



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

EDITOR-IN-CHIEF

CARLISLE A. PEMBERTON, *Senior Lecturer, Department of Agricultural Economics & Farm Management, The University of the West Indies, St. Augustine, The Republic of Trinidad & Tobago*

EDITORIAL ADVISORY BOARD

Compton Bourne, *UWI, St Augustine, The Republic of Trinidad & Tobago*
Carlton G. Davis, *University of Florida, Gainesville, Florida, USA*
L. Harlan Davis, *University of Georgia, Athens, Georgia, USA*
Vernon Eidman, *University of Minnesota, St. Paul, USA*
Calixte George, *St. Lucia*
Bishnodath Persaud, *UWICED, UWI, Mona, Jamaica*
William Phillips, *University of Alberta, Edmonton, Canada*
Reginald Pierre, *IICA, Washington, D.C., USA*
Dunstan Spencer, *Dunstan Spencer & Associates Ltd., Sierra Leone*
Karl Wellington, *ALCAN, Mandeville, Jamaica*
Holman Williams, *UWI, St Augustine, The Republic of Trinidad & Tobago*
George Wilson, *Kingston, Jamaica*
Lawrence Wiison, *FAO, Bridgetown, Barbados*

EDITORIAL STAFF

Editor-in-Chief	Carlisle A. Pemberton
Associate Editor	Curtis McIntosh <i>CFNI, UWI, St. Augustine</i>

Cover Design: **Karen Yorke**

INCORPORATING NUTRITION INTO AGRICULTURAL ECONOMICS RESEARCH IN THE CARIBBEAN

C. McINTOSH

*I Advisor in Food Economics, Caribbean Food and Nutrition Institute
UWI Campus, St. Augustine, Trinidad)*

C.A. PEMBERTON

*(Head, Department of Agricultural Economics & Farm Management, Faculty of
Agriculture, The University of the West Indies, St. Augustine, Trinidad)*

CHARLENE HENDERSON-BREWSTER

*(Graduate Assistant, Department of Agricultural Economics & Farm Management
The University of the West Indies, St. Augustine, Trinidad)*

INTRODUCTION

Agriculture encompasses the harvesting of wild stocks of crop and livestock species, the direct production of crops, the conversion of crops and wild stocks to livestock, meat and dairy products and the distribution of all these products to consumers in the right quantity, quality or form, time, place and price. In the English-speaking Caribbean, the vast majority of agricultural economic activities centre around food production and distribution - sugar and rice production in Guyana, sugar in Jamaica, St. Kitts and Trinidad and bananas in the Windward Islands. Bananas in the Windwards account for a sizeable proportion of the foreign exchange earned, estimated at EC\$376 million in 1992 and tourism accounting for approximately EC\$687 million (ECCB, 1992).

The region remains heavily dependent on imported food with the resultant loss of

foreign exchange, employment opportunities and the advent of chronic diseases linked to an over-consumption of high fat, high salt, low fibre foods. These imported foods are often relatively low-cost because of the heavy subsidization in the countries of origin and compete unfairly with local production which is not subsidized to the same extent.

Since the 1950s, there has been increasing concern about incorporating nutrition into agriculture on the ground that a close liaison between nutritionists and agriculturists is essential to improving food production and consumption levels. So important is the concern that some Ministries of Agriculture in the region have established coordinating mechanisms responsible for food and nutrition while similar mechanisms exist within Ministries of Health, in specialized agencies or as independent voluntary, non-profit bodies.

The pre-occupation with the issues of

demand and supply which have pervaded agricultural economics research for most of this Century is giving way to the wider issue of the quality of life. The agricultural economics agenda must perforce change to incorporate nutrition components which play a pivotal role in changing the demand configuration.

The paper first focuses on the agricultural economic environment in the English-speaking Caribbean; then presents a rationale for incorporating nutrition into agricultural economics research by reviewing the food, nutrition, health interrelationships. The paper later reviews Caribbean agricultural economics studies incorporating nutrition and finally identifies priority studies and policy options for improving health-promoting food production and consumption patterns in the region.

THE AGRICULTURAL ECONOMIC ENVIRONMENT

The period of colonialism, has left the English-speaking Caribbean a legacy of close linkages with the international economy forged by preferential markets and buttressed by financial institutions, educational systems and other socio-cultural influences including sports. The small size of the individual states in terms of land area, population and natural resource base meant of necessity small open economies but with limited export potential and low purchasing power (Table 1). With insufficient arable land to meet the production needs for food self-sufficiency (Belize and Guyana excepted) and the need to earn adequate foreign exchange for external purchases, the States became heavily dependent on foreign capital (grants or loans) for investment and the purchase of consumer goods, including

food. The states thus remain extensions of the advanced economies through the activities of multinational corporations (Fraser, 1985).

The small size of the states and their appendage status to the colonial power encouraged a tendency towards monoculture at the country level while ensuring diversity from the viewpoint of the colonial power. Small market size also militated against vibrant agro-industrial development and the consequent enhancement of product value.

These features combine to make the economies of these states extremely fragile and subject to changes in the world economy. A major consequence is the high import dependence particularly in the area of foodstuffs even though the economies in most are mainly agricultural. Preferential markets and the need for foreign exchange for the purchase of consumer goods and services led to the predominance of export crops at the expense of food crops and livestock. Despite the passing of several years since political independence, the food and agriculture practices of the States have not created the transformation of stated policy objectives. The food economy is thus dominated by a small group of importers/wholesalers often extending into retailing by way of supermarkets. Local products are distributed mainly by a large group of small traders through shops, municipal and roadside market places. These traders also handle some of the imported products.

RATIONALE FOR INCORPORATING NUTRITION INTO AGRICULTURAL ECONOMICS RESEARCH

John Mellor and Moises Mensah in the foreword of a 1984 publication on

"International Agricultural Research and Human Nutrition" wrote:

"The alleviating of absolute poverty and related ills, such as insufficient food intake and malnutrition, is one of the most important tasks facing mankind. Agricultural research and technological change are of prime importance in efforts to expand food production, generate economic growth, and reduce poverty. They are also important in efforts to alleviate hunger and malnutrition. A better understanding of the complex interaction between agricultural research and human nutrition as provided by this book is likely to facilitate explicit consideration of nutritional goals in the design of future agricultural research and related public policies" (Pinstrup Anderson et al., 1984).

This statement sums up succinctly the rationale for incorporating nutrition into agricultural economics research as long as it is realised that the whole area of agricultural research should be subjected to vigorous economic analysis in terms of benefits and costs and in particular the apportioning of costs and benefits among the population.

Given the age and sex distribution of the population, the estimated energy and protein requirements per person per day are 2250 Kcal and 43 grams of protein (Gurney, 1975). With the exception of Antigua and Barbuda sizeable excesses in energy and protein availabilities were recorded for 1984-86 (Table 2). In the case of Antigua and Barbuda the overall shortfall may have been due to underestimation of

food supply data given high levels of obesity recorded (Figure 1) and the limited resources of the statistical department.

Over the last 25 years there has been a significant improvement in the food supply and nutritional status of the population to the extent that the major nutrition problems are associated with obesity particularly among adult women (Tables 3,4, Figure 2).

While problems of nutrition and health are more concentrated among adults and arise from obesity there remain pockets of undernutrition among the children 0-5 years and school children. Further, while an oversupply of food is available the problem of distribution among the population is cause for concern as is the high import content. Skewness in the distribution of resources and incomes is at the heart of the food distribution problem.

An increasing body of literature now focuses on the linkages between food, nutrition and health spurred by the report of a positive correlation between the consumption of animal fat and the occurrence of atherosclerosis in man by Ancel Keys in 1953. Several studies have focused on the cholesterol heart disease relationship. Other studies, however, have sought to invalidate the cholesterol-heart disease hypothesis. Still others have sought to link micro-nutrient deficiencies, dietary fibre and various fatty acids to various health conditions (Ensminger et al., 1983; Smith, 1991). While the issues remain unresolved the research and ensuing debates have left a set of dietary guidelines which provide a basis for healthy nutrition and which should guide decision making in all areas impinging on food, nutrition and health including agricultural economics research.

The linkages between agricultural production research and human nutrition

have been expertly presented by Pinstrip-Anderson (1982, 1983, 1984). These included (a) incomes and food prices, (b) the production system, risk and fluctuations, (c) nutrient composition, and (d) intra-household factors (*Pinstrip-Anderson et al., 1984*). The following draws mainly from Pinstrip-Anderson.

Prices and Incomes

Household incomes in relation to consumer prices and food prices in particular determine the ability of households to procure sufficient food to meet their nutritional needs or maintain and consume supplies in excess of nutritional needs; though nutrient imbalances may be in evidence because of irrational food choices. Low food prices favour the non-food producers but have adverse consequences on food producers and food farm workers. Low food prices whether of local or imported food could spell disaster for the rural food sector resulting in rural-urban drift. The prices and trade policies adopted must reconcile the internal conflict between low food prices for all and adequate farm incomes.

Production Systems

The adopted production system results from the ecological conditions facing the farmer, the food trade and marketing policies of the government and the goals of the farm family, including nutritional considerations. Catastrophic events leading to disasters, fluctuations in product prices (local and international) as well as variability in weather conditions subject farm families to production systems that minimise adverse long-term consequences. The adoption of innovative technologies

may be delayed because of the attendant risks.

Nutrient Composition

Improvements in the nutrient composition of particular crops (sorghum, maize) which contribute significantly to the energy intake of certain groups could have a significant impact on nutritional status. More important, however, is the composition of the diet rather than particular foods since in the final analysis the major concern is the overall balance of energy and nutrients.

Intra-Household Factors

A shift from a subsistence economy while increasing farm incomes does not necessarily result in improving the nutritional status of the farm family. The type of cash crop (food vs non-food), the income stream (lumpsum or continuous) and how the cash is disbursed have implications for the nutritional status of the farm family. For example, bananas in the Windwards make a significant contribution to foreign exchange earnings, provide a continuous income stream, contribute to the local food supply through non-exportable produce. Yet a recent study revealed that the total food intake of banana producers was less than non-banana producers (*Henderson-Brewster, 1993*).

NUTRITION IN AGRICULTURAL ECONOMICS IN THE CARIBBEAN

Agricultural economics research in the Caribbean has always had a strong bias towards production and marketing. Such studies have been conducted mainly at the University of the West Indies, in the

Department of Agricultural Economics and Farm Management. Only within recent times has the research agenda included nutrition as a major component though there was a recognition in the Region much earlier.

The Caribbean Agricultural Research and Development Institute (CARDI) which was established in 1975 recognises the importance of nutrition but has not pursued any definite work in the area. Ministries of Agriculture and their international agencies such as the Food and Agriculture Organization (FAO) and the Interamerican Institute for Cooperation On Agriculture (IICA) while espousing nutritional objectives have not developed a research programme incorporating nutrition in the English-speaking Caribbean.

In 1974 the then Prime Minister of Trinidad and Tobago urged other Leaders of the Caribbean Community to agree to the Development of a Regional Food Plan to counteract the deterioration of the regional agriculture sector in the late 'Sixties and early 'Seventies. The Regional Food Plan developed by a Working Party was project oriented and focused on fish products, livestock, oils and fats, fruits and vegetables, cereals and grain legumes, spices and essential oils, agricultural inputs and seeds and other propagating materials.

In 1977 attention was drawn to the interrelationship between food, nutrition, health and education by the Standing Committee of Ministers Responsible for Education and the Conference of Ministers Responsible for Health. Agreement was reached at the level of CARICOM to expand the Regional Food Plan into a Regional Food and Nutrition Strategy (RFNS). The RFNS provides a framework for addressing the critical economic and health problems in the region with the food

and agriculture sector playing a pivotal role (RFNS, 1982). This was a clear recognition of the importance of incorporating nutrition in agricultural research and agricultural economics research in particular. Recent studies in food economics and food and nutrition policies undertaken in the Caribbean will now be reviewed.

McIntosh (1988), exploring the interrelationships between markets, prices and nutrition estimated food expenditure elasticities in respect of energy and protein intakes in Antigua and Barbuda and St. Vincent and the Grenadines. An elasticity of 0.5 was observed for energy intake for both countries, and 0.5 and 0.7 for Antigua and Barbuda and St. Vincent and the Grenadines, respectively for protein intake. In Antigua and Barbuda, protein intakes are significantly higher among males While no significant difference was observed with respect to energy intake. In St. Vincent and the Grenadines, no significant differences were observed in protein and energy intakes by sexes.

Pemberton and Harris (1988) examined the beneficiaries of cheap food policies in Trinidad and Tobago and the identification of those income groups that would have incurred losses from the reduction in food subsidies in Trinidad and Tobago after 1985. The analysis in this study was based on an income specific empirical demand model. The test for nutritional beneficiaries (or losers) was based on the significance of price elasticities obtained from energy demand functions for the different food groups and for different income strata.

The rationale was that an income group with a price elasticity for a certain food that is not less than zero is not price responsive. The members of such a group would not have benefited nutritionally if this food is cheaper as they would not

have increased their purchases of that food significantly. On the other hand a rise in the price of a food which for an income group, the price elasticity is significantly less than zero would represent a nutritional loss in terms of a significant reduction in the purchase of that food.

The study found that the selection of meat especially poultry for subsidization in Trinidad and Tobago, would have resulted in little nutritional benefit to consumers, since no income group showed significant price responsiveness for this food group. However the low income and poor consumers benefitted from subsidies on cereals and milk and oils and fats. Also the study concluded that the removal of the consumer subsidies on flour, milk and cooking oil would have hurt most the low income and poor households.

Sinha and McIntosh (1992), McIntosh et al. (1992) and Sinha (1993) focused attention on the changing patterns of food consumption and the morbidity and mortality due to the non-communicable, nutrition-related chronic diseases diabetes, cancers and cardiovascular diseases. Strong associations were established between increasing energy intake and dietary fat and these diseases, signalling the need for a re-examination of nutrient goals for the population.

Henderson-Brewster (1993) looked *inter alia* at modelling farm planning to satisfy nutritional constraints to determine the trade-off between income and nutrition on banana farmers in the North-West of Dominica. The analysis was based on production data obtained under the Caribbean Agricultural Extension Project (CAEP) and data on the nutritional composition of Caribbean foods obtained from CFNI. Of some concern in her study also was the effect of changes in the farm

price of bananas on the production of bananas especially if the farm families have to meet their nutritional requirements. The analysis was carried out using a linear programming model, where the desired (minimum daily) requirements for protein and energy from the different food groups, were introduced (when required) as explicit constraints in the model.

The essential nature of the results obtained by Henderson-Brewster are given in Table 5. Here it is seen that maximising income alone at a banana farm price of ECS.38 (US\$1.00 = EC\$2.70) bananas will be produced solely for sale (8.5 acres) and the total net farm income of the farm plan (also including activities other than banana) would be EC\$67,981. The trade-off of having to meet nutritional constraints was a reduction in net farm income of \$2,049 and the production of a small amount of banana for home consumption.

Reduction of the price of banana to \$.36 resulted in a fall in total net farm income and the elimination of banana from the optimal farm plan. However the trade-off to meet nutritional constraints was of the same order of magnitude as before (\$1,985).

FUTURE DIRECTIONS

The limited resources of individual Caribbean states - limited land and high population densities (Belize and Guyana excepted) make the primary focus of agricultural economics research that of determining the delicate balance between export agriculture and food for local consumption. Are resources better allocated to crops/livestock for local consumption or to alternative uses and the resulting incomes used for food purchases? Some authors view the latter

as extremely risky and a prescription for political dependence and insecurity. The current international movement towards trade liberalization suggests that the use of food as a political weapon will become less and less significant. The sources of food supplies will expand as would the markets for export products of the Caribbean, though preferential terms of trade may disappear.

The determination of that balance boils down to the relative value productivities of the resources in food versus other agricultural usage and the equity the distribution of the resulting incomes in cash or in kind. Food, however, is a derived demand for energy and nutrients by humans and the continued demand and value of foods will rest on the knowledge, attitudes and practices acquired by an increasingly conscious population of the food nutrition and health interrelationships.

The limited resource base of the countries also does not allow for a high degree of food self-sufficiency on an individual basis. The experience of the countries to date at regional self-sufficiency is to say the least depressing. Policies adopted by the countries will remain national in the foreseeable future. Despite this a generalised set of nutrient goals based on the nutrition-related disease pattern could guide agricultural economics research in the Caribbean. Ultimately as a percent of total energy intake complex carbohydrates should contribute approximately 65%, refined sugar 10%, food from animals 15% and processed fats and oils 10% (Table 6). Based on these contributions and number of items selected as in Table 5, the following nutrient composition emerges for Trinidad and Tobago (Table 7).

Such a diet provides 67% of energy in

the form of carbohydrate, 22% in the form of fat and 13% in the form of protein. Fibre content is also high (10g) as are calcium, iron, vitamin A, thiamin, riboflavin, niacin and vitamin C. At a cost of \$8.00 per person per day the size of the food industry for Trinidad and Tobago is estimated at \$3.603 billion dollars.

Given the association between food availability and the disease patterns in the English-speaking Caribbean, agricultural economics research should be directed to ensuring a more desirable balance of foodstuffs to meet the nutrient goals of the population while affording equity in their distribution. The changes in supply patterns would come from proper prioritization of commodities for local production versus imports. Nutrient-cost values could be useful in delineating foodstuffs in general and local production versus imports over a wide range of energy and nutrients.

Foodstuffs in which comparative advantage in local production exist should be given priority. Such imports that are expensive from a nutrient-cost point of view should be subject to appropriate duties and taxes to restrict demand. Estimation of price and income elasticities for such products could form the basis for an appropriate tax regime. Such taxes could then be used to subsidise local production and consumption of foods utilised by the poor. Agricultural economists have a role in identifying the poor and their response to price and income changes to basic foodstuffs. Stratification of the population by income groups, location, education status and gender of head of household could facilitate more rigorous analysis and targeted prescriptions.

Incorporating nutrition into production systems analysis has income and welfare implications for the farm household. What

type of production system will achieve optimum income and nutritious foods, given the possible conflict between these goals?

The incorporation of nutrition in agricultural economics research requires expertise in the area of nutrition as well as agricultural economics. Training programmes for agricultural economists do not demand exposure to the discipline of nutrition. In order to expedite the incorporation of nutrition in agricultural economics research the close collaboration of agricultural economists and nutritionists is recommended. In the long run the introduction of a bachelors of science and post graduate degree in Human Ecology within the Faculty of Agriculture would stimulate the development of an agricultural economics research agenda that adequately addresses nutrition issues.

Agricultural economics research related to the modification of commodity characteristics should focus less on nutrient composition and more on consumer acceptability cooking quality, texture, ease of preparation, storage, packaging, processing and so on.

Improved agricultural technology would be facilitated by production function analysis in which the outputs are quantified in energy and nutrients rather than gross physical quantities (total food energy produced per hectare and grams of protein rather than tonnes of rice per hectare). Costing output in similar terms makes for better comparison of products from a nutrition perspective.

REFERENCES

- CARIBBEAN COMMUNITY (1981): Regional Food and Nutrition Strategy, CARICOM Secretariat.
- EAST CARIBBEAN CENTRAL BANK (1992): **Economic and Financial Review**, Vol. 10, No. 4, Dec. 1992.
- FAO: Food Balance Sheets, various issues.
- FRASER, Peter D. (1985): **Caribbean Economic Handbook**. Euromonitor Publications Limited, London.
- HENDERSON-BREWSTER C. (1993): "Farm Planning and Family Nutrition in Dominica," Unpublished MSc Thesis, Dept. of Agric. Econ. & Farm Management, UWI, St. Augustine.
- MCINTOSH, Curtis E., & MANCHEW, Patricia (1985): Nutritional Needs, Food Availability and the Realism of Self-Sufficiency, in P.I. Gomes *Rural Development in the Caribbean*.
- MCINTOSH, Curtis, E. (1988): Markets, Prices and Nutrition: Exploring the Interrelationships. **CAJANUS**, Vol. 21, No. 4.
- MCINTOSH, Curtis, E., PIERRE, Giselle Doni, & SINHA, Dinesh (1993): *Food Consumption Patterns and Their Implications for Sustained Agricultural Development in Trinidad and Tobago*. CFNI.
- MCINTOSH, Curtis, E. & CHASE, Beverly (1989): "Nutrient-Cost Applications in Trinidad and Tobago." **CAJANUS**, Vol. 22, No. 2.
- PEMBERTON C.A. & HARRIS L (1988): "Determining the Beneficiaries of Cheap Food Policies in Trinidad and Tobago" **Food and Nutrition Bulletin**, the United Nations University, Vol 10, No. 4, December 1988.
- PINSTRUP-ANDERSON, Per. (1994): "International Agricultural Research

- and Human Nutrition. International Food Policy Research Institute, UN Administrative Committee on Coordination/Sub-Committee on Nutrition, Washington, D.C. 1984.
- SINHA, Dinesh P. & MCINTOSH, Curtis E. (1992): Changing Nutritional Patterns in the Caribbean and their Implications for Health. **Food and Nutrition Bulletin**, Vol. 14, No. 2, June 1992.
- SINHA, Dinesh, P. (1995): Food, Nutrition and Health in the Caribbean - A Time for Re-Examination. CFNI, Kingston 7, Jamaica.
- SMITH, Russell, L. (1991): **The Cholesterol Conspiracy**. Warren H. Green, Inc. St. Louis, Missouri, USA.
- UNITED NATIONS/ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN (1992): Selected Statistical Indicators of Caribbean Countries. LC/CAR/G.382, Vol. V, 1992.
- UNITED NATIONS/ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN (1992): "Overview of Economic Activities in Caribbean Countries".

Table 1: Area, Population, Gross Domestic Product and Trade Balance of Selected Caribbean Countries, circa 1990-1991

			GDP (\$M	Trade 1	Balance
COUNTRY	Area Sq. Km.	Population '000	Current Prices)	Exports \$M	Imports \$M
Antigua & Barbuda (1988)	280.0	62.5	944.0	60.0	675.4
Bahamas	13.935	254.7	-	636.3	1023.7
Barbados	430.0	258.8	2,892.6	411.6	1397.7
Belize	22.963	190.8	656.8	239.3	441.5
Dominica	750	71.8	397.4	129.5	289.3
Grenada	311	90.7	443.8	88.5	248.8
Guyana	214.970	794	33,399.0	10,246.4	12,290.0
Jamaica	10,992	2,222.3	42,367.0	1,145.2	1,799.5
St Kitts/Nevis	269	41.8	396.1	81.7	255.7
St. Lucia	616	139.1	938.0	296.6	797.4
St Vincent & The Grenadines	389	107.6	433.2	201.4	344.2
Trinidad & Tobago	5.128	1.234.4	22,419.4	8,436.4	7,084.8

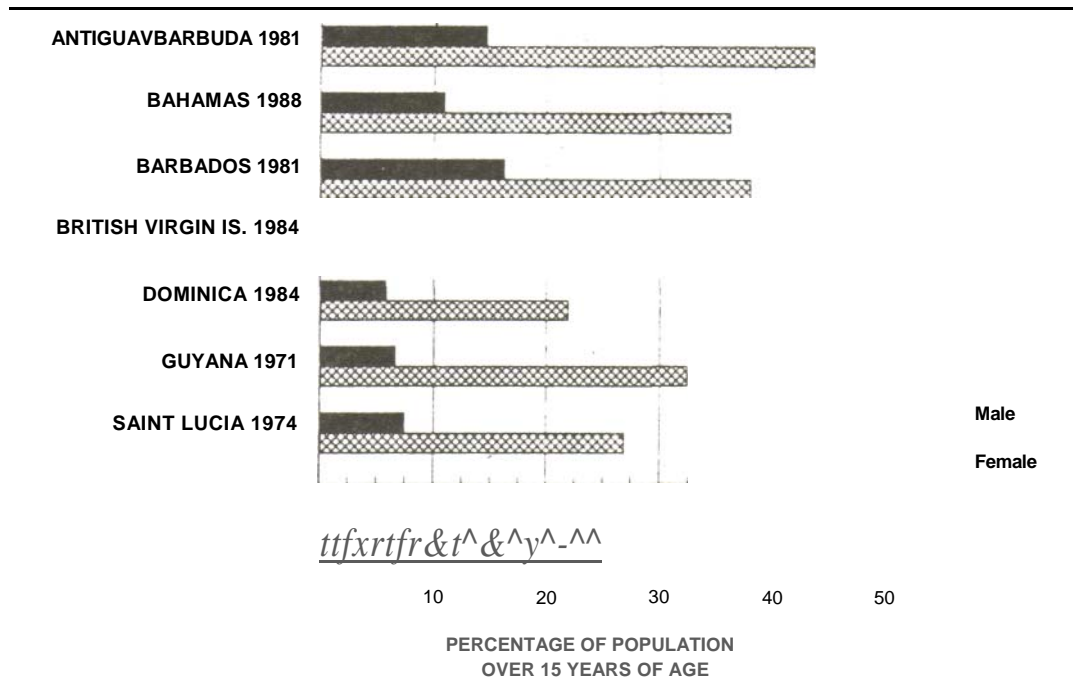
Source: UN/ECLAC *Selected Statistical Indicators of Caribbean Countries* Vol. V. 1992.

Table 2: Average Per Caput Energy, Protein and Fat Availability, 1986-1988 for Selected Caribbean Countries

Country	Energy (Kcal)	Protein (g)	Fat (g)
Antigua & Barbuda	2, 178	67.6	75.4
Barbados	3, 193	99.1	101.2
Dominica	2. 884	70.2	68.2
Guyana	2. 422	59.1	40.4
Jamaica	2, 679	63.1	61.8
St. Kitts/Nevis	2, 822	76.6	90.2
St. Lucia	2, 753	76.1	77.7
St. Vincent & The Grenadines	2. 774	56.8	69.4
Trinidad & Tobago	2, 982	76.9	84.0

Source: FAO: Food Balance Sheets

FIGURE 1: Prevalence of Obesity* in Caribbean Men and Women in Selected Countries



* More than 120% of standard weight for height.

Source: Dinesh P Sinha *Food Nutrition and Health in the Caribbean - A Time for Re-Examination* - CFNI. 1995.

Table 3: Trends in Energy Availability, 1961-63 to 1986-88; Selected Countries

COUNTRIES	1961-63	1976-78	1986-88
Antigua & Barbuda	2108	1875	2178
Barbados	2503	2996	3153
Dominica	2031	2378	2884
Guyana	2220	2376	2422
Jamaica	2034	2577	2579
St. Kitts/Nevis	2072	2312	2622
St. Lucia	1907	2206	2753
St. Vincent & The Grenadines	1919	2336	2774
Trinidad & Tobago	2405	2723	2982

Source: FAO Food Balance Sheets, various issues.

Table 4: Levels of Malnutrition* in Preschool Children Attending Clinics in Countries of the English-Speaking Caribbean, Circa 1990

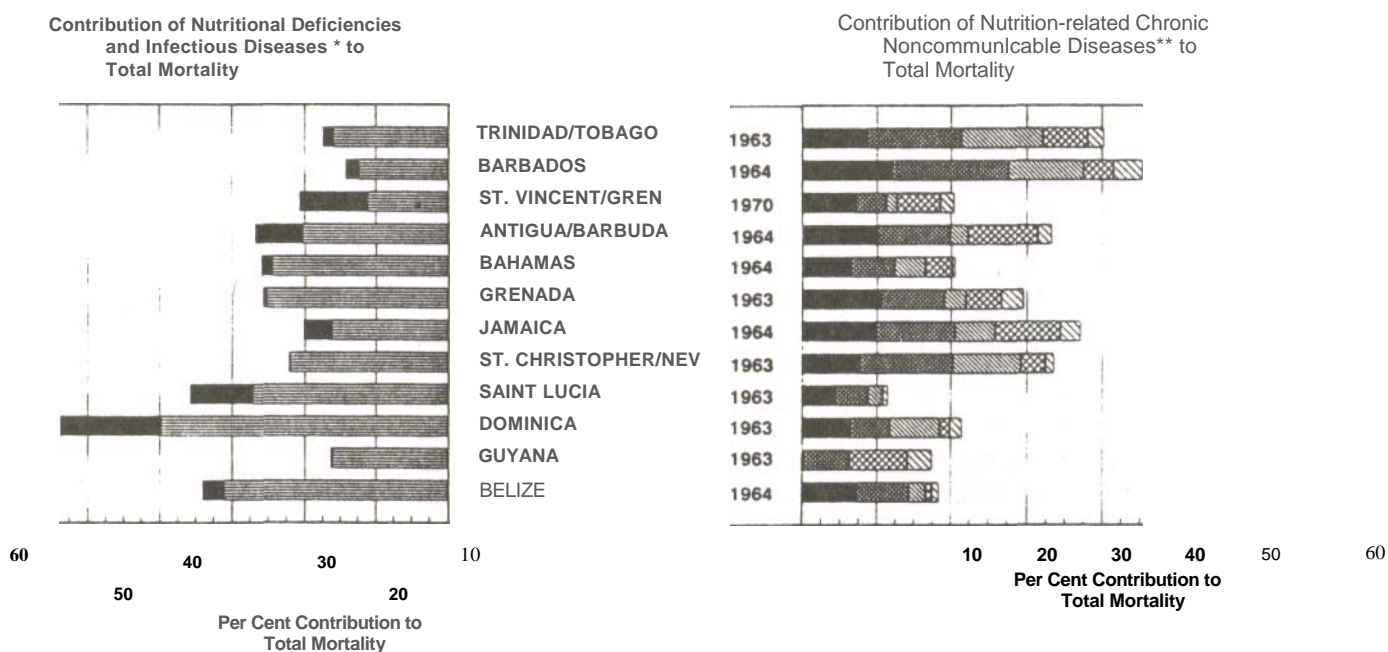
Negligible Levels of Malnutrition (Less than 5%)	Minor Levels of Malnutrition (5-10%)	Moderate Levels of Malnutrition (More than 10%)
Antigua & Barbuda	Belize	Guyana
Bahamas	Grenada	
Barbados	Jamaica	
British Virgin Islands	St. Christopher-Nevis	
Cayman Islands	St. Lucia	
Dominica		
Montserrat		
St. Vincent & The Grenadines		
Turks & Caicos Islands		
Trinidad & Tobago		

* Weight-for-age less than 80% of NCHS/WHO Standard

Source: Adapted from Dinesh P. Sinha, *Food, Nutrition and Health in the Caribbean - A Time for Re-Examination*. CFNI, 1993.

FIGURE 2: Changing Patterns of Causes of Deaths
in the Caribbean in the Last Thirty Years

A
The 1960s

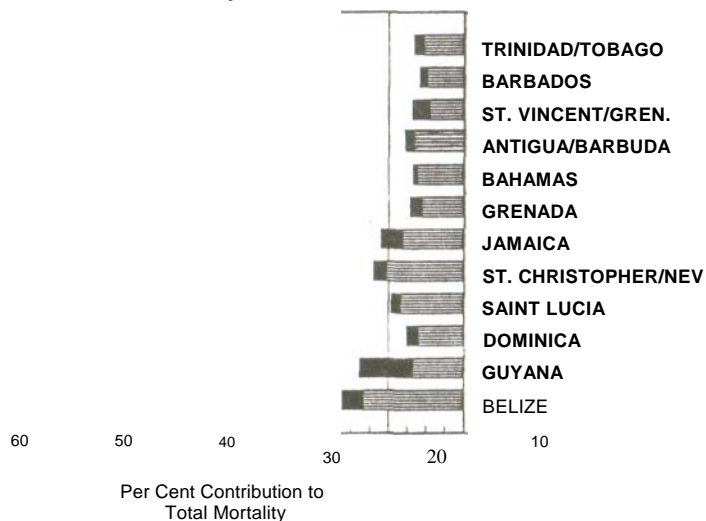


cont'd.

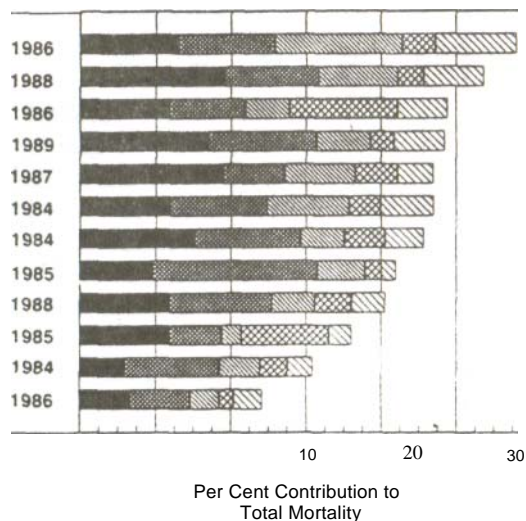
Source: Dinesh P Sinha. *Food, Nutrition and Health in the Caribbean A Time for Re-Examination* CFNI 1995.

B The 1980s

Contribution of Nutritional Deficiencies and Infectious Diseases* to Total Mortality



Contribution of Nutrition-related Chronic Noncommunicable Diseases** to Total Mortality



*Nutritional Deficiency Diseases

Protein-energy Malnutrition (ICD No. 260-263)
 Avitaminosis (ICD No. 264-269) Anaemia
 (ICD No. 280-285)

infectious Diseases

Infectious Diseases (ICD No. 001-139)
 Influenza. Pneumonia (ICD No. 480-487)

"Nutrition-related Chronic Noncommunicable Diseases

Malignant Neoplasms (ICD No. 140-208)
 Diabetes (ICD No. 250) Ischaemic Heart
 Disease (ICD No. 410-414) Hypertensive
 Disease (ICD No. 401-405) Cerebrovascular
 Disease (ICD No. 430-438)

Table 5: Trade-off Between Income and Nutrition and Banana Production

Banana Price = \$0.38

	No Nutritional Constraints	Nutrition Constraints
Net Farm Income	67981.53	65932.75
Banana Acreage (Sales)	8.5	7.9
Banana Acreage (Home Consumption)	0.0	0.02

Banana Price = \$0.36

	No Nutritional Constraints	Nutrition Constraints
Net Farm Income	67030.08	65045.44
Banana Acreage (Sales)	0.0	0.0
Banana Acreage (Home Consumption)	0.0	0.02

Table 6: Population Nutrient Goals for the English-Speaking Caribbean

Foods	% Energy	Selected Items
Complex Carbohydrates	65	
Cereals	30	5
Starchy fruits, roots and tubers	15	5
Legumes and nuts	10	5
Fruits	7	5
Vegetables	3	5
Food from animals	15	8
Fats and oils	10	4
Sugar	10	1

**Table 7: Nutrition Composition of the Diet based on the Selected Ingredients,
Trinidad and Tobago, June 1993**

Water (g)	268.3
Energy (kcal)	2500
Protein (g)	84.0
Fat (g)	60.0
Carbohydrate (g)	421.4
Fibre (g)	10.0
Calcium (mg)	1037.7
Iron (mg)	22.6
Vitamin A (R.E.)	2472.8
Thiamin (mg)	1.7
Riboflavin (mg)	1.16
Niacin (mg)	19.9
Vitamin C (mg)	335.5
Total Cost (\$)	8.02
Total Amount (Lb)	4.13
Total Amount (kg)	1.87