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**PROCEEDINGS  
OF THE  
CARIBBEAN FOOD CROPS SOCIETY**



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THE PROSPECTS FOR VEGETABLE PROCESSING IN TRINIDAD

With Particular Reference to Pigeon Peas and Sweet Corn

J. Cropper

Department of Agricultural Economics & Farm Management,  
University of the West Indies, Trinidad

Processing facilities have been available in Trinidad for a number of years, but most of the throughput of the existing plants still consists of imported materials which are merely packaged locally. The paper examines the situation more closely with respect to vegetables and considers the history, and the prospects for completely local production of two products - pigeon peas and sweet corn. This involves consideration of aspects of the production of these crops as well as arrangements for their processing.

THE PRESENT SITUATION

There are four plants in the Island involved in vegetable processing. Of these, one deals only with dry peas and beans, while the others handle a wide range of products. Information on the throughput of these plants is incomplete, since data for some are inadequate while one plant was unwilling to disclose its production figures (Table 1).

The main imported products which are canned are garden peas, carrots, sweet corn, mixed vegetables, dry peas and beans and combinations of these. The raw materials are imported mainly in frozen form, although some are dried. Tomato paste is also processed locally into tomato juice and ketchup.

Table 1 Estimated Throughput of Imported Vegetables in Processing Plants: Trinidad, 1972

Product	Quantity	Value (c.i.f.) <sup>f</sup>	
	(million pounds)	(£ per pound)	( \$'000)
Sweet corn	1.35 <sup>a</sup>	35.1 - 43.5	540
Garden peas	1.5 <sup>b</sup>	31.5	472
Carrots	0.9 <sup>b</sup>	24.1	217
Mixed vegetables	0.4 <sup>c</sup>	48.2	193
Green peas	0.1 <sup>b</sup>	44.4	44
Dry beans	3.4 <sup>d</sup>	27.4	932
Tomato paste	n.a. <sup>e</sup>	25.0 - 30.0	n.a.

a Information from all 3 plants processing this product

b Information from 2 of the 3 plants processing this product

c Information from 1 of the 2 plants processing this product

d Information from 3 of the 4 plants processing this product

e Information on quantities of raw material is not available, however, 1 of 3 plants processing this product produced approximately 2.7m. lbs. in 1971

f All currency is Trinidad Tobago dollars: T & T \$1.00 = approx. U.S. \$0.54

The only local vegetable to be processed in any significant quantity is pigeon peas.

Estimates of processing plants' throughput of imported vegetables in 1972, based on discussions with plant operators, provide some indication of the present market potential for locally produced vegetables (Table 1). The only addition to this list is pigeon peas, the local and overseas market for which is estimated to be 2.5m pounds annually. It is not anticipated, however, that this quantity of pigeon peas will be processed in 1972 due to shortage of produce.

Imports of processed vegetables may total \$2.5m to \$3.0m annually, but this cannot be confirmed. The published Trade figures show that from 1969 to 1971 imports of processed vegetables were \$0.7m to \$1.0m. However, discussions with plant operators indicate that imports for their factories alone will total more than \$1.5m in 1972, without including two significant items - dry peas and beans and tomato paste.<sup>1</sup>

Exports of processed vegetables (as specified in the Trade figures) have grown steadily in the past three years and in 1971 approached \$0.75m. Exports were mainly to Caribbean

<sup>1</sup>No indications were given in these discussions that throughput in 1972 would be significantly higher than in 1971.

Free Trade Area (CARIFTA) territories, with the exception of pigeon peas, but were for the most part imported vegetables which have been canned locally.

Of the products processed locally, some pigeon peas are already grown in the Island as a fresh vegetable and for processing; small quantities of sweet corn and carrots are grown as fresh vegetables; while tomatoes are grown for salad purposes. The remainder of the paper examines separately the prospects for meeting the market potential of pigeon peas and sweet corn.

#### PROSPECTS FOR PIGEON PEA PRODUCTION<sup>2</sup>

Fresh pigeon peas are popular locally, but supplies are seasonal: from December to March. Prices vary for the unshelled product from 15 to 35 cents per pound depending on availability, with an average of approximately 20 to 25 cents (1 pound unshelled is equal to approximately 0.5 pound of shelled peas). Ministry of Agriculture estimates of production are given in Table 2, together with the quantity of peas processed since 1965.

Varying quantities of the crop have been canned in Trinidad for the past 10 years. The maximum intake by processing plants was in 1966/67 when 3.0m pounds of unshelled peas were purchased; subsequently, however, this quantity declined until 1970/71 when only 0.3m pounds were purchased. The large supply in 1966/67 was evidently a response to an intensive effort by Government to stimulate production of the crop: this included payment of a subsidy of \$25 per acre of peas planted. In that year the processing plants were unable to accept all of the crop offered, nor could the fresh market absorb all supplies: thus much of the crop wasted.

The immediate decline in production after 1966/67 is felt to have been a reaction to the removal of the Government subsidy and to the oversupply of the crop. The long term decline has been the result of the lack of any overall policy for production both by Government and the processing plants. However, in 1971/72, in response to a continuing unsatisfied demand for the crop both locally and overseas, efforts were made by processors to increase supplies. The principal effort was the establishment by one of the plants of an agricultural department (of 1 man) to work with farmers in stimulating and coordinating supplies. The first effect of this move has been an increase in purchases by the plants from 0.3m to 0.7m pounds.

Meanwhile work has been in progress at the University of the West Indies to develop a variety of pigeon peas suitable for large scale mechanized production: a dwarf type of determinate growth which would be less susceptible to day length than the traditional type. Significant advances have been made in this work and limited quantities of varieties exhibiting these characteristics were released to farmers for commercial production during 1971/72.

Experience in attempting to promote production in 1971/72 revealed problems in communicating with, and coordinating the efforts of, large numbers of small farmers

Table 2 Production of Pigeon Peas and Quantity Processed: Trinidad, 1965 - 1972

Year	Quantity Processed	Estimated Production <sup>a</sup>
	(million pounds)	
1965	3.0	5.9
1966	1.5	8.7
1967	3.0	5.4
1968	2.5	4.8
1969	1.0	5.4
1970	1.0	5.0
1971	0.3	5.2
1972	0.7	

Source: processing plants.

Ministry of Agriculture: estimates are derived from reports of crop acreages and yields made by extension officers.

<sup>a</sup>Refers to crop production year, i.e. 1965/66, 1966/67, etc.

throughout the country. Concentrating on groups of farmers in selected areas did alleviate the problem somewhat. Recognizing the problems involved in this exercise, the largest processing plant<sup>3</sup> has decided to ensure a proportion of its supply by growing for itself a significant area of the crop in 1972/73.

<sup>2</sup>Mr. K. Manchouk, International Foods Limited, provided much of the information on the recent history of pigeon pea production and processing.

<sup>3</sup>Supplies are normally divided between the three plants processing this crop in the ratio 75:15:10.

The only evidence on aspects of the economics of production of the crop derives from the Texaco Food Crops Demonstration Farm (TFCDF)<sup>4</sup> where more than 40 acres have been grown since 1965. On this farm, experience has been variable, as Table 3 shows. Marketable yields have varied from 1000 to 6000 pounds per acre, variable costs have ranged from \$220 to \$390 per acre or 6 to 27 cents per pound (Table 4).

Selling the peas wholesale in the fresh market, a positive margin over variable costs was achieved in three of the five years in which the crop was grown (1965/66, 1966/67 and 1969/70). If, however, the peas had been sold to the processing plant, which offered a price of 11 cents per pound, a positive margin would have been achieved only in 1965/66 and 1966/67. If these crops had been produced on a small farm, typical of those on which pigeon peas are normally grown, and all labour had been provided by the family, returns to family labour would have varied from less than \$1 to more than \$8 per day (Table 5).

Table 3 Variable Costs Per Acre of Pigeon Peas: T.F.C.D.F., Trinidad, 1965/66 - 1969/70

Year	Labour <sup>a</sup>	Tractor & Materials	Total
(\$ per acre)			
1965/66	335	44	379
1966/67	231	77	308
1967/68	203	70	273
1968/69	154	66	220
1969/70	178	69	247
<b>Average</b>	<b>220</b>	<b>65</b>	<b>285</b>

Source: Records at T.F.C.D.F.

<sup>a</sup>Labour has been charged at the commercial rate of \$4.50 per day rather than the higher rate paid on the farm.

<sup>b</sup>The cost of labour for harvesting was calculated at 4.3 cents per pound as in 1966/67 since the crop was actually picked by the purchaser.

Table 4 Variable Cost Per Pound of Pigeon Peas: T.F.C.D.F., Trinidad, 1965/66 - 1969/70

Year	Marketable Yield	Variable Cost	
	(pounds per acre)	(\$ per acre)	(¢ per pound)
1965/66	5,980	379	6.3
1966/67	2,951	308	10.4
1967/68	998	273	27.5
1968/69	1,185	220	18.6
1969/70	2,021	247	12.2
<b>Average</b>	<b>2,626</b>	<b>285</b>	<b>10.9</b>

Source: Records at T.F.C.D.F.

Table 5 Returns to Labour in Production of Pigeon Peas: T.F.C.D.F., Trinidad, 1965/66 - 1969/70

Year	Use of Labor	Revenue <sup>a</sup> Minus Tractor and Material Cost	
	(days per acre)	(\$ per acre)	(\$ per day)
1965/66	84	614	8.30
1966/67	51	248	4.86
1967/68	45	39	0.87
1968/69	34	64	1.88
1969/70	40	153	3.82
<b>Average</b>	<b>51</b>	<b>224</b>	<b>4.40</b>

Source: Records at T.F.C.D.F.

<sup>a</sup>Revenue equals marketable yield per acre multiplied by 11 cents per pound (the price paid by the processing plants).

<sup>4</sup>A joint project between The University of the West Indies, the Trinidad Ministry of Agriculture and Texaco (Trinidad) Inc.

It is evident from these results that pigeon pea is a crop with potential for good returns both to the farm family which provides all its own labour, as well as to farms which employ labour. However, farmers cannot be assured of an adequate return to their land and labour if variation in yield continues to be a problem.<sup>5</sup> The causes of this situation must, therefore, be identified and overcome if the expansion of production is not to be hindered. But variation in yield is not the only factor which can limit the further production of this crop.

Farms producing pigeon peas are generally small. Thus, in order to increase farm income, farmers sell as great a proportion as possible of their produce retail or direct to retailers. The price paid by the processing plant is generally lower than from such sales. The tendency, therefore, is to produce only a limited quantity of the crop for retail sale. As a result the processing plants are buyers of the residual.

In an attempt to ensure a certain level of supplies, the processing plants have tried to sign agreements with farmers to purchase their crops. Not surprisingly, given the situation described above, farmers have been reluctant to sign agreements. Even when an agreement has been signed it has been virtually impossible to hold a farmer to it, given the lucrative alternative market and the large number of small, widely scattered producers. Nor is it in the long term interests of the plants to try to enforce all aspects of the agreements since as a result, farmers could become even more reluctant to sign in the future.

The solution to this problem may lie in emphasizing the economic advantages of producing pigeon peas to farmers whose size is such that small retail sales are insignificant or not worth the trouble. To such farmers an assured market at an agreed price is likely to be the most important consideration. The plants would, however, have to honour these fundamental aspects of any agreement in order to retain the confidence of the farmers.

Close liaison between the management of the plant and farmers at all stages of production, but especially at the time of harvesting, would be essential to the successful working of any such agreement. This liaison could be provided either by a specially designated representative of the plants (for example the present member of the agricultural department) or by a representative of the farmers (perhaps a cooperative) or by an independent agent, or by a Government agency.<sup>6</sup> The most important aspect of this liaison would be the scheduling of planting and harvesting in order to provide a predictable flow of the crop to the factories.

If the conditions outlined above were met, production could expand to 2.5m pounds of unshelled peas annually - the equivalent of the plants' estimate of local and foreign demand. Assuming a yield of 4000 pounds per acre (somewhat higher than the average of 2626 pounds obtained on the TPCDF) there would be a requirement of 625 acres of pigeon peas for processing: that is in addition to production for the fresh market. At the new (1972/73) price of 13¢ per pound the gross income per acre would be \$0.33m annually, of which approximately one-half would be distributed as wages.<sup>7</sup>

It is estimated by the plants that 2/3 of the peas would be exported: thus at the 1971 average export price of \$12.34 per case, export earnings would be approximately \$0.5m. In addition, assuming the local wholesale price to be the same as the export price, the value added in processing would also be approximately \$0.5m.<sup>8</sup>

Thus significant benefits could accrue from the increased production of pigeon peas to meet the estimated demand.

#### PROSPECTS FOR SWEET CORN PRODUCTION AND PROCESSING

Consumption of imported whole kernel sweet corn (locally canned) has been growing rapidly. Local production has, however, been largely confined to the Texaco Food Crops

<sup>5</sup> Yields in commercial production vary from 200 to 5000 pounds per acre, with the normal range being from 1000 to 2000 pounds: Henderson, T.H. (1965) Some Aspects of Pigeon Pea Farming in Trinidad, Dept. of Agric. Econ. and Farm Management, U.W.I., Occasional Series No. 3.

<sup>6</sup> During the period in which supplies of pigeon peas purchased by the processing plants declined, the Central Marketing Agency provided the liaison between farmers and the plants: this has now been discontinued.

<sup>7</sup> The net benefits would be somewhat less than these figures if the peas replaced existing crops.

<sup>8</sup> Calculated from 70,000 cases at \$12.34 minus \$4.55 (35 pounds of unshelled peas at 13¢ per pound are required per case of 24 x 16 oz. cans).

Demonstration Farm and as a result few persons in Trinidad have had an opportunity to sample the fresh product. Immature field corn, both boiled and roasted, is, however, popular.

Experience at T.F.C.D.F. shows that the crop can be grown easily at any time during the year, although irrigation is necessary if it is planted in the dry season. The wide range of marketable yields reflect, for the most part, unavailability of market outlets rather than yield variation per se (Table 6). As a consequence, labour costs have also varied considerably, since labour for harvesting is the most important single item of expenditure. In spite of the wide range of yields, returns failed to cover variable costs in only two of the 13 crops.

If the crops had been produced with family labour, returns to labour would have varied from a negative value to almost \$21.00 per day, with an average of \$11.78 per day (Table 7). This compares favourably with the average agricultural wage of \$4.50 per day.

Table 6 Average Cost and Returns Per Acre of Sweet Corn<sup>a</sup>: T.F.C.D.F., Trinidad, 1967 - 1972

	Average	Range
(\$ per acre)		
Labour Cost <sup>b</sup>	146	44 - 289
Tractor and Material Cost	122	86 - 149
Total Variable Cost	268	138 - 433
Total Returns	499	52 - 886
Gross Margin	231	-76 - 572
Marketable Yield	7,190 cobs	750 - 13,100 cobs
Price	7.0¢/cobs	4.9 - 9.1¢/cob

Source: Records at T.F.C.D.F.

<sup>a</sup>Based on records of 13 crops: a total of 16.5 acres

<sup>b</sup>Labour has been charged at the commercial rate of \$4.50 per day rather than the higher rate paid on the farm.

Table 7 Average Returns to Labour in Production of Sweet Corn: T.F.C.D.F., Trinidad, 1967 - 1972

	Average	Range
Use of Labour	32 days/acre	10-60 days/acre
Revenue <sup>a</sup> minus Tractor and Material Cost	\$377 per acre \$11.78/day	-\$42 - 742/acre -\$4.20 - 20.97/day

Source: Records at T.F.C.D.F.

<sup>a</sup>Revenue equals marketable yield multiplied by 7 cents per cob (the average price in the fresh market).

As already shown a potential market exists for 1.35m pounds of whole kernels with local processing plants. The need is to turn this potential into practice: a process which is not without its problems.

The major obstacle is the present organization of the canning of sweet corn. Orders can be placed by the processing plants with agents in North America for shipment of frozen whole kernels to arrive monthly in the Island. This material can be transported direct to the factories in refrigerated containers, to be used as required. Consequently there is a minimum of effort required on the part of the managements of the plants. Processing of locally produced corn would certainly involve more effort than this, and some form of Government persuasion may be necessary to initiate change.

The local product does have one major advantage: cost. As already shown, imported kernels cost from 35 to 42¢ per pound. At the existing average, fresh market price, the equivalent quantity of local corn would cost 28¢ per pound.<sup>9</sup> This corn would, however, require shelling: a process for which a relatively simple machine is available. It is possible also that a lower price could be paid to farmers for the corn in exchange for the advantages of an assured market at a fixed price. For example, a margin over variable costs of \$163.00 per acre, for a crop which lasts only 11 weeks, would be earned at a price of 6¢ per cob.<sup>10</sup>

<sup>9</sup>

This assumes 4 cobs per pound of whole kernels at a price of 7¢ per cob.

<sup>10</sup>Based on the average yield of 7190 cobs per acre at T.F.C.D.F.

In order for the corn to be canned, arrangements would have to be made to have the kernels removed from the cob, and the produce (not necessarily in the shelled state) transported to the processing plants. In this case 'transport' could include the freezing and storage of the produce prior to processing. There are several ways in which these arrangements could be made: one or both services could be organized by the processing plants, by the farmers themselves, by an independent agent or by a Government agency.

If the crop were to be processed in the fresh state it would be necessary to schedule planting in order to have an orderly supply of produce for the factories. Coordination between farm and factory would be critical for this crop, since quality deteriorates quickly after the optimum harvesting date. The alternative procedure would be to harvest at the optimum time, freeze the product and store until required. This, however, would still necessitate coordination: between farms and the freezing plant.

The two alternative means of organization - close coordination between farm and factory, and freezing and storage - involve costs. The choice of method would depend on the balance between cost and convenience.

On the assumption that the problems of the organization of production can be overcome and the processing plants persuaded to accept local sweet corn, a number of benefits would accrue to the local economy. 540 acres of corn would be required to meet the current demand of 1.35m pounds of whole kernels: this would generate for farmers a total income of \$0.32m annually,<sup>11</sup> of which approximately one-third would be distributed as wages.<sup>12</sup> The value added in processing is already realized with the imported corn, but a potential value added of \$0.21m exists in the provision of services (shelling, freezing and storage) between the farms and the factories.<sup>13</sup> In addition to these benefits there would be a saving of approximately \$0.54m in imports of corn.

Thus, as with pigeon peas, there would be significant benefits to the Economy from the production of sweet corn to meet the requirements of food processors.

#### CONCLUSIONS

The paper has demonstrated the potential for expanded processing of locally grown vegetables by reference to pigeon peas and sweet corn. A ready market exists for specified quantities of these products at prices which would enable the processing plant to pay remunerative prices to producers. In both cases the major requirement for the development of industries based on these crops is the establishment and maintenance of close cooperation between farmers and the management of processing plants. If the conditions as specified can be met, there will be benefits to the Economy in terms of added employment and profits as well as additional exports and a reduction in imports.

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<sup>11</sup>This assumes a yield of 10,000 cobs per acre at 6¢ per cob.

<sup>12</sup>The net benefits would be somewhat less than these figures if the corn replaced existing crops.

<sup>13</sup>This assumes that these services absorb fully the margin between the farm gate price and the price currently paid by the processing plants for imported corn. Alternatively part of the value added may accrue to plant operators (as profits) or to consumers (as reduced prices).

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#### VARIETAL SUSCEPTIBILITY OF COWPEAS TO POD BORER

Nader G. Vakili and David M. Walker  
Plant Pathologist, USDA AID Grain Legume Production Project,  
Federal Experiment Station, Mayaguez, and Senior Scientist,  
Puerto Rico Nuclear Center, Mayaguez

#### SUMMARY

Eight replications of thirty-two varieties of frijoles, *Vigna sinensis*, were grown at Isabela in a random block design. Five peduncles on plants in each replication was tagged at florescence. After 30 days the pods that developed from tagged flowers were examined for feeding punctures of the pod borer, *Bruchus chinensis* (Coleoptera: Bruchidae), on the pod exterior and for the number of seeds infested per variety.

Significant differences among varieties were found in the number of punctures and the number of seeds infested.