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Evaluation of Pigeonpeas Production for Diversification

INTRODUCTION

Pigeonpea (*Cajanus cajan*) is the most extensively grown leguminous crop in Trinidad and Tobago and is a popular item in the diet of the people. However, it has remained very much under-utilized from both the production and utilization aspects.

Production of pigeonpea is largely restricted to small farms to meet the market demand for green peas. Inter-cropping with maize and root crops is commonly followed. Except for land preparation, all other operations are manually done. Generally, more attention is paid by farmers to the associated crop than the pigeonpea. Production practices are primitive in relation to technological practices followed for the other crops. It is estimated that the economic returns derived by farmers from pigeonpea vary between 40 and 60 percent of the potential.

Consumption of locally produced pigeonpea is mainly in the form of the green immature peas. Although it is a popular and nutritious product, it should be remembered that at that stage, protein accumulation is not maximum. Hence the crop is utilized before its full nutritional potential is reached.

Thus the full nutritional potential of pigeonpea cannot be realized unless the production and utilization of dry pigeonpeas is also incorporated into the system.

The dry pigeonpea has two uses: (1) as a whole grain or after processing as a split product (similar to the common split pea - *Pisum sativum*). The nutritional status of split pigeonpeas and split peas (*Pisum sativum*) is summarized in Table 1. It is obvious from this table that split pigeonpeas is a high quality product and in many respects better than imported split peas.

The need for diversification of agricultural production has long been recognised in the Region. It is further emphasized that diversification should aim at agricultural expansion, rather than mere substitution of new crops as part of the output of traditional cropping system. Ideally, one should include all the possible crops in the evaluation exercise and select the ones that give promising results with respect to pre-selected criteria. However, due to limited time and resources available, this paper is confined to an evaluation of the diversification prospects of pigeonpea only.

The choice of crops for a diversification programme depends upon their relative contributions to the national economy and to profitability of the farmers. The contribution to the national economy can be evaluated in the following terms:

- (a) foreign exchange earnings (or savings),
- (b) employment generation,
- (c) food security, and

Table 1: *Nutritional Status of Split Pigeonpeas (Cajanus cajan) and Split peas (Pisum sativum)*

NUTRIENT	UNIT	SPLIT PIGEONPEAS	SPLIT PEAS
Protein	%	22.3	19.7
Fat	%	1.7	1.1
Fibre	%	1.5	4.5
Phosphorus	% mg	304	298
Calcium	% mg	73	75
Iron	% mg	5.8	5.1
Vitamin B ₁	% mg	0.45	0.47
Vitamin B ₂	% mg	0.51	0.38
Niacin	% mg	2.6	1.9
Vitamin A	I.U.%	220	66

Source: Adapted from Nutritive Value of Indian Foods and Planning of Satisfactory Diets, Special Report Series, No. 42, I.C.M.R., New Delhi, 1966.

(d) linkages with the economy.

At the farm level, the main criterion for adoption of a new crop in a diversification programme remains its profitability, subject to the suitability of the crop in an overall crop plan within the existing resource base and with the minimization of risk.

EVALUATION OF PIGEONPEAS FOR DIVERSIFICATION

National Criteria

In this section, we evaluate the suitability of pigeonpea for diversification from the point of view of the economy of Trinidad and Tobago.

(i) Foreign Exchange Earnings (Savings):

The importations of dry peas and beans in terms of quantity and value into Trinidad and Tobago since 1970 are given in Table 2.

It is obvious from this table that the importation of dry peas and beans from 1970 to 1984 varied between 7,751 and

14,809 metric tonnes. The annual importation for 10 out of the 15 years, for which the data are analysed, was more than 10,000 metric tonnes. A very substantial quantity of the imports (about 82 percent) is in the form of peas and split peas (*Pisum sativum*) for use as dhal. (*Pisum sativum*) is not grown commercially locally owing to climatic factors. However, dry pigeonpeas can be processed and used as a replacement.

The average annual value of imported peas and beans during 1981-85 was approximately TT\$18 Million. In order to maintain the same quantity of imports, in future, annual costs are likely to be around TT\$24 Million due to currency devaluation. This gives an indication of the magnitude of foreign exchange savings which can be achieved by using pigeonpea in a diversification programme.

(ii) Employment

Rising unemployment is a serious concern to all the Governments in the region. Agriculture, in general, provides the best

opportunity to generate employment with minimum of investment per job.

Pigeon pea production as currently practised in Trinidad and Tobago is quite labour intensive. On an average, it utilizes 46 labour days per acre. About 35 percent of the total labour is used for harvesting alone. A recent survey of pigeonpea production revealed that 56 percent of the farmers rely exclusively on their families for labour, while the remaining farmers use some hired labour for selected operations, mainly harvesting. (Mohammed).

However intensive use of labour may not provide a reasonable return to labour. Productivity of labour is also important. A few considerations with respect to labour productivity are now discussed. First, labour productivity is closely tied to farm size. There are situations where output per acre rises as farm size falls, but output per head is almost always lower on small farms than on medium sized farms with comparable soils and crops. In order to pay near urban wages to labour, agriculture must mechanize. If agriculture does not mechanize, no labour will be made available to it (Lewis).

It is estimated that mechanized dry pigeonpea production will require much less labour as compared to existing systems of production. The main areas of savings in labour use will be planting, weed control (inter-culture) and harvesting. The estimated requirement for labour is 10 man days per acre. In other words, each 100 metric tonnes will generate gainful full-time (220 days per year) employment to 10 persons.

(iii) Food Security

Dry peas and beans are a very good source of vegetable protein in human diet. Unfortunately the consumption of dry peas and beans in Trinidad and Tobago is based on imported products. Thus any problems in importation of these products will cause great hardships to the consumers. Domestic production will alleviate such hardships. Moreover, domestic production can be stored very conveniently for any emergency.

(iv) Linkages:

Domestic production of pigeonpea will provide linkages into two main areas i.e. processing and livestock feed. Once it has

been established that production and processing of dry pigeonpeas is commercially viable, the private sector will take up this venture thus generating additional employment.

Processing of dry pigeonpeas involves two stages, viz: decorticating and splitting. In this process, 85 percent of the product is converted into dhal while the remaining 15 percent husk and small broken pieces can be used for livestock feed. This bi-product has been used successfully in many countries.

Farmers' Criterion

The main criterion for farmers to adopt a new crop or even to continue growing the existing ones is the profitability of that crop. The continuation of pigeonpea production, over time, by small farmers in Trinidad and Tobago is an indication of its profitability. The exact number of farmers producing pigeonpea is not known but a very large number of small farmers are engaged in producing small quantities of pigeonpeas. Table 3 provides information regarding domestic production and prices.

Most of the pigeonpeas is harvested and sold green during the months of December to March. However, what cannot be harvested green is allowed to dry and harvested later on. Total local production had remained stagnant around three (3) million kgs. during 1963 - 75 and then increased to around six (6) million kgs. during 1976 - 1980. In this section, we examine the profitability of green pigeonpeas production based on actual farm situations during 1986 - 1987 production and projected profitability for dry pigeonpea production.

(i) Profitability of Green Pigeonpea

Cost of production, average yield, gross income and profit (gross margin/acre) for green pigeonpea production for pure stand and as an inter-crop, based on a survey of 30 farmers for the year 1986-87 are given in Tables 4 and 5.

It is obvious that harvesting is the most important item in the total cost of production. The difference between cost of production of pure stand and intercropped is negligible. Average yield of pure stand is 23 percent higher as compared to intercropped.

Table 2: *Summary of Importation and Value (C.I.F.)
of all Dry Peas and Beans*

YEAR	QUANTITY (1,000 KG.)	VALUE IN TT\$1,000
1970	9,624	N.A.
1971	12,750	4,115
1972	12,209	4,459
1973	11,432	5,815
1974	7,751	7,965
1975	9,903	9,033
1976	12,700	11,870
1977	12,189	13,963
1978	14,809	19,778
1979	10,514	13,590
1980	13,558	13,049
1981	13,244	21,748
1982	12,095	19,759
1983	9,921	15,480
1984	9,324	15,591
1985	4,770	7,634

N.A. = Not available

Source: Annual Overseas Trade, Republic of Trinidad and Tobago,
Central Statistical Office. (Various publications).

Table 3: *Domestic Production and Prices of Pigeonpeas*

YEAR	QUANTITY (^{'000} KGS.)	PRICE (\$/KG.)
1963	2,909	0.30
1964	2,681	0.32
1965	2,818	0.36
1966	2,545	0.33
1967	3,227	0.28
1968	2,272	0.31
1969	2,272	0.37
1970	2,899	0.57
1971	4,125	N.A.
1972	3,081	0.92
1973	3,218	1.08
1974	3,321	0.95
1975	3,320	1.29
1976	5,843	1.85
1977	6,369	2.29
1978	7,133	2.53
1979	6,369	4.07
1980	6,050	4.36
1981	N.A.	5.17

N.A. = Not available

Source: Annual Reports, Ministry of Agriculture,
Government of Trinidad and Tobago.

However, the intercropped system of production remains the more popular system of production as 80 percent of the farmers in the survey used this system. The low profitability of pigeonpeas in the intercropped system is compensated for by the income derived from the companion crops.

Though the profit per acre in both the systems is not very high, farmers are motivated to produce the crop due to other factors like low input requirement, flexibility in planting time and low risk.

(ii) Projected Profitability of Dry Pigeonpea Production

There is no commercial system of production for dry pigeonpeas in the Region. In recent years, Caroni (1975) Ltd. and the Chaguaramas Agricultural Development Project (CADP) have been attempting to develop a system for dry pigeonpea production. In Table 6 cost of producing dry pigeonpea is projected. Technical coefficients for this table are derived from the limited experience of the above mentioned projects, while the costing is based on commercial rates.

It is obvious from this table that the projected cost of mechanized dry pigeonpea production is substantially lower than green pigeonpea production carried out by small farmers.

Savings in cost are achievable through lower input into harvesting, which accounts for the major share of the cost in the existing green pigeonpea production. Savings are also achievable in inter-cultural operation and land preparation due to mechanization and economies of scales.

A dry pigeonpea production system has certain built in advantages. The crop can be allowed to mature fully without incurring losses through shattering of the pod. Thus the entire crop can be harvested. A well managed crop can be expected to yield an average 1,000 lbs. of dry peas per acre giving a direct cost of production of 82 cents per lb.

The profitability of dry pigeonpea will depend upon the price it could fetch.

SUITABILITY:

Pigeonpea is ideally suited for several cropping system as cultivars of varying maturity and growth habits can be identified.

It is also possible to plant pigeonpea at any time of the year. Apart from these advantages it is a soil ameliorating crop which incorporates substantial amounts of biologically fixed nitrogen and organic matter. It can be grown satisfactorily in almost all well-drained soils. The crop can also be grown as a relay crop or as a mixed crop. Cash inputs are minimal as is evident from Tables 4, 5 and 6. Perhaps the only risk that can be envisaged is pest (pod borer) damage. This however can be minimized by efficient management and judicious chemical control measures.

Apart from this manageable hazard, the crop is relatively free of risks. It is a very hardy crop. In the Caribbean no major diseases occur. In Trinidad, soil moisture is not a limiting factor. On the whole it is low input, low risk, well adapted for mechanization, with a vast potential for the future.

CONCLUSION

Despite the suitability of the crop for diverse cropping systems, and its importance to the national economy, production has remained stagnant over time. The reasons for this are manifold.

Small farmers producing green pigeonpeas could not venture into production of dry pigeonpeas due to their limited land resource. Moreover, during the recent past, all agricultural activities were in a state of decline due to the sudden expansion in the non-agricultural sectors. This triggered interest only in high input and high value crops like vegetables. The use of cash inputs in these crops was highly subsidised by the Government.

The policy of unrestricted importation of dry peas and beans did not encourage any medium or large scale farmer to invest in pigeonpea production.

In view of the changing economic environment, we are hopeful that the dry pigeonpea production will find a more favourable environment. In order to hasten the process the following policy and infrastructural measures need serious consideration:

- (1) Provision of processing facilities.
- (2) Continuation of efforts to improve the mechanized system of dry pigeonpea production.

- (3) Institution of production incentives on par with other crops.
- (4) Protection of producers from unfair competition.
- (5) Extension and information dissemination at the producers' and consumers' levels.

REFERENCES

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Mohammed, F. (1988). "Assessing the Potential for Dry Pigeon Peas Production for Processing." Course 312 Project Report, Department of Agricultural Economics and Farm Management, The University of the West Indies, St. Augustine.

Table 4: *Cost of Production - Gross Income and Profit Margin per Acre for Pure Stand Pigeonpeas Production*

OPERATIONS	COST TT\$/ACRE	% OF TOTAL COST
Land Preparation	300.00	16.4
Planting:-		
(i) Labour	138.50	7.8
(ii) Materials	4.08	
Interculture:-		
(i) Labour	361.50	24.4
(ii) Materials	83.85	
Harvesting	938.46	51.4
Av. Total	1,826.39	100.0

Average total Yield/Acre = 2,450.5 lbs.

Average Price/lb. = \$1.00

Gross Income/Acre = \$2,450.50

Gross Margin/Acre = \$624.11
(Profit)

Source: Mohammed (1988)

Table 5: *Cost of Production, Gross Income and Profit Margin per Acre for Intercropped Pigeonpeas Production*

OPERATIONS	COST \$/ACRE	% OF TOTAL COST
Land Preparation	300	16.12
Planting:-		
(i) Labour	162.30	9.11
(ii) Materials	7.10	
Interculture:-		
(i) Labour	376.25	21.52
(ii) Materials	24	
Harvesting	990.50	53.25
Av. Total	1,860.15	100.00

Average Total Yield = 1,992 lbs./acre

Av. Price = \$1.00

Gross Income/Acre = \$1,992

Gross Margin/Acre = \$132.
(Profit)

Source: Mohammed (1988)

Table 6: *Projected Cost per Acre of Mechanized Production for Dry Pigeonpeas*

OPERATION	LABOUR		MATERIAL			MACHINE	
	DAYS	COST	NAME	QUANTITY	COST	TIME	COST
Land Preparation	½	60	.	.		4hrs.	100
Planting	¼	30	seed		20	2	40
Interculture:							
(a) Mechanical	1	120				8 hrs.	100
(b) Chemical	1	60		5oz.	20	.	.
Pest Control	2	120		4oz. 5oz.	30	.	.
Harvesting	¼	60	.	.		2hrs.	60
SUB-TOTAL COST		450			70		300

PROJECTED TOTAL COST = \$820.00