SPECIAL ISSUE IN COMMEMORATION OF AGRICULTURAL LEGACY THROUGH TEACHING, RESEARCH AND INNOVATION
Extracted from Volume 79, Number 4, 2002

Small farmers' production constraints and implications for agricultural diversification in the Caribbean

St Clair Barker

Department of Agricultural Economics and Extension, Faculty of Agriculture and Natural Sciences
The University of the West Indies, St Augustine, Republic of Trinidad and Tobago

A long-term study was conducted between 1981 and 2001 in St Vincent, West Indies, and other short-term studies were conducted in the 1990s in the islands of Antigua, Barbados, and Trinidad, West Indies, to determine the major constraints to agricultural production and the influence of these constraints on the sustainability of agricultural diversification programmes in these islands. The results indicated that many of the constraints were common and included marketing, labour, pests and diseases, and praedial larceny. Agricultural information gathering was not a major problem and the main sources of information were the agricultural officers, the media, and other farmers. Agricultural diversification was not successful because it varied with the financial viability of the crops and how well the programmes were advertised and disseminated among the farmers.

Keywords: Diffusion; Innovation: Adoption: Diversification; Participation; Motivation

The agricultural sector of the English-speaking Caribbean has its origins in the plantation and estate agricultural systems (Smith, 1974). The reduction of financial returns from the production and marketing of traditional agricultural products such as arrowroot starch, cane sugar, cacao beans, and most recently, bananas, led individual countries in the Caribbean to pursue a policy of agricultural diversification in an effort to reduce economic risks, and if possible, increase export earnings as well as save foreign exchange (Persaud, 1969; Demas, 1987).

Henderson (1990) postulated that agricultural diversification may not be as successful as planned, because farmers are not motivated to adopt those innovations which the progammes offer. Nevertheless, it could be argued that diffusion or communication of information on a specific new technology is a prerequisite to its adoption. The Caribbean Agricultural Extension Project (CAEP) identified a number of problems which included information facilities and technical information. The CAEP also developed programmes and strategies that would reduce the negative impact on the diversification process.

Agricultural diversification in the Caribbean has been very difficult to successfully develop because the small-island states have had to compete with larger states (Gumbs, 1998). Inefficient production systems, low level of technologies, poor or deficient transportation, market restrictions including non-tariff barriers even when trade agreements exist, and the economy-of-scale disadvantages of small states plague the diversification efforts (Gumbs, 1998). More specifically, the Ministry of Agriculture (MOA) in St Vincent in keeping with the Government's policies as outlined in the St Vincent National Agricultural Policy (1975), the Policy Paper (1986), and the Five-year Programme (1993), embarked on an ongoing campaign to promote the diversification of the agricultural sector. Governmental support to the diversification thrust included the expansion of the feeder-road programme, the establishment of marketing depots within the farming communities, the expansion of the facilities, and the scope of the St Vincent Marketing Corporation (SVMC). The investment on the part of the Government and the importation of recommended agricultural inputs amounted to millions of dollars which was a significant part of the national agricultural budget.

Marketing was facilitated through the SVMC and credit was offered on a 'crop-lien' basis (specifically to small farmers) through the Agricultural Development

0041-3216/2021/030294-301

Bank (later the Development Corporation). More recently, a number of plots of farmland were made available to small farmers through the Agricultural Rehabilitation and Development Project and the Land Reform Programme (John, 1996).

In spite of the Government's support, the island's agriculture has not diversified more than it was 20 years ago when banana, arrowroot, sweetpotato, eddo, yam, nutmeg, coconut, and small ruminants contributed significantly to the total agricultural contribution to Gross Domestic Product (GDP) (Statistical Trade Reports, 1980-2000). Export agriculture and earnings are still declining and there is still an economic dependence on banana. At its peak, as many as 6500 small farmers participated in the production campaign and sold produce to the SVMC. and most domestic and export quotas were met. For a while, the combined export of food crops to regional ports (mainly Barbados and Trinidad) contributed as much as banana did to the agricultural economy. Since then, export has been falling progressively. This decline has taken place although a number of the supporting factors of production were made available to the small farmers, and in an environment where unemployment ranges from 20-40% and the demand for food in the region is increasing as reflected in the regional food-import bill (OECS Economic Reports, 1980-1998).

The decline of carrot production and other food crops (sweetpotato, eddo, yam, and plan-tain) affected life at the village or district level, as farmers experienced a loss of income, a decline in economic activity, and at the national level, a loss of foreign exchange earnings.

Given the local conditions including available technology, suitable climatic conditions, inputs availability, guaranteed markets, and some policy support (includng extension services), export efforts failed. Other attempts to commercialize other new crops have not been very successful and in some cases, they are failing as well. The factors (social, economic, political, and physical) constraining successful production of carrots and other vegetables and food crops by the majority of small farmers have not been documented.

The failure to bring about significant change in the agricultural sector in response to trade liberalization and the removal of preferential markets is common to a number of Caribbean countries [including the Organization of Eastern Caribbean States (OECS), Trinidad and Tobago, and Barbados].

In 1981, a study was conducted among vegetable and root crop farmers in St Vincent to determine their level of knowledge of vegetable and root crop farming, their adoption of technology existing for these crops, their sources of information, and the degree to which they had adopted diversification efforts. Diversification here means a change of the crop base within the farming systems or a change in the number of crop species. In 1994-1995, a follow-up study was conducted with the aim of determining whether the diversification process had continued and whether it had become profitable for the farmers to diversify their cropping base. In 2001, a further follow-up study was conducted to determine if there was any change. In 1997-2000, a similar type study was conducted in Antigua with the aim of determining whether there were any similarities in the findings between Antigua and St Vincent. The study was extended to include Barbados in 1998 and Trinidad in 2001. The methodology for each island is included.

Agricultural Diversification Features of the Islands and the Study Methods Used

St Vincent

St Vincent has inherited structural rigidities that constrain rapid transformation from one enterprise to another (Robertson, 2002). Thus, the agricultural diversification effort in this island will of necessity be a very slow process. The diversification process was mainly instituted through the need to diversify out of banana production which was the mainstay of the St Vincent economy. However, although there was still a marked focus on banana production, many farmers were being increasingly encouraged to diversify their banana production and include vegetables and root crops as part of their production strategies.

In 1981, a field survey was conducted among a sample of 150 vegetable small farmers. Based on the findings of the 1981 survey, and the recommendations made, a medium- to long-term programme was developed with inputs from both farmers and extension officers with the aim of alleviating the problems. Farmer training schemes included method and result demonstrations which were conducted on both Government agricultural stations and on farmers' holdings.

In 1994-1995, a follow-up study was conducted with the aim of assessing the impact of the programme of interventions. The methods used to gather the

information consisted of a Rapid Rural Appraisal (RRA). consultations with farmers, mass meetings. and a survey which was conducted via the use of questionnaires. Thirty-two independent variables were assessed. Approximately 400 farmers participated and contributed to the RRA and mass meetings, while 106 farmers were interviewed and their farms visited.

In 2001, a further follow-up study was conducted, whereby 170 small farmers were assessed to determine if any further changes were made in the farmers' diversification efforts.

Antigua

The contribution of agriculture to the GDP in Antigua has been decreasing over the last 25 years (Kentish, 2002). Although it had initially made the highest contribution to GDP, in 1980 its contribution was reduced to 12% and by 1996 it had further declined to 4.5% (Kentish, 2002). Employment in agriculture is about 4% of the nation's labour force, and agriculture is generally characterized by small-scale part-time farmers (Kentish, 2002). The main agricultural crops formerly produced in Antigua were sugar cane and sea island cotton. However, as a result of the reduced quotas for sugar on the world market, there was an urgent need to diversify out of sugar cane production. Antigua has also rapidly increased its tourism industry, with the concomitant increased demand for other agricultural products. In 1997, an extension campaign was launched among small-scale crop farmers, while in 2000, an extension survey was conducted among 86 farmers in Antigua. The process encouraged voluntary participation. A strategy was developed to guide the participating farmers to identify their farm-based problems and to prioritize those for immediate inclusion into the extension programme. A major focus of the effort was to remove the negative effect of as many problems as possible, which constrained the farmers' production efforts. Thus, personnel from the disciplines of agronomy, engineering, irrigation technology, pest management, marketing credit, and gender affairs were involved in the effort.

Meetings were held with farmers on a monthly basis for 48 months (1996-1999) at which technical and farm-related issues were discussed. An annual farmer-training programme was carried out over a 12-week period for three consecutive years (1997-1999) and farmers throughout the island were invited to attend sessions of their choice. Farm demonstrations were mounted on farmers' holdings and on District Agricultural Stations to reveal the latest techniques available in onion, tomato, cabbage, and pepper production. Farmers were taught management practices of pests and diseases such as the diamond back moth in cabbage and the Gemini virus complex in tomato. An evaluation of the broad-based extension programme was conducted among a sample (86) of small farmers in order to assess the degree to which the programme influenced their decision-making about crop production.

Barbados

The Barbados economy in additional to its agricultural contribution to GDP, also relied on the tourism sector. The agricultural contribution has mainly been the production of sugar cane. A Rapid Rural Appraisal was conducted in 1998 among a stratified sample of 214 farmers. The objective of this appraisal was to determine the existing constraints to small-scale farming, and if possible, the similarities and disparities that may exist among small-scale farming in Barbados versus those of St Vincent.

Trinidad

Although Trinidad and Tobago did not follow specific diversification programmes in the 1980s and the 1990s, the whole concept of agricultural development was articulated in almost all of the policy goals of the Ministry of Agriculture (Harry, 2002). There was one exception, the state-owned company, Caroni (1975) Ltd. There was a deliberate agricultural diversification programme in effect from the 1980s onwards. The current Sector Policy on Food Production (2002-2005) outlines several policy goals related to the diversification process (Harry, 2002). In Trinidad and Tobago, the overall aim of diversification is to increase foreign exchange earnings, improve local food security, maintain stability and sustainability in the supply of agricultural commodities, and increase the income of farmers (Harry, 2002).

In 2001, a study was conducted with the objectives of identifying the constraints to crop rehabilitation and expansion and to identify similarities and disparities to the problems compared to those of St Vincent, Antigua, and Barbados. For this appraisal, a total of 240 tree crop farmers were utilized.

Statistical analysis

Simple random samples as well as stratified random sampling (Seltiz, 1959; Blalock, 1960; Moser, 1969; Freund, 1973) were used at different periods in the conduct of the study. Where appropriate, chi-square analyses were used to test the relationship between the dependent and independent variables, while descriptive data were expressed as percentages of the number of cases studied.

Results

St Vincent

In the Caribbean region, the system of crop farming practised, in most cases, is mixed cropping. In St Vincent, in particular, farmers classify themselves within a particular farming system based on the profitability of that crop and not on the actual land size devoted to the crop. Thus, although structural rigidities exist which make it difficult to move from one farming enterprise to another, because the small farmers plant a mixture• of the crops outlined in Table 1 at the same time, they reclassify their farming system at different times based on the profitability of an existing crop. As shown in Table 1, in 1981, 71% of the crop farmers classified themselves as vegetable farmers, followed by root crop farmers (21%). This trend was similar for the next 15 years as shown by the data obtained in 1994-1995. However, six years later (2001), the trend showed that vegetable production was highly non-profitable (0.6%) and bananas were perceived to be the most profitable (46%) followed by root crops (42%). Based on the results of the survey, the physical land area devoted to each cropping enterprise had not changed, but because the demand for vegetables had reduced significantly with the reduction in the export markets, banana and root crops now provided the major portion of the income (data not shown).

In 1981, farmers identified labour (38%), pests and diseases (21%), the weather (19%), and marketing (13%) as their most serious constraints to production. In 1994-1995, pests and diseases (21%), marketing (16%), and praedial larceny (14%) were the most serious constraints. By 2001, the pattern of constraints had changed again, with marketing (28%), pests and diseases (25%), and access to inputs (15%) being the most serious constraints (Table 2). Throughout the three periods of the study, although farmers listed several other constraints, these were not significant to have an impact.

In 1981, farmers indicated that their main sources of information were radio (51%), extension officers (21%), and the agricultural stations (21%). By 1994-1995, most of the farmers identified extension officers (78%), followed by input suppliers and (or) marketing agents (26%), and other farmers (23%). In 2001, extension officers (58%), banana field workers (17%), and other farmers (9%) were the farmers' main soures of information.

Table 1 Number of farmers surveyed in St Vincent between 1981 and 2001 and classified according to their farming system

Type of agricultural system	No. of farmers surveyed			Per cent		
	1981	1994-1995	2001	1981	1994-1995	2001
Vegetable	107	42	1	71.3	39.62	0.6
Roots and tubers	32	20	72	21.3	18.87	42.3
Peanuts	2	—	—	1.3	—	—
Tree crops	1	2	1	0.7	1.89	0.6
Tobacco	1	—	—	0.7	—	—
Pigeonpea-legumes	1	5	—	0.7	4.72	—
Banana	6	15	78	4.0	14.15	45.9
Plantain	—	—	18	—	—	10.6
Livestock	—	15	—	—	14.15	—
Fruits	—	7	—	—	6.60	—
Total no. of farmers	150	106	170			

Table 2 Constraints to production by farmers surveyed in St Vincent between 1981 and 2001

Constraints to production	No. of farmers surveyed			Per cent		
	1981	1994–1995	2001	1981	1994–1995	2001
Labour	55	4	11	36.7	3.8	6.5
Pests and diseases	31	36	42	20.6	34.0	24.7
Weather	28	3	5	18.6	2.8	2.9
Marketing	20	17	47	13.3	1.6	27.6
Poor access roads	8	2	—	5.3	1.9	—
Unavailability of land	2	2	—	1.3	1.9	—
High cost of inputs	1	1	—	0.7	0.9	—
Low price of produce	1	—	—	0.7	—	—
Unavailability of transport	1	—	—	0.7	—	—
Access to credit	1	1	16	0.7	0.9	9.4
Praedial larceny	1	15	17	0.7	14.2	10.0
Lack of technological information	1	1	4	0.7	0.9	2.4
Damage to crops by animals	—	7	—	—	6.6	—
Access to inputs	—	—	26	—	—	15.3

Table 3 Sources of infomration obtained by farmers in St Vincent between 1981 and 2001

Source of information	No. of farmers surveyed			Per cent		
	1981	1994–1995	2001	1981	1994–1995	2001
Radio–Other mass media	77	8	—	51.3	16.9	—
Extension offices	32	83	99	21.3	78.3	58.2
Agricultural station	31	—	—	20.7	—	—
Other farmers	6	24	15	4.0	22.64	8.8
Relatives	4	10	—	2.7	9.43	—
Banana field workers	—	—	29	—	—	17.0
Traffickers	—	—	12	—	—	7.1
Input suppliers–Marketing agents	—	28	3	—	26.4	1.8
Friends	—	—	12	—	—	7.1
Banana Growers' Association	—	16	—	—	16.1	—
Chinese Agricultural Technical Mission	—	6	—	—	5.7	—

Antigua

The results of the study indicated that the average yield per hectare for tomatoes increased from 8000 kg annum-1 in 1997 to 15 000 kg annum^{-1} by 2000. Cabbage yield increased from 12 000 kg ha^{-1} in 1997 to 18 000 kg ha^{-1} by 2000, showing an increased production of 50%. Onion production showed an increase of 4800 kg ha^{-1} over the corresponding period from 12 000 to 16 800 kg ha^{-1} (data not shown).

With regard to adoption scores, the highest possible score that could be obtained was 230. The results showed 47.7% of the respondents obtained between 60 and 120, while only 18.6% attained scores above 120 (Table 4). The lowest score obtained was 16 and the highest was 207. The mean score obtained was 87.20 ± 44.55.

Based on the results of the survey, 37.2% of the farmers indicated that marketing was the main constraint to production and diversification efforts followed by praedial larceny (19.8%), pests (18.6%), rogue livestock (17.4%), and unavailable water for irrigation (12.8%; Table 5).

Table 4 Distribution of Antiguan farmers by knowledge

Knowledge/Adoption score	Number	Per cent
<60	29	33.7
60–120	41	47.7
>120	16	18.6
Total	86	100.0

Barbados

Among the farmers sampled in Barbados, 45.8% indicated that technical problems were their most serious constraint to production and diversification, followed by labour (33.6%) and agricultural policy (21.6%). Praedial larceny (19.2%), management (16.8%), markets (16.4%), and monkey damage (15.0%) were indicated as constraints as well (Table 6).

Farmers on this island were also requested to indicate how they obtained information on agricultural issues. Of the total number of farmers sampled, 50% obtained their information via the internet and other print media, while 38% sought their information from the Ministry of Agriculture. Approximately 16% sought information from fellow farmers, 15% did so from agricultural input suppliers, while 5% obtained their information from the Barbados Agricultural and Marketing Corporation (Table 7).

Trinidad

As shown in Table 8, the farmers in Trinidad identified availability and cost of labour to be the most severe constraint to production (50.8%) followed by bird and mammalian damage (45.0%), praedial larceny (39.2%), and plant disease (37.5%). Other factors that constrained agricultural production and diversification included weather conditions (21.7%), policy-related issues (21.7%), cost of inputs (12.5%), poor access roads (10.0%), marketing (9.2%), pest damage (7.5%), and lack of financial resources (6.7%).

Adoption behaviour was significantly correlated with encouragement of new entrants and of offspring into farming, willingness of existing farmers to improve their current methods of farming, investment and use in hiring labour, use of farm records, and farming status either full- or part-time (data not shown).

With regard to the issue of sourcing information, 42% of the farmers surveyed indicated their sources were Extension personnel belonging to the Ministry of Agriculture. Approximately 18% obtained their information from the media (print, radio, and television), while others indicated that they obtained their information from other farmers (2%), their spouse or other family members (1%), and agro-chemical salesmen (1%; Table 9).

Discussion

It has become clear for many years now, that the Caribbean Region has to diversify its agricultural production if the contribution of the sector to GDP is to be increased or even maintained (Gumbs, 1998). The major traditional commodities of sugar. banana, and rice have been severely constrained internationally as a result of the current liberalized market economy (Gumbs, 1998). Although the small island states have attempted to diversify their monocropping long-term enterprises to include more short-term intercropping enterprises, few successes have been reported. This was perceived to be mainly because of the lack of proper linkages and infrastructure with the more serious constraints being perishability and marketing.

Table 5 Problems outlined by Antiguan farmers as constraints to agricultural production and diversification

Nature of problem	Number	Per cent
Marketing	32	37.2
Praedial larceny	17	19.8
Pests	16	18.6
Roaming livestock	15	17.4
Unavailable water for irrigation	11	12.8
Drought	10	11.3

Table 6 Problems outlined by Barbadian farmers as constraints to agricultural production and diversification

Nature of problem	Number	Per cent
Technical	98	45.79
Labour	72	33.64
Policy	45	21.03
Paedial larceny	41	19.16
Management	36	16.82
Market	35	16.36
Monkey damage	32	14.95
Other	25	11.68

Table 7 Distribution of Barbadian farmers as constraints to agricultural production and diversification

Information sources	Number	Per cent
Internet, journals, print	106	49.5
Ministry of Agriculture and Rural Development	82	38.3
Other farmers	34	15.9
Agricultural input suppliers	33	15.4
Barbados Agricultural and Marketing Corporation	10	4.7

Table 8 Problems outlined by Trinidadian farmers as constraints to agricultural production and diversification

Nature of problem	Number[1]	Per cent
Availability and cost of labour	122	50.83
Parrot, monkey, woodpecker and squirrel damage	108	45.00
Praedial larceny	94	39.16
Plant diseases	90	37.50
Weather	52	21.66
Policy related issues	52	21.66
Cost of inputs	30	12.50
Poor access roads	24	10.00
Marketing	22	9.16
Pest damage	18	7.50
Lack of finance	16	6.66

[1] n = 240

Table 9 Distribution of Trinidadian farmers by information sources

Information sources	Number	Per cent
Ministry of Agriculture	101	42.0
Media	43	18.0
Another farmer	5	2.0
Spouse and (or) family	3	1.0
Agro-chemical salesman	3	1.0

All four of the islands studied indicated many constraints to agricultural production and to diversification. Some of the constraints are common but there are important differences.

Trinidad and Barbados reported that agricultural policy issues (22%) were constraints to production. But because of the nature of the economies of St Vincent and Antigua, the national agricultural policies of these two islands have always been advantageous to the small farmers and it was therefore not surprising that agricultural policies were not perceived to be negative. In St Vincent, in particular, the farmers are profit-oriented rather than subsistence-oriented (Henderson and Gomes, 1979; IFAD, 1993), and the agricultural policies were beneficial to the farmers.

Inspite of the favourable agricultural policies in St Vincent and Antigua diversification was not successful. In St Vincent over a period of 20 years the crop species diversification depended more on the profitability of the crop than on the constraints indicated in the survey. Farmers shifted their production (Table 1) to increase their profit.

It would appear that generally farmers in all four countries had access to information to reduce many of the important constraints to production but other factors limited diversification. Nevertheless, farmers in St Vincent and Antigua felt that the diversification programme embarked upon was not well publicized and that communication, in terms of providing them with operational details, were unsatisfactory. This suggests a need for improved communication, not only on the specific details of the programme but also with respect to markets, inputs, and other support services.

Trinidad was a different case because the focus of the diversification effort was not on small farmers but on public sector company with more capital outlay. Nevertheless, diversification failed in both models.

In conclusion, the constraints to production that the farmers perceived to be responsible for the failure of the diversification efforts, need to be addressed.

References

Blalock, Herbert, M. (1960) Social Statistics, New York, U.S.A., McGraw Hill Book Co. Ltd, pp. 395-397

Demas, William, G. (1987) Agricultural Diversification in the Caribbean Community: Some Issues, Seventh Annual Meeting of the Board of Governors, Grand Anse, Grenada, pp. 5-18

Freund, John, E. (1973) Modern Elementary Statis-tics, New Jersey, U.S.A., Prentice Hall Inc., pp. 449-450

Gumbs, F.A. (1998) Models for Caribbean Agricultural Diversification, Workshop Proceedings, 17-18 August 1998, St Augustine, Trinidad, CEPAT,The University of the West Indies, 148 pp.

Harry, E. (2002) The status and performance ofagricultural diversification in Trinidad and Tobago, in: Status and Performance of Diversification Initiatives of Caribbean States, Workshop Proceedings, 17-18 January, 2002, St Augustine, Trinidad, The University of the West Indies, pp. 40-45

Henderson, T.H. (1990) Farmer involvement and motivation for diversification programme implementation, in: Agricultural Diversification Policies and Strategies, Proceedings of the 19th West Indies Agricultural Economics Conference, p. 107110

Henderson, T.H. and Gomes, P.I. (1979) A Profile of Small Farming in St Vincent, Dominica, and St Lucia, St Augustine, Trinidad, Department of Agricultural Extension, The University of the West Indies, St Augustine Campus, pp. 37-40

IFAD (1993) A Baseline Survey of Small Farmers in St Vincent, Kingstown, St Vincent, W.I., Ministry of Agriculture

John, Karl (1996) Report of the Agricultural Rehabilitation and Diversification Project, Kingston, St Vincent, W.I., Ministry of Agriculture

Kentish, Florita, E. (2002) The status and performance of agricultural diversification in Antigua and Barbuda, in: Status and Performance of Diversification Initiatives of Caribbean States, Workshop Proceedings, 17-18 January, 2002, St Augustine, Trinidad, The University of the West Indies, pp. 1-5

Moser, C.A. (1969) Survey Methods in Social Investigation, London, U.K., Heineman, pp. 74-75

OECS (1980-1998) Annual Economic Reports, Castries, St Lucia, W.I., Organization of Eastern Caribbean States

Persaud, B.C. (1969) Agricultural diversification in the Commonwealth Caribbean: Some basic issues, in: Report of the Third West Indian Economic Conference, St Augustine, Trinidad, The University of the West Indies, St Augustine Campus

Robertson, R.H. (2002) Agricultural Diversification: The experience of St Vincent and the Grenadines and new challenges, in: Status and Performance of Diversification Initiatives of Caribbean States, Workshop Proceedings, 17-18 January, 2002, St Augustine, Trinidad, The University of the West Indies, pp. 35-39

Seltiz, Claire (1959) Research Methods in Social Relations, New York, Chicago, and San Francisco, U.S.A., Holt Reinhart and Winston, pp. 98-108

Smith, M.G. (1974) The Plural Society in the British West Indies, Berkley, Los Angeles, U.S.A., University of California Press, pp. 1-17

Statistical Trade Reports (1980-2000) Statistical Trade Reports, Kingstown, St Vincent, West Indies, Ministry of Finance and Economic Planning