Participation of African Women in development of science and technology in Africa

Participation des femmes africaines au développement de la science et de la technologie en Afrique

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Abstract: The need for sustainable development in Africa is becoming a reality as evidenced by the NASAC international forum of 8-10 March, 2018, held in Julius Nyerere International Convention Centre in Dar es Salaam, Tanzania. The results emanating from the discussions and deliberations of the forum have thrown more light on the importance of involving women in development of science and technology in Africa, hence sustainable development. It is worthwhile noting that the forum emphasized the importance of women participation and inclusion in the national frameworks that aimed at fast-tracking the realization of sustainable development goals (SDGs) in Africa. The forum also stressed the need for women's contribution to Africa's political, social and economic development. It is now very obvious that the indispensable role played by science and technology in the development of any nation, particularly when sustainable development is required, cannot be overemphasized. This article emphasizes the fact that science and technology constitute the foundation for successful sustainable development. Sustainable development cannot be achieved where the societal, environmental and economic state of a nation is not in neutral equilibrium, that is, when they do not balance. This article will also emphasize the crucial role which women can play in the development of science and technology. The urgent need to get women to fully participate in development of science and technology on our continent is fully discussed. Challenges facing women's participation in development of Science and Technology are discussed and strategies for encouraging women's involvement in development are suggested. In conclusion, it is recommended that most of the strategies suggested should be implemented, so that adequate participation of women in sustainable development will be a reality and not a concept. It is evident from this article and from the forum discussions, that we have a series of wonderful ideas; we need now to work hard and put in a lot of efforts to ensure that implementation of these ideas will not elude us.

Résumé : La nécessité d'un développement durable en Afrique devient une réalité, comme en témoigne le forum international du NASAC qui s'est tenu du 8 au 10 mars 2018 au Centre de Congrès International "Julius Nyerere" à Dar es-Salaam, en Tanzanie. Les résultats des discussions et délibérations du forum

ont mis en lumière l'importance de la participation des femmes au développement de la science et de la technologie en Afrique, et donc au développement durable. Il convient de noter que le forum a souligné l'importance de la participation et de l'inclusion des femmes dans les cadres nationaux visant à accélérer la réalisation des objectifs de développement durable (ODD) en Afrique. Le forum a également souligné la nécessité de la contribution des femmes au développement politique, social et économique de l'Afrique. Il est aujourd'hui très évident que l'on ne saurait trop insister sur le rôle indispensable que jouent la science et la technologie dans le développement de toute nation, en particulier lorsqu'un développement durable est nécessaire. Cet article souligne le fait que la science et la technologie constituent le fondement d'un développement durable réussi. Le développement durable ne peut être atteint lorsque l'état sociétal, environnemental et économique d'une nation n'est pas en équilibre neutre, c'est-à-dire lorsqu'il n'est pas équilibré. Cet article soulignera également le rôle crucial que les femmes peuvent jouer dans le développement de la science et de la technologie. Le besoin urgent d'amener les femmes à participer pleinement au développement de la science et de la technologie sur notre continent est pleinement discuté. Les défis auxquels se heurte la participation des femmes au développement de la science et de la technologie sont examinés et des stratégies visant à encourager la participation des femmes au développement sont proposées. En conclusion, il est recommandé de mettre en œuvre la plupart des stratégies suggérées, afin que la participation adéquate des femmes au développement durable soit une réalité et non un concept. Il ressort clairement de cet article et des discussions du forum que nous avons une série d'idées merveilleuses ; nous devons maintenant travailler dur et déployer beaucoup d'efforts pour faire en sorte que la mise en œuvre de ces idées ne nous échappe pas.

1 Introduction

The importance of science and technology (S&T) for development of any nation cannot be overemphasized, because science is the key to prosperity of a nation. It is virtually impossible to expect significant economic, social and environmental development without paying serious attention to Basic Science and Technology. Statistics have shown that women, if compared to men, are yet to distinguish themselves in this field of human endeavour. Results from research have proved that there is poor enrolment of women into science courses, both at tertiary and secondary levels. Counselling and awareness is required to get more women into this field of S&T. There is an urgent need to get women to fully participate in development of S&T in our nations. It is not without reason; it might interest us to note that if you train a woman, you have trained a nation. L'Oréal-UNECSO noted that"The world needs science but science needs women". Therefore we cannot do without Women in Science.

Furthermore, it is desperately important that ways, in which women should be encouraged to get involved in development of S&T and invariably in sustainable development, should be meticulously addressed. The works of (Okeke, 2004; Oxaal, 1997, Okeke, 2001, Okeke, 2014, Fuwape, *et al.*, 2008) have extensively addressed the issues of women's participation in development of S&T. Their works indicates that African women are yet to be fully involved in this exercise. They have since made several suggestions, strategies on how to remedy the situation, strategies recommended and challenges have been highlighted in their work, e.g. Samulewicz *et al.* (2012). Their work discussed barriers to pursuing careers in science, technology and engineering for women in the United Arab Emirates. They made similar suggestions of a way forward. On the other hand, the developed countries are not on the same level as the African continent, hence Etzkowitz *et al.* (2000) discussed the advancement of women in science and technology in Africa. Ceci *et al.* (2014) worked on women in academic sciences that resulted in changing the landscape. We, the African women, need to advance, and take up the challenges facing us so as to make it happen.

Sustainable development cannot be isolated from S&T; works of Okeke (2015), Isikwue and Okeke (2009), discussed details of the place of S&T in SD. Several authors have also discussed the burning issue of SD and S&T.

2 What is Science, Technology and Sustainable Development?

> Science is an organized study of the universe and its environment through core subjects. It is the basis of technology and innovation.
> Technology is the application of scientific knowledge for practical purposes for our comfort on earth.

Unfortunately, there is a very poor enrolment of women in the field of S&T at both secondary and tertiary levels of education, particularly in Physics. This is because, in the past, science optimized the male characteristics of competitiveness and aggressiveness among others, hence, science is regarded as a male, not a female subject. Women are yet to distinguish themselves in this area, this constitutes a serious problem facing African women's full participation in Science and Technology and to find of a woman scientist and a leader, the women scientists need to exist.

Sustainable Development

Sustainable development, SD, has a lot to do with higher science and technology, society, environment and economy; where the societal, environmental and economic state of a nation is balanced, then sustainable development is achieved.

The question is how do we build SD in Africa? We need a new set of values and a new mind set; women in science and technology will provide such values and new mind sets.

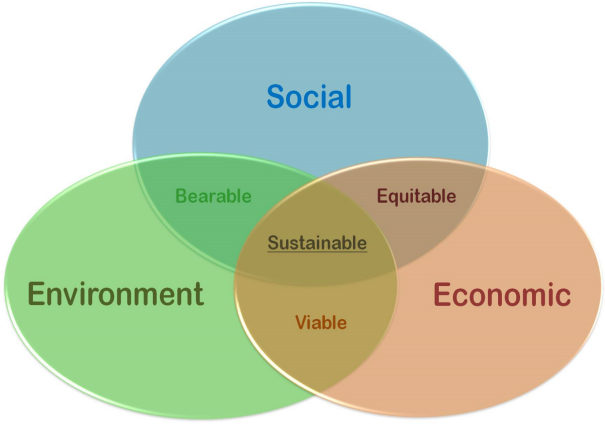


Figure 1 – Inter-relationship among economic, social and environmental state in a Nation

SD offers the possibility of a quality life, balanced by economic growth and ecological preservation. We must think of the future of each national culture and of humanity

as an entity in an integrated manner. SD will serve as an innovative tool in finding solutions to most problems of the world, not only of Africa, not just the physical and biological degradation of the environment, but also the social political and cultural dimensions. Fig 1 summarizes the state of any nation as considered when the economic, social and environmental states are involved. As can be seen from this figure, when the economic and environment states are stable, a viable condition is achieved. On the other hand, when social and economic states are stable, then, an equitable condition is achieved. Furthermore, when social and environmental conditions are stable, then consequently, a bearable condition is achieved. On the whole, when these three conditions are stable, it implies that the nation is in a neutral equilibrium; as such, sustainable development is completely achieved.

3 Factors that influence quick Sustainable Development

All sectors and stakeholders should consider the following factors that quicken the SD of a nation; culture, innovative research in basic science, science policy, capacity building, etc.

3.1 Culture

- Culture is very significant in local, regional and global SD
- It has to do with human appreciation of each other and natural resources around us
- The role and significance of culture are not considered in African schools
- Controversy exists as to the relationship between culture and SD
- Culture has been neglected in the past, but not now, there is an increase in ecological, economic and social challenges

  Culture helps to make development much more relevant to the needs of the people.

3.2 Innovation

- Innovation is vital to meet challenges facing development
- Different innovations play different roles in the development process
- Building elaborate innovation capacities promotes growth
- Innovation drives economic growth and addresses socio-economic challenges such as health and poverty

Most effective Science and Technological innovations contribute to sustainable development (e.g. Information Communication Technology (ICT), Computer Education, Satellite communication and other areas of application in biology, physics, etc.

3.3 Basic research in Science and development

- Is the ability to unfold people's imagination and to engage in intensive efforts in fundamental scientific research
- To assert authority and self-reliance in carrying out research activities
- Most outstanding technology innovations are based on research into fundamental phenomena in the universe
- It requires, motivation, determination, perseverance, and patience, among others

3.4 Science Policy

- Governments of African countries should put in place a mechanism for coordinating Science and Technology, Research and Development efforts
- Women in Science must be fully involved in development of science policy
- Universities should be fully involved in the science policy making
- Countries in Africa should revise their science policy and Women in Science must be fully involved in this revision
- There should be great emphasis on need for coherent, systematic and comprehensive approaches to determining S&T programs and their implementation
- Special consideration must be given to domestic production in agriculture, rural development, energy and environment, health, food security etc.

4 Role of Women in Sustainable Development through Science and Technology

Lydia Makhubu, the then Vice-chancellor of the University of Swaziland, noted that "the failure of the international science and technology systems to fully engage women was depriving the development process of a valuable input." She equally emphasized that the role of women is notably significant in pursuing policies of sustainable development. Women's capabilities and contributions in the field of science have long been neglected.

Women are expected to play the role of teacher, mother, transmitter, innovator, moderator, achiever, etc., a diversified role in the family and society at large. This fact places women in the centre of the process of sustainable development, hence, in the science and technological issues.

As a teacher; she teaches both her children, and other people around her, the values of culture and norms of the society, which has to do with sustainable development. She is solely involved with the education of the children. Makhubu pointed out that women are the key transmitter of values and norms from generation to generation.

As innovator, she introduces new methods of handling domestic issues, particularly in preparation of meals, farming, etc., which further advances into integration of science

into culture consciously or unconsciously. As a mother, she takes care of the entire family including the husband, and yet she is strong enough to face other challenges. She motivates her children, husband and yet fulfils all obligations she is meant to. She sees to the keeping of the environment, economic and social issues, indirectly promoting the sustainable development. Women, strictly speaking, are already involved in sustainable development and Makhubu stressed that it is therefore a major need to reconsider the role of women in the scientific enterprise, Makhubu said. "It is only through this that we will be able to devise viable sustainable development strategies".

Elizabeth Mzumngaile, a research and development coordinator for Zambian Association of Women in Science and Technology said that women had a major role to play in building the successful economies of the future, as these will be those that can develop science and technology and apply it in a sustainable manner. "Women are major conduits in the transfer of knowledge from one generation to another". Therefore, the importance of the role women can play in sustainable development through science cannot be overemphasized.

5 Challenges facing Women in achieving sustainable development through S&T in Africa

The failure of governments to fully implement policies made by them, in development of Science and Technology, is one of the major challenges. Again, the laxity on the part of some women researchers and the lack of transparency contribute heavily to the challenges. There is no encouragement from government to researchers, hence, this results in the brain drain. Lack of funds and facilities for innovative research work is another serious challenge facing us, as well as lack of conducive atmosphere, dilapidated infrastructure, hence, productivity is affected, since "environment influences learning". Another serious issue is distractions by various family assignments, but for this, I have to make reference to a great scientist and a role model for modern female scientists : Marie Curie, who provided an impressive example of a woman that did it all. This is because she was able to make huge strides in her research, while managing her family. Her life style is relevant to us women in science today and we must emulate her. She said and I quote "Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less." I am sure the message is very clear and accepted by us.

Major Challenges include:

- Lack of confidence in ourselves and no focus
- Neglect of our Culture
- Not much Innovative research work
- Lack of fundamental basic research
- Poor Science Policy that does not involve participation of women in science.

Other Challenges include:

- Laxity and non-dedication of some women researchers to their work
- Lack of self-confidence
- Non-encouragement of dedicated and committed female researchers by some governments in Africa
- Lack of funds and facilities needed for innovative research work
- Non-conducive atmosphere such as lack of power, dilapidated infrastructure, etc., which results in low productivity
- No or poor financing of fundamental research, as it seems that there is no definite evidence for their immediate benefit and applications.
- Lack of non-collaborative research works both at national and international levels; we prefer to work in isolation.



Figure 2 – During a collaborative Research Meeting in Spain

6 Strategies for improving Participation of Women in Science and Technology in Africa.

- Young girls should be encouraged to develop an interest in Science and Technology when still young, hence, they will develop an interest in choosing careers in science and technology
- Society should encourage women to Science and Technology by accepting that a woman is an individual in her own right and with peculiar qualities of mind

- One necessary strategy is empowerment of women, employing ICT as a tool (Oxaal 1997).
- Women participation in Science and Technology workshops, conferences, seminars, exhibitions is very important
- Collaborative National and International research work, team work should be highly encouraged and sponsored. This is a basic and necessary tool for solving the problems challenging us. Fig 2 portrays one of such collaborative research meetings in Spain, which is today yielding positive results.
- Most developing countries do not involve women nor encourage them to participate in the development and innovations in Science and Technology.
- They should be encouraged to use results and products emanating from Research and Development in Science and Technology
- Women scientists in developing countries should participate in developments and innovations in science and technology.
- Applications emerging from technology and innovations should be made cheap enough and affordable to all.

7 Way forward

The existence of African Women in Science and their participation in development of S&T will be very effective and lead to a tremendous success:

- When most of the strategies suggested in this paper are implemented.
- When research will be more team work than individual efforts and collaborative research work will be encouraged.
- When research and activities in science are carried out using locally available resources that meet societal needs, only then will research appeal to our younger girls and boys as well.
- Science policy makers must involve our women scientist administrators when drawing up S&T policy.

Science Academies can look into Gender Mainstreaming Activities like:

Networking

Promote networking through:

- Synergies between different academies.
- Interaction could be done through the Internet because of the lack of funds.

- This could help enhance science education, because sharing experiences is very important
- Collaboration among Women should be strongly encouraged. This can help strengthen participation by women in science groups.

Women Committees under various Academies

- Academies should strive to form committees for women members in their respective academies to oversee the promotion of participation in Women in Science.
- Various committees will oversee the activities of Women in Science and struggle to get more qualified women in science; this is crucial because once this is achieved, then SD is guaranteed.

8 Conclusion

African Women in Science must take up challenges facing us and look towards full participation in development of S&T and hence their application to solving societal problems. This invariably will lead to SD, when the social, economic and environmental problems are solved through S&T, thereby achieving SD. Success in taking up challenges will attract more females to participate in S&T. We need to be open and have a team spirit in our work, no antagonistic attitude, no disunity, tribalism, etc. It is time that we fight to see all our ideas implemented, we have lofty ideas but implementation has always eluded us.

- *WE NEED IMPLEMENTATION!*
- *THEN, WE SHALL ACHIEVE OUR GOAL! OTHERWISE, WE FACE A DANGER!!*



Figure 3 – Prof Francisca Nneka Okeke as a Laureate of L'Oréal-UNESCO in Paris, 2013



Figure 4 – OWSD UNN Chapter First Conference in University of Nigeria, Nsukka

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