
- Do not by-pass safety switches or fuses on power tools, vehicles, or implements.
- One operator at a time on power tools such as two wheel grinders.
- Keep grease pits covered when not in use.
- Keep flame and sparks away from flammable material, fuel and batteries.
- Keep hands, feet and head away from moving parts, belts and chains.
- Keep loose clothing away from moving parts, belts and chains.

#### TRACTOR AND IMPLEMENT OPERATION

Remember, a careful operator is the best operator. Observe established safety precautions and most accidents can be avoided. Avoid potential hazards by keeping equipment properly maintained at all times.

- Always be alert and obey safety signals such as the international symbol for ATTENTION 
- Be completely familiar with the Operator's Manual/s --- for both tractor and implements. Equipment should be operated only by responsible and well instructed operators;
- DO NOT SMOKE and avoid open flames in refueling areas and/or fuel dumps.

- Keep safety decals clean and legible.
- All tractors should be equipped with an approved roll bar and/or CAB protection. Always use a seat belt when tractor is equipped with roll bar and/or safety reinforced cab. Do not use a seat belt if the tractor is not equipped with a roll bar.
- Use caution when mounting and dismounting tractors and/or implements such as combines. Always use hand holds and keep platforms and steps clean of grease, dirt, tools etc.
- Do not start engine or operate controls while standing beside tractor or implement. Always sit in the operator's seat when starting engines or operating controls.
- Keep flames and sparks away from storage batteries (they give off gas).
- Do not refuel running or hot engines.
- Always stop engines and equipment before servicing, greasing or oiling.
- Do not jump off moving equipment.
- Do not carry passengers.
- Never stand between tractor and attached implements when someone is in the operator's seat.
- Make sure tractor and equipment is properly shut down and braked before dismounting.
- Make sure tractor and implement controls including transmission, PTO and hydraulic levers are in proper position before starting --- generally in neutral, off, down, or closed positions.
- Do not leave equipment in raised position and never work under raised <sup>equipment</sup> unless it is properly blocked and stationary.
- Never operate equipment or PTO shafts without safety guards and shields in place.
- Always shut down equipment before making adjustments and repairs unless directed otherwise by the operators manual. In any event, always follow procedures as outlined in the operator's manual.
- Do not get off tractor until PTO equipment is stopped.
- Be vigilant at field borders, on roads, around obstacles and near overhangs. Always operate at prudent speeds and pay particular attention when operating near banks, holes, ditches, over rough ground, on steep slopes or crossing public thoroughfares.

- Always make sure tractor and implements will swing clear of people and obstructions when turning. Use extreme caution in turns with three point hitch mounted implements.
- Do not coast, free-wheel or change gears when going down hill.
- Make sure all equipment is properly secured for transport with hydraulic, safety, supports, hitches, wheels and locks in proper position.
- Towed implements and/or vehicles that exceed the weight of the tractor should be equipped with brakes.
- Lock brake pedals together for two wheel braking on roads or during transport.
- Only pull from the drawbar or lowered link bar. Never pull from axle or any point above axle.
- Never touch moving parts, belts, shafts, pulleys, cogs or gears. Do not install or remove a belt when pulley is in motion.
- Always have tractor properly weighted with front end weights to prevent rising. Front wheel weights are not recommended due to the extra stress placed on steering and suspension. At a minimum, rear wheels should always be weighted with rear tires 75 percent filled with a calcium chloride solution, wheel weights should be added as required.
- Reverse rear wheel drive tractors when tires are stuck or frozen to ground.
- Always use properly fitting hitch, link, control arm and implement mounting pins.
- Do not run engines in enclosed structures without proper ventilation.
- Avoid parking on steep inclines.
- Do not wear loose clothing around moving parts.
- Always use a respirator or filter mask when operating in dusty conditions.
- Keep sparks and flames away from batteries and fuel tanks. Exercise caution when using jumper cables.
- Do not run equipment into live wires or underground conduits (water, electric, telephone, sewer, etc).

IV. MAINTENANCE/REPAIR

Outside of periodic oil changes and greasing, preventive maintenance in general is not practiced at M'Vuazi. Essentially, maintenance consists of repairs, often crude, made only after breakdown.

Maintenance procedures should be in accordance with operator manual instructions to the fullest extent possible. In the absence of manuals, the schedules provided herein should be used as a guide. Maintenance intervals are listed in time or milage or both when appropriate and reflect conditions at M'Vuazi. In addition to these schedules, a good rule of thumb, dictates daily oil, water, battery, fan belt, tire and general soundness checks and/or such checks each five hours of operation. At a minimum, always conduct such checks at refueling.

AUTO/LIGHT TRUCKS

<u>Maintenance Point</u>	<u>Maintenance Interval Milage (month)</u>
	Statute miles unless otherwise indicated
<u>-- AIR FILTER</u>	
Check .....	3,000 (3)
Replace .....	15,000
<u>-- VACUUM SYSTEM (fitting, hoses, connections)</u>	
Check .....	6,000 (6)
Replace .....	As required
<u>-- PCU VALVE (if equipped)</u>	
Check .....	12,000 (12)
Replace .....	As required
<u>-- BATTERY</u>	
Check fluid level .....	500 (daily)
Check specific gravity .....	6,000 (6)
Replace .....	As required

- BELTS

- Check ..... 500 (daily)
- Adjust Tension ..... As required
- Replace when cracked, checked, broken, stretched or every 45,000

- HOSES

- Check ..... 500 (daily)
- Replace as required or ..... 60,000

- ENGINE COOLANT (Level, corrosion, freeze protection if required)

- Check ..... 500 (daily)
- Change ..... As required

CLEAN INTERIOR AND EXTERIOR OF RADIATOR AS REQUIRED.

Make sure cooling fins are open and free of debris.

- ENGINE OIL

- Check ..... 500 (daily)
- Change ..... 3,000

- OIL FILTER

- Clean at oil change ..... 3,000
- Change ..... 6,000

- MANUAL TRANSMISSION/TRANSFER CASE

- Check fluid (oil) level ..... 6,000
- Change ..... 60,000

- AUTOMATIC TRANSMISSION

- Check oil level ..... 6,000
- Change oil ..... 30,000
- Check bands (if equipped) ..... 30,000 or as required

- REAR AXLE/DIFFERENTIAL

- Check oil level ..... 3,000
- Change ..... 60,000
- Adjust pinions ..... 60,000 or as required

- FRONT AXLE/DIFFERENTIAL

Check oil level .....	12,000 (with lock-out hub)
	3,000 (without lock-outhub)
Change oil .....	90,000 (with lock-out hubs)
	60,000 (without lock-out hubs)
Adjust pinions .....	As required

- BALL JOINTS/HUBS/TIE RODS/PITMANS/KNUCKLE JOINTS

Grease (if applicable) .....	6,000
Adjust (as required) .....	12,000
Replace all loose worn or broken parts	

Note: Make sure grease "zerks" are not blocked or corroded shut.

- CLUTCH PEDAL

Check play and adjustment .....	12,000
---------------------------------	--------

- SPRING SHACKLES/BUSHES/U BOLTS

Grease (if required) .....	6,000
Tighten as required or .....	12,000

Note: Check that center bolt is not broken.

- UNIVERSAL JOINTS

Grease (if required) .....	6,000
Replace as required or .....	90,000

- FUEL FILTER AND LINES

Check .....	3,000
Clean or replace filter .....	6 - 9,000 or as required

- VALVE LASH

Check and adjust after 1st 3,000 miles and each 30,000 miles thereafter.

-- BODY LUBRICATION

Lightly grease/oil/graphite mouldings,  
hinges, mounts frames, seals, window and  
latch mechanisms, etc ..... 15,000 (12)  
Tighten all body screws and attachments as required.

-- WHEELS AND TIRES

Check pressure, lugs condition ..... 500 (daily)  
Replace tire when average tread depth is 1/16  
inch or less and/or tire is deformed.  
Use recommended size.

-- BRAKE AND CLUTCH FLUID

Check level (all master and slave reservoirs)... 3,000 (3)

-- BRAKES

Check shoes, cylinders, pads, linings, springs,  
calipers, discs, drums, lines and couplings .... 15,000  
Adjust, replace, repair as required.

Note: Replace brake pads/linings when worn to within 1/8 inch  
of rivet head on riveted linings or 3/16 inch to shoe  
on bonded linings or no less than 3/16 inch thickness on  
disc brake pads.

-- POWER STEERING

Check fluid level ..... 3,000  
Check belt ..... 3,000

-- STEERING GEAR

Check oil level ..... 15,000  
Adjust as necessary.

-- WHEEL BEARINGS

Grease ..... 30,000

(wheel bearings cont. next page)

Adjust (remove slack, but must rotate freely) ... 30,000 or as required  
 Replace (both bearing and race at first sign of wear  
 such as "singing" or excessive heat)

- SEAT BELTS

Check and service as required ..... 12,000 (6)

- ELECTRICAL SYSTEM

Check headlites, brake lites, running lites,  
 cables fuses, etc. .... 3,000 (3)  
 Repair or replace parts as required

TRACTORS

<u>Maintenance Point</u>	<u>Maintenance Interval in Hours</u>
<u>ENGINE OIL</u>	
Check level .....	5 (daily)
Change .....	100
Change oil filter .....	100
Note: Due to high sulfur content of diesel fuel available in Bas Zaire, 100 hours between changes should not be exceeded.	
<u>RADIATOR</u>	
Check Coolant Level .....	5 (daily)
Change Coolant .....	2,000 (or as required)
Clean Fins .....	150 (or as required)
Clean screen (if equipped) .....	5 (daily)
<u>FUEL FILTER</u>	
Change .....	400 (or as required)
<u>BATTERY</u>	
Check level .....	20
Check specific gravity .....	400

<u>BATTERY</u>	
Check Level .....	20
Check Specific Gravity .....	400
<u>AIR CLEANER</u>	
Clean Pre-Cleaner Bowl .....	5 (daily)
Clean ELEMENTS/s .....	5 (daily)
Change ELEMENT/s .....	400
<u>TRANSMISSION/REAR AXLE</u>	
Check oil level .....	100
Change oil .....	1,000
<u>DIFFERENTIAL</u> -- Front wheel drive	
Check oil level .....	100
Change oil .....	2,000 or more frequently if generally engaged
<u>FRONT WHEEL BEARINGS/HUBS</u>	
Clean, adjust and lube .....	500
<u>BELTS</u>	
Check .....	100
Adjust and/or replace as required	
<u>FUEL INJECTORS</u>	
Change .....	500
<u>POWER STEERING</u>	
Check oil level .....	200
<u>BRAKES AND PEDALS</u>	
Check and Adjust .....	200
Lube pedal pivots .....	100
<u>HYDRAULIC OIL FILTER</u>	
Change .....	200

- VALVE SLAP (TAPPET CLEARANCE)

Check and Adjust ..... 500

- FRONT AXLE HUBS -- Front wheel drive

Check ..... 100

Change as required or ..... 1,000

- TIE RODS, SPINDLES, PIVOTS, KNUCKLE JOINTS

Check and adjust ..... 500

Lube (where required) ..... 100

FARM IMPLEMENTS

- Light daily greasing where required (do not push grease out of journals and make sure zerks are open).

- Daily inspection and tighten, adjust and regulate as required.

- Replace broken and worn parts immediately --- specific attention should be given to hitch attachments and pins.

Repairs should be made in accordance with shop manual instructions and/or appropriate professional procedures. To the extent possible, standard and/or approved replacement parts should be used. Repairs should not be put off --- fix the problem when it first appears. Repairs should be made in a clean and neat working atmosphere. This latter point would be one of the easiest and most important changes that could be made at M'Vuazi.

Work order sheets, while not mandatory, should be considered. It is a good method of not only keeping a maintenance and repair record, but provides a crosscheck on parts inventory as well. A sample work order sheet is provided herein. Note that it is not complicated with data such as hours worked, cost of parts and other information normally found on garage work order sheets,

PRONAM

GARAGE ATELIER

Fiche Entretien et Réparation Véhicule

Date d'Entrée au Garage : \_\_\_\_\_

Véhicule : \_\_\_\_\_

Marque

Identification

Modèle

M/Km au compteur : \_\_\_\_\_

Travaux à effectuer :

Pièces de rechange et produits :

Sortie du Garage : \_\_\_\_\_

Vu et contrôlé

Signature



The current practice of placing milage or date service reminders on dashboards is a good one and should be continued. This system might well be augmented with the use of a large wall mounted blackboard or planning chart. Also, some operator manuals contain large fold out service charts which should be posted --- they could serve as general guides for other equipment as well.

V. OPERATIONS

All operators of vehicles and tractors at M'Vuazi, including scientists and officials, need some training in the use of their equipment. For example, with the exception of the PPS, the contractor could not find one operator who understood the reason for, or correct use of, the lock-out hubs on the four wheel drive vehicles they were operating. In general, prudent operating practices are not in evidence. Speeding and reckless handling of vehicles and tractors is prevalent.

Tractor productivity is extremely low and unjustifiable. Plowing, harrowing and mowing practices are generally incorrect, with the machinery "out of the ground" more time than it is in the ground. It is not uncommon to observe a tractor at M'Vuazi raise its implement and drive 3/4 of the way around the edge of the field to pick up where it left off. Often tractors are "backed-up" the entire row just completed in order to begin a new row. Almost without exception, implements are raised at each corner, and the tractor "backed-up" to complete the turn.

Upon taking sample time checks, the contractor estimates that the tractors are productive for only one out of every four minutes of operation. The excessive amount of hours recorded on the hour meters of five relatively new tractors, covering such relatively small acreage, verifies this inefficient productivity.

This situation cannot be corrected by providing two-three hours per day training to half a dozen or so inexperienced tractor operators over a three month period. Training needs at M'Vuazi are a long-term continuous proposition requiring years.

Nonetheless, certain steps can be taken to improve the situation in the short term. First, and most importantly, training and orientation must be conducted in an atmosphere of mutual respect and not by the current practice of coercion, threat and intimidation. The trainer/instructor must be an experienced and knowledgeable expert in modern agricultural operations

--- such as a "practicing" farm manager. Operators must understand that they have the primary responsibility for the condition of their vehicles and equipment. Furthermore, they need to understand that it is their responsibility to operate the vehicles/machines in accordance with operator manual instructions and within safe and legal limits.

Second, the number of different drivers/operators per vehicle must be brought under control. In fleet operation, the more operators per vehicle, the more costs go up and the more efficiency goes down. Studies have shown that the life of a fleet vehicle is shortened one third with the addition of a second driver. Costs can become devastating with three or more operators per vehicle --- no one takes personal pride and satisfaction in the operation of the vehicle and there is a tendency to blame all abuses on the other drivers under such circumstances. The contractor recognizes program constraints in the assignment and use of the vehicles, but, present practices are outrageous. A more orderly system of dispatch needs to be developed. A starting point would be the full time assignment of one vehicle per scientist and reserving two or more vehicles for run-about and unscheduled errands (this is in addition to the two poor condition LAND ROVERS currently being used on the premises for such purposes).

Third, PRONAM should use simple vehicle logs or a combination log/squawk sheet. Since vehicles are generally fueled at M'Vuazi and fueling records are kept at the garage, these logs would not necessarily need to show fuel or trip mileage. The example shown herein is suggested because it shows dates and mileage readings at the point driver notices a mechanical problem and it can be reviewed by the mechanic at each refueling and/or servicing.

Fourth, registration and insurance cards should be in road vehicles, at all times. <sup>Many</sup> PRONAM vehicles are not carrying such papers and some vehicles, such as motorcycles, are not registered.

Fifth, seat belts (and roll bars when appropriate) should be installed and or repaired. Helmets should be worn by motorcycle operators at all times cycle is in motion.



VI. REPLACEMENT PARTS/ADDITIONAL EQUIPMENT

Annex II lists spare parts by make, model and description, and when available, by parts number. These spares are in addition to those already on hand and should be ordered immediately. If parts numbers are not available, send full description of part along with year, make, model and serial/vehicle ident/number, as shown on spec sheet, identification plate or line setting ticket. Send photographs and dimensions if necessary.

Parts should be ordered through reliable purchasing/forwarding agents or factory direct. Shipping should be by air freight and should take no longer than ten days from the agents receipt of order (covered by line of credit) to point of entry (ZAIRE) delivery. If a forwarding agent is consistently failing to make prompt deliveries, a new agent/s should be found. Likewise, PRONAM/USAID/IITA must expedite their processing procedures. There is little excuse for the current situation whereby months pass between the field request for parts and order processing. Modern agriculture is dependent on fast, reliable service -- in some instances, entire crops can be lost in a few hours due to downtime of major equipment. Present PRONAM/USAID ordering procedures should no longer be tolerated.

The PRONAM chief mechanic/counterpart has an accurate and up to date list of the replacement parts currently on hand. The contractor verified and signed the parts inventory ledger which can be found in the present stock room located in the basement of the main administration building. Currently, a shelf card system is used to keep running accounts of inventory. The contractor designed and explained the use of a simpler system -- see Section VIII Inventory. Once parts are moved to the new stockroom at the garage, they should be arranged by make, each make arranged by category (such as electrical, brakes, chasis) and categories arranged in the same shelf sequence for all makes with heavier items on bottom shelves or

floor. Only one person such as the partsman or his designee should have access to the stockroom. Exceptions to this rule should be minimal (special consideration should be given to the PPS and chief mechanic) and only when accompanied by the partsman.

In addition to the parts listed in Annex II it is imperative that the following items be acquired immediately for the FORD 5600/5610 Tractors (equipped with Category II hitches).

- 4 sets tie rod ends, steering arm knuckles, pitmans and links
- 2 complete upper links (Category II)
- 8 upper link draft position pins (Category II)
- 8 sensitivity pivot pins (Category II)
- 24 Linch pins (snap keys)
- 4 Category II to Category I hitch conversion kits including bushings, balls, check chains and upper link equipment ends.
- 2 sets Category II upper link equipment ends
- 2 sets flexible lower link ends (Category II)
- 2 sets lower links (Category II)
- 4 complete brake repair kits (L & R) including bands and drums.

Note: New Category II hitch pins (attach points) for all implements should be ordered.

The contractor recommends the purchase of the following agricultural equipment and implements:

- One 12 ft - 14 ft LANDPLANE (land leveler) hydraulically controled with a minimum of three leveling bars (tools).  
This leveler can be used with the SHIBAURA SE8340 tractor and could be used to drag roads as well. If hydraulics were installed on the FIAT 80C crawler, it too would be a good tractor<sup>for</sup> pulling the leveler.
- Two 10 ft - 12 ft shank and shovel tool bars (high, wide clearance type for trash conditions) equipped with "duckfoot" type shovels.

Also four extra sets of shovels, six extra shanks and a good supply of shovel and shank bolts for the above.

- One heavy duty frontend loader with two-way hydraulic lift rams and two-way hydraulic cylinders on bucket for FORD 3600 tractor.
- One (two optional) 3 - 4 bottom two-way (hydraulically reversable) plow -- mold board or disc type if available. These plows are generally of the pull type, but, a three-point hitch type (if available) would also be acceptable.
- One portable bush/limb shredder (PTO or with engine) for shredding manioc stalks. 5 TON per hour capacity or larger.

The following equipment would be optional:

- Complete hydraulics including pump, lines, two way valves (for two-four cylinders) and couplings for the FIAT 80 C crawler tractor. This tractor, which is in near new condition is essentially rendered useless in conjunction with equipment on hand.
- Dozer (adjustable straight/angle type) and hydraulics for above tractor.
- Tractor mounted (PTO pump) sprayer 50 gal - 100 gal capacity.
- Tractor mounted (PTO drive) fertilizer spreader 500 lbs capacity.

PRONAM/USAID/IITA need to pay particular attention to ordering only well constructed heavy duty machinery. Some makes of equipment on hand, such as the IMCO products are too light weight and of inferior quality. On the other hand, the BLANTON and RHINO (ATHENS) equipment is sturdy and exceptionally well made. Purchasing agents should be aware of quality and forward only heavy guage constructed implements with a reputation of reliability and endurance.

## VII. MANUALS -- SHOP, OPERATOR, PARTS and SPECS

All commercial road vehicles as well as private automobiles are delivered with specification information, commonly referred to as line-setting tickets, spec sheets, option lists or similar nomenclature used by the manufacturer. One copy is always attached to the vehicle, generally on the visor or on the inside of the glove compartment door. Often, a second copy is provided with vehicle delivery papers and it should be filed with administrative records. In the case of project equipment, it is suggested that a photocopy be kept on file at USAID or where purchase orders are prepared.

All vehicles, tractors and farm implements have a serial number, sometimes referred to as a chassis number or vehicle identification number (VIN). In fact, most new equipment with a value of \$100 or more has a serial number. Vehicles and equipment with motors generally have separate serial numbers for the motors -- in some instances, the chassis number and motor number are the same. These numbers, along with the model and part information on the spec sheet (line-setting ticket) should always be provided when ordering replacement parts.

All vehicles, tractors and farm implements are delivered with operator manuals. In some cases, such as basic farm implements, the operator, shop, parts and specs are combined in one manual or pamphlet.

In addition to the operator manuals and spec sheets, all vehicles and equipment delivered overseas should be accompanied with shop manuals and parts books (catalogs). These are generally two separate items and should always be included on the original purchase order. Any purchasing/forwarding agent that fails to include these manuals with shipments should be held accountable.

Note: Parts catalogs are usually divided into three or more sections such as reference, grouping and parts number. The reference section includes an exploded view with each piece numbered starting with one (1). The exploded view number can be used to find the grouping number (usually found under the exploded view) and the grouping

number can be used to find the parts number in a separate section (or catalog). Only the parts number itself can be used for ordering. Some of the requested parts at M'Vuazi listed the grouping number which is insufficient for ordering purposes.

All manuals and catalogs should be kept neatly and orderly at the shop. Currently, the books now on hand are scattered, torn and in many instances disassembled with important sections missing.

The following chart indicates the manuals on hand with a check (✓) mark. All others should be ordered immediately. Addresses are shown when available. FORD Tractor manuals can be ordered through the following source:

FORD TRACTOR SERVICE PUBLICATIONS

ORDER FORM SE 3480 - J - 38125

and

FORD TRACTOR PARTS CATALOG AVAILABILITY

ORDER FORM FTO 8801 - Q 1/81

HELM, Inc.

PUBLICATIONS DIV.

P.O. BOX 07150

DETROIT, MICHIGAN, 48207

OPERATOR/SHOP/PARTS CATALOG MANUALS

Page 38 of 74  
660-0077-S-00-3016

<u>VEHICLE/EQUIPMENT</u>	<u>OPERATOR</u>	<u>SHOP</u>	<u>PARTS</u>	<u>COMMENTS</u>
BLANTON Subsoiler - Redder 8000 Box 266 Rome, Georgia 30161 Phone 404/232/6585				
IMCO Foldover Disc Harrow P.O. 300, Neodesha, KAN 66757 316-325-3061	✓	✓	✓	All combined folder
RHINO Mounted Disc Plow 300 Athens Plow Division Austin Products, Inc. Box 609, Athens, TX 37303 615-745-3561 TWX (810) 584 - 3240	✓	✓	✓	All combined in one folder
IHI SHIBAURA Tractor Ishikawa-Shibaaura Machinery Co., Ltd. Seiwa Bldg - Nishishinjuku 1-6-8 Shinjuku-Ku, Tokyo, Japan Tel 343-3151 Telex 232-2128 Cable IHISHIBURHA TOKYO	✓	✓	✓	

<u>VEHICLE/EQUIPMENT</u>	<u>OPERATOR</u>	<u>SHOP</u>	<u>PARTS</u>	<u>COMMENTS</u>
FIAT 80C Crawler Tractor FIAT - Vendita Trattori Corso Marconi 20 10125 TORINO, Italy	✓		✓	12 V Electrical system manual Wall maintenance chart
FORD TRACTOR 5600 FORD TRACTOR Operations FORD MOTOR Company Troy, MICH. 48084	✓			Hydraulic load monitor TIPS Operator Supplement
LEYLAND AUSTIN 3-11 Ton Trucks British Leyland International ltd. Berkeley Sq. House Berkeley Square, LONDON W1 Tel 01-499-6050 Telex 22498				
BOMFORD CULTIVATOR Stockist: Agri-Projects International, ltd. P.O. Box 191 St. Julians Court, St. Julians Ave St. Peter Port, Guernsey, C.I. Tel (0481) 2632214 Telex 4191115 API GY G OF BOMFORD & EVERSHEED ltd. Salford Priors, Evesham, Worcs. WR 11 5SW Tel Bidford-On-Avon (0789-88) 3383 Telex 311081				

<u>VEHICLE/EQUIPMENT</u>	<u>OPERATOR</u>	<u>SHOP</u>	<u>PARTS</u>	<u>COMMENTS</u>
IMCO 601/602 LIFT and DRAG CUTTER "Bushhog"	✓	✓	✓	Slip clutch/combined pamplet
ATHENS 55 MOUNTED DISC HARROW Athen Tillage Tools Box 609 Athens, Tenn 37303	✓	✓	✓	Combined
FIAT TRACTOR 750	✓	✓		Shop manual in German and includes specs
FORD TRACTOR 5610	✓			
FORD TRACTOR 3600	✓			
DALTON COOPER and GATES P 8000-1 FARM WAGON Knowles Mfg. Co. Inc. Glenbeula, WIS. 53023	✓	✓	✓	Combined package
RANSOMES HR 36-106/120 Mounted Disc Harrow Ransomes Sims & Jefferies, ltd. Ipswich, England			✓	
RANSOMES HR 44 DISC HARROW Address same as above	✓		✓	Combined
CAT D318 DIESEL ELECTRIC SET (Form 32341) Serial Nos. 3K5901 & Up for serial No. .3V6078			✓	

<u>VEHICLE/EQUIPMENT</u>	<u>OPERATOR</u>	<u>SHOP</u>	<u>PARTS</u>	<u>COMMENTS</u>
CHEVROLET Model CKT 240-36E14 (Zaire Assembled) 3/4 Ton 4x4 Pickup (36 cyl. gasoline) General Motors Kinshasa or MICH. address below				Parts Catalog incomplete
CHEVROLET Model CK 2093 3/4 Ton 4x4 Pickup (V8 Diesel) Series 20 Warehousing & Distribution Div. of General Motors FLINT. MICHIGAN 48554				Parts catalog incomplete
LAND ROVER SERIES III 109 Leyland Motors Kinshasa or Address shown for Leyland Truck Listed above				
INTERNATIONAL S 1800 1854 4x4				
CATERPILLAR ELECTRIC PLANT Spec Plate Missing				
BRUSH (LISTER DIESEL) ELECTRIC PLANT Plant 2853 ST327UNA 10.5 KVA				

VIII. INVENTORY

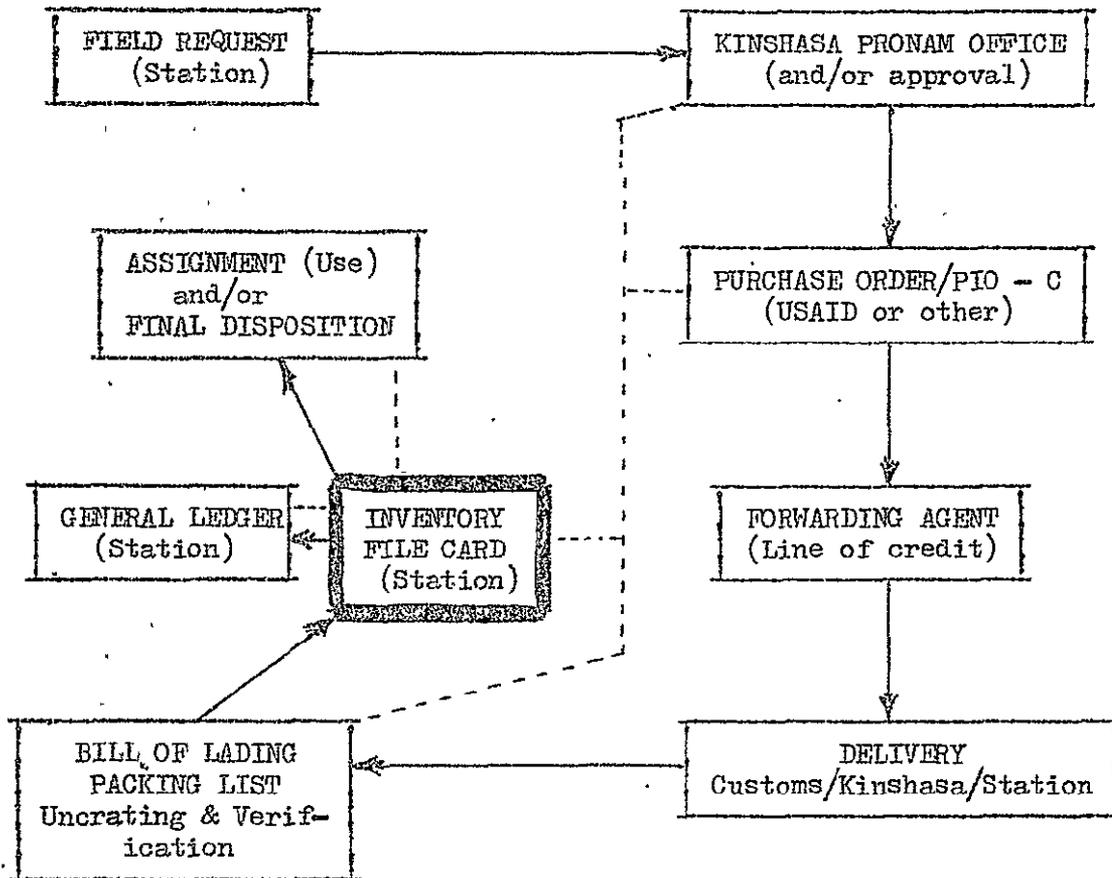
Under terms of the contract, a new inventory system was developed, including the design of file cards and other record keeping aids. Although presented to project officials for approval in December, the cards were not ordered until February and were not delivered until the close of business Friday, March 2nd --- several days after services had been completed at M'Vuazi.

In developing the new inventory system, several logistical problems, unique to PRONAM had to be considered.

- 1) Several different interested parties (e.g. USAID, IITA) require inventory data and not necessarily of the same nature.
- 2) PRONAM takes "possession" of most capital goods at its administrative office in Kinshasa, but cases are not opened and verified until they are delivered to M'Vuazi or other project sites. (The current verification process consists of listing what is in the case but does not cross check against bill of lading or packing list. In fact, bills of lading/packing lists are generally discarded. The new system corrects this mal-practice and coordinates with the central office.)
- 3) A simple and easily understood inventory system is required because in many cases untrained staff will be involved.
- 4) The inventory system must easily, accurately, and on an up to date basis, be able to show location and/or movement of all goods, whether they be capital or consumptive.
- 5) The inventory system must designate individual responsibility/accountability for assigned capital goods and account for the use of consumptive goods.

The PRONAM inventory process (flow) is as follows:

(See next page)



To meet the special requirements listed above while at the same time incorporating normal inventory procedures, the system divides all goods into two categories; capital (amortized goods) and consumptive (expendable goods). Examples of the former include vehicles, lab and farm equipment, tools, household furnishings, and office equipment such as typewriters and calculators. Examples of the latter include fuel, oil, fertilizer, replacement parts and office supplies such as stationery.

There is a file card for each category -- "FICHE INVENTAIRE" for capital goods and "FICHE MAGASIN" for consumptive goods. In rare instances, it might be a 'judgement call' as to whether an item is classified capital or consumptive, particularly on those of low value. A flashlight for

example would generally be classified capital, while the batteries would be consumptive. Generally speaking, goods that can be used over and over and/or transferred should be placed in the capital category.

The inventory file card is the heart of the inventory system --- it is the key to all inventory information including current disposition. It also directs the user to pertinent recall data anywhere along the inventory flow process.

Although the cards are relatively self-explanatory (see examples), a few words on their use should be helpful:

- 1) Cards should be initially filled out when item arrives at station (unpacked) and verified --- in other words, at point goods are initially inventoried. Do not erase errors- draw single line through print or script.
- 2) Cards should be chronologically numbered and kept in chronological order by these numbers.
- 3) Each capital good should have its own card such as a tractor or piece of equipment and each group or type of consumptive good should have a card such as a specific replacement part, say Model XYZ Spark Plugs.
- 4) The item and its card number should be registered in a general ledger organized by category or type such as tractors, appliances (or further breakdown to type of appliance, say "refrigerators"), fuel, etc. Consumptive goods and capital goods should be separated, preferably in two different ledgers.
- 5) As the item is inventoried (verified) the card number should be placed next to the item on the packing list/bill of lading. The packing list showing the card numbers should be sent to Kinshasa to be reconciled with purchase order and filed with administrative records. The Kinshasa office and/or forwarding agent should be

notified immediately of any discrepancies (including damage) between order, packing list and goods received.

- 6) Line item information not available or not applicable should be marked NA. KINSHASA office should forward to the station corresponding purchase order (PIO-C) information for inclusion on inventory card.
- 7) There must be only one transaction per line entry.
- 8) A capital good/s such as a seven piece dining room set should have only one card. It is suggested that each piece in such a case, be marked inconspicuously with card number such as 0003-1 of 7, 003-2 of 7 and so forth. Where practical, inventory numbers should be placed on other items as well.
- 9) The column marked value (valeur) is to be used when the funding agency or others require values under periodic depreciation schedules. In the case of a USAID funded capital good, the value is purchase cost plus shipping costs and remains the same throughout its project use. The value is removed from inventory at disposal/salvage point.
- 10) Cards covering items removed from inventory should be retained in an "inactive file."
- 11) A space entitled "Observations/Disposition Finale" found on the rear of the cards can be used to describe disposal procedures, damage history and/or other information deemed important (eg. tire size, attached accessories).
- 12) If an assignee has signed any document (including inventory card) for the receipt of a capital good, he must be presented with a duly executed release at the time the item is re-assigned or at the time employee terminates his service. (See sample release statement.)

- 13) When replacement parts or other consumptive goods leave the stock room, they should be noted on a clip board hanging by the door. Periodically, say once every two weeks, these notations can be transferred/reconciled with the inventory cards. This system is simpler and in the long run more accurate than the use of stockroom shelf cards. The chief mechanic suggested that shelves and/or parts be marked with the inventory card number to facilitate identification. The contractor concurs with this suggestion. The clip board sheet should require the following information:

<u>DATE</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>INVENTORY NUMBER</u>	<u>DESTINATION</u>
15/3/84	X4Z Plug	1482EX	00114	IT2108
<hr/>				
<hr/>				

Note: At PRONAM's request, cards were printed in French.

It is suggested that inventory at M'Vuazi be placed into and distributed from two divisions, each division having its own warehouseman or partsman. The divisions are:

- 1) LAB, OFFICE and HOUSEHOLD
- 2) VEHICLE, FARM and PHYSICAL PLANT

NOTE: The current system is along these lines but divisions and responsibilities must be more precisely defined. File cabinets for the inventory cards have been delivered to M'Vuazi.

The Kinshasa PRONAM office has neat and orderly files including lists of capital inventory and its initial disposition. Unfortunately, the flow of up to date inventory information between the station and Kinshasa is poor. It is expected that the new inventory system described above will rectify the situation.

Example of a release statement: (See household furnishings form on page 57)

RELEASE

I hereby acknowledge that the items listed below have been removed from the inventory assigned to Mr/Ms \_\_\_\_\_ and he/she has no further obligations or responsibilities for same.

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Signature:

Note: A form such as this should not be used if the assignee is held responsible for abnormal damage or other liabilities.

# PRONAM

FICHE N° 80-0427

## FICHE INVENTAIRE

DESCRIPTION : 3/4 ton 4XH CHEVROUET CKT 240-3614 1980  
ARTICLE MARQUE MODELE ANNEE

IDENTIFICATION : CKT 240-3614-10 IT 1249  
NUMERO DE SERIE / CHASSIS NUMERO D'IMMATRICULATION

FONDS (PIO/C) : N A

FACTURE (INVOICE / PACKING LIST / BILL OF LADING) : KIN M. ROUS ELL 10/NOV/80  
NUMERO DATE

REÇU EN INVENTAIRE : 14/NOV/80 - 11-221 NEW \$ 9,800  
DATE ETAT VALEUR

### MOUVEMENT / AFFECTATION

I. N. 47420

DATE	ORIGINE	DESTINATION	REÇU PAR	SIGNATURE	VALEUR	OBSERVATIONS
27/NOV/80	GABAGE	SAM SMITH	SMITH	<i>lcl</i>		

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# PRONAM

## FICHE INVENTAIRE

FICHE N° 83-0015

DESCRIPTION : 7 pc DINNING ROOM SET COLONIAL AMERICAN 1982  
ARTICLE MARQUE MODELE ANNEE

IDENTIFICATION : NA NA  
NUMERO DE SERIE / CHASSIS NUMERO D'IMMATICULATION

FONDS (PIO/C) : USALD

FACTURE (INVOICE / PACKING LIST / BILL OF LADING) : ASAM 6648 14/MAR/82  
NUMERO DATE

REÇU EN INVENTAIRE : 10/JAN/83 - NAZI NEW NA  
DATE ETAT VALEUR

### MOUVEMENT / AFFECTATION

I. N. 47420

DATE	ORIGINE	DESTINATION	REÇU PAR	SIGNATURE	VALEUR	OBSERVATIONS
16/JAN/83	INVENTORY MAGASIN	DICK BUTLER	BUTLER	B. Butler		

⊗ 1 table, six chairs

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# PRONAM

FICHE N° 83-1802

## FICHE INVENTAIRE

DESCRIPTION : FARM TRACTOR FORD 5510 1983  
ARTICLE MARQUE MODELE ANNEE

IDENTIFICATION : \* 14482C \* NA  
NUMERO DE SERIE / CHASSIS NUMERO D'IMMATRICULATION

FONDS (PIO/C) : USAID

FACTURE (INVOICE / PACKING LIST / BILL OF LADING) : NA  
NUMERO DATE

REQU EN INVENTAIRE : 14/OCT/83 NE NA  
DATE ETAT VALEUR

### MOUVEMENT / AFFECTATION

I. N. 4728

DATE	ORIGINE	DESTINATION	REQU PAR	SIGNATURE	VALEUR	OBSERVATIONS
15/OCT/83	GARAGE	SAME	VELOSO	Velso		
20/MAR/84	GARAGE	GANDAJIKA		W		(P)

(P) COPY of this card sent with tractor to Gandajika.

# PRONAM

## FICHE INVENTAIRE

FICHE N° 79-0003

DESCRIPTION : REFRIGERATOR <sup>⊗</sup> Westinghouse 149B 1979  
ARTICLE MARQUE MODELE ANNEE

IDENTIFICATION : 149B1672HR3 NA  
NUMERO DE SERIE / CHASSIS NUMERO D'IMMATRICULATION

FONDS (PIO/C) : NA

FACTURE (INVOICE / PACKING LIST / BILL OF LADING) : AFRICA EXPORTERS B-4440 12/DEC/79  
NUMERO DATE

REÇU EN INVENTAIRE : 26/FEV/79 - M. MAZI NEW NA  
DATE ETAT VALEUR

### MOUVEMENT / AFFECTATION

I. N. 47420

DATE	ORIGINE	DESTINATION	REÇU PAR	SIGNATURE	VALEUR	OBSERVATIONS
12/MAR/79	INVENTORY <del>MAG-STE</del>	SAVA SMITH	SMITH	<i>Sam</i>		
15/AUG/81	SMITH	JOHN JONES	JONES	<i>J. Jones</i>		
17/SEPT/83	JONES	STOCKP. D.M.	VELOSO	<i>VEL</i>		

⊗ 110V - use with transformer

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INVENTAIRE DE MAISON

Quantite      Designation/No. Fiche Inventaire      Observation

SALON:

SALLE A MANGER:

CHAMBRE A COUCHER:

#1

#2

#3

#4

CUISINE:

SALLE DE BAIN:

AUTRES:

(It is suggested that the stockman/magasisier use a form such as this to help keep track of household assignments)

IX. STATEMENT OF WORK

Seventy-nine full work days were completed and approved during the allotted time specified by the contract -- November 14, 1983 - March 1st, 1984.

In quantitative terms and in full compliance with the approved work plan, work accomplished during this period included:

- 1) The reorganization, floor space planning and equipment installation of a 15,000 square foot farm shop complex including nearly 3,000 square feet under roof.
  - Designed, constructed and installed 130 sq. feet metal security doors and framing.
  - Designed, constructed and installed 168 sq. feet extra heavy duty work bench.
  - Designed, constructed and installed 135 sq. feet of extra heavy duty shelving and cabinets (under and over work bench).
  - Designed, constructed and installed extra heavy duty 30sq. foot carpenter's bench/table with cabinets and vise.
  - Designed, constructed and installed extra heavy duty 18 sq. foot welder's bench/table with cabinet and vice.
  - Installed power tools and specialized equipment including the design and construction of mounts and supports for industrial grinder, industrial drill press, vice, 25 ton hydraulic press, etc.
  - Designed and supervised the construction of 160 sq. feet of reinforced concrete and cement block security walls and concrete floor repair.
  - Designed and supervised construction and installation of 42 sq. feet of wood security doors and framing.
  - Designed and supervised construction and installation of approx-

imately 120 sq. feet metal re-bar and wire mesh security windows/walls and designed 88 sq. foot security wall of similar construction.

- Supervised the re-location of the carpentry shop and industrial saw/planner/jointer.
- Developed material lists for all of the above.

2) The training of tractor drivers and shop technicians.

- Provided approximately 150 man-hours of training in the use, operation, adjustment and basic field maintenance of tractors and farm equipment involving such farming practices/techniques as plowing, harrowing and mowing.
- Provided training throughout the contract period to shop technicians in the use and care of tools and shop equipment.
- Provided diagnostic and repair services.

3) Developed a new and complete inventory system for PRONAM.

- Designed inventory file cards and other inventory forms and aids.
- Explanation and basic training for the inventory system to appropriate Project technicians.
- Development of stocking and ordering procedures including warehousing.

4) Development of maintenance schedules and aids for project vehicles, tractors and farm machinery.

5) Development and demonstration of farm safety procedures.

6) Prepared complete inventory list of vehicles, tractors, tools, farm implements, lab equipment and other project machinery at

M'Vuazi. Also listed items which program records indicate are located at Kinshasa, Kiyaka and Gandajika.

- 7) Verified spare parts inventory.
- 8) Recommended and prepared lists for replacement parts and additional equipment required to keep project mechanically efficient.

Note: At the request of the PRONAM Director the full 79 work days were spent in providing direct assistance to the project.  
This report was prepared after the 79 work days were completed.

ANNEX A - INVENTORYI. M'VUAZIA) VEHICLES

<u>Quantity</u>	<u>Description</u>	<u>Serial Number</u>
- 4 (Year ?)	KAWASAKI 100 EL motorcycles (All four inoperatable)	G7 547936 G7 548210 G7 548146 G7 548114
- 1 (1974 ?)	LANDROVER Series III Pickup (poor)	92007429C
- 1 (1974 ?)	LANDROVER Series III Station Wagon (poor)	93464197C
- 1 (1981)	INTERNATIONAL S1800 Md. 1854 4x4	IHTAR18E1BHB38771
- 1 (1976 ?)	LEYLAND 1160 WF 7 ton	CH513740/CV885
- 2 (1981)	JEEP (ISUZU Diesel motor)	IJEFM88HSCT018531 IJEFM88HOOPT018552
- 2 (1982)	CHEVROLET Md. CK2093 4x4 (3/4 ton pickups, V8 diesel)	IGCEK24C5CS151511 IGCEK24C7C5150003
- 1 (year ?)	CHEVROLET BLAZER Md. CK10516 (4x4 equipped with WARN 4 ton elec. winch)	CKO187F140438
- 6 (1980)	CHEVROLET Md. CKT240-36FH (3/4 ton 4x4 pickups assem. Zaire and serial number (VIN) is extension of model number, eg. CKT240-10)	-10 -11 -12 -13 -14 -15
- 2 (1983)	YAMAHA 125 DT Motorcycles	18G-00687 18G-002035
- 1 (Year ?)	HONDA 125S XL motorcycle (inoper- atable)	L125S-5222084

B) TRACTORS

- 2 (1982)	FORD 5600	*L619302* *619310*
- 1 (1983)	FORD 5610	*L654312*
- 1 (1982)	FORD 3600	*C497140*
- 1 (1974)	FIAT 750/1	840004
- 1 (1974)	FIAT 80C	*3394/74*
- 1 (1983)	SHIBAUURU SE 8340	10700

C) FARM IMPLEMENTS/MACHINERY

<u>Quantity</u>	<u>Description</u>	<u>Serial Number</u>
- 8	ATHENS (AUSTIN) Md. 300 Disc Plow 3 bottom (6 are unassembled)	071055 (All others N.A.)
- 4	BLANFON 8' Md. 8002 RIDGER	149 (others N.A.)
- 4	IMCO Rotary Mower (Brush Hog) (2 unassembled, one junked)	(All N.A.)
- 1	RANSOME (England) Disc 8' Harrow	A5454
- 1	RANSOME 8' Ridger	N.A.
- 1	RANSOME 10' Disc Harrow	N.A.
- 2	RHINO (Athens) 8' Md. 55 Disc Harrow	063001 063002
- 1	DAITHO (Japan) 4 bottom Disc Plow (Md. DDP234F)	19203659
- 1	STAR (Japan) 6' Md. X7 HDH24 Disc harrow	2052142
- 3	IMCO 6' Disc Harrows	(All N.A.)
- 1	(Make unknown) 6' Disc harrow	N.A.
- 2	Heavy duty 2 wheel trailers with tanks (approx. 1,000 l capacity each)	N.A.
- 1	Two wheel trailer $\frac{1}{2}$ ton	N.A.
- 1	Four wheel wagon (obsolete)	N.A.
- 2	KNOWLFS Md. P-8000-1 4 wheel wagon/trailer (one is unassembled, both need beds)	9972 9968

D) GENERAL EQUIPMENT

- 1	PRUSH (Lister 3 cyl. diesel) 10.5 KVA Electric Plant	2853 ST327UNA
- 1	CATERPILLAR Electric Plant (30 KVA ?) (Spec plate removed --- chief mechanic reports plate taken by company selected to install new electric line)	N.A.
- 1	380/220 15,000 V transformer Station	N.A.

<u>Quantity</u>	<u>Description</u>	<u>Serial Number</u>
- 1	MOTOROLA HF/SSB Radio/Trans.	212SGX0664
- 5	WATER PUMPS (Hand lift type - in storage)	N.A.

E) SHOP TOOLS AND EQUIPMENT

- 1	BALDOR 1HP Bench Grinder (Spec No. G10-164-2)	F981
- 1	DAKE Md. 25H 25 Ton Hydraulic Press	180228
- 1	SPRUNGER 1/2" Md. RD33 Radial Arm Drill Press	E-1525
- 1	BLUEBIRD Engine Stand	N.A.
- 1	MILLER Md. AEAD-200LE AC/DC Arc Welding Generator (constant current) 2 cyl. air cooled ONAN Motor and TRAILER	JB559841 H810/585259 JB508331
	Note: ONAN spec N° GGKA-MS/3848J	
- 1	WILTON 5" Md. 1750 Jaw Swivel Bench Vise	N.A.
- 1	RUGER 3 Ton Md. HP-3 Hydraulic Hoist/ Crane	81-24820-G
- 2	BLACKHAWK 10 Ton Md. 67410 (SJ-10) Hydraulic Floor Jack (ACI-4299 is in storage)	AC1-8001 ACI-4299
- 1	CHAMPION 200 lbs. Portable Air Compressor (Md. 80B... ?) with 5 HP BRIGGS & STRATTON gasoline motor (comp. Ser. No. BVO-004285)	004285
- 1	OK Jr. (Greenfield) 43 pc TAP & DIE Set (Chaser type)	N.A.
- 1	ARMSTRONG 21 pc Industrial Socket Wrench set (3/4" and 1" drive)	N.A.
- 1	HARRIS Prof. Acetylene Welding set complete with gauges, hoses, valves welding and cutting heads (in storage) No tanks.	N.A.
- 1	100 lbs. ANVIL (in storage)	N.A.
- 1	CHRISTIE 6/12 V Md. GM 40 amp. battery charger (in storage)	N.A.

<u>Quantity</u>	<u>Description</u>	<u>Serial Number</u>
- 2	SIX DRAWER TOOL CHESTS With locking top and drawer cover (in storage)	N.A.
- 2	Sump suckers (hand - in storage)	N.A.
- 2	50' trouble-light extension cord 12/3	N.A.
- 2	KEN TOOL Tire Tool Set (heavy duty truck - in storage)	N.A.
- 1	CHICAGO/MEAD portable 200 W drill/grinder A30255 (in storage)	
- 1	MILTON 12 V battery tester	N.A.
- 1	HEAVY DUTY TOW CABLE/HOOKS (approx 75' long)	N.A.
- 1	TOW/LOG CHAIN approx 20'	N.A.
- 1	TIRE CHANGER/BEAD BREAKER	N.A.
- 1	HONDA 2 HP Portable Water Pump	N.A.
- 1	SCHERR/TUMICO Precision Caliper set (inside and outside - in storage)	N.A.
- 1	BLACK and DECKER 4" Md. D12 Electric saw (in storage)	N.A.
- 1	BLACK and DECKER 3" Md. DI Electric Planner	N.A.
- 1	SET JUMPER Cables (in storage)	N.A.
- 1	GEAR LUBRICANT PRESSURE PUMP Md. B1316/E (Hand pump/tank type)	N.A.
- 1	5m x 7m truck Tarp (new - in storage)	N.A.
- 57 pc	ASSORTMENT HAND TOOLS & WRENCHES in two tool boxes (all poor condition)	N.A.
- 270 pc.	Misc. Assortment New Hand tools and wrenches (all in storage) including combo. wrenches, sockets, pipe wrenches, pliers, screwdrivers, industrial extractors, chisels, ring compressors, ring spreaders, grease guns, wheel and gear pullers, hacksaws, clutch alignment tools, bolt cutters, C clamps, pipe cutters, valve spring compressors, industrial reamers, flaring tools, grinder wheels, extension cords, hammers, battery testers and a 240/120 transformer.	N.A.

<u>Quantity</u>	<u>Description</u>	<u>Serial Number</u>
- 1	CPP (Power conversion products) Md. PD-12-12 12 V battery charger (in storage)	N.A.
F) <u>INSECT LAB</u>		
- 1	WILL-STURBIN STERO MICROSCOPE (without ocular lens)	761426
- 1	WILD MSA Md. N5A STERO MICROSCOPE (with one pair ocular lens)	165780
- 1	AMERICAN OPTICAL STERO STAR ZOOM Md. 569 Microscope	247075
- 1	BAUSCH and LOMB SPECTROPHOTOMETER Md. SPECTRONIC 710	0918270
- 1	RECORDING ON HYGRO THERMOGRAPH	1368
- 1	WEATHER MEASURE SERVICE CORP. RECORDING HYGRO THERMOGRAPH	2790
- 1	JRD MERRILL Thermocouple Pycrometer Md. 82-22 (with 6 thermocouple pycrometer)	0485
- 1	LAMOTTE Soil Test Kit	N.A.
- 1	DA-LITE <sup>P</sup> rojector Screen	N.A.
- 1	VOLPI Microscope Illuminator Md. Introlux with fiber optics	102834
- 1	TAYLOR SLING PSYCOMETER	N.A.
- 1	WARDS Insect cabinet (12 cornell drawers)	N.A.
- 2	NUTONE Md. 8220 Ceiling fans	N.A.
- 2	WHITE-WESTINGHOUSE Md. 155 Humidifiers	EEB113835 WFB113640
- 1	HERBARIUM Cabinet	N.A.
- 5	OHAUS 710-TO 600 gr. Tri-beam BALANCE	N.A.
- 8	waring Md. 8011G Electric Blenders	N.A.
- 1	BRETHWOOD SLIDE TABLE	N.A.
- 1	BÖGEN Md. 3047 TRI-POD	N.A.
- 4	NUTONE Heating Fans	N.A.
-	Misc. Timer clocks, thermostats, humidifiers	N.A.

G) PATHOLOGY LAB

<u>Quantity</u>	<u>Description</u>	<u>Serial Number</u>
- 1	PRECISION Shaking Incubator Cat. 6672	18AM/9
- 1	EAOI (Environmental Air Control, Inc.) CAB NG 8194	
- 1	METTLER Balance Md. PN 163	652470
- 1	LAB LINE Emperial II Radiant Oven (Cat. N° 3605 M)	0975
- 1	FISHER ISOTEMP Series 300 Oven (Cat. N° 11-245-33LD)	157
- 1	FISHER ISOTEMP Series 200 Oven (Cat. N° 11-603-231D)	543
- 1	PRECISION LAB Refrigerator Md. 812	N.A.

H) PLANT BREEDING LAB

- 3	FISHER ISO TEMP 300 Series Md. 2309 Oven	130 158 159
- 1	KJEDALL Nitrogen Determination Instrument (Cat. N° 21233-05)	62755

PRONAM records indicate equipment located at Kinshasa, Kiyaka, Gandajika includes the following:

II. KINSHASA

- 1 (1980)	CHEVROLET Md. CKT240-36EH	-07
- 1 (1983)	INTERNATIONAL S1800 Md. 1854 4x4 (in storage)	IHTAR18E6HA12538
- 1 (1979)	PEUGEOT 504 4 dr. SEDAN (diesel)	3328674
- 1	NASHUA 1220-S Photocopier	2070621727
- 1	MOTOROLA HF/SSB Radio/Trans.	212CFU0030
- 1	REALISTIC SSB/AM CB Radio Md. TRC-451	N.A.
- 1	GE PORTO MOBILE II Radio	N.A.

III. KIYAKA

- 1	1983 5610 FORD TRACTOR	*C689156*
- 1	1981 INTERNATIONAL S1800 Md. 1854 4x4	IHTAR18EX3HB3882

(Inventory continued Page 66a of 74)

<u>Quantity</u>	<u>Description</u>	<u>Serial Number</u>
- 1	YAMAHA 125 DT	186002032
- 1	MOTOROLA HF Radio/Trans.	N.A.

IV. GANDAJIKA

- 1 (1983)	FORD TRACTOR	C689157
- 1	RHINO 300 Disc Plow	N.A.
- 1	BLANTON 800L Bedder/Ridger	N.A.
- 1	BLANTON 7100 Harrow	N.A.
- 1	IMCO 6023 Rotary Mower	N.A.
- 1	MOTOROLA H/F Radio/Trans.	N.A.

All inventory should be placed on inventory cards -- Kin Office can provide dates received, PIO/C data and other info.

By mutual agreement with the PRONAM Director and in accordance with the approved work plan, office and household furnishings are not included in this inventory.

Note: It was reported that a 35mm SR camera system is located at M'Vuazi.

Other equipment in storage at M'Vuazi in addition to that listed above includes a MMA Little Windy cage vacuum, two welder's helmets, one NU-WAY BENSON (Petter) dryer (type AAI, ser. no. 93873) and misc. agricultural hand field tools such as machetes, sprayers, goggles and hoes.

ANNEX B

INTERNATIONAL TRUCK

S 1800 MODEL 1854 4x4 140" Wheelbare

<u>DESCRIPTION</u>	<u>QTY.</u>
- Starter, Motor .....	1
- Brush, Starter (Kit) .....	3
- Armature, Starter .....	2
- Brushing, Starter Drive Housing .....	8
- Drive Assembly Starter .....	4
- Master Cylinder, Brake (complete) .....	2
- Master Cylinder (Repair kit) .....	8
- Brake Wheel Cylinder .....	16
- Wheel Cylinder, Repair Kit .....	16
- Disc, Driven .....	4
- Sheck Absorber, Front (Extra Heavy Duty) .....	18
- Shack Absorber, Rear (Extra Heavy Duty) .....	18
- Shoe Brake, Front (Kit) .....	8
- Shoe Brake, Rear (Kit) .....	8
- Parking Brake Cable .....	3
- Parking Brake Shoe .....	6
- Parking Brake, Repair Kit .....	3
- Engine Overhaul, Repair and Gaskets including rod and main inserts (bearings) rods, pins, pistons, rings and sleeves (standard); valves and valve guides; cam bearings.	2
- One Fuel Infector Pump Complete .....	1
- One Fuel Infector Pump Repair Kit .....	1
- Main Spring Leaves - Rear .....	3
- Main Spring Leaves - Front .....	3
- Spring Shackles and Bushes, U Bolts, Front .....	2
- Spring Shackles and Bushes, U Bolts, Rear .....	2
- Spring Center Bolts, Front .....	4
- Spring Center Bolts - Rear .....	6
- Inner - Outer Wheel Bearings - Front .....	2
- Inner - Outer Wheel Bearings - Rear (Floating) .....	2
- Motor Mount Set .....	1

.../...

<u>DESCRIPTION</u>	<u>QTY.</u>
- Body Mounts Sets .....	3
- Clutch Disc .....	2
- Clutch Pressure Plate .....	1
- Clutch Throw-out Bearings .....	2
- One Transmission Complete .....	1
- One Transfer Case, Complete .....	1
- One Differential Rear/or Bull and Pinion Drive Set .....	1
- Rear Axle - Right .....	1
- Rear Axle - Left .....	1
- Front Axle - Right .....	1
- Front Axle - Left .....	1
- Universal Joints (Main Drive) .....	3
- Windshield Wiper Blades .....	12
- Fuse Assortment Set .....	2

SHIBAURA MODEL SE 8340: FOUR WHEEL DRIVE TRACTOR

<u>DESCRIPTION</u>	<u>PART N°</u>	<u>QTY.</u>
- Diesel Filter Elements (Cartridge)	130366070	24
- Diesel Filter Gaskets	130326060	24
- Oil Filters (Cartridges)	140516070	24
- Alternator	185046100	1
- Starter Complete	185086120	1
- Fuel Pump	130506030	1
- Front Wheel Bearing	042532210	4
- Front Wheel Bearing	042530201	4
- Tie Rod Ends (Steering Knuckles)	334800130	4
- Tie Rod Ends (Steering Knuckles)	334800120	4
- Wheel Lugs	010111240	12
- Wheel Lugs	11300816	8
- Rear Wheel Lugs	010111635	12
- Fan Belt	110996250	10
- Piston Ring (std.)	115106490	2
- Air Filter	314531011	4
- Hose	310160260	4
- Hose	310160250	4

<u>DESCRIPTION</u>	<u>PART N°</u>	<u>QTY.</u>
- Band	398750180	8
- Band	398750190	8
- Cylinder Head Gasket	111146250	2
- Pan Gasket	111996100	2
- Exhaust Valves	120166120	4
- Intake Valves	120176120	4
- Valve Guides	110136010	4
- Valve Guides	110136020	4
- Fuel Injectors Nozzels	131446025	8
- Clutch Disc	320400130	2
- Clutch Throw-out	398560530	2
- Front Wheel Lugs	336090020	8

CHEVROLET

MODEL CK 2093 4x4 3/4 Ton Pickup V8 Diesel Engine

<u>DESCRIPTION</u>	<u>QTY.</u>
- Fuel Pump Asm. ....	6
- Starter Motor .....	4
- Air Cleaner Filter Element (Cartridge) .....	24
- Gasket Kit, Oil Pan .....	8
- Gasket Cylinder Head .....	8
- Nozzle, Fuel Inj. ....	16
- Switch Asm. (Solenoid) Starter .....	4
- Drive (Starter) .....	4
- Bushing, D.E. (Starter) .....	4
- Bushing, Ctr. Brg. (Starter) .....	4
- Frame, Commutator End, Starter .....	4
- Brush, Starter Mtr. ....	12
- Pressure Plate, Clutch .....	8
- Yoke, Throw-out .....	3
- Master Cylinder, Brake .....	2
- Slave Cylinder Kit (Brake) .....	5
- Wheel Cylinder Rear, Repair Kit .....	12



<u>DESCRIPTION</u>	<u>QTY.</u>
- Shaft, Axle Inner RH .....	3
- Engine Block Assembly, Complete .....	2
Motor Starter .....	2
- Fuel Pump Asm. ....	4
- Fan Belt .....	20
- Switch Solenoid Asm. (Starter) .....	4
- Drive, Starter .....	4
- Bushing, Starter Motor (arm.) .....	10
- Throw-out Bearing Yoke .....	3
- Throw-out Bearing .....	2
- Brake Master Cylinder Asm. ....	2
- Brake Master Cylinder, Repair Kit .....	6
- Wheel Cylinder, Repair Kit (Rear) .....	10
- Universal Joints - Front drive line .....	5
- Universal Joints - Rear drive line .....	5
- Absorber Asm. Rear .....	10
- Front Drive Shaft .....	1
- Rear Drive Shaft .....	1
- Accelerator Cable Asm. complete .....	6
- Engine Mount Kits .....	4
- Gear Box Mount Kits .....	4
- Wiper Motor Asm. ....	2
- Water Pump .....	3
- Speedometer Head Asm. (instrument cluster) .....	2
- Fuel Gauge Asm. ....	2
- Free/Lock Hub, Repair Kit .....	4
- Wheel Cylinder Kits .....	20
- Exhaust Pipe Seal Ring (to manifold) .....	16
- Sealed Beam Head Lamps .....	10
- Engine Overhaul Kit complete with rods, bearings, pistons, rings, valves and gaskets.	3
- Cylinder Head Gasket .....	4
- Front suspension repair kits complete with tie rod ends, pitmans, spring shackles and bushes anti-shimmy kit and steering column bushes.	3

} Perhaps all  
 the same ?

<u>DESCRIPTION</u>	<u>QTY.</u>
- Horn Assembly .....	1
- Horn wiring and Steering Column asm. ....	1

CHEVROLET

MODEL CKT 240 - 36 E 14 (Assembled Zaire) 3/4 Ton 4x4 6cyl. Engine MD. 250 L 6

- Air Filters (dry type) .....	72
- Oil Filter .....	130
- Fuel Pump .....	3
- Fuel Pump Repair Kits.....	3
- Wire, Spark Plug .....	72
- Distributor, Ignition Hei Repair Kits (hi-intensity)	12
- Switch, Engine Oil Pressure .....	9
- Horn .....	9
- Bearing, Connecting Rod (Std or .002) .....	24
- Bearing, Connecting Rod 020 .....	12
- Ring Kit, Piston Std .....	24
- Coil, Ignition (hi-intensity dist.) .....	16
- Starter, Motor .....	6
- Water, Pump .....	8
- Nipple, by pas Hose .....	8
- Seal, Engine Front <sup>C</sup> over Oil .....	6
- Seal, Crankshaft Rear Main Bearing Oil .....	6
- Bearing, Clutch Throw-out .....	6
- Cover, Clutch Plate .....	6
- Fork (Throw-out) .....	4
- Pressure Plate, Clutch .....	9
- Gasket Kit Oil Pan .....	6
- Seal, Oil Pan Rear .....	6
- Screw Oil Pan Drain .....	6
- Seal, Oil Pan Front .....	6
- Bearing Crankshaft .....	14
- Gasket, Valve Rocker arm cover .....	6

.../...

<u>DESCRIPTION</u>	<u>QTY.</u>
- Bearing Crankshaft (020) .....	14
- Shield, Valve Spring Cap .....	32
- Spring Valve (with Damper) .....	32
- Cylinder Head .....	3
- Switch, Water Temperature .....	4
- Valve Exhaust .....	24
- Valve Intake .....	24
- Cylinder Head Gasket .....	6
- Spark Plugs .....	108
- Rod, Valve Push .....	32
- Gasket, Intake Manifold .....	6
- Gasket, Exhaust Manifold .....	6
- Ring, Exhaust Pipe to Manifold .....	12
- Radiator .....	2
- Fan Belt .....	16
- Fan Belt, Alternator .....	16
- Switch Asm. Solenoid .....	6
Drive Starter Motor (Bendix) .....	6
- Armature, Starter Motor .....	6
- Pole, Shoe N° 2077 .....	16
- Coil Starter Motor (Field) .....	6
- Screw, Pole Shoe (Starter Motor Field Screw) .....	16
- Brush (13/64") - Starter Motor .....	30
- Brushing Drive Housing (Starter Motor Arm.) .....	16
- Frame Asm., Commutator end .....	8
- Accelerator Cable Asm. ....	4
- Hub, Rear Wheel .....	4
- Free/Lock Hub, Repair Kit .....	8
- Free/Lock Hub Complete R&L .....	4
- U Joint Repair Kit (Front and Rear if not same) .....	15
- Drive Shaft Asm. Front .....	3
- Carburetor Needle Unit, Intake (with seat and gasket N° 3814)	12

<u>DESCRIPTION</u>	<u>QTY.</u>
- Wiper, Motor .....	3
- Speedometer Head Asm. ....	4
- Speedometer Gauge, ASM Fuel .....	4
- Absorber Asm. Rear Shock .....	16
- Absorber Asm. Front Shock .....	16
- Bushing, Rear Shackle (spring) .....	10
- Bushing, Front Spring .....	10
- Spring Asm. Rear .....	2
- Spring Main Leaf Bear .....	4
- Spring Asm. Front .....	2
- Absorber, Strg. Rly. & Tie .....	9
- Hub Front Complete .....	6
- Wheel Cylinder Kit Front and Rear .....	30
- Shoe Unit, Front Brake .....	16
- Shoe Unit, Rear Brake .....	16
- Seal (Front Disc Brake) .....	15
- Piston, Front Brake Caliper .....	10
- Screw, Brake Shoe adj., Rear .....	9
- Nut, Brake shoe Adjusting, rear .....	9
- Socket, Brake Shoe Adjusting Screw .....	9
- Vacuum, Asm (Brake) .....	4

In addition to the parts listed above, it is suggested that a selection of light bulbs, head lamps, fuses, wiper blades, ignition rebuild kits (particularly for hi-inten. ignitions) and alternators be kept in stock for all models. Optional spares would include axles, driveshafts, transmission and transfer cases, windshields and carb rebuild kits.

A decision should be made for the final disposition of the broken-down motorcycles--if they are to be repaired, parts lists should be prepared and parts ordered. A supply of control cables, tires and tubes, brake cables, light bulbs, primary and secondary drive gears (sprockets), chains, wheel bearings, coils, points, spokes and spark plugs should be kept on hand for all models.

A supply of 9.00x20 and 7.50x16 tires and tubes should be kept on hand for the trucks and pickups--eight of the former and sixteen of the latter are needed now.