BIOLOGICAL SCIENCES AND THEIR CONTRIBUTIONS TO MANPOWER DEVELOPMENT IN NIGERIA

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Abstract

This paper highlighted the relevance of biological sciences in manpower development. Emphasis was on the use of biological sciences in solving problems connected to pharmaceutical, medical, agricultural and industrial sectors of Nigeria's economy. A country can be self-reliant only when the skilled manpower connected to food, health and industrial sectors are forcefully tackled. Furthermore, the work of the earlier biological scientists through laboratory analysis, in the area of health and agricultural analysis, are what the present day generation still depends on for their economic survival. Lastly, the implication of poor introduction of biological practicals to secondary school students was also explained in the write up.

Introduction

In a society like ours, we need individuals with appropriate knowledge and skills in the pharmaceutical, medical, agricultural, industrial and scientific aspects of our economy. For a nation to advance she must have well trained and capable manpower in handling so many sensitive areas connected to health, food production, manufacturing of finished products coupled with general satisfaction with little or no importation of goods from other nations of the world. These aspects have not been achieved in Nigeria because patients are still flown abroad for medical treatment, while food and other finished products are still imported. These bring about inflation and general economic backwardness.

Manpower has for a long time been recognised in Nigeria. The first systematic attempt to bring about manpower development in Nigeria was made in 1959 when the Federal Ministry of Education set up a commission to make recommendations on Nigeria's high level manpower needs. The report of the commission, which was called "Investment in Education" has brought about a lot of influence on manpower planning since its publication in 1960. Nigeria is a developing country and has a long way to catch up with the more scientific and industrial advanced countries.

Biological sciences are keys that can open the door to this scientific and industrial advancement in Nigeria as the only science that study life. The idea of saving human life brings about the idea of producing gargets such as microscope and other scientific equipment used for example, in kidney and heart transplant or for the extraction of plant and animal products used for pharmaceutical companies. These bring about training of manpower to suit these purposes since life is precious in all its ramifications. Biological sciences build human and animal life and boost food production through gene manipulation. In doing this, the non-living components of our environments such as soil, air, sun and water also play useful roles for the betterment of plant and animal lives. Traditionally, biological sciences have formed part of the training programmes in schools from secondary to tertiary institutions were manpower are trained.

Importance of Biological Sciences to Man

One cannot over-emphasise the area of biological sciences in which our society benefits in so many ways. Such areas are mostly in the laboratory analysis and production of different products like bread, cheese, beverages, breweries, antibiotics, vaccines, vitamins, enzymes and so on. Modem biotechnology rests upon biological foundation for survival. The part played by microorganisms in our ecosystem are indispensable because they make possible nutrients to be mineralised and released through biodegradation. The cycles like carbon, oxygen, nitrogen and sulphur that take place in terrestrial and aquatic systems are sources of nutrients in ecological food chains and food webs. Today struggles are still in microbiological analyses on cure for Advance Immunodeficiency Syndrome (AIDS) and malaria vaccines in which the world cry out for help.

Biological practices start from home through health education such as general cleanliness, care and prevention of diseases, gestation, feeding, and method of First Aid treatment during snake bite, scorpion bite and other accident that take place at home and at work. These prepare the individual towards the different manpower to produce better output for the development of any nation. The educational system of Nigeria has adapted itself more and more to meet the demands for recruitment and training by which the whole range of a complex and varied occupational hierarchy depends. The problem turns out to be not only a

question of the provision of schools and universities, and the allocation of resources in money and materials, but also a question of the different scientific attitudes, assumption and experimentation with regard to biological courses in schools which are associated with the different occupational status in our class stratified society. Ottaway (1980) said that education is concerned with the preparation of the child for his future occupation in life. Our society springs into the dynamic and changing life that we all expect; hence the fundamental group is of course different status which builds better society. Biological sciences play important roles in the different fields of our economy in terms of health, industrial and agricultural sectors.

The primary necessities of man are food, clothing and shelter (Dutta, 1999). All these are met by plants and animals. Food comes primarily from plants in the form of cereals (rice wheat, maize, oat, rye and barley). Millets (smaller grains), pulses, vegetables, fruits, vegetable oils and so on. Plants are indispensable sources of fibres for the manufacture of garment. The value of wood, bamboo, cane, reed and thatched grass has been inestimable in providing shelter. Man has also tried to tap plants as sources of his comfort and use them to improve the quality of his life. All life forms follow a definite life cycle of birth, growth, reproduction, old age and death where biology plays important roles in all these stages. Plants and animal exchange gases such as oxygen and carbon dioxide; animals are used in farming, planting, harvesting and transportation. Animals produce raw materials used in industries such as milk, leather and pharmaceutical companies. The poultry farm provides enough food and meat for everyday life while their dung is useful in biogas and soil fertility. These life forms are improved upon through biological analysis for better yield and production.

The Place of Biological Sciences in Manpower Development

Biological sciences contribute to manpower development in so many areas according to Betty *et a!* (1981) and Dutta (1996). Such areas are explained as follows:

Agriculture

The methods commonly employed for the improvement of the quality, yield, sweetness, flavour, and high vitamin content of food crops, fish and meat is as a result of animal hybridization and crossing between cultivated crops. This was first discovered by the father of genetics, Gregor Mendel in 1856. Introduction of high-yielding, disease-resistant varieties, short duration varieties, early-maturing crops which avoid flood or drought and protection against diseases and pests were discovered through genetics manipulation by studying genetic make-up of food crops. Occupations such as farming, forest guard, hunting and timber contractors get their jobs through agricultural practices; all these contribute to the progress of our economy.

Many economic plants with a variety of uses have been discovered in their natural state particularly in forests, while a good number of them are now cultivated for food and industrial uses. It is of interest that India is the largest producer of tea, sugar cane, groundnut and jute; China produces rice; USA produces corn and cotton; Brazil produces coffee while Ghana produces cocoa and Russian Federation produces beet sugar. The most important exchange earners of India are jute goods, tea and coffee. These represent in value nearly half of India's total exports. A recent success is the production of a sweet-flavoured tomato with high vitamin content in a cross between cultivated tomatoes and wild South American species. Plant breeding has grown so much in economic importance that agricultural and plant breeding stations all over the world have embarked on programmes of artificial plant breeding to enhance the quality and yield of particular crops, and the power of resistance to pests and diseases. Apart from selection, and breeding, hybridization is needed to improve crops, poultry birds and tasty meat from pork, beef and chicken. Studies on how plants can draw their Nitrogen from air rather than from expensive fertilizer are in progress [Prescott et al, 1999]. All these are the work on genetics in which biological sciences play vital roles.

Pharmaceutical, Medical and Veterinary Science

Trained medical personnel treat human and animal diseases (vertebrates). The drugs used are mostly extracts from plants and animals. The general system of human and other animals have to be known for easier treatment by which biological sciences bring about many ideas about diseases. Such biological scientists are: Fracastoro (1946) who suggests that invisible organisms cause disease. Jenner (1978) introduced cowpox vaccination for smallpox. Bassi (1835 -1844) discovered that silkworm disease is caused by a fungus and proposed that many diseases are microbial in origin. Semmelweis (1847 -1850) shows that child microorganisms do not arise by spontaneous generation. Koch (1882) discovers tuberculosis and that anthrax disease are caused by *Bacillus anthrasis.* Metchnikoff (1884) described phagocytosis just as Ross (1897) shows that malaria parasite is carried by mosquitoes and Reed (1900) proves that yellow fever is

transmitted also by mosquitoes. Landstemer (1902) discovers blood group while Wright and others (1903) discovered antibodies in the blood of immunized animals. Beijerinck (1888) isolated root nodule bacteria for Nitrogen fixation used by plant while Ivanowsky provides evidence for virus causation of tobacco mosaic disease. Pasteur (1885) develops rabies vaccine while Winogradsky studies sulphur and nitrifying bacteria. Gallo and Montagnier (1983 - 1984) isolated the human immunodeficiency virus (HIV). In 1986 the first hepatitis B vaccine was produced by genetic engineering and approved for human use. All these laboratory discoveries have helped in the treatment of human and animal diseases. Resistance to antibiotics by pathogenic bacteria as a result of fertility factor transferred in their plasmid during bacteria conjugation was discovered through laboratory work.

These discoveries clear the way for superstitious beliefs such as in sickle cell anaemia disease and albinism which people attributed to some supernatural forces. If we understand how individual genes work, then we may be able to control certain genetic diseases of man such as diabetes and haemophilia (inability for blood to clot); develop new varieties of bacteria that could be used to produce expensive and rare antibiotics drugs, hormones like Insulin and antibodies. Plants can also be assisted to draw their Nitrogen supply from the air rather than from expensive chemical fertilizers. Gene manipulations have been used to handle certain diseases like colour blindness in which red-green colour appear grey.

Industries

Manpower is needed in food processing industries in order to maintain high standard of hygiene and prevent diseases like: cholera, dysentery and typhoid. Pollution of air, soil and water body through gases and effluent in our environment have to be controlled in order to avoid unfathomed illnesses. In water processing plant, microbiologist analyse water sample to be free from Coliform and other pathogenic organisms transmitted through water pollution especially when the water level is very close to soak-away safety tank. No man can do without food or water for a day and this need to bring about good health. In brewery industries drinks are hygienically tested to be satisfactory for public consumption through laboratory analysis so that any pathogenic life forms are not found. Pasteurised milk, canned food like corned beef, tin tomatoes, salad cream, sardine, cornflakes and other foods are packaged hygienically by scientist who study biological sciences. In cosmetic industries, raw materials are derived from plants and animals such as oil and perfume (from plant extract) only those that know something about human skin work perfectly in this industry. Animal fats are used for blue band production while bakery use yeast as their rising and fermenting agents. All these are work of biological scientists.

Environmental Conservation

The environmental health officers take control over environmental issues connected with conservation of plants and animals, sanitation in our homes and public places and issues on general pollutants in our fragile environment. General public enlightenment as regards bush burning, and other dangerous gases such as carbon monoxide and sulphur dioxide in our environment have been explained by public health officers to cause greenhouse effect and ozone layer depletion if not controlled. The uses of dangerous chemicals like Gamalin-20$_?$ Nitrogen- phosphorus-potassium (NPK) fertilizer to kill aquatic life forms in our river to be dangerous to our health when consumed. Environmental officers have tried to conserve animals going into extinction especially slow walking animals like chameleon and other low birth rate animals like elephant, tiger, lion, and others by operating forests reserves and zoological garden. Forest guard prevent economic plants like timber from deforestation especially when they are too young to cut down. Good numbers of medicinal plants are cultivated in various states in an experimental as well as commercial basis. In India, the Central Drug Research Institute in Lucknow has been doing research work on indigenous medicinal plants. The Tropical School of Medicine in Calcutta has done a good work and so have favour of some big pharmaceutical companies concerns (Dutta, 1996). The Medicinal Plants Committee of the West Bengal undertook experimental cultivation of certain very valuable Medicinal plants at Rongpo in Darjeeling districts with encouraging results. Some of these plants are: Ipecac (psychotria) and erythroxylum (cocaine-yielding) Podophyllum (for cancer), securinega (for poliomyelitis) Aralia (for vigour) cinnamon oil from leaf back (for antiseptic) Nutmeg (for flavouring) Nux-romia (for nervous disorders). Biological sciences crated this idea of environmental conservation and public health effects.

Most plants are tested in the laboratory to know their medicinal content. Such plants that have been tested in Nigeria are ginger which serve as antibiotics and preservative for stomachic digestive and carminative medicinally. Garlic has effective remedy for high blood pressure, rheumatic and muscular pain, giddiness and sore eyes. It also aids in intestinal and stomach ulcers and nature's best antiseptic. It can also be used in cases of torpid liver and dyspepsia. It has also be linked as a good tonic for the lungs. Wild plants are sometimes tested with pathogens to know their antibiotic effect. *Aloe vera was* discovered through this

procedure and is widely used in hospital for fast healing of wounds. Wastes in our environment have been reconverted into usable products such as paper into tissue paper; plastics converted into useful materials and waste iron re-melted for other uses.

Teaching Profession

The teacher like any other personnel plays many scientific roles with the different statutes he occupies both in his private and public life. The nature of the teacher's occupation places him in the special position of having a complicated set of roles in connection with his occupation. Such roles that involve biological sciences in schools are as follows:

(i) Teachers in lower schools teach general hygiene like brushing of mouth regularly, cutting of nails and hair, washing and ironing of school uniform, having good sleeping posture, observing some exercises and sweeping the classrooms and clearing of surroundings. The teacher encourages the pupils to wet a dusty floor in order to prevent respiratory diseases. He also teaches appropriate method of treating potable water before drinking especially in rural communities.

(ii) Teachers have administered first aid treatment to injuries during snake bite, sports injury or other minor illness before the doctor's prescription. These have saved many situations in the lives of pupils. Some plant herbs have also be used to remove poison. For example Coconut water has been used to remove poison from the system. Also dilute vinegar, orange and lemon juice has served as reliever to strong alkaline caustic soda consumption (Norton, 1975).

(iii) Teaching aspects of food that aids growth and development; as in the use of roughages which build the intestinal linings and the teaching of developmental stages of a child including sex education are taught in schools. They also teach ways of handling electrocution or shock through electricity and bad news also ways of avoiding bad habits like smoking, and drinking; and the consequences of these bad habits to the body such as cancer, tuberculosis, atherosclerosis and short life span.

Implication of Teaching Methods to Manpower Development in Biological Sciences

Okoro (1992) said that manpower development equip individual to make useful contributions to the economy of the nation. Education serves as instrument for building the biological sciences which build the different facets of professional bodies involved in skills and expertise needed for development. This human resource development will largely influence industrial, medical, agricultural and technological growth and development. Hence, the issue of manpower development of a nation seem more relevant nowadays for developing nations like Nigeria, as she strives to attain self-reliance. According to Gomwalk (1990) the wealth and economic self-reliance of a nation is proportional to the level of her scientific and technological development. Uwanrneiye and Bankole (1992) emphasised that the level of science and technological advancement is in turn dependent on the

quality of the teachers. The teachers must therefore command confidence in teaching the theoretical as well as the practical aspects of biology in secondary schools syllabus in order to instill the spirit of laboratory consciousness. Aina and Beecroft (1992) opined that the quality of a teacher is proportional to the quality of students and quality of students is equally proportional to the citizenry of a particular country. In realisation of this fact, the Federal Republic of Nigeria (1989) stated that all teachers in our educational institutions from pre-primary to university level have to be professionally trained for effective performance of their duties. The training of the biology teacher to be practically oriented in biological practical is very important for future laboratory analysis of his students. Mendel solved the problem of heredity because he was exposed to biological practical. His study till today has gone a long way in solving so many problems arising from day to day problem of marriage like paternity dispute of a child during argument about pregnancy, or problems of rhesus positive mother carrying a rhesus negative child like that of her husband lead to still-birth of the child because the negative rhesus factor of the child can react with rhesus negative factor of the mother leading to many complications for the child (Prescott *et al* 1999). It has also solved problems of child mal-formation leading to imbecile or poor development of the brain. Many medicinal plants have also been realised among the forest plants which has been extracted for curing diseases; all these are through laboratory analysis. Better yield of food produce such as fish, meat and food crops through cross breeding and chromosome or gene manipulation coupled with artificial mutation have been used to produce new features of plants and animals.

Conclusion

Biological sciences unravel many ideas used in medical, agricultural and industrial fields. Medical personnel cannot diagnose the course of a particular illness without a biological scientist in the laboratory. For

instance, typhoid or malaria parasites are unraveled by test in the laboratory and the therapeutic agent used for curing such ailment are also analysed before the doctor's prescription is done. So also in food production and raw materials useful in industries needed to boost output, is yet to be achieved due to poor manpower development in biological sciences. Such areas like pharmaceutical, medical, agricultural and industrial sectors of our economy are bound to bring about advancement in Nigeria depending on the training rendered to young scientists at school.

References

Aina, A.; and Beecroft, G. B. (1992). Towards Adequate Supply of Quality Technical Manpower Education and Development. *Journal 2:* 1-3.

Betty, C. H.; and Gilbert, R. J. (1981). Food Poisoning and Food Hygiene. 4th (Ed.) London: Arnold Publishers.

Dutta, A. C. (1995). *Botany for Degree Students,* 6th (Ed) Delhi Bombay Madras: Oxford University Press. India Pp. 687.

Federal Republic of Nigeria (1989). *National Universities Commission Approved Academic Standards in Education for ail Universities.* Lagos: National Universities Commission Pp. 26.

Gornwalk, G. D. (1990). Technology Education and Nation Building: A Paper Presented at the 4th National Conference of the Nigerian Association of Teachers of Technology Held in Jos.

National Teacher's Institute (1990). *Heredity and Continuity of life.* Cycle 2: Kaduna. Pp. 108. Norton, E.

(1975). *Hygiene in Home.* London: Mills and Boom Limited.

Okoro, 0. M. (1992). Manpower Development and the Teaching of Technical Drawing. *Journal of Vocational Studies, 5:* 105-107. Ottaway, A.K. C. (1980). *Education and Society.* New York: Humanities Press. Pp. 232.

Prescott, L.M.; Harley, J.P.; and Klein, D.A. (1999). *Microbiology.* 4th ed. Library of Congress, U.S.A. Pp. 962.

Uwameiye, R.; and Bankole, D.O. (1992). National Universities Commission Approved Minimum Academic Standard: An Appraisal. *Jn. of Vocational Studies,* 5: 50-52.