

# Policies or projects? Land use incentives and soil conservation in a Philippine watershed

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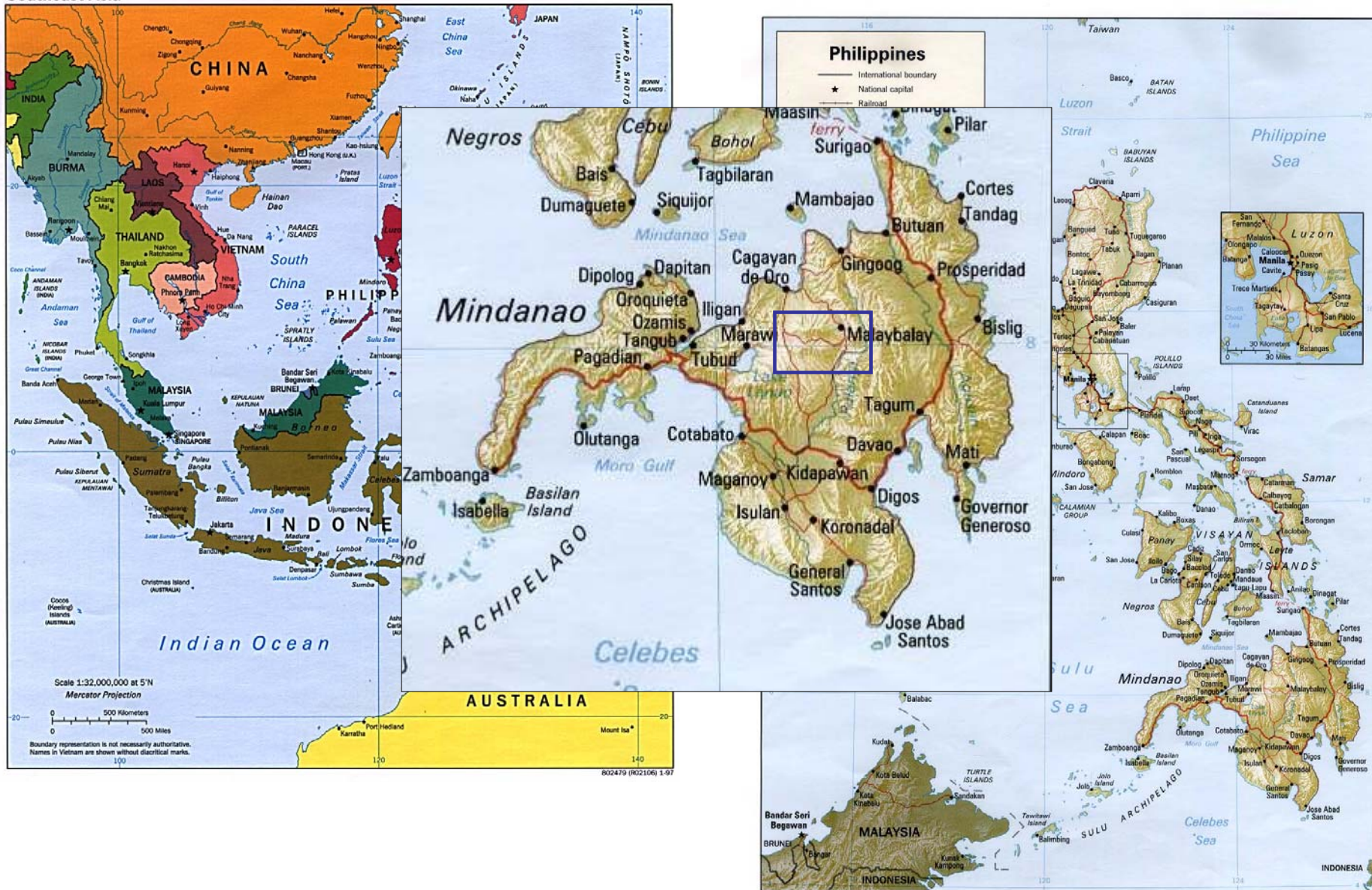
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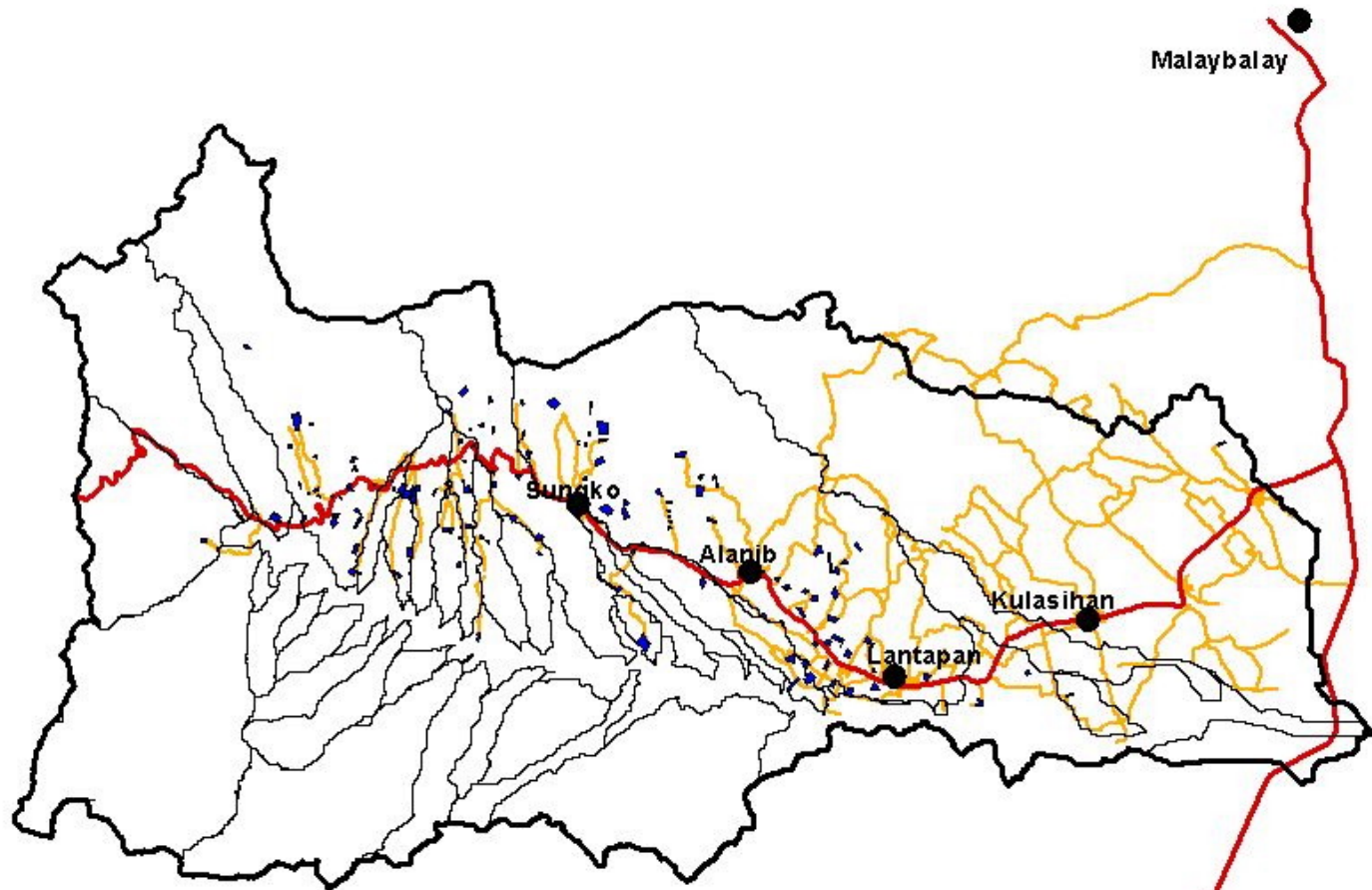
# Farmers and markets in uplands





- Previous assumption: ‘semi-subsistence’ production
  - Upland farmers beyond reach of markets & policies
- Implication: *direct intervention needed* for dev’t or conservation
  - Projects, command/control approaches to w/shed mgt
- But non-market strategies now lag behind reality of commercialized ag.

# Location of study site

Southeast Asia



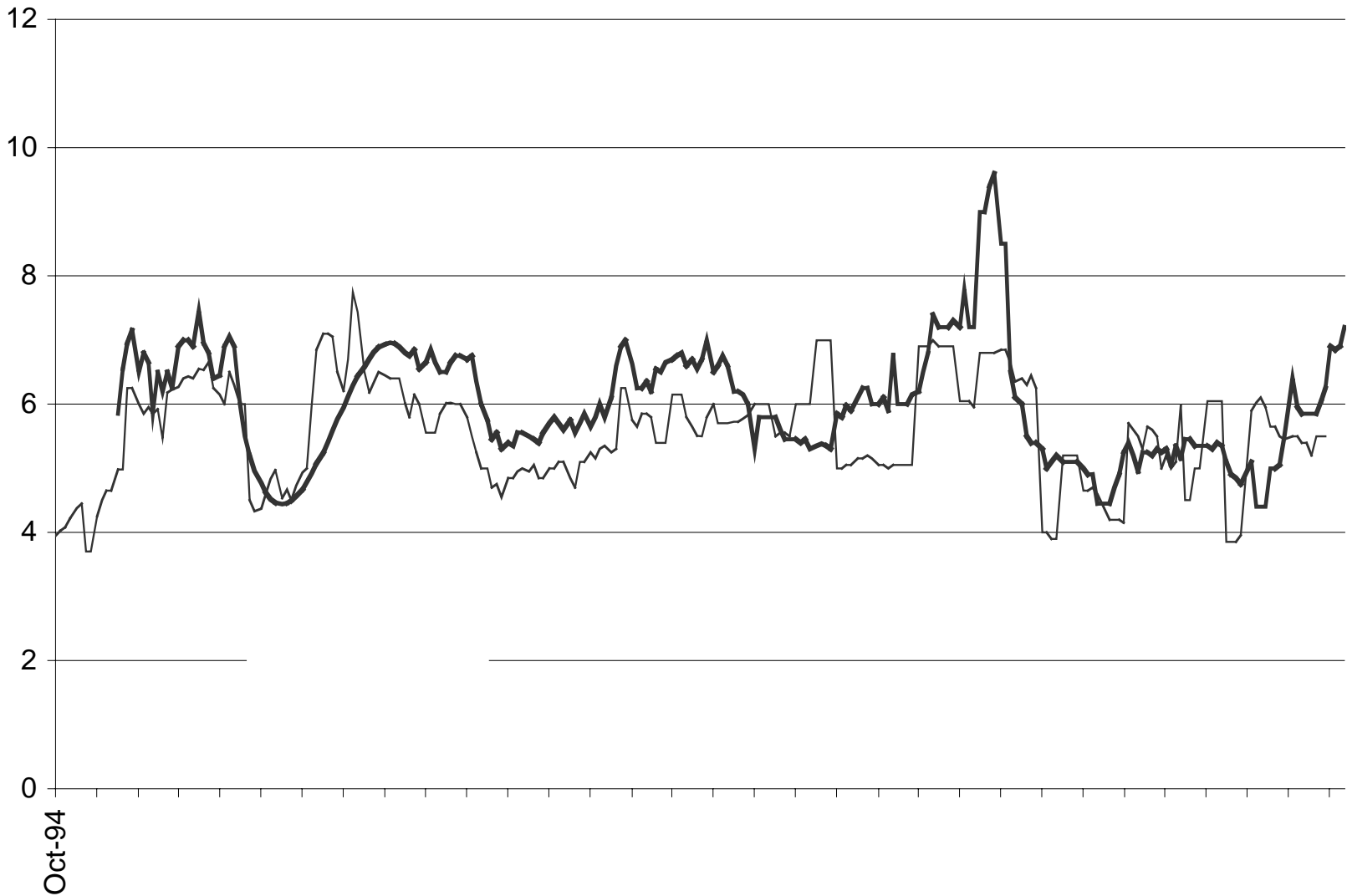


-  Farm Plots
-  Subwatershed boundary
-  Towns
-  National Highway
-  Lantapan Roads

600000 0 600000 1200000 Kilometers

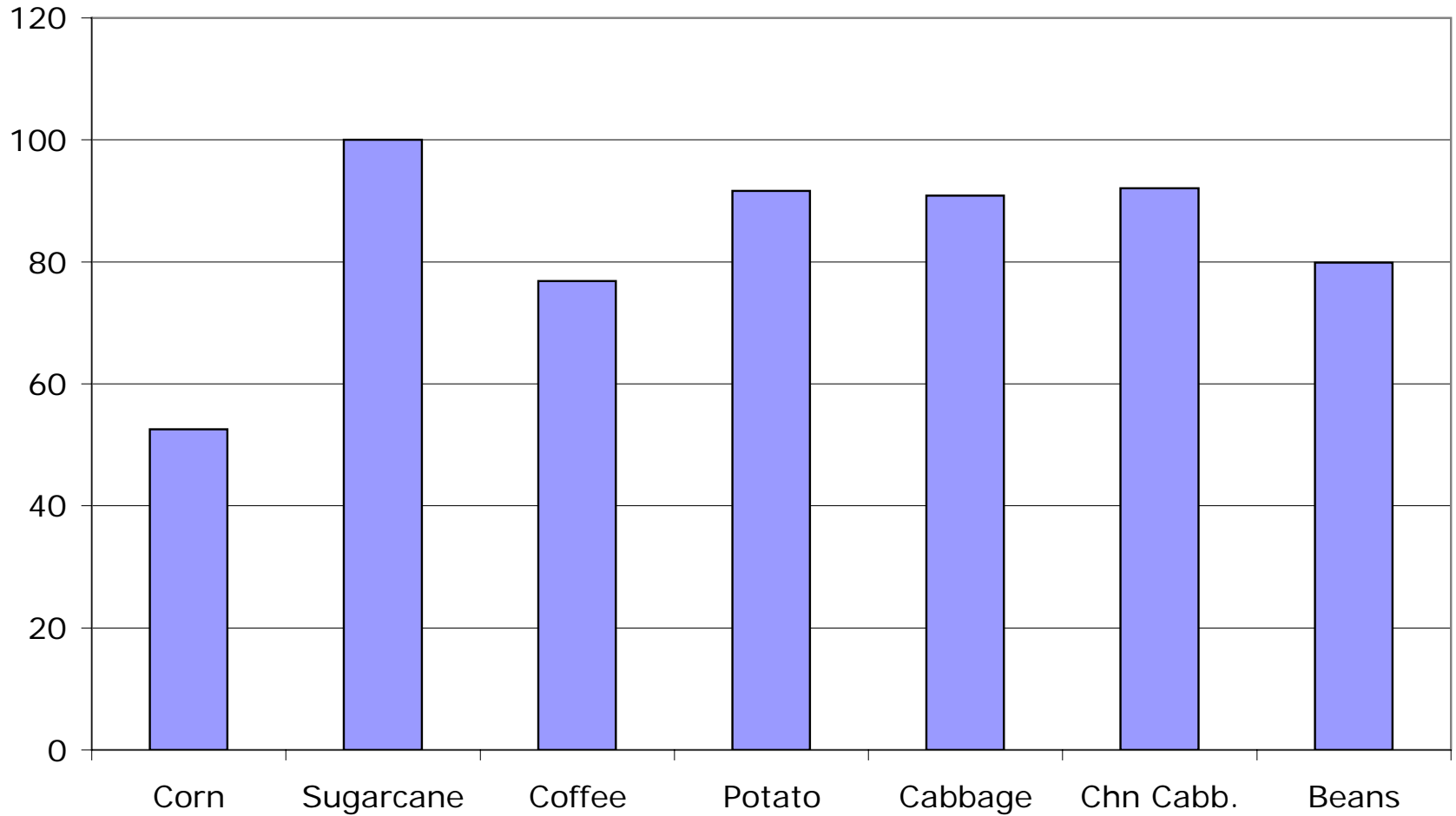


--> land cover



Yellow corn prices, Lantapan farm gate and Agora wholesale market, Cag. de Oro (SANREM data)

Sales as percent of major crops, Lantapan, 1994



Source: SANREM data

## Participation in non-farm labor markets

<u>Year</u>	<u>Percent of households</u>
1994	n.a.
1996	58.1
1998	79.2
2000	80.9
2002	75.5

## Three implications of commercialization

- Land values and land use decisions depend on commercial considerations rather than household needs ('separability')
- Greater reach of market interventions such as price and trade policies
- Market-based policies are cheaper and more efficient than direct interventions
  - They affect *all* commercial farmers, not just those in one project area



# Philippine upland ag. devel. policy

- Direct and sectoral interventions:
  - Early (1950s): support for ‘land to the landless’ programs
  - Later (1970s+): commodity support through R&D, extension, ‘high value crops’ programs
  - Price stabilization efforts (corn, palay) through NFA
- Trade policies
  - Vegetable import restrictions: cabbage, potato bans; binding WTO tariffs @ 100% (David 2003)
  - Rising protection for corn and sugar producers -- in spite of WTO accession.

## Trends in nominal protection rates for corn and sugar (%)

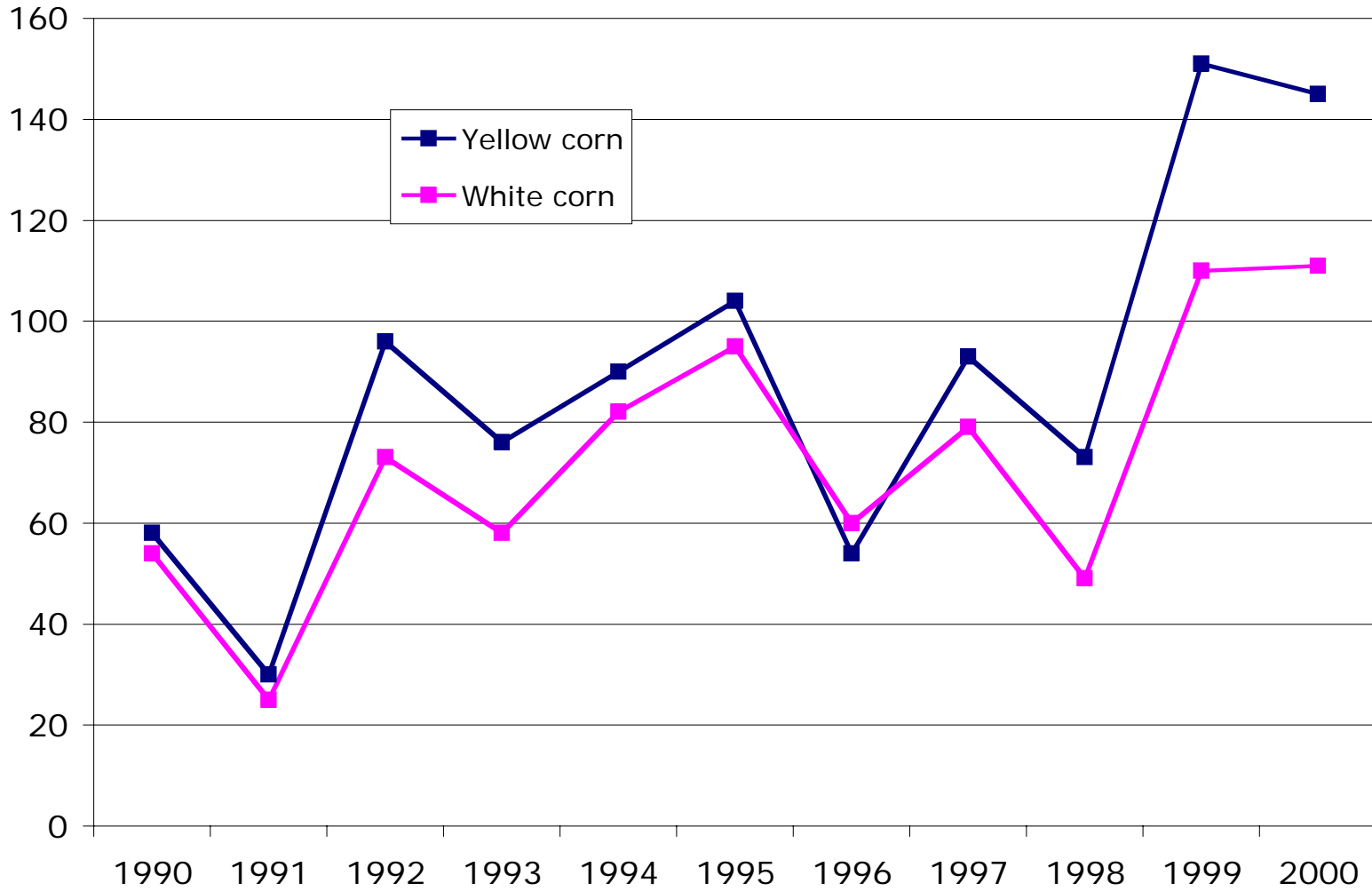
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Crop	1970-79	1980-84	1985-89	1990-94	1995-2000
Corn	24	26	67	76	87
Sugar	5	42	154	81	106

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Source: David 2003, Table 6.7.

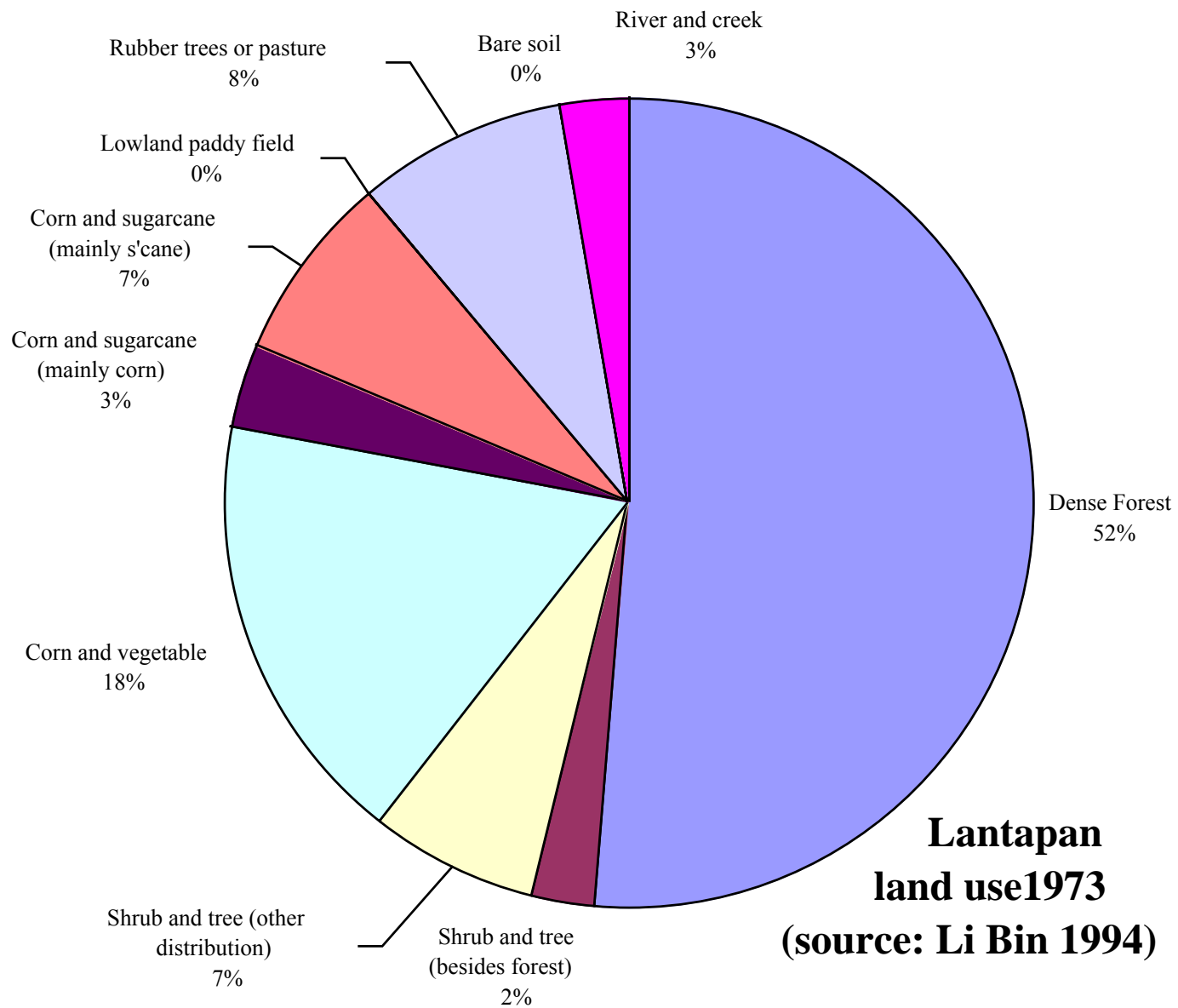
Corn: Nominal Protection Rate (per cent)



Source: ISPPS

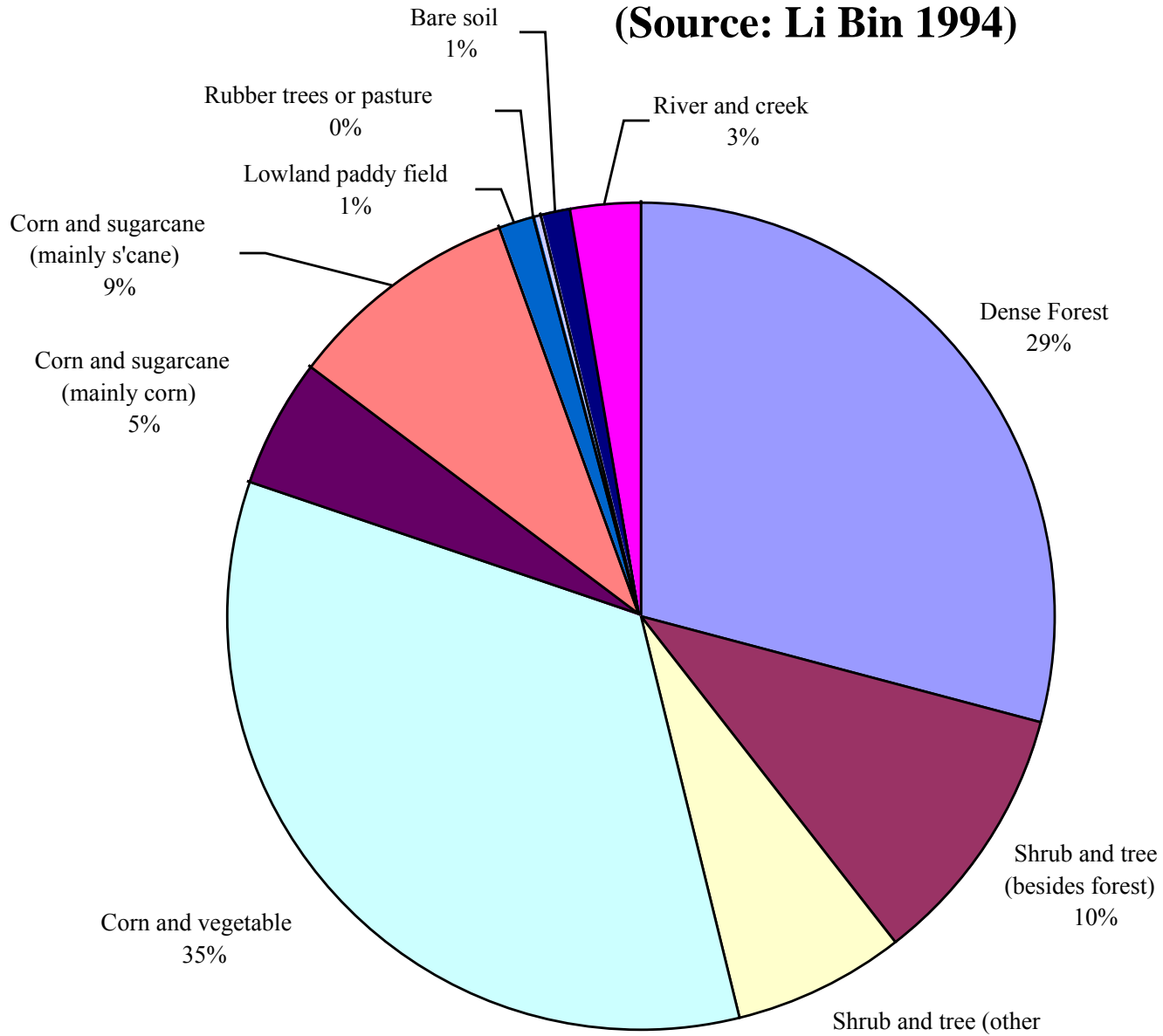
# Implications of upland ag. devel. policies

- In Lantapan, highest rates of crop area growth between 1960 and 1990s were in corn and sugarcane
- Vegetable production (esp. cabbage and potato) became important crops after 1960s
  - As source of income, less so as percent of land area
- Thus: agricultural expansion and intensification in upland areas



# Lantapan land use 1994

(Source: Li Bin 1994)



# Environment-economy interactions

- Commercial ag. expansion and intensification at expense of watershed functions
  - Expansion involves deforestation, shorter fallows
  - Unaccounted externalities (siltation, water pollution, unstable stream flows)
- Ag. development policies and conservation goals may be mutually contradictory
  - Forest cover and watershed function are threatened by expansion of protected and ‘high value’ crops

# A model of upland land use decisions

- Farmers assumed to maximize profits from ag.production, subject to constraints, e.g. availability of family labor
- Total land area of the farm (A) is a choice:
$$\sum N_i \leq A_{t-1} + \Delta A$$
  - where  $N_i$  is area planted to crop i,  $A_{t-1}$  is lagged area,  $\Delta A$  is year-on-year area change
- Land allocation by crop ( $N_i$ ) is also a choice



## Model solution

- Optimal land use and farm area choices depend on crop prices, input prices, family labor, household characteristics, and agro-ecological characteristics
  - Location in the watershed (e.g. altitude) is important
- We can distinguish separate ‘decision units’ by location for purposes of linking to environmental analyses
- We parameterize the model using Lantapan farm survey data from 1994 - 2002

# Different crops require different input mixes

Estimated cost shares (%) of inputs by crop

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	Land	Labor	Fertilizer
Corn	41	31	6
Veg	22	61	19
Coffee	34	42	8

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Source: production function estimates

# Policy ‘shocks’ will have differential effects by crop

- Higher corn or coffee prices will promote greater relative increases in total farm land area
- Higher vegetable prices will promote intensification (fert. & chem. intensity)
- Rising fertilizer prices will reduce vegetable area and use of chemicals
- Non-farm employment growth will reduce vegetable production faster than other crops
  - But may also discourage soil cons measures (Rola and Coxhead 2002)

## Price elasticities of land use & area change

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Variable	Corn area	Vegetable area	Total planted area
Corn revenue	0.26	-1.20	0.10
Veg. revenue	-0.17	0.42	-0.13
Wage	-0.23	-1.73	-0.39
Fam. labor	-0.07	0.26	0.01

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Source: Coxhead and Demeke 2004

## Extrapolation: effects of price and wage changes on corn area planted

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	Cut corn tariff to 50% (=25% price reduction)	Wages increase by 25% (= half of 1990s wage rise)
Lantapan (study site)	-0.065 ha/farm	-0.056 ha/farm
Mindanao	-45,000 ha	-40,000 ha
Philippines	-225,000 ha	-200,000 ha

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# Further implementation of WTO reforms

- Reducing Philippine ag. protectionism will diminish pressures on *all* upland watersheds
  - Quantifying environmental effects will require additional data and resources
  - Distributional & poverty outcomes uncertain
- Reducing US/EU domestic farm subsidies will have opposite land use effects!
  - Higher world corn prices --> incentives to expand area
  - Will offset domestic reform effects

# Property rights and local policy issues

- Ag. expansion in upper watershed is contingent on land availability
  - Enforcement of buffer zone restrictions limits expansion
  - Institutional mechanisms for this? Decentralization
- Environmental impacts of farming differ by location as well as crop and technology
  - Current ag. land tax laws, using capitalized income approach, can in principle be adjusted for these factors

## For more information

- Sanrem-SEA site:

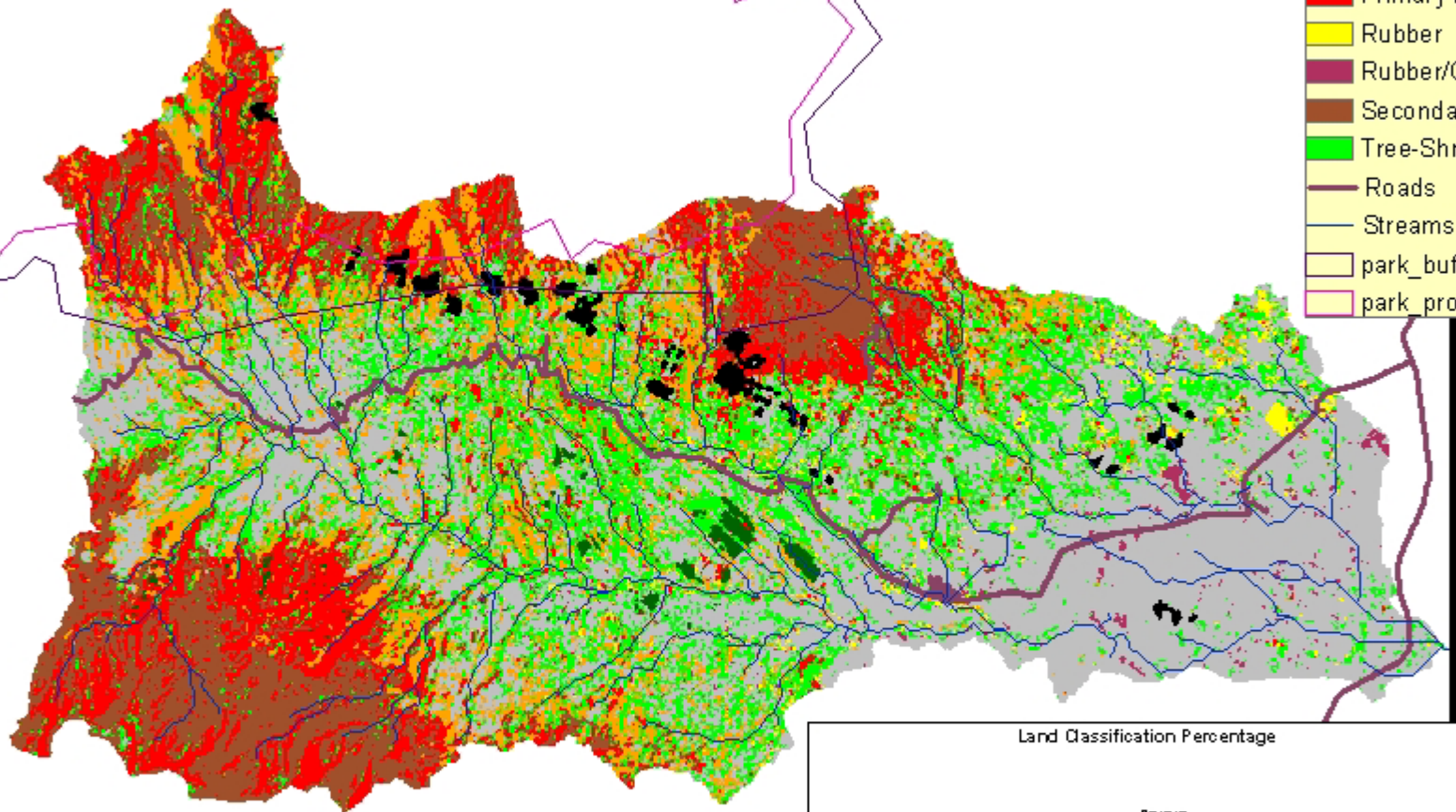
[www.aae.wisc.edu/sanrem-sea](http://www.aae.wisc.edu/sanrem-sea)

- Sanrem-SEA publications: see display & request copies
- Request revised & updated Sanrem-SEA CD-ROM (coming soon)



# Land Cover Classification of Manupali Watershed

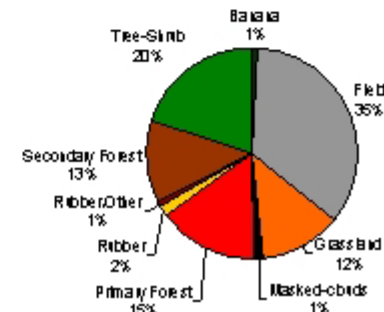
- Description
-  Blank
  -  Banana
  -  Field
  -  Grassland
  -  Masked-clouds
  -  Primary Forest
  -  Rubber
  -  Rubber/Other
  -  Secondary Fore
  -  Tree-Shrub
  -  Roads
  -  Streams
  -  park\_buffer poly
  -  park\_protect pol



<Double-click to enter text>



Land Classification Percentage



# Why do farmers specialize or diversify?

- Diversification is a risk-reducing strategy
- Specialization may reflect constraints, e.g. managerial skills for vegetable production
- Could diversification also reflect benefits of biodiversity?
  - Crop rotations, fallowing maintain biodiversity
  - Could this have measurable productivity effects, through economies of scope?
  - Farm vs. watershed-scale policy issues in biodiversity protection