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A Report on Pilot Project for the Manufacture of Japanese Style Bicycle Trailer (RIYACAR)

(Project No. TF/GLO/88/904)

October, 1992

by

Muramatsu Manufacturing Co., Ltd.
Tokyo Japan

Contents

Introduction

This report deals with the outcome of Pilot Project for the manufacture of Japanese style bicycle Trailer (RIYACAR)-Project No. TF/GLO/88/904.

With this Pilot Project, local people as well as urban people in Tanzania have a keen interest in Japanese Riayacar useful and easy to make.

It is recommended on the basis of the outcome of Pilot Project in this report, that the second phase of this project should be planned and implemented.

1. Background

Transportation in rural areas is given a higher priority in Tanzania. Special attention is given to facilities which are used by local people, especially the informal sector producers and small farmers, who carry their own products from productive areas to collection spots and market place. Presently this is done by human power drawn carts and animal power drawn carts. There is a strong need for the development and diffusion of improved drawn carts as well as bicycles. A good model for drawn carts is the Japanese RIYACAR.

One person can carry only twenty to thirty kilogram of agricultural prcduts and others. Even if he uses a bicycle, it is difficult for him to carry more than one hundred kilogram. With the Riyacar he can carry three hundred to five hundred kilogram.

This project addresses this problem by adopting a model trailer from Japan, to the local conditions in Tanzania. This pilot project is to faciliate technology transfer between Japan and Tnazania, and to test the technical and economic viability of the scheme through pilot test production.

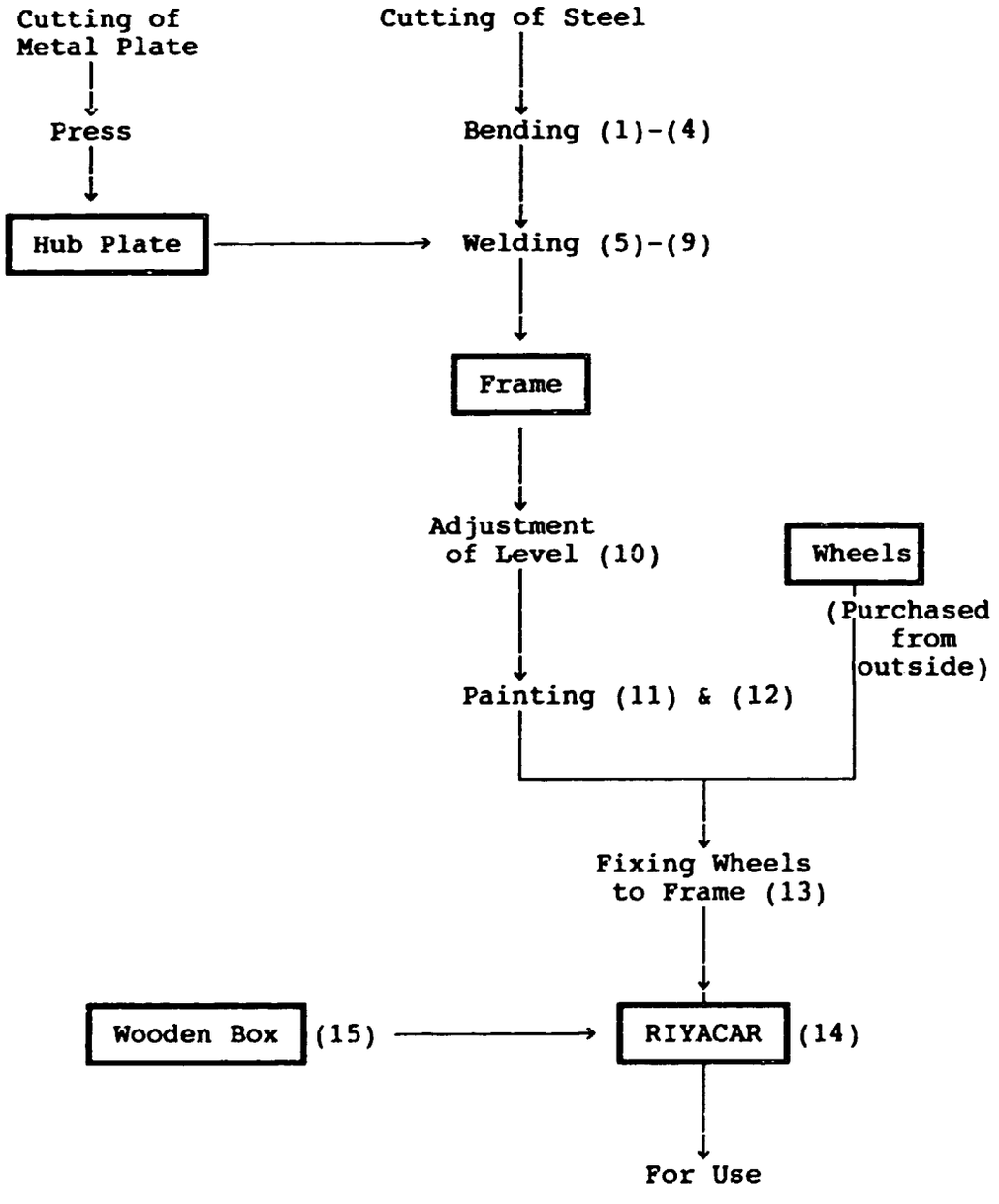
The M/S Tricycle Workshop was selected as a pilot plant to make the Japanese RIYACAR. The Workshop is located at the Small Industrial Development Organization (SIDO), Dar es Salaam Industrial Estate. SIDO is the Government Implementing Agency under the direction of the Ministry of Industries and Trade. The unit is a co-operative owned by six disabled persons. The personnel possesses basic skills, thus the unit is a suitable place for the establishment of a pilot plant.

The direct beneficiary is the tricycle co-operative unit at SIDO. The target beneficiaries are the urban informal sector as well as peasants in the rural areas who will benefit from increased availability of transportation facilities.

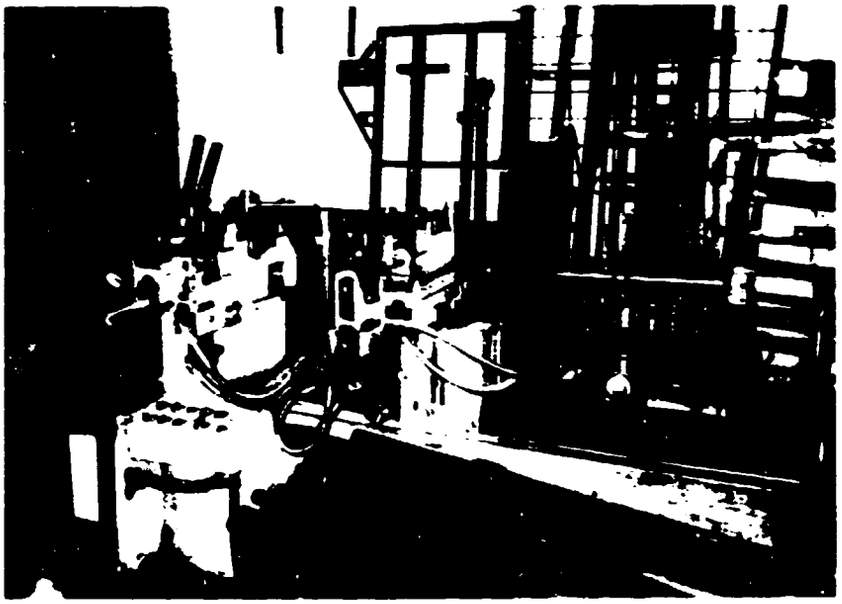
2. Production Process of the Riyacar

A Riyacar is made of three components; frame, hub plate and wheels. Basic technologies for the RIYACAR are cutting, bending, welding and painting. A flow chart of preparation and assembling of each component of the Riyacar is outlined as follows;

A Production Process of the RIYACAR



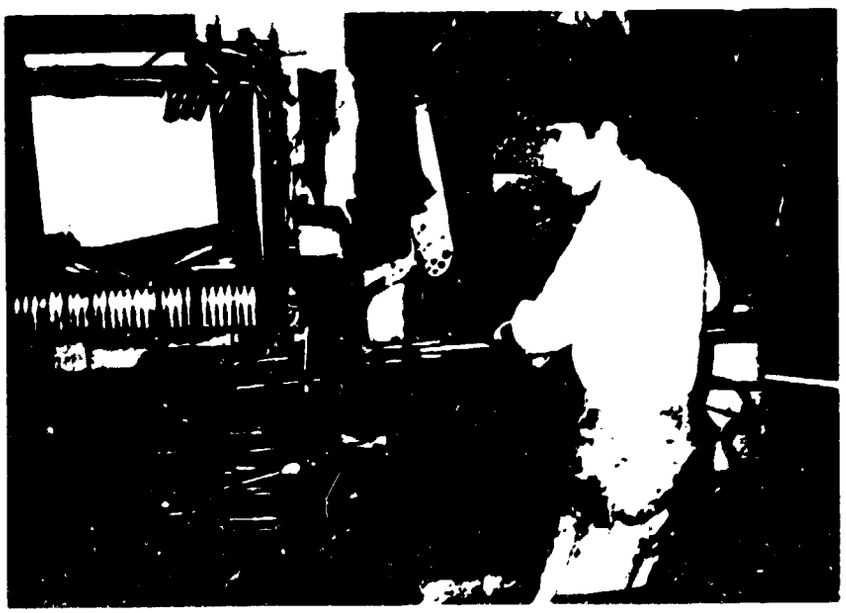
[Note] Numbers correspond to the photographs on the following pages.



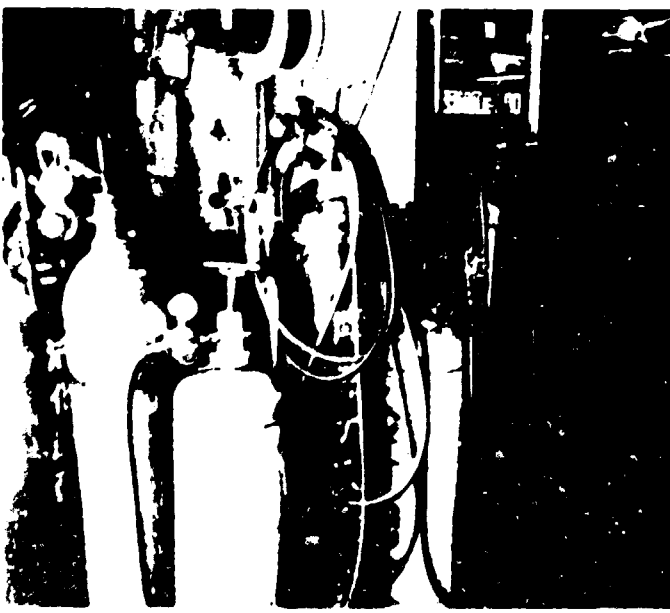
(1) Pipe Bender
(Oil pressure type)
in Japan

(2) Pipe Bender
(gear type)

This type was sent
to SIDO workshop



(3) Pipe Bender
(hand operated type)

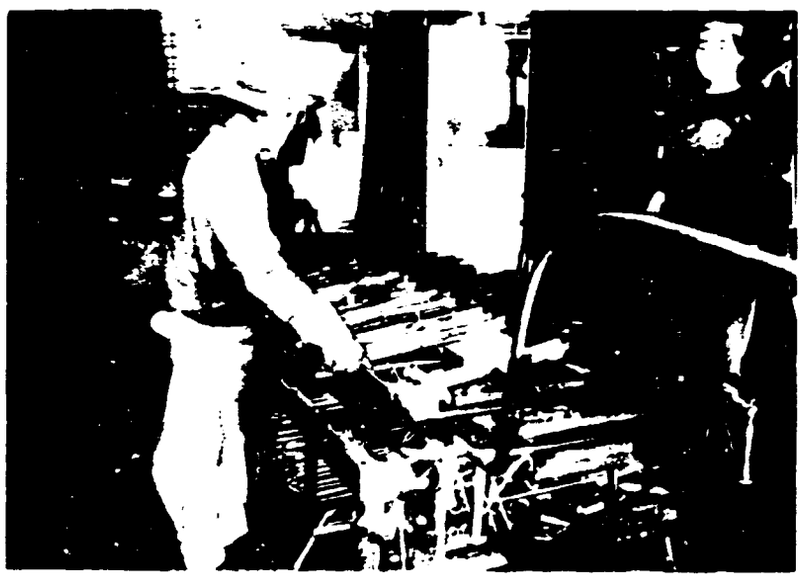


(4) Pipe Bender
(hand operated type)

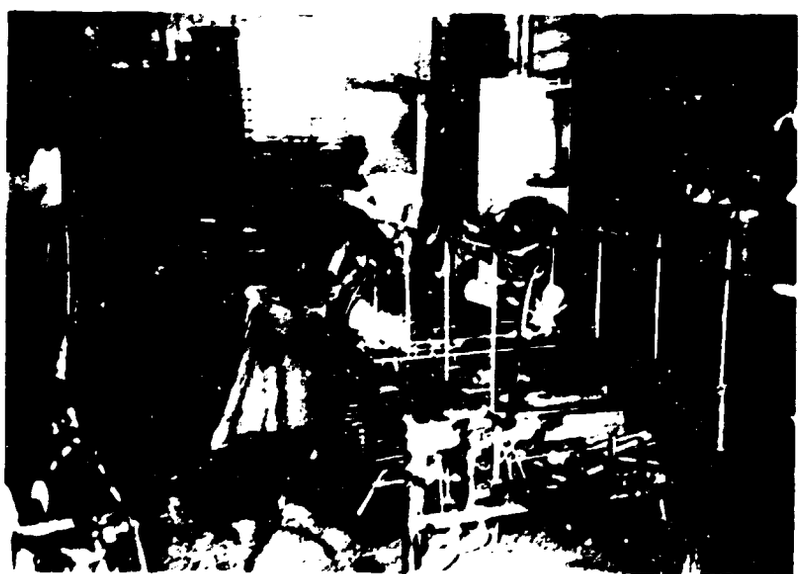
(5) Semi automatic
Welding machine
(CO2 Gas is required)

(6) C2H2 Acetylene Gas
and O2 Oxygen Gas for
Welding equipment

(7) Main frame is being welded

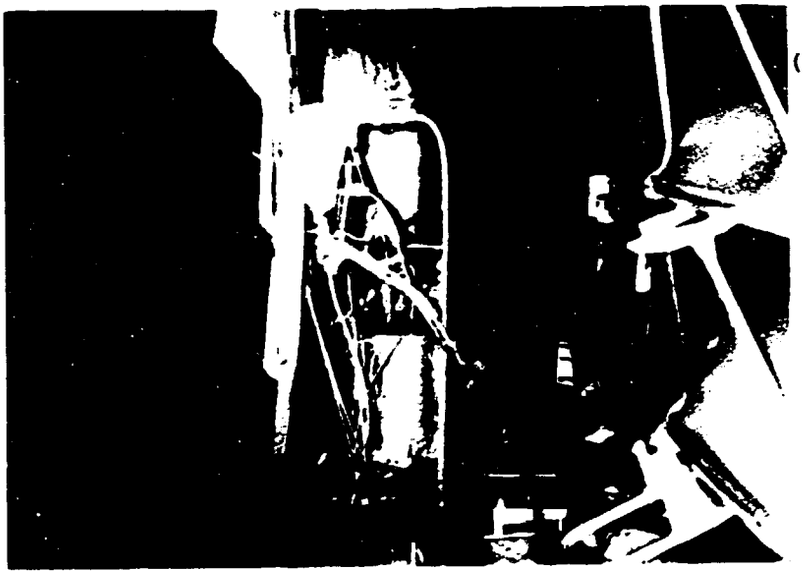


(8) Side frame is being welded

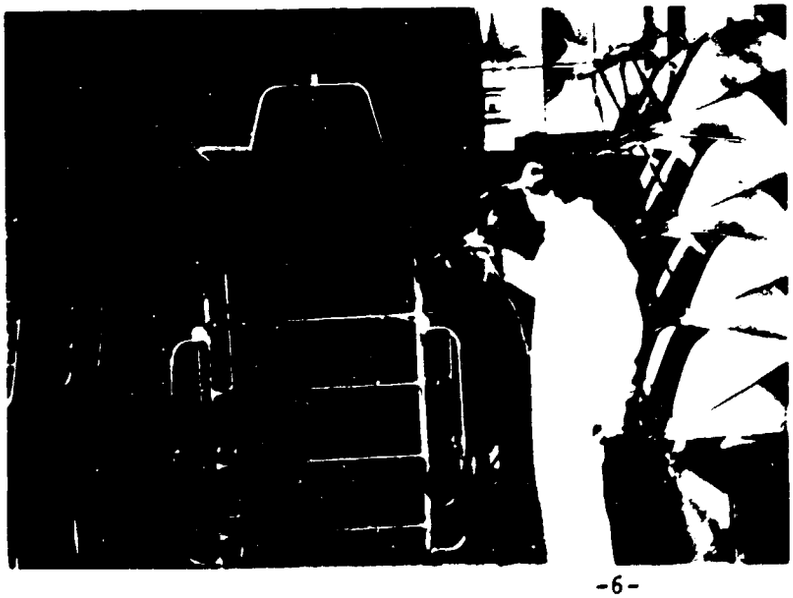


(9) Side frame and Main frame are being welded

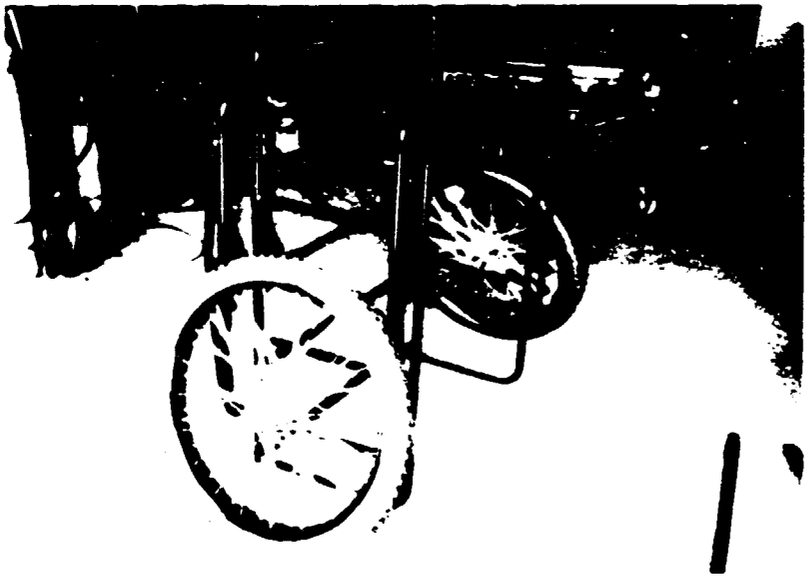
(10) Adjustment of the with C2H2.O2 Gas welding equipment



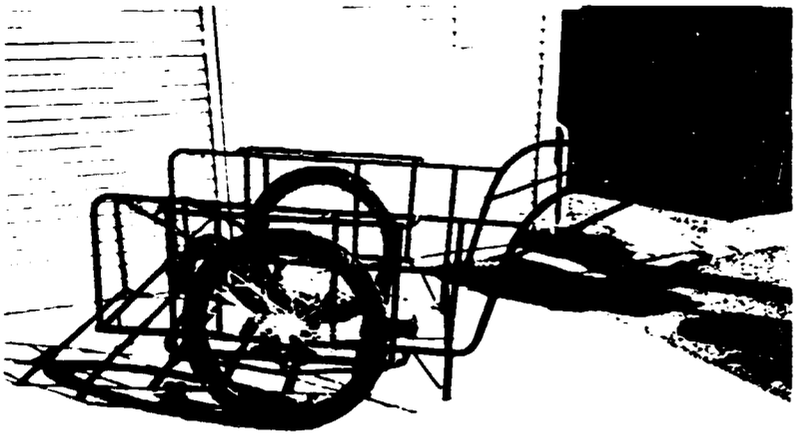
(11) Painting Equipment (electrostatic type)



(12) Painting



(13) Fixing wheels
Tire:26" x 21/2"



(14) Completed RIYACAR

(15) RIYACAR with wooden box

3. Training in Japan

One month training program in Japan was arranged for an engineer of SIDO (Small Industry Development Organization, Dar es Salaam, Tanzania).

Mr. Abebe Bebe N'doje was selected as a trainee for the program and sent from Tanzania to MURAMATSU Manufacturing Co., Ltd. (26-9, 2-chome Minamisenju, Arakawa, Tokyo, Japan) from 21, March through 20 April 1990.

He stayed at a lodging house of the Association for Overseas Technical Scholarship (AOTS) in Kitasenju, Tokyo, and commuted by bicycle between the lodging house and Muramatsu factory.

Before starting training for Mr. Abebe, engineers of Muramatsu asked many questions concerning the present situation of SIDO workshop in order to prepare a detailed training program. As a result of discussion with him, it became clear that the following were available at SIDO workshop.

- Electricity: 220V 3 phase (This information was given by the SIDO engineer, but it was not correct).
- Gas: CO2, C2H2 and O2 for Welding
- Raw materials: Steel pipes (The quality is not always good, but acceptable) and Steel for hub plate
- Wheels: not available in Tanzania. (Tires 26V 21/2, lims, and spokes have to be imported at present)
- Electric Welding machine: This machine is equipped with SIDO workshop. But semi-automatic welding machine is more suitable for making Riyacars.

After the technological level of his skill was confirmed, a more detailed training program on how to make Riyacars was prepared.

The training for a SIDO engineer started in order of production process shown in a diagram (page (2)) as follows:

(1) Cutting of steel pipes

It is not so difficult to use the machine to cut pipes. He could learn by heart the size of pipe and measurement of each part of Riyacar, and soon handle the cutting machine and cut pipes into each part of Riyacar.

(2) Bending (photo (1)-(4))

Bending machine with oil pressure. (photo (1))
4 pieces of 22.2øpipes for one Riyacar. He was trained to prepare two days on how to bend these parts of Riyacar with this machine. In TANZANIA these machines are not available, but it is possible to do the same work with other machines.(photo (2))

Bending machine with gear. (photo (2))

He practiced for 5 days to handle this machine.
We discussed sending a machine like this to the workshop in SIDO Industrial Estate.

Bending machine by hand. (photo (3))
Table and holder are needed to set the implement to fix the pipe. We expected to send this type of bending machine to the workshop in SIDO estate. He practiced 3 days to handle this machine for three days.

Bending implement by hand. (photo (4))
Main frame is bended by using this round mold. He practiced this implement 3 days.

(3) Welding (photo (5) and (6))

Semi automatic welding machine by electricity. (photo (5))
Wire and CO2 gas is necessary. Wire was expected to be sent several kilograms from JAPAN to TANZANIA. CO2 gas bombe (1) should have been sent, because it's too expensive in Dar es Salaam.

He practiced 20 days to handle this machine. He had already learned how to use the Arc welding machine. He could handle this machine easily. He could do easily because not only he had learned to use Arc welding machine, but semi-automatic welding machine can give us good result with not so high level technique.

C2H2 Acetylene gas and Os Oxegen gas welding equipment. (photo (6))
It's very difficult to learn the technique of how to weld by this equipment. The level and direction is adjusted by warming with the flame of this equipment.

(4) Painting (photo (11) and (12))

Painting equipment by electrostatic. (photo (11) and (12)
We expected to send Compressor and painting gun.
He practiced with this equipment for 15 days.

He practiced all of the steps how to manufacture Riyacar. He got better skill one by one and continued to manufacturer Riyacar. At the beginning it took one hour to weld pipes for one Riyacar. It was becoming shorter little by little. Finally, he could manufacture a Riyacar in 30 minutes. When we would send same machine and equipment to the workshop in SIDO estate in Dar es Salaam, he would be able to manufacturer Riyacar in same time frame. We talked about machines and equipments to be sent.

4. Equipment and Components provided

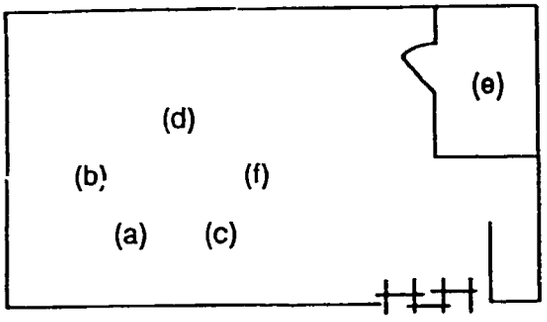
For the pilot workshop for production of Riyacar, the equipment, components, tools, spare parts and materials were decided on the basis of information on the existing Tricycle Workshop in SIDO industrial estate in Dar es Salaam and discussion between the SIDO engineer and experts of MURAMATSU Manufacturing Co., Ltd.

The equipment, components, etc. which were shipped to the SIDO Industrial Estate in Dar es Salaam were as follows,

(1)	Wheels	200 pcs.
(2)	Pipe Frame	100 pcs.
(3)	Bicycle for Pulling Riyacar	1 pce
(4)	Pipe Bender	1 set
(5)	Semi-Automatic Welding Machine	2 sets
(6)	Wire SCO 0.9 m/m	10 rolls
(7)	Compressor SU-37PBM5	1 set
(8)	Pop Riveter (handy Type) HR-002H/H-002	2 sets
(9)	Bench Grinder (Both side Type) EBK-2 (100V)	1 set
(10)	Handle Grinder HSG-100	2 sets
(11)	Electricity Drum (Socket + Code)	1 set
(12)	Bench Vice N-35	2 sets
(13)	Clamps (Normal) No.4006 B-150	6 sets
(14)	One-Touch Clamp No.3	6 sets
(15)	Pipe Cutter (Handy Type)	1 set
(16)	Tool Box	1 set
(17)	Transformer	2 sets
(18)	Handle Grinder (Large Type)	1 set
(19)	Working Table	1 set
(20)	Parts Setting Pattern	1 set
(21)	Riyacar knock-Down without Pipe Frame	50 sets
(22)	Riyacar Component Parts Joint (50 pcs.), Hook (1,000 pcs.), Hub Plate (200 pcs.), Stand Plate (100 pcs.)	50 sets
(23)	Bending Pattern	1 set
(24)	Bicycle Joint	50 sets
(25)	Arc for Welding Machine	2 sets
(26)	Second-Hand Blancket as Shock Absorber	10 pcs.
(27)	Second-Hand Motor Bike (HONDA XL-125;125CC)	1 pce
(28)	Refrigerator	1 pce
(29)	C.D. Cassette Recorder	1 pce
(30)	Mineral Water (Rokko no mizu)	64 bottles

5. Training at SIDO Workshop

TRICYCLE Workshop is located at SIDO Dar es Salaam Industrial estate. Six workers including 4 disabled persons are working with it. Existing machines and implements in the workshop were as follows. ((a)-(b))



(a) Manual implement for Bending

(b) Electrical Drill

(c) Arc Welding machine

(d) Bench Vice

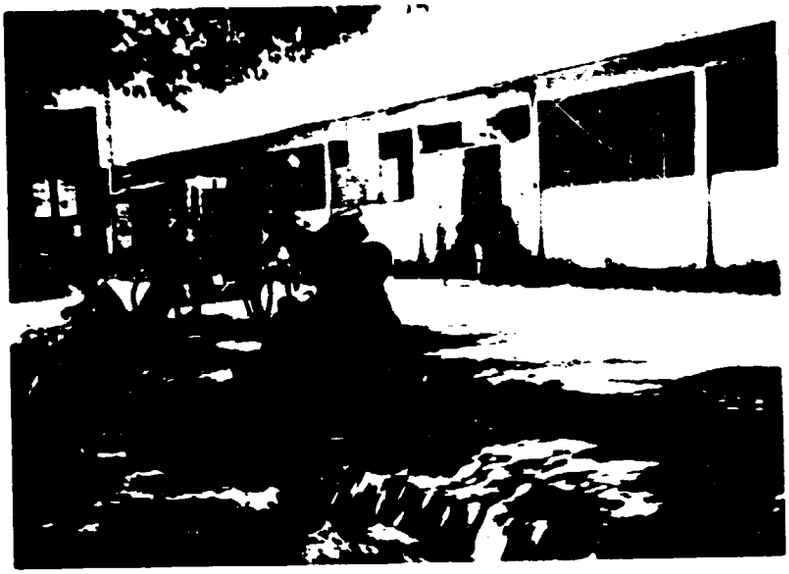
(e) Stock Room

(f) Manual Cutter

Tricycles for disabled people are manufactured in the workshop. The production process is very simple. Some of workers cut steel pipes with manual cutter. The others weld pipes with the arc welding machine.

All equipment, machinery, components, spareparts, and material arrived at SIDO Workshop in November 1990. Experts found that the voltage for these equipment was not suitable. The voltage being used in Tanzania had been informed of 220V 3 phases by the trainee when he had been staying in Japan. The correct voltage being used in Tanzania is not 220V one phase but 415V 3 phases.

It was impossible to get transformer to step down to 220V 3 phases from 415V 3 phases in Dar es Salaam. Fortunately, the Japanese experts could manage to find out a JICA expert who had experience of making such transformer in Dar es Salaam. He suggested that we should use the transformer for our equipment. It was being used at Lime Burning Plant Site on the outskirts of Dar es Salaam. We decided to move those equipment to the Site to try to manufacture Riyacars.



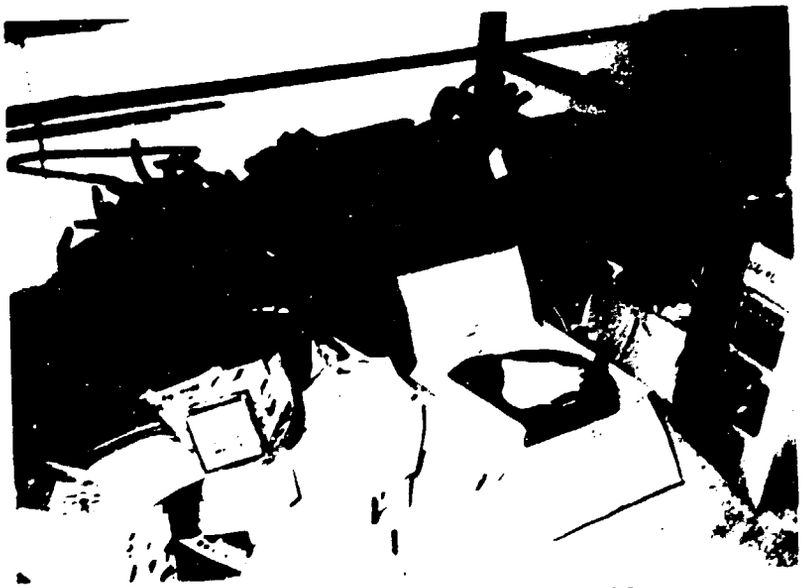
(16) In front of the SIDO Workshop at Dar es Salaam

(17) Workers are cleaning the floor of Workshop to settle equipment and machinery

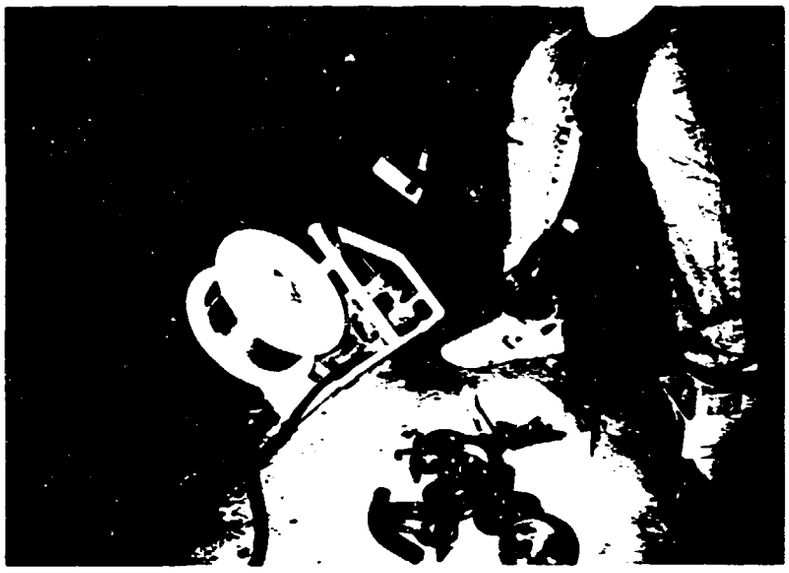
(18) Workers are cleaning the floor of Workshop to settle equipment and machinery

(19) Unpacking components from the container

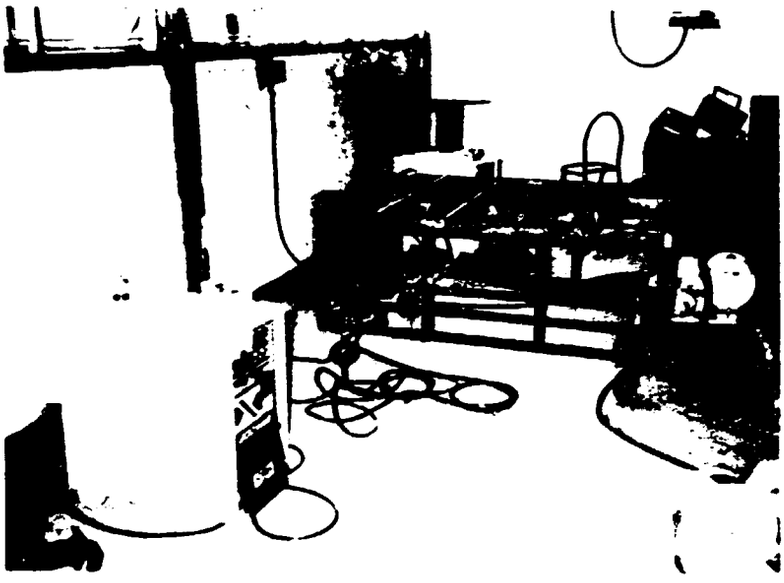
(20) Components in the stock room



(21) Components in the stock room



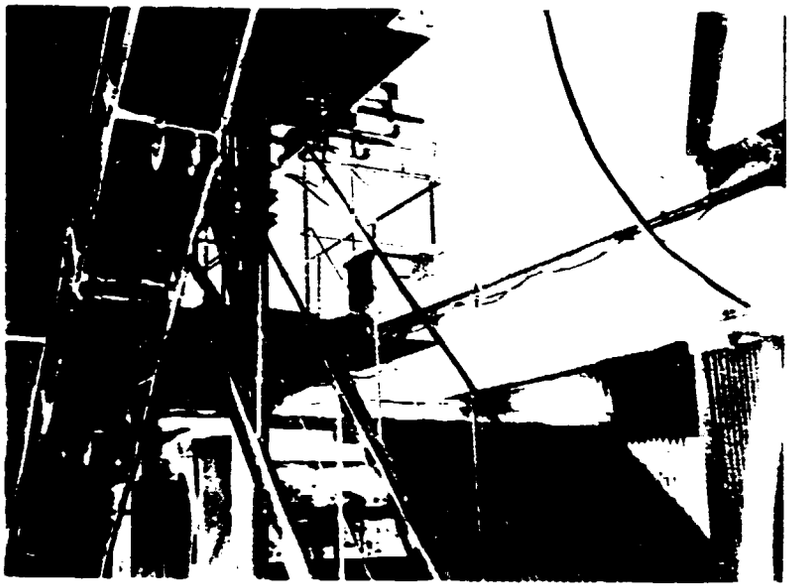
(22) Cable and Wire for Semi-Automatic Welding Machine



(23) Welding Machine and Working Table

(24) Spare Tires

to try to manufacture Riyacars.



(25) Transformer being used for Lime Burning Plant

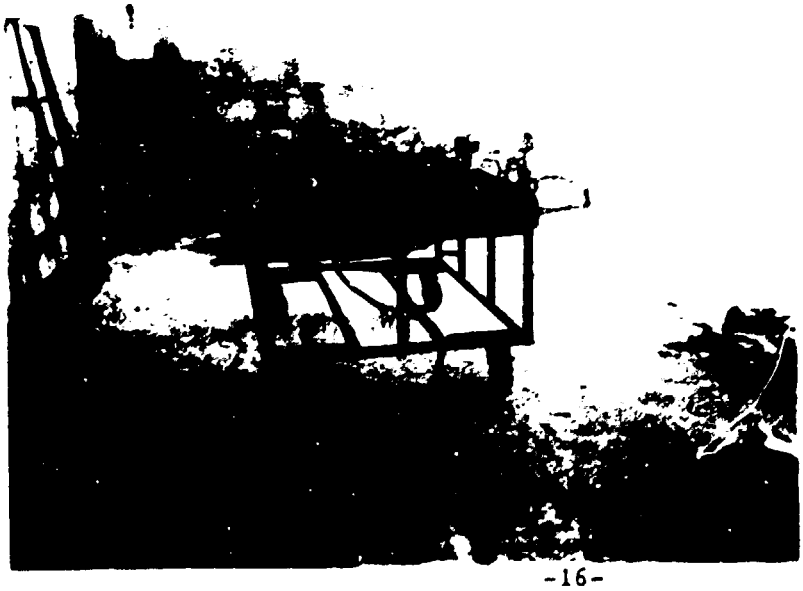
(26) JICA Expert is adjusting the distributor from 415V to 220V

Equipment and machinery necessary to start trial manufacturing were set up in a tentative workshop in the Lime Burning Plant Site. (photo (27)-(29))

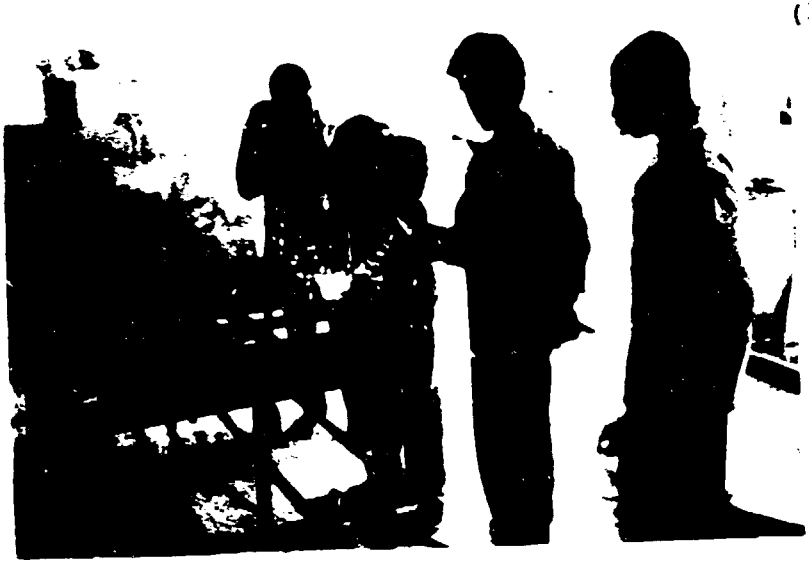
Training started for local trainees under the instruction of Japanese production engineer. (photo (30)-(35))

(27) Semi-Automatic Welding Equipment

(28) Bending Machine



(29) Working Table

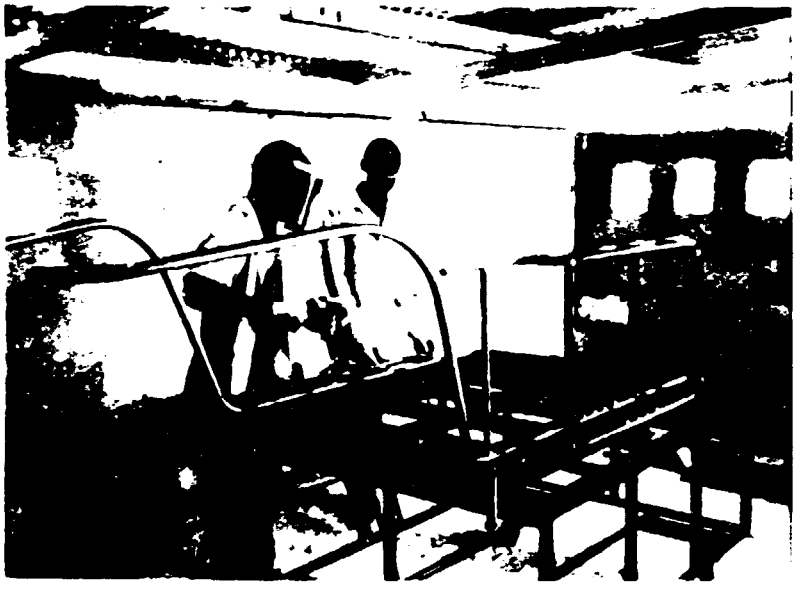


(30) Production Engineer begins to instruct how to use a Semi-automatic Welding Machine

(31) Local Trainees are trying to handle a Welding Machine

(32) Local Trainee is practicing to use the Welding Machine

(33) Engineer trained in Japan is manufacturing frame of RIYACARS.



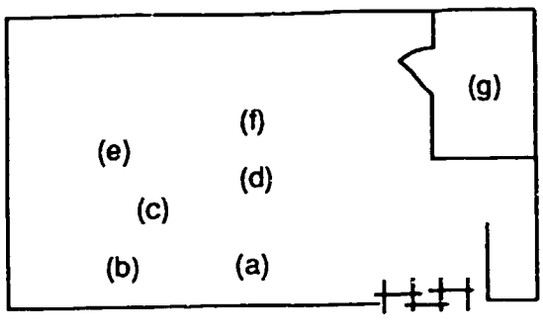
(34) Frame of RIYACARS is almost being completed

(35) Two RIYACARS were being manufactured in this Project, first time in Tanzania

During a trial to make RIYACARS in the tentative workshop, a transformer to step down from 415V 3 phases to 220V 3 phase was made with assistance of the JICA expert, and after the trial all equipment and machinery in the tentative workshop were transferred to the M/S Tricycle Workshop at SIDO Industrial Estate in Dar es Salaam.

A layout of the M/S Tricycle Workshop with new equipment and machinery is shown as follows:

A New layout of the Workshop



(a) Semi-automatic welding machine

(b) Semi-automatic welding machine

(c) Working table for manufacturing Riyacar

(d) Pipe bending machine

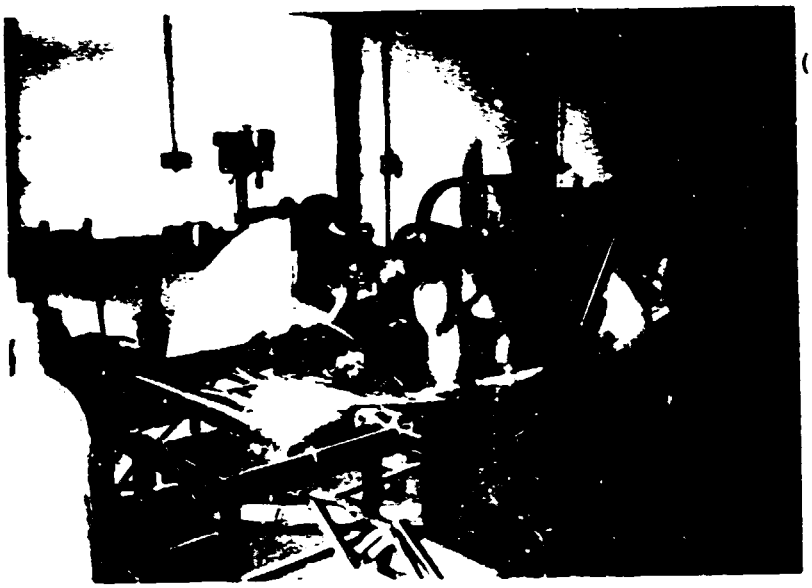
(e) Drills, Sanders and so on, implement

(f) Air Compressor for painting

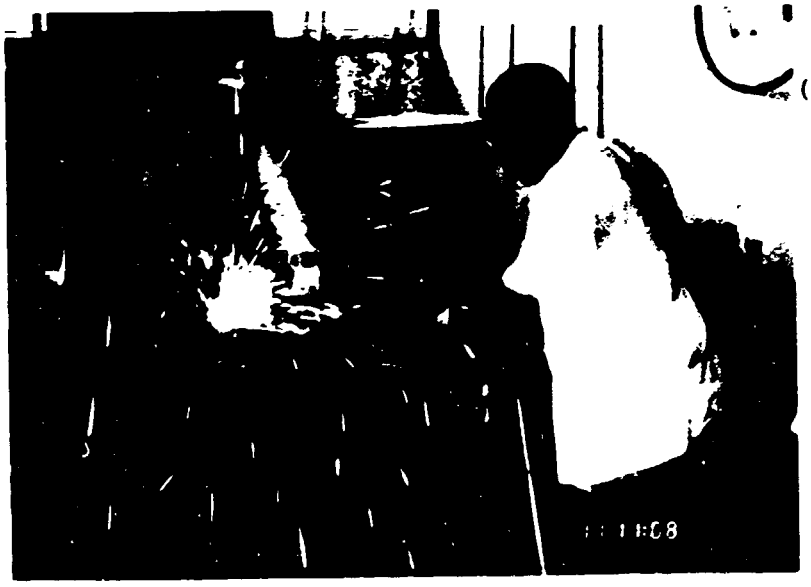
(g) Stock room for P/S RIYACAR components

In the tentative workshop local trainees were trained how to operate machines to manufacture Riyacars. One local trainee became able to weed five or six frames of Riyacars per day.

The selected equipment and machinery were appropriate to local trainees. It will be possible for local people to manufacture Riyacars in Tanzania under the supervision of the engineer who has been trained in Japan.

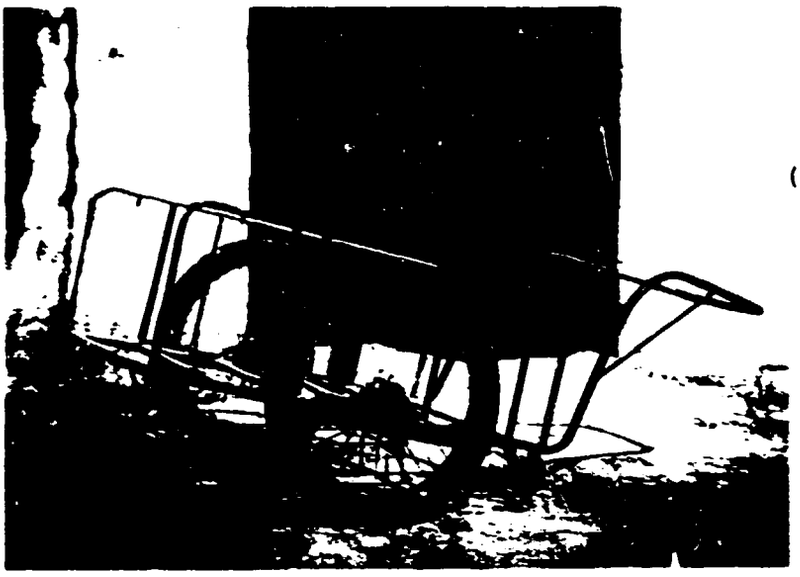


(36) Two members of the SIDO Workshop working with Semi-automatic Welding Machine



(37) Two persons welding the frames of Riyacars

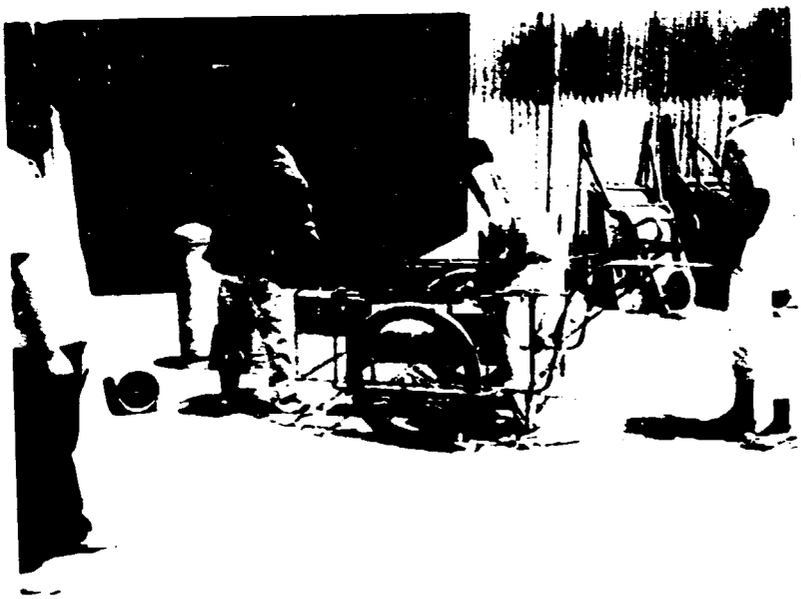
(38) Several frames of Riyacar have been made in the SIDO Workshop



(39) RIYACAR made in Tanzania

(40) RIYACAR made in Tanzania

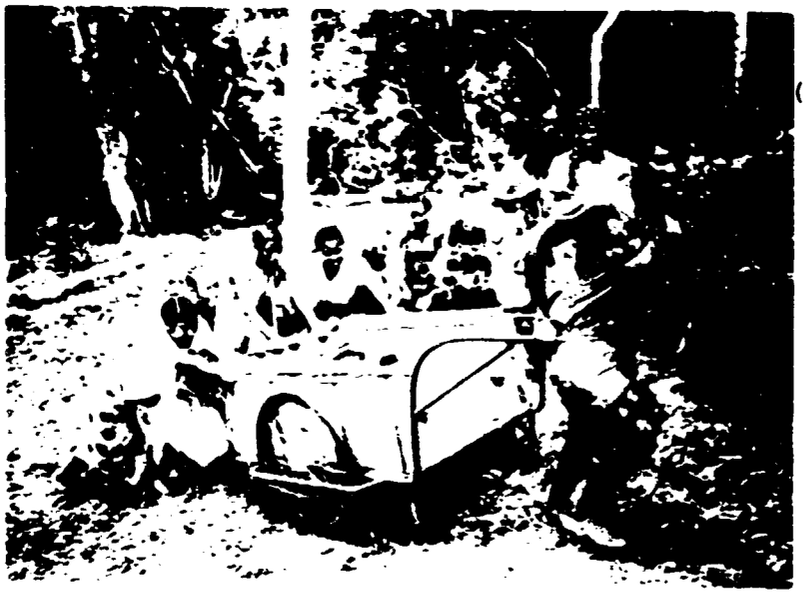
(41) Local people testing to pull RIYACARS.



(42) Local people are trying to carry gas bombes with RIYACAR first made in Tanzania

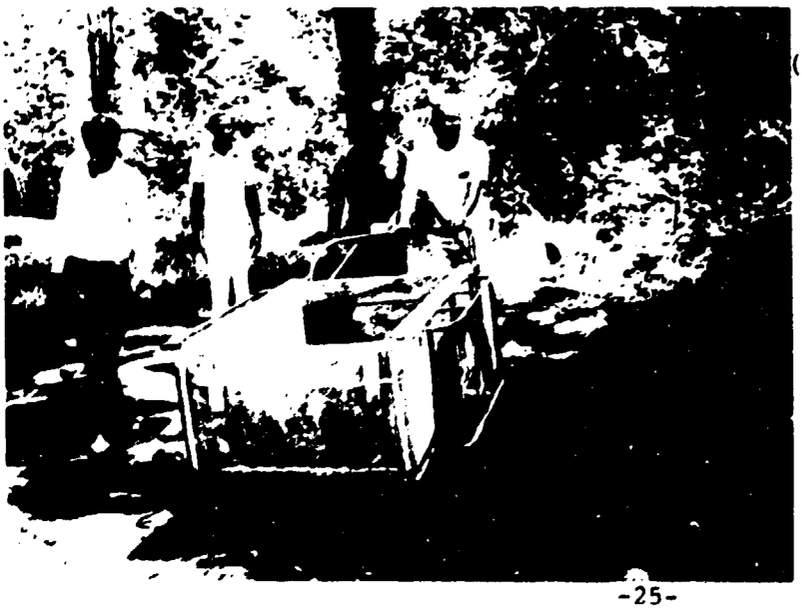
(43) Easy to carry three heavy bombes with RIYACAR by one person

(44) Local people using RIYACAR



(45) Local children pushing RIYACAR

(46) Local people using RIYACAR



(47) Local people recognizing usefulness of RIYACAR

(48) Local people recognizing usefulness of RIYACAR

(49) Many people on the road paid much attention to RIYACAR which could load many products smoothly

7. Conclusion & Recommendation

With training in Japan, and training by Japanese experts in Tanzania, a basic technology to make Riyacar has been transferred to local people working with SIDO Workshop. They are able to manufacture five or six frames of Riyacar a day.

During the stay in Tanzania, two Japanese experts surveyed both urban and rural areas as much as possible in order to understand the conditions of local transportation in Tanzania.

There were several kinds of autovehicles being used for transportation in Tanzania. Needless to say, autovehicles are very convenient, but too expensive for most of the local people to purchase. In addition, gasoline for auto-vehicle is very expensive, and auto-parts for maintenance must be imported and are very expensive. The Riyacar does not need fuel, and is pollution-free.

Local people tested the Riyacars made under the instruction of Japanese experts. (photo (41)-(43))

The Local people were highly appreciative of the Riyacar. They found it to be very useful (photo (44)-(49)) and easy to carry not only agricultural products, water, firewood and many kinds of other goods, but also patients and old men and women.

The Japanese experts confirmed that Riyacar is very essential to local people in low income rural areas to save human energy and time for transportation. Human energy and time saved can be used for new business with which local people could earn money.

Nowadays even in Japan, Riyacar has been given renewed attention because of its convenience, economy and pollution-free.

It is recommended that the following technical assistance be provided for the next phase of this project.

1. Although a technology to make frames of Riyacars has been transferred to Tanzanian counterparts, the technology to manufacture wheels has not yet been transferred for the first phase.
The technology transfer of wheels (especially, tires, spokes and rims) should be tried for the next phase.

2. Although steel pipes for Riyacars are available in Tanzania, the availability of materials to be made for other components of Riyacars should be studied in more details.

3. A quantitative market study, which has not been carried out during the phase one, should be conducted on the size of demand, the kinds of use, and also reasonable price for local people.

4. On the basis of the technical possibility of manufacturing Riyacars by local people and the viability of market for Riyacars, a commercially viable workshop of factory

should be designed for the next phase.

5. If most individuals in rural areas can not afford to get the Riyacars, the purchasing system, for instance, joint purchase or hire & purchase system, should be studied for the next phase in order to improve rural transportation.

6. The Riyacar can be used to carry many kinds of things in some ways; it can be pushed or pulled by hands, and pulled with a bicycle or motorbike. How to use the Riyacar should be taught to local people by demonstration for the next phase.