Caribbean Agro-Economic Society

Farm & Business

The Journal of the Caribbean Agro-Economic Society

33rd Conference Theme:

Drivers for Agricultural and Economic Development

Vol 11. No. 1, December 2019

ISSN 1019–035X

Rethinking Caribbean Food and Nutrition Security via Utilisation of Local Foods

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Abstract

The continued and growing dependence on basic food imports causes the food security status of the CARICOM countries to be extremely vulnerable to external shocks. Food import data show, for instance, that for the 01 to 09 Standard International Trade Classification (SITC) groups, inclusive of food and live animals, on average 85.5 percent of the regions' demand is satisfied from extra-regional sources. Examination of 2014 import data by value, revealed that fish and seafood products are the lowest extra-regional imports at around 65 percent, while meat and meat preparations are the highest at about 98 percent. The latter statistics are troubling when juxtaposed with the facts that several of these countries have the potential to increase meat production, and that consumption within this group is steadily growing. Moreover, all of the countries are known to suffer from shortages of foreign exchange, which is much needed to help spur economic development in critical sectors of these countries. It is accepted that any improvements in the Region's food and nutrition security (FNS) status, must be based on the use of local foods, contingent on increased domestic food production and increased intra-regional agricultural trade. But while there are varying levels of capacity or individual countries to increase their domestic food production, the potential for a higher level of food production, collectively, remains woefully unfulfilled. The paper suggests reasons as to why this continues to be the case and examines options for increased levels of domestic food production that can potentially positively impact the CARICOM region's food security and nutrition status. Among the critical areas where innovations may achieve the desired results are: technological improvements in domestic production and marketing; adoption of international agricultural health and food safety standards; intra-regional transportation of primary agricultural products; and the implementation of more targeted agricultural and fiscal policies.

Keywords: *CARICOM food and nutrition security; increased domestic agricultural production; targeted policies; food imports*
JEL codes: O24, Q18

Introduction

Since the 1970s, CARICOM countries have sought to wean their dependence on the importation of basic food items to satisfy their food security status. But despite relatively favourable agricultural resources in several of the countries, on average, 85.5 % of the region's food demand is currently satisfied from extra-regional sources, with the food import dependency ratio[1] increasing from 0.5 in 1995 to 0.71 in 2011(FAO 2015). The FAO analysis showed that whereas in 1995, there were six countries with a food import dependency ratio of 0.5 or less, namely: Belize, Dominica, Guyana, Haiti, Jamaica and Suriname, by 2011 only three of these countries - Belize, Guyana and Haiti – remained below that threshold (FAO 2015). As a consequence, the food and nutrition status of the countries, is extremely vulnerable to external shocks most recently evidenced by the 2007-2008 food security crisis influenced, *inter alia*, by price volatility (FAO 2011). These circumstances beg the question: are the factors that have led to this situation intractable or can something still be done to effect a change? The paper explores these issues.
The discussion commences with a synopsis of the regional initiatives to improve the food security and nutrition status of the Region. Next is a summary of the region's food security and nutrition status, followed by an overview of the profile of the agricultural sector. Some critical issues impacting investment decisions of farmers are then considered. The final section of the paper describes promising regional and global experiences, from which options for reducing the food import dependency ratio within the Caribbean Community, are distilled.

Synopsis of initiatives to enhance food and nutrition security within the region

From the mid-seventies to date there have been several regional policy iterations to stimulate agricultural growth, commencing with the Regional Food Plan of 1976 and culminating with the Jagdeo Initiative (JI) of 2005[2]. Collectively, the policies sought to improve the food security status through, *inter alia*: the diversification of production and markets; better inter-sectoral linkages; greater inward resource flows; and technological and structural improvements. Complementary projects were designed embracing program areas such as: public policy and planning; farm management; agronomy, horticulture; livestock production; food and nutrition; agricultural research, extension and training; domestic, regional and international marketing; and post-harvest and process technologies. (CARICOM Secretariat 1988). Regional agencies were expected to implement the respective projects. In 2005, the JI identified 10 key 'binding constraints' to agricultural development within the region. Refinement of the JI resulted in the consolidation of responsibilities within themes and among regional agencies, to stimulate the mitigation of the key binding constraints. These encompassed Regional level agreement on the assignment of roles, for developing constraint mitigation plans to Governments and or regional agencies, guided by various Technical Management Advisory Committees (TMACs). The TMACs

[1] Ratio: Total food imports/Total food consumption
[2] Others included: The Regional Food and Nutrition Strategy (1980); The Caribbean Community Programme for Agricultural Development (1988); and The Regional Transformation Programme for Agriculture (1996).

were replaced by four Thematic Groups (TGs) coordinated by designated regional agencies[3], with the involvement and inputs of designated support agencies as per their expertise. Member States' contribution included the assignment of national focal points and participation in a finance committee tasked with identifying of resources for the work of the thematic groups.

The various regional policy strategies exhibited:

(a) A philosophy that regional level action can catalyse agricultural growth in CARICOM;
(b) The absence of consultation with producers - the economic agents who take the production decisions and invest in the sector;
(c) The implicit assumption of a common agro-ecological and agri-business environment across the region; and
(d) The absence of funding dedicated to facilitating policy implementation.

The stability (or absence of growth) of the region's agricultural production over the period 2005 – 2012 (FAO 2015), is indicative of their ineffectiveness. Further, FAO (FAO 2013) noted that the food import bill more than doubled from USD 2.08 billion in 2000 to USD 4.25 billion in 2011, while only 12.7 % of food imports were sourced from within the region in 2010. The current marginal contribution of the agricultural sector to regional food consumption leaves the region extremely vulnerable to shocks from the global economic environment and or climate occurrences.

Overview of the region's food security and nutrition (FSN) status

The global hunger eradication agreements of the 1996 World Food Summit (WFS) and the 2000 Millennium Development Goals (MDGs) are both germane to the region's food security and nutrition status. The WFS pledge was to eradicate hunger from all countries with an immediate aim of halving the number of undernourished by 2015. One of the MDG's hunger targets, MDG 1c, was to reduce the proportion of the population that suffered from hunger by one half by 2015. The FAO (2015) publication, reported that the prevalence of undernourishment (PoU) in the Caribbean overall has dropped from 27.0 percent in 1990–92 to 19.8 percent in 2014-16, but national anomalies exist. Guyana and St. Vincent and the Grenadines have achieved the WFS 2015 goal to reduce hunger by one half, while Trinidad and Tobago is close to that goal achievement. Suriname has achieved the Millennium Development Goal of reducing the PoU by 5% by 2015 while Jamaica is close to achieving the goal. The Bahamas, Belize, Dominica, Jamaica and Trinidad and Tobago have undernourishment levels less than 10 percent of their population. For the other countries, except Haiti, the relevant PoU statistic is between 10 and 20 percent of their population. In Haiti, it is at 50 percent of the population (FAO et al 2015). Stunting, obesity and wasting are malnutrition issues associated with food insecurity, which have an adverse impact on child health and development. Stunting, a result of poor nutrition in early childhood, can permanently affect the physical and cognitive development of a child. Latin America and the Caribbean (LAC) has been estimated to have 5.9 million stunted children and of

[3] The Thematic Groups are: a) Business Development (market, private sector, finance, transport); b) Climate change natural resources management (land and water, and disaster risk management); c) Research and human Resources development (Research and development, and Human resource); and d) Agricultural health and food safety systems.

these 0.2 million are in the Caribbean (UNICEF et al. 2017). In LAC 6.9 % of children are estimated to be overweight in 2016, with the data showing a marginal increase in this group of children over the period 2000-2016. The absolute numbers reflect 0.2 million children (UNICEF et al. 2017). In 2016, wasting has been estimated to affect 0.7 million children in LAC. Of these 0.1 million are in the Caribbean (UNICEF et al. 2017).The obesity challenge is not restricted to children. In most countries, calories consumed per capita exceeds 2400, again with the exception of Haiti where the average consumption is 2000. Excessive consumption of calories is triggered by the use of processed food and leads to the twin challenges of obesity and overweight. For people above 15 years of age, female obesity exceeds that of males. For example, in Haiti, obese females outnumber males 16:1 while in Jamaica and St. Lucia the ratios are 6:1 and 4:1 respectively.

In a previous section, we demonstrated the futility of several attempts at regional strategies to stimulate agricultural growth, since instead of a reduction of the region's dependency on imported food, the food import bill has skyrocketed. We also see that, despite the high food import bill, undernourishment is still rampant in the region. In the next section, we examine more closely the available agricultural resources with a view to illustrating how these might be better utilised to more effectively satisfy the food security and nutrition needs of the region.

Important Characteristics of Caribbean Agriculture

Farm size, farm operators' profile and tenure arrangements[4]

Caribbean farms are less than 10 hectares (FAO 2015), with most (89.5%) under 2 hectares of land (< 5 acres) accounting for 55% of cultivated land. (Graham 2012). Many farmers (42.2%) are between 41-55 years of age; 29.2 % are over 55 years old; 22% are between 26 – 40 years old; and 3.2 % under 25 years of age (FAO 2012). Males predominate with there being a distinct absence of female farmers but not female farm workers in some countries[5]. They can be categorized as either commercial, semi-commercial or subsistence farmers. About 50% of farmers are full time and many do not keep records of their operations (Graham 2012). Fifty–six percent of farms are owned by the holder while 26% are family owned and 10% rented or leased. The others are operated under various local or common law arrangements including squatting on private or government land. There are as many as 12% of landless farmers in some countries (FAO 2012). Females tend to grow food crops as opposed to livestock. Some countries such as Guyana have a lower percentage of small scale females farmers (FAO 2012).

Females are very active in price setting in the village and urban markets and in establishing mutually beneficial smart clientele relationships with housewives and urban middlemen, resulting in the optimising of travel from their rural communities. Females are also

[4] Data from agricultural census' in: Antigua/Barbuda, Belize, Dominica, Guyana, Jamaica, St Lucia, St Kitts & Nevis, Trinidad and Tobago. FAO (2012). Report of Workshop on Small Scale Farming in the Caribbean. FAO Subregional Office for the Caribbean, Bridgetown, Barbados, Food and Agricultural Organisation of the United Nations (FAO).

[5] A recent survey showed that among the Windward islands, there were 73% male and 27% female farmers. Babwah, A. and Associates (2016). Market Study for Fresh Produce: St. Lucia, Grenada Dominica and St. Vincent & The Grenadines. Canada, World University Services of Canada (WUSC)

involved in initial processing and marketing of the artisanal fish catch and backyard gardening (FAO 2012).

Technological practices

Farming systems and practices are fairly uniform across the Caribbean and include use of improved germplasm through tissue culture and well managed plant seedlings available from private nurseries, agricultural ministries or agricultural institutions such as CARDI. Cultivation is predominantly rain fed, practiced by some 500,000 small farmers across the region (60% of all such farmers) (FAO circa 2010). Some farmers irrigate using harvested rainwater. The challenge of accessing water for irrigation is increased for farmers with hillside plots. Since most farmers plan their production to coincide with expected rainfall, rainfall variation presents increasing challenges and results in losses in harvests (FAO circa 2010). Drought conditions cause most small farmers risk crop loss or poor yields (Graham 2012).

Cropping systems practiced include crop rotation; intercropping and agroforestry; mulching; and the use of composts to improve soil fertility and conserve soil moisture. The use of fertilizers and other agro-chemicals is common but adoption of good agricultural practices (GAPs) is limited to farmers who export or are in a special programme with domestic market outlets (FAO 2012).

The evidence of agricultural mechanization is weak, likely due to the small farm sizes and the undulating terrain. In Grenada, the North-Eastern Farmers Organisation, rotates the use of small machinery among its members.

Except for poultry, livestock farming is not very well developed, consisting mainly of the rearing of small ruminants, particularly in the smaller islands where many of the livestock farmers are landless. Landless farmers choose to graze their animals on open lands or public lands during the day and herd them to a safe place near the household at night (FAO 2012). The use of improved genetic material through artificial insemination (AI) is common practice. Poultry farming is found in many of the island states. Large established farms of cattle, pigs, sheep and goats can be found in the larger islands as well as in Belize, Guyana and Suriname. Protected agricultural production, greenhouse and otherwise, can be found in the Bahamas, Belize, Barbados, Jamaica among others (FAO 2012) and Suriname (Gordon 2016b). One such Surinamese producer is keen on expanding the scope of his operations but is constrained primarily by access to investment financing at an affordable rate (Gordon 2016b).

Credit issues

Availability of and access to financing to facilitate investment in agricultural operations is a major constraint, restricting farmers' ability to invest in farming technology (improved practices) and infrastructure (irrigation, nursery facilities, harvesting and packaging equipment, etc.). Requirements, such as insurance and collateral arrangements as well as the structuring and disbursement of loans, are major hurdles (Graham 2012). Recently, two Surinamese farmers, one producing vegetables and the other swine – in both instances using modern technology - have observed that the current interest rates for loans from a commercial bank (between 12% and 20%) prohibit the strong expansion of their operations (Gordon 2016b).

Production and Trade Considerations Impacting Investment in Agriculture and Enhanced Food and Nutrition Security from Local/Regional Production

The producer as an economic agent

Economic theory asserts that an economic agent (EA) makes production decisions under the assumption of optimising behaviour. In optimising their production operations EAs consider, *inter alia*: (1) The availability and cost of the inputs or factors of production, (2) The prices of the outputs, (3) The markets for the outputs, and (4) The technology available to produce the desired outputs. All regional agricultural producers are EAs who, as per economic theory, *make their decisions in their own self-interest*! (Timmer C Peter 1998).This critical principle is sometimes overlooked by agricultural policy makers.

It is of interest to note that if the Executive Management Team (EMT) of the 'Caribbean Gold Enterprise' decided to increase the output of gold by 10 % within a given period, this goal can be easily achieved by line supervisors' actions such as greater raw material throughput and increased production line hours – more workers employed on the line and for longer hours.

In contrast, if a country's President or The Cabinet or the Minister of Agriculture… decides that the output of a specific crop, say cassava, should be increased by 10% in the coming year, that outcome does not necessarily follow. Such a goal is achievable only if the following occurs simultaneously:

(a) **Farmer A** perceives that a 10% increased cassava output is in her or his self-interest, and
(b) **All other cassava farmers** are of similar mind-set, **simultaneously**, perceiving a 10% increase in output to be in their self-interest as well.

The Government's decision may be based upon a 'macro' view of the cassava market, and may be supported by a suite of policy measures intended to mobilize farmers into increasing cassava production. However, in the final analysis, the farmer (EA) takes her/his production decision from a personal perspective solely, a much different view from that of the government. Consequently, the challenge is for the policy makers to design an agri-business macroeconomic and micro-economic environment that induces a majority of potential cassava farmers (EAs) to invest in cassava production. This necessitates that the policy maker(s) be *au fait* with what will influence the cassava producer (s) to invest in that crop. Further, the factors likely to positively influence cassava production are not necessarily the same for catalysing poultry production.

Water for agriculture

Caribbean agricultural production is primarily rain fed, as previously noted. CIMH and FAO (2016) reports that in general 70 % to 80% of rainfall occurs during the wet season. Yet, despite there being predictable wet and dry seasons, countries may experience drought conditions during the traditional wet season or unusual rainfall during the dry season. Variability in rainfall patterns across countries (CIMH and FAO 2016) together with farmers' rain fed production culture suggest that optimal water availability for agriculture should be addressed at the national level for best results. Further, rainfall patterns may vary across individual countries, requiring country specific differential responses.

Macro-economic, meso-economic, and institutional issues

The respective macro-economic environments that farmers face varies considerably by country if only because of the differences in the prevailing exchange rates, where nine countries have a fixed exchange rate[6] and the others a market determined exchange rate[7]. Dissimilarities in the national value added tax regimes adds to the macro-economic disparities. As a result, producers face different prices depending on the countries in which they are located. These circumstances influence the prices received by farmers and those paid by consumers, and ultimately the performance of the agricultural sector (Stevens and Jabara 1988).

Meso-economic issues, in particular public administrative procedures and market mechanisms, are two main channels for transmitting policy signals to the EAs (Zezza and Llambi, (2002). Here also national differences are impacting. Collectively these issues, among others, strongly suggest that, a necessary pre-requisite for successful agricultural policy in CARICOM countries is that the design of policies must have an overwhelming national focus.

Market issues: Domestic and intra-regional

The domestic food market is comprised of two segments: household and hospitality. Of these the hospitality market is the more demanding, although anecdotally the high end of the domestic household market embraces some of the product characteristics of the hospitality market.

A 2007 study of the purchasing patterns of its membership in ten Caribbean countries, co-sponsored by The Caribbean Hotel Association[8] revealed that a high percentage of vegetables, dairy and meat were purchased locally or regionally, compared to fish, fruits and eggs[9]. (Tourism Global Inc 2007). These data provide some indication of the region's hospitality market requirements for vegetables, dairy products, meats, fish, and fruits.

As the hospitality industry expands the demand for more domestic agricultural produce increases. In general, guests like dishes prepared with local food so hotels and restaurants will have greater incentive to use more local food items in their menu, if acceptable quality supplies are available (Gordon 2009).

While historically, the diet at the household level of many may have consisted of simple food items, now lifestyle and demographic changes have stimulated an increased demand for processed and convenience food products[10] (Gordon 2009). With respect to the supply of locally or regionally produced food items, among the key challenges in getting domestically produced food for distribution is a continuous supply at a steady price. Suppliers do not understand the concept of maintaining a stable price and vendors continually increase the prices because distributors are prepared to purchase the items (Gordon 2009) (Babwah and Associates 2016)*.

[6] The Bahamas @ 1:1; Belize and Barbados @ 2:1; and OECS states @ 2.7:1 (local currency: USD)
[7] Guyana 206.651:1; Haiti: 62.8002:1; Jamaica: 128.706:1; Suriname: 7.51205:1; Trinidad/Tobago: 6.74098 (local currency: USD). Obtained online from XE Converter.
[8] The countries in the study were: Antigua and Barbuda, The Bahamas, Barbados, Dominica, Dominican Republic, Jamaica, St Lucia, St Kitts and Nevis, Trinidad and Tobago and the United States Virgin Islands.
[9] Vegetables: 85%; dairy: 77%; meat: 63%; fish 28%; fruit 23%; eggs: 10%.
[10] Both husband and wife now work, while living further away from their workplace.

One distributor is of the view that supplies from the region are generally more costly than imports. Some supermarkets, although desirous of sourcing supplies locally, have identified quality (especially of perishables), grading and packaging as huge challenges with supplies from vendors and farmers. (Gordon 2009) (Babwah and Associates 2016).

Gordon (2009) noted that in 2008 about 80% of the demand for goat meat in Jamaica was satisfied by imports from Australia and New Zealand. It is unlikely that there has been a change in these circumstances since in 2014 imports of selected meats of HS code 0201-0207 totalled 47.4 million Kg for Jamaica with a value of USD 63.3 million (Gordon 2016a). This category of meat imports for the MDC's collectively totalled 86.4 million Kg with valued at USD 123,298,907million. Similarly, for vegetables of HS 0703-0709 the total imports were 34.4 million Kg valued at USD 35,467,697million. And for fruits of HS 0803-0809 the total imports were 39,429,031 Kg valued at USD 46,028,910 (Gordon 2016a).

Some other related market issues include:

(a) A responsive market intelligence system that farmers can rely upon in making their production decisions;
(b) The sensitisation of farmers to the critical importance of the standardisation of their products, with respect to size, quality, supply consistency, timeliness of delivery and other consumer desired characteristics;
(c) The critical importance of food safety considerations and the associated use of good agricultural practices (GAPs). Proper post-harvest handling practices, and traceability in the food chain;
(d) Improved national agricultural health and food safety systems and infrastructure to facilitate certification of compliance with international sanitary and phytosanitary standards, associated with ongoing related training of producers and vendors; and
(e) Appropriate intra-regional transportation facilities for agricultural products, perhaps through a private sector/public sector/ partnership (PPP).

Targeted Options for the Enhancement of Regional Food Security and Nutrition (through increased Production and Consumption of local/regional Food)

We now highlight cases drawn from regional and global experiences to illustrate the successes in the enhancement of food security and nutrition as well as increased production when the private sector takes a lead role, and farmers have increased access to markets. The discussion also covers the need for targeted support services to facilitate farmers' improved market access opportunities.

Producer focussed national level policy options targeted to identified market opportunities

Paul (2002) characterized Caribbean farming enterprises into four groups: (1) Small traditional subsistence farmers, practicing mixed cropping on marginally hilly lands; (2) Commercially oriented small farmers, targeting the domestic market with occasional intra-regional exports; (3) Some larger commercial farmers concentrating on the extra-regional export market; and (4) Idle unproductive large farms, under absentee ownership.

The diversity in agro-ecological and business environments strongly recommends a targeted approach to the enhancement of FSN within the region, to encourage the various economic agents to satisfy both domestic and intra-regional market opportunities. Towards this end both regional and global experiences are relevant, as illustrated below.

The Jamaica experience: In 2011, the Grace Agro Processing Division (GAPD) of the Grace Kennedy Group Ltd (GKG) successfully engaged 60 farmers in 2-year contracts to supply GAPD with 45,000 kg. per year of hot peppers and scallion for its operations. Farmer participation has since grown to 70 in 2015 and the output to 1,000,000 kg. annually. Farmers must use CARDI's pepper varieties. They use progressive production technologies (drip irrigation and plastic mulch) and benefit from discounted agro-chemical inputs purchased from GKG as well as a credit line for the duration of the crop (FAO 2016).

The Trinidad/Tobago Experience: The Trinidad and Tobago Agri-Business Association, in the 2009/2010 growing season, contracted raw material for its 3 processing plants from 130 farmers who supplied 0.9 million lbs. of cassava, 0.2 million pounds of sweet potato, 40,000 pounds of pommecythere (golden apple) and 80,000 lbs. of paw-paw. The farmers benefitted from, *inter alia,* a guaranteed market and prices for their products, supply of farm labour, effective irrigation and drainage systems, control of praedial larceny, expansion of and easier access to incentives, improved farm roads, crop and livestock insurance, and improved access to credit (FAO 2016).

The Philippine Experience (1): Nestlé (Philippines) sought to increase farmers' income through improved yields and increased productivity by implementing the company's philosophy of 'Creating Shared Value' (CSV) focused on activities and strategies with long-term positive impact on business and society. The strategy enhances farmers' (coffee and others) access to markets. Nestle sells farmers, tissue cultured coffee plantlets from France at cost, then later purchases the harvest from the farmers. Through 6 farm schools nationwide the company also provides free training to the farmers. It also promotes practices such as intercropping, mulching, and water conservation that collectively contribute to increased food security and improved wellbeing of the farmers and their families. Exceeding corporate responsibility, Nestlé's CSV programme contributes to improved nutrition through education of consumers, as well as promotes activities that enhance the environment (Nestle Philippines Inc. 2014).

The Philippine Experience (2): The Jollibee Foods Corporation (JFC)[11] is the Philippine's largest food service company of which The Jollibee Group Foundation (JGF) is a 'division', launched in 2005. In pursuit of its mission to, *inter alia*, improve access to education for youth, improve the livelihoods of farmers and promote environmentally friendly initiatives, the JGF started addressing two aspects of food security in the Philippines in 2011, food availability and utilisation. This resulted in the launching of a school feeding programme initially targeted to pupils at risk of dropping out because of hunger[12], linked to a JGF sponsored farmer entrepreneurship programme (FEP). The FEP farmers supplied school lunch menus and the JFC supply chain. Initially, the school meals were entirely funded by JGF, but beginning 2014 the Ministry of Education co-funded 25%. It is now entirely funded by that Ministry while the JFG focuses on quality, standards, and logistical issues pertaining to the delivery of the school meals. By eliminating the middleman and giving participating farmers direct access to the JFC market, the

[11] JFC is a 'fast food chain' similar to KFC.
[12] Kindergarten to grade 6

FEP contributes to an increase in farmers' income and improvement in their food security status. Currently, the small farm sizes[13] present challenges such as: difficulty with the consolidation of farmer supplies to JFC; and high cost of production since economies of scale are not possible in the absence of mechanisation. Through the FEP partnership with the Rural Bank of Guinabatan Inc. (RBGI), farmers are able to access funds for investment (Jollibee Group Foundation 2016) (Gordon 2016b).

The Antigua/Barbuda Experience: In 2009, the Ministry of Agriculture of Antigua and Barbuda collaborated with the FAO on a 'backyard garden' project to enhance the food security and nutrition status of selected communities. One activity, aquaponics, allowed a farmer to produce fish for household consumption and vegetables for sale to the hospitality sector. This householder was confident that the operations will allow the servicing of a loan of about USD 5,000.00 secured to help finance the operations (Gordon 2015).

The Suriname Experience (1): The vegetable producer Spirits grun 2 NV has been in production for about 4 years, using both open field and, more recently, greenhouse technology. The firm produces a wide range of vegetables and currently targets the hospitality sector in Suriname. The firm is pursuing vertical integration and is keen on expansion but is constrained by the prevailing high cost of financing (Gordon 2016c).

The Suriname Experience (2): Suriname Pig Farms is GLOBAL G.A.P. certified, vertically integrated, currently operates in 2 CARICOM countries,[14] and is poised for further market expansion. While the current focus is primarily the domestic market, the firm seems to have the potential to export to the wider CARICOM market in the near future, pending the resolution of some hurdles, namely: financing for infrastructure expansion, the satisfying of SPS regulations in targeted CARICOM markets, and appropriate transportation (Gordon 2016c).

The Israeli Experience: Israel is endowed with of 437,000 ha of arable land of which 162,000 ha are irrigated. It experiences rainfall mainly during the months of December –February, with annual precipitation varying from a low of 30 mm to a high of 1000 mm. Despite chronic water scarcity from poorly distributed rainfall, in 2014 Israeli farmers produced USD 2.1 billion of agricultural products including: vegetables; citrus and other fruit; cattle, sheep and poultry; and field crops. Israel's production efficiency is such that one farmer's output was projected to feed 111 Israelis in 2014, compared to 110 in 2010 and 15 in 1995. In comparison, worldwide, one developing country farmer was projected to feed 2-20 people while a farmer in developed countries was projected to feed 90-120 people (Lehmann and Regev 2016). Underlying these achievements is Israel's development and application of micro-irrigation technology (Neena Rai 2012), allowing the delivery of the precise amounts of water a plant requires to its root. In addition other precision agricultural techniques, such as thermal imaging, are used in crop, livestock and protective agriculture (Lehmann and Regev 2016).

Farmer / private sector collaboration for enhanced food security and nutrition

The experiences cited above convey the successful engagement of producers when they perceive the circumstances to be to their benefit. The experiences of Jamaica, Trinidad and Tobago and the Philippines also demonstrate that robust involvement of the private sector is

[13] Farm sizes are 1.5 to 3 ha average.
[14] Guyana and Suriname

critical. The failed Regional agricultural production strategies to date dictate that a new paradigm be immediately embraced focused on a strong farmer/private sector collaboration tailored to prevailing national circumstances. Alliance with the private sector such as the Massy Group, a Trinidad and Tobago based conglomerate with food distribution 'divisions' in other CARICOM countries,[15] is a prime example. The Caribbean Farmers Network (CaFAN), with a network in all the countries, is well positioned to stimulate committed farmer participation. Complementary technological and support services will be required.

Necessary complementary technological practices and support services

Rainfall dependency reduction: Caribbean countries experience drought conditions about five months each year, when water unavailability can result in farmers ceasing to plant (FAO circa 2010). Almost 90% of food crop farmers are impacted by lack of access to water for agriculture, except for rainfall events, and this is exacerbated by variability in rainfall occurrences caused by climate change effects (FAO circa 2010). These circumstances can be assuaged through accelerated efforts to promote rainwater harvesting together with the efficient use of micro irrigation systems. Greater access to water, will increase farmers' flexibility to invest in food crop production to provide the respective markets with a more consistent supply of desired quality standards. The increased output will lead to higher farmer income and an enhanced FSN status.

Support services and financing: Expanded agricultural support services, particularly research and development (R & D) and extension, will be required assist producers to adapt following their market influenced investment decisions. Currently it appears that R & D is driven more by the public sector's perception of producers' needs than by the producers' assessment of the markets' requirements. Also, R & D is currently financed almost entirely by the public sector. The design of systems that allow for a level of co-funding of R & D by producers and the public sector is likely to lead to R & D activities more focussed on the producers delivering a product with characteristics that the market seeks.

Financing is a complex issue, primarily because financial institutions are uneasy about the insecurity associated with many agricultural ventures. Producers are similarly concerned about the risks posed by weather and other exogenous factors. Based on some of the country experiences cited earlier and on the possibility of rainfall dependency reduction, financial agencies are likely to be more amenable to funding farmers, since some of the farmers' risks will be lessened. To complement this likely development, the promotion of an agricultural insurance market, particularly but not exclusively for unavoidable natural disasters, can be explored.

Intra-regional transportation of agricultural products

Transportation can be considered the weakest link in the thrust for enhanced food and nutrition security, through increased consumption of locally or regionally produced food. It will be critical to establish an efficient and reliable system to facilitate intra-regional trade of primary agricultural products. Almost three decades ago the then Caribbean Food Corporation (CFC)

[15] Massy has 'footprints' in Antigua/Barbuda, Barbados, Guyana, Jamaica, St Lucia and St Vincent/Grenadines. This serves as an illustration. The involvement of the private sector need not be limited to one firm.

unsuccessfully launched a project to explore the improved intra-regional transportation of agricultural produce. To date, efforts towards that objective are still ongoing, with similar studies being conducted as recently as 2016. The intractable challenges to date include: (1) the inability of producers to supply consistent quantities or volumes of produce for shipping; (2) the insistence of transporters that a minimum volume must be shipped; and (3) the reluctance of transporters to upgrade their vessels and improve conditions of carriage unless larger and consistent supplies are guaranteed, thus creating a seemingly insoluble impasse. This suggests the need for more inter-sectoral dialogue to arrive at a feasible resolution of these issues (Gordon 2017). Currently, the Windward Islands (WI), Belize, Guyana, and Suriname all have the potential to increase their food output and export intra-regionally. The big challenge is the availability of adequate and cost competitive transportation. For highly perishable items air transport is available, albeit costly. Schooners are now used to ferry agricultural produce from the Windward Islands to Trinidad and Tobago, Barbados and other ports in the Caribbean. Few (if any) of the vessels have refrigerated holds so that the conditions of carriage always lead to significant spoilage losses, compounded by theft (Babwah and Associates 2016). Limited intra-regional sea transport options are available for agricultural produce from Belize, Guyana, and Suriname. One possible solution to this seemingly intractable challenge might be the launching of an appropriately designed fleet of vessels under a private/public/partnership (PPP) concept involving some of the current schooner owners/operators, a subset of Governments, invited regional business enterprises, and established farmer groups. It may be that such a venture can attract financing from a designated window of the CDB, with suitable government guarantees. Governments' participation can include incentives to the company such as reduced or waived port charges. We anticipate that each shareholder group will be committed to the success of such a transportation company, facilitating them working collectively towards its profitability.

Agricultural health considerations

Upgraded agricultural health systems and infrastructure in most countries is critical for facilitating agricultural trade among the countries. These institutions are required to provide certification that the traded agricultural commodities conform to internationally accepted good agricultural practices as well as agricultural health standards, practices and regulations. Some countries may need to conduct additional pest risk analyses as a pre-requisite for trade in selected commodities. The development of specific protocols to facilitate trade in select items is an alternative to these analyses in the event of an impasse.

Monitoring of policy impact

Pursuant to the design and implementation of policies to enhance food security and nutrition in the region, it is essential to establishment a system for monitoring the impact of the respective policies. Such a system will have to be anchored at the national level to capture data that reflects the investment responses of the economic agents. The scope of the monitoring system should encompass outputs as well as characteristics of the sector and will allow for future policy adjustments.

Concluding Comments

A policy paradigm shift is urgently required to enable Caribbean farmers to increase food production, to satisfy more than the 13% of food consumption currently being achieved from local and regional production. For an excess of two decades, the policy and strategies to stimulate agricultural growth were anchored in regional level actions. These have patently failed, by virtue of the ballooning food import bill. The policy paradigm shift proposed entails a national level focus on producers in partnership with established private sector entities, with a strong emphasis on enabling farmers to increase their returns within the agro-ecological and business environments of their operations. This will require strategies that catalyse the agricultural economic agents – small farmers – into investment decisions from which they, as well as consumers at large will benefit. The new approaches require the promotion of a shift to embrace increased irrigated production and the use of the more efficient micro-irrigation technology. The policy paradigm shift, also envisages strong roles for established farmer organisations and national governments, with targeted support from regional agencies.

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