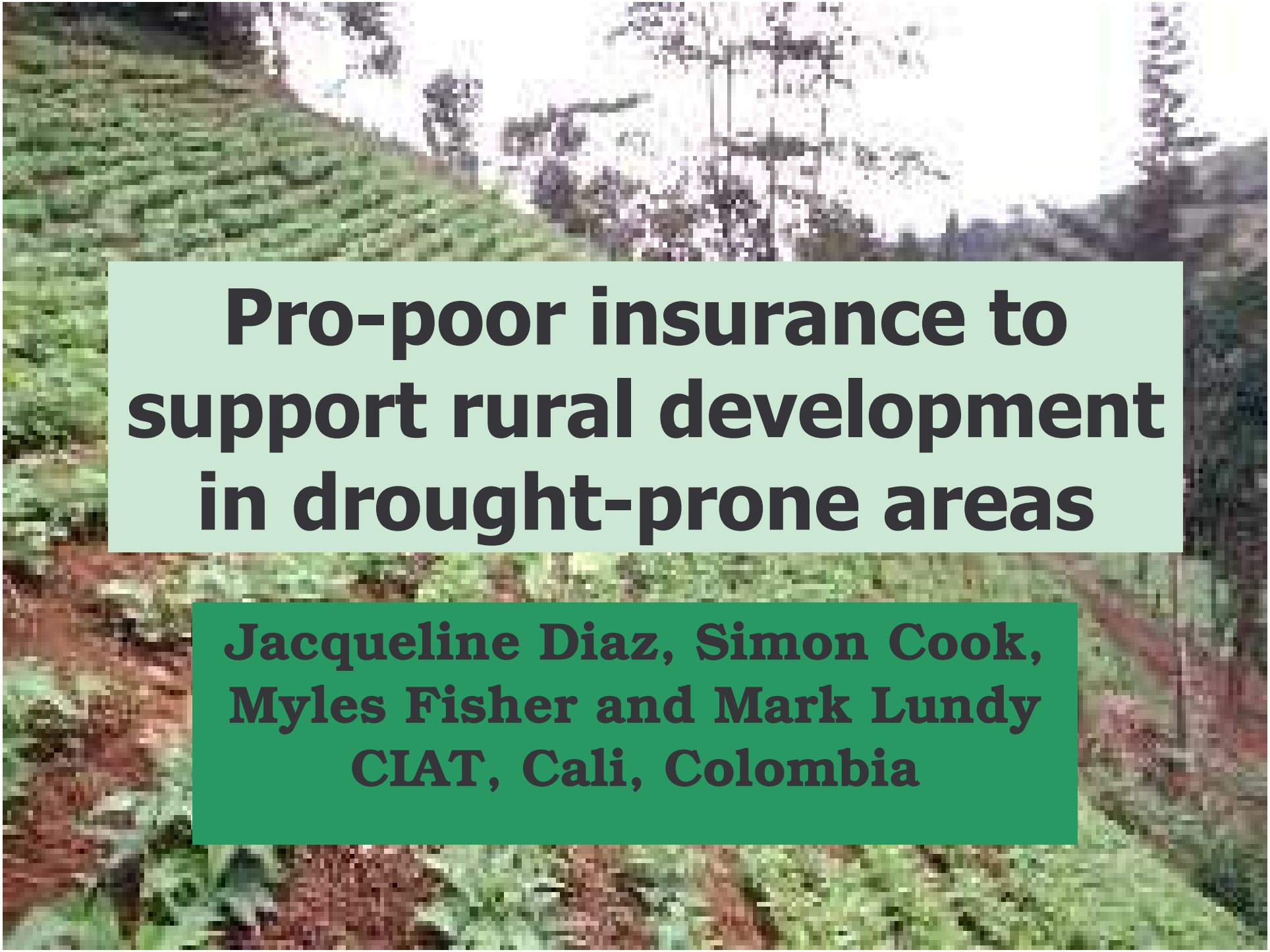
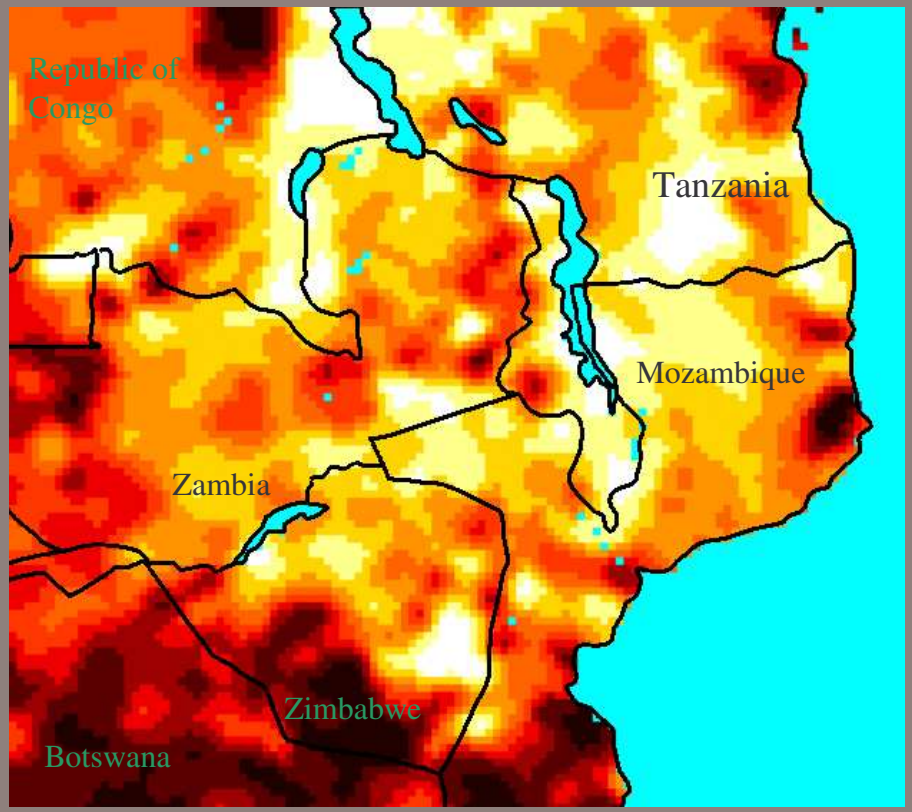


Pro-poor insurance to support rural development in drought-prone areas

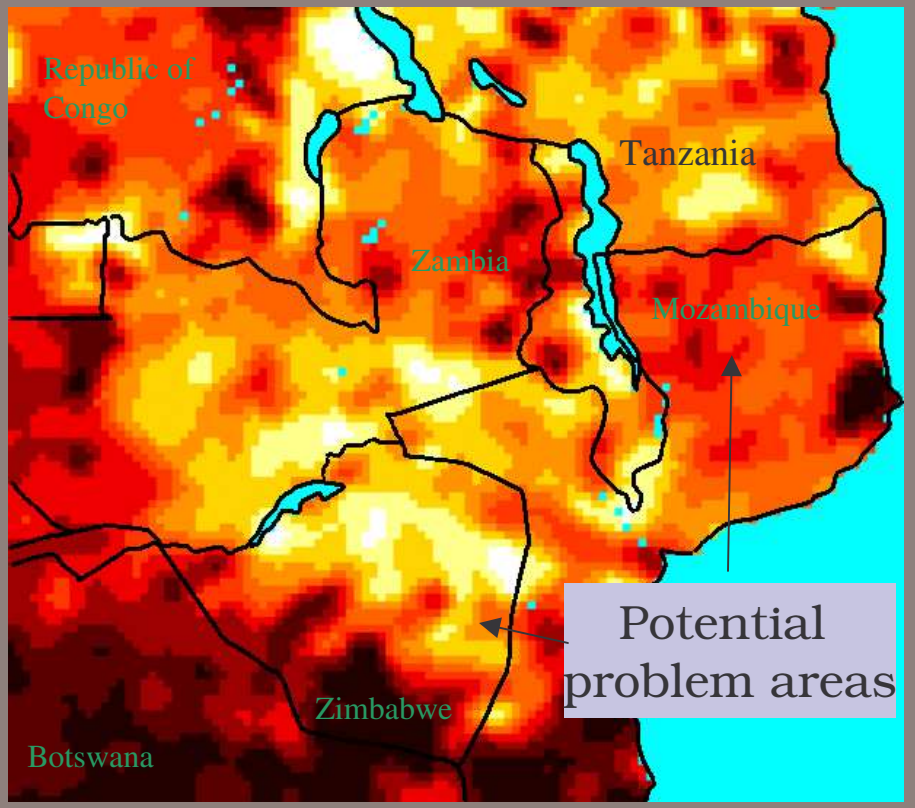
Jacqueline Diaz, Simon Cook, Myles Fisher and Mark Lundy
CIAT, Cali, Colombia

Impact of climate change on Maize production

Probability of achieving 1t of Maize



Present day



Year 2055

Source. P.G Jones & P.K. Thornton (2000) CIAT/ILRI

Drought risk and poverty

- Every year, millions hit by drought
- Tends to hit the poor hard
- Likely to be widespread

August 28, 2001 The New York Times

Drought Creates Food Crisis in Central America

By DAVID GONZALEZ

PILLADO, Honduras, Aug. 24 — A merciless and stubborn summer drought has left almost 1.5 million of the poorest farmers in Central America with no crops to sell or food to eat.

From Nicaragua to Guatemala, many of the region's poorest people have been reduced to scavenging for mangoes and bananas after seeing the bean and corn fields they planted months ago reduced to a crunchy tan carpet of withered stalks and wrinkled leaves.

Although the long-awaited rainy season has fir enough to sustain the year's second planting se crippled by debt from the failed harvest, farme

Impacts of climate risk

Catastophic crop loss

Slow-down of individual progress

Slow-down of the local economy

Farmers cite weather as enemy no. 1

Table 1 Risk-related hardship faced by rural households in Ethiopia

Events causing of hardship	Percentage of households reported to have been seriously affected in last 20 years
Harvest failure (drought, flooding, frost, etc.)	78
Policy shock (taxation, forced labour, ban on migration, …)	42
Labour problems (illness or deaths)	40
Oxen problems (diseases, deaths)	39
Other livestock (diseases, deaths)	35
Land problems (villagisation, land reform)	17
Assets losses (fire, loss)	16
War	7
Crime/banditry (theft, violence)	3

Source: own calculations based on Ethiopian Rural Panel Data Survey (1994-1997)

- Source: Dercon 2002

Drought risk:

Average income per household in Orissa

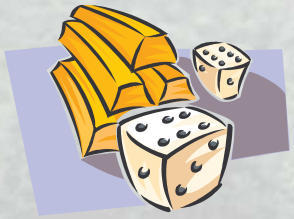
	Normal year (Rs)	Drought year (Rs)	Diff (%)
Crop	12018	4210	-65
Rice	*9290*	*2367*	*-74*
Other crops[1]	*2728*	*1890*	*-31*
Farm-labor	2474	1182	-52
Non-farm activities[2]	4291	6661	55
Other sources	1317	1192	-9
Total Income	32117	17502	-46
Sale of livestock	72	1774	A[4]
Sale of land	0	4768	A[4]
Sale of other assets[3]	0	2329	A[4]
Mortgaging/Borrowing	0	3130	A[4]
Total (asset sale + borrowing)	72	12001	A[4]

[1]Other crops include vegetables, oilseeds, pulses and other cereals.
[2]These includes plucking of leaves, *sal and sabai* and fruit sales.
[3]Other assets include farm implements, utensils, jewelry, timber, trees and bamboo.
[4]The percentage difference was not calculated because the values for normal year were zero or close to zero.

SPandey

Source: International rice research institute

How can insurance help?



- Allows reasonable risk-taking
- Increases access to credit
- Enables investment in biological and financial capital

Insurance is a tried and tested mechanism to cope with risk

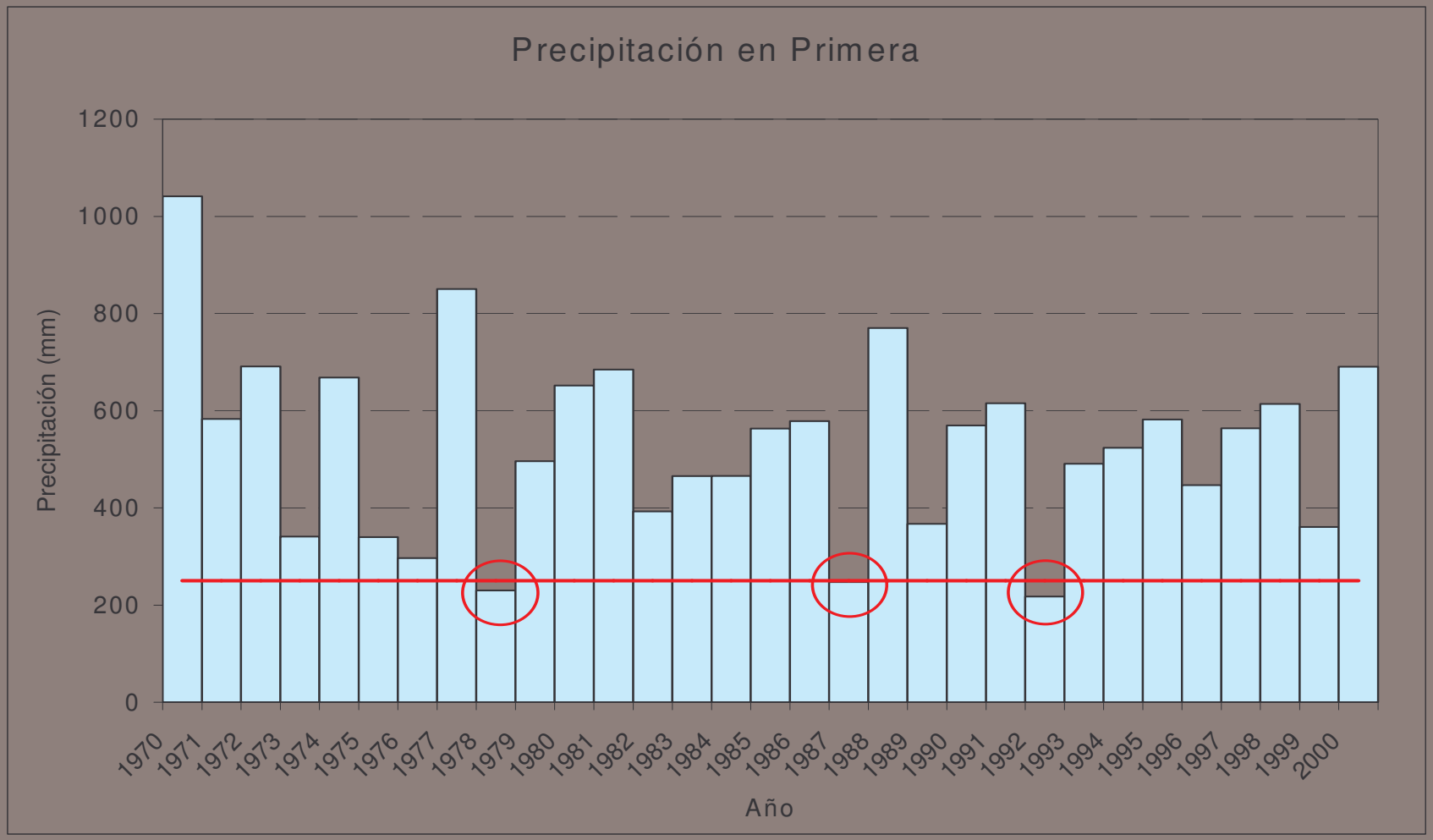

Basic Information
World Map
Basic Information
Catastrophe Catalogue
Geo Specials
Geo Services
Country Profile
Overview
Causes
Effects
Damage
Insurance
Preparedness
Disasters
FAQs
Earthquake
Volcanic Eruption
Tsunami
Tropical Storm
Winterstorm
Storm Surge
Regional Storms
Tornado
Hailstorm
Thunderstorm
Flood
Dryness & Drought
Frost
Iceberg & Pack Ice
High Sea
Meteorite
Insurance is used widely in developed economies...

Advantages of weather index insurance

- **Low cost: no need for inspections.**
- **No moral hazard:**
  - **the insured cannot influence the weather**
- **Less adverse selection:**
  - **Both insurer and insured know that same amount about the weather risk**
- **Weather data are measured independently by third parties**
  - ***everyone sees the numbers.***

An example of a weather index

"We will pay occurs if rain is < 250 mm between 1st May to the 31st July



Basis of insurance

- Let's agree:
  - A rainfall deficit of x mm results in a yield loss of Y kg/ha
  - X has a probability of (say) 10%, Y cost $100
  - To cover Y, the insurer will charge $10
- What rainfall deficit?
- What loss ?

Relate weather to yield

Option 2: Generate weather and link to yield using crop simulation models

DSSAT
Most crops modelled

Soils, slope, variety included

MarkSim

Generates 100 years of data

18 km grids over entire tropics

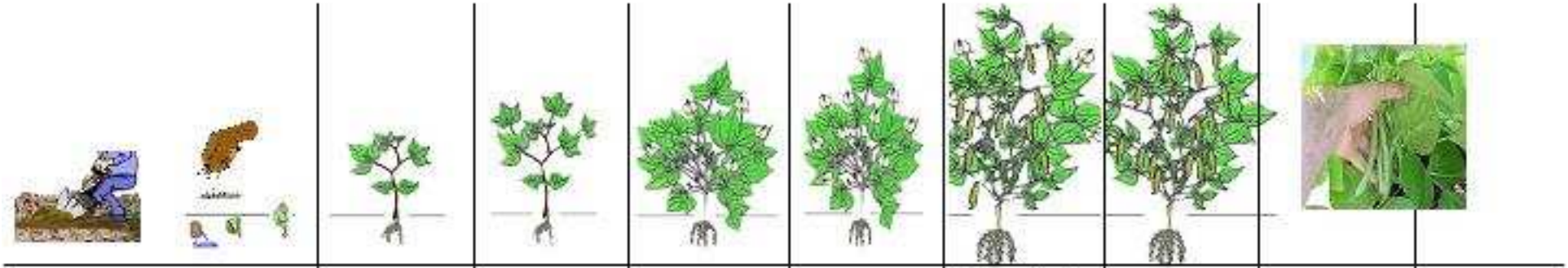
Daily rainfall, temp., s-rad

Simulate climate data

Rainfall deficit

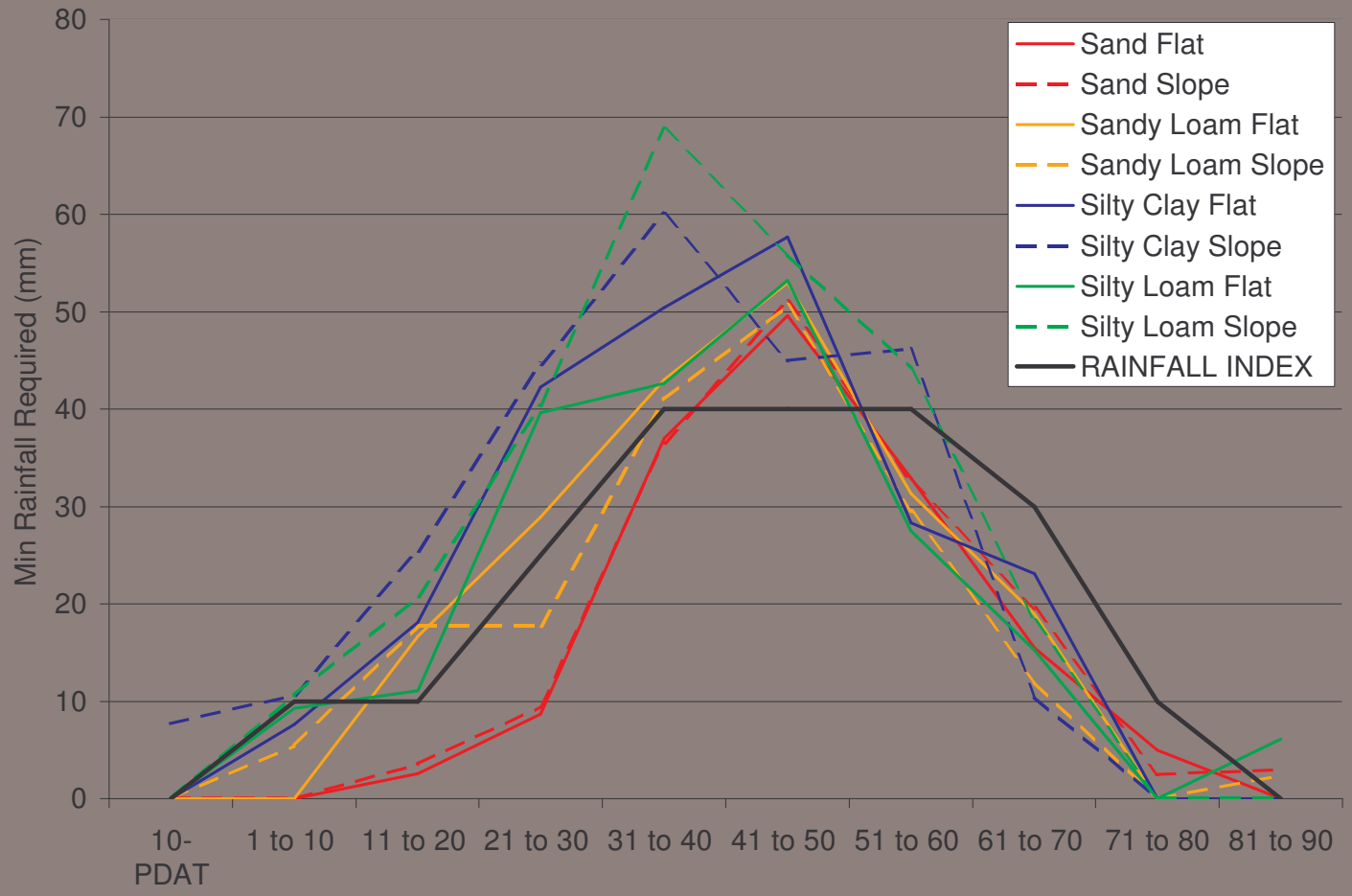
Method development

- **Divide crop growth cycle into 10 day windows**
- **Identify the *rainfall* requirements for each window**



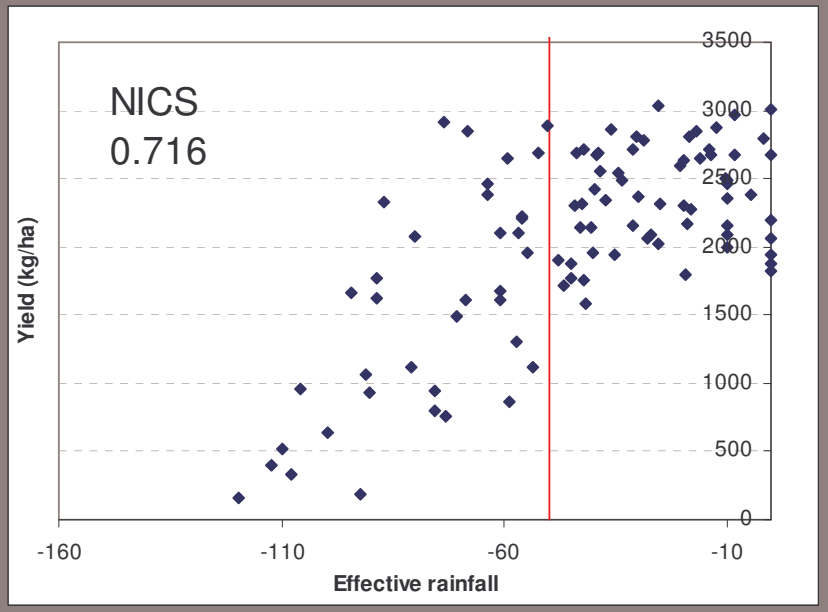
Results: Rainfall index for beans in Nicaragua

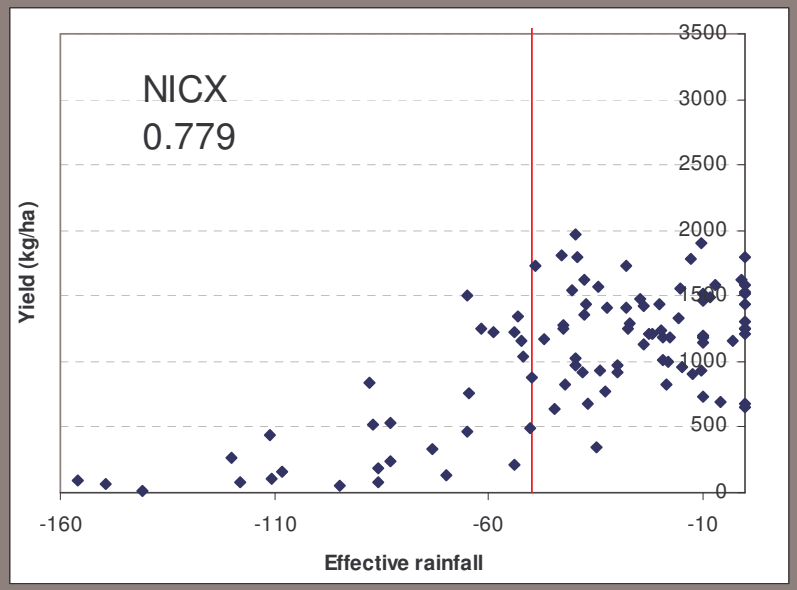
- Index is sum of deficits



Correlation between rainfall index and loss

- Indices vary from place to place
- Rainfall is the main (not only) factor





Example contract

Place name:	San Dionisio
Reference grid cell:	Lat 13.080, Long –86.410, Elev 914
Reference weather station:	San Dionisio
Crop:	Dry bean
Reference soil type:	Sandy loam
Planting date rule	First day when there is a cumulative rainfall of 30mm in 10 days
Earliest planting date:	15th of April
Latest planting date	15th May
Effective rainfall payment trigger	-70mm
Premium Price:	US$1
Indemnity Payment:	US$100

Example contract

Effective rainfall reference table

	Day 10 to day before planting	Day 1 to 10	Day 11 to 20	Day 21 to 30	Day 31 to 40	Day 41 to 50	Day 51 to 60	Day 61 to 70	Day 71 to 80	Day 81 to 90
Minimum rainfall (mm) for satisfactory growth (MIN)	0	10	10	25	40	40	40	30	10	0

Calculation of payout

1. Payouts are based on the **rainfall deficits**
2. Weather station rainfall (OBS) is summed in blocks of 10 days starting from 10 days before the planting date up to day 90 after planting.
3. The planting date is established using the planting date rule above.
4. Rainfall deficits are calculated by subtracting the MIN from the OBS. Only negative values are taken into account.
5. The total deficit is calculated by summing the 10 day blocks of deficits.
6. If there is a deficit less than -70mm you are entitled to an indemnity payment

Probability of a serious rainfall deficit (–70mm)