CHAPTER 3

AGRICULTURAL MECHANIZATION IN AFRICA - AN OVERVIEW OF MAIN ISSUES

by

R.N. Kaul

INTRODUCTION:

It is recognized that the major area of agricultural potential in Africa is the Sub-Saharan Africa region. However, during the past 30 years agricultural production in the region has increased by only 2% a year, whilst agricultural exports have declined, and food imports are increasing at about 7% a year. Only 30% of Africa's land area is capable of sustained production of rainfed crops with about one-quarter of this currently being used. It is reported that acreage expanded by only 0.7% per annum during the past 20 years. At this expansion rate productivity must rise by more than 3% a year - three times faster than in the past (IBRD, 1989). This is indeed a gloomy scenario. However, Swaminathan (1986) has compared the current spotlight on Sub-Saharan Africa for struggle against hunger to what several food experts predicted for many countries of Asia and Africa over 25 year ago. For example, India was singled out as a hopeless case that could not be saved from hunger and famine. Today India, has over 30 million tonnes of grain stock as a food security reserve. In this regard, Swaminathan (1986) and many others are optimistic of similar strides being possible for Sub-Saharan Africa if an appropriate action plan, involving appropriate technological change, is formulated and implemented.

Agricultural mechanization is one of the inputs in the farming production cycle. In a way it even signifies the technological status of agriculture in a country as, for instance, the African farmer is generally referred to as a "Hoe Farmer". Unfortunately mechanization is the most neglected production component (in comparison to the biochemical inputs e.g. seeds, fertilizer, etc.) and to a large extent, a controversial one too. Application efficiency in terms of placement, precision and timeliness etc. of other inputs like seeds, fertilizers, pesticides, is considerably influenced by the equipment being used in addition to it affecting other factors like labour needs, optimal crop combinations and production costs as well as timeliness of field operations. Agricultural mechanization thus plays a vital role in the overall production cycle and socio-economic development of a country.

Many workshops/symposia/seminars have been held over the past 3 decades, and at different locations to deliberate on the mechanization issue in Africa and examine the constraints that impede its adoption. Several

commissioned studies have also been undertaken on specific topics pertaining to agricultural mechanization. Commonwealth countries like Botswana, Gambia, Ghana, Kenya, Malawi, Nigeria, Tanzania, Uganda, Zambia, Zimbabwe have received reasonable coverage in identifying critical issues on mechanization through studies by Commonwealth Secretariat, UNIDO, FAO, ILO, PUDOC, World Bank, MSU and others. Among non-Commonwealth African countries, Algeria, Sudan, Ethiopia and Senegal have attracted good attention. The highlights of recommendations emerging out of such workshops/commissioned studies, over last several years, have been compiled to identify issues which are common. This paper gives the summary of these issues. Hopefully by bringing the international agencies and national experts together, as in this workshop, a common approach can be discerned which recognizes the problems involved and develops into an implementation strategy, so that the repetitive nature of "problem identification" can be halted and efforts diverted towards finding actual solutions.

MAJOR HIGHLIGHTS OF PAST WORK

The review of past work on agricultural mechanization problems in Commonwealth Africa, indicates that the following issues as being of major significance:-

(i) Proper place of agricultural mechanization in the production cycle.

(ii) Need for a national policy and strategy on agricultural mechanization.

(iii) Issues related to labour in the context of agricultural mechanization.

(iv) Lack of focus on small scale farmers.

(v) Neglect of local manufacturing.

(vi) Power sources on the farm.

(vii) Research and extension on agricultural mechanization.

(viii) Lack of continuity.

(ix) Networking and communications.

(x) Gender issue in mechanization.

These will be discussed in greater detail in the subsequent sections of this paper.

Proper place of agricultural mechanization in the production cycle

While it is recognized that lack of appropriate agricultural equipment/implements and power is one of the critical limiting constraints in increasing agricultural production, there has, however, not been a coordinated effort to focus attention towards removing this constraint. Often through a wrong approach, like indiscriminate importation, more damage has been done to the existing system than any help. Kline et.al. (1969) during an extensive review of agricultural mechanization status in Africa over two decades ago observed that:

> *"Role of mechanization must be seen in relation to the roles of other factors in the production function. In this context, mechanization is entitled to a special place in the order of priorities for developing systems of agriculture; the order of priorities for mechanization is frequently not the first".*

This observation is as valid today as it was in 1969, and is further stressed by Dr. Julius K. Nyerere when he addressed, as the host country President, the opening session of an International Conference convened by the Commonwealth Agricultural Bureau on "Advancement of Agricultural Production in Africa". We quote,

> *"In Africa now, mechanized equipment, chemicals and technical or scientific knowledge are not readily available to the farmers. Nor are they likely to be in the near future. Those facts have to be taken as a starting point for any consideration about how to advance agricultural production in this continent. For Third World countries are - almost by definition - short of capital, of economic infrastructure, and of technical and scientific knowledge in the rural areas. Thus, for example, even when tractors or combine harvesters have been acquired, they sometimes have to be sent hundreds of miles for servicing, and minor breakdowns can result in their being out of action for months at a time. Basing African agricultural advance exclusively, or even mainly, on industrial and capital intensive techniques of production is thus a contradiction in terms. A tractor can plough hundreds of acres; waiting for one which does not exist, or is not working, means that you get less output than if you had cultivated with a hand-hoe, and much less than if you had based your production plans on the use of animal-drawn implements" (CAB, 1984)*

Ironically not a single paper was devoted exclusively to problems of mechanization at that global conference, even though the proceedings covered 85 chapters and the Conference was attended by 360 delegates representing 36 countries as well as leading agricultural scientists from all over the World and the Conference was to give a "Comprehensive survey of the current status and constraints to advancing agricultural production in Africa" (CAB 1984). This

thus stresses the neglect of agricultural mechanization, in the production cycle and figures as a basic policy issue. The conference organizers did not see the role and importance of agricultural mechanization in advancing agricultural production and productivity in Africa.

Need for a national policy and strategy on agricultural mechanization

Practically all the reports have pointed to the need for a national policy and strategy on agricultural mechanization for each country. Despite having existed for over 35 years by then, and seeing so many developing countries committing serious mistakes in their endeavours to mechanize their agriculture, it is only in 1981 that FAO, belatedly decided to commission a study which resulted in a very detailed treatise as a guideline on agricultural mechanization policy and strategy formulation in developing countries (Gifford, 1981). At a recent expert consultation (COMSEC, 1990) convened by the Commonwealth Secretariat the following additional points were recommended to be incorporated in the guidelines in the light of additional experience gained:

(i) The concept of a national mechanization strategy and its importance in promoting agricultural mechanization is not fully appreciated. The purpose, justification and content of such a strategy need to be further clarified.

(ii) There is a need for practical guidelines on the methodology for strategy formulation especially regarding the organization and management of the process of achieving this.

(iii) There is a need for adoption of a flexible approach in the implementation of agricultural mechanization strategies in accordance with the country's circumstances.

(iv) Agricultural mechanization strategy should pay particular attention to meeting the needs of small farmers and women.

(v) The agricultural mechanization strategy should provide a focus and channel for technical assistance and investment funding by donor agencies and private sector organizations.

The above issues, among others, need to be considered in strategy formulation. So far however, few countries in Africa have even initiated the process of policy and strategy formulation for agricultural mechanization.

Issues related to labour in the context of mechanization

Labour has been recognized as the key to the understanding and improving of agriculture in Africa. Seasonal shortage of labour in Africa is a far more limiting factor in increasing productivity than in Asia. The major concern

voiced is the 'displacement of labour' by mechanization but that sounds more academic, in the African context, if taken in isolation as the labour problem appears to manifest itself in different forms. Few aspects are given below:

(i) There isn't that much surplus labour, in the African agriculture scene, if 'invisible' labour inputs are considered. The 'invisible' labour inputs include; walking to and from the fields (which can take up to 25% of hours spent per day); and other non-farm activities such as collection of firewood and water and other life support activities.

(ii) Increased utilization of biochemical technologies - e.g. fertilizers, hyv, etc. and sometimes even physical technologies - animal traction, can lead to increased labour demand in other parts of the agricultural production system which may greatly influence the adoption or non-adoption of these technologies.

(iii) Many of the recommendations on increased plant population and crop mixtures have not been fully accepted by farmers due to higher demand on labour for implementing them.

(iv) From a farmers' view point the returns to labour and risk management, the traditional cultivation practices appear still better adapted to the physical and economic environment of West Africa.

(v) Studies also do show that at the busiest period soon after the onset of the rains, farming efficiency using the handtool technology, with entire reliance on human energy can only be increased through using better mechanical aids.

(vi) Research by among others, Malton et.al. (1984), and Kaul (1989), has shown that any excess demand of labour negates farmer response to adoption, e.g. even though in cowpea - sorghum intercropping 15,000 plant/ha. (against farmer practice of 1,000 to 8,000 plant/ha.) gave higher yields, farmers rejected it due to excessive labour demand. On-farm trials confirmed that with higher plant population for planting and weeding, labour demand increased by 50 and 25 percent respectively. Similar experiences have also been reported in studies by the Agricultural Development Projects (ADP's) in Nigeria.

Labour related issues in the agricultural mechanization debate, are thus quite vital from several aspects and need not be seen only in context of 'displacement of labour' which is actually in many cases misleading.

Lack of focus on small scale farmer

In general though most rural development projects emphasize the role of small farmers, their beneficial effects can be offset as a consequence of distorted mechanization policies which usually benefit the capital intensive large scale farmers. About 80% of agricultural engineering imports are intended for modern farming (state farms, plantations, agro-food complexes) leading to only 10% of people benefitting from 80% of foreign exchange allocations for agricultural mechanization. This has been consistently perpetuating and continues to figure as an 'issue' in mechanization. The low purchasing power and generally poor economic status of small scale farmers have been seen as serious constraints to their adoption of improved technologies. Similarly there is need to identify the farmer's needs and wishes which may not always be the same. Equipment for small scale farming appears to exist in other regions of the world which could meet some of the requirements of small farmers in Africa. The small scale farmers face a lot of problems in so far as agricultural mechanization is concerned.

Neglect of local manufacturing

In Sub-Saharan Africa investment in agricultural equipment is about 1% of the agricultural production. Outlays on fertilizer and pesticides consumed in one growing season is far greater than that for equipment which has a working life of 15 to 20 years. Eighty percent of the agricultural equipment imported is used in the modern farming sector (state farms, plantations and agro-food complexes). It is appreciated also that the modern sector produces some key crops which are vital to the economies of many of the African countries especially for foreign currency earnings. The agricultural machinery industry provides an important linkage between industry and agriculture. Our review reveals an apparent neglect of the local manufacturing sector in most of the African countries. Among the major points which are significant from the many reports include:

(i) There are many small scale manufacturers and fabricators found all over Africa. These should not be ignored and regarded as a 'stigma' for even in the developed countries such manufacturers dominate the industry e.g. in Italy there are over 2000 small scale manufacturing firms, whilst in UK about 70% of the manufacturers employ less that 10 people. It is also possible to integrate the small scale artisan sector with the industrial sector by subcontracting fabrication and manufacturing of parts to them. Grouping of artisans together such as COBEMAG in Benin has helped to keep them engaged.

(ii) About 90% of the demand is met through importation in particular for motorized equipment, and only 10% is met through local production. It is estimated that the local market

for agricultural mechanization inputs in SSA is worth about US$3.0 - 3.8 billion in 1990 and is expected to increase to US$4.7 - 7.00 billion by 2000 (UNIDO (1983)). The agricultural machinery manufacturing industry in Africa employs less than 1% of the total industrial labour with only one third of the companies producing exclusively agricultural implements and equipment.

(iii) The predominant equipment in most countries are handtools being used in 60-95% of cultivated land with the exception of Botswana and Zimbabwe where in the former there is a widespread tradition of using draught oxen, and in the latter there is a large commercial farmers sector. There is also a supply-demand gap in most countries for handtools ranging from a few thousand pieces to hundreds of thousands.

(iv) The local manufacturer is also dependent on imported raw materials. The local value added ranges from about 30% for handtools to about 30-50% for animal drawn implements (UNIDO, 1983). Most local manufacturing companies operate at 30-60% of their installed capacity due to lack of raw materials; lack of skilled labour; or disorganized internal market, and high cost of imported raw materials (with freight costs being 30% of total cost).

(v) Multinational corporations have concentrated their efforts on assembly of tractors from CKD or SKD components, or they hold the local franchise for certain machinery brands. In many cases they concentrate on supplying the machinery and do not provide adequate spare part and maintenance support services. In addition due to their international connections they are able to win tenders for most tied aid which in many cases disrupts local manufacture and threatens existing production facilities.

(vi) Few of the local manufacturing companies have an internal R&D capacity. This has led to many of them copying foreign machinery and implements or manufacturing them under licence.

Issues on commercialization of prototypes

The problems of commercialization of prototypes vary between countries but some aspects which tend to appear repeatedly include:

(i) Prototypes being introduced may not be quite relevant to the farmer's needs. As for example, in a review panel observation, the following comment was made which is generally relevant

even today in relation to the prototypes being developed:-

> *"The ultimate goods are still far away. What we have seen are ideas yet to be fully developed. The real needs still remain to be properly diagnosed and then multi-disciplinary research and development has to take place at all levels ....."* (COMSEC 1977)

(ii) Even in prototypes which look commercially promising, the problems of commercialization are affected by the following factors:

(a) Pre-commercializing factors like:

- poor design
- wrong feasibility
- lack of extension services
- lack of entrepreneurs willing to take risk
- lack of raw materials

(b) Post commercializing factors like:

- Lack of unified policies (government) to protect local industry especially in relation to tied external aid.
- lack of manufacturer's initiative.
- unstable raw material source - both in quality and pricing.
- lack of prime mover and relative cost factor in relation to machine.

These have made many prototypes developed in Africa remain laboratory/workshop show pieces.

Power sources on the farm

Our review has established that most people take animal and tractor power as the only sources of farm power. Ironically the human manual power is not seen as a 'power source' but as a 'labour' matter. Few specifics on the animal and mechanical power sources, which cut across most reports are as follows:

(i) ***Animal power***

There appears to have been 'waves' of animal traction efforts

over the past 50 years which have receded or disappeared during periods of drought, change of government policy etc. Government policies tend to vacillate over emphasis on oxen and tractor system over time. There have been mixed reactions to its success and failures. For instance:

(a) In a review of 27 animal traction projects in Francophone countries it was found that most of them had not lived up to expectations because of high cost of animals and equipment, low acreage and yield effects, and the lack of reliable institutional support.

(b) The results of research in the Gambia revealed that the impact of oxenization has been largely confined to the groundnut crop with a small increase in area cultivated but no increase in yields. While in a study of 40 farmers in south-eastern Mali, it was found that animal traction farmers increased their acreage by 39 percent over hoe farmers but there was no change in yields.

(c) The profitability of animal drawn equipment is constrained by the length of the growing season. Horse drawn seeders were readily adopted in Senegal in 1930 as the speedy completion of seeding is essential in order to ensure germination. Similarly the ridger was accepted in Northern Nigeria as the soils were susceptible to high level of erosion (which can be controlled by ridging). Animal traction is risky in semi-arid environment with irregular rainfall. Tied ridging, especially in combination with fertilizer and animal traction, has been shown to alleviate, soil, water and labour constraint.

(d) One of the constraints identified on animal power utilization is that its application remains concentrated in a limited number of tasks typically transport or land preparation. Multi-purpose implement or 'tool carriers' have not proved successful at farmer level despite about 10,000 such carriers of 45 different designs having been fabricated. Information dissemination about the results on farmer's fields was not adequate which led to duplication and subsequent mistakes and failures.

(e) Substantial capital requirement for animal traction in West Africa has led to major cash flow problems in the early years following adoption. This initial cash flow problem poses an obstacle to adoption and reduces

acceptability. Introduction of a cash crop reportedly eases the situation.

(f) Other problems plaguing animal traction programmes include: poor nutrition; lack of dry season fodder; disease; high mortality rates; uncertain supply of tools; problems in destumping and consolidating of fields; lack of reliable markets, and failure to establish training programmes for potential animal owners.

Thus a multiplicity of factors have influenced the adoption rates of animal traction technology in Africa and no single factor can solely be blamed for its non-adoption.

(ii) *Tractor power*

The following are some of the common points noted from many studies on the issue of tractors in African agriculture:

(a) Since there is no domestic manufacturing industry, most tractors are imported. There is no control on the types and makes which can be imported. This has therefore generated a proliferation of types and makes of tractors e.g. a country which has a fleet of 3000 tractors and can import only 200-300 tractors per annum, has often got 12-15 makes. The consequence of this is large overhead costs in maintenance infrastructure (each make with its own dealer) and large inventories of spare parts which require foreign currency to maintain.

(b) Sub-Saharan Africa has fewer tractors per thousand inhabitants than either Asia or Latin America. This is the case even in countries where tractors were introduced first, with the number of tractors per thousand inhabitants actually declining, e.g. Nigeria: 1947 - 0.23; 1954 - 1.14; 1958 - 1.38; 1968 - 1.11; 1970 - 1.08; 1975 - 1.01; 1981 - 0.88. The use of tractors is by and large restricted to the large scale commercial 'agriculture in' many of the countries. Tractor use for small holder agriculture has usually come in 'waves' often dependent on donor's interest, and/or economic 'booms'.

(c) Studies on tractor hire projects have in most cases concentrated on the few failed Government owned and managed tractor hire schemes. These have shown a dismal picture in relation to their costs, economics and sustainability. Few studies have been undertaken on the

successful tractor hire schemes - e.g. contract farmers in Eastern Africa, etc. In many cases researchers who have studied these tractor hire schemes have often done a rushed job or have studied only a limited number of projects often those in the public sector. They have also been quite ready to give blanket prescriptions based on the conclusions of their limited studies. For example, Pingali et.al. (1987) in a study of 30 tractor projects in Sub-Saharan Africa from 1945-1980 (7 small holder; 13 Government tractor hire schemes, and 10 block cultivation schemes) concluded:

> *"In many tractor project areas no tractors can be found today. Where any tractors are still being used, their use is inevitably associated with rice cultivation. But even these surviving tractors today are privately owned. The transition from the hand hoe to animal-draft power, where its use is appropriate, continued to be made despite the emphasis on tractors. Of the seventeen attempts to bypass animal traction for tractorization only three succeeded, all of them associated with low-land rice cultivation schemes"* Pingali et al 1987.

Thirty tractor schemes (with less than 3000 tractors total), spanning over a period of 35 years (1945-1980) and covering the entire SSA region is just a very small and unrepresentative sample for one to conclude with such a blanket prescription. In addition animal traction has been even less successful despite over 80 years of extension effort.

Research and extension for agricultural mechanization

There has not been, by and large, any long term research undertaken on agricultural mechanization in Africa. Major emphasis within agricultural research systems has been on aspects that increase output directly (biochemical inputs) and relatively less has been placed on indirect contribution as can happen through mechanization. The research efforts of the international agricultural system (CGIAR) on agricultural mechanization has been insignificant. Similar situation exists also in the national research systems. Whenever economies have to be made on the research budget, the agricultural mechanization research programmes have been the first to suffer because these are relatively under-budgeted and in some situation may mean even complete elimination. In addition the following factors are pertinent in so far as R&D efforts on agricultural mechanization are concerned:-

(i) Farm mechanization R and D is generally undertaken in isolation from the work undertaken by the biological, (e.g. crop) chemical and social scientists.

(ii) There is little or no coordination between R and D efforts; local manufacture, marketing, distribution and farmers on agricultural mechanization research.

(iii) The beneficial effect of any rural development programme emphasizing small farmers can easily be offset if distorted mechanization policies encourage capital intensive large scale farmers elsewhere in the country.

(iv) Testing and evaluation have confirmed the difficulties of 'transplanting' machinery from other countries because of mis-matching of desirable specifications; over claims of operational performance, and high prices; among other difficulties.

(v) Farming System Research (FSR) has by and large, played a low key in trying to integrate agricultural mechanization aspects in the overall farming systems concept - which ironically is not in line with the 'holistic system' approach philosophy of FSR.

Lack of continuity

Some notable achievements have been recorded in various spheres of agricultural mechanization at different points in time and locations in the world. Ironically one of the major reason for failure of such achievements to spread in SSA has been the apparent lack of continuity. There have been substantial research and development contributions in areas of equipment development - manual/oxen drawn/motorized, throughout the continent, but most promising ones appear to suffer from lack of continuity. New concepts like multi-farm use of equipment and block farming have met with marginal success.

In commenting on success of research efforts, there are very few cases which can be considered as having been widely adopted though the innovations may have been very promising. A long time period is needed even to carry a prototype to a limited adoption scale. For example:

(i) In Botswana the Mochudi Toolbar (called the *Makgonatsotlhe*) took over 5-years under research and design before reaching limited trials stage.

(ii) the 'Snail' winch developed at Silsoe for ploughing/transportation took 6 years before the first prototypes were field tested.

(iii) The 'Tinkabi' tractor of Swaziland took nearly ten years to reach limited adoption stage.

At IRRI, in South East Asia however, within ten years, several of their prototypes (threshers, etc.) reached wide-spread adoption due possibly to the massive support and clarity of approach and the fact that fabricators were initially given firm orders to cover risk of capital involved. In general, however, on mechanization research in Africa there is too much expectation to have immediate results. The projects are conceived, and executed for some time, and then dumped either after or even before completion, if the researcher leaves the station or there is a priority of allocating research funds elsewhere. A new researcher comes, has different priorities and starts afresh, either on the same equipment (but has to be modified!) or a new one. This has thus generated a 'grave yard' of such experimental outfits, and mechanization dubbed as a failure, by those very planners who did not provide support to logical conclusion.

There have been undoubtedly failures on mechanization attempts all along but these have to be taken in their right perspective especially when compared with the Biological research thrusts such as:

(a) It is estimated that despite years of research on sorghum and millet, less than 5% of their combined cultivated area in West African semi-arid areas is sown to varieties developed through modern genetic research.

(b) Among some 7,000 sorghum introductions screened by ICRISAT in Burkina Faso only two cultivars have been found to be superior and well adapted under farmers' conditions.

(c) Among 300 millet entries screened, no superior cultivars have yet been identified.

(d) From the farmers' view point, in terms of return to labour and risk management, traditional cultivation practices still appear to be the best. (Schuh, 1986).

The idea is not to justify mechanization failures by citing Biological research failures, as above, but to emphasize that comparatively all is not bad in agricultural mechanization at least in relative terms to Biological research. If there was more continuity in agricultural mechanization projects the results could be more encouraging.

Net-working and communication

A common view which is quite ambiguous, in the reports reviewed relates to the problem of lack of exchange of information between countries and within a country. Each country has a capability to make a significant contribution to networking and for lack of regional cooperation, there are duplication in the R & D efforts. Thrust on networking can build on innovation already

developed. By having a regional project, efforts can be directed towards transfer/adoption of innovation from one country to another e.g. animal drawn planter from Botswana can be transferred to Zambia, helping their developmental work in the same area.

There have been a few attempts that have been initiated in this direction, among them:

(a) **Networking committees**

(i) ANSTI is the African Network of Scientific and Technological Institutions and operates through disciplinary based sub-networks, among which Agricultural Engineering is one. It has a wide range of activities including one covering agricultural engineering in general. Main focus is however on training at post graduate level.

(ii) Commonwealth Secretariat followed up a recommendation emanating from the Arusha meeting of 1977 by convening a meeting of the National Appropriate Technology Coordinators (NATC) in 1981 and came out with suggestions for setting up a coordinating mechanism at regional level in Africa on appropriate technology in areas like: research and development - approaches and institutions; linkages with industry; external assistance; local manufacture; promotion, adoption of appropriate technologies; coordinating institutions; secretariat for NATC; follow-up to a RATC (Regional Appropriate Technology Committee)

(iii) ILO/FAO planned a series of national workshops in several countries (Zambia, Sudan, Tanzania, Ethiopia and Kenya) to give an input to the work of an interagency joint activities project (ILO/FAO/UNIDO/UNECA) for an African Regional Network for Agricultural Tools and Equipment (ARNATE). As a follow up, preparatory and implementation strategies were agreed. The preparatory phase involved, regional consultation, preparatory technical mission, national workshop and follow up preparation for the network.

Most of these networks face serious financial problems, do not hold their meetings/workshops regularly, there is no continuity in their core activities and this often changes with changing

fashions in the international donor system, loss of interest by the main steering agency (FAO, ILO, UNIDO, etc.) due to changes in emphasis, etc. There has thus been little effort in creating a functioning network in Africa at regional or continental level.

(b) **Networking literature**

Few attempts are also reported towards communicating through Newsletters, Directories, etc. For instance:

(i) Commonwealth Secretariat compiled a *Guide to Technology Transfer in East, Central and Southern Africa (1981).* It gives an overview of agricultural implements situation and also gives an overview of agriculture, the technology available, existing trade and tariffs, etc. for the countries surveyed.

(ii) The Commonwealth Secretariat produced a booklet called *"Rural Technology in the Commonwealth - A Directory of Organizations".* It lists 122 organizations from many African countries involved with agricultural development and training.

(iii) UNIDO (1982) published a booklet on *Information Sources on the Agricultural Implements and Machinery Industry.* It has 941 entries.

(iv) UNIDO had planned to start an *Industrial and Technological Information Bank* (NTIB), as a depository of major items related to equipment, however it is difficult to determine progress todate.

(v) ILO made a country profile study on farm tools and equipment in 5 countries and it generated a *Manual on Tools and Equipment for Labour Intensive Farming.*

(vi) Others are from Intermediate Technology Group in U.K. and similar organizations elsewhere.

Again the problems of continuity, lack of funds, high turnover of key individuals etc plague these efforts at communicating.

The gender issue in mechanization

The role of women, though mentioned in several reports has not been properly focussed on agricultural mechanization issues. The so-called gender issue is not

really only the sex related differentiation. What is actually involved is to look at a typical system where men, women and children are traditionally integrated into a working unit with an unwritten understanding of the division of labour. The system though skewed in favour of total work hours put up by women, is operational though not with desired efficiency. Most attempts to introduce better farming tools further complicate the issue in that the tasks that were traditionally done by women, get unconsciously passed on to men who, with the new equipment, find the task easy and remunerative and leave only the difficult ones like pounding of grains and internal transportation for women to perform. Thus a new dimension gets introduced in this system, creating displacement of women from their traditional tasks and subsequent loss of income. In the African context, this involves extra difficult position for the family for, despite their hardship, women contribute a lot to the family income. Basically therefore the issue boils to finding appropriate technology for women so that within the existing farming system they can still perform tasks which are traditionally theirs.

DISCUSSION AND CONCLUSION

This review has clearly shown that the issue of agricultural mechanization is not 'unknown', but what is lacking is continuity and coordination on decisions on mechanization made by various agencies both on the national side and the international donor side. This may well be the main issue in so far as agricultural mechanization is concerned. Even a casual examination of the proceedings of various symposia/workshops and commissioned studies reveals that issues which were voiced two decades ago (Kline et.al. 1969) are being voiced again in almost the same language (Gifford (1990)). Among the areas where action has been on a discontinuous and often ad hoc basis, has been in the formulation of agricultural mechanization policies and planning for strategies at national level. Whereas national priorities do often change depending on the political climate within a country, and often beyond the scope of technicians, a start on agricultural mechanization policy and strategy formulation can be made through the National Appropriate Technology Committees. This approach was advocated by the workshop held in Arusha in 1977 and sponsored by Commonwealth Secretariat. Some progress was made between 1977-80 and a regional workshop of national coordinators was held in 1980. There was however no further action after this workshop both at regional and in many cases at national level.

It was hoped then in 1977 that a network on agricultural mechanization and appropriate technology would have evolved out of the meetings of national coordinators. Such a network would have facilitated communication not only within a country but also on regional basis and lead to the establishment of formal mechanism of communication such as newsletters, seminars, regional training courses on appropriate agricultural mechanization technologies. However progress on this front appears to have floundered right

from the first workshop of national coordinators held in 1980. It should be appreciated that agricultural mechanization's role in development is still shrouded by controversies and there are number of myths. These include fears that agricultural mechanization displaces labour and hence leads to unemployment problems - which is a potentially sensitive issue to many policy makers. It can however be shown that such fears are usually unfounded, if agricultural mechanization is well planned. There are also fears about the expensive nature of agricultural mechanization inputs but it can be shown that the apprehension on high cost of equipment is not that serious if it is considered in relation to annual inputs like fertilizers and pesticides (c.f. machine costs which can be spread over a 5-10 years period).

There is also need to initiate research in all areas identified in this review and on a more continuous basis rather than the ad hoc way it has occurred in the past. There is need for example, to synthesize all experiences on efforts so far made to develop equipment for small farmers - success and failure cases and reasons for the same. This could be done by a panel of experts and their report could be reviewed periodically. There is also a need to initiate research on the more difficult tasks currently done entirely by handtool/human energy - food processing innovations; small scale cotton pickers; mechanization of mixed cropping systems; harvesting aids for fruits and vegetables; small scale rural transport equipment and mechanical means of scaring birds and other predators. Action will also be required in the research front on better/improved techniques of extending mechanization technologies through both the public and commercial systems; as well as studying effective ways and means of integrating the small scale blacksmiths and manufacturers with the medium and large scale production systems. Above all, there are also the management challenges of agricultural mechanization systems which require research attention at all levels - planning and policy leaders; research management, farm manager level in both large scale and small scale agriculture. There will also be a need to develop better communication between agencies involved in development efforts, official government and non governmental agencies as well as the donor agencies. Hopefully all this should result in an end to the current practice whereby every 5 or so years we meet to redefine and identify the mechanization problem and we should instead focus our attention on a continuous and progressive basis on the this problem. The need for an annual workshop to monitor progress and sustain interest is singled out as one of the most appropriate action to ensure continuity.

**********&**********