Africa Development, Vol. XXIII, No. 1, 1998

Government Policy on Technological Development in Nigeria: An Appraisal

Arthur Ebun Davies*

Résumé: Le rôle de la technologie en tant que moteur du développement économique est désormais chose reconnue et acceptée au Nigeria. C'est ainsi qu'a été lancée en 1987 une politique globale dans les domaines scientifiques et technologiques. On s'attendait à ce que, avec la mise en oeuvre de la politique, la technologie indigène soit relancée et que le Nigeria franchisse la barrière technologique dans les plus brefs délais. Mais cela s'avère être un grand rêve, car la mise en oeuvre de la politique scientifique et technologique a essuyé des travers. Les activités de recherche et développement qui mènent aux innovations, inventions et à l'adaptation de la technologie indigène, n'évoluent pas comme il faut. De plus, des problèmes tels que le financement insuffisant de la recherche, le fondement fragile de l'éducation scientifique et la confiance excessive en la technologie étrangère préconditionnée, inappropriée, affectent la réalisation des objectifs de la politique technologique et scientifique. Cependant, tout espoir n'est pas perdu. Avec une méthode plus vigoureuse de mise en oeuvre de la politique par le biais d'un financement adéquat, une gestion appropriée et une coordination de la recherche et développement, le Nigeria est capable de réaliser un développement technologique.

Introduction

Nigeria has been and will continue to be an avid consumer of products and services from modern technology (Igwe 1998), relying very much on 'packaged' technology. Until 1987, Nigeria neglected the formulation of a comprehensive technology policy and programme that would enhance technological advancement. However, it is not true that Nigerians are unaware of the value of technology. Indeed, every Nigerian government since independence has been aware of the need to accelerate the process of economic development of the country by first eliminating the obstacles to

* Department of Political Science, University of Ilorin, Ilorin, Nigeria.

development imposed by, among other things, the prevailing technological underdevelopment and dependence.

Furthermore, there has been a growing awareness and acceptance of the thesis that technology is a propelling force which, in the Nigerian case, must be internally induced; and where it has to be externally supplied, must be internally managed if the goal of improving the quality of life of the people is to be realised and sustained (Obasanjo and Mabogunje 1991:96). It is probably against this background that the Nigerian government under General Ibrahim Babangida launched a science and technology policy in 1987. The implementation of this policy will hopefully reactivate various research projects reportedly stalled in some of the local research institutes, and co-ordinate and upgrade the technical manpower available in the country, as well as provide 'a framework for the effective transformation of the nation's technological base' (Makanjuola 1992:187).

This paper appraises the science and technology policy of the Nigerian government launched in 1987, pointing out the lacuna in the implementation of the policy and making some suggestions that should be considered when the policy would be due for a review. But before doing that, let us briefly discuss the situation of technology policy before the science and technology policy was launched in 1987.

Nigerian Technology and Technology Planning in Historical Context

If technology, defined by the *Encyclopaedia Britannica* is 'the systematic knowledge of making or doing things' then the people of Nigeria during the pre-colonial era had the knowledge which they applied systematically to produce for their needs. They designed and utilized what could be regarded as indigenous technology in all aspects of their productive endeavours such as iron-smelting, cloth-making, black-smithing, pottery, tanning and mining of different minerals (Onimode 1993:82). Trading in the commodities produced locally also flourished between Nigerian and European traders who frequented the West African coast. Although productivity was relatively low and technology utilized to produce the commodities was also crude by the level of technological development in Europe during that time, nevertheless the efforts of the people were worthy of praise.

They tried to improve their productive capability to satisfy their needs not by using imported technology but by being innovative. If such innovative capability had been allowed to develop, the state of indigenous technology would have been different. With exposure to other techniques in other cultures and the full mobilization of the people's productive forces, indigenous

and autonomous technological development would have reached a higher stage, albeit slowly (Davidson 1980:84).

British colonial rule imposed on Nigeria in 1861 interrupted the free process of autonomous development as it did in all the places where colonialism took root. The interruption was done in Nigeria to fully integrate the Nigerian economy into the world capitalist system. By exposing the Nigerian economy to an interplay of market forces that required the acquisition of new skill and a new orientation which only satisfied the commercial interest of Britain, indigenous initiative in technological development was relegated to the background (Amdi 1988). This can be said to be the beginning of technological underdevelopment in Nigeria because British colonialism actually dislocated the indigenous technological process through the massive importation of machinery. It also ridiculed the use of locally made tools and destroyed the initiatives of indigenous craft-workers and artisans whose output could no longer match the output of the imported machinery (Onimode 1983:83).

Side by side with the injection of the capitalist mode of production was the colonial legal system which did not protect, in any way, industrial property rights such as trade-mark or patent of innovations made in Nigeria, since only the inventions that had been registered in the United Kingdom were subject to such protection (Eze 1992:163). Additionally, the education system established in Nigeria by the European missionaries and supported by the colonial government did nothing to promote any indigenous technical know-how. On the contrary, the education system was designed to facilitate the training of personnel for the colonial administration and produce people literate enough to evangelise.

Related to the above was the obvious lack of incentive to make Nigerian students to be interested in science and technology-related courses, if such courses were ever made available. This was because the colonial administrative structure itself had little or no employment opportunities and therefore no regard for the science, engineering and technical cadre of workers whose presence in the administration would have provided an impetus in the design and implementation of industrial policy that would emphasize the development of indigenous technology as an important component of development (Adubifa 1990:45).

It has been argued in some quarters that despite the shortcomings in the colonial education system, the British still promoted scientific research during their rule in Nigeria. The promotion of scientific research could be seen in the establishment of a botanical garden in Nigeria in 1893; the department of

agriculture's research stations at Zaria and Ibadan in 1912; the tse-tse fly and sleeping sickness research station in 1922 and veterinary and forestry research stations at Vom and Ibadan in 1924 and 1925 respectively (Igwe 1988). However, a study of the research activities of these research centres showed that the centres' activities were related to agriculture. This confirms the popular view that in addition to general commerce, the British colonial overlords were also interested in the development of agriculture principally to promote the export of primary products generally referred to as cash crops.

Nigeria's independence in 1960 did not bring drastic change in the direction of formulating a science and technology policy because the politicians that took over from the British were the same set of people that had run their political apprenticeship under British tutelage. The post-independence administration that was established was in fact an extension of the British administrative system. For continuity therefore, the new rulers were compelled to apply the colonial strategy of emphasizing industrial policy that could transform agricultural and other resources into semi-processed products for export to the western market, notably Britain (Amdi 1988). Their planning process and development programmes were also not 'terribly different' from what the British did (Helleiner 1966:335). For example, all the three development plans drawn between 1962 and 1980 accorded, as the British plans did, the highest priority to agricultural development and industrialization, through the establishment of import-substitution industries and later export-oriented industries. All these were established by the joint efforts of local and foreign entrepreneurs who established turnkey type of industries where research and development (R and D) activities relating to these industries were carried out abroad. In addition to the industrial policy, the Nigerian government claimed that it was also committed to the development of indigenous technology by increasing its contribution to industrial research and development while making conscious efforts to expose Nigerians to advanced technology to complement local efforts (Third National Development Plan 1975-80:154). But the massive importation of packaged capital-intensive technology that was largely irrelevant to Nigeria's resource endowment belied the claim that the government was committed to the development of indigenous technology.

Therefore, the culture of massive importation of spare parts, machinery and even foreign workers, mostly Europeans, under the guise of technical co-operation, contributed greatly to the low rating of indigenous technology. Similarly, lack of clear ideas on how to promote indigenous technology beyond merely promising to 'adapt local technology and raw materials for industrial use' (Second National Development Plan 1970-74:145), failure to

invest in research institutes and centres, and the absence of a coherent science and technology policy that would direct how the indigenous research efforts as well as their finding could be utilized by Nigerian industries have contributed largely to the prolongation of Nigeria's technological dependence (Onimode 1983:182).

However, a decisive step to lay a foundation for a science and technology policy which could guide the efforts to achieve optimum use of Nigeria's human and material resources for the development of technology was taken in the preparation and, to some extent, the implementation of Nigeria's Fourth National Development Plan. By this Plan, the government established a separate ministry of science and technology with specific responsibilities that included the:

> promotion and development of scientific and technological research; formulation of national policy on science and technology; liaison with universities and polytechnics and the promotion and administration of technology transfer programmes (Fourth National Development Plan 1981-85:206).

In essence, the Fourth National Development Plan was the precursor of the science and technology policy on which so much is expected in Nigeria's stride to technological advancement.

The National Policy on Science and Technology

Development Plans are directional blueprints for the development of a nation's economy with provisions for the direct and indirect methods for achieving the stated objectives (Salvatore and Dowling 1977:201). In the Nigerian case, the development plans recognized technology as an important component which enhances the rational use of human and material resources to satisfy the needs of the people. However, the development plans did not give details about specific objectives, policy direction, priorities and strategies on how to advance the country technologically. The situation is not the same when a specific blueprint which discusses the development and management of technology in all its ramification is being prepared. It was probably the recognition of the sharp difference between incorporating programmes on technology development in development plans and preparing a separate blueprint that details all that needs to be said on the development of technology in Nigeria, that informed the Babangida administration to prepare and launch the science and technology policy.

Nigeria's science and technology policy herein referred to as the policy, aims at promoting economic development along a conceived path of science and technology. The thrust of the policy is to utilise Nigeria's human and material resource endowment to transform the country into an industrial giant

within a decade through creating 'harmony in the quest for knowledge about environment through research and the use of that knowledge to assure better quality of life' (National Policy on Science and Technology 1986). Generally, the policy objectives are intrinsically tied to the national but elusive objective of creating a united, strong and self-reliant nation that will ensure that all the problems that retard economic progress are tackled. This is to be done by, among other things:

> increasing public awareness in science and technology and their vital role in national development and directing science and technology efforts along identified national goals (National Policy on Science and Technology 1986).

Once this has been done, technology presumably, will be translated into actual goals and services, create and increase indigenous research and development and motivate creativity in Nigerians.

The Policy also declares one specific goal which can be summarized as follows:

(i) promote scientific and technological manpower development;

(ii) develop local capital goods industry by initiating design engineering and copy technology activities;

(iii) exploit and utilize Nigeria's material resources to maximum effect;

(iv) encourage local research and development activities in both privat and public enterprises;

(v) finance the development of science and technology through public and private sector contributions; and

(vi) create a scientific culture through the inculcation of science and technology in the thinking and working process of Nigerians (National Policy on Science and Technology 1986).

Institutional Arrangement to Implement the Policy

The Federal Ministry of Science and Technology is the apex organisation that coordinates all activities relating to the development of technology to concretize the objectives of the policy. It is also to oversee other institutions which were established or reorganised in readiness for effective implementation of the Policy. The institutions, include:

(a) the twenty-three (23) research and development institutes all of which concentrate their research and development activities on fisheries and marine, food crops, tree crops, livestock, medical and pharmaceutical research, civil engineering and agricultural services;

(b) the National Office of Industrial Property (NOIP) which has the responsibility for evaluating and approving all technology transfer agreements between Nigerian users and foreign vendors of technology;

(c) the universities of technologies and polytechnics;

(d) the Patents, Trademarks and Copyrights Department of the Federal Ministry of trade which, among other functions, grants approval for and registers patents for inventions from Nigerians;

(c) the National Centre for Technology Management (NACETEM) responsible for developing management capability of Nigerians in acquiring, developing and utilising modern technology; and

(f) the National Science and Technology Fund established to raise and administer funds for science and technology activities.

The structures put in place for the realization of the objectives of the Policy are quite impressive and, given the specific roles assigned to them, one might be tempted to say that the level of technological development in Nigeria would soon be upgraded remarkably. Again, if the comprehensiveness of the Policy, including the designated priority areas of technological pursuit (agriculture and agro-allied industries, health and capital goods industries), is to be used as an indicator, it would not be out of place to say that Nigeria could be transformed economically to join the ranks of newly industrializing countries in Asia and Latin America.

Implementation Gap in the Policy

It is common in Nigeria as it is in other developing countries to record the widespread failure of public policies to achieve stated policy goals. This is a phenomenon that is generally referred to in policy science as 'implementation gap' (Egonmwan 1991:213). In the context of this paper, the assessment of any implementation gap between the goals of the policy and the recorded achievement or failure can only be done if we ask the question: to what extent have the objectives of the policy been realised? Put differently, has the implementation of the Policy not become the graveyard of the Policy itself whereby the intention of the designer of the Policy is undermined by a myriad of unresolved problems? The answer to this question is yes because, contrary to what is expected, it does not appear that any meaningful research and development activities which will promote technological development in the country are currently in place. Besides, a science and technology policy that places emphasis on indigenous efforts but still encourages the domestic

market and the industrialization process to be influenced by and dependent on already packaged foreign technology is not likely to achieve much. What then are the problems?

There are many problems which the Nigerian government must tackle if the science and technology policy is to achieve its objectives. Although we recognize the effect of the numerous problems (financial, social, political, institutional, educational, etc.), which hinder the effective implementation of the Policy, we are focusing on only those that we think are very grave and for which urgent solutions are required to keep the effective implementation of the Policy on course.

1. Low research and development culture: the Nigerian elite has not cultivated the habit of giving priority to research and development activities which are necessary to industrialize a country. The point of emphasis is that research and development activities do not rank high in the national priority rating of the country. Developing countries like Korea, India, Taiwan, Mexico and Brazil, all of which do not have large resource endowment like Nigeria, have progressed technologically because they have made science and technology the epicentre of their development strategies (Igwe 1988). They have cultivated a research and development culture which recognises 'that every major productive or service institution requires an R and D unit either individually or in a formal co-operative research arrangement with similar bodies' (Nwokolo 1987). The bureaucrats in Nigeria do not seem to appreciate this fact and, therefore, are not in a hurry to boost research and development.

2. Low funding and injudicious use of budgetary allocations: one way of illustrating the low priority accorded science and technology by Nigeria in its development process is to look at the abysmally low proportion of the federal budget allocated to science and technology in the last ten years. For example, allocations to science and technology have hardly gone beyond 1.2 per cent of the entire federal budget and are definitely less than 0.3 per cent of the Gross National Product (GNP). This is unlike the level of funding for science and technology in the developed countries where allocations to scientific research range from 2 to 3 per cent of the GNP.

Despite some efforts being made by the government to increase the level of funding, its current annual budgetary allocation to science and technology activities has remained below the 1 per cent recommended to African states by the Lagos Plan of Action in 1980 and adopted by the Assembly of Heads

of State and Government of the Organization of African Unity (OAU). Besides, the paltry budgetary allocations are expended more on salaries and emoluments of large administrative staff and other sundry workers in the research institutes, leaving little for the recruitment and training of scientists, as well as the procurement of equipment and materials necessary for meaningful scientific research. This is what has made Nigerian research centres, universities and polytechnics to remain distressed.

It has now been widely accepted in Nigeria that the government, no matter how it tries, cannot provide all the funds for scientific research and the development of indigenous technology. In this regard, the Policy directs that science and technology be funded by both public and private sectors of the economy. As part of the plan to ensure regular funding, a science and technology appeal fund for N400 million ($80 million then) was launched by the government in 1987. Public and private institutions as well as public-spirited individuals were asked to contribute generously. The people responded, contributing N15 million ($3 million then) which the government promised would be judiciously used to ensure that 'the investment in the development of science and technology would yield dividends in the shortest possible time' (*Guardian*, July 29, 1987). However, the appeal fund seems to have gone into abeyance.

It is not a bad idea to launch a science and technology appeal fund to raise money to complement government funding. But it is a mistake for the government to allow the budgetary allocation to remain at such a low level as it is now and expect substantial amount from donations to fill the gap. While some individuals could be persuaded to contribute money to a science and technology fund and even endow chairs in Nigerian universities engaged in some research and development activities, it is, however, wishful thinking to expect any substantial contributions from the industrial and commercial sectors. There are many reasons for this view.

To start with, the private sector in Nigeria is dominated by foreign investors with no recognisable interest in the development of technology in the country as long as there is a ready-made technology that can be transferred to and paid for by Nigeria. There is also no regulation or policy directive that compels any private company, foreign or indigenous, to contribute to ongoing research projects in government-owned institutes. Therefore, foreign companies operating in Nigeria would rather fund research activities in their home-state than to promote research activities in their host-state.

Similarly, indigenous and foreign companies in Nigeria, majority of which are, incidentally, now declaring huge profits even when the Nigerian economy is still pretty much in bad shape, would rather donate to, for instance, the Nigerian Society for the Blind than to fund the research institute that is working tirelessly on the best and cheapest method to prevent blindness; or they would rather donate money to the home for the handicapped children as a philanthropic gesture and enjoy the bliss of the publicity that goes with such a gesture, than to fund research on the prevention of deafness, dumbness or the spread of polio virus among children. All these are possible in Nigeria because there is that general feeling that the promotion of science and technology is the responsibility of the government. There is also little appreciation of the need for the private sector, which will benefit from the economy in the long-run if Nigeria becomes technologically advanced, to support efforts to promote science and technology. The private sector in Nigeria appears not ready to subscribe to the view that most researchers in those countries that are industrialized are being supported by private industries and financial houses. The government of these countries only provide the minimum essential infrastructure (Tomori 1995).

3. Faulty education system: Education is a basic element in the development process. More important, good science education is imperative for any country that desires modern technological advancement. Therefore, for a country to benefit from its investment in education that is relevant to development, school curricula must be focused on science education. Regrettably, the present educational system in Nigeria and the orientation of majority of Nigerian students do not provide such hope for the country. School programmes and curricula, as well as the method of teaching science at the primary and secondary school levels do not promote enough awareness in science and technology. This makes it much more difficult for children to develop interest in learning up-to-date advances in science and technology with which they later develop technological skills (Adeniyi 1985:130). A good educational foundation would have influenced enthusiasm for science and technology in the general public, already enslaved by a culture of superstition, that have prevented the development of a scientific community in the country.
4. Lack of collaborative efforts in scientific research: it seems there is no direct link between research institutes and the universities. This is why research and development activities in Nigeria remain crude, uncoordinated and non-directional. If all the data and reports emanating from projects funded from public purse had been collated and deposited with a relevant

agency like the Ministry of Science and Technology or exchanged between the research institutes and the universities, it would probably have been much easier to disseminate scientific information in a systematic manner.

Furthermore, despite the establishment of some universities of technology with curricula that include industrial attachment for the students, there is no industrial interface between the universities and the industries which would have promoted a mutually interlacing and reinforcing linkage of science and technology with production, as it is generally done in the technologically advanced countries. Lack of this linkage is probably due not only to the contempt which the industries have for the scientists in the research centres and the science graduates of Nigerian universities, but also to lack of sufficient information on what the universities and the research centres are doing in developing indigenous technology. Moreover, lack of linkage or its ineffectiveness, between the research centres and the universities on the one hand and the industries which are the ultimate users of technology, has caused Nigeria to be the graveyard of uncommercialised inventions (Igwe 1988).

5. Ineffective scrutiny of transferred technology: Technology transfer can be defined as a process by which one country acquires hardware, technical skill and training necessary to operate the acquired hardware from another country. But the process is 'not complete until the buying nation is, in addition, able to manage, maintain, replicate and improve that technology through research and without assistance from the selling nation' (Adeniyi 1985:127).

Transfer of technology is not a new activity. It has been taking place between developed and developing countries, between developing countries or between developed countries. It is the transfer of technology from the developed countries that has, for example, enabled some developing countries to benefit from already tested technical know-how. It has also permitted the developing countries to use the technology already developed without having to go through the tedious and often costly process of developing it (Stewart 1978:122). There is in fact an endless list of advantages which purportedly accrue to the developing countries in their technology transfer deals. Substantial technical changes have not only taken place in the developing countries, but also that their industrial development has been accelerated by imported technology (Lall and Streeten 1977; Stewart 1979; and Lall 1985).

As a developing country, Nigeria has also been a recipient of transferred technology either through agreements reached between Nigerian entrepreneurs

and foreign investors or through joint ventures between Nigerian governments and foreign entrepreneurs. In order, therefore, to provide an effective method of checking the type of technology transferred to Nigeria, the government established the National Office of Industrial Property (NOIP). The NOIP has, among other things, the primary responsibility to:

(i) encourage a more efficient process for the identification and the selection of foreign technology;

(ii) develop the negotiating skills of Nigerians with a view to ensuring the acquisition of the best contractual terms and conditions by Nigerian parties entering into any contract or agreement for the transfer of foreign technology; and

(iii) register all contracts or agreements having effect in Nigeria (Decree No.70, 1979).

The provisions of this decree evidently show that (a) the Nigerian government has been eager to minimise if not eliminate the importation of useless technology by multinational corporations and (b) the government considers it imperative to scrutinise, before reregistering, the entire package of any transfer arrangement between Nigerian businessmen and foreign investors with a view to eliminating restrictive trade practices, tie-in-clauses and other lop-sided agreements that favour the foreign partners but which are inimical to the interest of the Nigerian partners and hence to Nigerian interest.

It is and within the scope of this paper to enter into polemics on the appropriateness or otherwise of the technology transferred to developing countries, including Nigeria or to discuss in detail the numerous undeserved concessions which the foreign partners in the transfer agreements have gained from these countries (Singer and Ansari 1977:193-214). It suffices to say that Nigeria has not benefited much from many technology transfer agreements and that the NOIP which is supposed to protect Nigerian partners in such agreements has failed to live up to its responsibilities. The observed ineptitude of the NOIP has, for instance, prompted the government to issue new guidelines to minimize the perennial undesirable consequences of foreign technology transferred to Nigeria: in terms of its huge costs to the economy; loss of control over decision on production and marketing as well as other restrictive clauses which inhibit the research and development efforts of Nigerian enterprises.

What is to be done

It has been shown in the foregoing that Nigeria has a comprehensive science and technology policy and that some structures have been put in place to implement it. Yet, Nigeria is not anywhere near technological advancement due to some problems including those discussed in this paper. It is true, however, that these problems exist in almost all the developing countries; some of them have overcome the problems or minimized them to such an extent that their technological advancement has been assured. This is not so with Nigeria. More worrisome are the persistence of the problems analysed in this paper and the seeming inability of the government to find solution to them. What then must be done to make the science and technology policy achieve its objectives? A number of suggestions will be in order here.

Adequate Funding

The development of local technology, managerial and other capabilities to utilize foreign technology for Nigerian needs is an expensive undertaking which requires a very strong stimulus from the government. This can only be done if funding for research and development activities receives a higher order of priority in the national budget than it is presently receiving. An annual budgetary allocation of 3 to 5 per cent of Nigeria's GNP is imperative because erecting or modernizing science and technology infrastructures, recruiting and retraining scientists and technologists will cost a lot of money. However, care should be taken when preparing the expenditure profile of the research centres not to use a larger percentage of the funds to pay the salaries and allowances of administrative staff whose productivity has limited bearing on research and development.

There should also be some discrimination in the allocation of funds for research from the national budget. Pure and applied research require different levels of funding as one is more important than the other. Pure research is, for example, basically concerned with adding more information to the stock of existing human knowledge; it may be done with or without sophisticated equipment. Conversely, applied research is a deliberate investigation which aims at finding scientific solution to practical problems inhibiting progress in the society. Both types of research should be funded but applied research should take priority and hence take a larger share of the funds allocated to science and technology. The fact is that funding applied research more than pure research is more rewarding because (i) objectives to be achieved can be stipulated in advance for the researchers to pursue and (ii) the success of the

research can be evaluated much more easily within the context of objectives that have been set (Johnson 1975:13).

In funding applied research, more expenditure should be allocated to agriculture and its related activities such as high-yielding and pest-resistant crops, durable food storage and preservation systems, cheap health-care delivery systems and the protection of the environment. These are the areas needing urgent attention to improve the quality of life of majority or Nigerians. No useful purpose will be served now in promoting, as the government seems to be interested in doing, complex and expensive researches for use in high-tech industries. They are not easily viable and for them to be viable, they must be export-oriented and the prices must be internationally competitive. This is difficult to achieve in Nigeria now or in the nearest future.

Improving Science Education

It has been observed that the prevailing poor scientific environment in Nigeria can be attributed to the poor foundation in science education which in turn has contributed to a very low culture of research and development. The solution to this lies in the readiness to revamp the education system in such a way that will increase technological awareness and enhance the prestige of scientists. Increased awareness in science and technology can be achieved through shifting emphasis in the school curricula in favour of science and organising regular science competition among school children. But the prestige of scientists cannot be enhanced until there are more employment opportunities with better pay for science and technology graduates. Though the government is the largest employer of labour, by the structure of the Nigerian civil service which has not shed its colonial garb, preference in recruitment is still being given to graduates of humanities and social sciences. Consequently, majority of science graduates are only employed as teachers while the remaining ones seek employment in the private sector which, too, has fewer places for them. Some even migrate to other countries, thus constituting a brain-drain of talents out of Nigeria. The Nigerian civil service under the leadership of people without scientific background, expectedly, has failed to appreciate fully the important role of science and technology in the development process (Nwokolo 1987). A Nigerian civil service that is modelled along the French civil service that consciously elevates the status of professionals in science, engineering and economics, is needed to ensure reordering of priorities in favour of science and technology in the country.

Developing Appropriate Technology

Given the present state of underdevelopment in Nigeria, the emphasis of a science and technology policy and the strategies for its implementation should be on the development of appropriate technology which, by definition, means small-scale, labour-intensive and capital-saving technology that primarily uses local skill and the material resource endowment of a country (Agarwal 1980:305). The development of intermediate technology with the remarkable characteristics of smallness, simplicity and cheapness (McRobie 1979:73) should also be on the policy agenda.

All these should be encouraged, however, without prejudice to the acquisition of foreign technology which may be necessary to complement local efforts. Equally important is that when a decision to import foreign technology from the advanced countries has to be taken, the decision-makers have to bear in mind that technologies developed in the advanced countries have characteristics that are largely influenced by the economic, environmental and institutional conditions in the advanced countries (Stewart 1978:80). These may not be appropriate for the Nigerian condition. Thus, it is not sufficient to import foreign technology; it is equally imperative to design a recognisable method of adapting, substituting, improvising, copying and improving the foreign technology to suit the Nigerian condition. This is the best way to accelerate the pace of local efforts to assimilate and later develop any imported technology (Lall 1980:704).

The technology to be developed should also not be the type that will eventually destroy the Nigerian environment. It means, therefore, that a good science and technology policy for the country should discourage the local development or importation of any technology that may cause environmental degradation and severe depletion of Nigeria's natural resources. Experience has shown that a technology that is acclaimed to bring about swift and widespread improvement in man's quality of life also has 'the potential for even swifter and more widespread damage and destruction on man and his environment' (*Development Dialogue* 1988:6). The current policy does not seem to address this problem.

Documentation of Scientific Information

Apart from the need for a systematic way of linking Nigerian research institutes with the universities and an effective method of promoting co-operation between research centres and industries, there is need to create facilities for documenting and storing scientific information beyond what can normally be obtained in journals or conference and workshop papers. In this

respect, the Ministry of Science and Technology may have to revisit the old suggestion that national science libraries be established to produce on a regular basis: (a) an inventory of research conducted outside the country but which is considered relevant in Nigeria; (b) a catalogue of scientific publications; (c) an index of postgraduate research dissertations and reports on projects submitted to Nigerian educational institutions and abstracted in a way useful to the user of such information; and (d) a directory of scientific research findings from local institutions (Oragwu 1979).

If the science libraries are properly funded, equipped and managed to perform the duties above, they will effectively serve 'as technology data banks' for researchers from the public and private sectors of the economy (Nwufo and Ashrafi 1985:393).

Conclusion

Nigerian's science and technology policy is as good as any that can be formulated anywhere, even in developed countries. But the implementation of the policy has suffered setbacks. No serious research and development activity is being undertaken to develop indigenous technology to produce variety of goods locally, whereas massive importation of finished products of foreign technology appears to be the new mercantile ideology of the Nigerian bureaucrats and businessmen.

This paper, however, takes the position that it is still possible to raise the frontier of technological advancement in Nigeria provided a more vigorous approach in the implementation of the science and technology policy is adopted along the lines suggested in this paper. The development of indigenous technology which is the crux of the policy is not likely to be attained in the present circumstances by merely formulating science and technology policy and relying on the voluntary stimulus of the private sector to make it work. There is definitely the need for the government to give a helping and directing hand. The implementation of the Policy should be backed by specific and stringent regulations that will ensure adequate funding, management, co-ordination, stimulation and execution of research and development in all the facets of Nigeria's industrialization programme.

References

Adeniyi, J. S., 1985, 'Technological Transfer: A Myth or Reality', in Olufeagba, B. *et al.* (eds.) *Technological Development and Nigerian Industries*, Ilorin, University of Ilorin Press, pp. 127-135.

Adubifa, A., 1990, *Technology Policy in Nigeria*, Ibadan, NISER Publication.

Agarwal, A., 1980, 'Science, and Technology: An Agonising Reappraisal' *Third World Quarterly* 2 (2), April, pp. 305-310.

Amdi, I. E.; 1988, 'The Evolution of Technological Policies in Nigeria: 1960-1987', a paper presented at the conference of the Social Science Council of Nigeria.

Davidson, B., 1970, *Old Africa Rediscovered*, London, Longman.

Federal Republic of Nigeria, 1997, Decree No. 70, Lagos, Federal Ministry of Information.

Development Dialogue, 1988, Vol. 1-2.

Egonmwan, J. A., 1994, *Public Policy Analysis*, Benin city, SMO Aka Press.

Eze, O., 1992, 'Transforming Nigeria's Technological Base I', in *Social Transformation for Self-Reliance, Proceedings of a National Conference*, Ibadan: Fountain Publications pp.159-186.

Fourth National Development Plan, 1981-85, Lagos, Federal Ministry of Information.

Helleiner, G. K., 1966, *Peasant Agriculture, Government and Economic Growth in Nigeria*, Illinois, Richard D. Irwin.

Igwe, B. U., 1988, 'Considerations in Formulating the Technological Agenda of Nigeria's Third Republic', paper presented at the Conference of the Social Science Council of Nigeria.

Johnson, H. G., 1975, *Technology and Economic Interdependence*, London, MacMillan.

Lall, S. and Streeten, P., 1977, *Foreign Investment, Transnationals and Developing Countries*, London, MacMillan.

Lall, S., 1980, 'Brandt on Transnational Corporations, Investment and the Sharing of Technology, *Third World Quarterly* 2 (4), October, pp. 701-705.

Lall, S., 1985, *Multinational Technology and Exports*, London, MacMillan.

Makanjuola, G. A., 1992, 'Transforming Nigeria's Technological Base II', *in Social Transformation for Self-Reliance, Proceedings of a National Conference*, Ibadan, Fountain Publication, pp.187-206.

McRobie, G., 1979, 'Intermediate Technology: Small is Successful', *Third World Quarterly* 1 (2), April, pp.71-86.

National Policy on Science and Technology, 1986, Lagos: Federal Ministry of Science and Technology.

Nwokolo, C., 1987, 'Research and Nigeria's Future', *New Nigerian*, April 18, Thursday, April 23 and Friday, April 24.

Nwufo, B. T. and Ashrafi, C. M., 1985, 'Industrial and Technological Development of Nigeria, The Need for a More Vigorous Approach', in Olufeagba, B. *et al.* (eds.), *Technological Development and Nigerian Industries*, Ilorin, University of Ilorin, Press.

Obasanjo, O. and Mabogunje, A., 1991, *Element of Development*, Abeokuta, ALF Publications.

Onimode, B., 1983, *Imperialism and Underdevelopment in Nigeria*, London, MacMillan.

Oragwu, F. N., 1979, 'Research and Documentation of Scientific Information', Paper presented at the Nigerian/US Workshop on Technological Development in Nigeria.

Salvatore, D. and Dowling, E., 1977, *Development Economics*, New York, McGraw-Hill.

Second National Development Plan 1970-74, Lagos, Federal Ministry of Information.

Singer, H. and Ansari, J., 1977, *Rich and Poor Countries*, London, George Allen and Unwin.

Stewart, F., 1978, *Technology and Development*, London, MacMillan.

Stewart, F., 1979, 'International Technology Transfer: Issues and Policy Options', *World Bank Staff Working Paper*, No. 344.

Guardian, July 29, 1987.

Tomori, O., 1985, 'Research and Research Funding in Nigeria', *Guardian*, March 6, 1985.