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Motivating Scientific Research and Development: My Lipid Experience

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Abstract

Scientific research is an important aspect of the function of a university lecturer. It is how he/she carries out this function that determines his/her relevance in the university system and indeed in the scientific community as a whole. Scientific research or investigation may be divided into four sections: mental exercise, investigation of new ideas and principles; improvement of old ideas and principles to conform with the dynamic conditions of nature; and application of established ideas and principles for the benefit of mankind. The university lecturer as a researcher, has therefore to engage in these areas of scientific endeavour in order to rise above the ordinary teacher and be relevant in this new millennium.

Many university lecturers are eager to engage in scientific research and development. But their efforts have often been vitiated by lack of: adequate conditions for the promotion of interaction with experts; attraction of research grants; establishment of fora for promoting national and international consciousness for research and development; and training and nurturing of young researchers who will continue the research and development culture. In the 1970s Africa had no articulated programmes on lipid research and development and there was little or no dissemination of information on lipid research unlike in other continents of the world where lipid programmes and activities were well established. There was therefore the need to inform and motivate research scientists in Africa on lipid studies.

This paper has therefore presented my research and development experience in lipid studies which I has spanned over two and a half decades, and has been able to motivate research scientists. Some of the areas that are relevant pertain to the fact that during this period of research and development I have been able to:

(i) Interact with experts in lipid studies at international conferences and association meetings in many parts of the world to be able to teach my younger colleagues new developments in the area of lipids.

(ii) Attract research grants from national and international organizations to be able to investigate and research on different aspects of lipids, and widen my research horizon and those of my research students.

(iii) Establish national and international organizations for promoting consciousness on lipids. One of these organizations, the African Lipid Biochemists Association was responsible for organizing the African Conferences on the Biochemistry of Lipids which were held in 1988 and 1990.

(iv) Train and nurture research and development scientists in the area of lipid and lipoprotein research. Some of my students and trained researchers are now very senior members of academic staff in different universities.

The significant finding in these my lipid studies is that there are numerous conditions in Africa that limit research and development. Some of these conditions include: lack of adequate information on research and development activities and results; lack of adequate funding for research and development; political and social instability; and lack of appropriate manpower for research and development activities.

The way forward for research and development is that African researchers must keep pace with developments that are going on in other parts of the world. The African governments, industries and organizations must pay more attention to research and development and support scientific activities and Associations. There must also be social and political stability for research and development to thrive. In addition to the above conditions there must be in place able and capable leadership in all areas of endeavour, be it in the government, in institutions of higher learning, in scientific organizations and associations for effective improvement in research and development in this new millennium. For the educational system in particular there must be educational curricula, in the post secondary levels, that emphasize research and development. It is only by implementing the above recommendations that Africa can be relevant and survive in this 21st century.

Introduction

Scientific Research or investigation is an important aspect of the function of a university lecturer .It is this aspect of him/her that differentiates a good academic from an ordinary university teacher. Scientific investigations and research may be divided into four main sections according to Ononogbu (1990). These sections are as follows:

1. Mental Exercise -which is purely for mental edification.
2. Investigation of new ideas and principles -which can lead to new methods and hypotheses for future utilization.
1. Improvement of old ideas and principles to conform with the dynamic conditions of nature - which involves confirmation, extension or rejection of old concepts and theories.
4. Application of established ideas and principles for the benefit of mankind -which leads to technological innovations and discoveries.

In order to be able to carry out these investigations and researches successfully , especially sections

2,3 and 4, the researcher must satisfy certain conditions which are:

1. Interact with experts in his/her area of research through conferences and association membership.
2. Attract research grants from national and international organizations.
3. Establish fora for promoting national and international consciousness and awareness in his/her area of research.
4. Train and nurture scientists and researchers who will continue his/her area of research when, he/she must have left the scene.

It is on the basis of the above conditions that I shall .discuss how my lipid research and activities have been able to motivate scientific research and development, and make recommendations for the future of research and development in Africa.

Lipid Research in Africa

By 1990 when I carried an investigation on universities and institutions in Africa to find where lipid and lipoprotein studies and research were being carried out, the result was quite disappointing. Only the following countries could report of appreciate researches and studies in their universities and institutions of higher learning: Algeria, Egypt, Morocco, Benin, Burkina Faso, Cote d'Ivoire, Ghana, Nigeria, Senegal, Sudan, Ethiopia, Kenya, Tanzania, Uganda, Zimbabwe and South Africa. Thus lipid studies and research were being carried out in only 16 out of the 55 countries in the whole of Africa. This represents 29.09%. Even in these countries where lipid studies and research were being carried out, the number of researchers or teachers with Ph.D degrees did not exceed two except in Nigeria and South Africa where the numbers were six and eight respectively .In some of the countries, research on lipids was being carried out in the agricultural research institutions and industries where the studies were only on the analysis of fats and oils for their physicochemical properties and the processing of the oils and fats for nutritional purposes. Lipid research goes beyond fats and oil analysis. It must include the nutritional, metabolic and health aspects for the full impact of lipids to be appreciated, because as stated by Ononogbu (1998) "The two major reasons for the occurrence of lipids appear to be genealogy and function",

Lipid Research in Africa has not advanced as much as it has in the Western countries, perhaps, because Africans feel that lipid-related diseases are not very common in Africa. Therefore emphasis should be on communicable diseases, the environment, hunger and malnutrition. On the contrary lipids and lipid related diseases have an important role to play in African development. Africa is blessed with many sources of lipids: the oilseed plants abound in Africa; animals whose meat sources contain less cholesterol and fat abound in Africa; marine and fresh water animals which are sources of oils rich in polyunsaturated fatty acids abound in Africa. Africa is thus surrounded by a lipid environment but these lipid sources have not been sufficiently exploited. This is because lipid research has not advanced in Africa. If we consider the other continents of the world, we shall see well organized lipid research centres. For example, there are the following:

1. WHO (World Health Organization) sponsored Lipid Laboratory at the centre for Disease Control and Prevention in Atlanta, Georgia, U.S.A. This centre controls and co-ordinates lipid studies in America and Overseas.
2. WHO sponsored European Lipid Reference Centres in Prague Czech Republic and in Denmark. These centres handle lipid standardization and research in Europe.
3. The Australian Lipid Standardization Programme. This programme co-ordinates lipid research and standardization in Australia and New Zealand.
4. The Asia/Pacific Committee for Clinical Laboratory Standards. This committee co-ordinates lipid studies in the Asian-Pacific region.

Apart from these internationally sponsored and established centres in these continents, there are also well funded and equipped lipid research centres. We in Africa are bereft of any of these centres. The reason is because Africa is short of the adequate number of researchers, especially in lipids, and the few available have not been able to motivate others. Figures produced by UNESCO (United Nations Educational, Scientific and Cultural Organization) have consistently shown that Africa is very much behind other continents in terms of the number of active scientists, engineers and technicians that it needs for its socio- economic development and industrial revolution. As asked by Odhiambo (1984), "How can scientific community support deep-rooted development in Africa?" I agree entirely with him who in answering the question said " Africa needs to establish and nurture a knowledge and class of those African Research and development (R and D) specialists who derive their livelihood and their status from the production and distribution of knowledge " .Again Professor A. Garton who used to be the President of the International Conference on the Biochemistry of Lipids said (1994)". Little did I realize in the 40s when I was an undergraduate and later a postgraduate research student and post-doctorate fellow in the department of biochemistry of the University of Liverpool that the decade 1940- 1950 was going to mark a watershed in the chemistry and biochemistry of lipids". Lipid scientists and indeed African researchers can make their mark and produce the watershed in Africa in this new millennium, if they take their research and development activities very seriously.

Interaction with experts and Association membership

Every academic in research has his/her professional (national and international) associations which he/she interacts with during the course of his/her academic development. I have been involved in lipid research for the past twenty eight years. My experience during these years have helped me to motivate my junior and senior colleagues in academics. Although I had attended conferences from 1971 -1975, my first serious participation was in Hamburg, Germany in 1976 when I attended the International Union of Biochemistry congress. There were only four Africans in that Conference and that did not give me any satisfaction. But again it was worse in 1977 when I attended the International Conference on Atherosclerosis in Milan, Italy .I was the only African in that conference. I held discussions at that conference with the organizers on how to help African lipid scientists. In 1982, however, at the 2nd Asian Pacific Conference on Clinical Chemistry there were

up to six Africans at the conference. I met with these African scientists to discuss the possibility of starting a regional organization on lipids. But this did not work out. In 1983 when I attended the 1st IDF/WHO Training Seminar in Diabetes mellitus in Zagreb, Croatia, there was no African present but there was a West Indian, who is now Professor and Head of Biochemistry at the University of West Indies, Kingston Jamaica. At that seminar I was appointed the Chairman to develop a postgraduate seminar programme for diabetes mellitus with particular reference to the role of lipids in diabetes mellitus. This experience helped me in later years in organizing a series of seminars and workshops in Nigeria. In 1986 at the International Conference on the Biochemistry of Lipids held in Oslo Norway, the attendance by Africans was still very low but I was happy to have met for the first time participants from the East African and Southern African Sub-region. As usual I held some discussions on the lack of effective co-operation and established lipid associations within the African region. My attendance of that conference appeared to have had a strong positive effect on my desire to establish lipid programmes in Africa. In 1988 when I attended the International Union of Biochemistry Congress in Prague, Czech Republic, I was delighted with the attendance by African scientists, and that encouraged me to approach the Union for funding for an African Conference. The positive effect these earlier conferences had on me encouraged me to attend further international conferences in the 90s the last of which was the African Evaluation Conference held in Nairobi, Kenya in September 1999. I then started in earnest to contact (for financial assistance) the professional Associations to which I belonged. Some of these were the International Union of Biochemistry, the American Association for Clinical Chemistry, the Clinical Biochemists Association (London), the International Conference on the Biochemistry of Lipids, and the American Oil Chemists Society .It is by attendance of international conferences that an academic can improve his/her research activities and interact effectively with his/her peers. Any senior academic who has not attended an international conference in his/her area of specialization cannot be relevant in that field in this new millennium which promises to be a millennium for African renaissance in research and development.

Attraction of Research Grants

Every institution of higher learning engages in teaching and research. It is the research aspect that differentiates one institution from another. And in order to succeed in research and development, there must be research grants from national and international sources to enable the researcher to perform satisfactorily. Some of the problems many scientists have encountered are lack of information on grant awarding bodies and inability to write satisfactory research grant proposals. Some of the International organizations that can help scientific researchers in their research include the following:

1. Service and Non-Governmental Organizations

(i) Rotary International -based in Evanston, Illinois, U.S.A. Rotary International has a programme called Ambassadorial Scholarships. There are five types of these scholarships.

(a) Academic year -In which the scholar is sponsored for 1 year as an ambassador of

good- will to a foreign country for a study that will not lead to a degree.

(b) Multi year (2 years and 3 years) -In which the scholar is sponsored for 2 years or 3 years to acquire a degree-

(c) Cultural Ambassadorial -In which the scholar goes to a foreign country to learn the culture of a country for 3 -6 months.

(d) Vocational -In which the scholar goes to a foreign country to practice hisl11er vocation for one year.

(e) Grants to University Teachers -in which University lecturers are given grants to lecture in foreign universities for one year.

(ii) Catholic Relief Services (CRS)
This organization gives grants for evaluation programmes.

(iii) The International Committee of the Red Cross (ICRC)
This organization gives aid to displaced people and grants for studies on effects of war and strifes.

2. Grant Awarding Organizations

(i) Third World Academy of Sciences (TWAS) based in Trieste, Italy. The objectives of this organization are as follows:

(a) To recognize and support excellence in scientific research performed by individual scientists from the Third World.

(b) To provide promising scientists in the developing countries of the South with conditions necessary for the advancement of their work.

(c) To promote contact between research workers in developing countries of the South and with the World Scientific community

(d) To provide information on and support for scientific awareness and understanding in the Third World.

(e) To encourage scientific research on major Third World problems.

Others which are not restricted to the Third world countries include the following: (ii) International Council of Scientific Unions (lCSU) -based in Paris, France.

(iii) International Atomic Energy Agency (IAEA) -based in Geneva, Switzerland

(iv) United Nations Educational, Scientific and Cultural Organization (UNESCO) -based in Paris, France.

(v) Food and Agriculture Organization (FAG) -based in Rome, Italy.

(vi) International Development Research Centre (IDRC) -based in Ottawa, Canada

(vii) United States Agency for International Development (USAID) -based in USA

(viii) World Health Organization (WHO) -based in Geneva, Switzerland

(ix United Nations Children's Fund (UNICEF) -based in Geneva, Switzerland.

(x) Canadian International Development Agency (CIDA) -based in Canada
(xi) International Foundation for Science (IFS) -based in Stockholm, Sweden.

There are agencies like the United Nations Centre for Human Settlements (UNCHS) (Habitat) which have gender programmes for women only and such organizations concentrate on granting research funds for the empowerment of women. Organizations such as the World Bank, African Development Bank (ADB), United Nations Development Programme (UNDP) and United Nations Industrial Organization (UNIDO) operate through the governments. So applications for funds from such organizations must be channelled through the governments. The Commonwealth Secretariat in London also disburse grants for scholarships, research and development programmes to members of the Commonwealth. A complete list of donor agencies can be obtained from the different university libraries, and researchers who have access to the Internet can access the websites of the agencies or use the e-mail addresses as these are always available from the regional or sub-regional representatives of these organizations. Perhaps, of particular interest to developing countries could be the website on Global Knowledge Partnership: www.globalknowledge.org which is a website for growing partnership and dialogue focused on harnessing knowledge and information as tools of sustainable and equitable development to empower the world's poor. Researchers must be encouraged to apply to these agencies and organizations for funds.

On writing research proposal, some of the details often omitted by researchers are: Project justification or value of the project; project time-table; personnel required; experience of the team members; external collaborators (where necessary); Budget and Budget notes. The socio-economic aspects of the proposal is always an important area which these donors look for .

During the course of my academic studies I was able to attract grants from the Third World Academy of Sciences, African Biosciences Network, International Union of Biochemistry, International Council of Scientific Unions, World Health Organization, Food and Agricultural Organization and International Development Research Centre. These grants helped me to further my research, help my research students and motive my colleagues in looking for grants from international organizations. The results of my project on the rubber seed oil, utilization have been transferred to an indigenous industry as part of the technology transfer of the project. Technology transfer is an important part of research and development.

Establishment of fora for Promoting National and International Consciousness

In order to create consciousness or awareness in an area of specialization, the researcher has to mobilize the experts in his/her area of research, nationally and internationally. In 1986 I initiated the Nigerian Lipid and Lipoprotein standardization programme which was funded by the Federal Nigerian Government. The study was in three phases. The first phase was to compile a list of institutions and centres where lipid studies were being carried out and the methodologies employed. The second phase was to carry out internal quality control studies in the centres and the last phase was to do with external assessment quality control. As a result of this programme, we were able to establish 18 lipid centres (see Fig. 1) in Nigeria.

These centres carry out various lipid studies ranging from nutritional, metabolic, health and analytical studies. I believed that the Nigerian lipid and lipoprotein Standardization Programme would form the basis or the pilot programme for an African Lipid and Lipoprotein Standardization Programme. But this did not work out. The aim of that programme was to establish databases in lipids which would be accessible to scientists in Africa; because for a long time Africans have been living under the erroneous impression that lipid disorders especially coronary atherosclerosis or heart disease are almost non-existent in Africa with the result that not much attention has been given to lipids in Africa by regional, sub- regional, national and international organizations. As I said earlier,

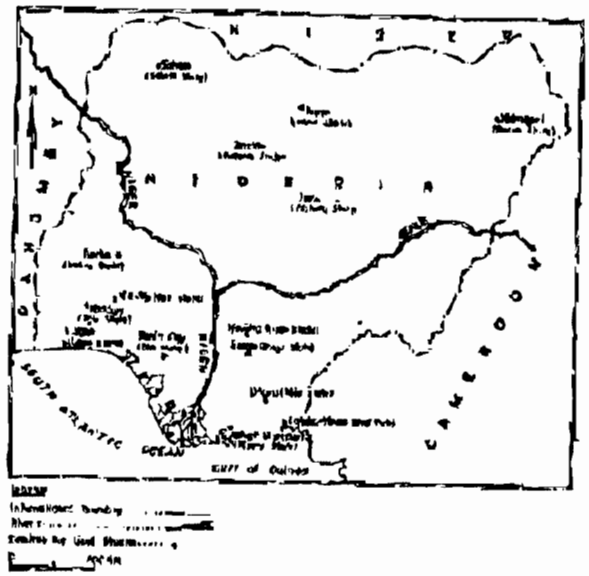

Fig. 1 **Map of Nigeria showing locations of centres for Lipid Studies**

my attendance in 1986 of the International Conference on the Biochemistry of Lipids was a turning point in lipid studies in Africa. Thus in 1988 I received grants from the International Union of Biochemistry and the Third World Academy of Sciences to organize the 1st African Conference on the Biochemistry of lipids. The aim of the conference was to gather African scientists who had been working in the area of lipids to discuss their research and research findings and to foster a closer relationship between lipid biochemists, chemists, and technologists in Africa. Thus, in 1988 the first African Conference on the Biochemistry of lipids was held at the University of Nigeria Nsukka. During the conference the African Lipid Biochemists Association (ALBA) was formed. The objectives of the Association were:

(i) To foster closer interaction among African scientists for the technological and scientific development of the African continent.

(ii) To raise awareness within the African region on the need to intensify and co-ordinate lipid studies.

(iii) To liaise with outside scientific organizations on matters relating to lipid studies in Africa.

(iv) To advise regional, national and international organizations as well as governments on issues relating to lipids and lipoproteins. The Association decided to organize biennial conferences called African Conferences on the Biochemistry of lipids in the month of November. I was elected the President of the Steering Committee of the Association. The membership of the steering committee is shown in Table I. Some members of the steering committee were made co- ordinators of different zones for effective dissemination of information as follows:

(a) North/Central African Zone: Professor Omar El Ahmady from Egypt.

(b) East/Southern African Zone: Dr .L. M. M. Chuwa from Tanzania.

(c) West Africa: Professor A. U. Osagie from Nigeria and Professor M. E. Addy from Ghana.

Table 1- Members of the Steering Committee

Prof. I. C. Ononogbu -President -Nigeria
Prof. P. O. Egwim -Member -Nigeria
Prof. A. U. Osagie -Member -Nigeria
Prof. E.A.C. Nwanze -Member -Nigeria
Prof. Omar El Ahmady -Member -Egypt
Prof. E. 0. Agbẹdana -Member -Nigeria
Dr. L.M.M. Chuwa -Member -Tanzania
Prof. M.E. Addy -Member -Ghana
Dr. E. C. Onyeneke- Member -Nigeria

It was also decided that an African Centre for Lipid Research be established at the University of Nigeria Nsukka. The Association also started the publication of a Newsletter in which the activities of the Association and other information relating to lipid studies were emphasized. In 1990 the Second African Conference on the Biochemistry of Lipids which was partly sponsored by the Association of African Universities was held at the University of Nigeria, Enugu Campus. Subsequent conferences were scheduled for 1992 at the University of Benin, Benin City, Nigeria; 1994 at the University of Cairo, Egypt, 1996 at the University of Ghana, Ghana; and 1998 at the University of Dar Salaam, Tanzania. But because of political and social instabilities in some of these countries during these periods, the conference could not hold. Although the continuation of this programme was vitiated by a lot of difficulties, the attempt was successful in a variety of ways as indicated in Table 2.

Table--2 **The Success of My Lipid Adventure**

1. Sensitized the international community on lipid studies in Africa.
2. Created awareness on the diverse areas of lipid studies in Africa.
3. Motivated African scientists to form Associations of specialized areas of scientific research.
4. Helped to widen the research areas of many African research scientists.
5. Drew the attention of the African communities on the need to utilize lipids properly for healthy and economic development.

Training and Nurturing Scientists and Researchers

An important aspect of Research and Development is the training and nurturing of younger researchers and scientists by their older colleagues. This is the only way to engender continuity in research and development. Many researchers often get research grants and there is no in-built section for human development in the research programme. This aspect is very important if researchers are to get replacements when they must have retired or tired. When I got a research grant from the International Development Research Centre (IDRC), I was able to use it to train three masters degree students and one Ph.D. student, and to send two of them for practical experience in Canada. Two of these former students are with me in my department and one of them will be a professor soon. Thus, I can therefore proudly say that lipid research will not die in my department after I must have retired. In order to keep research and development in progress there must be regular workshops and seminars as well as conferences, even if they are just a process of continuing education for researchers and investigators. Taking an example again from my lipid experience, I was able to organize postgraduate lipid workshops in 1992 with financial assistance from the African Biosciences Network, and workshops on vegetable oil utilization in 1993 and 1994 with financial assistance from IDRC. And since then I have been organizing seminars for researchers in lipid studies. These workshops, seminars and conferences have helped the researchers to keep abreast of developments in their areas of specialization and develop their skills in research and production. As I said when I was starting the Faculty of Science Lecture Series at Chancellor College, University of Malawi in August 1999, "Seminars, workshops and conferences encourage collaborative research and publications; and since the world is now a global village, we must think globally but act locally, .Information shared is a useful information but information hoarded dies with the owner and does not help development. Let us share from our research and scientific activities in order to enrich ourselves in these endeavours. " Many of the departments in Universities in the developing countries including Malawi do not have adequate manpower. This is because there is not enough relevant research and skilled manpower development and training programme. My belief is that if a professor in any discipline is not able to train and produce a competent researcher and student who can replace him/her when he/she retires, that professor has not helped the system to develop. We must lay proper foundation now for the advancement of research and development in our different areas of discipline.

Table **3: Limiting factors**

1. Unwillingness on the part of African scientists to participate.
2. Lack of funds.
3. Communication and Information retrieval and storage difficulties.
4. Political, social and environmental instability

Limiting factors to Research and Development *(See Table 3)*

One of the limiting factors in Research and Development is lack of information. Information is very crucial for research to thrive. Books and journals have remained the greatest medium of information for the scientific and research community .The information highway is open to many countries of the world now. But how many Africans and African institutions of higher learning have access to the Internet. We in Africa need to improve on our information network if we are to be relevant in this new millennium. The libraries must improve on their book acquisition and information network and Africans must improve their reading and information accumulation culture if the continent is to develop scientifically and technologically in this new millennium also. It is only when the above conditions are maintained that retrieval and dissemination of information on research findings can be achieved to promote scientific development in Africa. Another limiting factor in research and development is finance. Many research and development programmes have collapsed because of lack of funding. There is not enough support for research, production and development from African governments and industries. Africans cannot depend on outside bodies alone to fund research and production. Donor assisted programmes are helpful but they should not be the mainstay for funding research and development, because some of these donor assistances have a way of" garbaging in and garbaging out" as the computer scientists would say. If African governments can spend only a fraction of the amount spent on frivolities as well as on purchase of military weapons on research and development then Africa will be a technologically advanced continent. Edward Shevardnadze, the former Soviet foreign minister and now the President of the Republic of Georgia once said "we became a superpower largely because of our military night. But the bloated size and unrestrained escalation of this military might was reducing us to the level of a third-rate country unleashing processes that pushed us to the brink of catastrophe. Our military expenditures as a percentage of gross national product were two and a half times greater than those of the United States.... But we occupy about 60th place in the standard of living" (Shevardnadze 1991). This statement is just like seeing Africa in a glass darkly .It is estimated that developing countries, especially Africa, are importing weaponry from the Western countries worth US$39 billion per year. Apart from spending recklessly on weapons, African governments spend a lot of money on grandiose and useless projects which most of the time remain uncompleted by the time the government is voted out. The third limiting factor for research and development is political and social instability .Constant change of government, especially emergence of military rule affects research and development, and consequently economic development. Effective reforms and changes do not necessarily come from military take-overs or violent change of government. There must be peaceful and democratic change of government for research and development to succeed. And there must also be societal and

environmental stability for research, science and development to thrive. Wars, and intertribal and ethnic strifes have continued to create social and economic instability in Africa. It has been estimated that in the period 1945- 89, 127 wars have been fought and only but two of them have been in or between developing countries such as African countries. Since then the number of wars and strifes has increased. It is because of these social and political instabilities that African researchers and scientists run to the other stable countries for refuse. Research and development do not thrive in an unstable society .The last limiting factor for research and development is human resources. Africa does not lack enough human resources for unskilled labour. But it lacks appropriate and qualified human resources for research and development. World population data show that in 1999 Africa, North America, Europe, and Asia had populations of 771 millions, 303 millions, 728 millions, and 3,637 millions respectively and the projected populations for 2010 and 2025 have been put at 979, 1,290; 333, 374; 731, 719; and 4206, 4923 respectively all in millions (population Reference Bureau 1999). With this type of population Africa should be ahead of America and Europe in terms of research and development. But the reverse is the case. This is because Africa has not gotten the appropriate and qualified manpower within its large population to improve on its research and development. And there is not effective networking among the few research and development scientists. Perhaps this deficiency will be blamed on the type of educational set-up in Africa which has not promoted research and development. The culture of research and development has not been incorporated in the educational curriculum of many African countries. It is education, and in fact education which incorporates research and development that will liberate Africa from poverty and political and economic colonization by the developed countries.

Table **4. Recommendations**

1. Competent and capable individuals must be chosen as members of the leadership team in Governments, Institutions, Associations and Organizations.
2. There must be political and social stability in African countries. Constant change of government by non-democratic process. must be avoided; military takeovers must be avoided; Wars and strives must be avoided.
3. Government and Public spending must be regulated. Money should not be spent on purchase of arms on a large scale; Public funds must be spent judiciously; and there should be accountability
4. There must be effective Networking and co- operation between Scientists and Associations.
5. There must be the establishment of well funded - Research Centres in different areas of scientific studies in the African continent.

Conclusion

The way forward for research and development in Africa is summarized in the recommendations shown in Table 4. As we advance in this new millennium, African researchers, scientists and investigators must keep pace with developments all over the world. The Western and developed countries have moved into this 21st century with a lot of scientific achievement and development. Africa must hasten to catch up. The African governments, especially the Organization of African

Unity, and the sub-regional organizations must pay more attention to research and development and support scientific activities and associations. This implies that these governments must reorientate themselves on governance and government spending. There must be political and social stability. .Those who go into leadership positions whether in government, in educational institutions or in scientific organizations and associations must be people of proven integrity and ability .There is always a tendency to allow hustlers and rabble rousers to take charge of important posts. People who show a lot of enthusiasm to serve are not necessarily the most competent. The desire to serve or lead is just not enough. There must be the ability and capability to serve or lead which is qualified by the intelligent and intellectual disposition of the would be server or leader. Generally intelligence requires adequate and appropriate utilization of space and time, because intelligence may be defined as the ability to comprehend, interpret and utilize a situation effectively within a limited period of time and space. Curricula on educational programmes must incorporate research and development strategies at the post secondary levels. These are the challenges for Research and Development operators in this new millennium. I hope that this my experience in lipid studies will help others in research and development to perform better than I have done. But quoting Douglas Adams which was culled from CHEMTECH (1997) "Human beings, who are almost unique in having the ability to learn from the experience of others, are also remarkable for their apparent disinclination to do so". In the final analysis, however, Africa will emerge as a strong continent politically, economically and socially if countries in Africa invest aggressively on longer terms in Research and Development in this new millennium.

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