METHODOLOGICAL DIRECTIONS FOR THE ISLAND SPECIFIC PROGRAMME IN THE BAHAMAS: THE CASE OF CARIBBEAN SUGAR QUOTAS

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INTRODUCTION

This paper explores the Island Specific Programme in The Bahamas, which is a major policy initiative for the revitalization of agriculture in that country. What this paper proposes is a methodological approach, which can lead to the strengthening of the programme. Before turning to a discussion of the programme, a review is undertaken of agriculture in The Bahamas.

1. THE AGRICULTURE SECTOR IN THE BAHAMAS

1.1 The Sector

Currently in The Bahamas, agriculture (including fisheries) accounts for approximately 5 per cent of GDP and employs about 5 per cent of the labour force. In 1994, approximately 75 per cent of all landholders derived less than 25 per cent of their income from farming. In 1997 (the year for which the latest trade figures are available), approximately 90 percent of the nation's food supply, valued at $210.8 million was imported primarily from the United States.

The Bahamas is not considered to have a problem of food security, since earnings generated from tourism more than adequately pay the nation's food bill. It is estimated that for every $1.00 earned from tourism, approximately $0.8 is spent on imports with an estimated $0.6 being spent on imported food.

1.2 Weather

The islands of The Bahamas are bathed by the Gulf Stream, running from the South West. There are very few frosts and no long hot or dry periods. Rainfall is generally well distributed through the

year and could be adequate for crops without irrigation, given appropriate farm management practices. It is higher in the northern than in the southern islands.

The climate is tropical and favourable for growing a variety of crops. It is also highly suitable for commercially farmed livestock, such as cattle, pigs, and poultry.

An important feature of the weather of The Bahamas is the occurrence of hurricanes. There have been about 20 hurricanes or tropical storms during the period 1989 to 1996. The damage from hurricanes is sufficiently to have a negative influence on farmers' and land-owners' investment and management decisions.

1.3 Marketing and the Packing House System

The system of Government packing houses, set up in 1969, was intended to benefit farmers. It started with eight packing houses located in five islands and one central Produce Exchange at Potters Cay on New Providence, and a Produce Exchange on Grand Bahama. However, the packing house on Grand Bahama ceased operations in 1995.

The packing house system functions both as a means of assisting farmers to bring their produce to market, and indirectly, as a means of stabilizing prices, at times of abundant supply, through control of imports. That is, import licenses are not granted when local produce is available.

It is frequently claimed that the farmers are willing to use the packing houses only as a last resort. They are said to feel that the prices they receive are less than they could get elsewhere, and they have to wait a long time for payment. There seems little doubt that the packing houses are not run efficiently, in a technical sense, and are plagued with avoidable spoilage and high costs. The Government has tried to minimize financial losses in operating the system in two ways. First it reduced the annual budget allocation for purchases by the packing house system from $2 million to $1.5 million. Second, it reduced the value of annual sales permitted to a farmer. Originally there was no limit, but from 1995, it has been set at $9,000.

As seen in Table 1, the packing house system handled only about 6 per cent of the total crop production in the Bahamas in 1997/1998. The majority of the crop production was exported (about 55 per cent in 1997 and 42 per cent in1998). Direct shipment of commodities via alternative domestic marketing channels handled 18 per cent of the total crop production in1997 and 29 per cent of production in 1998. The value of other estimated crop production (i.e. production not marketed) comprised 22 per cent of total crop value in 1997 and 23 per cent in 1998.

The marketing of livestock products takes place within the private sector, as no livestock products are handled by the packing houses. However, there has been a suggestion that the activities of the packing houses be expanded to provide abattoir services

Table 1. Estimate of Value of Total Crop Production and Packing House Handling, 1997 and 1998

Crops	1997		1998	
	$ '000	%	$ '000	%
Exports	11883.43	55.1302	8383.71	41.5674
Direct Shipment	3836.56	17.7987	5787.37	28.6944
Packing House	1189.99	5.5206	1352.62	6.7064
Value of Other Estimated Production	4645.22	21.5503	4645.22	23.0315
Total Production	21555.2	100.00	20168.92	100.00

Source: Department of Agriculture (1998).

1.4 Crop and Livestock Production

Table 2 gives an indication of the value of crop and livestock production in the Bahamas for the years 1995 to 1998. Here it is seen that broiler production represents the largest industry, being valued at approximately $21 million annually over those four years.

The value of crop production reached some $25 million in 1996 but had fallen to $20 million by 1998. Layer production (table eggs) remained steady over the period at about $5 million. Swine production showed an encouraging increase from $0.48 million in 1997 to $0.80 million in 1998.

Table 3 gives an indication of the major crops in production in The Bahamas for the period 1997 to 1998. Here it is seen that, based on quantity produced, bananas and citrus fruit (especially limes, lemons, grapefruits and oranges) are the major permanent crops, while watermelon, tomato, onions, peppers, cabbages and okra are the major temporary crops. There was also substantial production of cucumbers, English potato and pineapples among the temporary crops and mango and papaya among the permanent crops.

1.5 Imports and Exports

Table 4 shows that food imports were approximately 14 per cent of total inputs into the Bahamas in 1997. Table 5 gives the main food imports and shows that animal products were the leading

exports, with poultry imports being the single largest food item. Poultry was followed by pork, fish, beef, sheep and goat imports. With respect to crop commodities, fruits, especially grapes and apples were the largest commodities imported followed by white potatoes, lettuce and onion and tomato.

Table 2. Value of Crops and Livestock Output 1995-1998 ($'000)

	1995	1996	1997	1998
Crops	17,286.03	25,637.80	21,555.22	20,075.00
Broiler	18,152.97	20,992.25	22,403.77	21,039.84
Layer	5,196.25	5,260.51	4,986.87	5,232.58
Other Meats	-	-	8.75	161.83
Swine	-	-	477.78	795.41
Sheep	-	-	9.71	12.69
Goat	-	-	4.42	6.83
Cattle	-	-	34.78	27.27
Family Island Estimate	-	-	469.82	436.10
Total	23,349	26,253	28,396	27,713

Source: Department of Agriculture (1998)
Estimate of Swine, Sheep, Goat and Cattle Production

Table 3. Crop Production Data 1997 and 1998

Permanent Crops	Unit[1]	1997	1998	% Change 1997-1998
Bananas	C/S	816,428	164,303	-79.88
Grapefruit	C/S	590,73	47,626	-91.94
Lemons-Myers	C/S	323,087	135,096	58.19
Limes-Key	Hd	43,223	55,057	27.38
Limes-Persian	C/S	90,610	95,013	4.86
Mango	Bu	18,006	18,044	0.21
Orange Sweet	C/S	97,648	119,120	21.99
Papaya	lb.	24,752	11,590	-53.18
Tangerine	Bu	4,812	8,745	81.73
Temporary Crops		1997	1998	% Change 1997-1998
Cabbage	C/S	36,773	40,549	10.27
Cucumber	C/S	9,874	10,573	7.08
Okra	lb.	120,067	156,626	30.45
Onions	Bgs	29,864	29,157	-2.37
Pepper-Goat	lb.	24,715	43,627	76.52
Pepper-Hot	lb.	50,256	84,502	68.14
Pineapples	doz.	1,191	931	-21.83
Potato Irish	Bgs	1,781	3,212	80.35
Sweet Pepper	C/S	23,030	25,387	10.23
Tomato	C/S	325,887	276,855	-15.05
Watermelon	lb.	1,818,458	2,194,931	20.70

[1]C/S is cases; hd is hundreds; bu is bushels; doz. is dozen; lb. is pounds and bgs is bags
Source: Department of Agriculture (1998),

Table 4. Main Products Imported into The Bahamas -1997

Principal imports c.i.f. -1997	%
Manufactures	31.2
Machinery & transport Equipment	28.7
Food and live animals	14.3
Chemicals	10.3

Source: Computed from Annual Foreign Trade Statistics, 1997 Report.

Table 6 shows that crop and livestock exports contribute only about 8 per cent of the exports from the Bahamas. On the other hand, Crustaceans (especially Lobster) contribute about 59 per cent of total exports from the Bahamas. Salt at 21 per cent of total exports is the other major export commodity.

Table 7 gives an indication of the level of trade protection afforded domestic production of agricultural commodities by the system of import duties and quantitative restrictions in place. Here it is seen of the major commodities analyzed that the highest level of protection was afforded to goat meat with a NPC of 3.18. Other commodities with NPC greater than one were sheep, chicken, pineapple and swine. In general the crop commodities showed little trade protection with onion having an NPC of 0.92 and bananas 0.84. For the other commodities analyzed the NPCs were all less than or equal to 0.60.

Table 5. Imports of Edible Vegetables and Certain Roots and Tubers and Meat and Meat Offal Exceeding $1 Million B – 1997

Item	Value of Imports ($million)
Crops	
Potatoes	2.110
Onion	1.348
Tomato	1.241
Cabbages and Cucumbers	1.142
Lettuce	1.932
Plantains	1.025
Grapes	2.265
Apples	1.307
Animals	
Poultry	7.667
Beef	5.700
Swine	6.653
Sheep and Goat	3.617
Fish	4.525

Source: Annual Foreign Trade Statistics, 1998 Report.

Table 6. Value and Percentage of Exports for the Bahamas by Commodity 1997 ($million)

Commodity	Value of Exports	% of Total Exports
Crustaceans (Lobster)*	59.82	58.64
Other Live Animals and Animal Products	4.7	4.61
Rum and Tafia	4.93	4.83
Vegetable Products	3.19	3.13
Salt	21.59	21.17
Other Mineral Products	2.28	1.63
Other Exports	5.49	5.38
Total	102	100

* Includes about $350,000 of exports of crabs.
Source: Annual Foreign Trade Statistics 1997 Report, Trade Protection for Agricultural Production

Table 7: Protection of Selected Agricultural Commodities in The Bahamas, 1997

Commodity	Domestic Price*	Average CIF Price* (Value)	NPC#	Rate of Duty %
Avocado	0.31	0.82	0.38	10
Banana	0.39	0.46	0.84	80
Mango	0.64	1.06	0.60	25
Onion	0.32	0.35	0.92	10
Papaya	0.25	0.74	0.34	25
Pineapple	0.53	0.45	1.17	210
Swine**	1.50	1.38	1.09	20
Sheep**	1.75	1.00	1.75	0
Goat**	1.60	0.50	3.18	0
Chicken***	1.05	0.77	1.37	35

• Price/lb. ** Carcasses and half carcasses
*** Frozen whole
# Nominal Protection Coefficient
Source: Ministry of Agriculture and Fisheries (Domestic Prices).
Annual Foreign Trade Statistics, 1997 Report (Data to Calculate Average c.i.f. value).

2. THE ISLAND SPECIFIC PROGRAMME

2.1 Rationale

The rationale for the Island Specific Crop and Livestock Programme has been set out in a paper by Pinder (1996). He suggested that the approach to the Programme has been to select specific commodities for islands in the different regions of The Bahamas, using the following variables as the basis for the choice.

- Rainfall;
- Average temperature;
- Soil conditions;
- Surface deposits of water and ground water resources;
- Agricultural infrastructure;
- Availability of shipping and distance to market.
- Import substitution prospects.

The approach has targeted specific enterprises for commodities that have good import substitution prospects for The Bahamas and for which a 'critical mass' (or level) of production is necessary to facilitate marketing and distribution, especially with respect to the Packing House System. Following the choice of these commodities is the choice of the location of production on specific islands, in line with the agricultural capabilities of these islands. This capability of the islands depends basically on their location, which governs their weather patterns and soil conditions, as previously discussed.

Based on this approach, Pinder (1996) sets out the crop enterprises with production potential for the different Regions. Table 8 gives this information as well as the islands belonging to the specific Regions of the Bahamas. In Table 8, it is seen that the wetter North Bahama Pine Islands are considered more suitable for perennial crop production and also vegetables and root crops.

3. The drier Central Bahama islands are considered suitable for some perennial crops like papaya, mangoes and coconut as well as pineapple. A similar set of commodities are favoured_for the still drier South Bahama islands. For the driest islands to the south east with less than 30 inches of rainfall, the only two commodities recommended are tamarind and aloe vera.

3. NEW METHODOLOGICAL DIRECTIONS FOR THE ISLAND SPECIFIC PROGRAMME

3.1 General Approach

A three pronged approach is being suggested to improve the Island Specific Programme. The contention here is that if the Programme is to make a significant contribution to agricultural

Table 8: Production Potential in Terms of Specific Crops for The Bahamas

Region and Islands	Characteristics	Specific Potential Enterprises
North Bahama Pine Islands:Grand Bahama, Abaco, New Providence, And North Andros	Rainfall 40 – 60 inches Available Ground Water Sub-tropical Soil high Ph Mechanical production possible	Citrus, banana, avocado, Vegetables, mangoes, root Crops forage crops and hay Pigeon peas
Central Bahamas: South Andros, Eleuthera, Cat Island	Rainfall 40 inches, Limited Ground Water Poor shipping Non-mechanical production Low labour availability.	Sesame (bennie) Papaya, Sugar apple Mangoes Coconut, Pineapple
Southern Bahamas: Long Island, Exuma, Crooked Island	Rainfall 30-40 inches Limited Ground Water Poor shipping Non-mechanical production	Mango Pineapple, Tamarind, Melon Sugar apple, Carambola
Southeastern Bahamas: Acklins, Mayaguana, Inagua	Rainfall <30 inches Sub-desert Severely Limited Ground Water Poor shipping Non-mechanical production	Tamarind Aloe Vera

Source: S. Pinder (1996).

development in The Bahamas, it must be based on an analysis that will allow it to target the commodities that will make the greatest contribution to competitive agricultural production.

Hence an important part of this new approach to the programme would be to expand the production of internationally competitive enterprises. Thus the approach that is being proposed would focus on:

(a) Improved collection of data, which would provide the basis for proper analytical procedures.
(b) Determination of the set of commodities which have the highest levels of competitiveness which could be alternatives for the Programme.
(c) Selection of an optimal mix of the alternative enterprises which could be consistent with the environmental and marketing constraints of the Islands of The Bahamas and which

would also maximize the returns to producers and minimize the support necessary for the Programme from the public purse.

This three pronged approach is now detailed.

3.2 Establishment of a National Agricultural Information System (NARIS)

Improvement of the collection of data for the Island Specific Programme should be undertaken within the context of a National Agricultural Information System for The Bahamas. Such an information system would have responsibility of gathering and storing data on the agricultural sector and having that data available in such a form that it can easily be accessed by interested parties to provide information for their special needs.

For the Island Specific Programme the information that would be required would include:

(a) Costs of production and production systems for a wide variety of crop and livestock enterprises for the major agricultural island in the Bahamas.
(b) The weather, including rainfall and temperature distributions, for the major agricultural islands, and
(c) The demands for agricultural commodities on the different islands including the demand of tourists.

The existence of such a NARIS would also encourage the improvement of the quality of data collection by the sponsorship of surveys among farmers and vendors and also the consuming population.

3.3 Determination of the Competitiveness of Agricultural Commodities

As argued earlier, the Island Specific Programme should be targeted to the expansion of commodities which show the highest levels of competitiveness in domestic production in The Bahamas. The procedure to determine the competitiveness of these commodities thus constitutes the second stage of the three pronged approach.

The procedure that is recommended here is that of the construction of Policy Analysis Matrices (PAMs) for the major agricultural commodities in The Bahamas. These PAMs provide an accounting framework from which can be derived a set of efficiency ratios which could give a clear indication of both the level of market distortions (National Protection Coefficient) that exist with respect to the commodity as well as its level of international competitiveness (Domestic Resource Costs).

By building PAMs for all the important domestically produced commodities and calculating NPCs and DRCs, the commodities can be ranked

in terms of their competitiveness. The information from the PAMs will also enable the calculation of the amount of subsidization that would be required by both the State and/or consumers to allow the expansion of commodities that are not internationally competitive.

3.4 Optimization and Simulation to Determine the Target Set of Commodities

The final procedure of the three pronged approach is an optimization /simulation methodology that would allow the selection of the best enterprises for the Bahamas Island Specific Programme. The approach that is being proposed here is to select from the list of commodities identified as alternatives in the second stage the final set of commodities which will be targeted in The Bahamas Island Specific Programme.

The overall optimization approach which is being suggested here could utilize linear goal programming to maximize the returns from these enterprises, while also trying to attain a minimum level of competitiveness of the enterprises while meeting the environmental and marketing constraints of the Bahamian agricultural sector.

The type of linear programming that is proposed here would have the general form of a transportation or regional competition model. The regions of The Bahamas would form the main rows and columns of the model, a module of which is shown in Table 9.

In Module i in Table 9 for example, X_{11} would represent production and utilization of Enterprise i in Region 1, e.g. Northern Pine Islands and c_{11} would represent the cost of production of Enterprise i in Region 1. c_{12} on the other hand is the cost of producing Enterprise i in Region 1and transporting it to Region 2 and X_{12} would represent the amount of the commodity produced in Region1 that is shipped to Region 2.

Constraints would exist in terms of the supply potential of the Enterprise in the different Regions, e.g. for Region1 in Table 9, S_1 would represent the supply of Enterprise i from Region 1. There would also be demand constraints for the products on the Region for having a good identified as a potential. For example, D_2 would represent the demand for Enterprise i in Region 2.

Modules like that in Table 9 would have to be built for all the relevant commodities identified in Stage 2. All the modules will have to be incorporated into one programming model. Goals built into the model may include trying to achieve the highest level of competitiveness (e.g. NPC) or comparative advantage (e.g. DRC) in the optimal choice of commodities and Regions to produce these commodities. This can be achieved by calculating, for each commodity, a competitiveness level and combining these levels into a goal equation that is optimized using goal

programming techniques. The overall objective of the model could be to minimize the total cost of operating the system, so that it operates at the highest level of efficiency, while trying to achieve a goal of attaining the highest levels of competitiveness or comparative advantage.

Once the optimal set of commodities, the regions of production and the destination of supplies have been chosen by the solution of the optimization model, simulation analysis can be done to determine the effect of stochastic factors like weather and windstorm damage on the model. Monte Carlo simulation techniques can be utilized here, making use of frequency distributions for rainfall, temperature etc., that can be derived from the National Agricultural Information System described earlier. The final results of the approach would be therefore a set of commodities, which will be most optimal for the Bahamian agricultural sector, in terms of efficiency of operating the system (lowest cost) and maximizing the level of competitiveness or comparative advantage. The results will also indicate how well the system will function within the real world environment of random occurrences caused by such factors as rainfall and windstorms. The results of the approach would therefore provide a firm basis for implementation of the Island Specific Programme.

4. CONCLUSION

The Island Specific Programme is one of the most exciting developments in the agricultural sector of the Bahamas. It has the potential of bringing about great structural change in the sector.

It is clear that the Bahamian economy has suffered a Dutch disease type syndrome whereby the substantial growth of tourism has served to retard and perhaps even reverse the growth of the agricultural sector. The real problem with this type of disease syndrome is that if the leading sector (in this case, tourism) declines because of factors exogenous to the economy, there will be a recession of the economy because the other sectors will be too retarded to pick up the slack in growth.

It is thus in the best interest of the Bahamian economy that the agricultural sector be revived and made to play a greater role, even in the presence of the booming tourism and financial sectors. The Island Specific Programme offers the promise of revival of the agricultural sector in a manner that will promote its sustainable competitive growth. Some methodological directions as proposed in this page will strengthen its prospects in this regard.

Table 9: Module i of Proposed Goal Programming Model

	Region 1	Region 2	Region 3	. . .	Region m	
Region 1	X_{11} (c_{11})	X_{12} (c_{12})	X_{13} (c_{13})	. . .	X_{1m}(c_{1m})	S_1
Region 2	X_{21} (c_{21})	X_{22} (c_{22})	X_{23} (c_{23})	. . .	X_{2m}(c_{2m})	S_2
.	.	.	.	. . .	. . .	.
.	.	.	.	. . .	. . .	.
Region m	X_{m1}(c_{m1})	X_{m2}(c_{m2})	X_{m3}(c_{m3})	. . .	X_{mm}(c_{mm})	S_m
	D_1	D_2	D_3	. . .	D_m	

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