

NIGERIAN AGRICULTURE AND THE CHALLENGES OF THE 21st CENTURY: THE STRATEGIC ROLE OF FOOD PROCESSING

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ABSTRACT

After 40 years of costly and of wasteful experimentation with different fashions in development strategy, Nigeria and other African countries have come back full-circle to the realization that as agricultural countries, agriculture-led development strategies are the appropriate response, as Lewis (1955) pointed out 45 years ago, to the deepening continent-wide crises of persisting poverty, hunger and malnutrition.

The Food Industries have tactical and catalytic roles to play within Agriculture-led development strategies in Nigeria and the other countries especially within sub-Saharan Africa. Food industries' capacity to fulfil this role depends entirely on whether the appropriate policy environment and complementary training can be created to foster a new breed of entrepreneurial players in Nigerian food processing. Vision 2010 has identified the development of Small and Medium-scale Enterprises (SMEs) as the engine for kick-starting the much-desired process of industrialization. What needs to be stressed is that Food Processing is the most fertile soil in which SMEs root and blossom into thousands of flowering industrial establishments and millions of jobs as a famous Chinese proverb puts it.

The strategic concept behind National Land Development Authority (NALDA) was to encourage the pulling together of unused and under-utilized tracts of land into viable cooperative farm enterprises that can be farmed scientifically using viable technologies. The idea of a Chain of Farm Service Centres to provide inputs and technology to NALDA and other Farmers within project environments remains one framework in which networks of food processing and storage infrastructure can become widespread throughout Nigeria's multifarious Local Government Areas.

Experience from Malaysia underscores the necessity to inject entrepreneurial blood through franchising and similar schemes into the promotion of the many sub-component parts of the Farm Service Centres in order to empower them to function as sustainable economic entities.

The mention of NALDA is not to say that this particular concept has been a success. Quite the contrary. NALDA has become an unmitigated failure, as we all know. But its failure derives from Nigeria's inability to implement excellent project ideas as we have seen with RBDAs, ADPs and many others. The point to be underscored is that innovative and bold ideas such as NALDA and its precursor schemes are a must. But they have to be pursued with honesty and competence to make the desired impact. Within the context of finding more efficient frameworks for input and service delivery for Nigerian Agriculture, it is absolutely necessary to identify and address the problem of Farm Mechanization. Anazodo (1980) tells us that engine power available on the Nigerian farm is only 18 watts/hectare, compared to FAO-recommended minimum of 373 watts/hectare. Consequently, raw human power accounts for 90 per cent of all power used on Nigerian farms; animal power accounts for 8 per cent and engine power for 2 per cent. Should there be any wonder why our farms are deserted by both young and old? Who wants to toil tirelessly on primitive farms for nothing?

Needless to say, farm mechanization through tractorization is an essential pre-requisite for Nigerian agriculture in the 21st century. Nigeria must aim to achieve the FAO target of 373 watts/hectare within the first ten to twenty years of the new century. To do this, Odigboh (1996) tells us that local manufacture of agricultural machinery is an imperative from multiple perspectives of making such equipment affordable, creating jobs and enhancing our technological capacity as a nation. The networking of Farm Service Centre Franchises remains one of the most attractive means of injecting entrepreneurial blood into this aspect of input delivery.

INTRODUCTION

1. Food and Agriculture in Nigeria at the Turn of the 20th Century

For Nigerian agriculture as for every other transactional aspect of our national life, the end of the 20th century is a watershed event and benchmark for sober reflection and for introspection as regards where we have come from, where we are and where we are heading.

The World Bank reports, for 1997, that agricultural domestic product in sub-Saharan Africa grew at only 1.5 per cent per annum during the quinquennium, 1990 – 1995. This finding compels us to draw three urgent and instructive inferences:

- (i) That this highly marginal growth rate contrasts adversely and sharply with the nearly 2 per cent level recorded during the decade, 1980 – 1990.
- (ii) With a country as well as sub-regional population growth rate of 3.5 percent, population is growing at more than double the growth rate of food further widening the precarious food-gap into the future.
- (iii) These indices of agricultural performance are the lowest and least promising of any development region of the world reported.

In 1996, FAO estimated that aggregate food production in sub-Saharan Africa for 1995 fell short of the 1994 levels by as much as 9.5 million tonnes. As if this was not bad enough, the food import bill of food-deficit countries in the sub-region escalated in 1996 in the face of rising cereal import prices caused by shrinking world surpluses. Although Nigeria, as a country, has not been unfortunate enough yet to confront explicit food emergency crisis in any recent year within memory, there were 22 million Africans within our neighborhood in 1996 and 1997 who faced food emergencies of varying degrees of severity. Among such countries, there are those spread-across the sub-region which faced exceptional food emergencies of chronic proportions which predate 1996 and have continued into the present.

Such victims are exemplified by:

- Central Africa: Burundi, Rwanda, Angola, Democratic Republic of Congo (formerly Zaire).
- Eastern Africa: Ethiopia, Somalia, Eritrea, Sudan
- Southern African: Malawi, Zambia, Lesotho.
- West Africa: Liberia, Sierra Leone.

With declining, even disappearance of all pretences of food security, African countries must now necessarily compete with Eastern Europe for shrinking stocks of international food aid. As a region, we not only need to meet the challenges of natural calamities and of incipient demographic transition, but also those of large population shifts caused by rural-urban migration, and the mass displacement of populations caused by civil wars and disturbances. Secular trends combined with recurring political instability are creating large pools and enclaves of food-insecure populations in sub-Saharan Africa.

Nigeria's abiding aspiration to assume leadership status in Africa puts additional burden of responsibility on the severity and import of the nation's agrarian failure. Therefore, no matter how much we strive to deceive ourselves in this country (for example, when we send US\$ 5 million worth of food to Sierra Leone), we are a fundamentally food-insecure country in a sub-region with deepening and compounding food-insecurity problem which looms large.

At the start of the 20th century, one must conclude inevitably that manifest food insecurity is the sad and supervening state in which Nigerian Agriculture finds itself.

2. Why Is Nigerian Agriculture Such a Dismal Failure? Why Are We food-Insecure In Nigeria and In Africa?

Food security is defined as the ability of a country or region to assure, on a long-term basis, that its food system provides the total population access to timely, reliable and nutritionally adequate supply of food. Eicher (1984) identifies four cornerstones of a national strategy to achieve

food security. These are:

- Efficient and expanded growth of food and agricultural production.
- Employment and income-generating opportunities to enable rural and urban poor to purchase an improved diet.
- Access to food to ensure that the entire population can satisfy subsistence food requirements.
- Adequate grain surpluses in reserves, and/or reliable trading agreements or protection against bad harvests, national disasters and uncertain world food supplies.

Improving a country's food security typically requires short-run and long-run measures. Short-run measures involve interventions to assure that the poor have access to food through various forms of real-income transfers such as rations and subsidized distribution of food. Such short-term solutions are needed to address both transitory food insecurity (e.g. famine relief) and chronic food insecurity (e.g. targeted food subsidies). Long-run solutions involve creating food production and distribution systems that assure adequate access of the poor to food through income-generation and efficient supply system for food that is domestically produced and/or imported. The long-run solutions, consequently lie essentially in economic development with particular emphasis on income-generation to empower the poor. One of the many tasks of food security analysis is to devise short-run solutions that do not have deleterious long-run effects.

It is quite clear, therefore, that the causes of food insecurity in Nigeria and elsewhere in Africa lie, to a large extent, in the failure of African States to develop economic systems that generate sufficient real-income streams for the poor to assure access to adequate food produced at home or purchased in the market. Developing such systems is not easy. However, because most of the poor live in rural areas, the neglect of agriculture and related agro-industries throughout much of the post-independence period has been the major contributor to food insecurity in Africa.

Neglect of the rural economy in Africa stems from a misunderstanding of the technical and

institutional requirements for agricultural change. In particular, there has been a tendency to underestimate by wide margins, the gestation period required to develop and internalize the prime-movers of agricultural development.

There are five prime-movers of agricultural change. These are:

- (i) A favourable economic and political policy environment:

the sobering truth which contemporary realities of Nigerian life drive home with such ruthless force is that flawed governmental policies can hurt economies and agricultural development far worse than all the natural calamities that have afflicted Africa since independence. As U.S. Foreign Secretary, George Schultz, once paraphrased it: "no measure of good intentions, and no amount of foreign assistance can alleviate the hardship caused by a government bent on misguided policies". One may ask what can be more misguided than a national leader preoccupied with a strictly personal and selfish agenda to enrich himself, his family and associates beyond comprehension and to perpetuate himself in office willy-nilly?

- (ii) Human and Managerial Skills that are produced by:

concerted and determined investment in schools, training centres and on-the-job experience.

- (iii) Continuous stream of new technology:

produced by high and sustained investment in agricultural research. It is through this that flows the accretionary growth of biological capital investment (e.g. improved livestock and crop breeds) and enhanced all-round technical progress in machines and other production aids such as chemicals.

- (iv) An expanding process of physical capital formation:

in infrastructures such as roads, dams, irrigation systems and processing plants to strengthen input/output delivery systems.

(v) **Strengthened rural institutions:**

such as land tenure, marketing, credit and forging effective linkage between national agricultural research and extension services.

Experience from the Indian agrarian revolution, from China and from Malaysia has shown that these prime-movers of agricultural change march hand-in-hand and that they require long gestation periods oftentimes in excess of 25 years to develop, internalize and re-express them in the form of creative and productive agricultural practice.

The accumulated evidence of the 40 years since the end of colonial rule would, therefore, lead to a number of inevitable and painful conclusions:

- (i) That the response to hunger and poverty in Africa must be conceptualized in a time-frame spanning at least 2 decades of concentrated macro-economic policies which favour agriculture, technology-generation, human and other capital formation processes and the strengthening of agricultural institutions.
- (ii) That as Africans, we must embrace the grim awareness that the solutions to Africa's agrarian crisis must be found within Africa.
- (iii) Because of the colossal, and often, criminal all-round neglects of the past 40 years, we must begin anew, the quest for genuine agricultural progress in Nigeria and in Africa. In doing so, we must commit ourselves to the unstinting development and internalization of the five prime-movers for agricultural change earlier elucidated.
- (iv) Time is not on the side of Africa, given that the rest of the world is fast slipping away and leaving us further behind at the brink of what President Abdou Diouf of Senegal described graphically in a United Nation's speech, as: "the mere primitive survival of the African people". Therefore, we must engage the massive advantage of Information Technology to save precious

time. This has been done before. The first industrial revolution dating from the Steam Engine took 150 years to bring about in Europe. The Americans, in the second wave caught up and overtook Europe in only 70 years. The Russians accomplished the third wave in 35 years catching up with America and Western Europe. Japan accomplished the fourth wave in less than 20 years. The Asian Tigers of the Pacific Rim rounded-off the fifth wave in less than 10 years to usher in the post-industrial society. The secret behind these waves of industrial transformation, with successive waves taking only half the time-span of preceding ones, is the empowering force of information. The computer age makes information flows even easier provided that African countries are prepared to commit themselves to what they have to do.

3. **Whither Nigerian Agriculture In the 21st Century?**

Against the background we have tried to lay about Nigeria's agrarian development in the dying months of the 20th century and the reasons as well as lessons of these precepts, it is now logical to attempt to address the prospects of Nigerian agricultural progress in the next millennium.

Certainly, only a magician and/or astrologer can claim to have the answer to the African paradox. Yes, Africa is a paradox indeed because it is the only continent in contemporary world history in which, in the words of Abdou Diouf: "vast human and natural resources and potential coexist with famine, illiteracy and the most dire manifestation of poverty". The continuing extroversion of African economies and the expanding weakness of our production systems in the face of rigidities and inequities of the international economic system furnish a fertile soil on which the paradox roots and feeds. I am neither a magician nor an astrologer. I do not have a crystal ball to look into. Indeed, if anything, African countries have defied predictability except as regards their saga of

individual and collective failure since independence.

If Africa's recent past were to be the sole barometer of its future, then there is very little to cheer about or to look forward to. But as Edmund Burke counselled: "the past and present are never a conclusive mirror of the future."

So be it with African agrarian evolution into the 21st century. It is safe to say about the present millennium that there are 5 dominant features which will mark it out from the 20th century and the other centuries before it.

- (i) The 21st century shall be knowledge-driven. To a degree never experienced before, it will be a science and technology century.
- (ii) Information Technology, Computers, Robotics and Automation will be a dominant force of the 21st century.
- (iii) Biotechnology will realize its potential and open up new vistas of possibility in every conceivable sphere of biological life especially in agriculture, medicine and the environment.
- (iv) Environmental realities and sensitivities of spaceship earth shall increasingly define the boundary conditions within which the complex equations of economic, social and political life shall be resolved within the global village.
- (v) In the words of Prof. Stephen Hawking, the Lucasian Professor of Theoretical Physics at Cambridge University: "the next millennium shall witness unprecedented achievement in technology in three pre-eminent domains: space research, smart computers and changes in human beings to cope with the consequences of these changes possibly through genetic engineering".

3.1. Postharvest technology as both an Essential Infrastructure and Catalyst for Agricultural Development of Nigeria

In relation to Postharvest Technology in Nigeria, these conclusions and lessons of both technology and agricultural policy analysis hold a number of important implications that are required to guide the development of the food industries. If we accept the idea of a long gestation period (20 or more years) between innovation and its impact on agricultural production as inevitable, then one of the many corollaries is that postharvest science and technology have a critical complementary role to play in picking-up the time-lag in the agricultural development process. It is necessary to highlight aspects of this interventionist and meditative role of postharvest technology within the innovation chain of agricultural development.

- (a) The first role is to ensure the maximum utility of food and agricultural resources available from current agricultural technology and activities without calling for expanded outlays of additional scarce and costly resources of land, energy fertilizer and other inputs. Enhanced efficiency of the post-harvest utility function for African agriculture means that we can better sharpen the cutting-edge that enables us to put current and anticipated yields of progressively improved agricultural technology to more efficient use while awaiting the ultimate benefits of long-term investment in agricultural change.
- (b) The second complementary role derives from a consideration of the long-term benefits of averting current levels of food and agricultural loss and/or reducing losses to acceptably low or inevitable levels. Estimates of aggregate food and agricultural losses have been put at roughly 30/40% for African countries (The Hunger Project, 1994). This level of wastage means according to IDRC (1985), that 50% more output over-and-above current

production levels must be targeted each year merely to maintain food supplies at current unsatisfactory levels. Postharvest technology holds two important keys to the problem of food wastage. First, is the key to effective conservation. Second, is the key to the maximization of value-added conversion.

- (c) If we take this line of argument further, we should acknowledge that the bumper crops of agricultural innovation (e.g. the Green Revolution's rice or wheat in Asia; maize in Central Africa; Cassava in West Africa; and soyabeans in several other parts of the world) derive their highest success only from the maximization of value-added processing. Thus, improved preservation techniques are required even now to maintain large strategic reserves of surplus grains in India or Zimbabwe. Resourceful processing is necessary to realize the vast industrial possibilities of otherwise dormant crop harvests in strategic reserves. It is by this means that rice paddy is converted into edible kernels, industrial and/or edible oil and protein-rich defatted, rice bran cake. Bio-fuels and/or building materials are made from rice husk. Soya bean yields edible oil and the range of protein-rich foods and beverages that have brought so much nutritional enhancement to the basic South-east Asian diet and is now being systematically exported to other parts of the world. Value-added processing is fundamental for sustaining agricultural productivity because it is the beaten-track to expanded rural employment and enhanced rural income both of which are critical factors required to empower the poor to purchase an improved diet from available commodity stocks.

India's experience, in the aftermath of the green revolution shows conclusively that unless poor people acquire enhanced purchasing-power through expanding employment and income-generating activities, surplus stocks in strategic reserves are ineffectual in addressing their hunger and poverty problem. The aberration of India's

bitter experience has been that although she had over 5 million metric tonnes of surplus grains in so-called strategic reserves from the mid-eighties onwards, hundreds of thousands of rural and urban poor still died of hunger amidst what has increasingly assumed the spectre of a cornucopia-mirage of chameleonic proportions.

3.2 The Food Industries in the Food System

It is an accurate assessment to say of the prospects of African development as it evolves into the 21st century that agriculture holds the key to the future. Lewis (1955) foresaw this when he said prophetically: "since most Africans are farmers, raising the productivity of farmers is a *sine-qua-non* of raising the African standard of living."

In the context of agriculture-led development strategies for African countries, vibrant food and allied manufacturing industries to conserve and convert enhanced agricultural output into maximized value-added products for global markets occupy a critical tactical niche. The food industries will, therefore, need to be seen as a strategic, autonomous and growth-stimulating force within the cosmos of African agricultural development. Just as the food and allied industries constitute the motive force that drives the agricultural industry of the developed countries of the world, African countries must learn to harness the same vital force to kick-start and sustain the engine of agricultural development in Africa. In recent years, we have seen this process enacted and reenacted in one country after another in the Pacific Rim: in Taiwan; in Malaysia; now progressively in Indonesia. The infant food manufacturing industries of these countries became the arena in which to acquire the experience and confidence for industrialization that has progressively expanded into other sectors. In this role, food manufacturing has proved to be a veritable instrument for targeting, sharpening and enhancing the value of agricultural commodities and fostering the global market of the resulting products.

Figure 1 below represents an attempt to capture graphically, the transformative role of the food and allied industries within the food system. Collectively, the agro-allied industries as part of

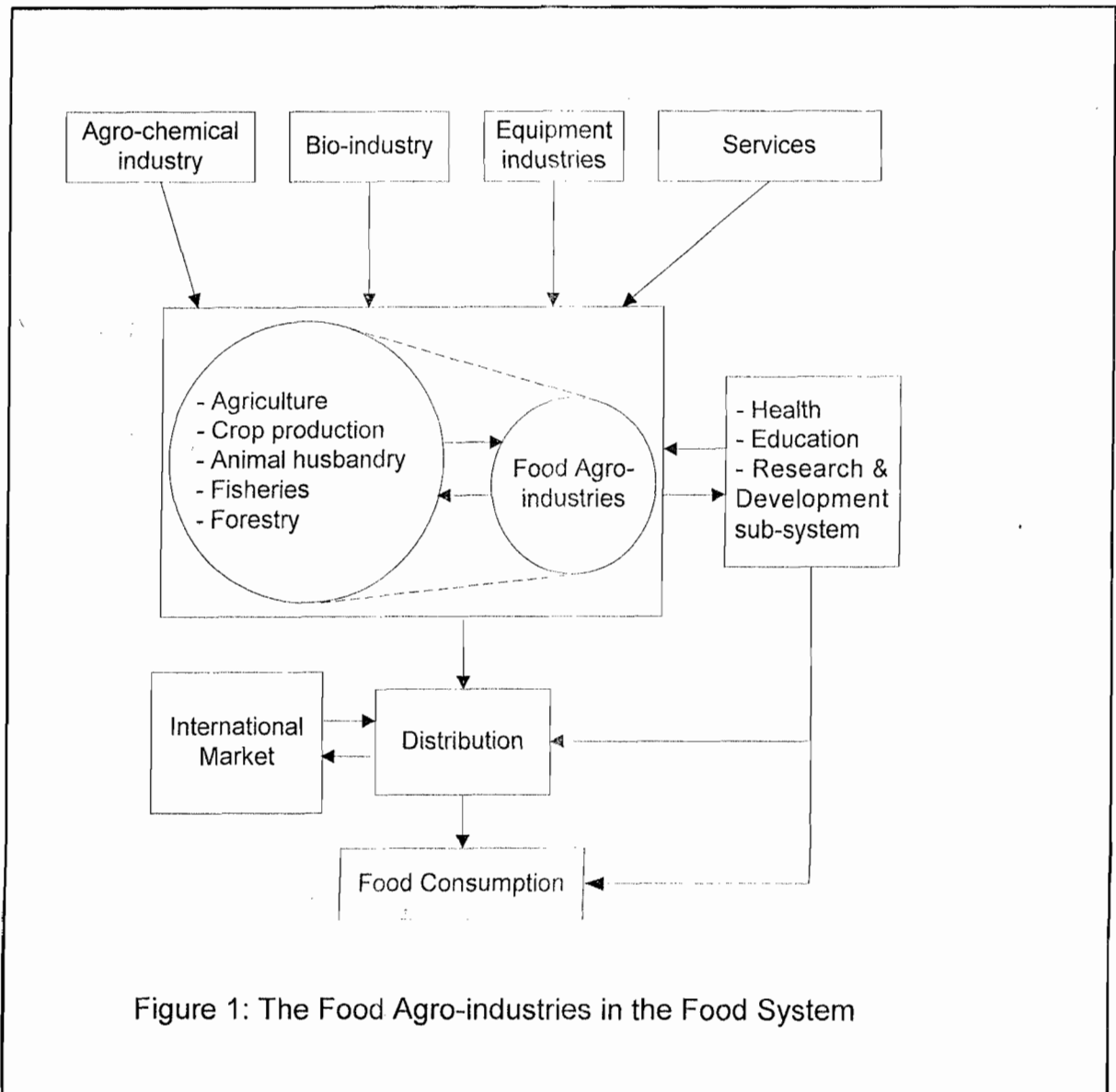


Figure 1: The Food Agro-industries in the Food System

the production complex with agriculture, animal husbandry, fishery and forestry, constitute the heart of the food system of the country. The upstream industries provide capital goods (machines, know-how etc.); intermediate production factors (seeds, fertilizers, pesticides, etc.) and services. Down-stream industries are the distribution chain and consumers of food product. The range of services enables the food system to function and develop (education, health, hygiene, research and development, training, finance, management, transport etc.). In countries aspiring to transit from largely agricultural to predominantly industrial economies, the food and allied industries assume in addition to their transformative role, the vital

function of economic catalysis for wider industrial development.

Conner (1988) illustrates, as shown below, many ways in which the food industries fulfil this function.

- The food processor engages in complex procurement activities in order to assemble what are often scores of ingredients, materials and supplies necessary to produce a single food product.
- Once made, the product must be distributed using merchandising skills that differ according to the type of final buyer, region of the country, size of purchase, mode of transportation, means

of financing and other forms of co-ordinated operations.

- Ensuring an orderly supply of food obligates processors to store inputs and/or finished goods for significant periods.
- Processors are adept in anticipating future supply and demand conditions. This is no mean task in circumstances of often-volatile agricultural output patterns. Because of their central position in the food system, processors allocate large corporate resources to collecting, assessing, and disseminating information on agricultural supply conditions and consumer buying trends. The collective purchasing and pricing decisions of food processors send useful signals up-and-down the food system, warning farmers and consumers alike of both actual and impending scarcity or abundance.
- Both ILO (1978) and UNIDO (1977) estimate food processing activities to form the basis of nearly 30% of industrial output and 20% of manufacturing employment in developing countries within the formal sector of the economy. If activities in households and small-scale cottage industries in villages and urban homes are taken into account, output and employment in food processing, when considered in their widest sense, would be much larger and much more pervasive than indicated.
- Food processing industries play unique and multiple functions, which stimulate both the agricultural sector as well as the manufacturing and service sectors. Growth in food processing implies expansion in all activities that supply inputs to it. Improvements in infrastructure, transportation, storage and marketing are pre-requisites for expanding the food industries. ILO's assessment is that activities in food processing in African countries can generate an aggregate all-round multiplier effect that can be as much as 7:1 in employment.

3.3. Targeted objectives of Food Processing within Agricultural Development

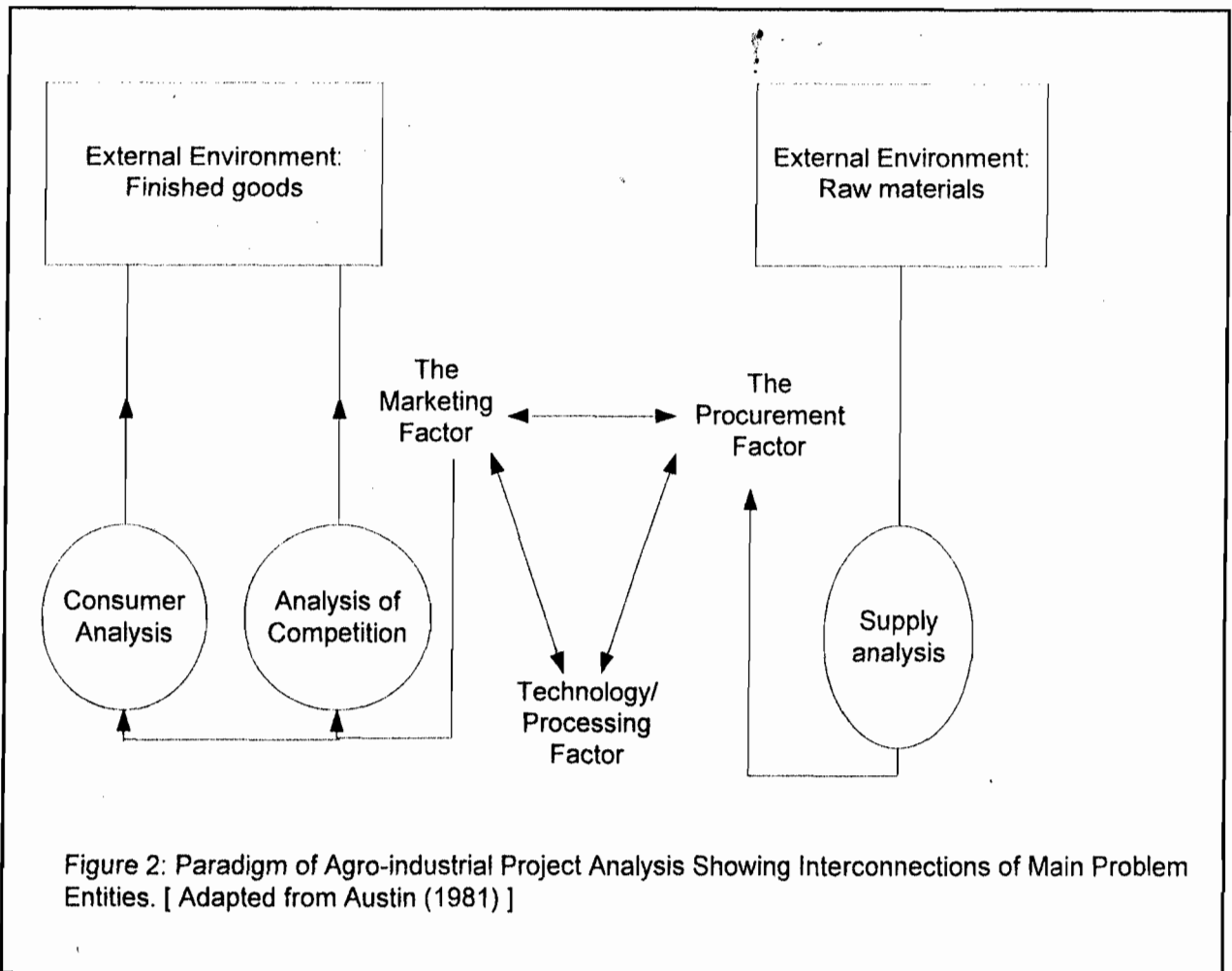
The principal objectives of giving priority to the development of food processing in the context of agriculture-led strategy would be:

- To meet urgent food and nutritional requirements of an expanding workforce whose health is fundamental and anchored in the nutritional quality of the national diet.
- To reduce qualitative and quantitative losses of agricultural products by bringing industrial processing nearer to the sources of raw material production.
- To augment foreign-exchange earnings by providing the basis of the export of processed products rather than raw materials or semi-processed products.
- To provide much-needed experience and training in the dispersal of industrial growth to backward and rural areas so as to generate new and enhanced employment opportunities.
- To create enhanced opportunities for expanded spread of ownership of production units.
- To stimulate the development of technological capabilities in terms of the capacity to engage in different scales of productive technologies in food processing.
- To foster the development of engineering capabilities to design and manufacture food processing and ancillary machinery.

In each of the above stated objectives, there is a primary component of "learning-by-doing" that is vital to wider industrial development. As the super-ordinate infant industry, food processing can provide the experience as well as become a learning guide for industrialisation.

4. Problems of the Food Processing Industries and their Containment

If food processing holds such vast potentials as has been suggested, why has it not prospered in Africa? It is necessary to understand that the development of food processing is



basically an entrepreneurial activity. It is, therefore, plagued by well-known problems of enterprise-development. That food processing, as other agro-industries, has not prospered in Africa is a reflection of the relative state of gross underdevelopment of entrepreneurial culture in Africa. There are, of course, many problems and obstacles that can be cited but in the final analysis, the absence of an ingrained enterprise culture that comes from training and widespread practice is a major causative factor.

Austin (1981) telescopes the plethora of problems of agro-industries in third world countries into three fundamental entities that this author has elsewhere (Ngoddy, 1993) christened "the holy trinity of problems of the food industries of Africans countries." These problems derive from the determinant activities in the operation of any agro-industry. They are:

- the marketing factor;
- the procurement factor, including

importantly, the procurement of investment finance;

- the technology factor which encompasses two related questions, namely: the building of an enabling management capacity and a critical mass of research and development capacity resource-base.

In a recent analysis of the ten sub-sectoral groups of the Nigerian food industry, RMRDC (1993) concluded that it is more appropriate to decompose the trinity into five problem-entities as follows:

1. The marketing problem;
2. The problem of finding investment finance;
3. The procurement problem;
4. The technology or processing problem;
5. The management problem

Figure 2 is an attempt to adapt Austin's (1981) agro-industrial system's paradigm to represent the interconnectedness of these problem-entities as a means of underscoring the

importance of the systems approach to project analysis.

4.1. The Marketing Factor

Marketing analysis examines the external environment's response or its expected response to a product or service by scrutinising consumer characteristics and the competitive context. Such information helps a project or firm to design procurement, processing (technology) and management (entrepreneurial) strategies and to construct a comprehensive market plan. Consideration of the marketing factor is fundamental to project analysis because it provides the market information required to assess a project's viability. Too frequently, a firm's substantial efforts and investments are put into mounting procurement, processing and managerial operations, only to have the expected benefits never materialise because of inadequate marketing analysis. The system's approach of contemporary project analysis enables market information once acquired to be linked with others to equip project management to take the best decisions at any given time. Because projects enter pre-existing markets, it is essential that firms know the market environments in which they operate or plan to operate. For these reasons, market analysis should examine four primary elements, namely:

- **Consumer Analysis:** to determine consumer needs, market segmentations, the purchasing process and the pattern of market research.
- **Analysis of the Competitive Environment:** to determine market structure, define the basis of competition and establish institutional constraints.
- **The Marketing Plan:** to define the elements of product design, pricing, distribution and promotion that constitute the firm's marketing strategy.
- **Demand Forecasting:** to project sales using a blend of field surveys and predictive techniques.

4.2. The Procurement Factor

Because of the transformative nature of food processing, the plant's input of raw materials is critical. In Africa, raw materials are, by far, the

dominant cost factor of manufacturing input. Our experience in Nigeria is that raw material costs fluctuate between 50% and 75% of total cost of manufacturing (RMRDC, 1993). Often in Africa, therefore, adequate finance is the major determinant of procurement, in particular, in terms of developing strategies of planned procurement. It is necessary in such circumstances that the term procurement is defined more broadly than is usually the case, to encompass not only the acquisition of manufacturing inputs but the enabling finance as well. There are five elements of effective procurement programming that are critical in food processing.

- **Quantity:** to identify output determinants and the competing uses of both raw materials and the available finance.
- **Quality:** to establish raw materials quality requirements of the market place; quality determinants and quality control. To define terms of finance that are favourable to agri-business enterprising in terms of interest rate regimes, repayment schedules, financial control and advisory services available.
- **Time:** to assess the constraints of seasonality, perishability and availability of raw material. To examine timeliness factors in finance scheduling and delivery.
- **Cost:** to establish the economic context of raw materials and their cost determinants, the pricing mechanism of both finance and raw materials.
- **Organisation:** seeks to examine the composition of the procurement system, its structure, elements of vertical integration in producer organisation; the financial policies and institutions available.

4.3. The Technology or Processing Factor

The processing factor embraces the range of technological questions that constitute the basis of the transformative operation of processing including importantly a consideration of regenerative R&D that ensures that processing remains at all times competitive. Technology is operationally central to any processing enterprise.

It represents the stage at which the product analyst must make crucial investment decisions as regards installed and operating capital profiles. There are six primary elements, which are important:

- **Choice of Processing Technology:** which seeks to review the technology implications of market requirements; flexibility of process techniques employed; costs and availability of labour, capital, materials and energy; nutritional consequences of technology; technology source considerations.
- **Plant Location:** examines the logistic impact of raw material sourcing, the market outlets, transportation imperatives, labour sourcing and costs, infrastructure, land and developmental requirements.
- **Inventory management:** assesses storage capacity, physical facilities and financial resources.
- **Supplies for Processing:** identify needs for inputs other than raw materials and finance.
- **Programming and Control:** examine the design of production and quality control.
- **By-products:** to examine the technical/economic possibilities of secondary outputs of production. Such considerations are increasingly the route for addressing long-term problems of environmental compatibility and in many cases of economic viability of marginal projects.

Research, Development and Training are a fundamental part of all six elements outlined above. Indeed, the processing problems of African countries derive, in the main from the unmitigated weakness of technological infrastructures that prevail in these countries. R&D and the associated training constitute the cutting-edge of technological infrastructure of any industry in any country. Developing improved know-how and propagating it continuously into industrial production is the beaten-track to the maintenance of competitive-edge.

4.4 The Management/Entrepreneurial Factor

It is no coincidence that the three broad management functions, namely: planning, implementation and evaluation are convergent with the prime components of the project cycle, namely: identification, analysis and design, implementation and appraisal. Starting and running processing plants as small/medium-scale enterprises (SMEs) is, first and foremost, an entrepreneurial and management problem. This is not merely in terms of the component functions to be performed but in the holism of the institutional structures that are required to sustain an enterprise. Failure to exercise effective entrepreneurial and management skills will mean failure to repay loans leading eventually to liquidation of the enterprise. Failure on the part of financial institutions to supervise and manage loan schemes resourcefully and efficiently for SMEs leads to enterprise failure. Failure on the part of governments to create and manage an enabling policy environment that fosters successful entrepreneurship in SMEs marks the beginning of the national economic decline that has become so typical of post-independence Africa.

Good management is to an organisation what good health is to the body: the basis of the co-ordinated, smooth and efficient functioning of all its parts. The entrepreneur is the prime engine of growth of SMEs. He/she organises and manages SMEs. He/she is the super-ordinate risk-taker, an innovator and a decision-maker. In the words of Andre Carnegie, one of America's pre-eminent entrepreneurs, "the entrepreneur is a person who knows how to enlist in his/her services, better men and women than himself". An environment, which breeds entrepreneurs is a *sine-qua-non* for thriving SMEs in food processing or any other sector of industrial manufacturing. Entrepreneurship and management development must be seen as an integral and mandatory part of activities required to foster SMEs in food processing. In other words, it is no longer sufficient to train food technologists who have no entrepreneurial skills and expect them to become agents of the strategic role of food processing within national

agricultural development in Africa that is advocated. There is a marked implication that is underscored here as regards the content and scope of current training of food technologists in Africa. It must not only be of high scientific and technical quality. It needs to become problem-oriented and entrepreneurial in the teaching and learning methods employed.

REFERENCES

- Anazodo, U.G.N. (1980): Agricultural Mechanisation as a Catalyst for Rural Development: *AMA*, 17 (3): 47 – 52.
- Austin, J.E. (1981): *Agroindustrial Project Analysis*. Economic Development Institute (EDI), World Bank Washington, D.C.
- Berg, D.J. and J. Seymour Whitaker (1986): *Strategies for African Development: A Study of the Committee on African Development Strategies*. University of California Press, Berkeley.
- Conner, J.M. (1988). *Food Processing: An Industrial Powerhouse in Transition*. Institute of Food Technologists (IFT), Chicago.
- Eicher, E.K. and J.M. Staatz (1984): *Agricultural Development in the Third World*. The John Hopkins University Press, Baltimore.
- F.A.O. (1988): *Sustainable Agricultural Production: Implications for International Agricultural Research*. F.A.O., Rome.
- Ihekoronye, I.A. and P.O. Ngoddy (1985): *Integrated Food Science and Technology for the Tropics*, McMillan Publishers, London.
- ILO (1978): *Appropriate Technology for Employment Creation in Food Processing and Drinks Industries of Developing Countries*. ILO, Geneva.
- International Development Research Centre (IDRC) Canada (1985): *Postharvest Technology in the Food System*.
- Lewis, W.A. (1955): "The Economic Development of Africa." In *Africa in the Modern World*. C.W. Stillman (Ed.) University of Chicago Press, pp. 97 – 112.
- Mellor, J.W. (1979): *India: A Rising Middle Power*, Westview Press, Boulder, Colorado.
- Mellor, J.W., C. Delgado and M.J. Blackie (1979): *Accelerating Food Production in Sub-Saharan Africa*. John Hopkins University Press, Baltimore.
- Ngoddy, P.O. (1993): "Investment Opportunities in Agro-allied Industries for Small/Medium-scale Enterprises in Nigeria with a Focus on Food Processing." Paper prepared for Empretec/World Bank Seminar on Investment Opportunities in Agro-allied Industries for SMEs, Jos, Nigeria 28 – 29 September, 1993.
- Ngoddy, P.O. (1993): "Problems of the Food Processing Industries of Third World Countries." Paper delivered at the International Agricultural Centre, IAC, Wageningen, November 24, 1993.
- Odigbo, E.U. (1996): "Local Manufacture of Agricultural Machinery and Rural Industrial Equipment in Nigeria - a National Imperative." Paper delivered at AGM-Seminar of the Nigerian Society of Engineers, Enugu Branch.
- Raw Materials Research and Development Council (RMRDC) (1993): MTF Report for Food, Beverages and Tobacco Manufacturing Sector. RMDC, Lagos.
- Schumacher, E.F. (1973): *Small is Beautiful*. Blond and Briggs, London.
- Sen, Amartya K. (1981): *Poverty and Famines: An Essay on Entitlement and Deprivation*, Oxford: Clarendon Press.
- Sen, Amartya K. (1984): Food Battles: Capacities in the Access to Food. *Food and Nutrition* 10 (10): 81 – 90.

Stewart, F. (1977): *Technology and Underdevelopment*. McMillan Publishers, London.

The Hunger Project, New York (1994): The African Prize for Leadership for the Sustainable End of Hunger. Announcement inviting Nominations for the 1994 Prize.

UNIDO (1977): *Draft World-wide Study on Agro-industries: 1975 – 2000* UNIDO/ICLS 65, 1977.