

**Toward combined index-based group and indemnity-based  
individual insurance for smallholder farmers:  
Review of some issues and questions**

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# I. Benchmark individual contracts for indemnity and index insurance

## 1. Individual indemnity insurance contract

- Payout can only be made after loss has been verified/audited.
- The optimal contract is full insurance after deductible (to limit the cost of audits).
- Remaining problems: MH and AS.
- The adjustment cost is independent of the size of the payout, hence relatively more expensive per unit of insured loss for small contracts.

→ Low demand because audit and hence the insurance is very expensive, particularly for smallholder farmers

## 2. Individual index insurance contract (index = a correlate of loss)

- No adjustment cost, no MH or AS, but basis risk.
- The optimal contract is partial insurance, even if premium calculated at fair price.

Intuition: The premium increases the risk because it increases the worst outcomes (cases of loss, no payout, and yet premium paid).

→ Low demand because very imperfect insurance due to high basis risk and worsening of extreme outcomes (Clarke).

Options to increase the value of index insurance are to:

- (1) Reduce basis risk (area yield based, satellite observations) (Carter),
- (2) Interlink insurance with credit to increase access to credit when there is heavy demand for credit and lack of collateral (Carter, Cheng, and Sarris)
- (3) Interlinked credit-insurance contract, with premium paid on credit and insured (McIntosh et al.'s Ethiopian project).

## II. Potential benefits of group contracts and their (optimal) design

Group contract =

- A higher-level contract between the insurer and the group
- A lower-level contract between the group and the members, where contract is used here loosely to include any formal or informal arrangement.

The underlying reasons for considering group contract are:

- (i) Reduction of costs in retailing, and use the group's administrative capacity,
- (ii) The group has a cheaper technology for loss assessment,
- (iii) The group may have some capacity to self-insure
- (iv) Insurance may have externalities on other members

## **Outline**

- 1. The upper level contract between the insurer and the group**
- 2. Within group allocation of the payout to members**
- 3. Mutual insurance within the group**
- 4. Uptake of group insurance against aggregate risk**

What do we (I) know? Research questions?

## 1. The upper level contract between the insurer and the group

Alternative options to determine the aggregate payout:

- a. Loss is fully observable at no cost. [Ex: Cotton cooperatives in Mali (Bellemare and Guirkinger)]
- b. Loss is estimated from an audited yield sample. [Ex: Villages in the rice producing area of China (Cai et al.)]. Area yield insurance.
- c. Payout is based on the realization of an external index (weather based index). [Ex: Input loan insurance in Ethiopia (McIntosh et al.); Flood risk in Bangladesh and drought and frost risk in Ethiopia (Dercon et al.)]
- d. The optimal theoretical contract suggests either complete audit or a partial audit of those with the highest losses (Clarke), and payout to the group equal to these audited losses less a deductible.

Solutions (a)-(c) give loss assessments that can be applied to individual contracts as well as to group contracts, where the group would only serve as a retailer. But (b)-(c) leave basis risks.

Solution (d) does require the group to have an explicit rule of allocation of the total payout across members.

→ The quality of the insurance provided through this group contract depends on the internal contract between the group and its members.



## Questions for research:

(i) The practice of sampling to estimate average yield loss is very different from the optimal theoretical solution. The theoretical model is likely hard to implement. Are there implementable schemes that would remain close to the theory?

(ii) Are there mechanisms other than audit to induce truthful reporting of the group (similar to what Ligon proposes for within-group mutual insurance)?

What does Agroasemex use with Fondos? (Auditing of their own accounts: is that sufficient?)

## **2. Within group allocation of the payout to members**

Aggregate payout to the group could be distributed with a formula based on the relative effective losses. This is based on

- the existence of individual basis risk within the group,
- ability of group members to have perfect information on each other,
- the assumption that members can agree on an allocation rule and enforce the desired allocation. Hence issues of cooperation, trust, and governance of the group should be raised.

1. First note that one usually cannot allocate the aggregate payout with the formula used to compute its amount.

$$\underbrace{\frac{1}{n} \sum_{i=1, \dots, n} \max(Loss_i - d, 0)}_{\text{mean individual payouts}} \geq \underbrace{\max\left(\frac{1}{n} \sum_{i=1, \dots, n} Loss_i - d, 0\right)}_{\text{per capita aggregate payout}}$$

2. Critical role of the person/mechanism in charge of implementation.

In the Chinese case, the aggregate payout is defined by the estimated sum of losses above the deductible, and the village leader is responsible for determining the individual losses and allocating payout accordingly.

Yet, ~ 50% rice producers say they would prefer a uniform compensation, as opposed to a redistribution proportional to individual losses (Cai). This most likely suggests lack of trust in the fairness of leaders in making payouts. (Is there a political economy of allocation of payouts?)

## Question for research:

- Need to better understand why/when members prefer a uniform rate over an allocation rule that depends on their losses?
- Is it true that there is perfect information and control of moral hazard within group, or a mechanism that implies truthful reporting?
- Are there institutional arrangements that allow implementation without rent appropriation?
- What would be the optimal allocation rule? (Is a deductible still optimal?). What are second best implementable schemes?

### 3. Mutual insurance within the group

Assumed by most theoretical models.

Mutual insurance can be restricted to simple sharing within a period of time, or can include some savings/borrowing over time by the group or the individuals.

Examples:

- a. Within period mutual insurance in a two-level insurance scheme for agricultural production?
- b. A genuine local insurance contract (with premium and payout), with the outside contract being a reinsurance contract. [Fondos in Mexico].

Idea from the mutual insurance literature (not integrated with an upper level insurance)

- c. Theory: Mechanism for insurance in production provided by a marketing cooperative when there is limited commitment (Ligon).

## Questions for research:

- (i) What is the optimal level of local vs. aggregate insurance for aggregate risk in schemes that allow for local intertemporal insurance (Fondos, Ligon)?
- (ii) How do the two levels of insurance connect? Is there a better contract than the juxtaposition of the two contracts?
- (iii) When there is capitalization at local level (Fondos, cooperatives), how to deal with entry and exit (i.e., property rights) to maintain correct incentives for members?

#### 4. Uptake of group insurance against aggregate risk (Enhancing complementarity between group and individual insurance)

Some substitutability between an index insurance provided *individually* and the internal mutual insurance.

→ Lower demand for the index insurance? [or possible decline in welfare if imposed, as in Attanasio's and Rios-Rull's theoretical model]

But not if group insurance?

- a. Experiment: Training to think of mutualizing the payout increases uptake (Ethiopia, Vargas-Hill et al.).
- b. Theory: If the group has some common assets to which individuals contribute according to their current income, then members of the group should optimally coordinate on their decision on whether to buy an insurance. The reason is that the marginal benefit of the insurance depends on whether the others are insured or not. (Dequiedt et al., with examples on cooperative that operates a processing facility with economies of scale).
- c. Further, the demand from the group is higher than the sum of the demands from the individuals because being insured creates positive externalities on others. This suggests that the group should act as a group in deciding of insurance uptake and not simply as an aggregator of individual demands.



## Questions for research:

- (i) Does a group index insurance benefit from the existence of a lower level contract?

*Hypothesis: Absent a mutual insurance contract within the group and provided there is heterogeneity in losses, a group index insurance, with rules of allocation of the payout based on locally observable effective losses, is superior to an individual index insurance. Hence uptake should be higher.*

- (ii) Reciprocally, does a group practicing mutual insurance benefit from the “group” aspect of an index insurance in terms of insurance value (i.e., except for lowering TC)?

*Hypothesis: Only to counteract the negative effect on commitment to the mutual insurance (how important is this empirically?), or if there is a public good aspect to being insured.  
Empirical evidence on differential uptake from group vs. individual index insurance?*

(iii) Is there merit to have a group decision as opposed to the group being simply the aggregation of voluntary subscriptions?

*Theoretically only if demand is too low due to externalities.*

*Group decision should not necessary be a 0/1 decision.*

*Case studies:*

*China rice insurance (voluntary, with participation ~40% with a 70% subsidy).*

*Two cases in the design phase: frost insurance for oranges (China), storm/hurricane insurance for coffee (Guatemala).*