Behavioral Economics and Green Growth
The Role of Insurance and Adaptation Measures

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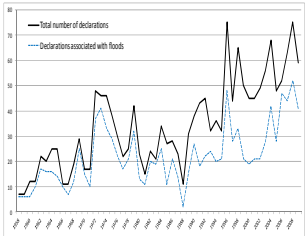
Green Growth in Action Workshop
Mexico City
January 13, 2012



Summary of Key Points

Many key decision makers do not invest in risk-reducing measures prior to a disaster

There are systematic biases and heuristics that are responsible for their behavior

Multi-year insurance and multi-year loans can incentivize individuals to undertake these protective measures

Agricultural Challenges Today: Three Examples

Example 1: A farmer has to determine whether to invest in new equipment to grow a high yield crop that has a much higher yield than his current low-yield crop if the area has less than the average amount of rainfall (i.e., a drought).

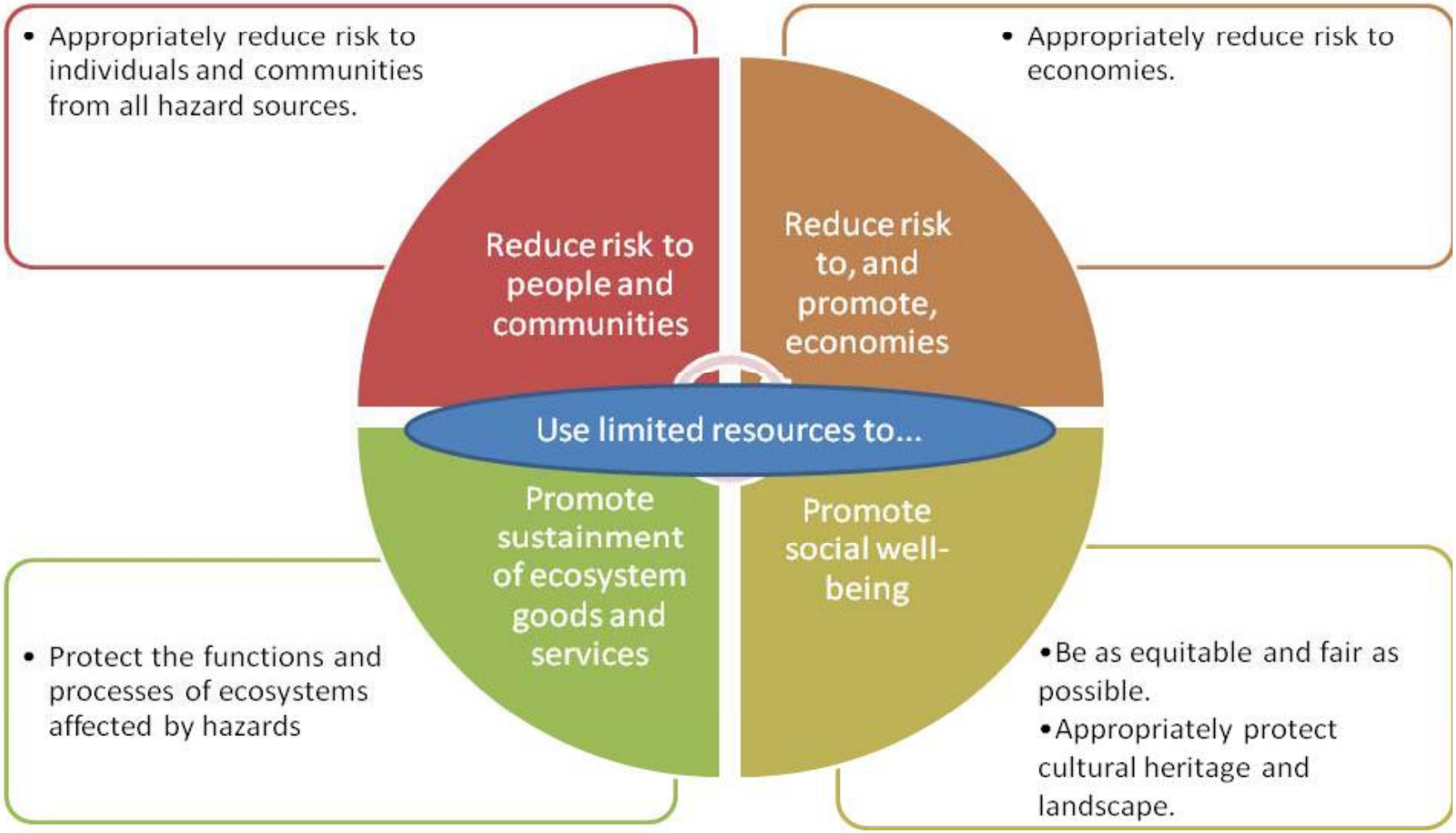
Agricultural Challenges Today: Three Examples

Example 2: A community has to determine whether it wants to invest in irrigation systems to reduce the consequences of low rainfall amounts on agricultural yields of farmers in its area.

Agricultural Challenges Today: Three Examples

Example 3: A government has to determine what investment strategies it needs to pursue to protect farmers against severe losses from a disaster during the growing season.

Goals of Risk Management



Economic Analysis of Investment Decisions

Notation

C= upfront cost of investment

p = probability of a drought

B= annual benefit of investment if drought occurs

β = decision-maker's annual discount rate

T = relevant time horizon

Decision Rule

Invest if $C < \sum_{t=1}^{T} (p\,B)\,\beta^t$

Assumptions as to How Decisions are Made

Individuals can estimate future probabilities of a drought

Individuals can estimate the costs and benefits of the investment

All future benefits are discounted exponentially

Perceptions and Choice Rules Used to Determine Whether to Invest in Protection

Why are farmers, communities and governments reluctant to protect themselves against weather-related events, such as a drought year or severe flooding?

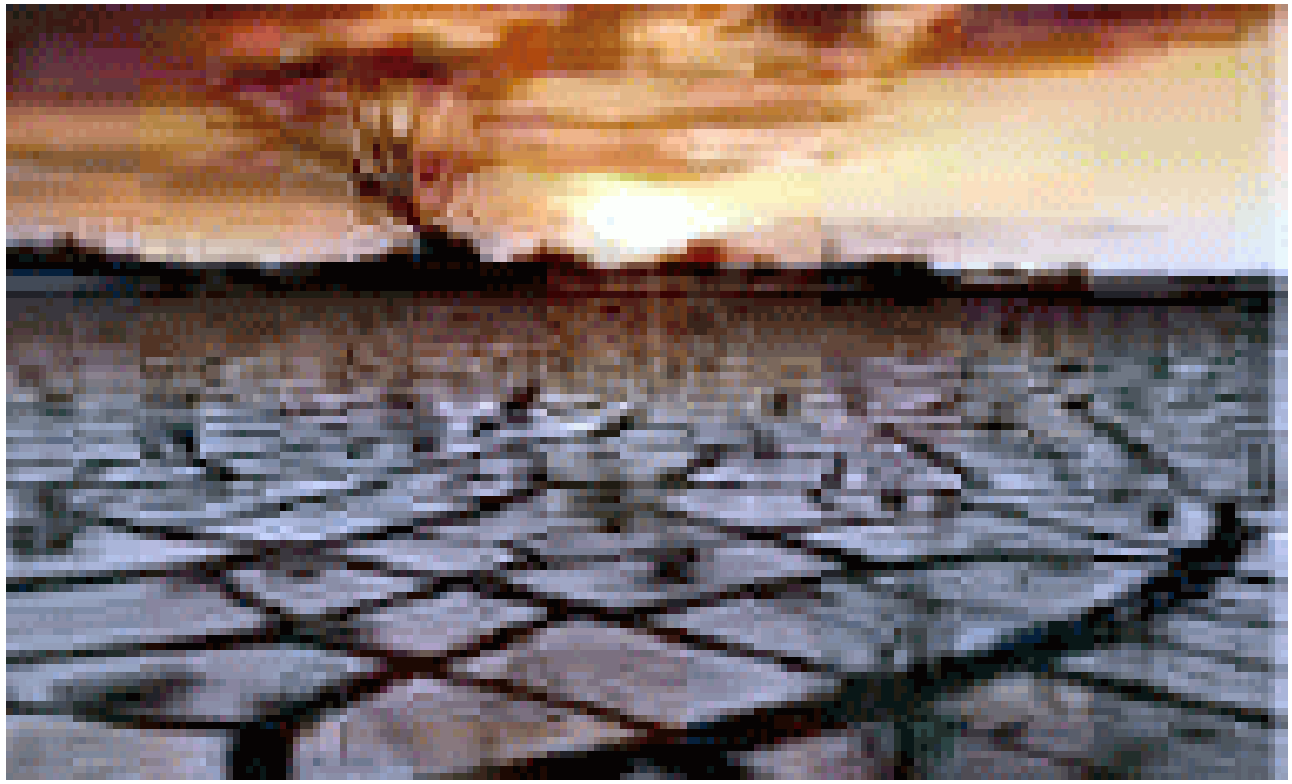
- ***Budgeting Heuristics:*** Limited disposable income after purchasing necessities.
- ***Safety-first Behavior:*** Invest in protective measures only if the probability of the event (*p)* is above the farmer's threshold level of concern (*p*)*.
- ***Under-weighing the Future*** Human temporal discounting tends to be *hyperbolic:* temporally distant events are disproportionately discounted relative to immediate ones.
- ***Myopic Behavior*** Decision maker considers only the expected benefits from the protective measure over the next year or two, rather than over the life of the equipment.
- ***Procrastination*** Individuals have the ability to *postpone* investments. A community might recognize the need to invest in irrigation measures to reduce the consequences of drought but may still fail to act.
- ***Underestimation of Risk*** Another factor that has been shown to suppress investments in protection is under-estimation of the likelihood of a hazard.

Role of Insurance and Loans in Promoting Green Growth Strategies

The United Nations and the World Bank have provided the impetus for implementing innovative *index-based* insurance schemes coupled with loans that overcome the financial constraints that prevent subsidence farmers from investing in seeds and other purchases that significantly increase agricultural productivity.

Nature of Indexed-Based Insurance

Index-based insurance makes payouts to the insured party contingent on a physical trigger such as rainfall measured at a regional weather station.



Index-Based Insurance Initiative in Malawi

Since 2005, low-income farmers have been offered protection against insufficient rainfall, and loans to purchase better groundnut seeds.

- Index-based insurance, in which the premium is calculated based on the probability that rainfall amounts in a particular area will be below certain amounts. Should rainfall be below the trigger, pre-specified payouts are given to affected farmers.
- Loans by banks to farmers to enable them to buy rainfall insurance, seeds and other expenditures necessary for high-yielding crops.

Index-based initiative in India: Gujarat

Self-Employed Women's Association (SEWA) has pioneered index weather insurance distribution, beginning in 2006.

Each year, SEWA has used village meetings to introduce the insurance sales, followed by door-to-door marketing visits.

Between 20 percent and 40 percent of visited households have purchased the insurance.

Index-Based Insurance Initiative in Peru

Peru has initiated a new insurance model to mitigate crop losses from El Niño that provides payments *before* the event occurs.

Purchasers of the insurance make a relatively small initial payment and receive a payout when sea temperatures exceed 24°C between Nov. and Dec. This provides a cash infusion to the insured in Jan., before serious flooding occurs (Feb.-April).

Initiative to Protect against Flooding in Vietnam

GlobalAgRisk has developed rice production insurance that has been structured similarly to business interruption insurance.

Vietnam Bank for Agriculture and Rural Development lends to rice farmers against a pre-defined early-season flooding event.

Contract is underwritten against recorded water levels at a main river gauge station, using this data as a proxy for flood damage.

Our proposal:

Extend the length of these contracts to multi-year insurance and multi-year loans

Multi-Year Insurance and Loan Programs for Communities and Government

Index-based insurance programs are designed to cover a one-year period to enable farmers to purchase high-yield seeds and other inputs to increase their productivity.

For investments with a long life such as new equipment or irrigation systems, there is an opportunity to utilize multi-year insurance (MYI)coupled with multi-year loans to overcome behavioral biases.

How Combined Insurance-Loan System Would Work

- Community or government would purchase index-based insurance to protect itself against losses from a disaster.
- Annual premium would be based on risk and reviewed every five years to reflect structural changes such as global warming.
- Farmers would be covered for five consecutive years, making the chances of receiving a claim during this period more likely than if they focused on annual probability of a disaster.
- Multi-year loan would spread the upfront cost of investment over a number of years. Local authorities, banks or institutions such as the World Bank could provide the loan.
- The annual premium reduction of the MYI policy when one invested in a risk reducing measure (for example, an irrigation system) should be greater than the cost of the loan if the measure is a cost-effective one.

Role of Risk Transfer Instruments for Covering Catastrophic Losses

Catastrophe bonds ("cat bonds") can enable a country, a company or any organization to access funds from investors if a severe disaster produces large-scale damage.

Advantages of using a cat bond:

- *Multi-year coverage and price stability.* Average maturity is three years, with a few bonds as long as five or ten years.
- *Guaranteed expedited payment.* Money can flow to the government in just a few weeks (parametric trigger).

Open Questions

What are the challenges and opportunities in promoting multi-year micro-insurance for farmers?

How attractive are multi-year insurance and loans for stimulating green investment?

What steps can be taken to encourage the government and communities to provide insurance to assist farmers in improving their crop yields and to recover from the next major disaster?

What role can organizations such as OECD, the UN and the World Bank play in encouraging green growth in developing countries?