

PROSPECTIVES FOR
CROP INSURANCE IN
INDONESIA

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*This paper presents the personal opinions of the authors but does not necessarily reflect those of the Federal Crop Insurance Corporation, the Agency for International Development or the United State Government.

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After a very brief review of the functioning of the Indonesian agricultural sector, it was determined that the implementation of a crop insurance program would serve to support the government's policy of stimulating agricultural production through both intensifying and extensifying farm level activities. Insurance is a means for increasing the efficiency with which social as well as private resources are used.

Two distinct programs were identified as being technically feasible. One would insure rice farmers based on the average production of their village or some other, larger area of land. The second program would insure small holder estate-crop farmers based on the individual yield each delivered to the processing plant.

The Government of Indonesia should assign a task force to carry out a detailed analysis and design study aimed at implementing a pilot and eventually, a full-scale, nationwide program. Because of the potential usefulness of crop insurance to stimulate agriculture in other nations, the Government should invite international organizations involved in agriculture development to participate.

Before a crop insurance program is begun, all parties to it should have a good idea as to how it will operate and what results are to be expected. Because crop insurance is such a new program (the oldest are only 42 year old) and there are so few programs in existence (15 world wide), the present paper is designed to provide general education as well as discuss two models which might be feasible for Indonesia.

It is expected that some time must elapse after the presentation of this report and the commencement of a full scale analysis and design effort. That period of time should be used to arrive at a general consensus on the shape and scope of the final program and the necessary process for getting there.

This report, therefore, does not enter into detail on certain aspects (eg-budget requirements), but as mentioned above, presents information to support the decision to begin or not an analysis and design study.

The consultants appreciate having had the opportunity to observe the Indonesian agricultural system and to comment on the appropriateness of crop insurance as a development tool in the present situation. We should be very happy to assist in any feasible manner in the future should the opportunity arise.

There are two main reasons for considering crop insurance. One is the effect on the farmer; the other--the effect on the government and it's programs.

A. The first reason is to improve the economic and social welfare of the small farmer through the stabilization of farm income and food crop production. More specific objectives under this heading are:

1. To encourage the farmer to increase production by reducing the risks involved in using modern technology.
2. To encourage the farmer to extend his operation to larger hectarage, whenever possible, by reducing the risk in using additional credit and making additional investments.
3. Stabilizing the farmer's economic position will also have a stabilizing effect on the overall food supply as it will allow the farmer to continue producing his optimal crop even though it may involve considerable cash outlays and risk.

B. The second main objective is to assure optimum use of government funds supplied to the agricultural sector.

1. To establish a government subsidized crop insurance program whereby the credit of the farmer is guaranteed through an insurance mechanism thus freeing up additional funds for use in other areas.
2. To improve the success factor for program such as BIMAS which are trying to promote the modernization of agriculture.
3. To provide feedback from, and promote acceptance of government programs.

The shape of any crop insurance program must depend on the functions to be executed. These functions are:

- A. Farmer Enrollment: How will the insurance be "sold" to the farmers? How will they be informed, signed-up, and have their premiums collected?
- B. Rate Making: How will the rates be made and revised?
- C. Guarantees: What sort and level of guarantee will be given?
- D. Underwriting: How will the insurer assure itself that assumptions upon which the rates are based are not violated? How will it assure that not only people likely to have losses will buy insurance? (Insurance, after all, is based on the premise that some good and some poor risks will be mixed to produce average and stable loss results.)
- E. Loss Adjustment: How will losses be measured?
- F. Loss Payment: How will loss payments be delivered to the farmers?

Add to the functions listed above the constraints that the system must be low cost and effective and one has the necessary information with which to begin building an insurance model. Now, let us examine two possible models for Indonesia and how these will permit the exercise of the functions listed below.

Area Yield Rice Insurance

We believe that an area yield insurance program on rice is feasible in Indonesia. It would operate in the following manner.

- A. Farmer enrollment would be handled through the credit system. The insurance company would enter into a contract by which the lender would agree to require insurance for all borrowers who

intend to grow rice in specified areas. The BIMAS agents would carry general information to the villages and the lenders would provide point-of-credit information. The application for insurance would be incorporated into the loan application. The premium payment would be added to the farmer's loan and would be forwarded to the insurer by the lender. In the beginning, only farmers receiving credit from official and formal sources would obtain insurance. Social justice, however, requires that farmers unable to obtain formal credit not be discriminated against. Eventually, the insurer could incorporate these farmers through agreements with informal lenders.

- B. Rate making in the beginning must be based primarily on judgment. The data that does exist is indicative rather than definitive. As the program proceeds, experience rating (or the incorporation of loss results as they occur) will permit the rates to be improved. See Annex E for a discussion of experience rating.
- C. Guarantees offered will be on an area basis. For example, the insurer would guarantee that all the irrigated lands in one village would produce one result and all the dry rice land in that village would produce another. The level of the guarantee would be no more than 75% of the normally expected yield.
- D. Underwriting would be taken care of automatically by the fact that the credit source creates a group which is formed for purposes other than insurance. Since there would be no voluntary sales, there would be no need to set up a special underwriting department.

- E. Loss adjustment would be done by taking sample cuttings on a small number of farms in the insured area. The insurer should do this with its own personnel and should be sure that the farms used for this purpose are ones which have employed the agreed-upon management practices. The loss adjusters would be part-time employees of the insurer working under the supervision of full-time employees.
- F. Loss payments would be made through the credit agency. The insurer would send a notice to the farmer that a deposit had been made to his account at the bank. The bank would pay off his loan and he would withdraw the balance in cash. The insurer would send separately a notice to each farmer. This could be done by the BIMAS agent.

At this time we do not recommend that an insurance program be begun for other food crops unless there be areas of strong concentration of these crops. The area yield nature of the insurance requires that the insured crop be widely planted. Otherwise only a few farmers would be insured in an area and one would be reduced to doing loss adjustment by the excellent, but expensive, individual yield system.

Individual Yield Small Holder Estate Crop Insurance

We believe that it might also be feasible to insure some of the small holder estate crops. It is desirable to do so because the insurance would improve the farmer's willingness to intensify and to extensify their operations and because the same healthy effect on the credit system would be realized. It is the guarantee and loss adjustment systems that would differ here from those of the rice program.

- A. Loss adjustment would be done by using the records of what the farmers delivered to the processing plant. The insurer would want to keep a mild watch at the processing plant to make sure that distortions were not introduced in the generation of that data.
- B. The guarantee could now be on an individual farmer basis since accurate and individualized records would be available from the processor. This is desirable since it provides for more complete risk removal from the life of the farmer. The case of the farmer doing poorly, but not being indemnified because the group did well is eliminated.

It would be appropriate to add here a final word about the size of any program. We strongly recommend a five year pilot program. The objectives of this are: (1) train the people who will be called on to manage a national program; (2) to permit operating policies to be developed and perfected without costing the government a great deal; and (3) to permit the gathering of economic impact data which will be used by resource controllers in determining whether or not they wish to commit large amounts of government resources to this program at a later date.

Being cautious and beginning a small pilot project is not excessively conservative. One only has to remember the experience of both the United States and Japan. These are the two pioneer programs, begun within a few weeks of each other in 1938. The US program lost over one hundred million dollars of capital by 1944 and had to be overhauled. It was restructured completely and begun anew in 1948. The experience in Japan was similar with that program being restructured after the war.

A pilot project of a few thousand hectares can provide exactly the same learning experience as one of a few million hectares, but at a much reduced cost.

V. Organization Structure

The location of the insurance organization in Government should be at a place where it will be responsive to the needs of the agricultural sector, able to command adequate financial resources and not be subject to undue pressure to either pay or deny losses. The insuring organization should be a Government owned Corporation, able to enter into binding contracts in its own name.

We recommend either the use of PT Asuransi Kredit Indonesia (ASKRINDO) or the establishment of a new organization for this purpose. ASKRINDO has the advantage of already having knowledgeable management. It's basic law would have to be amended to permit it to function as a crop credit insurer.

Alternately, a new organization could be set up within the Ministry of Agriculture to perform this function.

We do not recommend that any credit granting institution be the insurer. It would tend to be biased in favor of paying unnecessary losses.

We do not recommend BIMAS if it is intended that estate crops will be insured. Service organizations such as BIMAS can be used to inform the farmers as to the nature and use of their insurance program.

In the case of area yield insurance on paddy where loss adjustment will be done by sample cuttings, no other organization does this to the extent needed by the insurer. Other organizations which measure production seem to have up or down biases which need to be avoided. We recommend that the insurer do its own loss adjustment.

Farmer enrollment would be done at the point of credit by the Credit Institution. All farmers receiving credit for insured crops would be required to purchase insurance.

AKRINDO's Credit Insurance for the loans of crop insured farmers and ad-hoc disaster relief programs (such as allowing farmers to not pay back loans) would be eliminated for insured crops and areas.

The table below lays out insurance functions and possible executing organizations.

Function	Organizations	
	Food Crops	Small Holder Estate Crops
System Management	ASKRINDO or new	ASKRINDO or new
Farmer Enrollment	BRI and other lenders	BRI and other lenders
Underwriting	Credit Group	Credit Group
Ratemaking	System MGT	System MGT
Loss Adjustment	System MGT	Plant Records
Farmer Education	BIMAS & DG Food Crops	DG Estate Crops

VI. Implementation Plan

There are basically four stages that must be experienced by a crop insurance program. The first three are preparatory to the fourth, the nationwide, full scale effort. The first three stages are described in Annex B. We will briefly reiterate here.

Stage I- Preliminary Investigation

During this stage, one decides whether or not to invest in a formal analysis and design process. The present consultation is part of this effort.

Stage II- Preparation

Here one does the formal analysis and design and prepares for a pilot project.

Stage III-Pilot Project

Here one tests one's ideas and gains experience for the eventual management of a full scale, national program.

We recommend the following effort to complete the preliminary investigations.

1. Provide observation training to a small number of GOI officials so that they can continue to generate information about the suitability of crop insurance for Indonesia. This can be done by attending the FAO/Government of Japan crop insurance conference scheduled for Tokyo in September, 1980 and by visiting other countries with well developed crop insurance programs.
2. GOI officials should identify what additional questions will need to be answered for internal decision making and obtain this information.
3. A small task force should be appointed for the purpose of preparing a budget and scope of work for the committee that will carry

out the analysis and design of the pilot project. This committee should contain one (or more) representative from each of the following:

- A. BIMAS
- B. Bank Rakyat Indonesia
- C. Director General of Estate Crops
- D. Director General of Food Crops
- E. Bureau of Planning, Ministry of Agriculture
- F. Ministry of Planning
- G. ASKRINDO

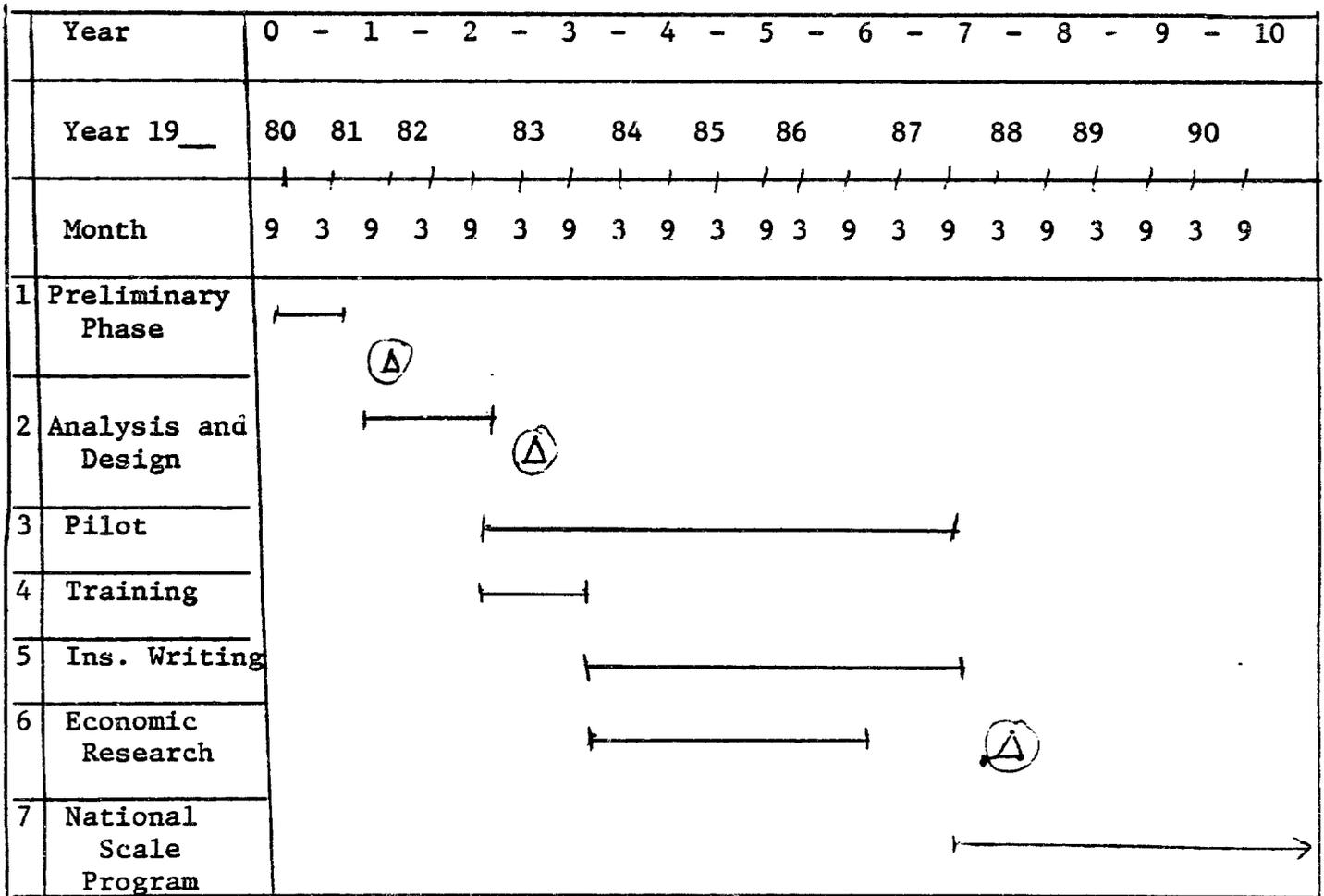
The Committee should recommend the persons charged with executing the scope of work indentified in numbers 2 and 3 above. This group should include the personnel identified in Section VII.

Timing

1. The preliminary investigation committee, should be pulled together, analyze this report, identify the scope of work for the preparatory stage and obtain approval for further implementation in 9 months. (March 30, 1981).
2. The preparation stage could be completed in 18 months, with funds and authorization for a pilot program. (September 30, 1982).
3. The pilot program will require the following blocks of time.
4. Training and policy design-12 months, depending on how much has been done in the preparation stage.
5. Insurance offered, pilot scale-this will be done continuously for a period of 4 years, 1983 to 1987.
6. Economic impact analysis-this will be done during the first three years the insurance is offered and will be made available in the fourth year to decision makers.

7. Decision to convert a national program--year 6.

Commence National Program--September 30, 1987.



Note: The time required for items 1, 2, and 4 can be shortened with aggressive management.

Key: = Decision Points

VII. Personnel and Resources Required

During the Preliminary stage no full-time personnel is required. During the preparation stage, funds to support the following time and travel are required:

Budget analyst--4 person months	(Indonesian)
Agricultural Economist--6 person months	(Indonesian)
System Designer--6 person months	(Indonesian)
Crop Insurance Consultant--5 person months	(Foreign)
Travel to Indonesia of Consultant	3 trips
Travel to Tokyo conference of 2 Indonesians*	2 trips
Travel to the US of 2 Indonesians*	2 trips

* Assuming they have not travelled earlier.

During the 5 year pilot stage, approximately the following resources are needed:

Manager (1)	5 person years
Actuary (1) (part-time)	2 person years
Legal Advisor (1) (part-time)	1 person year
Chief Field Operations (1)	5 person years
Field Representatives (3)	12 person years
Education Specialist (1)	5 person years
Accountant/Administrator (1)	5 person years
Agricultural Economist (1)	5 person years
Secretaries (2)	10 person years
Clerks (2)	9 person years
Insurance Advisor (1) (full-time)	5 person years
Insurance Consultants (Many)	2 person years
Research Consultants (As needed)	1 person years

Six jeep type vehicles will be needed during the project. A complete central office needs to be equipped.

Foreign travel (training) for the Indonesian staff will be 14 trips of one month duration each.

Travel to Indonesia of the consultants will be 20 trips of 6 weeks each.

No attempt has been made to put a price tag on these items because of the inexperience of the consultants with Indonesian costs. A general estimate of US \$1.5 to US \$2.5 million would be reasonable to cover 5 years of the pilot project's operating costs.

Insurance loss expenses would have to be financed additionally. Several million dollars of reserve would be required for this purpose. See Section VIII for additional comments.

VIII. Sources of Financing

Crop insurance programs have three general categories of expenses.

They are:

- A. Administrative expenses;
- B. "Normal" losses; and
- C. "Catastrophic" losses.

"Normal" losses are what the insurer projects that its average loss experience will be over the intermediate term (ie--about 10 years).

"Catastrophic" losses are those which are significantly higher than the planned level of average losses. Obviously, in the long run, "normal" should include catastrophic, but in the beginning estimates of "Normal" are judgement based and may not contemplate the level or frequency of losses which actually occur. Therefore, in arranging the finances of a new insurer, it is helpful to think in terms of paying "normal" and "catastrophic" losses.

Some sources of income to cover these 3 classes of expenses are the following.

- A. Farmers, through premium payments will contribute to cover losses.
- B. Government, through subsidies, reserve capital and guarantees cover all administrative expenses, part of "normal" losses and, in the short term at least, "catastrophic" losses.
- C. IDO's (International Development Organizations) through Grants can cover training, technical assistance or start-up administrative costs.
- D. IFO's (International Finance Organizations) through contingent loans or reinsurance can cover catastrophic losses. They may

also make loans or grants to cover administrative expenses and "normal" losses just as they would finance agricultural credit systems.

IFO's do not now offer reinsurance but, because they are strong financial organizations, they could begin to do so. Something requiring less of a change on the part of the IFO's, however, would be to offer contingent loans mentioned above. These are loans which are arranged before hand and which are not disbursed until the occurrence of some agreed upon contingency. In both the reinsurance and contingent loan case, the country pays for draw-downs (premiums before the loss in the case of reinsurance and loan repayments afterwards in the other case), but saves the opportunity cost of not having to tie up its capital in idle reserves.

One source of financing is not listed above, because it is more illusory than real. Banks, as sources of agricultural credit, are frequently targeted as potential premium payer, but this is unrealistic. Charging a premium to the bankers would further reduce their (already negative) margins. This would make it more difficult for them to lend to farmers. This is, of course, contrary to the objectives of the program.

Finally, we should mention commercial reinsurers as another potential source. A new crop insurance organization will find it difficult to obtain reinsurance. But, if after several years the organization has developed a good "track record", then it should be possible to obtain reinsurance. It should take five to ten years to develop such a track record. Very good experience could cause the commercial reinsurance market to open sooner.

IX. Sources of Technical Assistance

Successful crop insurance programs worthy of emulation, are presently operating in the U.S., Japan, Canada, Sweden, Mauritius, Israel, Panama, Puerto Rico, and South Africa. The governments of the first three all have foreign aid programs and could provide training in their countries or short term consultants in Indonesia.

Insurance management consultants (of the general type) can be obtained from many sources. International insurance companies such as the American International Group are one source. International insurance consultants such as Towers, Perrin, Forster & Crosby, Inc. and Guy Carpenter, Inc. , both of the U.S., are another.

Economic consultants with crop insurance experience would be available from Robert R. Nathan, Associates, Washington, D.C. Other competent economic consultants without crop insurance experience are available. This type of consulting firm has the advantage of being able to package all of the services listed above, plus the long term crop insurance advisor, which is generally not available from the countries listed in the first paragraph.

In Annex A, we present a listing of all the crop insurance programs in the world.

X. Conclusions and Recommendations

A. Conclusions

We believe that the following conclusions correctly reflect the situation and possibilities in Indonesia.

1. The reasons expressed by G.O.I. officials for instituting crop insurance are valid. These include:
 - a. To promote farmer's welfare;
 - b. To increase food production;
 - c. To improve the functioning of the credit system; and
 - d. To improve the efficiency with which public resources are used.
2. Two types of insurance programs are technically feasible:
 - a. Area yield insurance; and
 - b. Individual yield small holder estate crop insurance.
3. Operating costs must be kept at a minimum.
4. ASKRINDO is one candidate for the role of insurer.
5. Technical assistance is available.
6. In the final analysis, government and the farmers, must finance the program. Some assistance may be available from international agencies.
7. The credit system can not finance the insurance. Rather, insurance must finance the credit system.

B. Recommendations

We wish to make the following recommendations to the government of Indonesia:

1. That a task force be appointed to prepare the scope of work and budget for an Analysis and Design team, which will investigate the establishment of a pilot project.
 2. That several government officials likely to be involved in this project be sent to the FAO Crop Insurance Conference which is scheduled for Tokyo in September, 1980.
 3. That the members of the Analysis and Design Team be sent for Observation Training to one or more of the countries with successful crop insurance programs.
 4. That any pilot project implemented include a sound economic impact analysis component.
 5. That international technical assistance be obtained if a program is begun.
 6. That international organizations interested in agricultural development be invited to participate in the project.
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XI. Annexes

Because of the general and worldwide lack of knowledge about crop insurance, several papers, both general and specific, have been attached to permit the interested reader to further pursue his interest in this field. The papers presented are:

A. Status of Comprehensive Type Crop Insurance Programs Around The World

This is an inventory of the 15 programs presently in existence.

B. A Crop Insurance Development Program

This is check list of the issues which must be addressed as a country establishes a crop insurance program.

C. Lessons from the US Crop Insurance Experience

This is a general and state-of-the-art paper which compliments the next paper (D). The appendix, with a discussion of risk and uncertainty and of the economic principles underlying crop insurance is useful.

D. Exploiting Crop Credit Insurance for Development Purposes in Developing Nations

This paper is earlier and more comprehensive than the previous (C). It is a good, general, if somewhat dated, review of crop insurance related issues.

E. A Note On Experience Rating of Crop Insured Farmers

This discusses one important technical aspect; adjusting a farmer's or a region's premium rate up or down in accordance with losses incurred. The presence of this feature helps to increase farmers' satisfaction with the program. Experience rating is not discussed elsewhere in the crop insurance literature.

UNITED STATES DEPARTMENT OF AGRICULTURE
FEDERAL CROP INSURANCE CORPORATION
Washington, D. C. 20250

Subject: Status of Comprehensive Type Crop Insurance Programs Around
the World

To: James D. Deal, Manager, FCIC

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This report will bring you up to date on new developments in comprehensive crop insurance on the international scene. Before beginning, let me list, for the record, those countries which presently have comprehensive or catastrophic risk insurance programs. A catastrophic risk program is one which protects against a hazard with a significant catastrophe potential. Drought and hurricanes are examples; hail and fire are not. The catastrophic risk programs are included because they are as difficult to manage as comprehensive and can be readily converted into fully comprehensive programs.

The countries with programs are:

1. U.S. Will expand with new law
2. Japan Main focus on rice, but expanding
3. Canada Run by provinces with federal funding
4. Sweden The only area-yield system
5. Mauritius Insures sugarcane against typhoons
6. Mexico One million small farmer clients
7. Costa Rica Primarily large rice farmer clients
8. Sri Lanka Continues to have structural problems
9. Israel Successful Government-Private sector program
10. South Africa Coop. initiated Government-Private sector program
11. France Disaster relief cover on existing hail insurance
12. Zimbabwe Tobacco program
13. Puerto Rico Multi-crop, multi-peril
14. Panama New and working with IICA/AID
15. Soviet Union No adequate reviews of this program have been published in the west.

Now, to review the new developments.

1. Korea: Korea has decided (inside the administration) to proceed with a pilot program. One person has received extensive training (6 months in the U.S. The GOROK has informally requested one month training in the U.S. for four more technicians, assistance in drafting legislation and

STATUS OF COMPREHENSIVE.....

the presentation by FCIC of a two-day seminar to the Korean Rural Economic Research Institute in Seoul. It is reasonable to think that the first insurance policies will be issued in the spring of 1981. The GOROK is aware of the need to have a good economic research program in order to review the pilot crop insurance program's impact.

2. Cyprus: The old hail insurance program in Cyprus was amended three years ago to permit it to cover more crops and risks. It now covers some broad hazards, such as disease, and has begun to grapple with the comprehensive type issues.

Recent FCIC participation in an FAO conference in Cyprus permitted a consultation. Presently, FCIC is assisting by sending educational materials to Cyprus and making contacts with reinsurers. Training opportunities in the U.S. and technical consultations to Cyprus are likely in the future.

3. Spain: The Spanish legislature (Cortes) has just passed a law changing the present hail program into a comprehensive endeavor. The program will be a mixed private-public sector enterprise. Private companies will market, a pool of these companies will insure and the government will reinsure. There appears to be some technical difficulties with the structure created by the Cortes which might limit the program's ability to obtain commercial reinsurance. FCIC has provided a technical consultation and will continue to assist with educational materials. A request for training and further consultations are likely.

4. Venezuela: IICA/San Jose has agreed in principle to assist the GOV in implementing a program. Final papers should be signed this year. An economic research component will be included. FCIC will be called on to provide training and technical consultations.

5. Philippines: The Philippines have approved a crop insurance law and assigned staff to work on it. To date, however, policies have not been issued. The cause for the delay is unknown. FCIC provided two consultations in the mid-1970's but has had no significant contact since.

6. Indonesia: AID's Development Support Bureau (DSB) is presently preparing to finance a two person, two week pre-feasibility and orientation consultation to Indonesia in response to the GOI's request. The consultation is scheduled for June 1980, with the participation of one FCIC personnel.

7. India: The General Insurance Corporation of India, a state monopoly, has begun a small pilot program with cotton farmers. The farmers have market contracts with a Parby gin and also receive inputs and technical assistance from there. With marketing so well managed, there is an excellent chance for success. FCIC has provided educational materials.

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8. Bolivia: Despite the political disturbances of last year, the IICA people managed to convince the GOB to get a law passed and financing arranged for this new program. IICA has recently requested that FCIC provide one week of training in June to 7 employees and officers of this program. (Plus 8 others from Panama and IICA/San Jose.) Insurance activities could begin as early as October or November 1980.

9. Ecuador: This is the other IICA/AID country. A law was signed on April 21, 1980, which created the insurer and provided financing. Both of these programs will have economic impact research built-in.

10. Dominican Republic: There has been persistent interest here for many years. FCIC, AID and IICA have all provided assistance. Funding has been set aside to cover excess losses and a law drafted which now awaits only the president's signature. It was hoped that if Ecuador did not continue in the IICA/AID program, that the Dominican Republic could take it's place and find financing for the research and off-island administrative costs. Presently the program is "on hold" because of this financing problem. A relatively small level of assistance will bring quick results here.

Summary

It appears that at present in the world there are only twenty-five comprehensive or catastrophic risk type crop insurance programs in existence or being established. The programs in the developed countries are generally older and more successful than are those in the developing countries.

Considerable controversy exists as to the feasibility and suitability of crop insurance for developing countries. The IICA/AID program is implementing one type of crop insurance, called crop credit insurance, and measuring the economic impact. Korea is also likely to measure the impact. So it appears that in a few years that we will have hard research data from five or more countries- Panama, Ecuador, Bolivia, Venezuela, Korea and also Mexico if data quality problems there can be resolved. It is necessary to have results from more countries, especially in Africa and Asia before we can have truly reliable research results with which to answer persistent questions as to the feasibility and effectiveness of crop insurance for developing countries.

The final note to mention here is that there are presently four definite requests for assistance pending. They are:

June 2 to 7, 1980

Train 5 people from the IICA program

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Summer , 1980

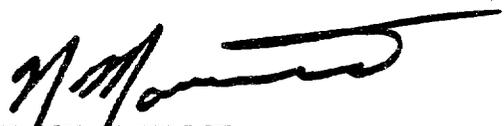
Train 2 people from the Sri Lankese
program

August & September, 1980

Train 4 people from the Korean program

June/July, 1980

Two weeks of Actuarial consultation
to Cyprus



NELSON MAURICE
Coordinator for Foreign Programs

A CROP INSURANCE DEVELOPMENT PROGRAM

A WORKSHOP PAPER OF THE
NEAR EAST/NORTH AFRICA REGIONAL AGRICULTURAL CREDIT ASSOCIATION

CROP INSURANCE WORKSHOP

NICOSIA, CYPRUS

MARCH 10-14, 1980.

Committee:
R. Roberts
G. Zacharia
T. Togawa
N. Maurice

Introduction

The Drafting Committee feels that rather than producing a summary of discussion at the Workshop, it would be more useful in the immediate post-Workshop period to produce a paper which outlines a step-wise approach to the introduction of crop insurance.

Essentially the aim behind this is to emphasize that much work must be done before a decision can be made on whether or not to implement a crop insurance scheme.

This paper outlines a suggested investigatory phase after which a decision is made as to whether or not to go ahead with a pilot program. Then, assuming the decision is "Yes", then preparatory and pilot phases are outlined for action.

In each section the significant decisions to be taken are indentified, as are the steps necessary to provide the information required for making the proper decisions.

II. The Program Development Process

A. Preliminary Investigatory Phase

1. The major decision to be taken at the end of this phase is:
should we invest in a formal analysis and design process?
2. Information necessary to support this decision:
 - (a) Susceptibility of farmers' and national economics to agricultural risk. Indicators of this susceptibility include:
 - is the potential insured portion of the farming sector sufficiently commercialized to make cash income from sale of crops a significant part of the family income?
 - What is the potential of the agricultural sector to grow through increased crop production? To what extent does risk hinder this growth?
 - What is the adequacy of traditional and formal risk-bearing mechanisms for permitting investment-fueled increases in crop production?
 - What is the adequacy of domestic food supply?
 - What effect does agricultural risk have on national balance of trade?
 - To what extent are national financial management and planning affected by crop production hazards?
 - (b) Specification of Government objectives
 - how important in national planning is the welfare of the rural population; for example, income stability?
 - other, for example does Government want to settle certain geographical areas or carry out resettlement under a land reform program, or promote certain crops such as export crops.
 - (c) To what extent is the agricultural credit system affected by crop production risks?
 - (d) Are the minimum human, financial and infrastructural resources available to run a crop insurance system? Will they become available?
 - (e) Could a crop insurance system be made acceptable to rural populations? Can sufficient influence be mustered to convince farmers of the advantages?

- (f) A priori benefit/cost analysis of a mature, comprehensive risk crop insurance program. Of necessity this analysis should not be at all detailed.

3. Methodology

This first decision does not have large financial or political implications. It can therefore be made on the basis of the report of a small task force which would embrace requisite political, economic, financial and agricultural expertise - with modest staff support for analytic/research purposes.

B. Preparation

1. The major decision to be made at the end of this phase is:

Whether or not to
authorize and fund
a pilot crop insurance
project?

2. Information necessary to support this decision:

- (a) What form should a pilot program take to be a feasible pointer for further decision-making?

- What crops?
- What risks?
- Where and how big? (number of farmers)
- What mechanism for computation of indemnities and what insurance unit?
- What other operational mechanisms (computation of premium rate, adjustment of losses)
- What should be the administrative structure?

- (b) What would be the financial details and implications?

- administrative budget
- expected losses
- maximum probable and possible losses
- items to be subsidized, amounts involved
- required reserve (capitalization)
- method for establishing reserve

- (c) What legislation is necessary?
- (d) Can sufficient safeguards be built into guard against adverse selection, moral hazards and fraud?
- (e) Is necessary manpower available? What training will be necessary?
- (f) Does the country have the necessary financial and administrative systems to handle money flows?
- (g) Does the capacity exist to adequately evaluate the economic impact of the pilot scheme? The social impact?
- (h) Can efficient monitoring be built into the pilot scheme so as to enable the insurance aspects to be improved on an ongoing basis?
- (i) What assistance is available from international and bilateral financial and development institutions?

3. Methodology

This decision is a major one. It will involve considerable sums of money and a certain degree of commitment, to crop insurance per se, by the Government.

The decision could again be taken on the basis of a task force report. This time the task force is likely to need reinforcement in the fields of:

crop insurance
 evaluation/monitoring mechanisms
 manpower planning.

C. Pilot Program

1. The major decision at the end of this period is:
Whether or not to substantially expand the program into one of truly national scope?

The pilot program would be designed to:

- Provide economic impact information upon which the decision to enlarge the program or not will be decided;
- Permit development of workable operating policies; and
- Develop a core of trained personnel, who could be the leaders of a national program.

2. Information required for decision-making:

(a) Does the system work?

- are indemnities adequate?
- are they paid on time?
- do money flow systems function adequately?
- is the long term underwriting loss ratio expected to be less than 1.0?
- does the loss adjustment system function efficiently and honestly?

(b) Were farmers generally satisfied with the program? Was there adequate participation?

(c) What was the impact (implied or actual) of the project

- on farmers' incomes? (growth and distribution)
- on the national economy?
- on the credit system?
- on government finances?

(d) What were the social and political effects

- at farm level?
- on strength of local associations or cooperatives?
- at national level?
- on rural/urban population flows?

(e) What would be the resources required to develop a national program?

- manpower?
- finance?
- availability of reinsurance?

(f) Is there popular demand for a national program?

(g) What additional legislation will be required?

3. Methodology

The management and Board of the pilot program will have been continually informed as to the results of the built-in monitoring process of the pilot project. The accumulated evidence, plus feedback from other sources will provide the necessary information for the expansion decision to be taken.

**Lessons from the
US Crop Insurance Experience**

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presented at the
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Opinions expressed here are solely those of Mr. Maurice and not FCIC, USDA or USAID.

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US Crop Insurance Experience**

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I. INTRODUCTION

Many developing nations are considering the establishment of crop insurance programs to benefit their citizenry. Your presence here today is evidence of that as are the numerous requests for assistance received in the past two years by organizations such as FCIC (Federal Crop Insurance Corporation), USAID (US Agency for International Development), FAO (Food and Agriculture Organization), and the IDB (Interamerican Development Bank).

Policy makers of interested governments are asking themselves a series of questions in order to determine if crop insurance has any value for their people. Some of the questions being asked include these:

- Why should we support crop insurance?
- Can it really be done properly?
- Must the government support it? How?
- Must the government finance it?
- What will it cost?
- Can we use the private sector?
- What examples are there for us to examine?

This paper is written to address these concerns. It examines the development of the crop insurance program and attempts to discover principles that are general in nature and of value to other nations that might want to consider this program.

The author is very much aware of differences, social and political as well as economic, that exist between the United States and many developing nations. Keeping this in mind, generalizable principles or lessons will, hopefully, be extracted. The reader will surely judge the successfulness of this venture.

II. Brief History

This section is designed to give the reader a quick overview of the historical development of crop insurance. It is a brief sketch which will make some of the later discussions more readily understandable. It is not designed to be a documented or exhaustive history, although the author would be pleased to correspond with persons so interested.

The honor of being the first to write about crop insurance goes to Benjamin Franklin who wrote, in 1788, to a French correspondent and suggested insurance as a means to protect against nature's wrath. Although Franklin's other insurance enterprises are still alive and flourishing, nothing came of this suggestion.

The first significant work on crop insurance took place in what is now Germany in the middle of the 19th century. There, all-risk crop insurance was studied and pursued. The risk of catastrophic losses made it impossible for the small mutuals then attempting to write all-risk to do so. They simply did not have the capital to confront the risks involved. As a second best choice, they focused on insuring against hail damage which was a serious problem at that latitude and which did not involve the catastrophic risk of the all-risk approach.

These mutual hail insurers were successful and spread throughout Europe and to Canada, the US, Argentina and elsewhere. Stock and mutual companies, dating back to the 1880's and 90's can be found writing most of the hail business.

The existence of the catastrophic risk did not prevent experimentation. There were several attempts in the US between 1880 and 1917 which all failed within a few years because of excessive losses.

The first successful all-risk programs date to 1938 when Japan and the US undertook programs. To Japan goes the honor of being senior; by one month. These programs differed from all previous attempts in, at least, one very important way. They were government sponsored and not private companies with limited capital. Money would be available to pay losses. Viability was guaranteed.

An important lesson should be made explicit here even though it is painfully obvious. An insurance operation is viable is income matches or exceeds outgo. The participation of large governments able to finance occasional and very large losses provided a alternative to the limited risk hail approach.

The insertion of the capital finance of government did not mean that other problems had also been resolved. Money and wisdom do not necessarily go hand in hand. Indeed, after World War II, both programs were recognized as essential failures and were restructured. The US program had consumed one hundred million dollars between 1938 and 1946. No insurance was offered in 1947. A reduced

program operating under more conservative management began anew in 1948. Japan's experience was parallel. That program did not match the needs of post war Japan and was completely overhauled.

Beginning in 1948, other nations started all-risk or broad risk* insurance programs along similar lines. Today there are, perhaps, 15 significant and successful programs in operation in the world. FCIC in the US has operated as an experimental program for the last 31 years. It has been limited in size; both the number of farmers and different crops that could be insured have been restricted. Essentially, the Congress, took a "show me" stance. That is, it placed the burden upon FCIC's management to demonstrate that it was technically equal to the challenge it faced.

During the 30 year period, 1940-1978, FCIC has had an underwriting loss ratio of 97%. That is, for every dollar of farmer's premiums that it took in it paid out ninety seven cents. That this is less than 1.0 and that something has gone into reserves is significant.

We have seen two stages in the development of crop insurance so far. The first was the creation of private sector hail insurance as a reaction to the limits imposed by the catastrophic risk. The second was the creation of government run insurance programs to overcome the catastrophic risk problem. A third stage has existed in Japan since the beginning and is now emerging in the US. That is the combination of government and private insurers. That will be discussed below in section VI.

* By broad risk, we mean the insuring of one or a few risks, but risks with catastrophic potentials involved. Typhoon insurance in Mauritius and Puerto Rico are examples. Hail in Kansas is not

III. Objectives

The first question that any government policy makers should ask when considering crop insurance is: Why? Why should we invest government resources in this program? What will we get out of it? how will the people be benefitted?

The reasons why this is the first question to be asked and to be answered is that the answers to all other questions depend on this one. Once the ultimate objective of the program is specified, the program can be analyzed, designed, and costed.

In the broadest of terms, it is possible to say that crop insurance programs can be designed to either maintain or develop. That is, they can provide income to help farmers' survive from one year to the next or they can protect the farmers' working capital, thus allowing the farmer to develop and to become more productive. To a considerable extent, both objectives can be obtained simultaneously. However, it is quite possible to design systems which sacrifice the development incentives as they promote the maintenance aspect.

An example of a development oriented program is Japan's which has the objective of stimulating rice production. Increasingly greater subsidies are given to more marginal farmers, thereby encouraging their farming activities to take place.

Another example of a development oriented program are the crop credit insurance programs of Latin America, with which the author is associated and which protect the farmers' access to credit.

An example of a maintenance oriented program is Sweden. There many programs already exist to stimulate agriculture and keep farmers productive even after large losses have occurred. For example, emergency loans are available as needed. Crop insurance is seen as a mechanism for providing equity between urban and rural workers. It prevents rural income from falling below urban incomes when there are widespread losses. The area yield loss adjustment system places all farmers in a area into one group; measures their average income; and pays them all at the same per hectare rate when losses occur.

Farmers who suffer greater than average losses are not compensated additionally. This residual risk retained by the farmer would act as a disincentive to the adoption of more productive but more risky technologies. However, other programs such as emergency loans protect against some of this risk.

So, the area yield program is used because it maintains average salaries well enough while saving administrative expenses. To our knowledge, the question of which would be cheaper, in Sweden or elsewhere, a development oriented program alone, or a maintenance oriented crop insurance system plus a disaster relief program has never been analyzed.

Which of these two approaches would be best for any country? . At least two factors impinge on the choice of programs. The first is the degree to which agriculture is presently or potentially viable. The second is the degree to which traditional risk bearing institutions of farmers are capitalized or decapitalized. Examples of traditional risk bearing institutions are extended families, livestock reserves and informal lenders. The financial health of these institutions is highly covariant with the wealth of the country as a whole.

In the figure below, we present our estimation of appropriate program choices for different situations.

Figure 1: Appropriate Situations for Different Risk Management Options

		FARMERS ARE, OR CAN BE:	
		Viable	Non-Viable
TRADITIONAL RISK BEARING INSTITUTIONS ARE:	Well Capitalized	(A) DOCI	(C) MOCI or AHRP
	Poorly Capitalized	(B) DOCI with some MOCI features	(D) AHRP

DOCI= Development oriented crop insurance
MOCI= Maintenance oriented crop insurance
AHRP= Ad hoc relief program

Notice that in two cells, C and D, we recommend an ad hoc relief program. This is because it is cheaper and does not commit the government to provide resources which it might not have. In cell C, for example, poorer nations might opt for ad hoc relief while more affluent nations would tend to organize maintenance oriented programs.

An example of the mixture recommended in cell B is a crop credit insurance that pays off a farmer's loan and, in addition, makes a cash payment to the farmer.

IV. Financing Crop Insurance

A. Kinds of Subsidy

The involvement of government in crop insurance causes the question of subsidies to be raised automatically. There are two kinds of subsidies to be considered here. The first is a temporal subsidy caused by the sporadic occurrence of large losses. When this happens, funds are taken from the government to be repaid during ensuing good years. This is an inescapable and quite acceptable subsidy.

The second is a permanent and general subsidy. Here the government decides to charge less than the actuarially determined premium each year and to make up the difference itself.

B. Temporal Subsidies

The development of the US program provides some insight into these. Let us examine the temporal first. The United States government itself reinsures FCIC's losses. It is felt that the government's finances are adequate to meet any reasonable challenge.

This, however, is not the case for most developing nations. Big losses could mean serious problems. Basically there are four options that a smaller nation could consider. First, it could place funds in a reserve for the insurer. There are two problems with this. First, the necessary cash might not be available. Second, the funds would be sitting idly, and they might be urgently needed elsewhere.

To free these funds, a nation might choose a second option and capitalize its insurer on a pay-as-you-go basis. That is, the government lends its "full faith and credit" to the insurer. When there are losses, the insurer draws down the needed funds from the national treasury. This has the potential of disrupting the development plans of the government as there may not be a budget left for planned programs.

The third option is clear outgrowth of the second, that is, to default on the promise to pay. We doubt that this option is ever deliberately chosen, but it is the inadvertent result of the second option which has destroyed otherwise well designed programs.

The final option is reinsurance, or the insuring of the crop insurer with another insurance company. The main problem of reinsurance is that it must be paid for with hard currencies. The benefit is that, in bad years, the nation's economy is bolstered by cash flows from abroad. Reinsurance will be discussed at greater length in section VII.

C. General and Permanent Subsidies

Let us now turn our attention to the second subsidy presented: the permanent and general subsidy. From its beginning, FCIC has

received a subsidy approximately equal to its administrative expenses. Why? The arguments presented include these:

- The program was experimental and therefore administrative costs would be somewhat higher.
- The program was experimental and the underlying total cost of the program was unknown. A subsidy protected the farmers from overpaying.
- Government often acts to keep farm prices low. A subsidy here provides some relief.
- Farmers, like all insureds, are resistant to paying premiums. A subsidy promotes sales.
- The farmers are saving the government money by buying insurance, paying for their own losses and not depending on disaster relief.
- The government runs the program and controls the level of administrative costs. Farmers can not shop elsewhere.

All of these arguments would seem to be valid for developing nations also. Indeed, it is interesting to note that we know of no all risk programs that are not subsidized at least to the extent of administrative costs.

Many countries subsidize more than administrative expenses. They cite the following reasons:

- Insurance promotes development from which all segments of society benefit.
- Subsidy on insurance is a subsidy on an output. This is both more effective and efficient than a subsidy on an input such as a credit or fertilizer.
- The subsidy on this output (ie-quantity) relieves pressure, to a certain degree, for increasing the value of the other output factor (ie-price).
- A subsidy which makes the insurance affordable to poorer farmers promotes income distribution.

It is interesting to note that a proposed law is now before the US Congress which would increase the subsidy given FCIC by an amount equal to about 30% of the losses. When added to the administrative expense subsidy, it appears that about one half of the US crop insurance cost will be borne by government.

D. Small Farmer Bias

The last reason presented above, income redistribution, merits an examination. Many crop insurance analysts, in the US

and elsewhere, recommend measures to promote equity. For example, the law now before Congress would limit the maximum amount of subsidized insurance a farmer could buy. Presumably, this will make small farmers more competitive. They are focusing on the subsidy itself as an income redistribution and although this analysis is technically correct, it suffers from not taking into consideration another factor with even more significant income redistribution power. This is, what we call, the small entrepreneur bias, or in this case, the small farmer bias of insurance.

The small farmer bias effect is demonstrated in the appendix. It argues that insurance, by its very nature helps the small proportionately more than the large. Although they are emotionally important, direct redistribution efforts such as limits to subsidies or level premiums rates are probably less important than the small farmer bias effect.

E. Financing and Objectives

The final observation that we will make is about the relationship between the availability of subsidies and the purpose of a program. Any request by or for farmers for a subsidy to an insurance program designed to benefit them will compete with similar requests from other segments of society. A request to support a maintenance oriented program will have a difficult time defeating the why-not-give-US-the subsidy argument of politically more powerful groups such as urban consumers.

In fact, the maintenance oriented program might be at a disadvantage to an ad hoc relief program, which has two advantages. First, no costly administrative machinery has to be created and funded. Second, no permanent nor contractual obligations are created which will bind government in the future.

The development oriented program, on the other hand, has a very strong argument supporting its plea for funds. It stimulates growth in the economy; growth which benefits all classes. Although the amount of growth has never been empirically measured, to the best of our knowledge, there is a reasonable probability that the growth significantly exceeds the costs.

An additional argument, subsidies on input vs. output, provides the promise of a more efficient way of using funds already flowing into the sector.

It would seem, therefore, that a development oriented program would have a better chance of capturing needed subsidies. And, since viability is defined as income matching outgo, then the development oriented program would seem to have the greater chance of being viable.

V. Program Features

A. Sales

The purchase of crop insurance in the United States is voluntary. This feature recognizes the great variety in financial structure of American farms as well as farmers' renowned dislike of obligatory programs. In addition, since the present program is subsidized, there is a feeling that the government shouldn't be spending more money to sell what it already gives away.

If the bill which is presently before Congress passes, the situation will change. Disaster relief programs will be eliminated on a county-by-county and crop-by-crop basis as the insurance is introduced. It is possible that during the transition large numbers of farmers may fail to purchase insurance. The occurrence of an extensive loss at this time would have a deleterious effect on the economy. To prevent that, FCIC will market its insurance aggressively using traditional sources (eg. Department employees) as well as beginning to use commissioned agents from the private sector.

Any voluntary sales program such as this opens the insurer to problems of adverse selection. FCIC controls for this by having a professional underwriting staff and by having perfected its rate-making process.

A developing country without FCIC's forty plus years of experience may find this difficult to do. One solution is to imitate the crop credit insurers and institute semi-obligatory purchase requirements. In this case, credit and insurance are linked. Credit can not be obtained if insurance is not purchased. This association with the credit group overcomes the adverse selection problem, reduces sales costs and identifies farmers who are prepared to use modern inputs.

Finally, we will mention that FCIC's advertisements stress the positive, a priori impacts of insurance on the farm. That is, the farm as a financial enterprise is able to operate more effectively when farmers are not concerned about risk. One of the more popular FCIC slogans is... "Crop insurance: it pays off in good years and bad."

B. Level of Guarantee

FCIC does not guarantee 100% of a crop's potential value. Rather, the use of deductibles and conservative conversion prices, used for converting the commodity guarantee (eg. bushels) into money equivalent, keep the guarantee under 75%, usually closer to 50%. This is done for several reason.

- There is a zone of frequent variation; small losses that occur often.

- Farmers can handle small losses well enough; it is the big losses that hurt.
- Small losses are just as expensive as big ones to adjust.
- The farmer should have a residual financial stake in his crop to ensure that he tries as hard as possible to bring it in.

FCIC's guarantee is not only kept down, it is also kept up. What we mean, is that the foregoing are reasons for keeping guarantee levels below approximately 75%. But, there are reasons for keeping available maximum coverage above approximately 50%.

- For marginal farmers, variable production costs are the minimum that need to be guaranteed.
- For hypermarginal farmers, total (ie.-variable plus fixed) costs need to be insured.
- In the case of crop credit insurance the loan needs to be covered.

A country that decided to have a mixed-development and maintenance oriented program would want to set the guarantee somewhat higher than the loan or total costs amount. Remember, however, that it is not particularly efficient to set the level so high that one is operating in the frequent loss zone. In general, a maximum of 75% to 80% is recognized as the limit.

C. Rate Making

The rate making system employed by FCIC reflects a policy decision to promote both equity and development. Rates are set on the basis of crops and areas. Counties may be split into sub-zones if climate and soil require. Rates are designed so that there is considerable sharing of losses within the county, less so within the state and even less across the country.

In addition, individual's rates are adjusted up or down each year to reflect their own personal experience. Good farmers tend to pay less than careless farmers. Thus, the FCIC can be thought of as having a concentric rating system. A farmer's premium will reflect first, his own experience; then his neighborhood's experience, then the state's and finally, the nation. The system is considered to be both fair and effective.

We stated above that it was a development oriented system. In part, this is because the rates charged reflect the true risk level for each crop and area. Thus, premium rates are a source of valid information about the profitability of any undertaking. The insertion of accurate cost information into the decision making

aparatus tends to promote the optimization of total social welfare.

Another approach to rate making that might be considered is to level all premiums. That is, to have everyone pay the same rate, regardless of the situation in which they operate. This has two benefits. The first is that there is immediate redistribution of wealth; the second is that a sophisticated rate making apparatus is not needed.

This approach was not used in the US because, in part, of the tradition of individualism that exists and, in part, of the recognition that the small entrepreneur bias effect is a more potent income redistributor than level premium rates. But, the key reason for rejecting this approach was that it would not work in conjunction with a voluntary sales program. There would be severe adverse selection. Those from whom the redistributor was taking funds would tend to abstain. Those remaining in the program would have higher than anticipated losses and rates would have to increase. Once this happened, another group of farmers would drop out. The results are as disastrous as they are predictable.

The lesson here is that any attempt to achieve a direct redistribution of wealth by altering premium rates or benefits will fail unless the insurance is effectively obligatory.

D. Loss Adjustment

The US loss adjustment system is based on a measurement of the individual's results. Again, this was necessitated by the voluntary sales feature, tradition and the completion in the field.

The drawback of an individual yield system is that it is costly. The benefits are that it is accurate, permits a more complete removal of risk than the area yield method, rewards good farmers and permits an accurate allocation of production costs. A development oriented program is more effective when using this approach as we saw in section III.

To date, no adequate studies have been made comparing the costs and benefits in the total agriculture sector of the two loss adjustments. When total system costs are added in and the decrease benefits subtracted, the apparent cost advantage of area yield may vanish altogether.

We should like to propose here an experiment in funding the individual loss adjustment and insurance management expenses. Since, with an individual system, it is necessary for an insurance representative to visit every farm at the beginning of the year, some farms on a random basis during the year and all farmers who report losses, and since the insurance organization is concerned that farmers use a certain standard and minimum technology, then we propose, that the crop insurance function be given to the extension agency and that extension agency be converted into an

insurer which will do extension only as a corollary to its new main function.

This would have several effects:

- Capital costs of starting the insurer would be decreased.
- A new government bureaucracy would not be created.
- More farmers might be reached with better quality information.

As stated, this is a suggestion for an experiment. Some of the old extension functions should be kept. Perhaps, the "wholesale" and high level (ie-large farm service) extension program. This approach might be able to improve the generally poor job that is being done around the world in reaching small farmers.

Let us share two lessons learned from FCIC's experience about who should do adjustment. First, individuals who represent farmers' or bankers' interests must be avoided since they have conflicting interests in the matter. In the US, loss adjustment rate making, and the establishment of coverage levels were affected strongly by farmer groups until 1953. It is generally agreed that FCIC did not approach actuarial soundness until after 1953.

The second thing that can be said about adjustment is that the adjustor must be an employee of this insurer. It is not possible to establish uniform standards and enforce their application when the people imposing them participate in a reward structure that, at best, ignores those standards and, at worst, is contrary to them.

For example, in the pre-1953 FCIC experience, loss adjustment guarantee levels and rate making were affected by politically oriented committees of farmers in each county. Loyalty to the insurer's standards may have been subjugated to the loyalty to the political party's needs. Those needs may have required paying losses which need not have been paid.

This dominance of political over economic principles can be called the socio/political hazard of government insurance. Its unchecked presence makes international cooperation such as risk sharing and reinsurance impossible.

E. Allied Operations

By allied operations we refer to those programs of the agriculture sector which might be linked to crop insurance. These include, for example, soil conservation, price management and commodity storage. US policy has been fairly consistent in recent years: to avoid linking. However, in the early days of FCIC's existence there was some experience with in-kind transactions and grain storage.

Operations in-kind were permitted in FCIC's first few years. Farmers could deliver so many bushels of wheat to a warehouse or cash to the insurance office to pay for their insurance premiums. If they suffered losses, they could be paid in cash or kind. Some reasons for this approach are these.

- Farmers short of cash could pay with grain.
- Farmers could pay at harvest time.
- Farmers would reap the benefit of price fluctuations.
- The nation hoped to have self-regulated, ever normal graineries from which adequate supplies would flow to consumers.

The program was abandoned after a few years. It failed to match expectation. The last two reasons are a good indication of why. Farmers didn't reap significant profits through speculation and the graineries were not ever normal. Specifically:

- The program was costly. Grain had to be stored, transported, rotated and spoilage losses absorbed.
- The program was technically difficult. Managing a grain storage program was a considerable burden for the insurer's officers.
- The program duplicated existing government and private sector facilities.
- The program created uncertainty for management which never knew if it would have to pay-off in cash or kind.
- Storage is a charged political question. Should stocks be held to drive up prices thus favoring farmers or released to favor consumers?
- The program provided one more thing for farmers to dislike about the insurance.
- Farmers were no better speculators with the grain stored here than stored and sold elsewhere (actually it was often in the same place).
- The amount of grain stored was small. That is, it corresponded only to the insurance premium. It was considered more of a nuisance than it was worth.
- Not all crops could be stored.

Our good friend and colleague, Professor Toyoji Yamauchi of the University of Osaka Prefecture points out one benefit that is relevant to conditions today in developing countries.

If losses are of a general nature, that is, covering a large area, then national production will be down and prices up. Farmers will receive, under the cash system, a fixed money amount which will buy a decreased quantity of food. In-kind operations would guarantee a level flow of commodities.

Dr. Yamauchi is right, of course, but the litany of problems cited above make us reluctant to open our arms once again to in-kind. Unkind? No. Let us suggest another solution: reinsurance. With a reinsurance treaty that paid benefits when there were large losses of the sort described, there would be significant inflows of foreign exchange. This could be used to purchase cheap food commodities on the international market. The food would then be sold to the farmers who would have been paid off in national currency.

VI. Private Sector Involvement

The bill now before the US Congress has provisions in it which will reverse historic patterns. Specifically, the new law will permit FCIC to reinsure private companies that wish to provide all-risk crop insurance to American farmers. In addition, farmers will receive the same subsidy (administrative expenses plus, perhaps, 30% of losses) whether they purchase from FCIC or private companies.

Although it appears to be the intent of the present administration to expand FCIC's operations so that it becomes an aggressive marketer of crop insurance, some analysts are saying that if the private sector is given reinsurance and the same subsidy, that it will compete successfully with FCIC. According to their scenario, in a few years FCIC will become a reinsurance agency exclusively, financing and auditing the private sector. They point to Japan which has operated in this manner successfully for over 40 years. They also claim that a successful US experiment in this area would be a strong incentive to countries with crop-hail programs to make similar changes.

A government/private sector cooperative insurance effort has interesting aspects. Developing nations might want to consider this model for the following reasons:

- Existing insurance expertise in the private sector can be utilized. The government does not start from the beginning with untrained managers.
- The participation of private insurers who are not eager to pay unwarranted claims counteracts the socio/political hazard.
- The participation of many private groups in the program's management counteracts the usual tendency towards centralization that accompanies government services. This creates a nurturing environment for democratic evolution.

There are problems associated with this approach which governments will have to be careful to control. They are:

- Skimming, or the insuring of only the best clients. Governments will have to set and enforce penetration standards.
- False claims. Governments will need a spot check loss adjustment capacity operating to make sure that the insurers do not "milk" the reinsurer.

The government/private sector cooperation model seems very appealing. It has worked in Japan and South Africa and failed in Mexico. It is likely to be tested in the US. Like the merger-with-the-extension-service model, it deserves to be tested.

VII. Reinsurance

FCIC does not purchase reinsurance, this is the result of consistent US government policy. Basically, the government feels that it can handle loss fluctuations without additional support.

While this may be true for the United States, it is not true for many smaller nations. Mauritius, South Africa, Puerto Rico, Israel, Rhodesia-Zimbabwe and Costa Rica all use or have used reinsurance.

Reinsurance is of interest to crop insurers as a means of financing exceptionally heavy losses. It is more efficient, that is, less expensive, than either tying up funds in idle reserve or permitting the nation's budget and development plans to be disrupted.

An example of the kind of reinsurance that seems to make most sense for national programs is a stop loss policy with a co-insurance clause. This is demonstrated in figure number 3.

The reinsurance policy demonstrated in figure number 3 has three features:

- The insurer pays all losses up to an amount equal to 100% of that year's premium.
- The reinsurer pays 80% of all losses between 100% and 600%. This means that it will pay up to 400% of the year's premium.
- The insurer pays 20% of all losses between 100% and 600%. This is to assure the reinsurer that the insurer will not pay claims unnecessarily.
- The insurer pays all losses beyond 600%. Of course, the insurer could purchase another layer of reinsurance that begins at 601% and indeed, this is frequently done.

It is recommended that the insurer retain the base (ie.-first 100% or whatever) for two reasons:

- It should be capable of covering these losses without undue hardship.
- By retaining these "normal" losses it saves the premium which must generally be paid in convertible currencies and saves on reinsurer profit and administrative margins.

It is now proper to ask whether or not reinsurance is available from the normal commercial channels. We have surveyed the London, Continental and American markets and can report the reinsurance is available, with certain restrictions.

These conditions are:

- The program be in existence at least 5 years so that minimal data be available for the establishing of rates.

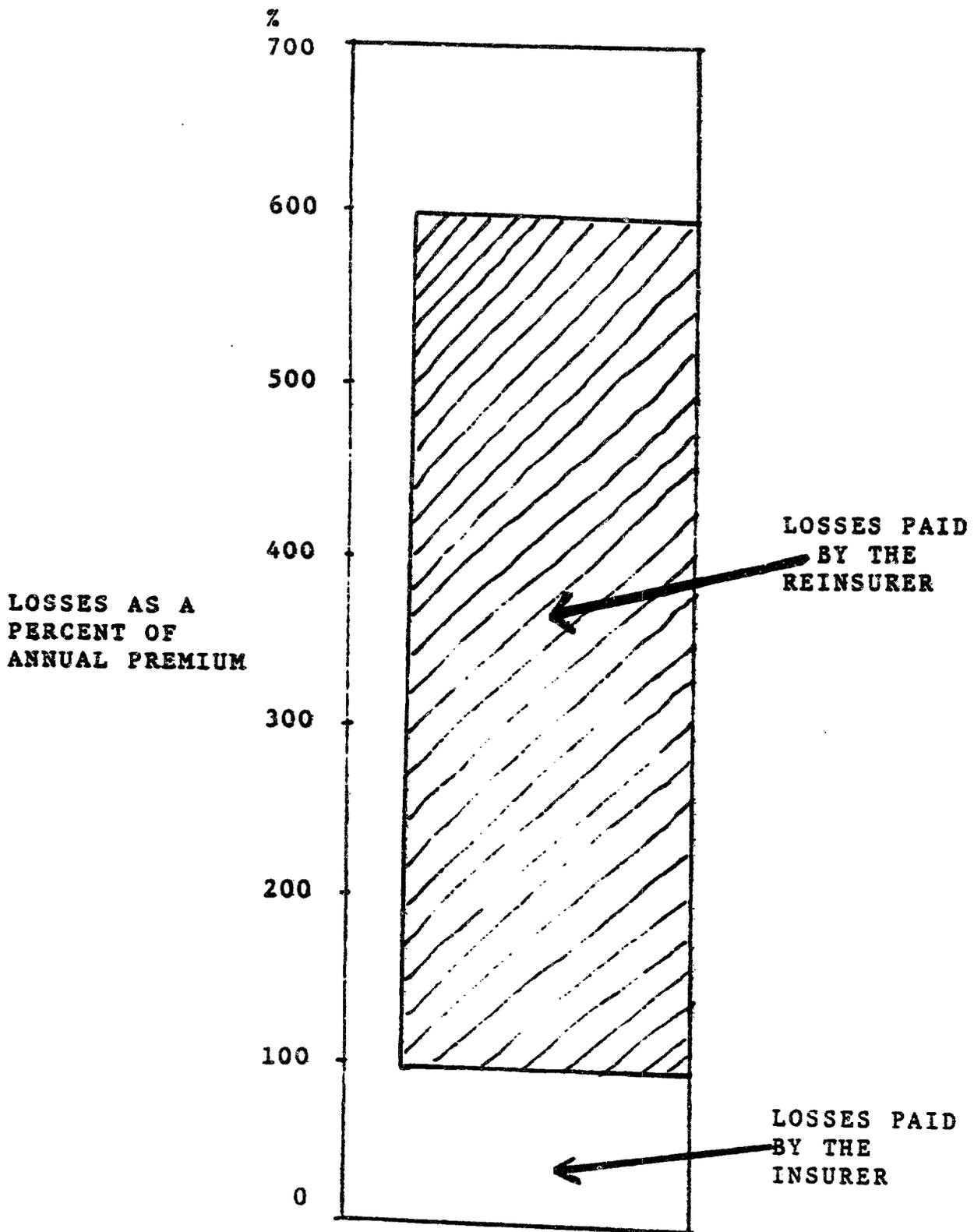


Figure: Hypothetical Reinsurance Treaty for a Crop Insurer (Stop Loss with a co-insurance Corridor)

- Competent personnel be in charge of the program.
- The socio/political hazard be controlled.

The 5 year minimum is not really a problem. Any program will have to go through a slow, initial growth phase. It is not advisable in any case that the insurer have more business written during this period than it can afford to lose because management will be preoccupied with organization, design and growth issues. Crop insurance programs must go through a 4 stage genesis. Reinsurance is really only needed for the last.

- Stage 1: Design; 1 year
- Stage 2: Pilot; 3-4 years.
- Stage 3: Implementation; 3-10 years.
- Stage 4: Operational; remainder.

The socio/political hazard is not an insurmountable problem. Self-restraint, conservativeness and integrity on the part of government leaders is important. Structural features such as the government/private sector cooperation model are also effective. Finally, the reinsurer will have to accept some responsibility itself and spot check the insurer's operations from time to time.

In addition to traditional reinsurers, national crop insurers should approach the international finance organization (IFO) such as World Bank and the Asian Development Bank. Although these organizations have no experience with reinsurance, they do have the prime requisite for beginning: capital.

The IFOs are aware that they could reinsure but are uncertain if they should. They are mainly concerned about two issues.

- If reinsurance is available from the commercial market, why should they become involved.
- The political relationships that exist between nations and IFOs violate the arm's-distance relationship that normally prevails between insurer and reinsurer. IFOs are concerned that political pressures may be used to force payment of unwarranted claims.

An alternative to reinsurance that may be applicable in the case of IFOs is the contingent loan. This is a loan that is agreed upon beforehand but is not granted until the occurrence of some predefined contingency. The loan must be paid back like any other loan. One difference between a contingent loan and reinsurance is the timing of payments for the services. With reinsurance, the cost is borne by users before and after the loss. With a contingent loan only post-loss users only pay for these costs.

The appeal of contingent loans to the IFOs is that the contractual repayment feature will minimize the tendency of government to use them unnecessarily.

APPENDIX

Risk, Uncertainty, Insurance and Individual Decision Making

The effect of insurance on risk and uncertainty and, thus, on individual farmers' decision making behavior is important to the arguments presented in the paper. An examination of this relationship is presented here.

A. Risk

Risk refers to the probability of experiencing some outcome which is less than desired. There are two quantifiable aspects of risk that are particularly useful for understanding decision making behavior. The first is the expected or average, value of risk. The expected value of risk can be represented as follows:

$$E(R) = \sum_{i=1}^n P_i X_i$$

where:

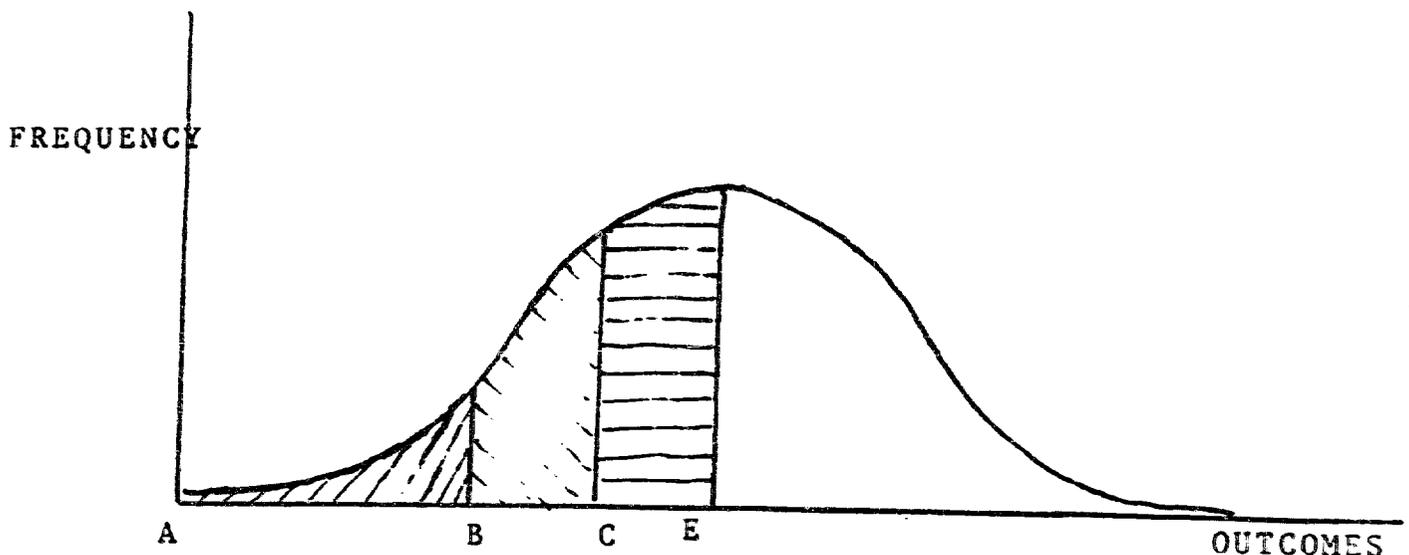
$E(R)$ = expected value of risks.

P_i = probability of occurrence of the i^{th} outcome.

X_i = value of the i^{th} outcome.

The second aspect is the absolute risk constraint. This refers to the constraining capacity of certain large, although infrequently occurring losses. The size and frequency that define a large magnitude loss as being constraining are not constants. Rather they vary from person to person and situation to situation. Common sense indicates that individuals with greater reserves of wealth are able to withstand larger losses than individuals with fewer reserves. These concepts are illustrated in figure A-1.

FigureA-1: Risk



- E =Expected outcome
- A-E =Total risk zone
- C-E =Risk carrying capacity of small farmer
- C =Catastrophic risk limit for small farmer
- B-E =Risk carrying capacity of large farmer
- B =Catastrophic risk limit for large farmer

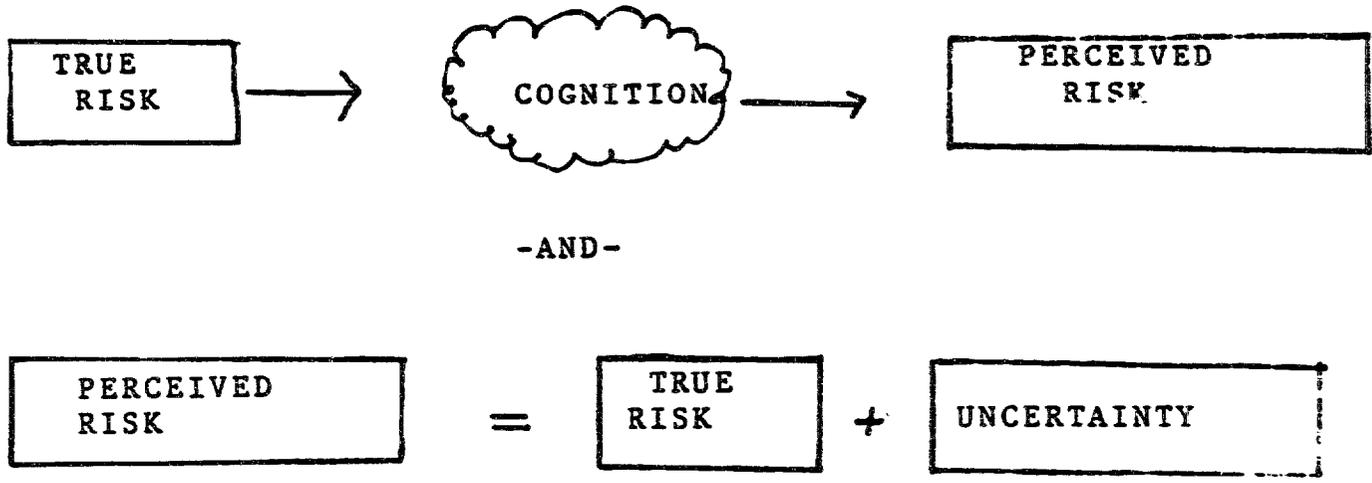
The expected value of risk is represented by the shaded area under the curve. Constraining absolute risk values are shown by the areas under the curve from A to B for larger farmers and from A to C for smaller farmers.

Note also that the compliments of the area A-B and A-C can be defined as the risk carrying capacity of these individuals. That is, the small farmer is able to accept the risk represented by the area under the curve from C to E. The larger farmer can accept the risk from B to E.

B. Uncertainty

Having defined risk, let us now turn to uncertainty, which is the error that the individual makes in estimating risk. If we assume that there is some true risk associated with every event, then we can demonstrate uncertainty graphically as follows as shown in figure A-2.

Figure No. A-2: Uncertainty



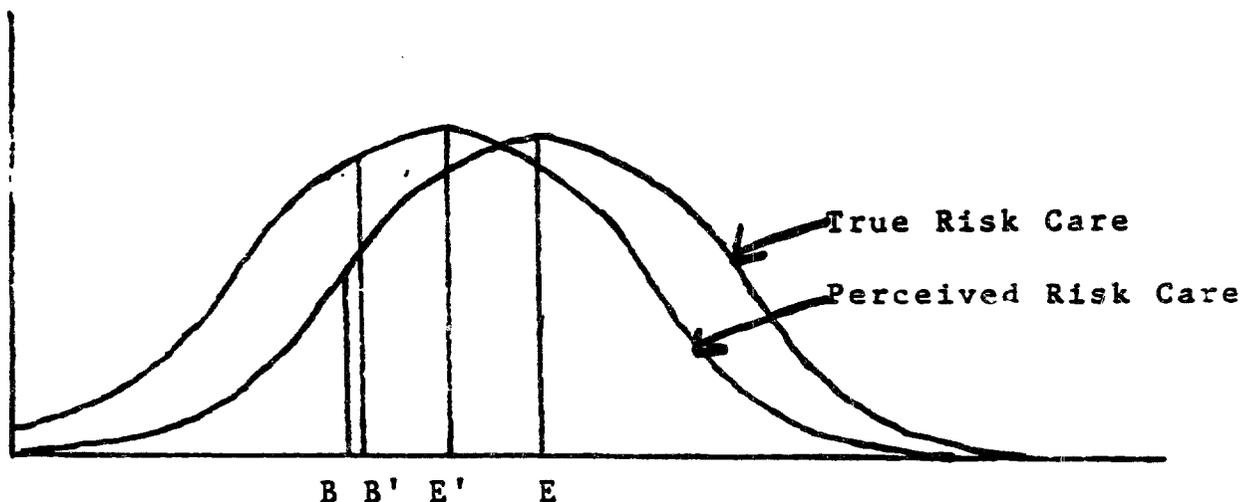
Except for fairly simple and trivial cases, such as the flipping of coins, it is not possible to know exactly what is the true risk associated with any event. Our estimates must be filtered through the human cognitive process and must be based on incomplete data. An error is created, and we shall call this error uncertainty.

Uncertainty can be either positive or negative. If it is negative, that is, if it causes perceived risk to be less than true risk, it will have the effect of encouraging farmers to take chances when they should not. The effect of negative uncertainty on decision making is self-correcting and not of interest to our discussion.

The affect of positive uncertainty, which we shall simply call uncertainty from now on, is to make options seem less desirable to the farmer and to discourage him from using them.

The way in which uncertainty distorts the evaluation of risk is further illustrated in figure A-3.

Figure A-3: Distortion of Risk Evaluation by Uncertainty



E = Expected outcome; true risk case

E' = Expected outcome; perceived risk case

B = Limit of risk carrying capacity zone (B-E); true risk case

B' = Limit of risk carrying capacity zone (B'-E');perceived ris

From figure three, we can readily see that uncertainty causes a decrease in the evaluation of the expected outcome of an event and an increase in the location of the absolute risk constraint.

C. Average cost effect

Having defined the terms true risk, perceived risk and uncertainty, we may proceed to a discussion of the effect of insurance on farmers' decision making. Insurance affects the farmers' decision making in two ways: through the average cost effect and through the absolute value effect.

Let us consider the former: the average cost effect. When the farmer makes a decision to sow or not to sow certain crops with certain technologies, he, at least implicitly, calculates expected costs and income and proceeds if the proposition promises a profit. The cost side includes an allocation for perceived total risk.

Table No. A-1 demonstrates this process with hypothetical figures for an hypothetical crop or technology option. The figures for case No. 1 were arbitrarily determined. Those for the other two cases were derived from the first.

Table No. A-1: Effect of Insurance on a Risk & Uncertainty Costs

Expected Costs	Case No. 1: Not insured	Case No, 2: Insured	Case No. 3: Insured with a subsidy
Average Production costs	80	80	80
Perceived risk	20	0	0
True risk	(10)	(0)	(0)
Uncertainty	(10)	(0)	(0)
Insurance premium	0	15*	5**
Total	100	95	85
Expected profit	99	99	99
Expected Net Profit (loss)	(1)	4	14

Let us examine case number 1, the without insurance case. The farmer expects to have production costs of 80. He also perceives the riskiness of this venture to be 20. This perceived risk is composed of 10 for true risk and 10 for uncertainty. Total expected costs, therefore, are 100. This will produce a loss of 1, so the farmer will reject this option, assuming others are available.

In case number 2, the farmer is sold an insurance policy that guarantees a yield of 99. The policy costs 15. The figure 15 covers true risk associated losses of 10 plus administrative costs. It is not necessary to charge a premium to cover uncertainty losses, because these do not occur. The only loss that corresponds to uncertainty is opportunity loss.

The accounting in case number 2 is now: 80 for production costs

as before, 15 for the insurance premiums and nothing for perceived risk which has been transferred to the insurer. Total expected costs are now 95, which leaves a profit of four. Our farmer can now adopt this option, assuming he has none better available.

The third case is a linear transformation of the second. A subsidy of 10 has been given so an insurance premium of only 5 will be charged. Profits are correspondingly larger and the option is now even more attractive. Note that a differential application of a subsidy could be used to stimulate the use of desired technologies. Some conclusions that can be drawn from this examination are these:

- Uncertainty is the degree of distortion in the measurement of true risk.
- Uncertainty provides a margin to cover insurance administrative expenses.
- If uncertainty is greater than insurance administration costs, total perceived costs will be reduced and expected profits increased.
- A premium subsidy provides an additional and linear increase in the expected profit of the insured activity.

D. Absolute Value Constraint

Now let us consider the second effect; the management of catastrophic risk. Unlike the previous, average cost, effect this operates on relationship between the absolute value of the risk and the farmer's absolute reserves. We are not concerned with the average profit over many years, but rather with the timing of a loss large enough to bankrupt the farmer.

If that loss occurs before he has been able to build up reserves, he will be driven out of business. Prudence requires that the farmer not exploit profitable opportunities which also involves large and even infrequent losses. The effect of this is that the opportunities for production that would benefit the individual and society are lost.

As suggested above, the burden of this constraint falls unequally on individuals; in inverse proportion to their reserves. Table A-2 demonstrates the nature of the absolute value constraint.

Table No. A-2: The effect of absolute value constraint on crop and technology options which wealthy and poor farmers can consider.

Crop Options	Expected Net Income Per Unit	Catastrophic Loss (Freq.=5%)	Option Viable for		Opportunity Loss *
			Wealthy Farmer (Cons.= -500)	Poor Farmer (Cons. = -200)	
A	1000	-175	Yes	Yes	1500
B	2000	-400	Yes	No	500
C	2500	-550	No	No	---

*Opportunity Loss = Expected net income of option C less that of the option actually chosen.

Table 2 assumes that there are three different crop options available to wealthy and poor farmers. The average or expected income from the three options are 1000, 2000, and 2500 per hectare. If we were using only the expected profit rule, we would already have enough information to choose option C.

Yet, this is not the case for we have hypothesized that our wealthy farmer is willing to accept losses of up to 500 and our poor farmer losses up to 200. We have further assumed for purposes of simplification that their frequency constraints are the same, say 5%, and need not be taken into consideration hereafter.

Finally each of the options have been assigned a catastrophic loss that occurs with the given frequency. We can then see that option A and B do not violate the wealthy farmer's constraint and that he, by subsequently applying the expected profit rule will choose option B over A. For the poor farmer however, both option B and C violate his constraint. A is acceptable and he will choose it as there is no other.

The last column of table A-2 points out that the wealthy farmer suffers an opportunity loss of 500 by choosing B instead of C. For the poor farmer, choosing A involves an opportunity loss of 1500.

The implication of this is that the disincentive of risk affects most severely farmers whose capitalization is marginal. These are, among other, our poor and small farmers.

The corollary of this is the small entrepreneur or small farmer bias of insurance. If insurance is made available to both wealthy and poor farmers, they would tend to similar production levels (option C, in this case) and the poor farmers would experience

greater absolute and relative increases in their incomes. In this example, poor farmers could increase their income by 1500, or 150%. Wealthy farmers would only increase income by 500, or 25%.

One of the attractive features of the insurance as an income redistributor is that it is non-confiscatory. Redistribution takes place as the result of poorer farmers being able to accept challenges which he previously could not. Nothing is taken from the wealthier farmer, the poorer farmers are just made more produ

E. Conclusion

In conclusion, the effects of the insurance on the farmer are two: firstly, the insurance (and the subsidy) tend to increase the net income, real and perceived, from the insured crop and thus promotes the production of that crop. Second, when the insurance removes catastrophic risk it removes the obstacle which previously excluded certain otherwise viable options from consideration.

It is important to remember that insurance will have a greater impact when it is directed toward the smaller farmer because any level of risk will have a greater impact on him than on the larger farmer.

Finally, the true cost of both catastrophic risk and uncertainty is the value of the opportunity loss of foregone production. Both society and the farmer suffer on this account.

EXPLOITING CROP-CREDIT INSURANCE
FOR DEVELOPMENT PURPOSES IN
DEVELOPING NATIONS

Nelson Maurice*

PRESENTED AT
THE FERTILIZER ASSOCIATION OF INDIA/
INTERNATIONAL FERTILIZER DEVELOPMENT CENTER SEMINAR

DECEMBER, 1977**

ABSTRACT

Crop-credit insurance, a linking of crop and credit insurances, provides protection for farmer and banker both, thereby stimulating agricultural production and providing a broad range of other benefits. It is a new kind of insurance, a development adapted especially to the needs of less developed countries. Successful programs exist in less developed countries and can serve as effective models for government officials wishing to exploit this development potential for their own nations.

Economic analysis is lacking from the literature, but the analysis presented here indicates that crop-credit insurance is a more efficient means of stimulating agricultural development than several alternative policies. Government subsidies are required and are justified on the basis of economic viability.

The insurance plan itself and the needs for reinsurance are also discussed. Finally, the role of cooperatives and private sector groups is analyzed.

*Nelson Maurice is an agricultural insurance consultant to the US Agency for International Development. Opinions expressed here are his and not USAID's.

**Changes have been incorporated in this paper through July, 1978.

D

**EXPLOTACION DEL SEGURO AGROREDITICIO
CON FINES DE DESARROLLO EN LOS PAISES
EN VIAS DE DESARROLLO**

ABSTRACTO

El seguro agrocrediticio, una vinculación de los seguros para cultivos y créditos, ofrece protección tanto para el agricultor como para el banquero, con lo cual estimula la producción agrícola a la vez que brinda una amplia gama de otros beneficios. Constituye un nuevo tipo de seguro, una innovación adaptada especialmente a las necesidades de los países menos desarrollados. En la actualidad existen en varios países menos desarrollados programas que se desenvuelven con éxito y que pueden servir de modelos eficaces para funcionarios gubernamentales que en beneficio de sus propios países desean explotar este potencial para el desarrollo.

Los trabajos escritos sobre el tema carecen de análisis económicos, pero en el análisis que aquí se presenta se indica que el seguro agrocrediticio constituye un medio más eficiente para estimular al desarrollo agrícola que otras varias políticas opcionales. Los subsidios gubernamentales se requieren y justifican sobre la base de la viabilidad económica.

También se examinan el plan de seguros propiamente dicho y las necesidades de reaseguro. Finalmente, se ofrece un análisis del papel que les incumbe a las cooperativas y a diversos grupos del sector privado.

**ASSURANCE AGROREDITIVE
AUX FINS DE DEVELOPPEMENT DANS
LES PAYS EN DEVELOPPEMENT**

RESUME

L'assurance agrocreditice, combinaison d'assurance des récoltes et des crédits, apporte une protection tant au cultivateur qu'au banquier, stimulant de ce fait la production agricole et assurant une large gamme d'autres avantages. Il s'agit d'un nouveau genre d'assurance, un concept adapté spécialement aux besoins des pays moins développés. Des programmes satisfaisants existent dans les pays moins développés et peuvent servir de modèles efficaces aux fonctionnaires désirant exploiter ce potentiel de développement pour leurs propres pays.

L'analyse économique manque de documentation, mais l'analyse ici donnée démontre que l'assurance crédit contre les mauvaises récoltes constitue un moyen plus efficace de stimuler le développement agricole que certaines autres politiques possibles. Des subventions du gouvernement sont nécessaires, et justifiées sur la base de la viabilité économique.

Le plan d'assurance lui-même et les besoins pour son renouvellement sont également étudiés. Enfin, le rôle des coopératives et des groupes du secteur privé fait l'objet d'une analyse.

APROVEITAMENTO DO SEGURO AGRO-CREDITICIO
PARA FINS DE DESENVOLVIMENTO POR
NACOES EM DESENVOLVIMENTO

RESUMO

O seguro agro-crediticio, uma liga de seguro agricola e de crédito, oferece protecao tanto ao agricultor quanto ao banqueiro, estimulando assim a producao agricola e proporcionando uma vasta gama de outros beneficios. Trata-se de uma nova modalidade de seguro, um avanço especialmente adequado às necessidades de países em vias de desenvolvimento. Existem, em países menos desenvolvidos, programas bem sucedidos que podem servir de exemplos reais a funcionários governamentais desejosos de aproveitar este potencial de desenvolvimento em beneficio de seus próprios países.

Em material impresso não consta a análise econômica, porém a análise aqui apresentada indica que o seguro agro-crediticio é um meio mais eficiente de estimular o desenvolvimento agricola do que vários outros planos alternativos. Subsídios do governo são necessários e se justificam com base na viabilidade econômica.

O plano de seguro em si e as necessidades de resseguro são também debatidos. Finalmente é analisado o papel das cooperativas e dos grupos do sector privado.

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Exploiting Crop-credit Insurance

For Developing Purposes in

Less Developed Nations

I. INTRODUCTION*

Although the commercial and agricultural activity known generally as crop insurance has occupied the minds of men for a long time, it still remains under-exploited today. Many attempts have been made using traditional, private sector approaches to develop crop insurance. There has been success with limited risk programs in Europe, the United States and a few other countries, notably Argentina. However, most attempts by the private sector to offer all-risk insurance have failed. 1/

Governments have been operating successfully in the all-risk area since 1938 when Japan and then the United States established the first modern programs. Today, close to two dozen nations have government operated all-risk crop insurance programs. There is considerable variety in the structure and success of these programs (see Crawford).

One notable similarity, however, is that the successful programs are concentrated in the developed nations. Less developed nations have not exploited this potential resource. To date only the program in Mexico has achieved a considerable degree of success and contributed to the development of the nation. But, the degree of success achieved is remarkable. It is deliberately used to support the agricultural credit system and direct the development of the agricultural sector in accordance with government policy. In Mexico, crop-credit insurance is an integrative and facilitating tool. It facilitates the workings of other institutions and integrates them by serving as a planning focus and a policy directive tool.

Crop-credit insurance provides relief to both farmers and lenders at the same time while providing considerable leverage for promoting the development of agricultural sectors. Farmers have long demanded a system such as crop insurance to protect themselves against losses in production. Banks have desired some sort of credit insurance system to protect themselves against losses resulting from the farmers' inability to repay loans when they suffer crop losses.

This paper explores several facets of this new kind of insurance; the potential benefits, requirements, problems, alternative policies, the

The author wishes to express a debt of gratitude to Drs. P.K. Ray and Bernard Oury. Dr. Ray's classic text Agricultural Insurance is the outstanding work in this field. Dr. Oury's seminal article in 1969 first focused attention on the relationship between crop insurance and economic growth.

The only exception is the Sentraoes cooperative in South Africa which has been operating without governmental support as an all-risk crop insurer since 1970.

insurance plan itself, experience in other countries, the need for re-insurance and finally, the potential for participation of private groups such as cooperatives.

II. DEFINITIONS

A. Agricultural Insurance

Agricultural insurance includes all forms of insurance which affect agricultural activities, including crop insurance, fire insurance on farm buildings, liability insurance on animals and so forth.

B. Crop Insurance

Crop insurance includes all forms of insurance which compensate the farmer for losses of his crops.

C. Agricultural Credit Insurance

Credit insurance protects the lender when there has been a crop failure, but does not forgive the farmer his loan. The insurance company takes over the farmer's note once it pays the bank. The insurance company then, has a legal right to collect from the farmer. Commercial and export credit insurance are the models for this line (see Phelps).

D. Crop-credit Insurance

Crop-credit insurance refers to a close linking of all-risk crop insurance and the agricultural credit mechanism. Farmers are compensated for their losses, but benefits go first to cancel outstanding loans, and then the remainder is paid in cash to the farmer.

The program in Mexico is the best developed example of crop-credit insurance. They, however, refer to it as investment insurance because the insurance is limited to the maximum a farmer may borrow. This is limited to the "direct" investments in the crop (interest, premiums and rent, for example are excluded). Because of the focus on protecting both the farmer and the lender and because of the direct links to credit institutions (for sales, premium collection and benefit payment purposes), crop-credit is a superior title to crop-investment insurance.

E. Specific Risk Crop Insurance

Specific Risk Crop Insurance (or limited risk crop insurance or crop-hail insurance) protects farmers from damage to his crops resulting from certain, specified hazards. Generally, these hazards occur in a small area and at a specific time. The losses resulting from these losses are readily identified. Hail, fire and windstorm are typical examples. This limitation on hazards covered came about as a result of private insurance companies with limited capital needing to limit their exposure to losses.

F. All-risk Crop Insurance

All-risk crop insurance (or comprehensive crop insurance) does not really do what its name implies. Generally, policies state that all losses are covered except a few that are specified in the coverage clause. Universally, self-inflicted, carelessness and poor management caused losses are excluded. The main difference between all and specific risk insurance is that hazards occurring over broad areas and long and indefinite periods of time are included. These include drought, excess moisture, disease.

When integrated with an agricultural development program, the insurance can cover the appropriateness of recommended technology.

G. Loan Guarantees

Loan guarantees protect the lenders and may even allow the farmer to be forgiven. However, they are not insurance plans as premia are often not collected. When collected, they are not actuarially determined but fixed at some arbitrary figure, usually between 1% and 5%.

H. Income Maintenance Programs

Income maintenance programs are designed to prevent farmers income from falling below a certain level as a result of production or price declines. They differ from crop insurance, however, because of the absence of contingencies. There are no contractual obligation requiring the farmer to behave in any particular manner.

Crop insurance, of course, acts to maintain income. When it cancels the farmers debt it keeps his income above zero. When coverage exceeds his borrowings, the insurance provides some useable income for the farmer. Here, however, the term income maintenance is reserved for programs that do not test each individual farmers harvest yield or require him to pay premia and use specified technologies.

I. Informal Risk Management Methods

Informal risk management methods include ad hoc submissions to reality such as permitting, either deliberately or not, loan extensions, soft loans or decapitalization. They are generally unplanned measures born of desperation.

J. Traditional Risk Management Mechanisms

Traditional risk management mechanisms developed by the farmers themselves are of different classes. The technical, agricultural class includes the use of traditional seed varieties, interplanting and farming in several ecological niches. In the economic class are share cropping, buying or selling of labor and dependence on and subservience to village money lenders. In the cultural class, we find the maintenance of extended families, compadrazgo and food sharing arrangements. (See Cancian (2) for a somewhat different typology.)

Traditional risk management devices may be either relatively less or more productive and desirable than modern methods (insurance). The use of traditional seed varieties is economically less desirable than the use of appropriate high yielding varieties combined with insurance. Mixed planting techniques may be more productive than monocultural farm practices (see Berry, Bartlett).

III. POTENTIAL BENEFITS OF CROP-CREDIT INSURANCE

Although crop-credit insurance is simply designed to pay-off farmers and banks when crops fail, there are a broad range of benefits that can be derived when proper planning and integration takes place. Those benefits are presented below under six categories, those that accrue principally to all consumers, to farmers, to lenders, to the agricultural sector in general, to government, and finally to rural communities.

A. Benefit Accruing to Consumers: Effect on Production and Price

In policy terms, crop insurance is a production stimulating tool. The insurance can be thought of as an output subsidy, calling forth increased production of the insured crops. If this is done without planning, then an excess can be created which could depress prices and decrease farmers' welfare.

However, with planning this need not happen. Only those crops which the nation desires need be called forth. Japan deliberately uses its crop insurance program to pursue self-sufficiency in rice. It is now self-sufficient and frequently adjusts the premium subsidy and coverage level to keep production in balance.

stability of both
In the long run, availability and price of foodstuffs can be enhanced with the help of crop insurance.

B. Benefits Accruing to Farmers

1. Benefits as a Right

Farmers are protected as a matter of right, not by chance nor political connection nor post-loss governmental decisions. This is an important difference between a crop insurance program and relief or credit insurance programs. The importance of this is that the farmer knows for certain before he plants what his minimum incomes will be. Some of the risk of farming is contractually transferred to the insurer. With a relief or credit insurance program, the farmer's uncertainty about what and how much risk he faces is not resolved until after the loss has been sustained and program authorities solicited.

2. Utilization of Rural Labor

Under most circumstances crop-credit insurance should lead to an increased utilization of rural labor. In one computer simulation analysis, it was predicted that rural labor utilization would increase by 64% (see Nathan). Of course, the size of the absolute increase would depend on the extent of the insurance program.

The increased labor would tend to come primarily from the farm family, but some hiring of off-farm laborers would be required, even by small landholders.

The adoption of technology could result in a displacement of labor, but the type of technology appropriate for smaller farmers is not likely to displace labor.

3. Income Distribution

If the programs are directed primarily at small farmers, income distribution will be favorably affected as a result of increased income resulting from more productive agricultural technologies. To a lesser extent, the subsidies of the program by government will also affect income distribution positively.

C. Benefits Accruing to Lenders

1. Decapitalization Avoided

Agricultural lenders are protected from the steady decapitalization that results from the individual crop failures which occur each year and after the area-wide catastrophes which occur from time to time.

2. Easier Portfolio Management

The banks can concentrate their efforts on managing their portfolios and controlling bad debts resulting from perverse wilfulness and similar causes. When crop-credit insurance is in place, the pool of delinquent borrowers contains a higher proportion of nonserious farmers (NSF), those who exploit the agricultural credit mechanism for selfish and, often, non-productive purposes. Crop-credit insurance then, enhances the ability to identify and eliminate NSFs. This is necessary both to protect credit institutions and to assure that scarce resources are allocated to those who will use them best.

The bank is able to identify and keep its creditworthy customers. Usually, without insurance, lenders are faced with having to cut off borrowers who are unable to repay loans even if they are hard-working and good long term prospects. The bank may have invested a great deal to develop these farmers to the point where they were good credit risks.

3. Interest Rates and Foreclosures

The political positions of banks (and when it is the case, the governments who own them) are considerably improved. For example:

A. They do not have to foreclose on or harass delinquent farmers as frequently.

B. They can accept customers whom they previously had to reject.

Governments can take advantage of the introduction of subsidized insurance to remove the tow ceilings imposed on interest rates. Low interest rates have been a major obstacle to the establishment of effective rural credit systems since they act as a disincentive to private sector participation. When that happens, government must supply all rural credit from its own scarce resources. By switching its subsidy to insurance and permitting interest rates to rise, government can stimulate or leverage a correspondingly larger amount of credit from the private sector.

4. Private Credit Availability

The flow of private credit to agriculture will become more likely as a result of the insurance protection. In Mexico, the insurance agency recently contracted with the private banking sector to insure sixteen billion pesos in agricultural loans (see The News). Private lenders have less to fear and will be more willing to participate in the agricultural credit system.

5. Savings

Savings will be affected. Depending on the size of the marginal propensity to save of farmers, part of their increased income will be saved. This saving must, of course, be directed into investments if it is to have any economic impact. Finally the product of the farmers marginal savings rate and his increased income must be greater than the product of the governments marginal savings rate and the income which it channels into operating the program if there is to be a net positive impact on savings.

For these savings to reach the agricultural credit system, it may be necessary to extend the banking and cooperative systems to include farmers not now being served.

Traditional insurance savings (from the establishment of reserves) will be minimal as the programs will tend to be operated on a pay-as-you-go basis, and because premium will be financed partially by bank loans.

D. Benefits Accruing to the Agricultural Sector

1. Adoption of New Technology

Insurance affects the adoption of new technology by transferring risk from the farmer and at the same time improving on the agricultural extension service. In order for the insurer to perform its function, it must send its inspectors to each farm one or more times each year. These inspectors make sure that the farmer has sown what and where he said he would in the agreed manner, and that he has fertilized and weeded and so forth in conformity with the insurance contract.

Two things are happening here; first, the farmer and a technician are coming into contact and having an opportunity to talk. If the technicians are properly trained, there is ample opportunity to share knowledge. Second, the insurance contract contains contingencies which effectively require the adoption of new technologies.

That is, the farmer will be paid when there is a loss IF he does "certain things." Those "certain things" are designed to assure that on the average farmers will produce above the guarantee level and the insurer will not have excessive losses. Typically, the types of seed and type and amount of fertilizer are specified. The farmer may be allowed to choose at what level of technology he wishes to operate, but his guarantee will be adjusted accordingly.

In Mexico, insured farmers are given earliest and latest permissible planting dates. Farmers in the state of Michoacan mentioned to me that both they and their uninsured neighbors relied on the insurers advice for planting times. After 500 years someone has finally replaced the Aztec priests as keepers of the agricultural calendar in Mexi.

The key element here is that the insurer has a need to have its personnel actually visit farms. Extension agencies merely have to avoid complaints, they do not have to produce results. If an extension agent turns in false trip reports and spends his time at something else, no pressure will be brought to bear on the agency unless complaints flow in. If the insurance inspector does this, there will be a trend of rising losses from his area which will be readily detectable by the home office.

2. Extensification of Operations

There will be a tendency to extensify operations. It was a farmer in Mexico who used the "working for the bank" (see E below) metaphor to explain why he only planted one of his three hectares. Although he could have borrowed to plant all three, he took only enough to plant one third of his parcel. If his crop failed, then he would plant two hectares the second year and would use the additional income to pay off both years' loans.

This man was operating at the margin of survival, much too close to follow an optimizing strategy. His was a survival strategy (see Lipton). It is interesting to note that even where land availability is a problem underutilized reserves probably exist.

3. Intensification of Operations

By the same argument, crop-credit insurance supports the intensification of agriculture and the adoption of new technology. This operates in two ways. Where simple fear of borrowing is involved as in the "working for the bank" example above, insurance permits the transfer of the risk and an allaying of the associated fear.

Where the farmer is uncertain about the appropriateness of the technology recommended relative to his personal operations (which are very distinct from test plots!) and the yet-to-be-experienced weather conditions, the insurance relieves him of that uncertainty and permits him to choose the new, intense technology.

4. Research Feedback

Research programs will benefit from feedback provided through the insurer. The insurance agency will pay when poor recommendations flow out of the research agency. To avoid these losses, it will provide field data to the research agency which can then re-examine its findings and provide improved recommendations to the profit of the insurer, the farmer and the consumer.

5. Willingness to Borrow

Farmers will be more willing to borrow as they do not have to fear "working for the bank" if they suffer a few bad years. Debt carrying capacity is a limited resource for the small farmer. His lands and/or capital are limited and he cannot expand much in succeeding years to earn additional income to pay off the first year's loan. Farmers fear that payments due on past loans may exceed present expected income; he may become a perpetual slave to the bank!

For the payment of a small premium at the beginning of the year, additional reserve capacity is immediately created for the farmer to use when needed.

6. Responsiveness to Market Forces

The existence of the insurance and the information system it requires will increase the farmer's responsiveness to market forces. It is to be expected that considerable switching of crops and rationalization of land use will take place.

Insurance is, among other things, a cost allocating mechanism. As the result of the normal underwriting, loss control and ratemaking functions, the price, coverage and availability of insurance protection will vary. When this is added to expectations about price and the farmer's new freedom from risk and uncertainty, it can be expected that he will avail himself of the comparative advantage of superior crops.

7. Insurance Collateral Replaces Need for Land Title

Public, as well as private, capital is made to flow by the insurance's resolution of two related problems. First, land tenure, land title and mortgageability of land become less important. The insurance serves as collateral for the production loan making it possible to lend to a farmer who does not have clear title to his land. This holds for production loans only, not capital improvement loans.

even

Second, small farmers with mortgageable land titles will become subject to production loans from formal institutions. Previously, the high financial and political cost of foreclosing the mortgage of a small holder made those guarantees useless. Again, insurance serves as a superior collateral.

8. Agrarian Reform

Agrarian reform projects can be supported. In Mexico, communal ejidos are characterized by the fact that the land held by each individual is inalienable. ^{2/} There, the insurance is a necessity for collateral purposes.

Whether or not other land reform projects vest an alienable title to the farmer, there will be a need for credit and a need for guarantees to the credit institution. Newly settled farmers are not particularly good credit risks and the collateral effect of crop-credit insurance will help overcome this.

Crop-credit insurance can support and be an integral part of any integrated rural development project.

E. Benefits Accruing to Government

1. Positive Financial Effect

~~Unlike informal risk management~~ techniques, crop insurance provides for some income to government from farmers. With a policy of decapitalization, for example, agricultural banks simply accept their losses and hope that government will re-capitalize them every few years. Even with a subsidized insurance program, however, farmers are paying some premiums. If the portion paid by the farmers is greater than the costs of administering the insurance program plus increased losses resulting from the improved insurance coverage, than the governments financial position is improved.

2. Policy Implementation

The existence of the insurance and the insurance institution will facilitate the implementation of national agricultural policy.

Insurance will both create conditions favorable for farmers accepting national policies and provide a certain degree of coercion to accept such policy. For example, government may alter the level and distribution of subsidies, crops insured, coverage levels and insuring conditions (i.e.--technologies required).

^{2/} The land is held as a life tenancy with the rights of survivors recognized subject to the approval of ejidal leadership.

3. Government Planning Stability

Government will be relieved of the need to manage disruptive ad hoc relief programs as the insurance mechanism will be in place, and capable of distributing assistance. In the United States for example, legislation is presently pending to deny emergency relief benefits to any farmer who had insurance available but failed to purchase it (see Comptroller General, U.S. House of Representatives).

4. Balance of Payments

Of course, if production is being stimulated there can be an effect on the nation's balance of payments as imports may be reduced or exports increased. The assumption here, of course, is that the crops being stimulated are exportable or in demand domestically. Prior planning must take place to assure that this is true.

F. Benefits Accruing to Rural Communities

The benefits presented here are tentative and have never been measured or analyzed. Nevertheless, they should not be dismissed as they have valid potential. Crop insurance officials in several countries volunteered these items. They felt that these were real benefits but were unable to substantiate them.

1. Rural Emigration

Rural-urban migration may be slowed. The improvement in agricultural activities and employment will make rural settings less desperate and reduce pressure for emigration. When I asked a small group of young farmers in Mexico what they would do if crop insurance was not available, I received the expected answers--

- plant less land;
- not use credit;
- not use fertilizers; and
- plant maize for consumption rather than a cash crop.

However, I also received two surprising answers--

- go as a wetback (illegal immigrant) to the U.S.; and
- plant marijuana and smuggle it to the U.S.

Facial expressions and the ensuing conversation and activities led me to believe that the respondents were not jesting or trying to be shocking. It all seemed most reasonable to the eight or ten men present.

2. Rural Industry

Rural industry will fare better on a base of progressive, rational and responsive agriculture where it can count on a relatively stable supply of commodity inputs and a more affluent and effective consumer class.

3. Rural Communities

Rural communities themselves will be supported. Money will flow through the community regardless of whether the crop was good or bad (see Walker and Hensen).

It should be noted although the lists of benefits presented above are all potentially available through a properly exploited crop-credit insurance system, all require considerable planning to achieve.

It is possible to establish a costly program which will provide few of these benefits while serving as a disincentive to production as may be the case in Sri Lanka. (See Maurice (2)).

IV. PROBLEMS AND CRITICISMS OF CROP-CREDIT INSURANCE

A. Reaching Small Farmers

Many critics feel that crop insurance programs will tend to be taken over by larger farmers and will serve their needs preferentially. This is certainly the case in Costa Rica where the average insured farm had almost 26 hectares of sewa land covered in 1975. But, this is not an intrinsic and universal program defect as crop insurance in Costa Rica was lobbied for by a group of larger rice farmers and was created to serve their needs. A recent legislative enactment charges the insurer with extending its operations to all farmers. Suitability and success in reaching small farmers can only be measured by examining progress since that law passed.

A better example of what is possible with respect to large and small farmers is Mexico where approximately 900,000 farmers with average land holdings of 3.4 hectares were served in 1975 (see Aseguradora (1)). This demonstrates vividly the potential for reaching small farmers.

Preferential service to large farmers can be avoided procedurally as a result of policy directives. For example, insurance administrators can be given a quota of small farmers that they must serve. Smallness can be defined objectively (e.g. hectares of Y crop) and measured easily. This approach would not be effective under usual private insurance conditions, but would be if a government subsidy were involved.

Another approach would be to vary the subsidy of premium in accordance with the size of the farmer. Making larger farmers pay the full cost of coverage will reduce their use and leave more resources for serving the smaller farmers (see Maurice (1)).

When crop insurance is introduced, greater economic benefits would be expected for and from small rather than larger farmers. This is because they live closer to the survival margin and base decisions on a "survival algorithm" or "Focus-Loss" model (see Lipton, Berry, Shackle).

As a result of the reduction of risk, these farmers can be expected to depart more radically from their traditional mode of operation than would wealthier farmers. The insurance provides collateral for loans that they were not able to obtain before or allows them to use technology which was too risky given their previously inadequate reserves. Larger farmers, by definition, have reserves (their own wealth or access to credit) to tide themselves over after a poor year. Insurance simply will not affect their activities as much as it will smaller farmers.

Relative to this point, it is interesting to note that in the United States only 13% of farmers eligible to purchase all-risk crop insurance do so. The others have wealth, access to credit or use multiple cropping systems for protection (see Shipley).

Finally with respect to the small/large farmer dichotomy, we should look at cultural factors. Insurance field workers will tend to be educated, travelled, cosmopolitan and have aspiration to a certain degree of affluence which cities and stable office work offer. They will gravitate towards larger farmers who will share or understand these values and who will accept more readily their recommendations.

One way by which this inevitable problem may be minimized is by using "barefoot technicians" as much as possible. Field workers should be chosen who come from farm backgrounds and who have not left them too far behind. The cultural and social status difference between field workers and large farmers should be increased while reducing the difference between field workers and small farmers.

B. Risk and Technology Adoption

Crop insurance advocates claim that by transferring risk and uncertainty from the farmer to the insurer, the farmer is freed to adopt risky technology (see Maurice (2)). This is based on the rationale that marginal farmers operating close to the edge of survival cannot afford to dip below

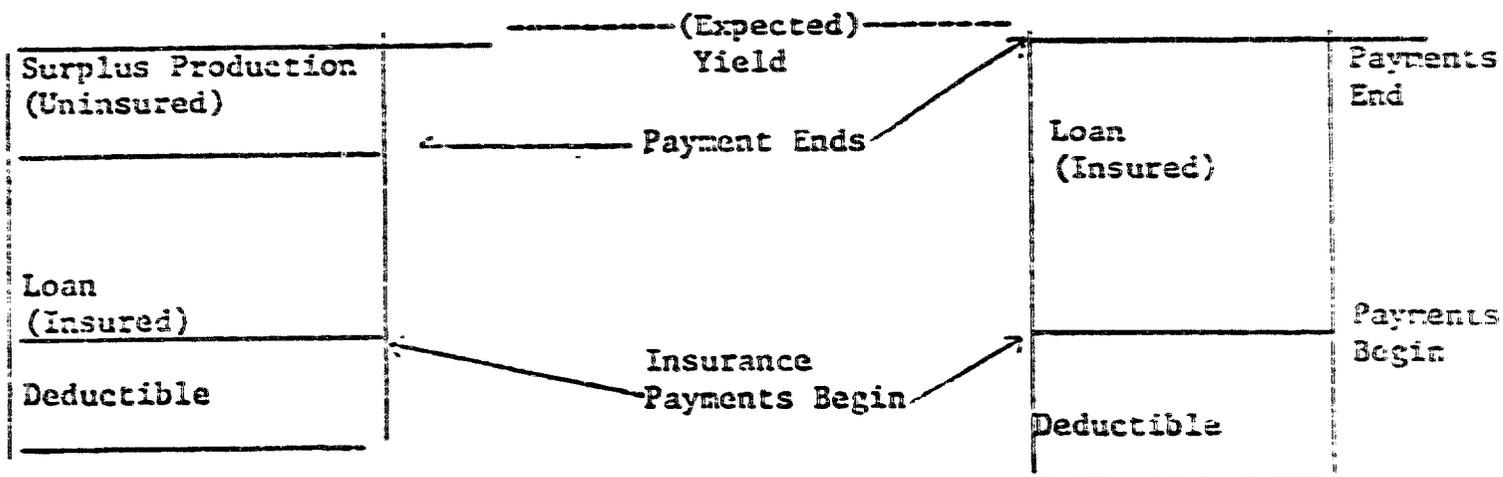
some minimal income level. Traditionally they employ a host of risk management devices, many of which involve suboptimal use of land and labor (see Cancian, Sutti) These strategies are designed to avoid or reduce the severity of the worst loss which can befall them. What is left is the Maximum Probable Loss (MPRL).

Farmers try to limit the MPRL to keep their minimum income above some threshold. If they can do so and adopt more productive technology they are likely to innovate.

Critics maintain that crop-credit insurance coverages may be insufficient to prevent incomes from dropping below this threshold. Most existing crop-credit insurance only insure the outstanding loan. It is possible for a farmer to lose production corresponding to the deductible and the loan and still have enough surplus production left over to maintain his income above the survival threshold. But, in a total disaster year, this is inadequate as it will leave the farmer without any income at all. See figure 1A. In the Mexican case the entire difference between the expected yield and the loan is used as a deductible. This always provides inadequate income protection since the farmer is always below his threshold if the insurer pays any claim at all. See figure 1B.

Figure 1A.
Insurance coverage plan
for a typical crop-credit
insurance program.

Figure 1B.
Insurance coverage
plan for Mexico



The Mexican plan protects the credit system and guarantees the farmer that he will be able to borrow if he can make it through the year somehow. Development is still promoted, however, because the credit system is kept intact. Development arising from farmers adoption of risky technology however, is probably reduced.

To achieve effective leverage on both credit institutions and farmers, the insurance should cover at least that part of the expected yield which corresponds to the farmers minimum income. See figure 2.

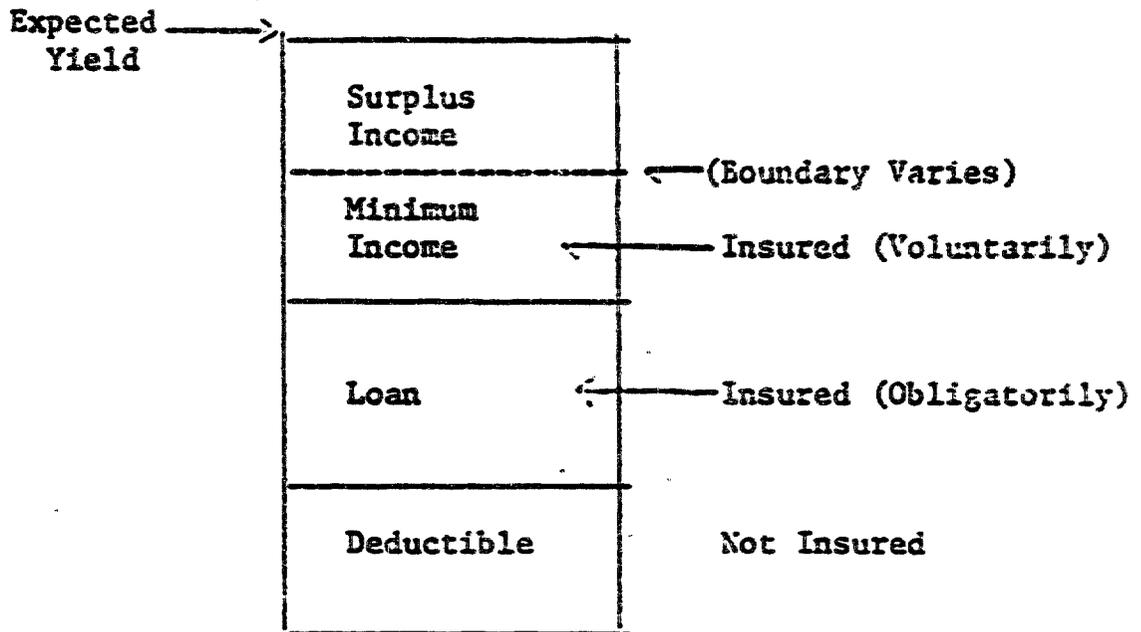


Figure 2. Insurance Coverage Plan
Protecting Farmers Minimum
Income

Since different farmers have different minimum income levels, it is impossible to set one single effective limit or know what is proper for each farmer or group. One effective approach would be to use a two tier coverage plan. (A deductible of 25% to 35% of yield is assumed in all cases.)

- Tier One: Base coverage equal to the loan, obligatory and partially subsidized by government. Upon loss, payment of benefits go first to repay the loan.
- Tier Two: Additional coverage for any amount chosen by the farmer subject to the condition that when added to the base coverage and deductible it not exceed the expected yield. Benefits from this tier received after loan is repaid. Purchase is voluntary and not subsidized.

A coverage plan of this sort is feasible and would overcome the criticism of insufficient risk removal.

C. Institutional Problems

Another criticism is that crop insurance is too complex and requires institutional support which is too sophisticated for most of the less developed nations. Although there have been several failures, there is no evidence that the intrinsic program requirements exceed the capacity of all LDCs.

It is true that not all countries will be able to undertake the task of providing crop insurance at this time. Some cannot meet the indispensable requirements presented in the next section. They do not even have the modest basic manpower required or the economic resources necessary to underwrite the project. Without either of these a program will be a complete failure.

Some nations do not have the other institutional supports in place, i.e.-- agricultural credit, marketing, research, input supply and planning systems. Without these a system can operate with a minimal degree of success, but will fail to provide the full benefits for which it is designed.

Some nations have too many projects in their development pipelines and are simply unable to add more at this time. None of this indicates that the institution building task is too complicated; rather, only that resources are limited. Crop insurance is not usually the top priority item for a developing nation. Since it complements (i.e.--integrates and facilitates) the operations of other agencies, it should not be organized until the others have been begun. The other agencies do not

have to be perfected, but should at least be in existence. Crop-credit insurance could be begun at the same time as the agricultural credit system is established.

What does the experience with crop insurance around the world tell us? First, that the insurance technology is well developed, thoroughly understood and dominated. In several developed nations, it is thoroughly under control. Over the past thirty years, the FCIC program in the United States has had 97% loss ratio. The technical problem of establishing rates and controlling losses has been well dominated. Countries with successful programs include Japan, the United States, Canada, Sweden and Mexico. These countries, especially Mexico and Japan can serve as models for LDCs.

Second, experience tells us that not institutional sophistication, but another crucial element dominates the prospects for success. A look at four programs in less developed countries will be helpful.^{3/}

The program in Sri Lanka could properly be termed unsuccessful. It is not reaching the number of farmers intended and is not delivering the promised services to those it does reach. In addition, the program may well act as a disincentive to improving agriculture. The insurance institution is not "in control," in the sense that it is not doing what its creators had planned. This seems to be the result of unrealistic expectations about what a program could do, how farmers would react to it and how it could be financed. Specifically, premium rates were kept lower than what was actuarially determined as necessary and adequate government subsidies were not provided. This under-financing has led to insufficient staffing, delegating away proprietary insurance functions and, eventually, an inability to deliver the services promised (see Maurice (2)).

The program in Panama is new but some observations can be made. First, it has enjoyed adequate start-up funding and has pulled together a competent staff who have dominated the task at hand. Second, as in Sri Lanka program designers also had unrealistic attitudes about long term

^{3/} Several countries with special and limited programs are excluded. For example, the successful program in Mauritius which insures sugar cane mainly against windstorms (see McDonald). Other countries with programs that failed are excluded because the failure was due to extraneous causes. The old CSNA program in Brazil which operated in a hostile political environment is an example.

financing for the program. If adequate subsidies are provided in the future, the institution could continue to grow as successfully as it has; if not, it will fail (see Maurice (1)).

The program in Costa Rica has enjoyed reasonable success. There the institutional problem has been minimized by attaching the program to the National Insurance Institute, a government operated insurance monopoly. Financing has been inadequate in Costa Rica also, but the insurer has responded by limiting its activities in accordance with the finances available to it. The operations carried out are professional and successful.

The program in Mexico has been adequately financed and is successful. It is unique among all programs reviewed, in that, on its Board of Directors is not only the Secretary of Agriculture, but also the Secretary of the Treasury as well as a representative of the Bank of Mexico. The work plan and the budget of the agency is approved each year by the two Secretaries. To date, the budget allowed the agency has always matched the work plan assigned it. The program in Mexico has been generally successful. The agency has demonstrated that it has the ability to correct the problems encountered and grow successfully.

The common element of these four programs is the crucial role of finances, not of the difficulty of managing the institution. Given the substantial body of knowledge about crop insurance available in the world and the identification of financing as the crucial element for success of several programs, one must reject the criticism that the institutional factors are too difficult until contrary evidence is presented.

D. Expense

Some critics claim that crop insurance is too expensive. Although there is only limited data to help analyze this question, some observations are possible.

The only known study of economic benefits and costs was recently performed by a consulting economist under the project which the author is directing for USAID (see Nathan).^{4/} That study used a computer simulation analysis to estimate the Internal Rate of Return (IRR) of a ten year stream of benefits and costs. Costs were reasonable guesses based on the Mexican and other

^{4/} For a comparison of operating costs in the U.S. and Japan, see Chen. No benefit/cost analysis was performed.

experience and on the judgment of technicians with field experience. The benefits were derived from estimates of increases in production that would accrue as farmers changed the allocation of their land, the crops planted and the technology employed in responses to decreases in risk as a result of the availability of insurance. Data generated in a USAID sponsored survey of Guatemalan highland farmers was used as a base. See Table 1.

Table 1. Program Specification and Economic Costs for an Illustrative Crop-credit Insurance Program
 Source: After Nathan, pages 55 and 179.

<u>Year</u>	<u>Number of Participants</u>	<u>Economic Costs (\$000)</u>	<u>Cost Per Participant (\$)</u>
0 (Preparatory)	0	250	--
1 (Pilot)	250	240	--
2	1,000	413	--
3	2,500	525	210
4	3,500	555	159
5	5,000	570	114
6	7,500	585	78
7	9,500	600	63
8	12,000	615	51
9	14,500	630	43
10	17,000	645	38

The data presented here represents Nathan's estimated high cost. The associated IRR was 73 percent indicating substantial net positive economic benefits. ^{5/} This, of course, was a simulation study and not a measurement of benefits of any actual program. A study of an ongoing program is overdue.

^{5/} The IRR for the base case was 184 percent.

The Nathan study measured only increased production as a benefit. It recognized, but did not include in its calculation other benefits including increased employment, effect on the balance of payments, increased savings, improved income distribution, the impact on credit institutions, the effect on prices and on stabilizing government expenditures. Some other non-quantifiable benefits have been discussed already in this paper. The positive IRR understates the true benefits as it ignores these additional unquantified benefits.

At this point, a critic may claim that regardless of the economic IRR, the programs are not financially viable because of the need for continuing subsidies. But, "as long as the national economic benefits of an insurance program are positive, the financial viability of the institution operating the program is of secondary importance. Indeed, the structure of premiums and indemnities should be guided principally by the objectives of the program (increased productivity through the adoption of higher technologies) and the target group (small farmers), rather than by the financial soundness of the managing institution." (Nathan, p. 10.)

Economic rather than financial soundness is the proper measure of the desirability of this kind of program and the only study on the matter has a positive conclusion. (There have been other studies which attempted to analyze costs and benefits of crop insurance, but they were too general to be of any use here (see Medin, Millot). In absolute terms crop insurance makes sense.

In relative terms, however, it is necessary to compare crop insurance against other alternatives in order to determine if it should be funded. Some alternatives for stimulating agricultural production and farmers' welfare are the following:

1. Credit insurance;
2. Loan guarantees;
3. Interest rate subsidies;
4. Price stabilization policies;
5. Supervised credit;
6. Group farming; and
7. Technical assistance and extension.

1. Credit Insurance

Credit insurance programs promise considerable savings because they are directed towards the lenders and enjoy the low costs of group policies. They have, however, two drawbacks which must eliminate them from consideration.

First, in order to survive for a long period of time they, like all other insurance programs, must charge adequate premiums and prevent excess losses. In order to do this, it is necessary to inspect hazards at the farmers level in order to set premium rates and underwriting conditions. It is also necessary to inspect the operations and reported losses of farmers to prevent the milking of the program. If this is done, all the work and costs of crop insurance are being incurred and there will be no savings advantage.

Second, credit insurance protection stops at the bank level. The farmer is not protected, his loan is not forgiven; it is transferred to the insurance company. If the loan is forgiven, then by definition we have crop-credit insurance!

2. Loan Guarantees

These schemes typically involve the government placing a fund of money at the disposal of farmers to use to pay off loans when natural disasters render them unable to do so. Several drawbacks mitigate against accepting this alternative.

First, the program may be temporary, ending when the fund is used up. No benefits would be provided after that. Crop insurance, however, is designed to be permanent.

Second, although one could charge farmers or lenders a premium for the guaranty, the problem of actuarial soundness surfaces. Typically, these funds have charged an arbitrary amount, between 1% and 5%. What relationship this bears to the likelihood of loss on any given farm is unknown. It is necessary to establish a rate making capacity similar to what is found in crop insurance programs. Again, costs begin to approximate those of a crop insurance program.

Third, if a flat level of premium is charged there will be dissatisfaction on the part of the farmers because of the inequity. (See Sanderatne.) In addition, and more seriously, there will be a distortion in the use of land and other inputs. The cost allocating functions of insurance are lost.

Fourth, if a government wants to set up a permanent fund, with or without charging premiums, it could keep it operating by providing it with annual appropriations. It is to be expected that losses would be higher than with insurance as there is no loss control mechanism. However, administrative expenses would be lower. On balance, it is likely that the increase in losses paid would greatly offset the decrease in administrative expenses.

The financial advantage of the two alternatives could be compared by calculating what I call the Degree of Financial Improvement (DFI) associated with each.

$$DFI = 1 - \left(\frac{IL + ACI - FP - \Delta ACL}{UL + ACL} \right)$$

where:

- IL = Insured losses that would be incurred by an insurance or guarantee program.
- ACI = Administrative costs of the insurance or guarantee program.
- FP = Premiums paid by farmers.
- ACL = Administrative costs of portfolio management of the lender.
- UL = Uninsured losses, i.e., those that occur when there is no special system. This would also be decapitalization losses.
- Δ ACL = Change in costs between the uninsured and insured cases.

The DFI can range from -1.0 to +1.0. A positive number indicates a financial (i.e., cash) saving for government when using an insurance scheme. The denominator is constant as it represents the losses in unpaid loans and associated administrative costs for which government is responsible.

There is, however, considerable variability in the numerator. IL will usually be greater than UL because the insurance program is designed to pay losses. IL can be varied by offering different coverage levels and using more or less administrative capacity to prevent and control losses. Δ ACL will probably not vary much. It recognizes the decrease in costs that should result when the lender has fewer delinquent loans with which to cope.

The farmers share of the premium (FP) can be set by government at any level. An increase in FP, or a decrease in government's subsidy, will move the DFI towards +1.0. Planners can use the DFI for comparing alternative insurance or guarantee schemes and for finding premium subsidy levels which the government can afford.

Fifth, it is possible to build a loss control system into a loan guarantee program. There are three approaches to this. One is to operate at the group level, and pay off all farmers' loans on an average basis whenever there is an area wide catastrophic loss. This system is inefficient as some farmers are paid who have not suffered losses and other farmers are not paid who have suffered losses. There is often not a reasonable matching of losses and benefits. Instead of protection and relief from risk, farmers are left holding a compound lottery ticket (see Sweden in Maurice (2)).^{7/}

Another approach is to work at the group or bank level and force the banks to control losses. This is done by having a ceiling on losses. If banks go beyond this limit they are expelled from the pool. Presumably the threat of losing the service is enough to get banks to spend the resources necessary to supervise small agricultural loans adequately. The fallacy of this approach is obvious.

The final approach is to control losses down at the level of the individual farmer. As we saw with credit insurance, at this point one is actually doing crop insurance.

In all cases, we have seen that loan guarantees are either temporary or more costly than crop insurance or if properly organized are de facto crop insurance programs.

3. Interest Rate Subsidies

These will promote the use of credit, in fact, they will distort its use; crop insurance will not do this.

Rate subsidies do nothing about risks which affect users. This in turn determines who the users will be. Primarily, those who have sufficient wealth to not be concerned about "working for the bank" or slipping below their minimum income level will borrow. Rate subsidies are biased in favor of larger farmers and will not help the most needy.

Also, if the hypothesis presented earlier is true, that poorer farmers are affected more as a result of the introduction of crop insurance because of their marginal position, less than optimal economic results will be realized from the interest rate subsidy.

^{7/} See page 36 for a discussion of compound lottery tickets.

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4. Price Controls and Stabilization

Price policies are complimentary to crop insurance policies. As risk affects farmers it affects them through their income which is a combination of price and production. Crop insurance only protects against declines in quantity produced. Price policies affect only price in the short run. In the long run, both have an affect on the others domain.

If price policies alone are relied upon, small farmers still face considerable risk and economic disincentives to increasing production. If prices are kept high, good years may produce enough wealth to carry farmers through one or two bad years. But, more likely, price policies will be used to keep prices at some relatively low level in response to demands from urban consumers.

Crop insurance also only does half the job as farmers are left open to the risk of low prices. But, two of the requirements for a successful program are the existence of effective marketing and planning systems. These two can be used to prevent much of the adverse price effect that will be caused by increased production.

A disadvantage of the price policy approach is that it is extremely broad and expensive. All producers are included and subsidized. The system will provide more benefits to larger farmers; there is no chance of using the tool for redistribution of income as with crop insurance. Nor is there any chance of directing the tool at any segment of the population. Although price policies will promote land use rationalization they will not do this as effectively as insurance which allocates a differentiated cost to each farm zone, crop and technology. Price policies do not provide (nor incur the expense of providing) supervision or extension. Finally, price policies do not provide direct protection to banks.

In resume, both tools are recognized as being powerful, output side promoters of production. Price policies are very broad and may favor larger farmers. Crop insurance is more like a scapel; it can be directed anywhere, used for redistributing income, protecting banks or improving extension efforts. Each is complementary to the other, and the farmer faces less risk when both are employed.

It is impossible at this point to say which dominates the other. Crop insurance has an advantage in that it can be directed at small farmers. Further research on the question and experimentation with crop insurance programs is required.

5. Supervised Credit

Crop-credit insurance programs are designed to support supervised credit programs. By removing risk from the farmers they encourage them to join the credit programs. Then, by their inspection activities they complement the credit supervision. It has been suggested that supervised credit programs reduce the farmer's risk by providing extension services. This is not the case; see item 7 below for a discussion of this point.

Supervised credit is not an alternative to, but a complement of crop-credit insurance.

6. Group Farming

This method has been suggested as a risk management and production promoting device. Like traditional risk management methods, it does transfer some risk away from the individual farmer. Also, like traditional methods it does this inefficiently. No protection is provided, for example, when a drought affects the entire collective farm.

Social costs are quite high. Farmers must cease to operate individually and create a permanent structure for cooperation as close and as vital as is usually found in human marriages. Systems for management, decision making and for sharing costs and production must be created.

When social conditions are appropriate for group farming, the collective farm itself will probably want to purchase a crop insurance policy. This would be especially true if the communal land is inalienable and unable to be offered as collateral for a loan.

7. Technical Assistance and Extension

It has been suggested that by providing farmers with improved knowledge about his activities, that his risk and uncertainty can be reduced and production stimulated. Risk and uncertainty for example, are reduced when a farmer is guaranteed a fixed price. Uncertainty is reduced when the farmer is guaranteed that a certain seed variety will produce a certain yield under normal conditions. In this case, however, considerable risk remains. It is the risk that the conditions will not be normal; that there will be too little

or too much rain, for example. Therefore, the first criticism of technical assistance as a risk reducing mechanism is that it leaves too much risk behind. The maximum probable loss may still be great and may still be below the farmer's minimum income threshold. The farmers uncertainty (e.g., wondering if his yields will be like those of the test plot) remains unaffected.

A second criticism is that crop-credit insurance can do a better job of extension than extension agencies. As discussed in the benefits section (Adoption of New Technology, page 8) there is an improved element of supervision and awareness of failure to reach farmers implicit in crop insurance. If the insurance and extension agencies are merged, resources can be used more effectively and each might be better able to support the other.

Looking at another aspect, we can see that because of the residual risk, technical assistance does little to improve the situation of banks. They will still be reluctant to lend to farmers without adequate guarantees.

Extension and technical assistance while useful seem to be thoroughly dominated by crop-credit insurance as a means for reaching farmers, lenders and promoting production.

8. Summation

We have looked at the cost/benefit position of crop insurance and found it to be positive and worthy of support. We have looked at some alternative tools for stimulating production and helping small farmers and found none superior and all lacking except for price policy which is a complement for crop insurance.

Based on this analysis, it is recommended that crop-credit insurance programs be initiated on a pilot basis, that their benefits be closely analyzed, and that the comparative advantages of insurance and price policies be further studied.

E. Operations in Kind

From the time of the first thinking about crop insurance it has been suggested that farmers be allowed to pay premiums with produce, that they receive benefits in kind and that the insurer operate a crop storage facility. The program in the United States began by permitting payment of premium and benefits in kind but this was quickly abandoned when its costly and cumbersome nature became evident (see Halcrow, Myrick).

Today, no crop insurance program in the world permits operations in kind. The cost and difficulty of doing so are more than can be borne by insurance programs. One estimate is that as much as 20% of the value of a crop is consumed by storage, handling, transportation, and spoilage (see Keyfitz). Many crops are excessively perishable and not subject to storage at all (see McNicol). For an insurer to deal in these, it must create an entire marketing department complete with quality control, packaging, transportation and sales units. Clearly, the problem is beyond the scope of the insurer to handle.

Operations in kind are suggested for several reasons. One is that the poor farmer is unable to pay for his insurance except with his produce at harvest time when prices tend to be depressed. Therefore, it is recommended that the insurer accept payment at harvest time in kind and at a guaranteed price. Crop-credit insurance overcomes this problem by financing the premium by an add-on loan and allowing the farmer to pay it off when he pays the rest of his loan. The farmer unfortunately retains the price risk. This is a different problem and cannot be handled safely by the crop insurer.

A second reason offered for in kind operations is that the insurers build-up and draw-down of reserves will counter natural cycles and thus moderate price fluctuations. This is a price operation, one which requires more stock to impact on the market than will be produced by the insurers reserve. The problem is large, complex and political. It can best be handled by a price control agency. There will be strong political pressure on the agency to behave in different ways (farmers who want prices raised. consumers who want them lowered, and others who are concerned about maintaining emergency stocks). It is safer to keep the insurer isolated from these forces so that it can focus on its own technical and demanding task.

Dr. Yamauchi suggests a third reason for in kind operations. In years of widespread crop failures, payments of insurance benefits in money will not permit the purchase of adequate food stocks as prices will have risen due to scarcity. Therefore, the farmers' minimum income threshold will be violated. While this is true, it is still not advisable to operate in kind for the cost, complexity and political reasons. Rather, the solution to be pursued is to use reinsurance. 8/ A reinsurance policy would provide benefit

8/ Purchased from international sources. See Section VIII, Reinsurance.

payments in hard currency which the nation could use to purchase and import the needed food at relatively stable world prices. When this crop is delivered to the countryside, the farmer would be able to purchase reasonable quantities.

It is appropriate to note here that crop insurance should not, indeed, not, replace all traditional risk management methods. Farmers must and will continue to use some of these methods for protection in times such as these. Crop insurance will replace dysfunctional methods (e.g., using stable producing but low yielding varieties; not borrowing; not extensifying production) but it will only complement the functional methods (e.g., extended families, food sharing agreements).

F. Farm Laborers

It has been suggested that although crop insurance will benefit farmers and lenders that it will worsen the plight of farm laborers. Presently laborers are subject to relief payments (where such assistance is available) just as are farmers in times of catastrophic losses (see Crawford). With insurance, farmers may reap all benefits and landless laborers would be worse off.

While this is true, it is important to analyze the impact of crop insurance on labor utilization. According to the Nathan study, the use of rural labor would be increased on the typical small (Guatemalan) farm from 110 man/days to 180 man/days per year as a result of the technological changes induced by the introduction of crop insurance. Although much of this labor will be provided by the farm family, some of it will be hired labor. If the insurance is directed at smaller farmers, the technology options available will be labor intensive. If the insurance is directed at larger farmers the technology employed could easily displace labor.

On balance, farm laborers could be better off with insurance than without. The introduction of crop insurance implies a trade of uncertain and infrequent relief benefits for more frequent employment of unknown certainty.

G. Summation

In this section we have examined some of the issues and criticisms relevant to crop insurance. The first dealt with whether or not crop insurance could reach small farmers. It was suggested that despite biases in favor of large farmers (lower administrative costs) that the program could be directed at small farmers and would produce greater net economic benefits for the national economy.

The issue of the relation of risk to technology adoption was discussed. Although not nearly enough is known about this, the focus loss or survival algorithm model seems most relevant. It is generally supported by field observations of the author and suggest that there is a positive correlation between the removal of risk and the willingness to borrow capital to finance the use of improved technology.

The issue of institutional problems was analyzed and in the case of four programs in developing countries, success was shown to be more dependant upon the adequacy of financing. Institutional problems leading to failures seemed to grow out of inadequate fundings.

The cost of crop insurance was discussed and it was shown that there was only one benefit/cost analysis of the matter. That study suggests that net economic benefits are positive and that financial viability is secondary to economic viability. An analysis of potential alternatives to crop insurance was undertaken. All suggested alternatives were discarded for ineffectiveness of inefficiency. Price policy, however, was shown to be complementary.

The possibility of joining the administration of crop insurance, grain storage and price controls was studied and rejected. The complexity of carrying out operations in kind would threaten the viability of the insurance administrative capacity. Political problems associated with grain storage would further hamper operations.

Finally, in analyzing the condition of farm laborers, it was recognized that they might lose relief benefits if such were available but would also be subject to increased employment opportunities.

V. ANALYSIS OF REQUIREMENTS FOR CROP-CREDIT INSURANCE PROGRAMS

Many writers have discoursed on what are the key elements for the successful establishment of a crop insurance program. Below, I present my list separated in two parts labeled Indispensable and Desirable but Dispensable (see Ray for his list of key elements).

A. Indispensable Requirements

1. Personnel

Skilled personnel must be available. This is as essential as it is obvious. Let's look at the minimum personnel requirements. The organization will have to start small and grow organically, that is, grow in harmony with other parts of its environment. Crop-credit insurance has a captive market (the borrowers) but can only grow as fast as the agricultural credit system. Therefore, there will be some time to train people as the agency grows.

D

Director--needed from beginning--should be a lawyer, economist, agricultural economist, insurance executive or have similar experience.

Actuary--from beginning--part time in beginning--can be borrowed from the social security agency or from private industry; previous specialty unimportant, can be trained in crop insurance outside the country in one or two months and can be assisted by consulting actuaries from other countries.

Lawyer--from beginning--part time--duties assist in preparing contracts and policies.

Chief Fieldman (Inspector)--from beginning--full time, should be an agricultural economist or agriculturalist.

Assistant Fieldman--needed later--full time--some should have training similar to the chief, others should have minimum agricultural training.

Deputy Fieldman--needed later--part time, used at peak season--should be able to read and write, drive a motor vehicle and should come from farming backgrounds. If these people are "barefoot technicians" (i.e.--not urbanized like the highly educated people above) they will reduce the cultural communication gap between farmer and agency.

Communication/Training Specialist--from beginning--full time--experienced with writing, teaching. Will produce training materials and explain the program to bankers and farm leaders.

Product development specialist--from beginning--full time--should be a generalist, perhaps an agricultural economist; should have an aptitude for mathematics. Will assist actuary, lawyer, chief fieldman in creating the insurance structure, designing policy coverage, gathering data, etc.

Secretaries, clerks and accountants are also needed.

In addition to the four full time and two part time professionals beginning immediately, an underwriter will be required later if any voluntary business is written. Loss adjusters will also be required.

Beyond this, department heads with skills similar to the chief fieldman can be added as the organization grows and needs to separate line and staff operating units.

Manpower requirements are crucial, but are not excessive.

2. Credit System

There must be an agricultural credit system. It can be small or large, monolithic (government bank) or diverse (coops, private banks and government), but there must be either an already existing system or one begun at the same time as the insurance program.

3. Marketing System

There must exist an effective marketing system capable of disposing of the production stimulated by the insurance.

4. Input Supply System

There must exist an effective input supply system capable of providing the fertilizer, seeds and hardware needed when they are needed.

5. Research Capacity

An agricultural research capacity must exist to develop or adapt new technology to local conditions.

6. Planning Capacity

A planning capacity must exist to bring these disparate ingredients together and direct their efforts so as to maximize the usefulness of their resources. Planning is a key element here. Agricultural development is a servomechanical process: setting courses, measuring accomplishments and making adjustments as needed. If resources and the development potential of crop-credit insurance are to be efficiently and effectively used, planning is a prime ingredient.

7. Subsidies

National governments must be willing to partially subsidize operations. All major all-risk crop insurance programs have their administrative costs subsidized and most have a part of the losses subsidized. Because of its experimental nature, the obligatory purchase feature and the limited financial resources of poor, marginal farmers, partial subsidies must be provided.

8. Loss Reserves

Adequate reserves must be provided. Losses covering a wide area and classed as catastrophic may occur in the first or any subsequent year. These losses may overwhelm the ordinary financial arrangements of the insurer. Reserve capital in the form of drawing rights on a capital fund or the national treasury or the pledging of the "ful faith and credit" of the government are required.

The important element here is that the insurer be able to pay off its debts promptly and without recourse to "fine print." If not, farmers will remain uncertain about their financial futures and will not be induced to make production stimulating decisions (see the Sri Lanka Case in Maurice (2)). Recourse to reinsurance is one other way of providing this reserve capital.

9. Summation

In resume then, the indispensable ingredients for a successful crop-credit insurance program are:

- A modest pool of competent personnel;
- An existing agricultural credit system;
- An existing agricultural marketing system;
- An existing input supply system;
- An existing agricultural research capacity;
- A functioning and effective sector planning capability;
- Government willingness to provide adequate subsidies; and
- Adequate reserves to cover catastrophic losses.

Agricultural extension per se does not appear to be necessary since it can be provided more efficiently by the crop-credit insurance program itself.

B. Desirable But Not Indispensable Requirements

1. Actuarial Data

Actuarial data must be available for ratemaking, coverage and guarantee level purposes. When the program began in the United States there was 30 years of high quality data on the county and village level to use. This is seldom the case in less

developed countries, but is not a serious obstacle. Some data exists in most countries. Meteorological data, hydrological and soil surveys are generally available and are useful. Tax records and other indications of production are useful. These or similar sets of information will permit the classification of farms into more-or-less homogeneous groups and will permit the establishment of trial premium rates.

Since the insurance program must begin small and grow through pilot stages there will be ample opportunity to revise rates as experience is gained. If, additionally, the programs are partially subsidized and have access to adequate reserves, then there will be no danger of bankruptcy or of overcharging farmers because of inadequate data.

2. Demand

There must be adequate farmer demand for the insurance (see Crawford). In the case of voluntary insurance, demand is an indispensable requirement, but when the insurance is obligatory, demand is no longer as crucial. There should be demand to assure that farmers will cooperate with the program and not flee it, select adversely against it or sabotage it.

Crop-credit insurance is semi-obligatory, that is, if the farmer wants credit, he is required to purchase insurance. He may only buy both or neither. As long as there is demand for credit there will be demand for insurance.

A caveat here is that there must not be such dislike of insurance that it will reduce demand for credit. This is reported as being the case in Puebla, Mexico (see Diaz-Cisneros, Morss, et al), but the data there is subject to alternate interpretation. First, many of the things about which the farmers complained are proper and reasonable ingredients in an insurance program. This suggests that there is a need for education which the insurance institution had not yet recognized. Another aspect of the Puebla complaints is that the farmers feel that there is not enough insurance coverage, that all the benefits go to the bank. The Mexican insurer, ANAGSA, has responded by establishing a pilot program in Michoacan which provides additional coverage and education (see ANAGSA (2)). The results of this pilot program seem to be high farmer satisfaction and utilization of credit and technology.

Although dissatisfaction or negative demand for insurance could have cut down on the use of credit, this does not seem to be the case. Insurance and banking officials in Mexico reported to me that more insurance would have been sold in recent years if additional lending funds had been available.

For a voluntary insurance plan, the situation is quite different. Here demand is not a moot question; effective demand must exist.

Effective demand for a product appears to depend on three conditions:

- a. A felt need to resolve some problem;
- b. An understanding of the product as a potential solution of the problem; and
- c. Sufficient purchasing power to effect the purchase.

Purchasing power exists when farmers can afford to pay for the insurance. This can be achieved by insuring wealthier farmers (who do not need insurance as much as poorer farmers) subsidizing premiums, charging inadequate premiums (to the long term detriment of the program) or financing the premium at the bank while introducing new, more profitable technologies. Crop-credit insurance relies on this latter method as well as government subsidies to assure effective purchasing power.

Understanding in either voluntary or compulsory programs is obtained by providing education on top of a base of common understanding. It is likely that most peasant farmers will understand, in general terms, this intangible and sophisticated thing called insurance. The fact that adverse selection ^{9/} must be protected against in all programs indicated that farmers understand. The farmer must understand the system to be able to manipulate it (i.e.--select adversely).

However, poor farmers generally have no experience with insurance and are unaware of the contingencies for "fine print." This must be explained for them to properly conceptualize potential benefits and to avoid disappointment, dissatisfaction and rejection later.

^{9/} In insurance, adverse selection refers to the process where poorer risks (those most likely to suffer losses) will buy insurance whereas better risks will not. This leads to the insurer paying larger than anticipated losses.

Once they understand insurance the farmers must see it as an effective problem solving tool. One group of Indian farmers, for example, were concerned about agency corruption and incompetence jeopardizing their benefits (see Chandrakarth). Diaz reports the same feeling about Mexico. The farmers may feel that they are buying a "compound lottery ticket" rather than insurance. (See arrow.) This "compound lottery" has the farmer paying the premium and going through a series of obstacles and contingencies each of which has two outcome possibilities--reject the claim or go on to the next, and eventually the last level. The farmer's certainty about receiving insurance protection is reduced. Education to remove the apparent obstacles and institutional reform to remove the others is needed.

The felt need to resolve a problem is affected by several factors. First, a need must exist. In one case, a crop-hail program in Swaziland failed because hail simply was not a serious threat (See McDonald).

Second, the need must be felt to be not subject to easier, better known solutions. Traditional forms of risk management compete with crop insurance. (See Yamauchi, Shipley.) These include social and technical methods as well as simply having adequate wealth to carry the farmer over to the next year. Many traditional risk management forms, however, affect only the farmer and not the banker.

With crop-credit insurance, the service provided is joint. It may be that the farmer's felt need level is low, but the banker's may be high. In fact, the denial of credit to small farmers because of the riskiness perceived by the banker will raise the farmer's felt need level considerably.

Semi-obligatory crop-credit insurance then seems to have the requirements for creating or tapping effective demand.

- a. The unique joint nature of this insurance assures a high felt need level where credit is scarce.
- b. Purchasing power is supplied by the credit institution and by the technology being introduced as an integral part of the insurance program.
- c. Understanding exists at a basic level but must be supplanted by education. A truism amongst insurance people is that "Insurance is Sold and Not Bought." The significance of this is that understanding is

not needed in the beginning but must be developed for the program to succeed.

3. Land Tenure

Stable land tenure is mentioned by Ray and most who follow him as essential. The reasoning is that it permits for the development of long term data, easy identification of plots and stability in the program in general. However, as we saw in the benefits section overcoming land tenure problem* is one of the benefits of crop-credit insurance. The existence of the insurance will support a tendency towards stable land tenure in the long run as the economic viability of farms is increased and the riskiness of farming decreased.

If stable land tenure were the case, it would be less expensive to offer the insurance. Where it is not, nations will have to be content with serving fewer farmers in the beginning and taking more time for their programs to grow to maturity.

4. Access

Easy communication with farms is also presented by Ray as important for program success. But, again, this is not a sine qua non, but an obstacle to having an extensive program. Obviously, only those farmers who can be reached can be served. Decisions have to be made about how the limited resources of the insurer will be spent. There is no requirement that an insurance program cover 100% of a nation's farmers. Quite the opposite crop-credit insurance implies that only potentially credit worthy farmers will be covered. As the credit system is extended, so will be the insurance system.

If resources are available, quite a few farmers can be reached. In the Mexican program, insurance fieldmen often go on horseback to visit the more remote clients. How far they can go is a matter of resources.

Farmers with several small landholdings present a greater problem. It sometimes takes all day to visit the separate parcels. The existence of insurance will remove one of the reasons for this tenure pattern. Economic incentives such as decreased coverage or, preferably, an increased premium rate would tend to promote consolidation.

5. Price Policy

Price support or stabilization is often mentioned as a requirement for two reasons. First, if farmers are reasonably assured of a certain price for their produce, this will remove a large element of risk from their lives and call forth production of that crop. This will complement the effect of crop insurance. If crop insurance is offered but prices are unstable over a wide range, too much risk remains for production to be effectively stimulated.

This is one of the reasons for indicating planning and marketing as essential requirements for crop-credit insurance. If there is no price control program, planners must consider the eventual effect of the insurance on price. Insurance can be provided on different crops in different years or on a large variety of crops (the U.S. and Mexico both insure 35 - 40 crops) so that the farmer has alternative crops to choose from each year and market glutting can be avoided.

The second reason is that if prices drop sufficiently low during the growing season farmers may deliberately cause losses in order to collect from the insurer. For example, farmers with irrigated tomatoes may permit excess water into their fields to cause root rot. There are, however, various techniques to control for this problem. Various deductible and premium adjustment (increase) provisions come into play. Also, there is the use of regular inspections to detect some of the deliberately caused losses. No system is sufficient and the sum of all systems is not perfect control but, sufficiently tight control to permit the insurer to carry on operations safely.

6. Summation

Desirable support conditions which we have here examined include:

- a. The existence of adequate technical data;
- b. Active farmer demand for insurance;
- c. Stable land tenure conditions;
- d. Easy access to farmers; and
- e. Stable commodity price conditions.

While all of these are shown to be important, it is suggested that by various strategies crop-credit insurance programs could begin and prosper without their pre-existing.

VI. REVIEW OF EXISTING CROP INSURANCE PROGRAMS

This section presents a capsule description of ongoing crop insurance programs which would be of interest to executives or administrators concerned with implementing programs in their own countries. Visits to the programs in the developed nations are relevant because much of the technology developed is transferrable. Establishment of contacts for the purpose of arranging training or consultants' visits is important.

A. Mexico

The program is administered by ANAGSA (Aseguradora Nacional de Agricultura y Ganaderia, S.A.), an autonomous government agency. It has been in existence since 1961 and now serves nearly one million farmers with a staff of approximately 2,000 employees. Half of the farmers farm less than 3.5 hectares of land. Approximately 85% of the insureds are ejidal farmers, most of whom would not be able to obtain credit if the insurer did not exist.

The program suffers from heavy centralization of administrative and decision making functions in Mexico City, inadequate education of insured farmers and inadequate coverage. Solutions for all of these factors have been implemented in a successful pilot project in the state of Michoacan.

ANAGSA offers the most relevant, successful model of a crop-credit insurance program for less developed nations.

B. Japan

Japan's program provides an interesting example of how to successfully mix government and private sector resources. The insurance is actually offered by cooperatives in each community which are called Mutual Relief Associations. These reinsure the bulk of their contracts with federations, there being one in each prefecture. The federations in turn reinsure the bulk of their business with the government through the Ministry of Agriculture and Forestry.

The organization chart for crop insurance is not "I" shaped (mutuals, federations, government), but "Y" shaped as it has two "heads." In order to balance the power of government and assure that federations and mutuals are able to defend their interests, a trade association called NAlA (National Agricultural Insurance Association) was established. NAlA plays a vital lobbying, representational, educational and research role in Japanese agriculture.

The program services approximately 5 million farmers with farms as small as ten ares. It uses 18,000 employees, mostly part timers employed by the mutuals. It is a highly successful program with, apparently, a high degree of satisfaction on the part of farmers. It is not a crop-credit insurance program. An agricultural credit insurance or guarantee program had been established approximately ten years prior to this one. This program is used to stimulate production and protect farmers' income.

Japan's program is relevant to less developed nations (LDC) because of the small size farms involved, the uniquely successful blending of private and public sector and the emphasis on stimulating food production. Additionally, the country offers an excellent opportunity for training and a source of assistance in the form of competent advisors.

C. United States

Crop insurance is available from two sources in the U.S. Against the risk of hail and certain other risks one can purchase protection from many small companies and mutuals. These all belong to a trade association, CHIAA (Crop Hail Insurance Actuarial Association).

All risk coverage is only available from a federal government agency, the FCIC (Federal Crop Insurance Corporation). Participation is voluntary and only about 13% of eligible farmers participate. The size and wealth of U.S. farmers, the vitality of the agricultural credit system and the numerous support programs make the insurance unnecessary for many.

The program in the U.S. is subsidized only to the extent of administrative costs. Losses are fully paid from farmers premiums. In the thirty year period, 1948-1977, losses have amounted to 97% of premiums! This is a marvelous technical achievement and represents a thorough domination of insurance technology.

The FCIC program is relevant to LDC leaders because of this technological domination and as a source of training and consulting assistance.

D. Sweden

A bold experiment was attempted in Sweden, to provide coverage on a group basis and thereby realize significant cost savings. This feature is called the Area Yield System and has provided mixed results. Sweden is now in the process of adjusting, or perhaps, abandoning Area Yield. The program as a whole is successful. It is administered by several different agencies, of which the lead agency is the Central Bureau of Statistics.

It is an excellent source of training and consultative assistance for LDC programs.

E. Israel

All risk insurance in Israel is offered by the INFRA (Insurance Fund for Natural Risks in Agriculture, Ltd.). INFRA's operations are relevant to LDC for two reasons. INFRA was given a government guarantee of deficits for seven years. By that time it must have sufficiently brought the insurance business under control to be able to operate on its own. It is presently at this weening stage, trying to switch from the government guarantee to commercial reinsurance. If it is successful, this will be a dramatic demonstration of the viability of crop insurance programs in small countries. The element of reinsurance is crucial here and is discussed below.

The second reason for its relevance centers on the control and marketing mechanisms. Control is vested in a committee of government officials and farm leaders. Farm leaders outnumber government officials. The farm leaders are mostly officials of agricultural marketing boards. The insurance is marketed through the boards, sold as a group policy covering all members of that group. This offers the opportunity for saving administrative costs but also creates a danger in that the coverage may be misapplied. The outcome of this experiment will be important for program designers in other countries.

In addition to the reasons mentioned above, INFRA offers the possibility of providing training or consultative assistance to other nations.

F. South Africa

The only totally independent program in the world is located here. The Sentraoes cooperative in Ficksburg, its predecessors, and members have offered crop-hail coverage since 1929. In 1970, it began to offer all risk coverage. Although small, the program has operated successfully. It issued 586 policies in 1975/76 for an average coverage of Rand 4,280 and a premium of Rand 206,000. ^{10/} All risk insurance accounted for only one percent of Sentraoes' total premium income. Its success is defined by the fact that it has managed to stay in business for six years, keep its average loss ratio down to 76% and convince international reinsurers to sell it reinsurance coverage. It is one of only two all-risk insurers in the world who presently enjoy commercial reinsurance coverage.

G. Mauritus

Mauritus is the other. It insures sugarcane production through a national marketing board. The program has been in operation since 1946. It insures only against hurricane, drought and excessive rainfall. The latter two occur over long and indefinite periods of time and thus involve consequential losses such as insect infestation and disease. Therefore, it can be classified as all-risk coverage.

The experience of Mauritus would be relevant to any country which depends on one or a few commercial, export oriented crops. Crucial to the operation of this program was the pre-existence of the marketing board which has a monopoly in the trade of sugar in that country.

VII. THE INSURANCE PLAN

This section deals with the specifics of a hypothetical insurance plan designed to stimulate agriculture production, protect farmers and protect the agricultural credit system in the context of less developed countries. Dr. Ray presents an excellent discussion of this topic which complements what is presented below.

A. Whom to Insure

Because of the higher net economic benefits associated with insuring smaller than larger farmers (see Sec. IV., 1.), it is recommended that coverage be directed at the small farm sector. Probably the easiest way to achieve this is to subsidize the premium of small but

^{10/} In June, 1977, Rand 1.00 = U.S. \$1.15.

not large farmers. Operational definitions of small/large can be established for each country by creating a list of crop acreage equivalences and setting a ceiling for qualifying for subsidies.

For example, set the ceiling at 10 points with--

1 hectare of crop A	=	1 point
1 hectare of crop B	=	3 points
1 hectare of crop C	=	4 points
.		.
.		.
.		.
1 hectare of crop N	=	x points

A second question under the rubric of whom to insure is whether payments should go to banks or farmers. This was touched on in Section IV., 2. Priorities require that the credit system be protected first and that a second tier of coverage be available so as to impact on farmers' income.

B. What to Insure

Both crops and livestock are insurable. Livestock has been omitted from this discussion on the assumption that resources are scarce, the majority of LDC agricultural activity is in crops and that ranchers would tend to fall in the larger farmer classification where lower economic benefits are expected.

Livestock insurance is feasible and should be considered by any nation which has a significant potential for this activity. There is an additional requirement for livestock insurance--there must be an extensive pool of veterinary doctors available for use by the insurer. The primary service of this line of insurance is not the payment of benefits upon death or disability of an animal, but the provision of veterinary services by the insurer to prevent the occurrence of death or disability (See Munich Re). Therefore, if there is not an adequate pool from which the insurer can hire full time personnel, it will be unable to control losses or operate successfully.

Although the livestock line deserves consideration in some cases, I shall continue to ignore it in this paper so as to concentrate on the equally demanding and difficult task of crop insurance.

What crops then to insure? The answer is all those whose production one wants to stimulate. This requires the active participation of the planning, research and marketing agencies. They will help to identify crops which are needed and have good prospects for delivering positive economic benefits. It is expected that a country would begin insuring a basic grain crop, but this need not be the case. The insurance should be used as a leverage tool wherever it seems to be most beneficial.

As many crops as possible should be insured so that land use rationalization will take place (spurred on by the cost allocating function of insurance) and farmers will be able to make varied choices in response to their expectations about harvest prices. If an effective price stabilization or control program is functioning this latter loses some of its significance.

In addition to land use rationalization, another reason to insure as many crops as possible is to take advantage of the stabilizing effect on losses incurred. If the losses of different crops are not intercorrelated or are only slightly so, then the cyclic pattern of losses will tend to be flattened out. Less capital reserve will be required for any given total dollar volume of coverage written. Conversely, more farmers can be served for any given reserve capital amount.

Despite the advisability to insure as many crops as possible, a caveat is necessary. Any insurance program should begin small and grow conservatively. This is to give it time to learn from its mistakes while introducing new programs. If a program is introduced on a large scale, mistakes will be more expensive, but no more useful as learning devices than if the pilot program approach is used. As a rule of thumb, one might begin by insuring two or three crops and add as many as two more in each succeeding year.

C. Life Insurance

Yes, there is a role for life coverage here. Automatic coverage equal to the farmer's loan will save both bank and widow grief. The coverage can terminate with repayment of the loan or continue until the beginning of the next crop season. Coverage can be equal to the loan or some multiple, such as twice. This would provide an added visible benefit and reduce farmer dissatisfaction.

Since the life coverage would be of the group type, its cost would be low and administration easy. Cost could be included in the crop insurance premium without causing any significant distortion.

D. What Risks to Insure

It is easier to operate a specific risk program.

Losses are limited and hard actuarial data can be built up more easily. But, the specific risk approach leaves too much risk untransferred and leaves the farmer still in jeopardy of falling below his minimum income threshold. Theoretically, all-risk is preferrable. However, there may be some areas where one single loss cause dominates and the specific risk approach would be satisfactory. Puerto Rico and Mauritius both started off this way, insuring against windstorm. All-risk does a more complete job of transferring risk away from farmers and should have a greater impact on technology adaption.

covered in an all-risk program,
In addition to the standard risks, /e.g.--

- drought;
- excessive rainfall;
- disease;
- pest damage (after using standard or recommended control practices);
- animal damage;
- windstorm; and
- flood,

the appropriateness of recommended technology when properly employed should be covered. This is automatically done when yield is guaranteed.

Variations in price should not be insured. Where price and quantity were both insured, the offering company always went bankrupt. Research is going on now in Japan and there is a small program operating in British Columbia, Canada. 11/ However, the task of controlling prices is still formidable and can be managed more efficiently by using control or stabilization policies than through the insurance mechanism.

11/ That program is titled Income Maintenance and has been in existence since approximately 1974. It covers approximately ten commodities, including beef and pork. The program was started as a support to an Agrarian Reform program. Certain marginal lands were classified for agricultural purposes only. The income maintenance program was chosen as the most efficient way to subsidize farmers locked onto those lands.

E. Voluntary or Compulsive

This question has intrigued most writers on crop insurance. Should farmers be forced to buy insurance? If they are forced, they may be resentful and political costs may run high. But if purchase is a voluntary matter, adverse selection will take place.

With crop-credit insurance this becomes a moot question. If farmers want loans, they must purchase insurance. Dissatisfaction is avoided by educating farmers about insurance and structuring the program to provide realistic and adequate benefits.

Actually, for developing countries the voluntary/compulsive question is not relevant. If the program is to be directed towards poor farmers, it must have a compulsion element to assure a sufficient number of participants, a control of adverse selection and a lowering of average "sales" cost. Linking with credit is an effective way of doing this.

The pertinent question turns out to involve deciding whether the program should attempt to be universal or particular in coverage. Using the credit approach, it will be particular and will tend to be insurance. If the initial attempt is at universality, the strain on the capacity of the organizational structure will be great and the viability of the organization threatened (see Sri Lanka case in Maurice (2)). A universal program will have a tendency to move from insurance towards non-contingent income maintenance as the structure disintegrates.

F. Coverage on the Individual or the Area Results

Sweden attempted to avoid the cost and inaccuracies involved in adjusting losses on each farm by creating an area wide system. It measures the deviation from the guaranteed yield for each crop in the area and then calculates a weighted average for each farm based on the acreage of each crop planted. It is the most sophisticated area program proposed or in operation and is extremely well administered.

Farmers are dissatisfied with it however, and it should not be implemented elsewhere. The reason for this is that farmers operate on an individual basis, but this insurance compensates on a group basis. Too much risk remains, i.e.—the difference in performance between the individual and the area (see Swedish case in Maurice (2)).

G. Flat or Differentiated Premiums

For the sake of social fairness and ease of administration, flat premiums for all farmers are often recommended. This has several drawbacks however. Farmers in low risk areas complain that they are being forced to subsidize farmers in high risk areas. Farmers who are modernizing complain that they are subsidizing more traditional farmers.

Production costs are not allocated accurately with flat premium structures. There will be no incentive to switch to the most economic crop and the most efficient use of land, labor and capital will not be produced. Useful information about the productiveness and riskiness of agriculture will not be generated and directed to decisionmakers. The use of differentiated premium is strongly recommended.

H. Program Finance

Agricultural lenders should be used to finance premia. However, because target population in LDC's are extremely poor, government subsidies are necessary. These subsidies will take the following form:

1. **Administrative expenses:** Because these programs are experimental; because the use of administrative personnel is under government rather than free market control; because of the mandatory nature of the program; and because of the poverty of small farmers, it will be necessary for governments to underwrite administrative expenses.
2. **Pure Premiums (or losses):** A portion of the premiums designed to cover losses should be subsidized by the government in the case of small farmers. Smaller subsidies or no subsidy at all can be offered to larger farmers.
3. **Guarantee against catastrophic losses:** Losses in excess of premiums charged may occur. Until the reinsurance mechanism is developed, the national treasury will have to guaranty this amount.

Revenue to support these subsidies will come from several sources. These include:

1. General revenues: Over the long run, general government revenues will increase as a result of the increased economic activity in the agricultural sector caused by the presence of crop-credit insurance. Subsidies financed by general revenues represent a transfer to the agricultural sector and specially to the small farm sector.
2. Savings of agricultural bank decapitalization: Government supported or guaranteed lenders would suffer decapitalization without the existence of crop-credit insurance. That foregone decapitalization is a savings for government which can be used to underwrite part of the subsidy.
3. Transfer of other subsidies: Subsidies on inputs, which distort the use of the input and do not necessarily lead to optimal use of inputs or maximum production, can be partially or totally transferred to the insurance program. Subsidies applied through the insurance mechanism tend to act as output subsidies, calling forth maximum production of the subsidized crops and optimum use of inputs.
4. Extension services can be used both as a source of personnel and funds. The crop-credit insurance mechanism will tend to perform the extension function more effectively than the traditional extension services. The traditional service should maintain responsibility for those classes of farmers not reached by the insurer and can retain the research function.
5. Private sector funds can be leveraged for agricultural production credits as a result of the crop-credit insurance programs, thus freeing up government funds for other purposes. Instead of investing directly in development banks and getting zero leverage (1:1) on the amount of money loaned, it is possible for government to invest in the insurer to guarantee private sector credits and enjoy a leverage factor in the 1:10 to 1:20 range.

Funds exist therefore, to operate a program. The size of the program and the amount of funds which the government is willing to make available are critical variables in the financing equation. The availability of reinsurance and careful underwriting (choosing different crops with zero or negative correlations) will increase the magnitude of risk that can be absorbed for any given amount of capital.

Loans to the governments for the purpose of increasing the number of participants in the programs is an effective way of channeling resources to the agricultural and small farmer sectors.

VIII. THE ROLE AND PROBLEMS OF REINSURANCE

Because of the potential for catastrophes involved in all risk crop insurance, insurers must have access to large amounts of capital. Unfortunately, small and less developed countries seldom have adequate financial capacity to finance the full risk burden. Catastrophic losses could bankrupt a program or negate one of the desired benefits of crop insurance--avoiding large, unexpected and disruptive demands on national treasuries.

The ideal way to resolve this problem is to reinsure the excess risk which the national government is unable to safely retain. Specialized reinsurance companies such as Munich Re and the Lloyds group exist to handle this kind of problem. With the exception of Mauritius and Sentraoes, ^{12/} the international reinsurance companies have refused to cover this risk.

There are several reasons for this:

- Catastrophic potential is involved so the reinsurers must be very careful about the business they accept lest they lose significant funds.
- Specialized facilities are required to verify that losses do not occur unnecessarily or that false claims do not pass through the system.
- Crop insurers, if they are governmental entities, are not motivated by a desire for profits. Commercial reinsurers have as a prime assumption about their clients, that they too want to make money or at least avoid losses. Reinsurers loss control systems are based on this assumption.
- Governmental crop insurers are motivated by social/political concerns. It is to be expected that they will pay claims for social/political reasons which private insurers would avoid for profit reasons. A case in point is Costa Rica where approximately 85% of the coverage is on one crop in one province. Although putting all one's eggs in one basket is normally avoided by commercial insurers, something other than a concern for profits has convinced program officials here to structure their portfolio in this manner.

^{12/} Sentraoes is able to obtain reinsurance because of its concern for profits and its long, successful and reassuring history. Mauritius has probably obtained reinsurance as a result of its long and successful history which is important to reinsurance companies concerned about the administrative viability of a concern.

With commercial reinsurance out of consideration, we must seek alternatives, the most likely of which is a reinsurance pool. This pool would operate regionally and would be formed and financed by those governments which have programs. It would pay losses when necessary and could channel and provide technical assistance and serve as a focus of integration and mutual assistance to the several insurers.

An important corollary function of the pool is that it would be used to wash out the social/political hazard and replace it with a profit motivation. At this point, the basic risk is "cleaned" and the commercial reinsurance market may be tapped for financial support.

Participating governments will be unwilling to subsidize each other over the long run, so there will be a necessity to build a strong loss adjustment and control capacity into the reinsurer. In addition, there will be a need to charge an adequate reinsurance premium. This will cause the pool officials to examine the means by which the basic premiums are calculated and assist in improving this method.

The pool would be financed by contributions of premiums and by purchase of capital stock. The purchase of capital stock can be financed by loans to the governments involved from international banks and development agencies. Loans should not be made directly to the pool, but through member governments so as to keep their interest in avoiding losses.

By using the pool to increase the number of farmers insured, the number of crops insured and the number of climatic zones covered, the amount of capital required relative to the size of operations will decrease. Thus, scarce capital will be used more efficiently and more farmers can be served (see Cummins).

There are several types of reinsurance coverage available (see United Nations). The type most appropriate for this situation is called excess of loss. Under excess of loss, the reinsurer pays benefits when a single, catastrophic event occurs and resulting losses rise above some threshold. The desirability of this approach is that some discrete event must be identified and the reinsurer can send in its loss adjustment and control crew to prevent unnecessary claims from being presented.

Stop loss is another coverage form often suggested. Under this form all losses during a time period are aggregated and the reinsurer pays if they exceed the threshold. This coverage form is undesirable because many small losses resulting from the social/political hazards will be included and the reinsurers loss control team will be unable to remove them efficiently.

IX. ROLE OF COOPERATIVES AND OTHER PRIVATE SECTOR GROUPS

There is demand that cooperatives and other private sector groups be given an opportunity to participate in crop insurance programs. Arguments in their favor are that they are closer to the people, generate additional capital and energy, improve information feedback, and control losses better among their members (see Souchon). Arguments against them center on their inability to generate adequate capital to protect insureds in case of catastrophes (see Souchon).

The problem of capital can be resolved by having governments reinsure the cooperatives as in the case in Japan and Israel. Or, it can be done by having the cooperative insurer seek outside reinsurance on its own as is the case with Sentraoes and the intention in Israel. An added advantage of cooperatives is that they have a profit motivation, or at least a very strong desire to avoid losses, and thus overcome the social/political hazard which prevents purely governmental programs from tapping the commercial reinsurance markets.

In order for cooperatives or similar groups to be able to play a meaningful role, there must be a strong cooperative movement or some other social institution prepared to establish crop insurance cooperatives. In Japan, for example, the cultural support of community organizations made creation of insurance mutuels feasible. Western nations with their individualistic societies would not be able to do so quite as easily.

Israel demonstrates one way out of this problem. It took advantage of the existence of marketing boards and other agricultural associations as a management control and delivery device (see Gilboa). ^{13/} Mauritius also has a marketing board at the center of its sugar cane insurance program.

Vertical integration of the insurance cooperative movement (as achieved in Japan's "Y" shaped organization structure) is necessary if cooperatives are to have any permanence. When marketing associations are used, they already are integrated vertically and are operating at the national level where they have developed some expertise in working with the government.

^{13/} Included are the Agricultural Center, Farmers Association, Farmers Union, and Production and Marketing Boards of Vegetables, Fruit, Cotton, Groundnuts, Flowers, Citrus, Poultry and Vine Growers, and the Field Crops, Sugar Beet and Fish Breeders Associations.

The use of private insurers has been attempted and not proven successful so far. In Mexico, for example, the government agreed that private insurers should form a consortium to offer the insurance and share the risk. The government provided substantial subsidies and guarantees to insure the integrity of the private insurers and the viability of the system. The program failed when the individual companies' underwriting efforts directed the programs at large farmers who were less expensive to reach and, perhaps, better risks. No attempt was made to set a quota for the number and percentage of small farmers served (see Basave-Gomez).

Cooperatives and other private sector organizations can play meaningful roles in the delivery of all-risk crop insurance benefits if they have reinsurance, either from governments or the commercial market available. The introduction of cooperatives into the delivery system lessens the social/political hazard and improves the prospects of obtaining commercial reinsurance. The two most relevant approaches in existence are through the use of marketing and production boards and through the use of community institutions.

X. SUMMARY AND RECOMMENDATIONS

A. Crop-credit insurance is a form of crop insurance which protects both farmers and bankers and provides a broad stream of benefits to the agricultural sector and the general economy.

B. The state of knowledge about crop insurance is mixed. We know how to do crop insurance and have several successful models to study, but we do not know if we should support these programs. Only one economic benefit/cost study has been undertaken to date; further analysis is required. This can best be accomplished by instituting a series of pilot projects and observing the results of these.

C. A substantial range of benefits can be expected of crop-credit insurance. Of signal importance are the stimulation of food production, the adoption of technology, the protecting of agricultural credit institutions and a positive effect on the flow of private and public credit.

D. Crop-credit insurance will produce greater economic benefits when directed to small rather than large farmers.

E. Crop-credit insurance will deliver its benefits more efficiently to the agricultural system and more directly to small farmers than any alternative policy tool.

- F. Although there is a realistic opportunity for private sector action, government action and support seems a prerequisite in this area. Subsidies of administrative costs are required and subsidies of losses are desirable to overcome farmer resistance.
- G. Economic viability rather than financial is the proper criteria by which nationally supported crop insurance programs should be judged.
- H. Crop-credit insurance is not a first priority item for develop- nations. Agricultural marketing, research planning systems and an agricultural credit system must at least be begun at the same time as the insurance program or be already in place.
- I. Other requirements are not excessive but must be met to guarantee a successful program.
- J. The possibility of catastrophic losses threatens the solvency of most small nations's programs and can best be overcome by using reinsurance.
- K. The replacement of the profit motivation by the social/ political hazard is the single most important obstacle to commercial reinsurers' participation. The formation of regional reinsurance pools is likely the most effective way to wash out the social/ political hazard. The use of cooperatives or other private sector organizations will also help control this hazard.
- L. International banks and development agencies should not provide capital funding directly to any reinsurance pool as this will not have a positive effect on removing social/political risk. They may, however, make loans to participating governments which would use that money to capitalize the reinsuror.

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A NOTE ON
EXPERIENCE RATING OF
CROP INSURED FARMERS

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FCIC has a policy of experience rating insured farmers. In general, if a farmer has had several good years, his rates are correspondingly reduced. If he has had several poor years, the rates are increased. This is demonstrated in the attached table.

Some examples might help to explain the working of the table and the system.

Case No. 1

Farmer A has insured rice with FCIC for the past 20 years. He has had several small losses but none that exceeded his premium paid-in in any year. His loss ratio (total indemnities divided by total premium paid) is 0.72.

Does Farmer A get a discount? How much?

Answer: Yes; 20% discount.

Solution: Note that we use only the last 15 years. On the table entitled "% Adjustments for Favorable Continuous Insurance Experience," we look for the cell that corresponds to 15 or more years and a 72% loss ratio. That cell contains the number 80 which means that the farmer will pay a premium which is only 80% of the normally quoted rate.

Case No. 2

Farmer B has been insured for 11 years. On four occasions, his losses exceeded premiums paid-in that year. His loss ratio for the 11 years is 2.12.

Does Farmer B earn a discount? How much?

Answer: No; he must pay a 28% surcharge.

Solution: Ignore the fact that Farmer B has been insured for 11 years. Take only the number of excess loss years and his cumulative loss ratio into consideration. Use the table entitled "Percent Adjustments for Unfavorable Insurance Experience." Note that the cell that corresponds to 4 loss years and a 2.12 loss ratio contains the number

128. This means that the farmer will be required to pay 128% of the normally quoted rate.

By this time, the reader will have probably deduced from the two tables that we have three zones based on loss ratio.

Loss Ratio

Characteristics

0-80%

The more reliable the statistics, that is, the greater number of years which it represents, the larger the discount.

80-110%

Because the experience is very close to the expected result, no change is made. The data is neutral.

110-over

Here the combined loss ratio and number of excess loss years are combined to calculate the required additional surcharge.

Two Questions International Visitors Will Consider

The first question is . . . Is this the kind of system feasible in a developing country?

This, of course, is the question which visitors from countries with developing agricultural sectors must ask themselves. Can it work where there are many farmers on small farms, the opposite of the case in the

We feel that the answer is yes. In order to be successful, it will be necessary for the insurer to use a computer to handle the complex accounting. This can be done from central computer facilities or on a small computer that the insurer obtains for itself. The latter is the preferable course since it permits the insurer greater control over what operations are done and when.

The second question is . . . Why should we use this system? The answers follow.

1. Improved acceptance of the insurance by the farmer. Farmers, as all insureds, complain that their rates are too high. With this system in place, they are guaranteed to pay rates that reflect their own experience.

2. Protection against adverse selection and other deterrants to actuarial soundness. Farmers will often ask that programs be designed in ways to improve the usefulness for themselves, but which also

and inadvertantly destroy the actuarial foundations upon which the program is built. The very vitality of the program is often jeopardized.

Individual experience rating permits the insurer to recuperate losses from those who caused them and thus protect itself. It also makes the true cost visible to the farmers so that they can decide if this is the way in which they wish to continue their program.

Premium Adjustment Table

% ADJUSTMENTS FOR FAVORABLE CONTINUOUS INSURANCE EXPERIENCE (LP Pg. 5)

	Numbers of Year Continuous Experience Through Previous Year															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 or more
Loss Ratio $\frac{1}{2}$ Through Previous Crop Year	Percentage Adjustment Factor For Current Crop Year															
.00 - .20	100	95	95	90	90	85	80	75	70	70	65	65	60	60	55	50
.21 - .40	100	100	95	95	90	90	90	85	80	80	75	75	70	70	65	60
.41 - .60	100	100	95	95	95	95	95	90	90	90	85	85	80	80	75	70
.61 - .80	100	100	95	95	95	95	95	95	90	90	90	90	85	85	85	80
.81 - 1.09	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

% ADJUSTMENTS FOR UNFAVORABLE INSURANCE EXPERIENCE

	Number of Loss Years Through Previous Year*															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Loss Ratio $\frac{1}{2}$ Through Previous Crop Year	Percentage Adjustment Factor For Current Crop Year															
1.10 - 1.19	100	100	100	102	104	106	108	110	112	114	116	118	120	122	124	126
1.20 - 1.39	100	100	100	104	108	112	116	120	124	128	132	136	140	144	148	152
1.40 - 1.69	100	100	100	108	116	124	132	140	148	156	164	172	180	188	196	204
1.70 - 1.99	100	100	100	112	122	132	142	152	162	172	182	192	202	212	222	232
2.00 - 2.49	100	100	100	116	128	140	152	164	176	188	200	212	224	236	248	260
2.50 - 3.24	100	100	100	120	134	148	162	176	190	204	218	232	246	260	274	288
3.25 - 3.99	100	100	105	124	140	156	172	188	204	220	236	252	268	284	300	300
4.00 - 4.99	100	100	110	128	146	164	182	200	218	236	254	272	290	300	300	300
5.00 - 5.99	100	100	115	132	152	172	192	212	232	252	272	292	300	300	300	300
6.00 - Up	100	100	120	136	158	180	202	224	246	268	290	300	300	300	300	300

* Only the most recent 15 crop years will be used to determine the number of "Loss Years" (A crop year is determined to be a "Loss Year" when the amount of indemnity for the year exceeds the premium for the year) $\frac{1}{2}$ Loss Ratio means the ratio of indemnity(ies) paid to premium(s) earned.