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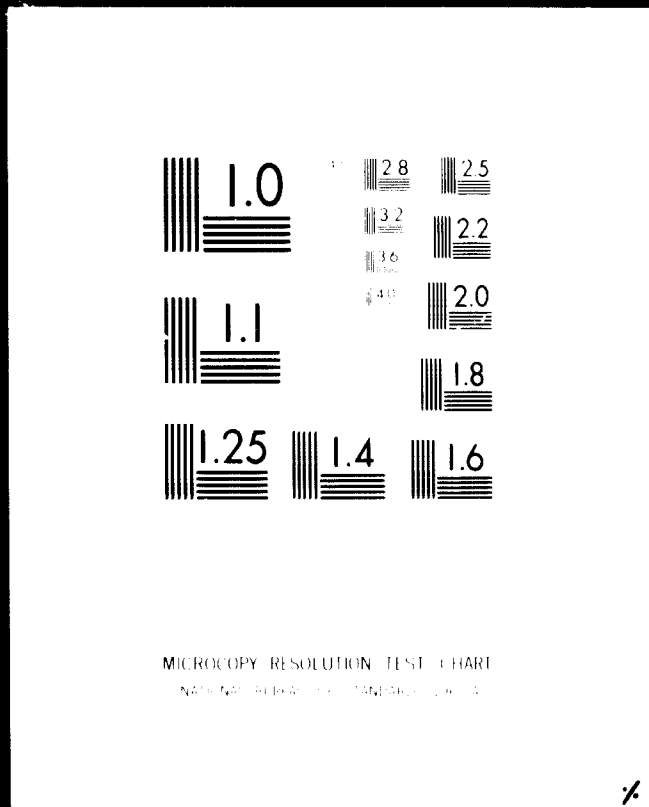
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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
U.N.I.D.O. - VIENNA

SURVEY OF THE NEEDS AND FEASIBILITY OF PILOT DEMONSTRATION
PLANTS FOR LOCAL MANUFACTURE AND DEVELOPMENT OF AGRICULTURAL
TOOLS, IMPLEMENTS AND ANIMAL DRIVEN EQUIPMENT IN THE
SUDANO-SAHELIAN ZONE .

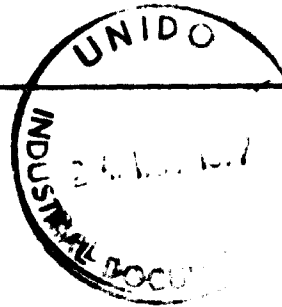
PROJECT RP/RAF/75/011/11-01

by

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3 March 1976



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This report has not been cleared with the United Nations
Industrial Development Organization which does not therefore
necessarily share the views presented.

1976

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Introduction

The present report covers mission RP/RAF/75/O11/11-01 which took place in Upper Volta, Chad, Senegal, The Gambia and Mauritania from November 14 until December 21, 1975.

The Objective

To assist the "Secretariat of Permanent Inter-state Committee on Draught Control" (C.I.L.S.S.) by conducting an integrated pre-investment study on local manufacture in selected countries and establishment of appropriate pilot plants for the manufacture and development of agricultural tools, implements, animal drawn equipment, simple manually operated agricultural equipment, irrigation pumps, wind mills, water drilling equipment, pipes and allied irrigation machinery.

This had been prompted by (a) the Meeting of Council of Ministers of Sahelian Recipient Countries, in Banjul in December 1974 and (b) the Meeting with the Donor Countries organized by UNSO, in Geneva on July 1, 1975.

The original objective of the mission was modified by subsequent meetings between C.I.L.S.S., U.N.S.O. and U.N.I.D.O., and it was decided that what was needed most was a general survey of (a) the actual requirements of the agricultural machinery sector (b) the needs of existing manufacturing facilities.

The C.I.L.S.S. has made a similar survey in Mali and Niger, The present report should contribute to complete the picture of the situation in the Sudano-Sahelian Zone.

The seven countries member of CILSS, being at different levels of industrial development, the "regional" aspect of the project was found inadequate at this point of time, and it was decided that a "national" approach should be used.

It was also decided that project RAF 803 - irrigation equipment and allied items - should be reviewed and modified by CILSS before being activated.

1. Upper Volta

It is our firm belief that, given the actual level of industrial development in most of the Sudano-Sahelian countries, an integrated project such as the one that was launched in Upper Volta (project UPV/71/514), is the most practical approach to the problems these countries are faced with, although one factor still remains unsolved for the time being - the pilot plant we will describe is entirely dependent upon important supplies from the outside (semi-finished industrial products, machinery components, spare parts etc.). Part of these components could be manufactured by small industrial units that could be added later.

1.1 Craftsmen Training Centers and Regional Workshops ¹⁾

1) The description is based on a report by Mr Lyonnet - ILO Principal Expert - Head of the ARCOMA workshop in Ouagadougou, and our visit on the site;

1.2 Centre National de Perfectionnement des Artisans Ruraux C.N.P.A.R. = National Training Center for Rural Craftsmen under the leadership of Mr Simpore, Seydou - Director.

CNPAR has two centers, one in Bobo-Dioulasso and one in Ouagadougou, where blacksmiths, carpenters, masons, well-sinkers and mechanics are being trained.

CNPAR, through its "Assistance, Advisory and Support Service" (SACS), is controlling and supporting more than 400 workshops located in the bush, to which they provide raw materials, tools and other equipment.

These workshops participate to:

- the maintenance of the agricultural machinery
- the promotion and spreading of prototypes
- the production of components for agricultural machines, carts, yokes, threshers etc.

Training at the C.N.P.A.R. - Duration: 7 months

The selection of applicants is made by the Regional Development Organization (ORD) which presents the candidates to SACS for a final selection.

Number of trainees: 102 Illiterate: 93 %

Number of applicants: 250

Age: 19 to 40

Compulsory qualifications:

- be a rural craftsman
- have a professional activity
- be domiciled in a locality

Desirable qualification: - be married (this in order to keep the rate of defection to a minimum).

Salary: Fr. CFA 6,116/month divided as follows:

- 3,116 for raw materials and tooling
- 3,000 for personal needs

Note: Out of the 3,116 Fr., 300 is put aside to improve the ordinary, and PAM offers a hot meal a day.

Training:

The blacksmith, for instance, will learn how to use and shape the tools and jigs he will take along with him at the end of the training period, including his small forge. Hammers and anvils have to be imported. He will also become acquainted with labor costs, cost of raw materials and profits.

1.3 The Workshops in the Bush

2 types:

- a. The Primary Workshop: The blacksmith is endowed a hut which is equipped with the simple tools he has shaped himself during his training.
- b. The Multi-Purpose Workshop: where 2 or more craftsmen will be associated; e.g. a blacksmith, a carpenter and a mechanic. A loan, reimbursable in 4 1/2 years, is allocated for the building of the workshop. A small warehouse for spare parts is usually added to the shop.

1.4 The Regional Workshops for the Manufacture of Agricultural Machines (A.R.C.O.M.A.)

Two pilot workshops have started operating in 1975 under project number UPV/71/514 and are manufacturing simple agricultural machines at a semi-industrial scale, using the network set up by the C.N.P.A.R.

The ARCOMA at Bobo-Dioulasso has an actual production of 1'000 to 1'500 ox-driven multi-purpose frames. The annual production could be risen to 2'000 units.

The ARCOMA at Ouagadougou is actually producing: 600 ox-driven and 600 donkey-driven multipurpose frames (types HV2B & HV1A); 300 ox- and donkey-driven carts and different harvesting machines.

These workshops operate in close coordination with the Regional Development Organization (ORD), which are responsible for the marketing of the products and the liaison with the end-users.

Capital Investment:

A pilot plant such as the ARCOMA, with a production capacity of 2'000 units per year, requires:

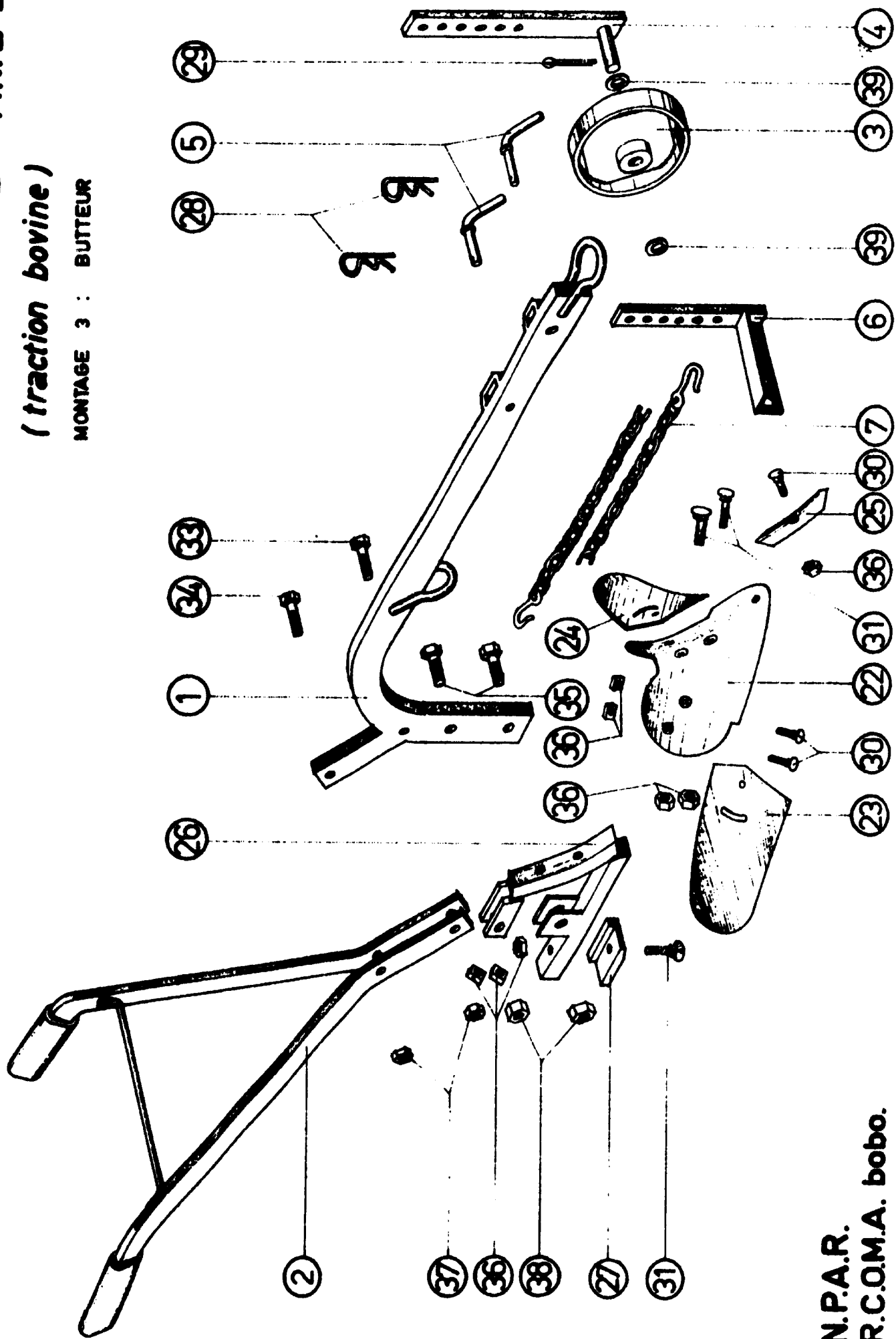
- 5 to 6,000,000 Fr.CFA for the building
- 3,571,000 Fr.CFA for machinery
- and 2,000,000 Fr.CFA for jigs, fixtures and tooling.

Inference:

Any project of this type is only viable at condition one constantly supports the activity the way it is done in Upper Volta; the components used by ARCOMA, such as ploughshares, landsides, hoeing tines etc., are manufactured by the workshops of the bush. This provides the craftsmen with an established market for part of their production and leads to an income that encourages the purchase of more and better equipment. Loans are also easier to obtain and reimburse under such conditions.

MULTICULTEUR TYPE HV.2 B
 (traction bovine)

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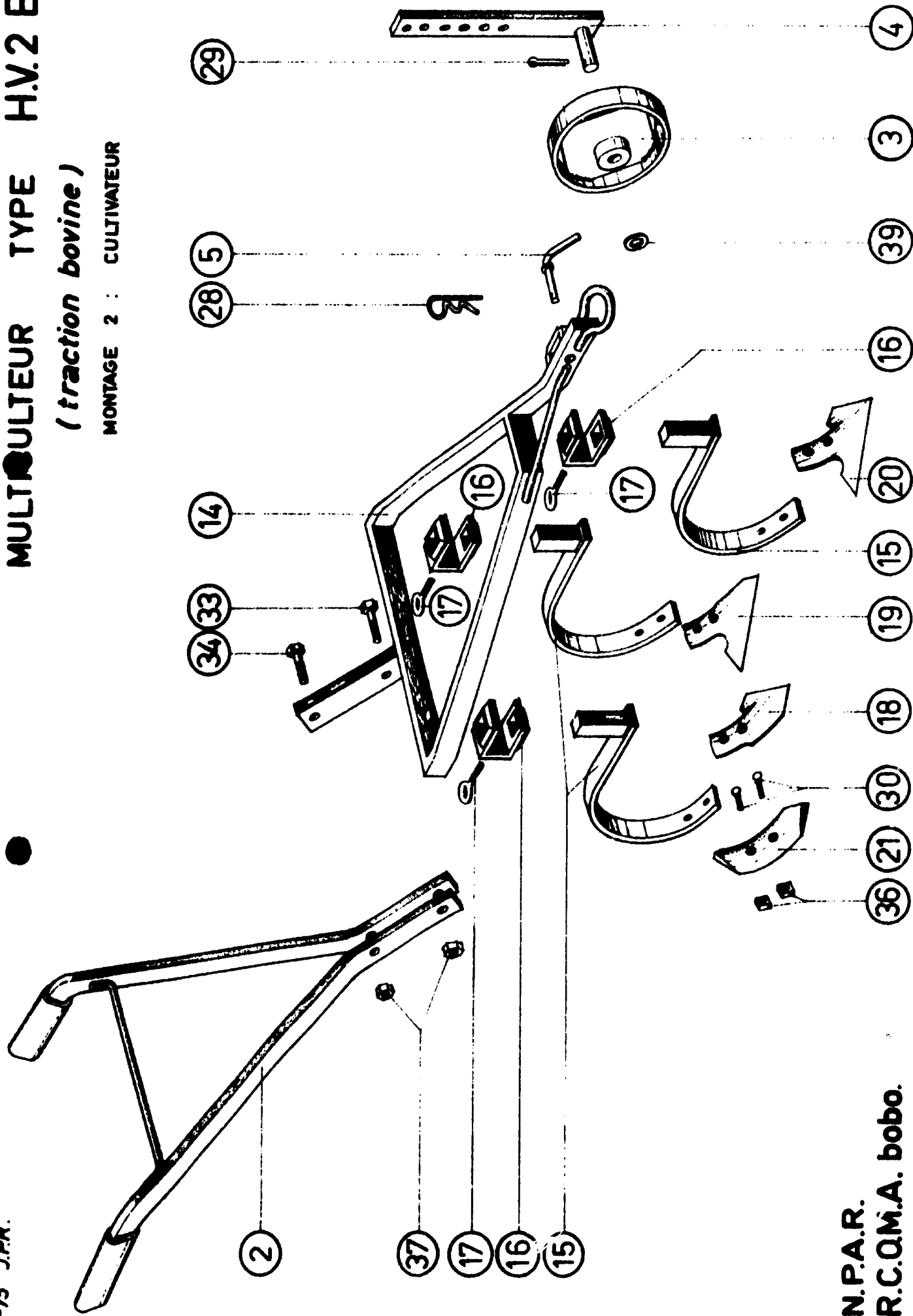


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MONTAGE 2 : CULTIVATEUR



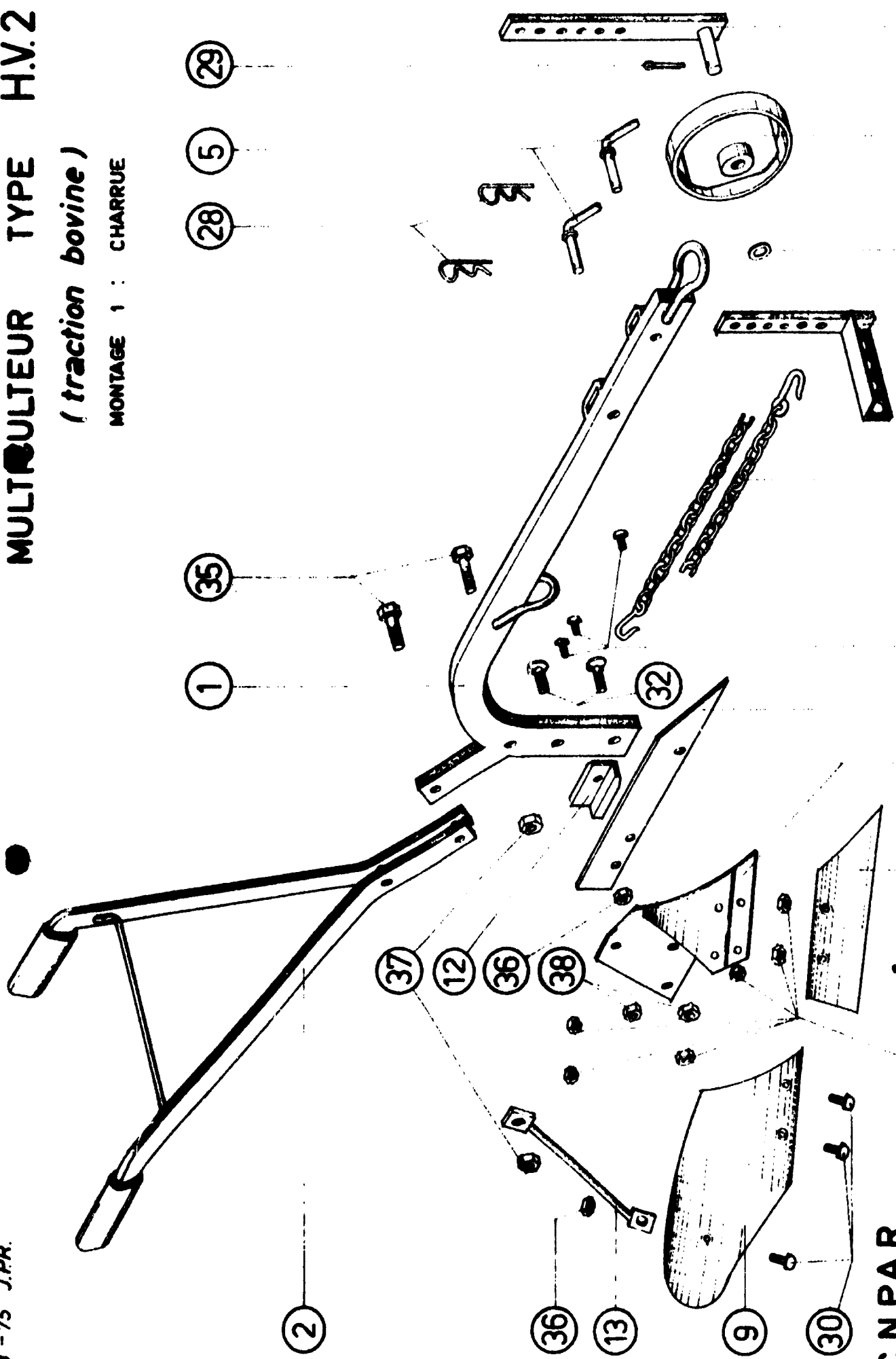
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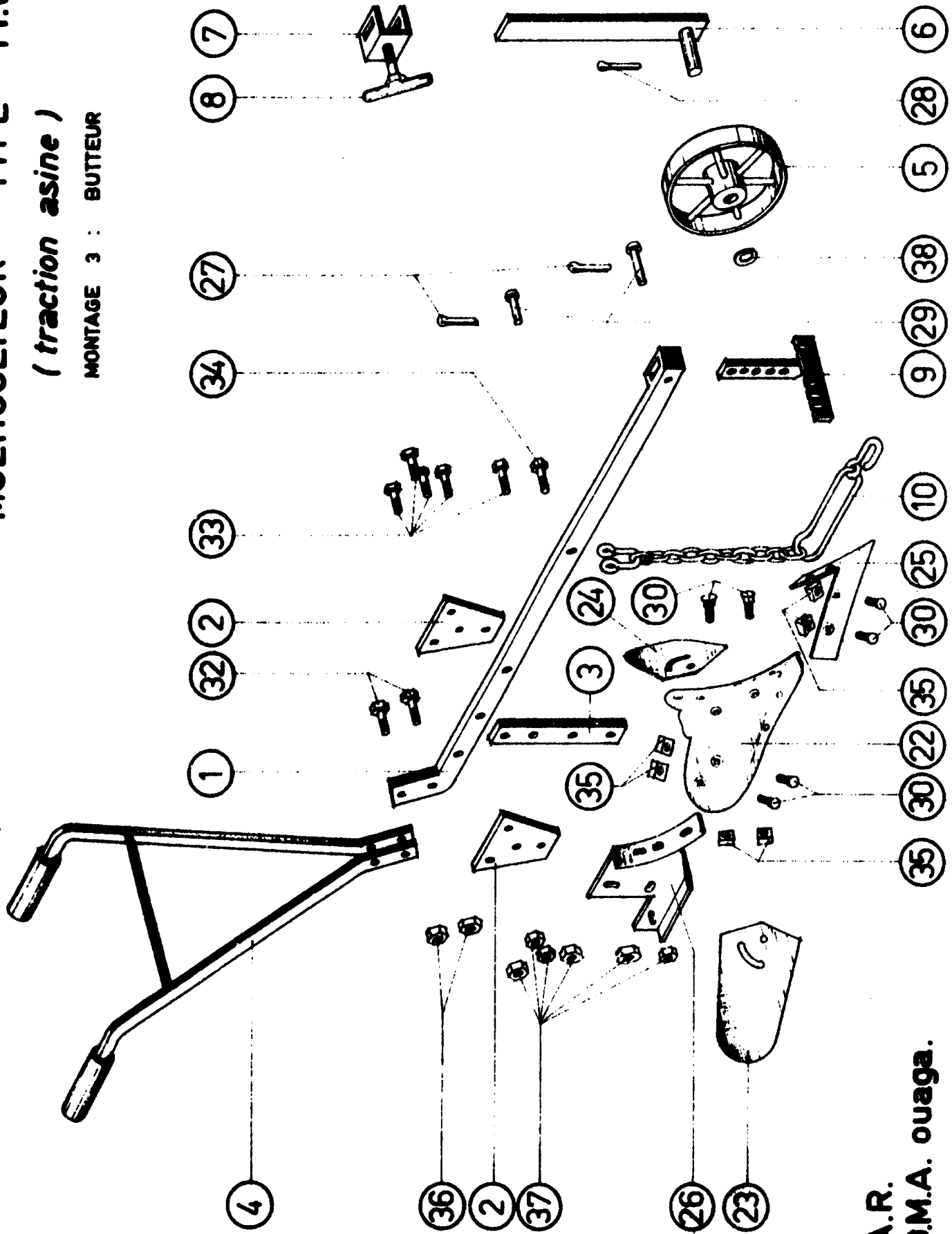
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MULTICULTEUR TYPE H.V.1 A

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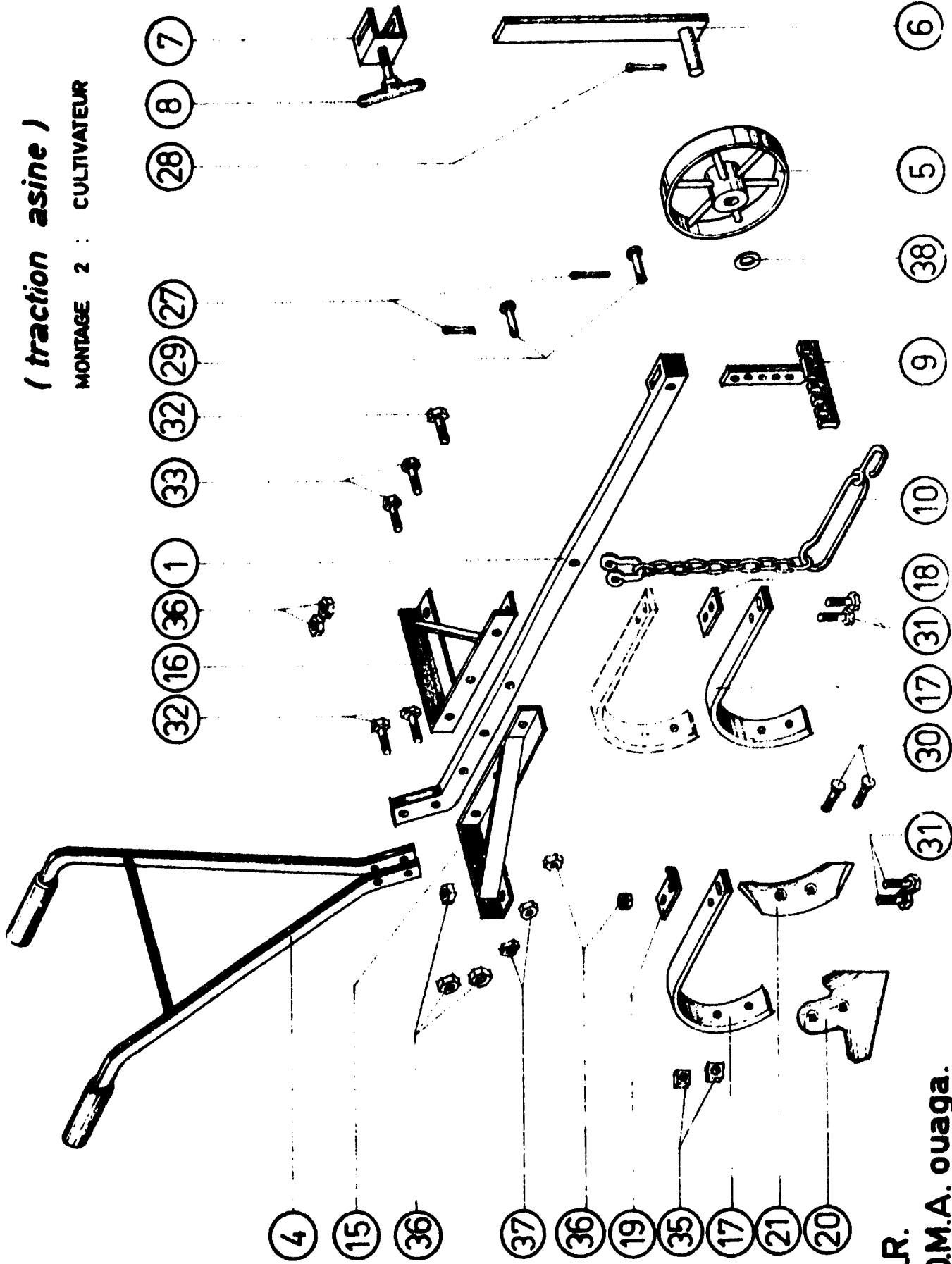
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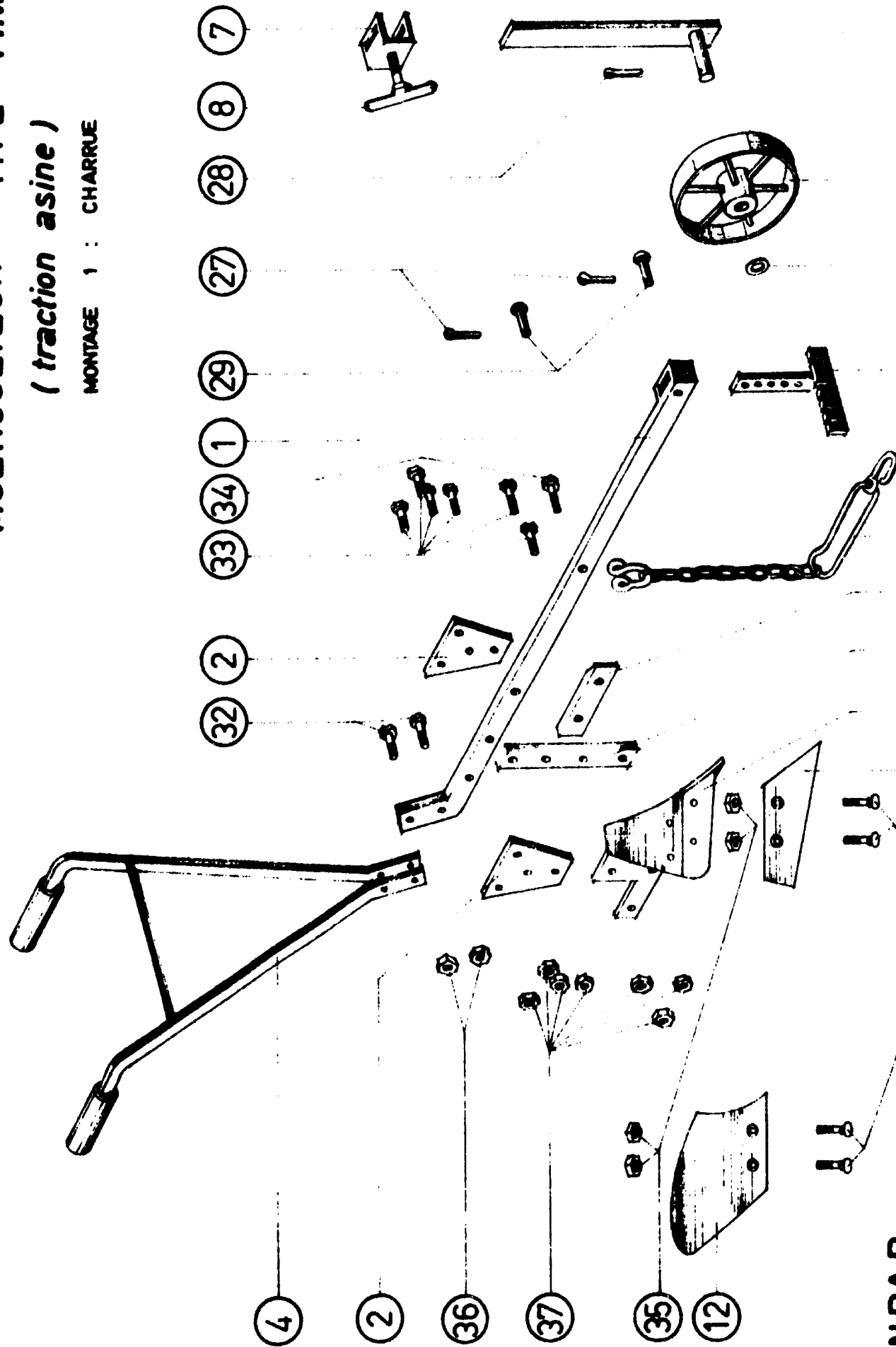
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MULCULTEUR TYPE H.V.1 A

(traction asine)

MONTAGE 1 : CHARRUE



C.N.P.A.R.
A.R.C.O.M.A. ouaga.

2. Chad

2.1 Agricultural Machinery (AM) - Actual Situation

All of the AM used is imported. Most of it comes from Senegal (SISCOMA) and Cameroon (TROPIC).

Since 1973, year during which the Government has abolished purchasing credits, the demand for AM has been constantly growing to the point where today the demand exceeds by far the offer.

The increase in AM and the forecasts look as follows:

	<u>3.9.74</u>	<u>3.9.75</u>	<u>76/77</u>	<u>77/78</u>
Ploughs	39'450	47'483 (1)	25'000 (2)	25'000
Weeders	977	1'581	1'500	3'000
EBS (RWE)	1'735	2'945	2'000	2'000
Carts	10'015	10'882	4 to 6'000	5'000 (3)
Yoke oxen	95'145	109'977	60'000 (4)	

(1) at the end of 1975, 12'000 ploughs were sold of which 8'000 as first equipment and 4'000 as replacement

(2) firm order

(3) of which 1'000 with tires (SPLATI - Milan and TROPIC - Douala)

(4) obtained by multiplying by 2 the number of ploughs, plus 10'000 animals in reserve

The selling prices for AM were set by Ministerial Decree in May 1975. They are about half of the actual cost (FED subsidy and CotonTchad short term loans).

A few examples:

	<u>Fr, CFA</u>	<u>US \$</u>
Bourguignon, Tropic and Siscoma Ploughs	8,000	40
EBRA seed drill	14,900	75
Bourguignon, Tropic axle & wheels assembly	16,000	80
Tropic and Bourguignon EBS (RWE)	3,000	15

Prices of yoke-oxen (not subsidized):

	Fr.CFA		
	<u>1974</u>	<u>1975</u>	\$
Young oxen, untrained	11.500	16.700 =	83
Yoke oxen, sell off price	19.400	27.500 =	137

2.2 Training Centers

There has been an attempt, some years ago, to create with the help of ILO, a training center for craftsmen, especially blacksmith. Unfortunately the results obtained were deceptive, most probably due to the fact that the trainees were lacking in motivation or did not have the necessary qualifications.

The National Office for Rural Development (O.N.D.R.) is presently conducting a feasibility study on a training programme aimed at the repair and maintenance of agricultural machinery.

The ONDR is preoccupied by three main bottlenecks: the supply of AM in order to maintain the actual rate of growth, the supply of spare parts, and the training of repair and maintenance personnel.

A thorough census dated January 1975 shows that in the Southern part of the country there are 728 traditional blacksmiths. It has been established that out of the total:

- 414 are equipped to weld; 447 to temper; 550 to bore
- 446 are capable of making ploughshares; 381 landsides
- 371 are capable of repairing ploughshares; 235 landsides

2.3 Industrial Project

TROPIC, a company located in Douala (Cameroon) belonging to the Bastos Tobacco Company, had plans to erect a production unit at Moundou (Chad). The annual production was to be 15'000 simple agricultural machines, the investment Fr.CFA 420,000,000. The site chosen by the manufacturer did not receive the Government's approval, and the project is further delayed.

2.4 Action Required

- Assist the ONDR in creating a Training Center for Rural Craftsmen, especially aimed at blacksmiths, well-sinkers and mechanics. Valuable time could be saved using the experience acquired by the CNPAR (Upper Volta) and the Secrétariat d'Etat à la Promotion Humaine (Senegal).

SWISSAID has a maintenance and repair shop for AM at Koumra; this could be used as a starting point for a Training Center for a Pilot Unit for well-sinkers.

- As a follow-up action we recommend the start-up of a Pilot Plant similar to an ARCOMA unit.
If TROPIC proceeds with their project, they will have to face an acute labour problem. We therefore believe this company should participate financially to the Pilot Plant Project; a unit of that kind being the ideal base for training, as of now, the specialized labour they will require.
- It should be possible for UNIDO to act as mediator between the Chad Government and the TROPIC Company, so that both parties agree upon a location, bearing in mind that Moundou has the necessary industrial substructures.

3. Senegal

3.1 Agricultural Machinery (AM) - Actual Situation

Senegal has an important AM production unit - SISCOA. It started in 1964 with the start-up of the plant at POUT; 10 ha, 8'000 m2 of building, 270 million Fr.CFA investment, 200 full-time workers.

SISCOA has an annual production capacity of 100'000 simple animal-drawn and miscellaneous agricultural equipment. They have a Training Center where agents of the Agricultural Extension Service and farmers learn how to use the equipment.

Main Production:

Seed-Drills	20 to 22'000
Western hoe	10 to 14'000
Ploughs (UCF type)	10'000
Carts	15'000
Multi-purpose SINE frames	9 to 10'000
Multi-purpose ARARA frames	4,5 to 5'000

Export: more than 40 % of total production

Main Markets: Ivory Coast, Mali, The Gambia, Mauritania, Guinée-Bissau, Dahomey, Upper Volta and Chad.

Diversification Programme:

It would be desirable for SISCOA to start the production of:

- edge tools
- components and the assembly of simple hand-driven water pumps

Needed Support:

In order for them to keep up with the demand for AM and spare parts, they would need:

- financial means to develop new models and purchase machinery to produce edge tools
- technical know-how and prototypes from developed countries

3.2 Training Centers 1)

(Centres de Formation Professionnelle Rurale)

This ILO initiative has obtained excellent results. A census made in October/November 1975 has located 839 craftsmen out of the 855 that went through the Training Centers since they started. The survey shows that 80,3 % of the craftsmen went back to their village, 49,3 % of them received some tooling through the Belgian Aid and may be considered as well equipped. The blacksmiths are leading with 61 %.

Proposed Action:

- Intensify the Equipment Campaign; this could solve part of the acute shortage in spare parts
- Determine with the help of SODEVA (Société de Développement et de Vulgarisation Agricole) the number of cooperative centers a well equipped maintenance and repair shop could cover.

3.3 Motorized AM

If the land development scheme planned by the "O.M.V.S." has to be kept on schedule, there should be an urgent need for tractors and motorized equipment.

The scheme foresees a yearly development of 6'500 ha for Senegal and Mauritania combined. This should be doubled in 30 years.

SISCOMA has a small lightweight tractor of Brazilian design on the drawing board. The Ministry of Industrial Development commented during our visit that the cost of such a tractor should not exceed US \$ 2,500.

1) For more information one should refer to the report of Mr Mesle - "Recensement et Reinsertion des Artisans" - November 1975.

3.4 Water Requirements

Mr Sebron - Expert on Solar Energy in Senegal - indicates in his recent report the requirements in water of the villages in Senegal.

<u>Number of Villages</u>	<u>Amount of m3 of water per day for population and cattle</u>
7'800	less than 10
2'700	between 10 and 23
4'500	between 10 and 30

3.5 Hand-driven Waterpumps

Several types are available on the market. Just to mention a few:

- Deplechin (Belgium): reliable and strong
- Vergnet (France): a recent design - has the disadvantage of failing and needs constant priming
- Briau (France): well-known for their Africa and Royal pumps
- and finally a very simple manual pump which we would like to investigate further - the Champenois (France) African Pump.

The pump consists of a drum (hand or animal driven) and a fabric belt. The belt is a sandwich construction of open-cell sponge in between 2 layers of nylon. The belt is hanging in the well and the sponge is squeezed by the drum during the rotation.

The output per hour is 2'000 to 3'500 liters depending upon lifting height.

The metallic components of this pump could easily be manufactured locally, the rubber cover on the drum and the cellular elastomer of the belt should be imported.

This type of pump could be used in distant villages where regular maintenance is a problem.

Proposed Action:

We suggest that with the help of the "Direction de l'Hydraulique Urbaine et Rurale" 2 or 3 units should be tested, and that during the testing period the following points should receive special attention:

- the rubber layer on the drum and especially the cellular material of the belt should be resistant to fungus growth - certain types of chemicals in the rubber compound encourage this growth
- the rubber layer and the sponge should be U.V. and ozone resistant
- when the pump is at a stand-still the layer of sponge in contact with the drum, under the action of heat, should not take a permanent compression set, which would make the pump useless.

The above points should be put together in a "material specification" and submitted to the manufacturer.

3.6 IC-Engine Driven Pumps

There is a potential market for small units (2 to 3 HP). The market-gardeners are most probably the best place to start a thorough investigation. Usually 10 of them share 1 ha of land and could purchase the unit in common.

3.7 The Windmill

When it comes to a thorough investigation and study of the possible use of wind-driven pumps, one should concentrate on "windgenerators" rather than on the classical type of windmill-driven pump erected on top of the well and pumping the water by means of rod and piston. The biggest disadvantage of the windmill is that the winds are weak during the dry season when the need for water is at its peak. The windgenerator has the advantage that it can be erected away from the well, and even the village, and can be used for other purposes such as lighting, battery charging etc.

One of the most promising designs is the vertical-axis wind turbine developed from a 50 year old French and Finnish design.

There is a type of windgenerator available on the market in Senegal - the AEROWATT - sold by a company in Dakar, SAM.

The price is rather high: 5 1/2 to 13 million Fr. CFA (US \$ 27,000 to 65,000) depending upon the type - this does not include the pump.

If UNIDO considers a study on the subject, we recommend to contact the ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION in the U.S. 1) and the following scientists that are specialists in the field:

- Mr Ronald L. Thomas and
Dr Joseph Savino, NASA-Lewis Research Center, Cleveland
- Dr Thomas E. Sweeney, Princeton University, New Jersey
- Dr William L. Hughes and
Dr R. Ramakumar, Super Speed Turbine Research Programme,
Oklahoma State University
- Professor Karl H. Bergey, University of Oklahoma
- Professor William E. Heronemus, University of Massachusetts
- Dr E. Wendell Hewson, Oregon State University

3.8 Solar Energy

Africa is undoubtedly the ideal ground for the future use of solar energy. We believe, however, that for the time being no industrial project can be undertaken until the installation costs become competitive.

1) The U.S. Government will invest \$ 12 million in a windpower research programme in 1976, compared to \$ 200,000 in 1972.

4. The Gambia

4.1 Agricultural Machinery - Actual Situation

It is impossible to quantify exactly the number of agricultural machines in actual use. This is mainly due to the fact that a considerable amount of equipment, including spare parts, enter The Gambia illegally. We estimate the need of The Gambia at 500 multi-purpose frames and 2'000 handtools a year. (The Gambia has 85'000 farms.)

The most recent equipment we have surveyed came from Senegal and Niger, the older equipment is most probably of European origin. The order placed with SISCOA (Dakar) for the 1975/76 campaign amounts to Fr.CFA 58,700,000 (US\$ 294,000). An order for spare parts was placed with a Nigerian company, totaling 10,000 Nairas (US\$ 16,000).

Main Bottlenecks:

- lack of spare parts; prices too high; long delays in delivery
- certain types of equipment, e.g. the 3 and 5 tine Canadian hoe, are not adapted to the conditions in The Gambia and are too heavy for the type of oxen which, although very resistant, are much smaller and less powerful than in Senegal.

4.2 Training Centers

The Gambia has three training centers:

- a Demonstration Center in Wellingara
- an Agricultural Station in Yundum
- a Vocational Training Center in Lamin

Mr Brynolf H. Doorman, UNIDO Expert, during his mission IS/GAM/71/1389 made a detailed report on the above.

4.3 Existing Industrial Unit

On the outskirts of Banjul (Kanifing Industrial Estate) there is a company called Cham & Secka Metal Works. The owners, Messrs CHAM and SECKA, both have a sound experience in metal and mechanical construction. The plant is small but very well equipped with modern machinery and welding equipment. The main product lines are nails and spikes, bedsprings, benches, door and window-frames etc.

They employ 45 people and are very keen on going into the production of handtools and spare parts for agricultural machines.

This could possibly solve the lack of spare parts in The Gambia and be a first step to an integrated project for local manufacture of AM.

4.4 Proposed Action

Short Term:

- financial and technical support to CHAM & SECKA so that they can start producing spare parts for AM and handtools (this includes know-how, blueprints, prototypes and machines)
- encourage a commercial agreement between SISCOMA and CHAM & SECKA
- subsidize a visit abroad to one or two manufacturing plants specialized in the field.

Long Term:

- the existing facilities at CHAM & SECKA's could easily be extended to a small semi-industrial production unit for simple animal-drawn agricultural implements, hand-operated machines and irrigation equipment.

4.5 Inference

From the meetings we had with the Ministry of Agriculture, the Ministry of Industrial Development and the Chamber of Commerce we can confirm that the proposed actions would be welcome and obtain full support from the authorities.

4.6 Extension and Diversification of the CHAM & SECKA facilities

To enter the production of spare parts and simple hand tools, we estimate that the cost of the additional equipment needed is around 30 to 40,000 US\$. The equipment consists of a forging press (second hand), a Universal lathe, a shaping machine and a small forge. If, at a later date, it is decided to start the semi-industrial production of simple animal drawn implements, another 15 to 18,000 \$ will be needed.

Raw Material is available at the Yundum scrap yard.

5. Mauritania

5.1 Agricultural Machinery (AM) - Actual Situation

Either because the information is not available or the person having this information was absent during our visit, the fact is that we were unable to quantify the situation. If one refers to the 4 volume survey dated January 1975 concerning the Development Project of the South-East Mauritanian Territory which was financed by the "Fonds d'Aide et de Coopération de la République Française", it looks as if we were not the only ones to lack recent data - the report indicates AM quantities dated back to the 1960's.

One could eventually come to an approximation by cross-checking SMECMA-Bamako and SISCOMA-Dakar information, if available, but even these figures would lack accuracy because of the permeability of the border with Senegal and the fact the Mauritanian farmer buys directly in Mali.

The "Agriculture - BMD" Campaign (Banque Mauritanienne de Développement):

This has been the only large scale operation that encouraged the use of animal-drawn cultivators, the introduction of farmer-loans and the formation of farmer-groupings. Unfortunately the operation lasted only one year (1966) and was made in Region no. 1 only (Eastern Hodh). 2'195 ploughs were distributed during the BMD campaign, of which 1'700 are said to be still in use,

The Cooperatives:

The cooperative selling points have a very limited turnover, prices of AM being too high. Spare parts, on the contrary, sell well - around 20,000 UM a year (US\$ 500). Considering that a plough, although free of import duties, sells at 3,300 UM (\$ 83) one understands that the Mauritanian farmer buys directly in Mali the small plough which costs between 800 and 1,000 UM (\$ 25) and is easier for animals to be drawn.

5.2 The Development Project

The main objectives of the third five year plan covering the 1975 - 1979 period are:

- the improvement of the standard of living
- the economical independence of the country

The Ministry of Agriculture of the M.I.R. has several projects under investigation:

- strengthening the programme for the maintenance of pumping and irrigation stations
- the spreading of animal drawn agricultural machines in South-East Mauritania with the objective to increase the arable land to 46'400 ha (actually 39'000) and the production of millet and sorghum to 33'800 metric Tons (actually 18'500)
- creation of 2 training centers that should be used as repair and maintenance centers for AM; one in the Senegal River region and one in the South-Eastern region.

This third project should thoroughly be investigated to see whether it is possible to add a pilot unit similar to ARCOMA; a more important industrial project cannot be justified. The annual need of the South-Eastern region for multipurpose cultivators, for instance, is estimated at 700 units, spread over a period of 9 years.

If two pilot units were to be created, they should necessarily be supported by a training and equipment campaign for blacksmiths and a network of demonstration points, similar to the PEDMA centers in Mali. The need for instructors and specialized labour could be met with by the following institutions:

- Centre de Formation et de Vulgarisation Agricole de Kaédi
- Collège d'Enseignement Technique de Nouakchott
- Centre Mamadou Touré de Nouadhibou

5.3 Source of Supply of Raw Materials to the Pilot Units

The "Société Nationale Industrielle et Minière (SNIM)" will soon put on stream a steel-works in Nouadhibou that will produce wrought iron, profiles and recast railway steel.

5.4 Other Industrial Project Under Study

An agro-industrial sugar complex in the Gorgol valley (4th Region). Production capacity: 60 to 80'000 metric Tons of sugar; 3'000 ha plantation, and a refinery.

If this project materializes, one will have to introduce motorized equipment for which no maintenance is foreseen today.

5.5 The Hydraulic Situation

The water supply in numerous villages is far from sufficient, and this dramatic situation encourages migration and immigration from border villages.

In the South-Eastern part of Mauritania - Guidimaka, Ould Yenge and Hodh regions, there are 56 wells for 37'942 inhabitants, the remaining 28'249 must rely upon ponds and draining-wells.

The depth of the wells varies between 10 and 20 meters (30 to 60 ft), the water level between 0,50 and 1 meter (20 to 40 inches). The majority of the wells should be deepened and concreted, and new wells sunk. It takes 600 days to sink a well.

5.6 Project RAF 74301 - Improvement of Pastures and Animal Breeding

This project is the kind of field action that could be of great help to projects RAF 802 and 803 and should receive adequate help and attention.

The original objective of the project was:

- mapping of zones 4,5 and 6 - some 90'000 km²
- creating a pastoral station around a well

Mr Naegele, Head of the project, gave us the following details:

The well is located at Hassi Ould Babouk, 107 km South of Nouakchott. It was sunk and abandoned by a civil engineering company.

The equipment on the site consists of: a rather large shed, a generating set, a 30 m³/h submersible pump and a concrete reservoir.

1) The objective is to create a community of about 100 to 200 people spread on a 2 to 3 km radius. All of them are refugees from the Sahelian zone that were surviving thanks to the help from the Red Crescent.

The Agricultural Station:

3 to 4 ha of arable land are on both sides of the reservoir and divided between vegetables, millet and sorghum. A nursery for shrubs was recently created and an orchard is being planned. The use of donkey-driven implements is being encouraged, this is new.

Recommendation:

An integrated project could add to the existing facilities:

- a forge and a small repair and maintenance workshop
- a small processing unit making licksalt stones
- a demonstration center for AM and tools

The project could be extended to other deep-seated wells (10 existent, 36 being sunk, 100 planned).

-
- 1) Some very good ideas can be found in Mr J. Neveu's report (ILO):
"La Cellule de base de Sienana (Haute Volta)".

**Establishment of a Semi-Industrial Pilot Plant for Manufacture
of Simple Animal Drawn Agricultural Implements**

A. Pre-Project Activity

A team of 3 experts: one expert with a former experience in the establishment or management of a pilot unit in Africa - one agricultural engineer and the expert that secured the contacts with the authorities and the industrial sector during a previous mission in the area.

Objectives:

- selection of the location, using existing facilities whenever possible
- final selection of the most needed agricultural tools and implements; this should be done in close cooperation with the industrial sector knowing the market and the local organizations for rural and industrial development
- securing the raw material sources
- selecting and recruiting the candidates for an accelerated training
- choice of workshop machinery and tooling, to be kept at a minimum level

Length of Mission: 2 months

B. Establishment of the Pilot Unit 1)

1. Operational Activity

1 project leader	36 months
1 production engineer	12 months
1 production manager	24 months

2. Equipment

(in US\$)

Workshop	30,000	
Machinery	18,000)	stage 1
Tooling	10,000)	
	30,000	stage 2

1) The above figures are based on the actual cost of the ARCOMA unit in Ouagadougou.

3. Raw Materials:

40 to 50,000

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- Mr P.N'Jie (Snr) - Chamber of Commerce
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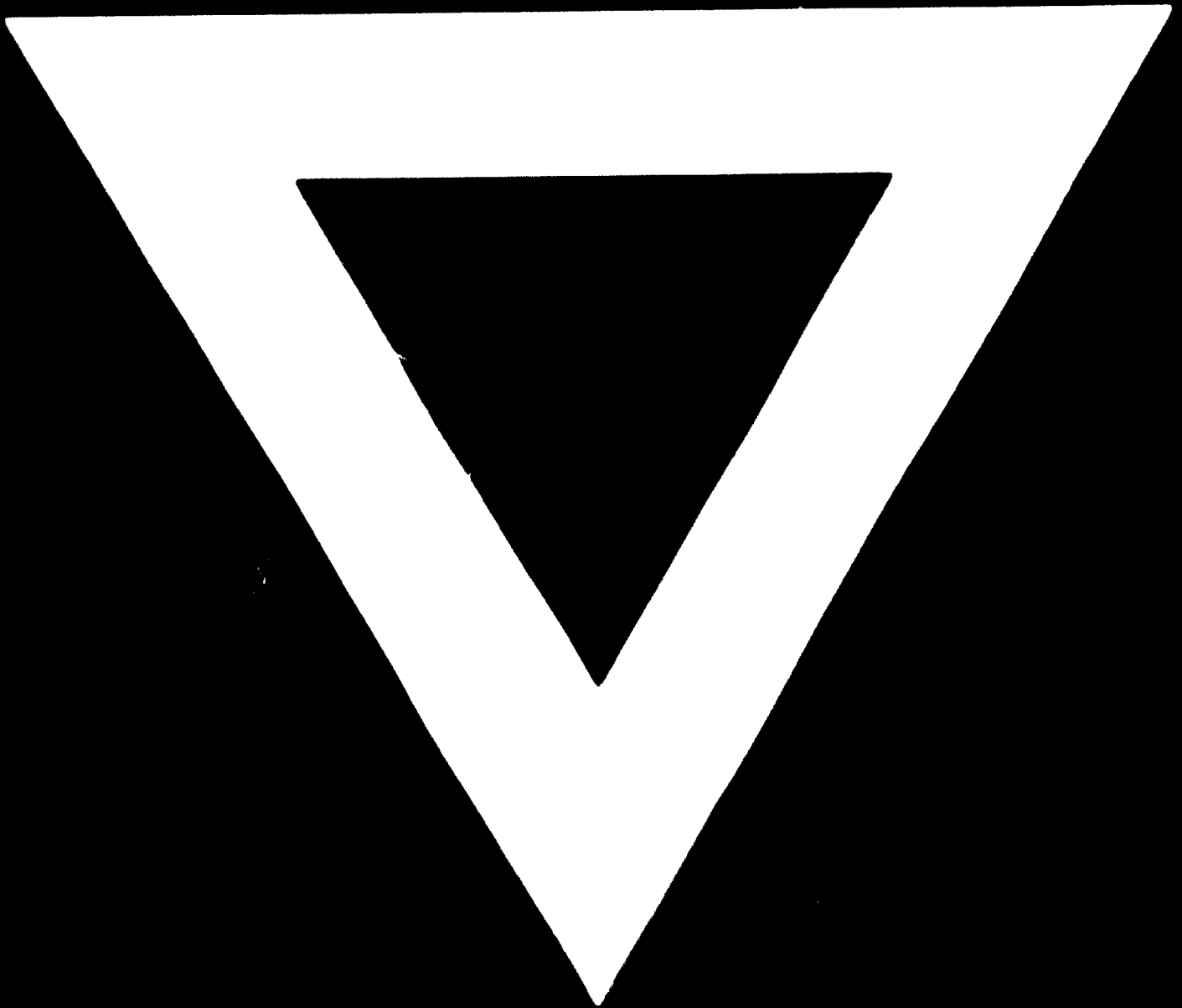
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