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AGRICULTURAL INSURANCE: A MEANS OF STABILIZING SMALLHOLDERS RETURNS: CASE OF THE CARIBBEAN

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It is quite significant that this Conference has as its theme "Incentives and Support Systems for Food and Agriculture". Its importance is evident from the concerns being expressed throughout the world in developed and developing countries regarding the problems of providing food and basic nutrients to meet the needs of a growing population. In the Caribbean there is evidence of the awareness of the problem.

Increases in the populations throughout the Region is at levels which demands increased food production hence hopes of a narrowing of the population - food gap in the near future is highly uncertain unless new techniques and some level of innovation can be introduced to bring new producers and previously idle land into production. This recognition is evident here in Jamaica for example, where the government is seeking to stimulate the agricultural sector for domestic and export needs introduced Agro 21.¹ This program as I understand it, seeks to modernize the agricultural sector in order that it might make a contribution through the application of modern technology, mobilization of unused and underutilized areas of land into production and the introduction of a commercial type approach to agricultural activity.

Agriculture thus becomes the meeting point for two imperatives of development - growing more and varied food and finding new job opportunities.

The constraints to production are many and varied. Variability of the weather, lack of good quality seeds and the inability to secure sufficient factor inputs are all factors affecting the level of production. Countries in the area are further constrained by the possibilities of hurricanes, droughts and other national conditions over which there is no control.

The presence of the growing food needs can be assured from the changing population throughout the region while individual country agricultural policy throughout the Caribbean region calls for increrasing agricultural production, there is no Caribbean policy in this regards.

Inspite of Caricom, there is no regional policy geared towards the coordination of agriculture into a National plan for economic development. The seriousness of this lack of direction cannot be overlooked when all around the world there are pressures being exerted on restraining food production.

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Factors which contribute to making the food situation an urgent matter with global concerns are:

1. drought and other climatic variations have affected worldwide production;
2. rocketing farm land prices have made the purchase of agriculture land more difficult;
3. shortages of fertilizers and pesticides have made high yields more difficult;
4. population growth has increased the number of people to be fed; and
5. affluence has increased consumption demand of the food available.

In one way or the other, all of the above related to Caribbean countries. The masses of the population are becoming more disenchanted with policies which have failed to provide them basic food and nutritional needs.

The objective of this paper therefore is to make the case for a policy, which could well serve as a catalyst to production, a stimulant of agricultural production and a more balanced distribution of income and higher levels nutritional intake throughout the region. This tool is Agricultural Insurance.

DEFINITION AND OBJECTIVES OF AGRICULTURAL INSURANCE

Agricultural Insurance is a technique which provides farmers some minimum protection against the risk and uncertainties involved in crop production in return for a premium. It is a means whereby a farmer can stabilize his income from year to year while reducing the extent of variability in income resulting from crop losses.

In a broader sense, agricultural insurance "is an efficient way of spreading risks among farmers, among regions, across sectors of the economy and over time." The likely benefits include improved farm resource allocation, higher farm incomes and increased output of important food crops.²

In addition to the individual farmer or micro-economic benefits there are also macro-economic implications from the presence of such a program.

If a large number of farmers in community or a region are insured then, the insurance can become an important component in the stabilization of the income of that community or region. The reality of the situation is that a calamity will be faced by all the inhabitants of that community or region hence, if a large indemnity payment is provided for crop losses due to some catastrophic situation, this serves as a substitute for funds generally received from a sale of the crop. These funds circulate in the community or region and sustains other business activities and job survival thus stabilizing the income of others in that community or region.³

2

Peter Hazell, Carlos Pomareda, Alberto Valdes (1986): Crop Insurance for Agricultural Development. ed. Baltimore: The John Hopkins University Press. p.294.

3

Vincent R. McDonald (1974): "Crop insurance possible mechanisms for stabilizing small holder returns." IBRD, Washington, D.C. (January).

P.K. Ray in his book on agricultural insurance makes the following points:⁴

"A contractual right to assistance in the event of crop failure further enables farmers to improve their credit in general and more particularly by using the insurance policy as collateral for loans or extensions of credit. At the same time, bankers and others including co-operative credit institutions that extend such credit are provided with an opportunity for making larger and better loans since their borrowers are expected to have more stable incomes and can offer more tangible security for such loans. Furthermore, people in the rural communities and trade centres also find an opportunity of improving the stability of their incomes due to a stabilization of farmers' incomes on which they depend so much. The community also gains in so far as the insurance gives farmers a greater confidence in venturing practices and in making greater investments in agriculture production. Again, if the insurance could be integrated with food and other commodity reserves, it might go a long way to normalize the availability of supplies and to stabilize prices of the insured agricultural commodities. Finally, the government's obligation, wherever undertaken, to provide relief in case of crop disaster is reduced to the extent farmers themselves pay for the insurance."

A potential wide linkage exists in the spreading of benefits from this program.

The Theoretical Underpinning of a Crop Insurance Program

An appreciation of the merits of a crop insurance program requires some basic understanding of the theoretical concepts of insurance. As Hazell⁵ notes:

"Agricultural production, particularly in the developing countries, is generally a risky process, and considerable evidence exists to suggest that farmers behave in risk averse ways."

Hans P. Binswanger⁶ makes the point that:

"The failure of crop yield insurance markets does not arise from lack of demand for the stabilization of consumption and income. Recent experimental studies indicated that farmers in developing countries are poor and typically risk-averse."

4

P.K. Ray (1967): Agricultural Insurance Principles and Organization and Application to Developing Countries. New York: Paragon Press, p.287.

5

Peter B.R. Hazell (1974): "The economic significance of risk in agricultural planning: A case study in Mexico." Development Research Centre, IBRD, Washington, D.C. (May), p.1.

6

Hans P. Binswanger (1986): "Risk aversion collateral requirements and the markets for credit and insurance in rural areas." Crop Insurance for Agricultural Development. Baltimore: The Johns Hopkins University Press, p.67.

Hazell laments the fact that risk considerations are rarely incorporated into regional or sector planning models; "Better farmers are assumed to behave in a profit maximizing way he suggest."⁷

Fundamental to such discussion is the realization that insurance is a device which can be used to reduce the level of risk faced by the farmer by spreading any losses over many persons ..., a wide area and over a number of years.

Risk and Uncertainty

The terms "risks" and "uncertainty" are often used synonymously but in fact they have different technical meanings. Risk involves a quantitative measurement of an outcome such as a gain or loss in a manner such that the mathematical probability (or odds) of the outcome can be predicted. Because of its measurability, losses resulting from risk can be estimated in advance, and can be insured against. Uncertainty on the other hand is immeasurable and is always present when knowledge of the future is less than perfect. It refers to anticipation of the future and is unique in the mind of each individual farmer.⁸

Probably, the distinct difference between the two categories, risk and uncertainty is that in the former, the distribution of the outcome in a group of occurrences is known (either through calculation a priori, or from statistics of past experiences), while in the latter, uncertainty, this is not true. In one case the distinction was made as follows:⁹

"Using the definition that risk is a measurable uncertainty, a future event that is an individual can be a risk to a group of similar individuals. The individual cannot measure uncertainty, because he can in no way estimate how much resources to lay aside each year to protect himself against the contingency. On the other hand, there is some size group of similar individuals, with similar circumstances, such that it is possible to find some annual rate of deposit which would be sure within a given range of probability to accumulate sufficient funds to pay for any losses within the group during the year."

The Nature of Crop Insurance

Any production decision or for that matter, any kind of an investment decision implies a prediction of future events - either explicitly or implicitly - for the farmer. The forecast of annual returns is a specific factor or point estimate, generally referred to as the most likely or best estimate. For example, one might forecast that the return on one acre of coffee is \$5000 a year for five years. The question arises as to how good is such an estimate. Are we

7

Peter B.R. Hazell (1974): Op. cit.

8

Earl O. Heady (1965): Economics of Agricultural Production and Resource Use. New Jersey: Prentice Hall.

9

Dana H. Myrick (1965): "Improving the effectiveness and acceptability of the Federal Crop Insurance Program." Paper discussed at Workshop. Laramie, Wyoming. (July).

certain, uncertain or somewhere in between? The level of uncertainty present can be defined and measured in respect to the forecasters "probability distribution" and the probability distribution could consist of a few potential outcomes or a number of outcomes.

In forecasting yield, and indirectly incomes, we could make an optimistic estimate, a pessimistic estimate, and a most likely estimate; or alternatively, we could make high, low and best a guess estimate. If the weather conditions are good and there are no hurricanes, diseases, etc. we could expect our optimistic estimate to be realized; the pessimistic estimate would hold if poor weather conditions prevailed - hurricanes etc. occur, and our best guess estimate would occur if these exogenous factors stay at normal level.

These assumptions can be further expanded to include an assessment of the farmers' acceptance of, or aversion to risks. The typical farmer could be classified as either (a) a risk averter or (b) a risk lover.

It is generally accepted that there exists some level of risks in the farmer's decision to engage in agricultural production. Given this assumption, it follows that agricultural producers who are risk averters would seek to minimize such risks through programs or devices which allow for greater certainty or uniformity in returns from production over the long run if not in the short run. Such a device could be agricultural insurance.

Maximization of Expected Monetary Return: Decision Criteria

The farmer's decision to use or not use crop insurance is one based on both economic and non-economic consideration. The decision criterion used for situations involving risk is to maximize the expected value of the events. The expected value is defined as the overall sum of the probability of each times the income contribution of that event:

$$\text{MAX: } E(X) = \sum_{i=1}^n P_i(X) X_i; i = 1 \dots n$$

where: $P_i(X)$ = probability to event X_i ;

$$\sum P(X) = 1$$

The expected return under condition in which consideration is given to the use of a crop insurance program can be hypothesized to be:

Expected Return

<i>Changes in Exogenous Factors</i>	<i>Returns (\$)</i>
Exceptional crop weather	6,000
Normal weather conditions	3,000
Usually poor weather	1,000

The anticipation of variations in the expected returns based on changes in exogenous factors is an improvement over the earlier best guest estimate of \$5000 per acre for coffee since here we have introduced information we did not have before, but there are still missing links. We must now consider how likely it is that we will have

the occurrence of any one of the three exogenous factors above. The probability concept can not be used to compare the riskiness of alternative investment prospects under the probability of various conditions.

Estimates of the probability of various weather conditions affecting farmers income can therefore be made. Assuming the odds are 2 to 10 (.2) that there will be poor weather, 5 in 10 (.5) that there will be normal weather and 3 in 10 (.3) that exceptional crop weather will occur, the expected monetary value can be calculated.

Payoff Matrix

Changes in Exogenous Factors		Annual Dollar	$P(X_i)$
-----		-----	-----
Exceptional crop weather	0.3	6,000	1,800
Normal weather conditions	0.5	3,000	1,500
Usually poor weather	0.2	-1,000	-200

Expected Value =			3,100

The expected value criterion can be extended to the situation where two or more alternative investment opportunities exist. Assuming one farmer (Producer A) purchases agricultural insurance at a cost of \$200 per year, this in effect reduces his annual dollar returns under various weather conditions by \$200 with the insurance providing a minimum return of \$2,000 (see matrix).

The second farmer (Producer B) does not insure against crop failure and therefore under conditions of unusually poor weather his annual earnings are negative, requiring some level of dissaving.

Calculations of Expected Values for Two Producers

Changes in Exogenous Factors	Probability of these changes occurring	Outcome if this state occur	$P(X_i)$
-----	-----	-----	-----
<i>Producer A (with insurance):</i>			
Insurance cost = \$200/yr.			
Exceptional crop weather	0.3	\$5,800	\$1,740
Normal weather	0.5	2,800	1,400
Usually poor weather	0.2	1,800	360

Expected Value =			\$3,500

Producer B (without insurance):

Exceptional crop weather	0.3	\$6,000	\$1,800
Normal weather	0.5	3,000	1,500
Usually poor weather	0.2	1,000	-200

			\$3,100

The expected value under these two alternatives, A and B, is \$3,500 and \$3,100, respectively. Using maximizations of expected value as a decision criteria alternative A is clearly superior to alternative B. In other words, it paid farmer A to insure his crop against failure.

A Proposal and Rationale for a Crop Insurance Program among Caribbean Countries

This proposal is being made under the general assumption that some form of agricultural coverage is possible and desirable in the region.¹⁰ The principal advantage of establishing a Caribbean agricultural insurance program rather than just local programs is the broader geographical distribution of risks which it would allow. This is a clear case where distance¹¹ would contribute to economies of scale for the participating countries. This is particularly important in the case of crops since their dependence on the weather, while likely to affect large areas of an island will not necessarily simultaneously affect crops in widely scattered countries in the region.

While it is not the author's intention to spell out in full detail all of the intricacies involved in establishing a program in this paper, it is contended that some form of a program is possible under the establishment of rather "rigid" conditions.

There is enough evidence - around the world¹² to sustain this belief. The success of the program would rest on the structure, support and cooperation of these involved. The program's primary objective should be: (a) the reduction of uncertainty, to would-be producers, (b) increased food production of, and (c) the stabilizing of the incomes of producers.

The program visualized is one which requires the setting up of national agricultural insurance programs in each participating country followed by the creating of a regional insurance agency (Caribbean Agricultural Reinsurance Agency - CARA) which would provide

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Already, there is a well organized program of insurance for bananas, coconuts and livestock in Jamaica. There are reports that other Caribbean territories have insurance on specific crops, e.g. Dominica - bananas. Other countries in the hemisphere with some form of a program are Brazil and Mexico.

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Among the larger countries, Jamaica in the center lies almost 800 miles from Trinidad and Tobago in the east. Guyana on the other hand is more than 1,350 miles south of the Bahamian islands.

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Among the countries which have instituted some form of a crop insurance program are: Brazil, Canada, Iran, Israel, Jamaica, Japan, Lesotho, Mauritius, Mexico, Puerto Rico, South Africa, Sri Lanka, Sweden and the United States of America.

reinsurance¹³ to the national entity. This regional body could be a completely autonomous body created for this purpose, or, it could be a part of some existing regional body as the Common Market Secretariat or the Caribbean Development Bank.

The first step in introducing such a program is to recognize its merits in the efforts to increase aggregate production by Caribbean farmers and in stabilizing agricultural incomes throughout the region. In addition, it would have the further impact of strengthening the financial stability and productive capacity of farmers and hence their credit worthiness for borrowing funds needed for farm improvement.

The recommendation in terms of a program is for an insurance program based on crop yields and covering only the most important agricultural commodities produced by the farmers of each participating country. To be actuarially manageable¹⁴ the program should include as many of the Caribbean countries as possible and involve as many farmers as possible. Countries such as Canada, Japan and the United States with its broad geographical base are in a position to carry on alone, but this is not true of individual Caribbean countries.

Because of the existence of some differences in emphasis of agricultural crops, currencies and problems of management, a direct regional insurance agency arrangement would not be feasible. Rather, a program of reinsurance involving a wider sharing of risks over both time and space should prove more beneficial and less costly since contracts would be established between the proposed regional agency and the national company as the original insurer.

Conceivably the program would operate like this. A farmer who is a member of a national insurance company (e.g. National Crop Insurance Company of Jamaica) has his coffee crop insured for an equivalent of \$50,000. In the event of a loss the national company pays to the farmer his full loss value (up to e.g. \$40,000) but it sends a bill to CARA for a portion of the aggregate losses of all farmers as defined in the contract. Thus in one policy the farmer gets all the protection he wants, the burden of coverage is lessened for the national agency

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Reinsurance has been described by Ray as "a device by which an insuring agency shares the risks assumed by it with one or more other similar agencies or with agencies which specialize in reinsurance. The first is called a direct-writing agency or company, and the second the reinsurer. Usually a contract or "treaty relation" is entered between the two, defining the specific circumstances under which reinsurance is to apply, the respective shares or obligations in case of losses and indemnities to be paid, and the allocation of premiums received by the direct-writing agency." France and Puerto Rico are examples of countries in which some form of crop reinsurance has been instituted. In 1957, the US Federal Crop Insurance Act was amended to permit US FCIC to provide reinsurance for crop or plantation insurance in Puerto Rico when such reinsurance is not available from private sources at reasonable cost.

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A sound actuarial basis for insuring any crop regions: elimination of all poor risks; an accurate classification of land in the country in region on the bases of productivity and the establishment of a premium rate on all areas of land adequate to cover the risk of loss and to establish a reasonable reserve.

and the regional agency is able to achieve its objectives of encouraging production and providing stability in individual countries involved without the demands on it being frequent and for small individual losses.

Understandably, there are many problems to be faced in such a program. In looking at the advantages and disadvantages of this program, there should be clear guidelines as to responsibilities and obligations of each insurer. For example, in addition to agreeing to assume (for a fee) a part of the excess losses of the Jamaica Insurance Agency (JIA) CARA should (a) credit JIA with the share of indemnity due them; (b) see to a uniform code of practice on the part of each participating country; and (c) provide expert advice and assistance as needed. The national insurance agencies on the other hand should (a) agree to send to CARA a portion of the premiums collected; (b) keep CARA informed of its operations; and (c) follow the general directions and guidance of CARA.

Before attempting to institute a program there are a number of questions which must be considered. Among these are:

- (a) would insurance on the commodity meet a real need?
- (b) would another plan serve better?
- (c) how many people are involved?
- (d) what causes of loss will be covered?
- (e) how frequently do these losses occur?
- (f) what does it cost to produce the commodity?
- (g) are reliable acreage and yield records available?
- (h) is there much variation in acreage and yields from year to year?
- (i) what levels of coverage (percent of average yields) will be provided?

Once most of the above and other questions have been considered, a decision to institute a program might be made.

Some Implications of the Program

Among the other problems to be resolved are how to measure the losses. In addition, there is the matter of the guarantee. Should the guarantee be determined by the farmers ability to produce or by the amount of money and time spent in growing the crop? Who should have the biggest guarantee - the farmer who invests the most or the one who can produce the most.

What price to use in arriving at the indemnity payment is also of primary interest since it will determine the actual monetary return. If the price is set before fixing the premium then that precludes using market prices. If there is a government price then this also would have to be set before determining the premium. Ideally therefore, the price should be close to the market price during the insured year.

Financing the Insurance Program

There are major difficulties envisioned in the financing of the program. Agricultural insurance programs in the countries envisioned are not designed to make profits - at least not in the context of development. For one thing - the program can only be initiated in countries with adequate agricultural, economic, institutional and philosophical infrastructure. It is incumbent on the government of the countries involved, the credit institutions, farmers organizations, etc., to cooperate in making this insurance available to small holder

producers. How much capital is actually needed to get this program in operation will have to be worked out. What can be said is that the cost will vary with the size of the program, the extent of coverage and the number of countries participating.

Actual financing on the local level would be through; (a) premiums received, (b) government subsidies for administrative costs, and (c) surpluses or reserves brought forward. At the regional level the reinsurance agency might be initiated with the assistance of a loan by a consortium of international or regional institutions including locally operated life insurance and banking institutions to establish a case reserve. In addition, an agreed portion of all premiums collected will be ceded to the reinsurance agency. The initial program would be an experimental or pilot scheme, with relatively small capital needs. The program should be structured in a way that lends itself to flexibility and expansion.

In instituting programs such as this, there is need for an appreciation of the overall contribution which it could make to the typical Caribbean country in search of a means of encouraging agricultural production among its small farmers. Bernard Oury in his paper on Weather and Economic Development points out:¹⁵

"While agriculture is a risky enterprise, human ingenuity has not failed to devise ways and means to reduce risks or to mitigate their results ... The first device that comes to mind is to avoid agricultural risks so far as possible by concentrating agriculture in places that have a favourable climate. But in most countries the scope for such concentration is severely limited and, with a growing population, is progressively further narrowed."

We probably cannot control the climatic conditions but we can provide a means to overcome its impact. We can bring regional and multinational aid funds together for the purpose of insuring or reinsuring crop yields. We can see to it that through such efforts the poorest farmer, who is willing to produce will have consistent credit to meet his production needs.

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