

THE DEVELOPMENT OF TECHNOLOGY IN UGANDA

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Introduction:

This report explores state strategy in setting up technological institutions and departments to mediate in the transfer of technology. The first part of the report looks at the historical context in which modern technology set foot in Uganda. It then examines both institutional and informal mechanisms of acquisition and application of technology. The last part deals with state policy, with special reference to the government department of technology.

Technology is the body of knowledge available to a civilization for use in the fashioning of implements, practicing manual arts and skills and the extraction and collection of materials. Technological development is imperative if the standard of living of a population are to be maintained and elevated. In Africa, state concern with respect to technological development is symbolized by the Lagos Plan. This plan states that "top priority should be given to the development of human resources for the creation of science and technology, on the one hand, and on the other, to develop a technology infrastructure of manpower, knowledge, skills, innovations and productive capacities to absorb and adopt imported technology, on the one hand, and on the other hand, to develop technology locally for the identification and exploration of natural resources and the conversion of raw materials into semi-finished and finished goods and products".

There exists institutional frameworks to guide, promote and regulate the generation, acquisition, development and deployment of science and technology used to attain a country's development objectives. There also exists in many countries systems for disseminating technological information to would-be-users.

Over the years, technology development has gone through a process of evolution. In the early days, technology was generated as a result of the instinctive adaptation of human activity for survival. Many important tools were invented by accident, and many others through trial and error. Systematization of accumulated knowledge, gained from repeated trials, has resulted in science, and now, science has become the primary base for technological development.

It is at the same time important to note that the purpose and source of technology production have changed considerably over the years. In the early days, technology was often produced through individual efforts to meet the demand arising from the gradual and evolutionary process of societal change. Today, technology is often produced to satisfy human needs and increase human capacities, as well as to achieve strategic self-reliance and gain a competitive edge in the market place. The relationship of technology and society has thus evolved from that of a follower to that of a leader of change.

By examining technology development at various levels, e.g. the policy level, the sub-sectoral level, training level, feasibility study level and project implementation level etc. this study seeks to find out how technology has developed in Uganda, the factors that have influenced the slow pace of technological development and lessons that can be drawn from the past for the future.

Pre-Colonial Times.

In 384-322 B.C., Aristotle said "All men seek one goal; success or happiness. The only way to achieve true success is to express yourself completely in service to society. First, have a definite, clear, practical ideal - a goal, an objective. Second, have the necessary means to achieve your ends - wisdom, money, materials, and methods. Third, adjust your means to that end". Looked at in the present context, Aristotle's statement can be interpreted as meaning a community must first have the technology, and then apply that technology to achieved the agreed objective.

Uganda has been having contact with the outside world for almost two centuries now and during this time, there have been opportunities for, and sometimes deliberate efforts to frustrate, the acquisition, adoption and development of technology.

There is archaeological evidence that before contact with the outside world was made, there were some technological activities going on. These technologies were developed primarily for use in meeting the physiological and safety needs of these early communities. Archaeological studies have revealed the existence of iron works in the agricultural Bantu communities in the Western Region of the country in the 16th Century. By the end of the 16th Century, fashioning of iron implements like axes and spears was relatively well advanced. The objective was to survive. Communities therefore had to develop and have the appropriate technology for making implements for use in meeting this objective.

The mixing of tribal groups resulted in the development of trade. Because of the need for iron implements and other commodities in some communities, these items were used as a medium of exchange between the pastoral and agricultural communities. One would exchange so many spears or hoes or pots, for one cow or for a slave.

At a later date, traders from the East African Coast brought items like guns in exchange for slaves, ivory etc. This introduced new technologies in the country. Because of the changed circumstances, spears technology was no longer appropriate to defend communities against foreign interests. The local community responded accordingly such that by the time of colonization, some communities had begun to copy the manufacture of such items guns, coins etc. The society had begun to acquire and adopt foreign technology. It is worth noting that as far as the Uganda Society was concerned, this technology development was a result of a change in the circumstances.

The Colonial Period.

It is mainly believed that the primary reason for colonization was trade. Colonies were seen as potential markets for goods manufactured by the colonial masters and also as very good sources of cheap raw materials required in the manufacture of various items.

During the colonial period, there were sometimes deliberate efforts to frustrate the development of indigenous technology. Stories are told of very harsh punishments being given to people, when such people were caught engaging in activities like gun-smithing.

Since Uganda is a colonial creation, her social-economic and industrial infrastructure during the colonial period were built as appendages of the metropolitan countries. Uganda was meant to produce cheap raw materials that would then be sent abroad for refining and manufacture of goods which would then be sent back to Uganda as imports. The refining of copper and the manufacture of cotton cloth are fine examples of this policy. All the copper produced in the country was being exported after some purification. No industry that uses copper as a raw material was built. This is why, up to now, the vast majority of copper products have to be imported. This does not compare very well with the pre-colonial times when house-hold copper items were in use among the agricultural and pastoral communities of the 16th Century.

When it became economically difficult to sustain this policy, a policy of import substitution was instituted, changed circumstances led to the presentation of new technologies. The processing of bulky items of low value which would be uneconomical to transport over long distances was then thought of. A hydro electric power plant was built and a number of factories were set up. These factories were either for "assembling" products made elsewhere, or for initial processing of raw materials for export. For example, a soft drinks bottling plant was set up. Abundant, bulky low value water is added to some high value imported chemicals and then bottled for the local market. The actual chemical composition of the added high value imported chemical is still a closely guarded secret. The ginning of cotton was done locally, cotton yarn exported and then finished cotton materials imported. No plants for extracting locally available raw materials, processing them and making products ready for the market were set up. The situation was so bad that when foreign nationals left the country in the early seventies, the few factories that had been set up as appendages of industries in other countries broke down due to lack of indigenous trained manpower and due to lack of necessary inputs to sustain them.

Thus during the colonial period, the technology acquired and developed, seems to have been that which was appropriate for achieving the masters objectives of having sources of cheap raw materials and creating markets for their products.

Colonial Education Policies.

Education, defined as the act or process of imparting knowledge or skill, is an effective means of guiding, promoting and regulating the generation, acquisition, development and deployment of science and technology. Educational institutions in Uganda throughout the colonial period do not seem to have been meant to equip the local people with technological knowledge that would have been of use in fashioning implements, practising manual arts and skills and extracting or collecting materials. Policies seem to have been designed to produce mid-level manpower to help with the administrative process. There were half-hearted attempts in the mid-1930's to build technical schools. These attempts were half-fulfilled because of the debate over literary education or vocational education. The education policy was such that the indigenous elite were heavily biased against technical education. This bias for literary education continued all the way through to independence and thereafter. This is because the education system had already been geared towards producing teachers, doctors and administrators.

There was, however, some limited provision for technical, vocational and agricultural training by missionaries. A number of schools like Kisubi Technical Institute, Layibi, Kichamba etc. gave some technical education especially in subjects like carpentry. Generally, education suffered the colonial legacy of missionary tradition which emphasized broad general education coupled with a strong religious element culminating into an elite system. Central Government Schools were eventually established on the same colonial line of "character building" but still, there was limited provision for technical, vocational or agricultural training.

The Post Colonial Period.

After independence, there is no evidence of any serious attempt to work out policies that would have helped move Uganda's education system from literary to technical education. Lamentably, some of the schools which had provided some technical education were converted to give literary education. This is the case of Wairaka Technical School for example.

Jointly funded by the Madhvani group and Busoga Local Government, Wairaka was started as a technical school to train manpower for industries that were springing up in

Uganda's industrial town of Jinja. The college does not seem to have trained any manpower for industry and was immediately turned into a farm school. It operated as a farm school for a number of years before being turned into a senior secondary school. In 1985, it was turned into a Technical College and operated as such for two years. After two years, these plans were abandoned and Wairaka allowed to continue operating as an ordinary senior secondary school. Now, the people of Jinja Municipality, Jinja, Iganga and Kamuli districts are seriously considering joining efforts to build a technical institute, (the Wairaka Institute of Technology), near the Senior Secondary School.

Such actions have caused an imbalance in the national educational system and this has resulted in educational institutions in Uganda not being well synchronized with the needs of the economy. The education system seems to be geared to producing senior secondary school leavers and university graduates for paid white collar jobs yet these jobs have become fewer and fewer to find.

The flight and expulsion of foreign nationals in the early seventies was a mixed blessing from an indigenous technology development point of view. On one hand, they did not leave behind indigenous trained and experienced personnel to run the various enterprises. This led to a total breakdown of whatever technological infrastructure that had been built. On the other hand, the breakdown of the infrastructure created enormous economic problems. There were no resources to sustain the continued importation of required inputs. As a result of this, a number of indigenous entrepreneurs set up small scale manufacturing plants based on locally available resources. This sector has been sustaining the economy ever since. Their activities include the manufacture of simple spares for industry and motor vehicle parts. The present government has appreciated the great role being played by these units and has acted to encourage and promote them. The department of small scale industries in the Ministry of Industry and Technology has been strengthened and a department of technology in the same ministry has been established. Both these departments are meant to work closely with small scale industrialists by providing advisory services and guidance.

Small Scale Industries in Uganda are part of the burgeoning informal sector. This sector is so pervasive that it threatens to engulf the whole of the Ugandan economy. This sector grew as a result of the drop in production capacity of the state and the acute scarcities that this engendered. The deep economic crisis that hit Uganda mainly as a result of political instability had important consequences for the productive and employment capacities of the state. The informal productive sector grew in response to the pressure on supply of essential products in the economy.

Small Scale Industries In Katwe.

A survey centred on:

- The type of technology used,
 - The organisation of production and its accompanying social relations,
 - Employment generated and incomes,
 - Relations with the state and state agents.
- The survey was conducted in Katwe, a suburb of Kampala. By interviewing small scale entrepreneurs in the suburb, the objective was to determine the role played by the informal sector in "Indigenizing" technology or creating a fabric for innovation.

The study showed that up to 80% of enterprises surveyed relied on family labour. Productivity was generally low, using mostly hand implements. There was a high degree of replication of work, especially in the metal working. In the metal industry they made grills and burglar proofing and manufactured various pieces of metal to be used as spare parts. In the electrical field, they manufactured battery chargers and electric welding sets. Some workshops specialised in such activities as the repair of dynamo generators, motors, rotors, both step-up and step-down transformers for the Uganda Electricity Board. The operation consisted mainly in rewinding coils to replace burnt out ones. Other workshops repaired or manufactured car silencers and crankshafts as well as grain milling machines and hullers.

As stated, these enterprises relied largely on family labour and this appeared to be more productive than in the formal industrial sector. The system of apprenticeship enabled the use of cheap labour. According to a recent IDRC report, value added in this artisanal sector was as much as 50%⁽¹⁾. In some of the larger enterprises in Katwe, salaried labour was used. The number of employees and apprentices

ranges between 5 - 20 people. Some of the hired labour are products of the Kyambogo Polytechnic, while others are graduates of the several technical schools and colleges strawn all over the country. This seems to be the only form of diffusion of information and technical know-how that is found between the modern and the traditional sectors compared to the more formal mechanisms such as:-

- through professional associations and institutions to popularise knowledge.
- By the Japanese style where the transfer of technology from the large companies to the small one succeeds through the supply by small manufacturers of compnents to the larger companies.
- Through a system of affiliation whereby small enterprises co-operate with larger ones in terms of technology, administration and finance.

The nearest form to the Uganda case is through apprentices who having been trained in the larger enterprises of the modern sector, become independent master-artisans in the informal sector. All heads of workshops interviewed were artisans themselves. Many had started as small roadside repairers of items like bicyoles, radios etc. and had over the years graduated into master-artisans.

In Katwe, artisans are a collection of individuals and families without any internal professional collective structures, cooperatives or unions. But, this is not to say that they are not capable of acting in unison. In fact, during the interviews, they boasted of resisting state repression in the past. They alluded to "Radio Katwe", a powerful grassroot mobilising machinery against the state. Many were of the opinion that the state was incapable of controlling or directing the evolution and functioning of the artisanal jobs. These artisans in the informal sector are a potential mobilising force at grassroot level. The artisans are unanimous in accusing the state of inefficiency and unwillingness to help them. They contend that state demands on them are onerous. They, as examples, cited the state demands that all artisans applying for state aid should open up an account with the Co-operative Bank of not less than 10,000/-. They also complained that the Bank interest rate charged on loans is too high, and of the taxes they had to pay, both as vendors and as manufacturers.

According to them, things are not made any easier by the corruption that is rampant in government departments. This makes state assistance very expensive. To many of them, there is a clear dichotomy between themselves and the state.

This vision, however, could be illusionary. Their political activities, especially after 1979, indicates a close link with political structures. The state is also part of their economy. There is a strong link between individual state agents and the individual small producers. The state is both a united body and the sum total of agents whose strategies spread out in circles. The state sometimes protects markets. The workshop dealing with the repair of transformers was repairing them free at first, precisely in order to cultivate and capture this market. Other connections are through theft of government equipment to be used in their workshops.

Training

Crucial to the transfer of techniques is technical education. In Uganda, the Namutamba Pilot Project started in 1968. Both Teacher Training and trial syllabuses in the surrounding 15 (fifteen) Primary Schools were tried out. The schools were to be developed into community schools for the non-formal education of youths and adults. This project was aimed at the practical content of primary and secondary school curricula so as to better prepare the majority of graduates for productive employment or self-employment⁽²⁾.

After 1970 technical, agricultural and vocational training was introduced at all levels of secondary school. Technical subjects like agriculture, woodwork, metalwork, technical drawing, industrial art and commercial subjects were introduced. By 1972, there were 12 rural trade schools, 5 technical schools and 1 technical college. In 1975, the Ministry of Education introduced a new curriculum for all Secondary schools. The new approach was to move away from factual courses and stress the process of discovery of principles and concepts along with experimentation and project work. The ratio of arts to science students was 60:40⁽³⁾.

During the years 1971 - 1979, technical and commercial education dropped as a result of lack of facilities and insecurity. Higher technical institutions included the Uganda

Technical College (UTC) and the faculty of Technology of Makerere University. These institutions received aid from UNESCO.

In 1980 a new curriculum was designed. It made Agricultural and Political Education compulsory, with at least one vocational or technical subject. The project, however, faced severe shortages of tools, machinery and materials. A pilot project in general technical education was started in Mengo Senior Secondary School.

Between 1981 - 1983 the number of technical institutes / ^{increased} from 5 - to 19. Four vocational training centres were operated by the Ministry of Labour. Industrial Upgrading Courses were run by the YMCA and Trade Unions.

Today, technical education in Uganda comprises four different categories (4);

- Uganda Polytechnics (1). It admits post "A" level students and trains them in various engineering fields, e.g. water engineering, Refrigeration and Air Conditioning, Telecommunications, Technical training and Electrical, Mechanical and Civil Engineering.
- Technical College (4 in all). These admit post "A" level students also and are trained in Civil, Mechanical and Electrical Engineering.
- Technical Institutes (28 in number) admit "O" Level students for a period of two years and train them in various trades similar to these found in Technical School.
- Technical Schools (24 in all) admit post primary school students and their courses run for three years. They are trained in trades like carpentry, brick-work, electrical installations, tailoring, fitter mechanics, plumbing, motor vehicle mechanics, shoe-making and leather work, printing and decoration, agricultural mechanics, etc...

Within the regular secondary school system a technical subject is compulsory. This may be in such fields as agriculture, woodwork, building, drawing, industrial art, textiles and clothing, etc.... There are also vocational institutions run by the Ministry of Labour.

The Ministry of Education however accepts that all the Polytechnic and University level graduate engineers are under-utilised. This is because these higher technicians and engineers are taught to conceive technology, but the infrastructure to do so is absent. The country instead

relies heavily on the importation of technology and finished products. At the lower levels, however, the graduates of these various technical institutions get ready absorption in the informal sector.

Technical Education in Uganda remains marginal to the Education System. This is well demonstrated by the percentage of expenditure on it for financing development projects in the financial year 1987/88 (5):

Institution	Amount in Million of U. Shs.
Technical Schools and Institutes	3.4
Secondary Schools	80.4
Primary Schools	12.6
Makerere University (Local Funding)	44.6
(Joint Foreign and Local Funding)	37
Technical Colleges and Colleges of Commerce	12.4
National Teachers' Colleges	10.8
Primary Teacher Training Colleges	10.7

Technical Education also received some funding from the IDA, EEC and the WFP tractor programme for Secondary Schools.

There has been some transfer of technology in the form of training. Many Ugandans have trained abroad for higher degrees and a number have been trained in industries and vocational training institutes abroad. For effective technology transfer, more "On-the-job" training is required as this would give the best results. When new technologies are to be introduced in the country, "pre-manufacture" transfer of technology is necessary. To do this, indigenous nationals could be sent to train on machines in plants using similar techniques. When this training is completed, nationals would then be able to take part in the installation and eventual running of the plant. Such a procedure would ensure that when foreign personnel leave, they leave behind trained and experienced personnel to run the plant thus lessening maintenance and repair problems. The transfer of technology in Uganda has led to perpetuation of dualism of the traditional/modern sector. This has led to perverse growth and has been accompanied by a distribution of income which is also perverted. This has mainly been as a result of external financing which has subordinated the decisional latitudes for the diversification of sources of technology. Most of our technology is western and more specifically British. Where

these has been diversification the lack of co-ordination has rendered the transfer expensive and ineffective. The array of sources ranging from the British made textile industry, the Yugoslav built Meat Canning Factory in Soroti, the Russian built Spinning Mill in Lira, Egyptian, Pakistani and Indian technological aid in the fields of Agriculture and Medicine makes co-ordination all the more important.

The establishment of a Ministry of Technology is a recognition that Technology is not merely one of the factors of development but a major variable. This realisation, it is hoped, will open up possibilities of options between several technological solutions, in this way diversifying sources and reducing the cost of technological dependence. There is need to depart from projects where on making the feasibility study technology is regarded merely as one of the factors. (Such studies reduce technology to the estimated costs of the factors.) Such studies reduce technology to the estimated costs of investment in fixed capital, the rate of depreciation, etc.. The real aim of such studies is to ensure profitability of the projected plans and to ask for aid.

In Uganda there has been very little transfer of technology through the adaptation of imported technologies to local resources and even less through the development of appropriate technology. The acquisition of modern technology is very expensive. It involves the buying of patents, importing intermediary products and equipment, buying from a restricted market, etc...

The training of Ugandan nationals abroad as a means of transfer of skills has often led to an adoption of respect for modernity and this has stifled the will to innovate and look for less complicated technological solutions.

Rural Technology.

Agricultural development is of central importance to the Ugandan Economy. A correct appraisal of technological development in this sector is therefore of prime importance. Successive Ugandan governments have since independence professed the main axis of their rural policy to be the provision of appropriate production inputs, improving the marketing and cooperative movement structures, diversifying crop production and modernising of the production structure through the adoption of appropriate technology (6).

In reality, however, policy commitments to devote resources to applied research on appropriate technology have not been

followed up. In the precolonial period technology developed was rudimentary and had no significant effect on the organisation of production. This technology had mainly to do with weapons for war or defence of rural communities and the making of agricultural implements or tools used in the processing of foodstuffs. The colonial government did not build on this infrastructure but rather destroyed it and introduced "modern" technology. The postcolonial government extended the modernising drive and pursued a policy not to rock the boat. In other words, the colonial social organisation of production was left intact. In Uganda this meant a hierarchical relationship of owners of large tracts of land issue of the 1900 Buganda Agreement, thousands of tenant farmers and other categories of farmers practicing usufruct and customary land tenure systems. The postcolonial governments did not legislate on land use planning which would have taken into account population pressures, crop requirements and ecological needs. The large holdings of land by individuals favoured by political authorities were not reviewed. Past regimes arbitrarily seized land and reallocated it. This led to rural conflict and xenophobic reactions against immigrants especially as the land frontier had been reached in areas like Mbarara, Bushenyi and Mbole (7).

Any rural technological innovation has to take into account the social relations on the ground.

Postcolonial governments pushed for the use of tractor technology even as it was evident that most farmers could then not afford this technology which also implies consolidation of the small holdings. Governments were ambivalent in their support for hand tools and animal powered implements and the expansion of tractor based agriculture. The issue of the use of modern technology in agriculture is a complex one. Its use requires heavy capital and little labour. It is therefore appropriate for large scale operations. Its application in developing countries, however, could reduce employment and increase rural inequalities. Initial studies of the UCB operated Rural Farmers' Scheme point to this direction. It has been argued that the package of credits extended to farmers could entrench the rural hierarchical structure (8). Other than through state subsidy, the small farmers in Uganda with small incomes and relatively little access to credits cannot afford this technology. Neither are developed countries willing to produce simple and handy equipment for such an unsure market. In addition to the cost of acquisition is the problem of maintenance given the large

number of small isolated clients. This would require a very extensive distribution network. Whether agricultural technology is imported or of indigenous origin, it is important to know which farmers adopt it and how it spreads in the countryside. If the purpose of applying new techniques is to increase production and remove rural poverty and inequality, then the category of beneficiaries is crucial.

Because of the large number of isolated farmers, government and other agencies tend to concentrate on the "progressive farmers", with the hope that these will have a demonstration effect which will eventually spread to the whole of the agricultural community. In Uganda a Progressive Farmers Association was launched in 1988. It comprises mainly government notables and retired civil servants (9). This argument is however erroneous because there are a number of non-economic factors that influence the adoption of technology, including motivation, psychological reasons, social status, caste systems, etc. These policies only serve to reinforce the hierarchical relations in the country side.

Non-formal education is then crucial to the diffusion of technology in the rural areas. This has been largely absent in Uganda. It has been observed elsewhere that the capacity to adopt new technologies increases with the level of literacy. If education is to be linked to development then the educational needs in Uganda should be redefined. The colonial education system that was a servile imitation of Europe, where manual labour was despised and whose content was divorced from reality has to be abandoned. It is only then that the peasant farmers can effectively benefit from processes intended to diffuse technology into their communities. Government has at its disposal a number of means to propagate new techniques at farm level: these include, the mass media (radio, posters, prospectuses, etc); or through cooperatives, pilot schemes, etc.

The Future Development of Technology in Uganda.

In line with the recommendation of the Lagos Plan of Action a department of technology was established. The main functions of this department include:-

1. Policy formulation for the application of technology in Uganda.
2. To establish and maintain approved standards for locally manufactured and imported goods.
3. To control and co-ordinate research activities in industries and other organisations involved in technology work.

4. To assess and regulate foreign technology input in national development programmes.
5. To study, develop and up-grade indigenous technology.
6. To establish and co-ordinate an Industrial and technological information bank.

It is hoped that when this newly established department carries out its designated duties, the acquisition, adoption and development of technology for economic development and improvement of the standards of living, will be accelerated. It is now widely accepted that technological development is essential if the exponential growth of the population and the resultant fall in the living standards is to be avoided. This fact has been recognised by many organisations for example the commonwealth secretariat who, in "A proposal for the developing commonwealth, London, May 1983" say "If we wish to achieve a modest gain in our standard of living - and indeed prevent it falling as our population increases, we must multiply the opportunities for the productive employment of engineers and technicians, and, necessarily, multiply the rate at which such people are being formed. If this is not done, and started as soon as possible, it seems clear that the increased population can only expect hunger, over congested towns and miserable living conditions ...

In addition, the present shortage of engineers and technicians has resulted in poor and unreliable service in utilities, poor efficiency in industry and the inability to execute development projects."

The task before the newly established department of technology is therefore both formidable and challenging. The problems of developing, up-grading, assessing, regulating e.t.c technology have to be tackled at various levels e.g. the policy level, the sub-sectoral level, training level, feasibility study level and project implementation level etc.

For example, in order to assess the technology, it will be necessary to prepare a framework within which the desirability of the technology will be examined. There are a number of criteria impregnated in issues like social, economic resource endowment, the environment, technical and managerial skills etc. When criteria are identified the issues of assigning weights on different criteria will also pose a difficult situation. Another highly relevant point will be the ever-changing importance of the criteria.

In evaluating or assessing the technology envisioned in a project, guidelines that will be available in the initial stages will be the broad national objectives and goals. Thus, there will be an acute need for some previous experience with technology and an insight into all the relevant issues.

But, for all this to be possible, we need a technology policy, a comprehensive statement by the highest policy making body in the Government.

A National Science and Technology Policy.

At the moment, we have industries under the Ministry of Industry and Technology, some under the Ministry of Agriculture, others under the Ministry of Animal Resources, some under the Ministry of Cooperatives and Marketing and so on. We have educational and research institutions under the Ministry of Education, some under the Ministry of Regional Co-operation, others under the Ministry of Animal Resources, some under the Ministry of Agriculture etc. What role will the Commissioner for Technology play in the acquisition of plant and machinery for the various industries and activities in the country? Is there a role to be played by the technology staff when new investments are being worked out? If so, What? These, and many more similar questions have to be answered remembering that technology is only as good as the purpose for which it is utilized and that with equal success, its use can be directed toward conservation or degradation of our natural world, toward optimal human development or total destruction of humanity. Uganda needs a technology policy.

This must be a comprehensive statement by the highest policy-making body of government to guide, promote and regulate science and technology activities for national development purpose. It must contain statements of aims and objectives of principles and purposes and of commitments of government for science and technology.

The policy should provide the overall criterion for the use of resources and should provide guidance for formulating policy instruments and plans. While setting the national technology goals and objectives and inducing the formulation of relevant policy instruments, it should also embody anticipatory decisions on specific investment programs in various sectors. The main purposes of the policy would be:-

- To commit government funds and set priorities for research and developments;
- To encourage technology innovation to meet national objectives;
- To attract enough dedicated science and technology workers;
- To provide science and technology services;
- To utilize selected technologies as tools for national development to legitimize the technology policy;
- To integrate the technology policy into the national development policy;

Since a technology policy can affect and conflict with the current status of various groups such as Ministries and departments, its acceptance by all these groups should be sought. The policy-formulating body should draw up the organizational structure and the operational mechanism and specify the responsibilities of each group to handle implementation of the different policy instruments.

Implementation of a well formulated and accepted national technology policy will resolve the issues raised above and will solve current national unease about:-

- Lack of indigenous nationals' involvement in current rehabilitation and construction programs. If we are to build an independent, integrated and self sustaining economy, we must progressively reduce our dependence on foreign inputs. We need to build national capacities to carry out rehabilitation and construction programs.

Acquisition of know how, where we do not have it, will be necessary.

- The falling standards in the training of artisans, craftsmen, technicians, engineers and scientists are required in the various enterprises. Since the polity would embody anticipatory decisions on specific investments programmes in various sectors, vocational and professional training of nationals to man the various sectors of the economy will have to be done to make sure that the right manpower is available when it is needed.
- Substandard jobs done by contractors and inappropriate technology imported into the country.
- The inappropriate research that is sometimes done in the country. Research and development studies must produce technology to: Satisfy human needs; gain competitive edge in the market; achieve strategic self-reliance;

and increase human capability and productivity. Some research, especially agriculture, has been done but a lot more needs to be done especially in the field of material so that the technology produced will be used to build industry that will be locally based.

- The low levels of industrial production due to lack of raw material and spare parts. Industry set up here must be locally based. The question of setting up an industry that depends, for its operation, on a huge proportion of foreign inputs in terms of raw materials, spares and personnel, must be addressed. We must for example build a national capacity to manufacture spare parts. A number of small scale industries can be set up to manufacture the various parts that are required nation-wide and possibly for export.
- The inability to adapt technology. This has led to continued dependence on imports. A system must be worked out so that after the initial importation of machinery and equipment, it would not be necessary to import more. For this to be possible, full engineering drawings, installation of land maintenance manuals would have to be supplied with the equipment. More "on-the-job" training would be necessary and when new technologies are to be introduced in the country, pre-manufacture transfer of know how would have to be arranged. Management and technology transfer agreements would have to take these into account.
- Apparent lack of government support of local industries. To encourage local industry and therefore create an independent and integrated economy, organizations could be discouraged from importing anything from outside, if that item or a suitable alternative is being locally produced in sufficient amounts. This will not only save foreign exchange but will lead to development of indigenous know-how. It will of course be necessary to control standards to ensure that goods on the market meet approved standards. A system of checking on the prices will also be necessary.

Industrial And Technological Information Service.

A pre-requisite of industrial development is the transfer of economic, industrial and technological information to entrepreneurs, planners and decisions makers. As an

inherent aspect of the policy of industrial development and promotion, the Ministry of Industry and Technology, with the assistance of the World Bank and UNIDO is establishing a computerized Industrial and Technological Information Service within the Ministry. The nucleus of such a service is already being established.

The information service will be need based. The objectives of the service are:-

- (a) To provide information on the following:-
 - process technologies;
 - machinery and equipment with special emphasis on equipment suitable for small and medium scales;
 - markets;
 - standards and specifications;
 - development policies and programmes of other countries;
 - general information on industrial development.
- (b) Identify the needs of users and selectively disseminate information to them.
- (c) Reduce the gap between the users of information and the sources thereby contributing to enhancing the technological capabilities of entrepreneurs in Uganda.

To hold with the process of acquiring information, linkages have already been established with a number of international organisations such as Intermediate Technology Development Group, the United Nations Industrial Development Organisation (UNIDO), volunteers in Technical Assistance (VITA), Tropical Development and Research Institute, International Labour Organisations (ILO) and National Information Centres.

The centre intends to work closely with the National Chamber of Commerce and Industry and the Uganda Manufacturers Association, in providing information to them or through them to the entrepreneurs. Though the Industrial and Technological Information service, is still in the initial stages of development, it hopes to provide the following services:

1. Question and Answer Service.

Entrepreneurs who require information on a specific product or aspect can channel their questions to the information service. Information will be collected from available sources or from external sources and made available to the inquirer.

2. Bibliographic Service.
Information available on specific products is being compiled into bibliographies. The purpose is to make users aware of the information that is available on a specific product. Those interested can visit the information centre and refer to the publications.
3. Reference Service.
A library will be accessible to the public for reference.
4. Awareness Bulletins.
With the expansion of the service, users will be kept informed of the information received by the unit. This will enable them to follow up and be up-to-date with developments in their respective areas of activity.
5. Information Packages.
Information Packages on specific subjects e.g. leather products, edible oils, foundry etc. will be compiled. Subjects will be selected according to existing demand for information on a particular sector. Coverage will be provided for raw materials, techniques of production and alternatives, machinery and equipment, common technical problems encountered, standards specifications, markets etc.
6. Photocopying Service.
Photocopies of articles will be made available. A small fee to cover expenses will however, be charged.

C O N C L U S I O N

The lasting basis for the acquisition of skills is the internalization of processes integral to the technology being acquired. There will have to be a deliberate effort in research related to the use of local materials. This will be facilitated by a co-ordination of efforts by the different organizations involved in the application and vulgarization of technology. The informed sector has got a lot to contribute in the use of indigenous materials and skills to manufacture both consumer and capital goods. The Ministry of Industry and Technology has catalogued many of these informal activities and now acts as a link between them and foreign bodies and companies. Professional associations like the Uganda Manufacturers' Association and the Uganda Small Scale Industries Association act as important channels for the diffusion of technology.

Import-substitution industries are islands of technology as their processes are in most cases not integrated with the local economy. Instead they act as channels of capital flight and little technical advantages trickle down to the local community. In the past there has been little emphasis on vocational education. The educational was geared to the training of state functionaries while missionary schools were geared to "character building". These policies have led to a structural imbalance has led to a situation whereby the civil service is overstaffed while at the same time there exists an acute shortage of technical know-how.

The dependency relations in which Uganda is entangled hamper the effective transfer of technology. This dependency is both ideological and material. As long as part of the development budget is externally sponsored, the latitudes of decision-making in terms of technological objectives are quite limited.

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