

## FOOD SCIENCE AND TECHNOLOGY RESEARCH: CHALLENGES AND OPPORTUNITIES FOR THE AFRICAN CONTINENT

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Reports on the state of the world portray a gloomy picture for Africa due to a number of factors that include decreasing food supplies and dwindling incomes amid an upward trend in population growth. Food is a basic commodity in the lives of all people. The field of food science utilizes the tools of chemistry, physics, mathematics, microbiology, engineering and other basic sciences to study and improve the way food is processed, handled, and preserved. It involves knowledge of the chemical composition of food materials; their physical, biological and biochemical behavior; human nutritional requirements and the nutritional factors in food materials; the nature and behavior of enzymes; the microbiology of foods; the interaction of food components with each other, with atmospheric oxygen, with additives and contaminants, and with packaging materials; pharmacology and toxicology of food materials, additives and contaminants; the effects of various manufacturing operations, processes and storage conditions; and the use of statistics for designing experimental work and evaluating the results. Food technology is the application of food science to the practical treatment of food materials so as to convert them into various food products. The latter should meet the needs of consumers for safe, wholesome, nutritious and attractive foods.

Agriculture is the backbone of most African economies and has close linkages with other industrial sectors. More than half of the population is directly or indirectly dependent on agriculture for income. Agriculture can be made more profitable in Africa. The plan for modernization of agriculture in Uganda is a novel idea. The vision is to eventually achieve a profitable, competitive, dynamic and sustainable agricultural and agro-industrial sector. Food science and technology has an important role in elevating the levels of nutrition and standards of living of the people. Food crops indigenous to the continent, dubbed "lost crops of Africa", are grown largely on a subsistence basis and their market potential has not been explored. These foods remain underdeveloped and have not been adequately processed. The recurrent droughts in most parts of Africa demand that research on production and post-harvest technologies of indigenous, drought tolerant crops such as sorghums, millets and some legumes be pursued aggressively. Simple technologies for fruits and vegetable preservation for the purpose of reducing post-

harvest losses are not practiced in communal areas and the urban markets. Losses as high as 60 % have been observed in some commodities. Food preservation using appropriate technology and the reduction of post-harvest losses can aid in increasing the food availability.

Research in food science and technology must be pursued aggressively in such areas as traditional food crops. Improving drying techniques to preserve nutrients, improving food storage for household food security, reduction of post-harvest losses at village level through preservation and proper storage of basic staples, prevention of attack by fungi and development of mycotoxins during storage of grain, and processing for preservation of fruits, vegetables, milk and meat products. For example, maize losses (about 15 %) caused by grain rotting during the field drying stage in Swaziland, can be reduced. Among cereals, the harder the grain the more resistant it is to pest damage. In general, potentially effective improved post-harvest technologies for grains have been identified. African food scientists and agricultural engineers should focus on adapting the new technologies to specific environments and ensuring that they are economically and socially viable. For crops other than grains, however, there is much potential for further technology development at the level of small- and medium-scale enterprises. For example, there is scope for derivation of new products with market prospects from traditional crops such as sweet potatoes. Decline in production of roots and tubers has been associated with increased urbanization, which does not favor highly perishable products. Further research into converting these starchy roots into less perishable and more convenient food products for the urban population could reverse these trends. Food scientists can play a leading role in the development of agro-industries. Commodities are converted into processed foods that are usually more stable and more marketable than the raw, untreated foods. Availability of seasonal, perishable products is thus ensured throughout the year and food is provided in a more convenient form than the raw material. Small-scale technologies can be adapted or developed for widely dispersed populations, unlike urban populations requiring processed foods in huge quantities by large-scale enterprises. Agro-industries spread among rural communities can offer the advantages of processing perishable crops and animal products close to their source while providing income for rural people.

Food science programs have been introduced in most African institutions. However, most programs lack facilities for both basic and applied research. A survey of the Zimbabwe cereal industries in 1995

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indicated that 94% of the research was applied and 6% basic in nature. The major activities included testing quality of food commodities, improving products, and developing new technologies. Research activities were being hampered by lack of the following: facilities: finance, personnel, policies and general infrastructure. Lack of support from other scientists resulted in some food scientists working in isolation. The trend was observed in most of southern Africa. Public funding for food science and technology research must be sought in order to facilitate technology transfer programs and skill development in specific areas. Currently, universities have the highest concentration of professional experts but are largely working in isolation. Dissemination of the technologies generated is crucial; hence, universities must have the capacity to transfer their research technology to the processors who should apply them. Networking among

food scientists and other scientists should be established so as to exchange information and collaborate in regional research projects. Academic and industrial institutions within the continent should jointly undertake research projects addressing common, identified problems. Collaborative linkages should be formalized through memorandum of understanding between universities, national agricultural research institutions, and food industries within the region. Programs involving staff and student exchange in the region will be ideal in terms of widening experience, learning from each other, and jointly seeking solutions to food science issues. In addition, inter-continental collaborative research programs are valuable in providing food scientists the opportunity to stay abreast of developments in the field and the challenges of adapting new technologies to different regions, countries and communities found in Africa.