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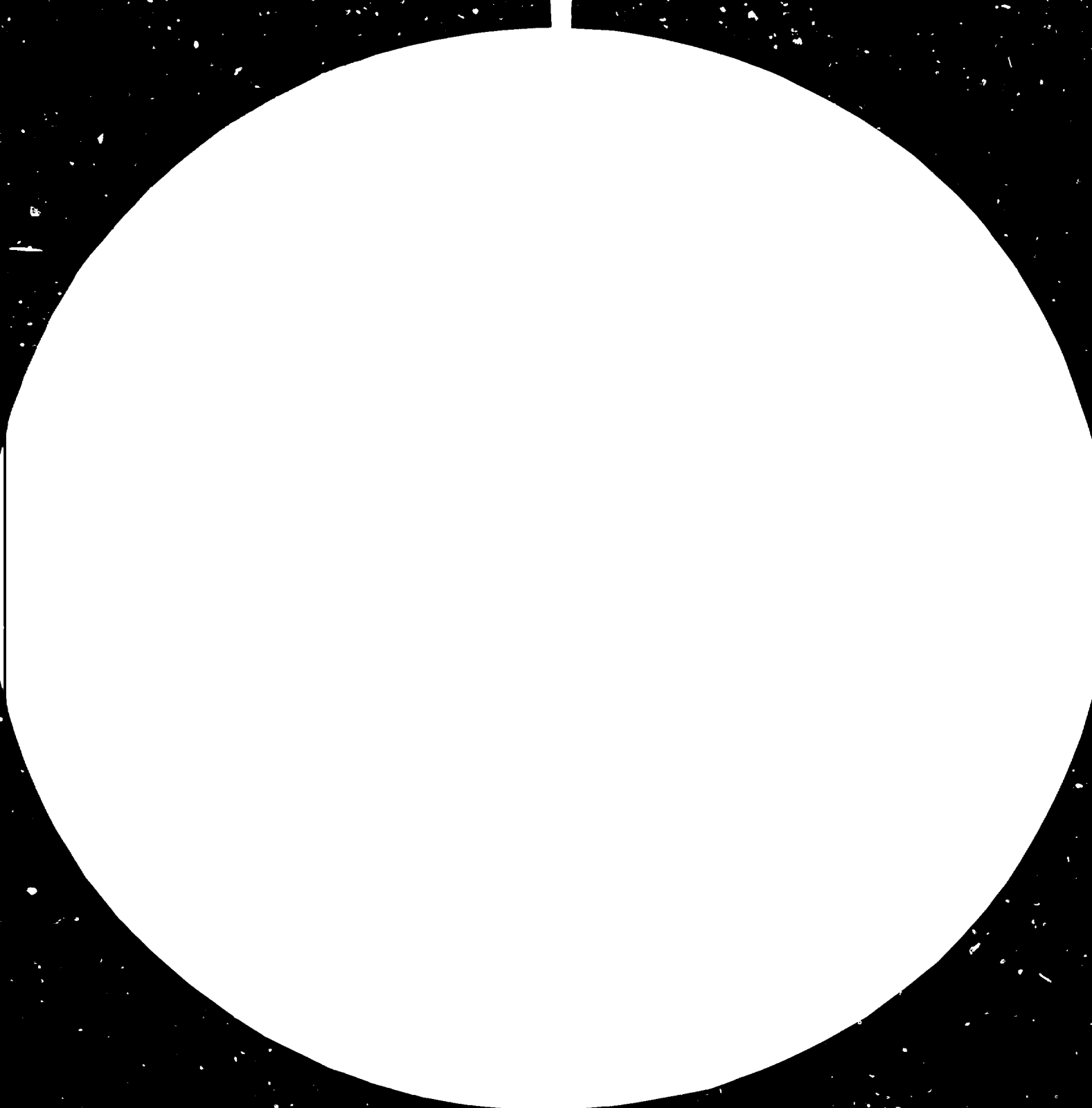
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MEASURES FOR PROMOTING THE AGRICULTURAL MACHINERY
PRODUCTION CAPABILITIES IN AFRICA*

prepared by

the UNIDO secretariat

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INDEX

	<u>page</u>	<u>para</u>
<u>Summary</u>	v - viii	i - viii
<u>SECTION I: Consideration on some basic prerequisites</u>	1 - 5	1 - 17
A. Is appropriate agricultural machinery important for African agricultural development? (para 1-2)		
B. Were national objectives elaborated through national agricultural mechanization policies? (para 3-4)		
C. What products are necessary and and relevant for agricultural mechanization and/or rural development?(para 5-7)		
D. What national capabilities exist for local production? (para 8-11)		
E. What are industrialization policies and the scope of agricultural machinery sector? (para 12-13)		
F. What are the national programmes of action? (para 14-15)		
G. Many questions - but few positive answers(para 16-17)		

	<u>page</u>	<u>para</u>
<u>SECTION II:</u> An integrated approach towards manufacture of agricultural machinery	6 - 14	19 - 40
A. Present status based on diagnosis(para 19)		
B. Need for integrated approach (para 20 - 21)		
C. The big dilemma (para 22)		
D. Criteria for new unit establishment and tech- nical parameters for production (para 23 - 25)		
E. Production levels: types of production units (para 26-29)		
F. Techno-economic alternatives in production programme (para 30 - 32)		
G. Need for backward-forward linkage (para 33-34)		
H. A mechanism for integrated and interlinked approach (para 35-37)		
I. Policy-technical decisions and technical follow up (para 38-40)		

	<u>page</u>	<u>para</u>
<u>SECTION III:</u> Policy-technical aspects: integrated horizontal deve- lopment of engineering industry including agricultural machinery	15-22	41-61
A. The basis (para 41-44)		
B. Methodology (para 45-46)		
C. Technical parameters for production (para 47-49)		
D. Pre-requisites (para 50-51)		
E. Step by step approach (52-53)		
F. The implications (para 54-57)		
G. The Government action needed (para 58-61)		
 <u>SECTION IV:</u> Technical aspects: upgrading of existing engineering production facilities for manufacture of agri- cultural machinery	23-31	61-81
A. Justification (para 61-67)		
B. Product range (para 68-69)		
C. Why to upgrade (para 70-71)		
D. Numerous analysis of con- straints but few actions (para 72-76)		
E. How to upgrade (para 77-81)		

	<u>page</u>	<u>para</u>
<u>SECTION V:</u> Engineering back up support	32-35	82-91
A. Many institutional support desirable but start with basic ones (para 82-85)		
B. National basic institutional support (para 86-88)		
C. Necessary technical/engi- neering institutional back up support (para 89-91)		
<u>ANNEX A:</u> Elements of upgrading production facilities	36-39	

SUMMARY

- (i) Before one discusses even the basic elements of production promotion of agricultural machinery in Africa, it is imperative that certain pre-requisites with respect to the national policy and plan of action are to be clarified, confirmed and elaborated. Some of the major questions that only the Governments of the developing countries of Africa can answer are - is appropriate agricultural tools, implements and machinery important for African agricultural development? Were rational objectives elaborated through national agricultural mechanization policies? What products are necessary and relevant for agricultural mechanization and/or rural development? What national capabilities exist for local production? What are industrialization policies and the scope of agricultural machinery sector? What are the national programmes of action?
- (ii) It should be noted that if the above aspects are defined, then the technical solutions for the promotion of local development and manufacture of agricultural tools, implements and machinery in Africa will become easier, practical and viable. It should be also noted that it does not mean that one can not find and initiate technical solutions if positive answers are not found or developed on all above numerous questions. Agricultural machinery subsector - if sufficient demand exist or could be created - could be taken up for manufacturing promotion as an independent entity with appropriate interlinks with ancillary industries and basic facilities. On the other hand, if the demand figures are low at present, then agricultural machinery subsector could be incorporated with other engineering products to facilitate a viable total production volume, with due emphasis on ancillary industry interlinks.

- (iii) Thus the approaches for promotion of local production of agricultural tools, implements and machinery within the framework of engineering industries at a national level could be realized through (a) establishment of a new plant or (b) upgrading of existing production facilities.
- (iv) However, there is a need for the Government to establish/strengthen policy level inter-ministerial mechanism to develop integrated programmes of action with viable techno-economic solutions as summarized below:
- (v) The policy/technical aspects: integrated development of engineering industry including agricultural machinery: inter-ministerial, multi-disciplinary mobilization of manpower/resources to define the product group needs for rural sector, rationalization of product groups/products/component into manufacturing technological aspects and promotion of engineering industry including agricultural machinery in an integrated but on a horizontal diversification/specialization basis.
- (vi) Technical aspects: upgrading of existing engineering production facilities for manufacture of agricultural machinery: production expansion/product diversification in existing engineering manufacturing units through appropriate upgrading of facilities. This is based on the fact that some engineering production facilities do exist in the developing countries of Africa, and there is a need to provide African farmers with appropriate low cost agricultural tools, implements and simple machines. The immediate solution is to strengthen existing manufacturing units to produce some required agricultural machinery.

(vii) In this context, there is a need to strengthen and /or establish appropriate institutional support services. These may be at Government policy/planning level, national technical level and production unit/factory/industry level. It is to be noted that development of Government level policy institutional infrastructure/facilities are complex and will involve total development plans. On the other hand, the blacksmith/rural family units and small/medium scale industries of Africa have no capabilities to initiate and implement plant level engineering institutional activities. Therefore, there is a need for the Government to strengthen and / or establish national level engineering/technical back-up support institutional facilities. These are primarily in the area of (i) engineering design, development and industrial liaison through transformation of applied R+ D into commercialization and (ii) engineering/technical common services including raw material bank, quality control, tool room, engineering services in design, machinery selection and process planning etc.

(viii) Thus the major questions and critical elements of the issue are:

- what are the policies of the Government on promotion of agricultural machinery industry in specific terms? What is the mechanism to implement? What are programmes of action?
- On an integrated policy level basis, what mechanism the Government has established to promote engineering/capital goods industry including agricultural tools, implements and machinery with emphasis on rationalization in manufacture, development of ancillary industry and promotion of basic facilities such as foundry, forge, gear shop, heat-treatment, etc., with due consideration to horizontal integration?
- on a technical-economic term basis what steps are to be taken to upgrade existing production units - blacksmiths/ rural units, small scale/medium scale primarily for production expansion and product diversification in agricultural machinery sector, If so, what products? How many? And how?

- What national engineering/technical back-up institutional support has been thought of? How to strengthen existing one or establish new ones in the areas of (i) engineering design and development and (ii) engineering common technical services.

SECTION I

CONSIDERATION ON SOME BASIC PREREQUISITES 1/, 2/

A. IS APPROPRIATE AGRICULTURAL MACHINERY IMPORTANT FOR AFRICAN AGRICULTURAL DEVELOPMENT?

1. The Lagos Plan of Action calls for "agricultural revolution". Will this not also call for the provision of industrial input, for agricultural development and industrial processing of agricultural production? In this context, appropriate agricultural tools, implements and machinery - which is regarded as one of the major industrial inputs for agricultural development all over the world - is also important and relevant to the development of Africa? Can African agricultural development and - on a parallel basis - African industrial development and rural industrialization promotion be achieved without judicious application of application of appropriate agricultural tools, implements and machinery? If not, then is agricultural tools, implements and machinery not a very important element for agricultural and industrial development? If so, is it not imperative that viable programmes are to be developed, initiated and implemented by the Governments of African countries for the promotion of agricultural tools, implements and machinery sector? If so, is it not absolutely essential that this will require joint and cooperative actions by the Ministry of Agriculture and Ministry of Industry as a focal point for national action?
2. If the answer is affirmative in general and if the need for promotion of agricultural machinery sector is accepted at a national policy level, and if basic steps are initiated to formulate integrated national level programmes in this area, then only, the modalities of implementation aspects will be meaningful to achieve national objectives.

Note: The number in bracket refers to the reference documents

1/ diagnosis of the present situation and trends of production and utilization of agricultural machinery in African countries. UNIDO 1932

2/ proposition paper for issue No. 1: diagnosis of the situation of agricultural Machinery in Africa. UNIDO 1982

B. WERE NATIONAL OBJECTIVES ELABORATED THOROUGH NATIONAL AGRICULTURAL MECHANIZATION POLICIES?

3. As national agricultural mechanization policies is a function of complex elements and involves an intermediate/long-term planning of strategies, only the Governments of developing countries of Africa can develop and implement their own agricultural mechanization policies and plans.
4. The question is, how many Governments have undertaken this exercise. How detail the policies have been elaborated. Is it possible to develop a technical and techno-economic solution? In other words, does the national agricultural mechanization policies define the priority on small, medium and large farming systems and clearly elaborate the weightage on manual, animal and power-operated labour with reference to agricultural tools, implements and machinery?

C. WHAT PRODUCTS ARE NECESSARY AND RELEVANT FOR AGRICULTURAL MECHANIZATION AND/OR RURAL DEVELOPMENT?

5. Assuming that agricultural mechanization and/or rural development policies could be transformed into possible product requirements, are the required products specified by national technical authorities? If so, what are the products, product specification in the area of agricultural tools, implements and machines with emphasis on manual-, animal- and power-operated labour sources?
6. Has the Government made at least a pre-feasibility analysis on product, specification, potential and demand? How deep this studies are from the techno-economic point of view. Has any feasibility, pre-investment and investment analysis conducted on any specific product/product groups. In other words, do the national Governments have a specific product specification and demand list?

7. In this context, has an analysis been done to define what products could be locally developed and manufactured, what products could be assembled and manufactured through collaboration arrangements and what products have to be imported for some time to come?

D. WHAT NATIONAL CAPABILITIES EXIST FOR LOCAL PRODUCTION?

8. Assuming that national ABC analysis has been conducted on what products to develop/manufacture, to collaborate/manufacture and continue to import, has the Government analysed the national capabilities for local production? How deep and thorough?
9. In this context, what are national capabilities in engineering design and development and transformation of applied R and D to manufacturing promotion? What positive contribution by national agricultural machinery institutions and other national mechanical engineering institutions (assuming that they are engaged in agricultural machinery area also) has been achieved during the past 5 years? What are the results?
10. What are the national capabilities (mobilization of inter-ministerial and multi-disciplinary resources) for analysis on investment promotion, negotiations, technology transfer and investment project implementation? What agricultural machinery product has been taken up for this exercise from the past 5 years? What are the results?
11. What production facilities - public and private sectors - at blacksmith, rural small and medium level exist in the mechanical/metallurgical engineering field in the country? Has the Government undertaken an analysis of the constraints and bottlenecks of existing engineering production sector with a view to remedy and improve? What are the policies?

E. WHAT ARE INDUSTRIALIZATION POLICIES AND THE SCOPE OF AGRICULTURAL MACHINERY SECTOR?

12. The major questions to be asked and answered are on: what is the national Government policy on engineering industry development and production? What emphasis and weightage is given for promotion of blacksmiths, rural small industry and medium level industry?
13. Regarding agricultural machinery - with due consideration to agricultural hand-tools, animal-drawn implements and power-operated equipment, - what priority is given to the product group and the corresponding level of production?

F. WHAT ARE THE NATIONAL PROGRAMMES OF ACTION?

14. The major choices available are: is the Government's policy on promotion of agricultural machinery giving priority on upgrading of existing engineering manufacturing facilities and promote product diversification/production expansion? Or is the priority on development of total engineering sector and upgrading/establishment of basic facilities? As the above two approaches are complementary, has the Government developed parallel actions? What progress has been achieved up to now?
15. As any programmes for development and manufacturing promotion of agricultural machinery and/or engineering industry/capital goods require corresponding development of engineering back-up support, what steps have been undertaken by the Government? What specific actions have been taken up to promote institutional development in (a) engineering design and development; (b) industrial engineering and process planning; (c) repair and maintenance; (d) common engineering facilities/services; (e) marketing; (f) finance; (g) management; (h) training; (i) extension, etc.

How far these measures were effective at a national level?
What are its positive effects on promotion of local agricultural machinery industry?

G. MANY QUESTIONS - BUT FEW POSITIVE ANSWERS

16. The above queries have many questions. It may not be possible to answer all of them positively and it may not be possible to develop all programmes of action. But a start-up should be undertaken to analyse this sector together with other appropriate required engineering products from a national point of view with emphasis on policy solutions with due consideration to the techno-economic aspects.

17. It should be pointed out that such an indepth analysis and formulation of integrated programme of action is not necessarily a pre-requisite for development and promotion of local agricultural machinery industry. A start-up should be made to upgrade existing engineering production facilities with emphasis on agricultural machinery production expansion/product diversification. On a parallel, but separate basis, integrated development of capital goods/engineering industries should be initiated. In addition, to meet the requirements of both above actions, a programme to strengthen/establish engineering back-up support is to be initiated on a priority basis.

SECTION II

AN INTEGRATED APPROACH TOWARDS MANUFACTURE OF AGRICULTURAL
MACHINERY

A. PRESENT STATUS BASED ON DIAGNOSIS

19. The main features of present situation and agricultural machinery demand a local production in existing industries in Africa could be summarized as follows:
- fundamental lack of agricultural equipment suited to African conditions and in particular to the needs of small farmers;
 - decline in demand and widening gap between potential demand and actual needs;
 - unbalanced investment on import of heavy agricultural equipment;
 - complex and ad-hoc features of demand for agricultural equipment;
 - limited production means and equipment in small and medium size enterprises;
 - small artisanal production considered to be essential but ignored in reality;
 - limited local production to meet the internal demand which is primarily met through imports;
 - major bottlenecks and constraints faced by existing enterprises;
 - ad-hoc, isolated and non-interlinked actions on manufacturing development based on ad-hoc policies.

B. NEED FOR INTEGRATED APPROACH

20. An integrated approach towards local manufacturing promotion of appropriate agricultural tools, implements and machinery by the developing countries of Africa will call for an interrelationship between agriculture and industry. This will also call for a judicious interdependence on agricultural mechanisation and local manufacture of agricultural machinery.

21. The integrated approach should take into account the challenges until the year 2000 and the political objectives declared by the African states. The major elements required to develop such an integrated approach could be defined only after clearly knowing what technologies of agricultural mechanization will be followed, what are the agricultural machinery equipment and products necessary and which could be locally manufactured. In other words, the question of "how to produce" should be considered after answering "what is to be produced".

C. THE BIG DILEMMA

22. In majority of African countries there is an immediate need and demand for selected agricultural tools, implements and machinery. The big dilemma is:

- SHOULD ONE PROMOTE SPECIFIC AGRICULTURAL MACHINERY PRODUCT MANUFACTURE?

(either through: *Establishment of new agricultural machinery production units

or *Upgrading existing engineering units for production expansion/product diversification of specific agricultural machinery)

- SHOULD ONE PROMOTE POLYVALENT ENGINEERING/METALLURGICAL PRODUCT MANUFACTURE (WHICH INCLUDES AGRICULTURAL MACHINERY ALSO)?

(either through: *Establishment of new Polyvalent production units

or *Upgrading existing engineering/metallurgical manufacturing units for polyvalent product diversification).

D. CRITERIA FOR NEW UNIT ESTABLISHMENT AND TECHNICAL PARAMETERS
FOR PRODUCTION

23. The basic criteria for establishment of any new production unit (either specific agricultural machinery or polyvalent engineering products including agricultural machinery) is the total demand, volume of production, techno-economic aspects, technological level of manufacture and potential for backward - forward interlinks in manufacture.
24. The degree of complexity of the product, the level of sophistication, the type of raw material required, the desired level of quality control, the production volume, unit cost of product, the interrelationship with ancillary and supporting industry, the nature of inputs and degree of required labour skill, the degree of labour intensity, the geographical parameter of marketing and necessary marketing and after sales service/repair and maintenance infrastructure, the magnitude of finances are some of the relevant elements that establish the critical parameters for the type of production unit, selection of production facilities and more than all the technology of production.
25. In this context, the most important aspects to be considered regarding establishment of a new production unit are:
- what are the existing manufacturing facilities in the country. Has it sufficient capacity for production expansion and what additional inputs are necessary;
 - in what ways the product could be designed/adapted so that it can perform multi-functions. In this context, what components could be graped together, rationalized and/or standarized with emphasis on production processes and technology;
 - which components/products could be manufactured through existing manufacturing facilities;
 - what are the minimum physical requirements in terms of production facilities for a new factory, taking into account the ancillary industry linkage;
 - considering a given production volume, the possibilities of establishing a number of smaller production units or one single unit.

E. PRODUCTION LEVELS: TYPES OF PRODUCTION UNITS

26. Considering the wide range of engineering/metallurgical products including agricultural machinery and implements and widely variable complexities of products, there are at least three distinct possible types of production units as highlighted below:
27. Rural family worker/ownership units: these are primarily either rural blacksmith/artisan level or sometime up-dated small workshop level employing 1-5 persons where production is carried out by manual operators and seldom/with very limited application of power operated machines. The most basic characteristics of these units are inbuilt family management in material procurement/production/marketing/finance. In addition production is based in self contained simple facilities, and except for basic recovered raw material, nothing else is purchased from outside.
28. Small scale/industrial estate workshops/enterprises: these are production units with a mix of manual-operated machine tools and power-operated simple production machinery with a degree of engineering management systems primarily situated in urban areas or periphery of towns employing 15 - 100 persons. These may be on single person ownership, partnership, co-operative or Government-aided/owned production units. The production system is on a "bread and butter line" (selected basic products on a continuous basis) with some organized outside job, or on batch production systems or provision of services (repair and maintenance, ad-hoc outside jobs, ad-hoc spare parts fabrication etc.) These units have some organized material procurement/production/marketing/financial management systems. Limited supporting facilities (foundry, forge, etc.) may exist and in addition to basic raw material, selected components and hardware is purchased from outside. These units are capable of acting as subcontractors of components to medium/large manufacturing industry.

29. **Medium/large industries:** these are normally based on specific product/product group production as the main activity employing 100 - 1000 persons (sometimes more). The manufacture is based on relatively high volume with both conventional and semi-automatic/automatic/special purpose machines. Selected supporting industries such as foundry, forgeshop, heat-treatment, tool room, quality control laboratory etc., normally exist within the industrial complex or have the capacity to procure necessary products/services from outside sources. These industries have well-established and operating material procurement, production, marketing and financial control systems. The manufacturing programme is based on import of selected components, local purchase of components through ancillary industry and production of selected components within the factory and overall processes to produce finished final products.

F. TECHNO-ECONOMIC ALTERNATIVES IN PRODUCTION PROGRAMME

30. Accepting the three categories of product groupings (a. simple, b. intermediate and c. power-operated) and three production levels (i. rural family worker/ownership units, ii. small-scale/industrial estate and iii. medium/large), the technical parameters give possible alternatives in production programme as detailed below:
31. Simple engineering products including simple agricultural implements: these could be manufactured in all of the developing countries of Africa in rural family worker/ownership units and/or small scale industry/industrial estates. In addition, if the demand is significant and desired total production volume is high, then the production target could be met through a limited medium scale industry or 1-2 large factories.

32. Intermediate engineering products including appropriate agricultural implements/machinery: these could be manufactured in most of the developing countries with appropriate common engineering and industrial services/infrastructure facilities in small scale industry/industrial estate. In addition, if the demand is significant and the desired total production volume is quite substantial, it could be manufactured in a few medium scale industries.

G. NEED FOR BACKWARD-FORWARD LINKAGE

33. When formulating a programme for local manufacture of appropriate agricultural tools, animal-drawn implements and intermediate agricultural equipment by most of the developing countries of Africa, and standard power agricultural machinery by a selected few, the following policy-technical aspects will have to be taken by the Governments:
- promotion of local manufacture of appropriate agricultural machinery to meet the industrial input requirements for agricultural development as well as rural industrialization;
 - maximum possible incorporation of agricultural machinery with other appropriate engineering and metallurgical products that could be locally manufactured to meet the requirements of other sectors (transport, land development, irrigation, construction, mining, forestry, energy, consumer and industrial sectors, etc, as well as spare parts requirements);
 - interrelationship with physical/operational requirements of a new factory with respect to the optimum utilization of the existing capacities/facilities through rationalization;
 - maximum possible utilization of downstream side of existing raw material processing plants (such as iron and steel mill, re-rolling plant, general foundry, forge etc., as well as wood working plants);

- maximum possible development of basic facilities, promotion of ancillary industries, spare parts manufacture and establishment of subcontract relationship between ancillary industry and manufacturing plants;
 - within the above framework, upgrading of existing engineering industries for production expansion and product diversification;
 - establishment of interlinks with production units and engineering design/development and adaptation and back-up support institutional facilities;
 - in this context, promotion of programme development with emphasis on polyvalent product design, production techniques, production facilities and basic facilities. In some special cases, specific programmes for specific agricultural machinery development/manufacture may be required.
34. Thus the interlink is an important aspect to be considered first before any actual production programme is elaborated. Such maximum possible interlinks are to be incorporated in all production programmes either through establishment of new units and/or upgrading of existing facilities.

H. A MECHANISM FOR INTEGRATED AND INTERLINKED APPROACH

35. Unfortunately the agricultural machinery manufacturing subsector in the developing countries including in those of Africa is an "orphan"-not really fostered - either by the Ministry of Industry or through joint programmes. While the Ministry of Agriculture is interested in application, there has been no appreciable progress in possible local manufacture through lack of dialogue and joint action programme by the Ministry of Agriculture and the Ministry of Industry.

36. Therefore, it is very important that the first step is establishment of an interlink between the Ministry of Agriculture and the Ministry of Industry. Presentation of a joint programme of action to the Ministry of Planning on local manufacture of agricultural machinery to meet the requirements, can be regarded as the basic step.
37. At the same time, the Ministry of Planning may take necessary steps and establish guidelines for promotion of agricultural machinery manufacturing programme within the framework of total national level engineering product requirement or as an independent entity concerning agricultural machinery alone. Both approaches may involve establishment of new plants or upgrading of existing facilities. This will call for specific policy and legislative actions incorporating incentives.

I. POLICY-TECHNICAL DECISIONS AND TECHNICAL FOLLOW UP

38. In case the planning strategy involve total national engineering/metallurgical product requirement analysis (including agricultural machinery and implements) and a horizontal manufacturing programme development, then there has to be an inter-ministerial mechanism to define the requirements of various sectors such as industry, construction, rural development, mining, transport, irrigation, energy etc.
39. On the other hand, if it involves agricultural machinery alone, the inter-action between the Ministry of Agriculture and the Ministry of Industry is sufficient. In this context, it is recommended that maximum attention is given to the possible upgrading of existing engineering units to produce required agricultural machinery. In this context, it should be noted that policy level directives and legislative actions involving incentives are basic steps to encourage the existing enterprises to upgrade resulting in production of agricultural machinery involving new product lines or expansion of existing production volume or product diversification. The various aspects of upgrading of existing enterprises as a follow up is primarily technical in nature involving techno-economic features.

40. Thus the actions required for promotion of agricultural machinery manufacturing sub-sector in the developing countries of Africa may be summarized as follows:
- POLICY/TECHNICAL ASPECTS: integrated horizontal development of engineering industry including agricultural machinery;
 - TECHNICAL ASPECTS: upgrading of existing engineering production facilities for manufacture of agricultural machinery

SECTION III

POLICY-TECHNICAL ASPECTS: INTEGRATED HORIZONTAL DEVELOPMENT
OF ENGINEERING INDUSTRY INCLUDING AGRICULTURAL MACHINERY

A. THE BASIS

41. The agricultural machinery industry is basically of a mechanical/metal working nature. Generally classified under engineering, metallurgical and capital goods industry, the basic facilities of the agricultural machinery sector consisted of production facilities and services which could act as the nucleus for horizontal industrial integration. At the lower level of integration, those facilities were simple such as welding and fabrication shops with ancillary wood-working shops, heat-treatments, etc. At higher levels of manufacture, the facilities included malleable, spheroidal and non-ferrous foundries, steel foundry, gear and transmission shops, surface treatment plants, tool rooms, complex heat-treatments, with ancillary plants producing rubber, electrical, plastic and other components. Where a number of small factories are to be established, some of the basic facilities could be set up as common facilities.

42. Thus as agricultural machinery sector incorporates a wide range of products from simple hand-tools extending up to power/specialized machinery, fits into varied manufacturing levels and technology from rural units to large factories and is allied to engineering sector at various stages from metal working/metallurgy to ancillary industries. In principle it is within the family of "Engineering and Capital Goods". Therefore, emphasis is to be given on development of basic facilities and services for promotion of agricultural machinery industry within the framework of allied industrial development.

43. Therefore, at the planning stage consideration should be given to such factors as the range of products, production volume, raw material requirements, standardization and quality control, backward and forward linkages, skills requirement, market potential, financial requirements and design development. Another important factor would be to decide to have either a large production unit or a number of small units that would collectively provide the same volume of production yet greater employment opportunities. The additional advantage in the latter alternative would be forging of links between basic facilities and rural industries.
44. The setting up of basic facilities through vertical integration might not be economically viable in the absence of adequate demand. It might therefore become necessary to establish basic facilities through horizontal integration. In effecting such horizontal integration, regional complementarities should be considered.

B. METHODOLOGY

45. In order to establish a "bench mark" for necessary basic facilities and services with due regard to the agricultural machinery sector, it is first necessary to consider the technological level of production for all required rural engineering products including agricultural tools, implements and machinery. This will require the possible grouping of products, the analysis of different production levels, possible matching of product groups to production levels taking into account not only techno-economic aspects but also socio-economic cultural and political factors. As the next step it is desirable to view the basic facilities and services with reference to specific production levels separately and then explore ways and means of integrating the same with other allied industries and basic facilities.

46. What are "basic facilities and services"? The "facilities" are the production facilities which are the nucleus for horizontal integration of industries. At the "grass root level" of integration, the elementary basic facilities are grey cast iron foundry, forge shop, press shop etc. At higher levels malleable, spheroidal and non-ferrous foundries, gear and transmission shop, surface treatment plants, as well as ancillary industries in rubber, electrical plastic components may be included. The "services" are complementary, but integral elements of production such as heat-treatment, tool room (jigs, fixtures, and tools) quality control etc. It is to be pointed out that these "facilities and services" could be also established as a part of "vertical integration" with reference to a specific product/product mix within a manufacturing plant if the production volume justifies full utilization of the capacity and magnitude of investment. However, in principle in most of the developing countries of Africa such high volume production of agricultural machinery and implements may not be possible to start with.

C. TECHNICAL PARAMETERS FOR PRODUCTION

47. The degree of complexity of the product, the level of sophistication, the type of raw material required, the desired level of quality control, the production volume, unit cost of product, the inter-relationship with ancillary and supporting industry, the nature of inputs and degree of required labour skill, the degree of labour intensity, the geographical parameter of marketing and necessary marketing and after sales service/repair and maintenance infrastructure, the magnitude of finances are some of the relevant elements that establish the critical parameters for the type of production unit, selection of production facilities and more than all the technology of production.

48. Therefore, the alternatives to be considered are (a) if "basic facilities and services" are established within a manufacturing unit, how to achieve full capacity utilization through manufacture of appropriate parts/components and relevant services to other allied industries? and (b) if the basic facilities and services are to be established as independent units, how to design the project which will be basic to serve all allied industries? In both alternatives the basic pre-requisite is an indepth analysis of which industries could be served, what components and parts could be manufactured. At what production volume level? At what cost and at what magnitude of investment? In addition to basic facilities and services, the "supporting industries" such as appropriate working, hardware and ancillary part and supporting services such as applied design, adaptation and development; repair and maintenance, marketing etc., also play an important role in defining the scope of basic facilities and services.
49. However, from a socio-economic and political point of view, it is the Governments of the developing countries of Africa who have to make a decision on the strategy/policy aspects as well as on the choice of production levels/type of production units with reference to three product groups taking into consideration the various technical parameters and alternatives detailed above.

D. PRE-REQUISITES

50. The first and basic pre-requisite is an indepth analysis of the type and volume of rural engineering products and urban requirements as well as agricultural tools, implements and machinery (on individual products as well as product grouping basis). As a follow-up, an exhaustive estimate of demand volume for next few years to be developed based on anticipated implementation of country's economic/agricultural/industrial development policies. This will give an anticipated demand projection on a product grouping basis.

51. The next pre-requisite is the transformation of Government policies on industrialization into specific type/levels of production units to be promoted in the country in each product group. This will establish the base line to formulate an implementation programme to manufacture specific product groups (simple, intermediate, and powered agricultural equipment) at specific production levels (rural family worker/ownership units, small scale/industrial estates, and medium/large industry) and detail the basic facilities and infrastructure needed for successful realization of the production programmes.

E. STEP BY STEP APPROACH

52. This approach will involve a series of policy actions by the Government followed-up with technical level implementation programmes. This concept assumes that one of the most suitable approaches towards the promotion of the agricultural industry could be the establishment of basic manufacturing facilities and services prior to or besides the start of the manufacturing project for a particular group of machinery.
53. The following line of action could be considered for the development of basic facilities and services:
- orientation of the agricultural machinery manufacturing concept from a specialized, fully vertically integrated process (suitable to high volumes) to a combined purchase-production-assembly type of operation, as common in all industrialized countries;
 - widening of the range of end products from agricultural machinery to associated sectors is equally vital for the development of the rural activities (transportation, watering, housing, power generation);
 - aiming at an increase of the volume of production especially in areas where the market for agricultural machinery only is, at least, initially very limited, by entering the market of machinery for related sectors;

- reaching the industrial stage of the production of semi-finished/complete components or sub-assemblies, that are necessary for a number of local industries as well as for the crucial availability of spare parts supply for imported machinery;
- broadening the purchase volume of materials/special components to be imported from industrialized countries by concentrating, standardizing, rationalizing the requirements for various end-product manufacturers in a particular country and channelling them through the basic facility involved in the manufacture of the semi-finished/sub-assembly goods;
- specializing training and technical skill required for the production of agricultural machinery, in view of the specific aspects of the machining/assembly/testing process, leaving to the basic facility the task of acquiring the technology and expertise needed for the manufacture of the basic components.

F. THE IMPLICATIONS

54. The basic approach is complex, multi-disciplinary and will involve more of Government policy/legislative action for defining total needs for rural and urban sector - which may include products/product groups to meet the requirements of rural sector, rationalization of product groups/products/components into technological manufacturing aspects and promotion of engineering industry on a horizontal diversification/specification basis.
55. This basic approach includes agricultural machinery as well as all other appropriate engineering products primarily to meet the requirements of rural sector (agriculture, transport, construction, domestic, rural industrialization, spare parts, etc.) and treats agricultural machinery sector as an integral element of engineering sector in general and capital goods sector in particular.

56. This basic approach is based on an assumption that the Governments of developing countries of Africa have awarded significant emphasis to development and local manufacture of appropriate agricultural machinery and implements, within the framework of rural development and rural industrialization. It also assumes that the Governments have a mechanism to undertake a complex analysis of rural engineering product needs and rationalization of production facilities. This will involve: identification of total spectrum of rural engineering needs and products, integrated programmes on adaptation of existing machinery; development through design and prototype fabrication of equipment; promotion of local manufacture through rationalization, in-plant training and co-operation between national institutions and manufacturers in all engineering areas, introduction of appropriate production techniques, marketing and extension services at national levels and promotion of local manufacture of appropriate products, taking into account the need for introducing high employment potential production techniques with emphasis on utilization of domestic resources and with particular emphasis on the development of small and medium industries with a view to promoting rural industrialization.
57. Therefore, this approach emphasizes the establishment of common basic facilities - such as foundry, forging, tool room, heat-treatment, etc. - at a national level. This approach may not necessarily depend on ultimate products to be produced. This approach will facilitate accelerated promotion of horizontal integration. However, such facilities should not be established in a vacuum. The basic facilities are in principle a service unit in industrialized countries. But for developing countries in general and for Africa in particular it is recommended that it should take into account the possible products in the engineering field including agricultural machinery and the "basic facilities" should be established with an in-built "bread and butter product line". That means, the basic facility should at least cater its 40-60% of its production capacity for a well-defined product production on a regular basis and the balance production capacity is to be used for promoting horizontal integration, jobbing to others as sub-contractors etc.

C. THE GOVERNMENT ACTION NEEDED

58. In order to promote agricultural machinery sector within the framework of development of engineering/capital goods industries with emphasis on intermediate/long-term objective, there is a need to initiate an inter-ministerial, multi-disciplinary programme of action by the Governments of developing countries.
59. The technical aspects of such a programme will include:
- identification of products;
 - selection and adaptation of technology suited to local conditions;
 - specification of facilities to be set up and services required;
 - continuous flow of information on product and process improvement;
 - scheduled supply of raw material, finance, manpower;
 - manufacturing programme elaboration; etc.
60. The policy planning programme will also involve:
- promotion of basic facilities and services in rural industrial sector;
 - interlinking small/medium industry in industrialized/selected developing countries with small/medium industries of other developing countries for promotion of appropriate basic facilities and services and investment promotion;
 - ways and means of promotion of horizontal integration through well-defined national basic facilities and services; and
 - establishment of guidelines on incorporation of basic facilities/services in manufacturing contractual agreements and investment promotion.
61. This basic approach does not exclude initiation of upgrading actions. It is to be mentioned that while basic approach will involve first policy measures at national Government level with technical follow up, the upgrading follow up will involve mainly technical measures at factory/industry level with modest policy support by the Government.

SECTION IV

TECHNICAL ASPECTS: UPGRADING OF EXISTING ENGINEERING PRODUCTION
FACILITIES FOR MANUFACTURE OF AGRICULTURAL MACHINERY 3/

A. JUSTIFICATION

61. This technical approach is primarily to "demistify" the so-called complex nature of agricultural tools, implements and machinery requirement and production in developing countries of Africa. It is based on the fact that the failure in launching agricultural machinery production in developing countries of Africa was partly due to the fact that in the past this subject was always discussed in terms of planning, strategy, financing, marketing, demand, never involving technology. In all developing countries of Africa there are some stronger or weaker production capacities that can be used, with less or more upgrading, for the production of agricultural machinery. The simpler way one can adopt the stronger are one's chances for success.
62. The major problem facing the African developing countries today is a continued recurrent imbalance between agricultural food production and ever-growing population both in the rural and urban areas. The economy of most of the African developing countries is broadly based on rural agriculture, with

3/ Measures for upgrading the production capabilities in the agricultural machinery industry in Africa (by consultants: SORES) UNIDO 1982

limited levels of industrialization both in engineering and allied metal working sector. In many countries, the agricultural share is 90% of the total exports. Human labour and utilization of animals are the major inputs in the overall rural farming system. The tools and equipment available for farming are often inadequate and poor in quality. In vast areas irrigation is carried out mainly from the seasonal rainfall. The so-called mechanization level attributed to the farming operations is confined to the application of traditional hand-tools and simple animal-drawn equipment. The cultivation of techniques are often based on past conventional and traditional methods. To a great extent the manufacture of agricultural hand-tools and implements are often undertaken at village blacksmith level without sufficient technological and engineering back-up support facilities.

63. It is true that the term "Agricultural Machinery" covers a wide spectrum of products from hand-tools, animal-drawn implements and hand-operated machines, irrigation equipment, crop protection machinery to power machinery and equipment such as tractors, power tillers, engines and combines. Consequently, the agricultural machinery is not just "tractorization". The manufacturing capability varies from blacksmith/rural workshop level to large factories. But with reference to the present and immediate future conditions, potential and opportunities for agricultural machinery in Africa, with emphasis on local production, the agricultural hand-tools, manually-operated equipment, animal-drawn implements and simple low cost power equipment are to be considered on a priority basis.

64. In this context, a number of machines and equipment developed in selected other developing countries (such as manually-operated dusters, sprayers, maize shellers, threshers, seed treaters, chaff cutters, animal-drawn improved implements such as seed drills with fertilizer distributors, planters, etc.) are not yet being manufactured in developing countries of Africa, primarily due to lack of communications, transfer of technology and adaptation difficulties.
65. In addition, selected machines and equipment developed by certain national and international institutes (example: small power tiller, weeder, power threshers, simple seeders, batch drier, seed cleaners, herbicide applicator, etc.) are suitable for promotion for local manufacture in selected countries of Africa. There is also a need to develop new simple machines and equipment based upon the experience and adaptation of designs suited to dry land farming.
66. There are some mechanical/metallurgical engineering production facilities in the developing countries of Africa. There is a need for simple and intermediate agricultural tools, implements and machinery. Therefore, the main emphasis is to be focused on how to start some production, a modest expansion and some new development utilizing existing production facilities. One should not promote-at the start - the consideration of all factors to initiate a national action. The problems will become too complex and there will be no start made. So, one should consider a "start up" approach to break the present stagnation. Once a modest viable process of decision-making and a modest additional production start, then the situation will become self-dynamic and countries will make next step further decisions. In other words, through a methodology to upgrade existing production facilities, it is possible to keep the problem as simple as possible to facilitate quicker decisions on a modest scale which will act as a "spring board" for next set of more complex decision by policy/technical authorities of the African Governments.

67. Thus, the technical upgrading approach is primarily through agricultural machinery product based production expansion/production diversification in the existing agricultural machinery/mechanical/metallurgical engineering manufacturing facilities through upgrading existing production and technical facilities. This may be regarded as an approach not necessarily to solve the national requirements/problems in total. The actions required are primarily at factory/industry management level with emphasis on technical solutions. The policy and legislative support from the Government are important, but may be regarded as marginal or modest. In other words, the initiative is at factory/industry management level.

B. PRODUCT RANGE

68. Considering the majority of the developing countries of Africa, - with due consideration to the size of holdings, the farm income, the agricultural technology at present farming level etc., - the need for agricultural machinery, which may have a potential for local production are simple agricultural tools, animal-drawn implements, manually-operated equipment and simple low cost power-drawn implements. The following are broad-based categories:

Category I: Hand tools such as hoe, machettes, spades, weeder, (simple) knife, sickle, ax, pick-ax, shovel, etc.;

Manually-operated equipment: pedal thresher, hand-sprayer, corn sheller, cassava, puller/chopper, hand pump, chaff cutter, storage bins etc.;

Animal-drawn implements/ equipment: plow, cultivator, leveller, ridger, seeder/fertilizer drill, pump, sugar-cane thresher, reaper, cart, etc.

Category II: Tractor-drawn basic implements: plow, cultivator, (intermediate) harrow, leveller, seed drill reaper, trailer;
Simple low cost low HP power equipment: power thresher, pump, chaff cutter, corn sheller, peanut decorticator, rice mill, hammer mill, power tiller, low HP engine, etc.

Category III: It is to be noted that standard tractors, engines, (standard) pumps, harvest and post-harvest technology equipment systems may be applicable to a few countries from a local manufacturing point of view.

- (note: (i) The above list of products is not necessarily exhaustive.
(ii) Category IV: specialized machinery such as complex high-HP tractors, combine harvesters, special crop machinery is not considered for Africa from the local manufacturing point of view, at the present)

69. Although the category I and II and in some cases category III agricultural machinery could be mentioned as those which African developing countries require in principle, the actual and specific products needed are to be determined by each developing country of Africa.

C. WHY TO UPGRADE

70. With due consideration to the present status of mechanical/metallurgical industries in Africa, the existing manufacturing facilities may be classified into following three levels:

Level A: Blacksmiths and rural worker/family owned units
(with or without electricity)

Level B: Small scale and medium scale production units

Level C: Medium scale industry and in very few cases large scale industry.

- 71 . A programme to upgrade existing facilities of engineering production units in general and agricultural machinery production units in principle will result in production of agricultural tools, implements and machinery at an early date with minimum investment. The output will be
- (a) increased production volume of presently produced product/products
 - (b) and/or increased volume of production with additional new products
 - (c) and/or increased value added.
- In all these aspects, the improvement of quality and reduction of production costs are to be in-built elements.

D. NUMEROUS ANALYSIS OF CONSTRAINTS BUT FEW ACTIONS

72. A number of surveys, diagnostic analysis, fact finding missions, techno-economic analysis, etc., have been conducted in most of the developing countries of Africa on the status of engineering production sector in general, and agricultural machinery manufacturing units in particular. Many reports, technical documents, and manuals have been written highlighting the constraints, bottlenecks, problems of the manufacturing units. The present problems may be enumerated as follows:
73. At rural family units and small scale industry level, the problems are: (i) inadequate finance and unstable markets; (ii) lack of low-cost improved production facilities; (iii) lack of improved designs; (iv) lack of suitable materials, particularly high-carbon steel and hardware; (v) lack of suitable machinery and equipment and heat-treatment facilities; (vi) lack of suitable production technologies.

74. At medium and large scale level the problems faced are somewhat different. However, main problems may be summarized as follows:
- (a) lack of sufficient internal markets and export outlets;
 - (b) lack of suitable designs. In many cases those supplied by foreign collaborators need modification for local use;
 - (c) uncertainties in supply of spare parts, which often lead to machine breakdowns and plant stoppages;
 - (d) higher production costs caused by low productivity;
 - (e) increasing prices of raw materials;
 - (f) lack of technical personnel at the middle management level;
 - (g) lack of training facilities, particularly at the operator level;
 - (h) insufficient working capital;
 - (i) substitution of high-quality parts with lower-quality ones to save money. This is false economy and reduces customer satisfaction.
75. There is no overall solution to these problems. Individual agricultural machinery manufacturing units must analyse all of the major problems that hinder their production. However, production expansion and product diversification could be achieved through modest upgrading of the facilities with appropriate organizational/management/training aspects at factory/industry level. In order to facilitate factory/industry management to undertake such upgrading, there is a need for the Government to provide appropriate incentives, benefits, facilities and institutional support with respect to engineering design, finance, common engineering facilities, training, etc.; as well as raw material supply, marketing facilities and technical guidance/services. This will call for the Government to establish a mechanism to provide these services to agricultural machinery production sector on a priority basis.

76. What is necessary is to make a start to upgrade one level to the next level in terms of production volume, product range and product mix with in-built quality control and cost reduction elements.

E. HOW TO UPGRADE

77. Although, more agricultural machinery could be produced either through establishment of new production units or by upgrading existing engineering/agricultural machinery industrial units, the following analysis is limited to the later proposition as it will result in quick outputs. It must be understood that action by individual factories/industries to expand upgrade on a modest scale (which is quite logical and obvious) will not solve the national requirements. However, a Government national scheme to promote, encourage and assist a number of existing units to upgrade will contribute towards meeting national agricultural machinery requirements fast with minimum investment at factory level.
78. The objectives are:
- to produce agricultural machinery in an engineering production unit which is not yet producing any agricultural machinery;
 - and/or - to produce more of the same agricultural machinery (product/s) in a manufacturing unit which is already producing same;
 - and/or - to produce an increased number of products (product range/product mix) through introduction of new agricultural machinery products keeping total production volume;
 - and/or - to achieve a higher total volume of production of agricultural machinery through a combination of product volume and product range volume

79. This may be achieved through:
- upgrading blacksmith shops to rural family worker units;
 - upgrading blacksmith/rural family worker units to small scale industry level;
 - upgrading small scale industry units to medium scale level;
 - upgrading medium scale industry units to large scale level.
80. In this context, it should be noted that the upgrading will also involve the following elements:
- transformation of production units into components subcontractors (on a partical production capacity basis) to other production level units;
 - wherever necessary establishment of specific factory level additional basic facilities such as foundry, forge, heat-treatment etc.
81. Although, all upgrading aspects have to be analysed at individual factory levels, the following table no. 2 may be regarded to provide basic guidelines on upgrading with respect to product design, material requirement, management, production techniques, machine tools and production facilities, and necessary supporting facilities, ancillary industry, marketing and financial aspects.

SECTION V

ENGINEERING BACK UP SUPPORT 4/ 5/

A. MANY INSTITUTIONAL SUPPORT DESIRABLE BUT START WITH BASIC ONES

- 82 When one speaks of agricultural machinery sector in developing countries in general and in Africa in particular, there is a tendency to emphasize the need for many institutional supports. There is a tendency to make it so complex, so inter-related and so multi-disciplinary that one cannot make a modest start. The "total approach" so preached by many, makes technical personnel in developing countries of Africa helpless to take the first step which one can start on a modest basis. On the other hand, the complex nature of the Governments in general will have to take into account the existing realities of specific ministerial responsibilities. In this context, "co-ordination, integration, etc" become difficult to implement; on the other hand, if "total approach" is regarded as a "minimum common programme" of concerned ministries with mobilization of resources, establishment of interlinks and promote a co-operative plan of action, then the implementation will become meaningful, viable and effective.
- .. One can not deny that many institutional support is necessary for promotion of agricultural machinery industry in Africa. Some are at policy level, some at national technical level and a few at factory level. From a policy level point of view, the institutional facilities/ set up for agricultural mechanization analysis/planning, the financial aspects, legislative aspects, extension/popularization activities, marketing/service programmes and training etc. are important. But it does not mean that unless that all these policy institutional aspects are strengthened/ established, one can not make a start-up on agricultural machinery local production promotion.

4/ Rationale of Profiles for engineering back-up support UNIDO 1982

5/ Industrial service facilities for engineering back-up support in the agricultural machinery industry in Africa (by consultants Bureau Curtoy) UNIDO 1982

84. Then the question to be asked is, can the existing production units/factories/industries start-up necessary technical institutional activities at plant level? In this context, it should be noted that in developing countries of Africa the production level is primarily at blacksmith/rural family unit level and in some cases at small/medium level. They are mainly involved with day-to-day production and have no significant capabilities to develop plant level institutional activities in engineering design and development, raw material bank, national marketing/repair/maintenance etc.
85. It is therefore obvious that the Governments will have to strengthen the existing and establish appropriate new national technical institutional facilities to support the existing engineering industry in general and agricultural machinery industry in particular.

B. NATIONAL BASIC INSTITUTIONAL SUPPORT

86. In developing countries of Africa the rural artisans and family workshops had potential that could make substantial contribution to the development of rural industries generally and the agricultural machinery industry in the rural areas, particularly if appropriate techno-economic institutional support are provided to them. Those might include supply of upgraded and appropriate production equipment, establishment of appropriate supporting industries in wood-working and hardware, establishment of simple heat-treatment facilities and introduction of quality control measures. For fuller exploitation of their potential, it would be also necessary to improve their accessibility to training facilities, provide improved prototypes, appropriate raw material, concessional credit facilities, research and development facilities and encouragement for formation of co-operative marketing arrangements, with governmental institutional support on standardization.

87. Small-scale industries should be promoted and encouraged to manufacture intermediate agricultural implements and equipment and to act as ancillary component suppliers to medium-scale and large industries. The strengthening of the small industries should include small- and medium-scale foundries, forge shops, common engineering facilities, upgrading of production facilities, provision of appropriate materials at reasonable prices, establishment of suitable training programmes and introduction of co-operative marketing arrangements. Provision of credit on soft terms and institutionalized research and development support in terms of improved designs, drawings and prototypes would also be required.
88. In the promotion of medium-scale and large industries manufacturing powered agricultural machinery, measures were needed to develop ancillary and supporting industries that would establish a solid industrial base and links with small-and medium-sized industries.

C. NECESSARY TECHNICAL/ENGINEERING INSTITUTIONAL BACK UP SUPPORT

89. In principle, with due consideration to the fact that engineering industrial status is primarily at blacksmith/rural family unit levels and at small/medium scale industry levels in Africa, the two necessary technical/engineering institutional back-up support are in the areas of:
- engineering design, development, adaptation with emphasis on industrial liaison and transformation of applied R+D into commercialization;
 - common engineering services including raw material bank, tool room services, industrial engineering/technical services including engineering design, machinery selection, process planning and trouble-shooting.

90. Considering the engineering design and development aspects, the following two parallel approaches are necessary:
- strengthening of existing national agricultural machinery institutions in engineering design and technical service to industry. This will require a new approach. The classical work on "testing and so-called field adaptation and never ending testing" should stop. Although, these institutions are with Ministry of Agriculture, there is a need to inject new blood and strengthen to make them capable to act as a bridge between application and manufacture. This will call for strengthening their capabilities in mechanical engineering design and industrial extension.
 - strengthening existing mechanical engineering institution (for example metal working development centres, mechanical engineering department of universities, etc.) to undertake agricultural machinery design and development in co-operation with agricultural engineering institutions and manufacturers.
91. Regarding common engineering services, these will serve the total engineering industry, including agricultural machinery sector. There is a need to strengthen existing units and/or establish new ones.

ANNEX A

ELEMENTS OF UPGRADING PRODUCTION FACILITIES

- (requirements at (a) blacksmith/rural units level,
- (b) from blacksmith/rural unit to small/medium scale level and
- (c) from small/medium scale to medium/large scale level)

Note: ↓ upgrading within present level → upgrading from present level to next level

Elements	Blacksmith/ Rural Family Worker/Ownership Units	Small/medium scale industry	Medium/large industry
1. Product design	- requires improved prototypes and relevant assistance	- requires applied R+D institutional support	- requires institutional support on licencing
2. Material required	- requires provision of carbon steel, wood, hardware, sheet metal and sections (material ENI series, scrap material, etc.)	- requires provision of mild steel, cast iron, carbon steel wood, sheet metal, sections, paints and some subcontracted components (material ENI, 8, 16, 32, 42 and castings grade 16, 17)	- requires provision of steel-medium and high carbon, free cutting and forge steel; casting - grey malleable, nodilur and non-ferrous castings; sheet metal and sections, paint, boughout semi-finished and finished components: imported components both semifinished and finished, hardware and components from ancillary industries (material: ENI, 1a, 8, 16, 24, 32, 42, 46, MS 16, 18, 20 SWG; castings grade 17 etc.)

cont'd.

Elements	Blacksmith/ Rural Family Worker/Ownership Units	Small/medium scale industry	Medium/large industry
3. Management	- requires introduction of basic techniques, but retaining rural environment and traditions	- normally on line management ownership based on individual or partnership has to be strengthened through institutional training	- requires well-defined management system with horizontal and vertical interaction, administration, finance, production and marketing are major departments
4. Production techniques	- application of simple powered machinery, simple jigs and fixture and basic heat-treatment etc. necessary	- application of jig and welding fixtures are common. Production techniques are more job basis with minimum batch size. Heat-treatment, process planning, method study standards and quality control etc. at elementary levels. Need upgrading.	- based on batch or continuous production system, application of process planning, settling up of standards, quality control, production control, cost control and common and essential wide application of jigs, tool fixtures, welding fixtures are essential.
5. Machine tools	- small hand tools such as hammer, anvil chise, hacksaw, small coal fired furnace with hand-operated blower, pedal-operated grinding wheel and occasional use of bending, drilling equipment when power available when necessary. - need upgraded simple production equipment.	- some manual operated equipment plus power-operated conventional machine tools, welding units, limited inspection equipment, electrical/coal/oil fired furnaces, some heat-treatment, are necessary. - need supporting industries such as foundry, forgeshop, and common engineering facilities.	- conventional powered machine tools and equipment plus semi-automatic and special purpose machinery. Also tool room machinery, gear cutting, heat-treatment, painting, fabrication equipment are necessary. - Need upgrading local technical capabilities in selection of machine tools and negotiations with supplies.

cont'd.

Elements	Blacksmith/ Rural Family Worker /Ownership Units	Small/medium scale industry	Medium/large industry
6. Supporting production facilities (within the plant)	- introduction of improved simple facilities for heat-treatment and some quality control necessary	- some heat-treatment and quality control/inspection facilities necessary. - Need establishment of common engineering and technical service facilities for small/medium scale industries	- heat-treatment quality control inspection are an integral part of large scale industry
7. Outside supporting industries	- Needs hardware industry, wood-working industry and supply of proper steel and scrap iron required	- needs foundry, hardware industry, special component industry, such as disc, high carbon steel tines etc., and also jigs and tool manufacturing	- needs foundry (ferrous, grey malleable, spheroidal iron and non-ferrous) forging and die casting, gear cutting and transmission shaft manufacture, special sheet metal components, rubber parts, electrical items, paint, etc.
8. Marketing	- needs development of co-operative institutional marketing, in addition to present direct sales to farmers	- through wholesale distributor or directly to farmers. - needs assistance in marketing and strengthening of distribution/service systems.	- needs strengthening of agents, national distributors with some/adequate facilities for spare parts supply and after sales service. - needs strengthening of spare parts supply, repair and maintenance and training programme.
9. Financial assistance	- as very little assistance from the financial institutions available now, they suffer from inadequate working capital. needs financial institutional support.	- as at present limited finances available from private sources or governmental institutional loans, there is a need for expansion of this programme.	- need significant domestic private capital, national financial institutional and governmental loans.

cont'd.

Elements	Blacksmith/ Rural Family Worker/Ownership Units	Small/medium scale industry	Medium/large industry
10. Financial assistance cont.	<ul style="list-style-type: none">- mainly depends on local money lenders with high interest rates.- there is a need to give more attention to establishment of rural financial institutions to assist these small units to develop rural entrepreneurship.	<ul style="list-style-type: none">- working capital from banks against inventory security- there is a need to strengthen small scale ind. development corporations/institutions and link the financial institutional activities to promote this sector.	<ul style="list-style-type: none">- international institutional finances and equity and equity participation by foreign collaborator are the main sources of finances. Working capital through banks against raw material stock, inventory and work in progress.- there is a need for international financial assistance in this sector.



