"LInking Smallholders potato FArmers to the Market while caring for the Environment: the case of Ecuador"

A program evaluation

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FAO-ESA / CIP

CONTEXT

CONNECTED TO 2 FAO-ESA RESEARCH EFFORTS:

1) Using markets to promote the sustainable utilization of crop genetic resources

Assess how agricultural input markets affect farmers' utilization of CGR and how policies and interventions can improve farmers incentives for their sustainable utilization

2) Supermarkets and the poor

Assess possibilities and constraints for smallholders to supply to dynamic markets and how changes in ag output markets affect their production system and choice of market outlets.

IN COLLABORATION WITH:

CIP (centro internacional de la papa)

American University (Washington D.C.)

Parallel project in Bolivia (with Proinpa, AU and Wageningen University)

CO-Funded by: FNPP y FNOP

MOTIVATION

AGRO-INDUSTRIALIZATION: PROFOUND CHANGES IN AG. SYSTEMS:

- New organizational and institutional arrangements (pre-established contracts vs spot markets; vertical integration vs alliances or cooperation)
- Imposition of private grades and standards for food quality and safety

NET EFFECT: CONTROVERSIAL

- **Positive:** more profit-oriented decision making; more market options both for inputs (seeds, fertilizers, agrochemicals) and for outputs (new market options to sell)
- **Negative:** possible exacerbation of rural poverty; Potential effects on the environment on biodiversity and intensification of pesticides use to comply with standards.

Main objectives:

Objective: Analyze the impacts of market integration on farmers' welfare and on the environment

- **Market integration**
  - Measured by participation to platformas
- **Farmers welfare:**
  - Productivity
  - Yields, gross margins, commercialization
  - Health related: knowledge and precautions in using pesticides
- **Environment:**
  - Use of agrochemicals
  - Biodiversity conservation

Methodology

Qualitative Analysis

- Farmers Focus Groups
- Potato value chain

Quantitative Analysis

- Household survey (1007)
- Community survey (34)

Setting the scene

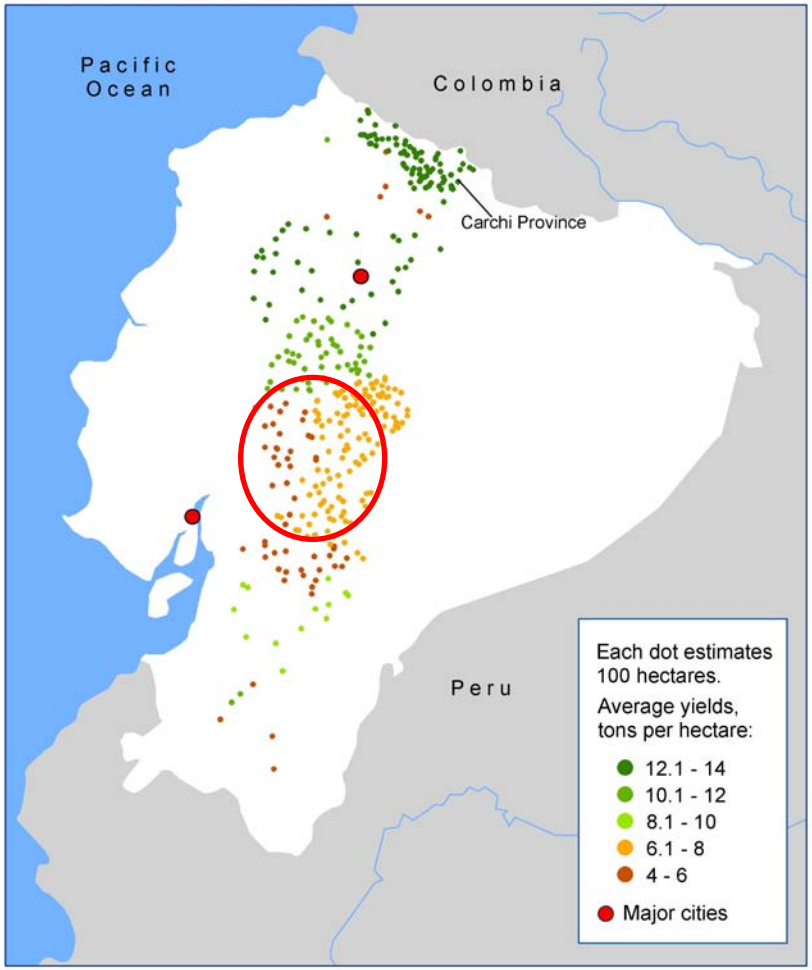
Ecuador and the commodity of potato have been chosen for this study because:

- **Potato:** staple crop, crucial to the food security of many Ecuadorian peoples, but also a crop used in the processing of chips, fries and other foods. Last but not least it is a crop for which the Andes are the centre of origin and diversity.

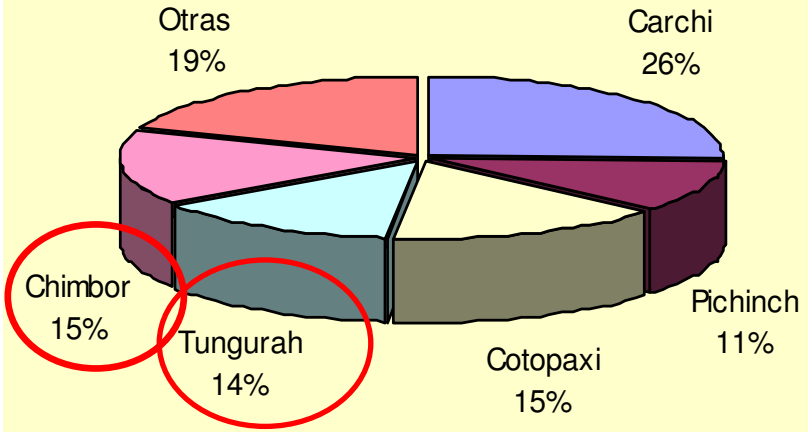
- **Ecuador:** on going agro-industrialization but widespread poverty, particularly in rural areas. Various degrees of farmers' integration to the market.

Ecuador: Production areas

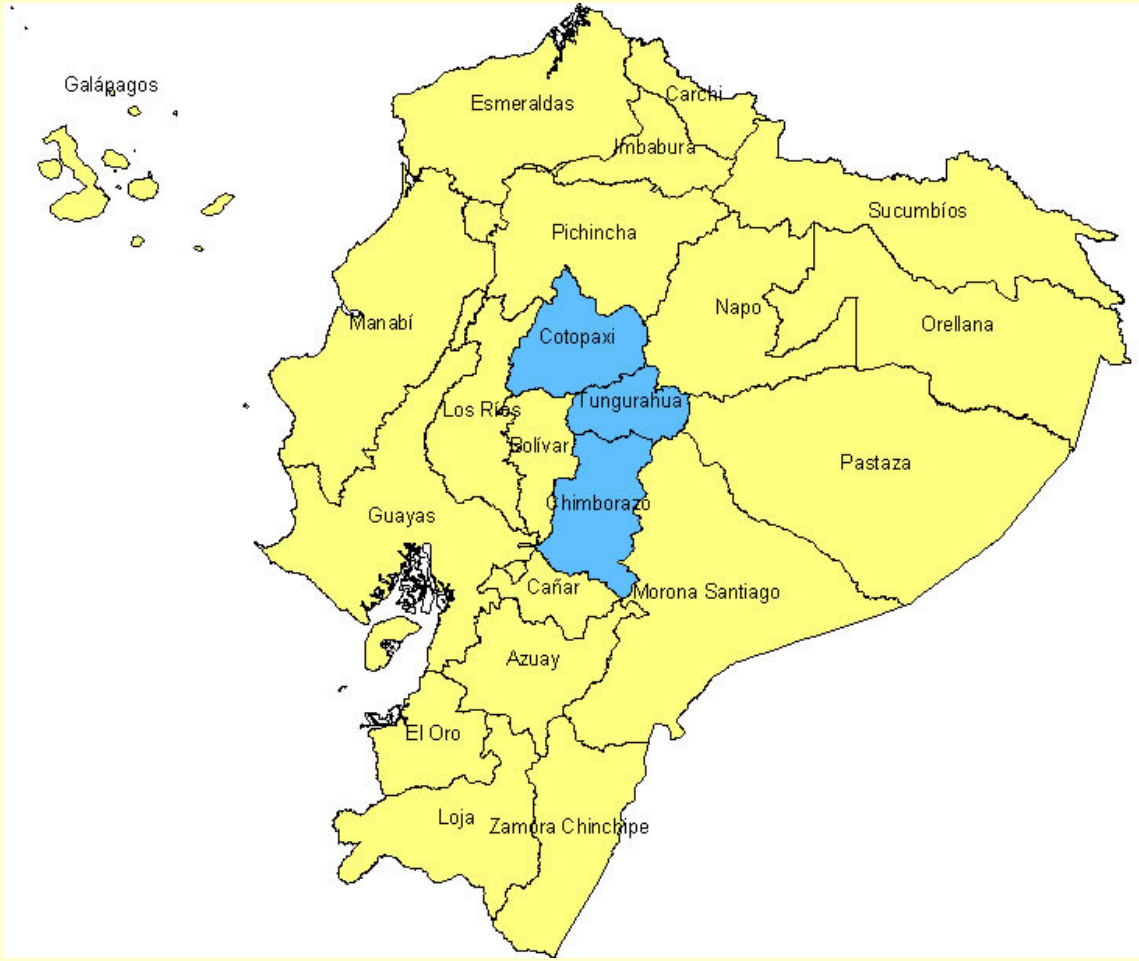
Potato is one of the main traditional crops in Ecuador, about 82,000 producers in 90 cantons



Main Production areas



Study area


Galápagos
Esmeraldas
Carchi
Imbabura
Pichincha
Sucumbíos
Napo
Orellana
Manabí
Cotopaxi
Tungurahua
Los Ríos
Bolívar
Pastaza
Chimborazo
Guayas
Cañar
Morona Santiago
Azuay
El Oro
Loja
Zamora Chinchipe

National context

- 50% of potato producers are small farmers (less than 2 hectares of land). They utilize 19% of total cultivated area
- Higher yields are obtained in the north, in the area of Carchi
- Minimum level of export
- Import is growing particularly for processed and frozen potatoes (96%)
- On internal demand: 74% is for home consumption, 9% for industrial consumption and 17% is for seeds

Focus of the study

Description of Intervention

- INIAP through the FORTIPAPA project funded by COSUDE and CIP (Papa Andina) promoted the creation of ***multistakeholders' platforms*** for production and commercialization of potatoes in the sierra central of Ecuador.

Plataformas: alliances between farmers, public institutions, NGOs, and service providers.

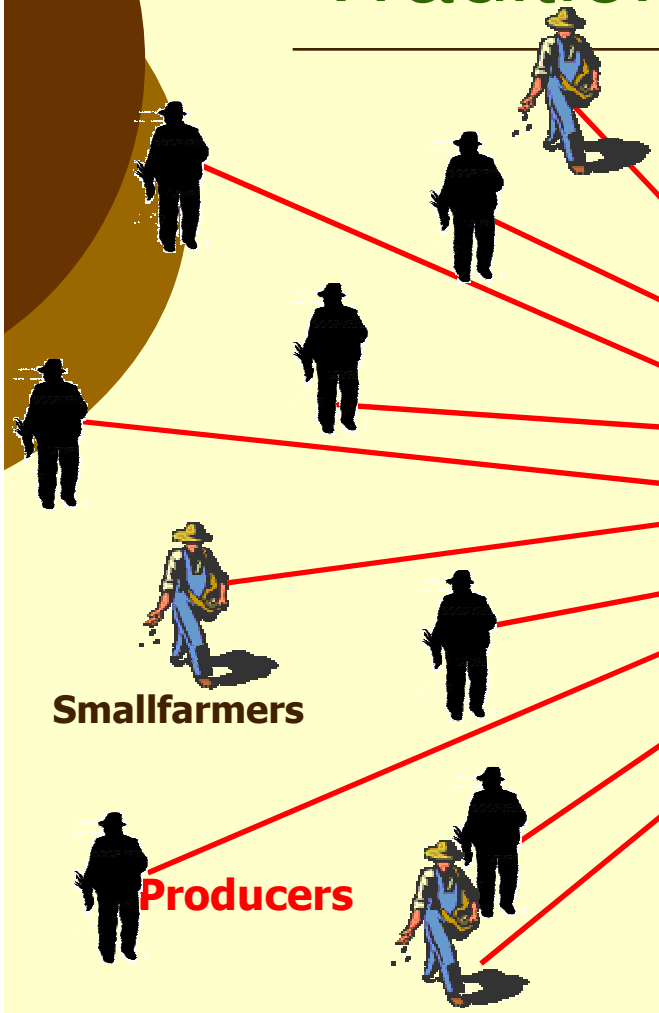
Objective: build capacity and link small-farmers to specific market opportunities with a value chain vision.

Description of Intervention

CIP (Papa Andina) supported the project through:

- **Research and analysis** for new market opportunities
- **Capacity building** through FFS on potato production
- **Provision of quality seeds and introduction of new varieties more market oriented** (in particular Fripapa a new variety very suitable for potato processing and frying and resistant to late blight)
- **Quality control** of potato produce (at centro de acopio)
- **Commercialization** of potato produce to restaurants and other clients
- **Consolidation** of small-farmers groups and creation of Consorcio de Pequeños Productores (CONPAPA)

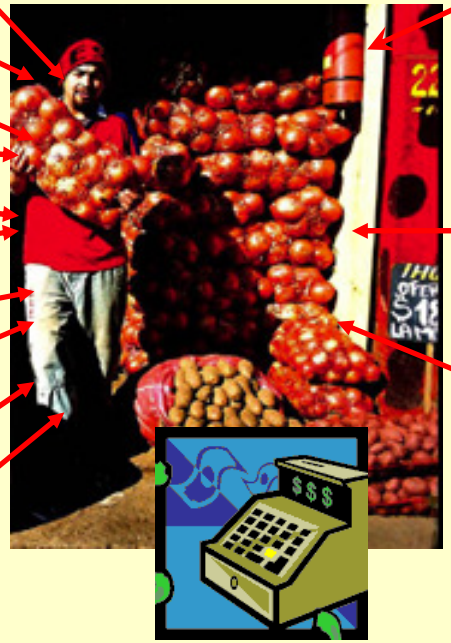
Traditional value chain

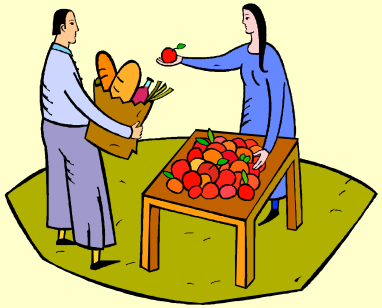


Smallfarmers

Producers

Wholesale market





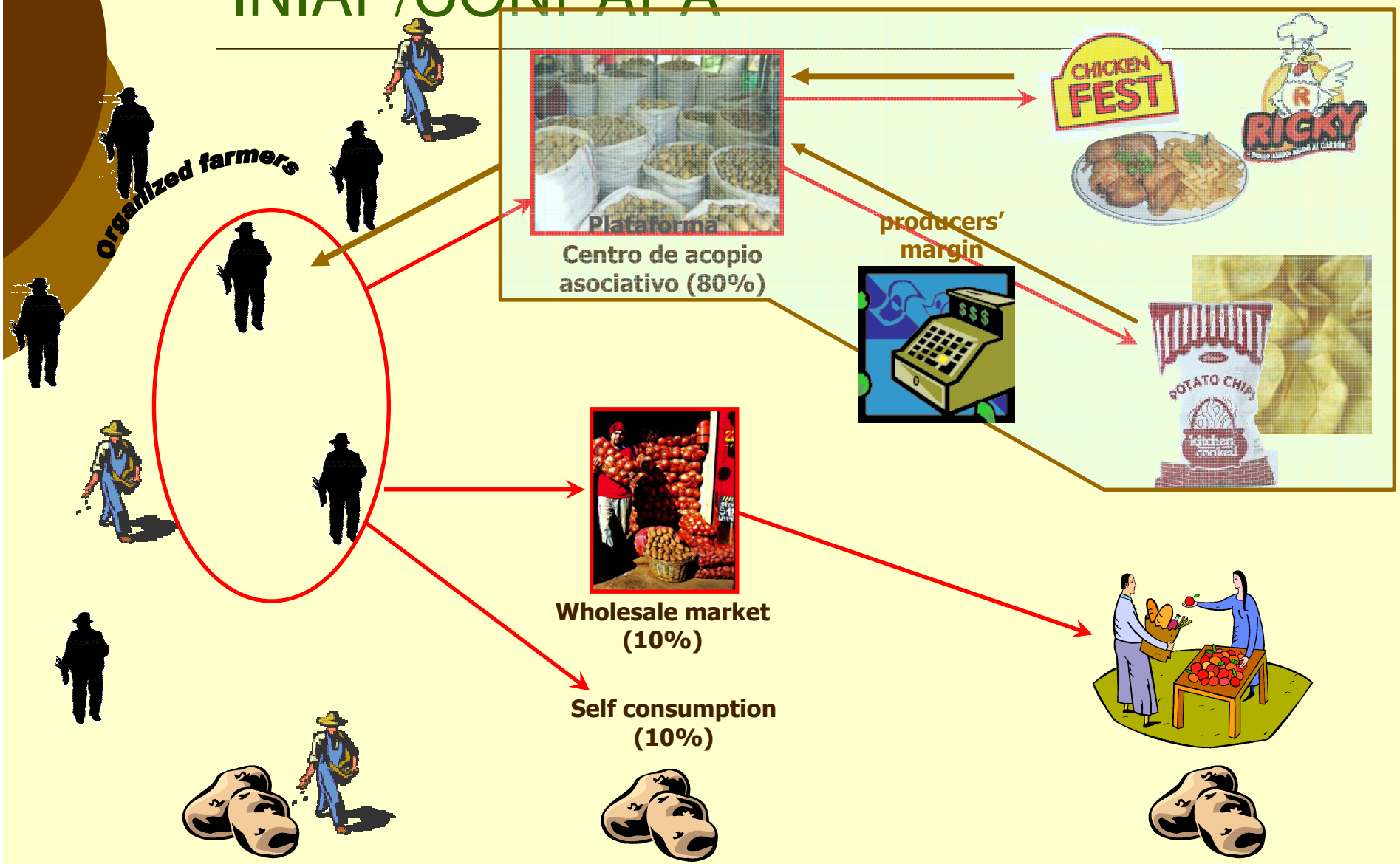
Retailers

Producers	Intermediaries and traders and traditional storage	Wholesalers	Retailers Shops	→ Fresh potato produce

Traditional value chain

- Traditionally small producers have worked individually and applying a low efficiency model.
- The analysis shows a long intermediary chain between producer and final consumer thus reducing the gross margin for farmers.
- Failure in the system to produce and distribute certified seeds at an accessible price which affects yields and production, as well as the incidence of pests and diseases.
- Key issues: disorganization, missing resources for good production, gaps in technical knowledge for production etc.

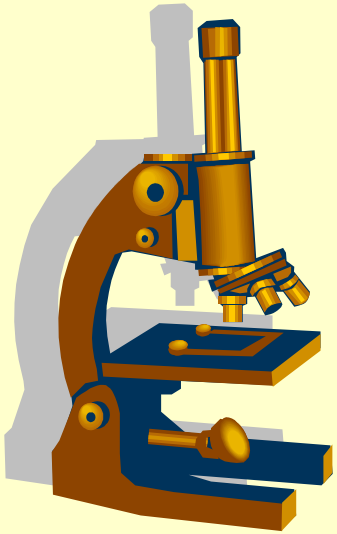
Aternative value chain INIAP/CONPAPA



Alternative and parallel value chain

- It is “Alternative” in the measure in which it represents a channel that allows access to better negotiation conditions as well as to a better price.
- It is a “Parallel” chain because its functioning does not completely eliminate the traditional chain. However a high percentage of potato produce is commercialized through this channel.
- The main difference with the traditional model is that there are some key elements that facilitate producers’ access to a more efficient chain which has direct effects in increasing negotiating power, gross margin, productivity level, access to services etc.

IMPACT ANALYSIS



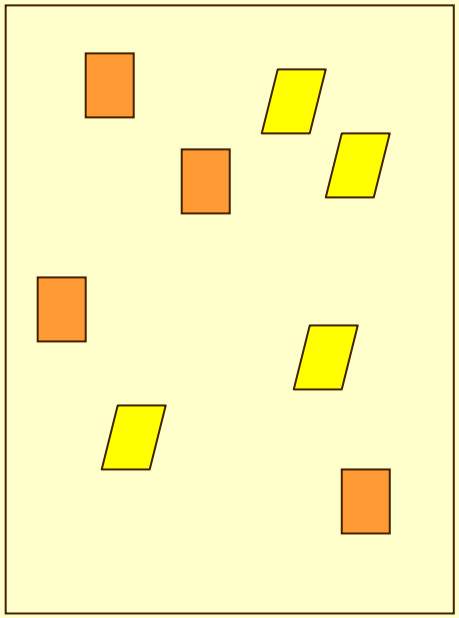
Impact Analysis: problems and methodology used

Issue: impossible observe the outcomes for participants if they had not participated.

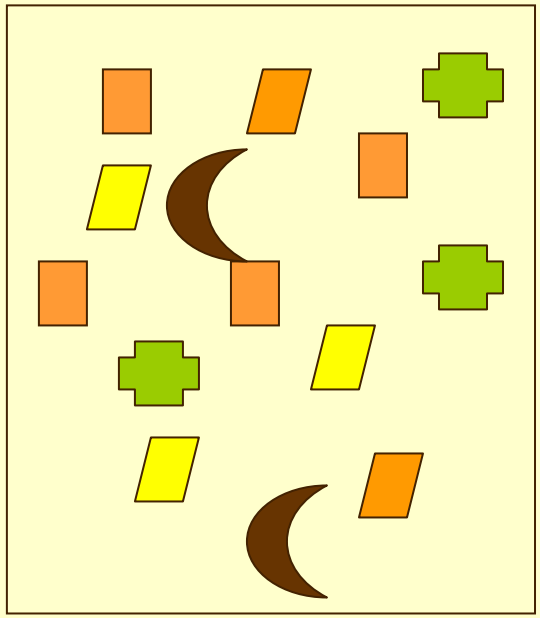
- In **experiments** you assign randomly treatment and control. So you can compare the impacts between the 2 groups **(there are no differences in characteristics among the 2 groups)**
- In our case we have not random assignments within a selected "eligible group" nor control groups to compare the impacts
- **Counterfactuals** cannot be seen or heard—but we can create an estimate of them.
- **How:** simulate an experiment through selecting a **control group** that is as similar as possible in terms of observable characteristics to the **treated group** (platforms' participants).
- Selection of control via **PROPENSITY SCORE MATCHING** which is a "correction strategy". It corrects for the selection biases in making estimates.

PSM

PARTICIPANTS



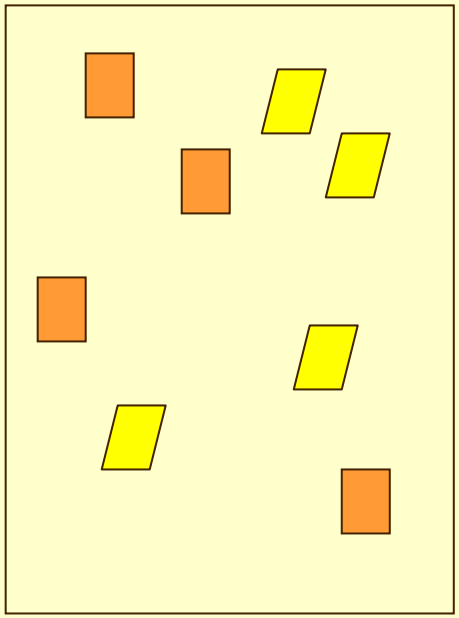
NON PARTICIPANTS



PSM employs a predicted probability of group membership e.g.,
treatment vs. control group--based on observed predictors,
usually obtained from logit or probit regressions to create a counterfactual g

PSM

PARTICIPANTS



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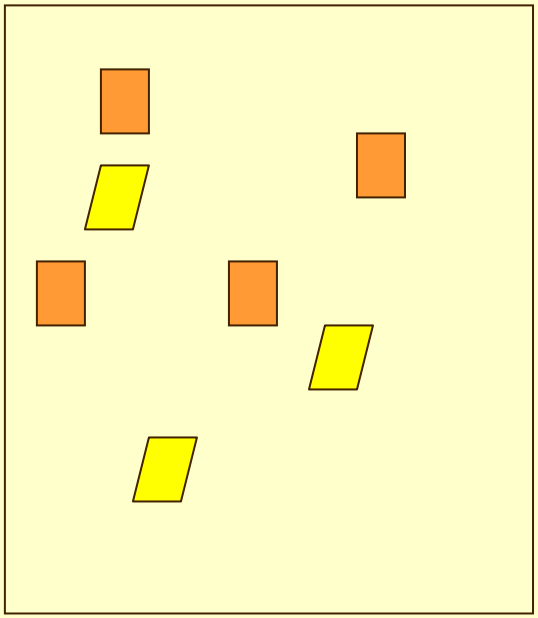


In summary the basic idea of PSM is to construct counterfactuals for treated individuals who have similar characteristics (X) and then compare the the outcomes of the treated to their counterfactuals.

Criteria for “Good” PSM

- Identify treatment and comparison groups with substantial overlap
- Match, as much as possible, on variables that are measurable and stable
- Use a composite variable—e.g., a propensity score—which minimizes group differences

General procedure for PSM

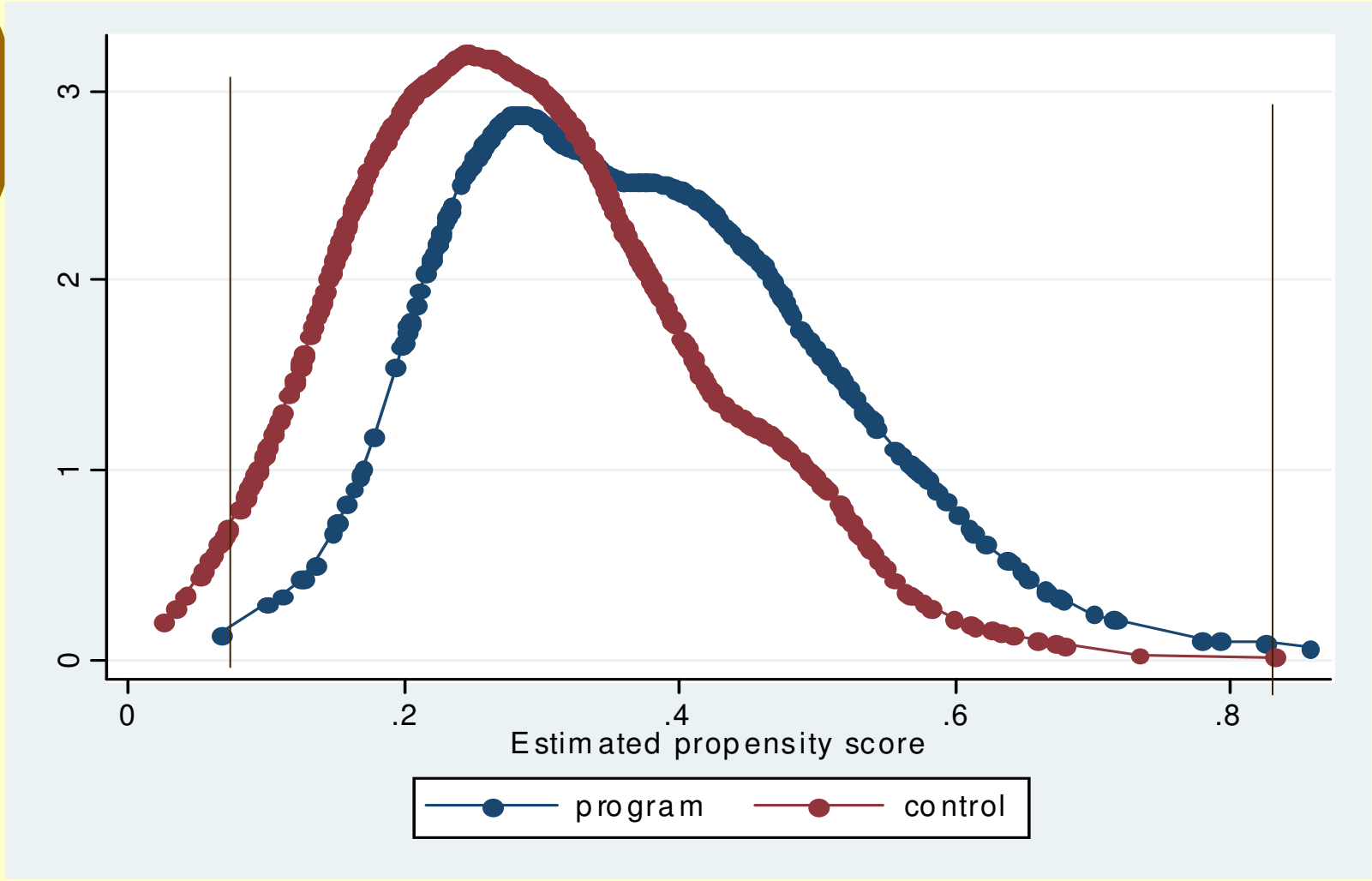
- Run Probit or LogitRegression:
  - Dependent variable: Y=1, if participate; Y = 0, otherwise.
  - Choose appropriate conditioning (instrumental) variables.
  - Obtain propensity score: predicted probability (p).

- Match Each Participant to One or More Nonparticipants on Pscore

  (Nearest neighbor; Caliper; Mahalanobis; Difference-in-differences matching (kernel & local linear weights))

Calculate average treatment effects or multivariate analysis based on new sample

Area of common support



Sample selection

Was done in several steps:

1. Selecting comparable communities (to the participant communities) through running PSM *ex-ante* using socio-economic variables from population census
2. Corroboration of communities selected through key informant interviews and through field visits.
3. On selected communities participants and non – participants were randomly assigned from the list provided by municipalities and platform coordinators.

Sample: survey

1007 households:

- 324 participants
- 683 non participants

Participant communities (17)

Chimborazo: 12
Tungurahua: 5

vs

NON Participant communities(17)

Chimborazo: 12
Tungurahua: 5

Validation

- Also run first difference method
- Weighted matching
  - all approaches gave same results

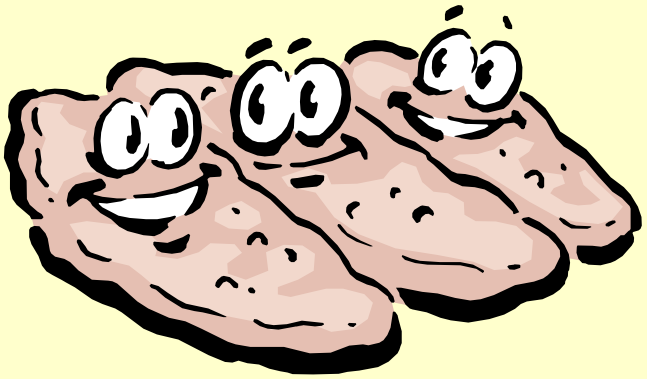
Results

What kind of households?

Variable	Media	Part	No Part
Land owned in Ha	2.56	2.64	2.52
Years of education of HH head	4.95	5.52	4.68
Average age of HH head	42.22	41.26	42.68
Family size	4.69	4.84	4.62
Average family education (yrs)	5.16	5.61	4.94
Ha of potato land	1.24	1.21	1.25

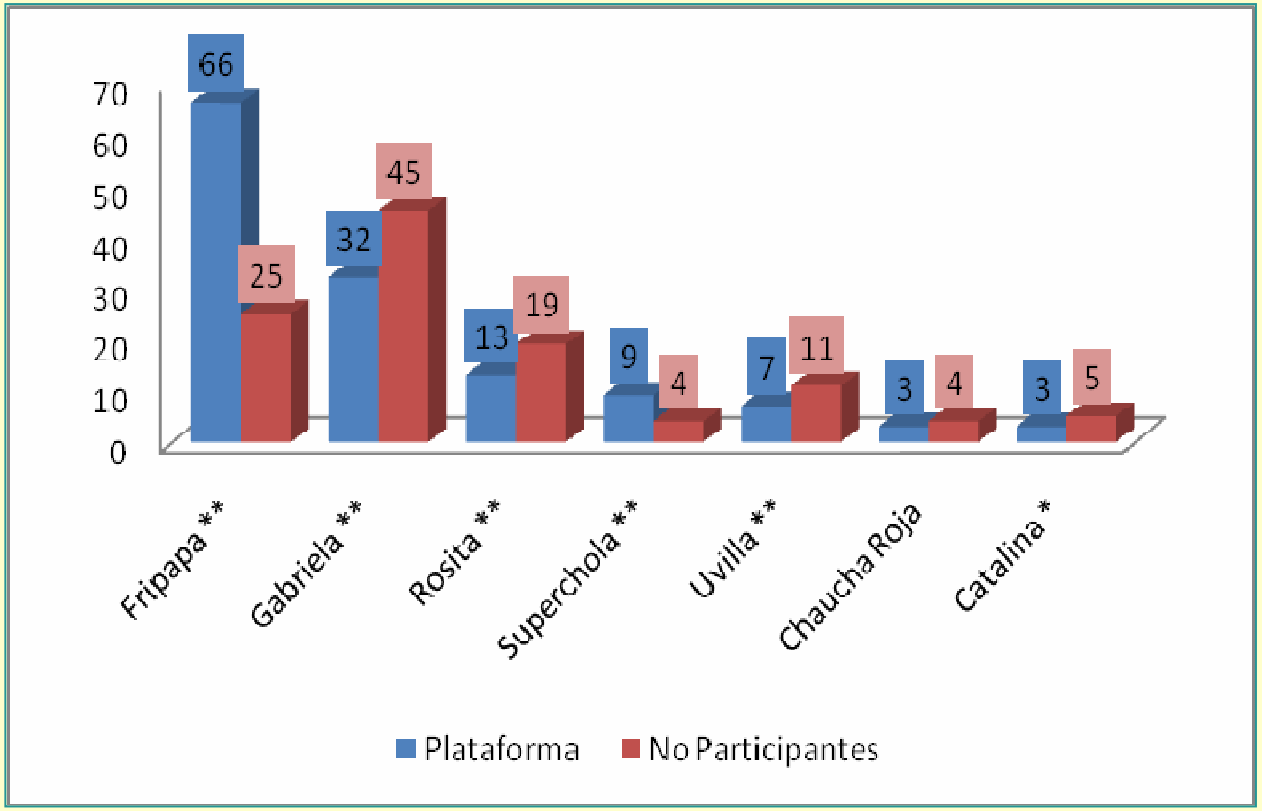
Environmental Impacts:

Biodiversity



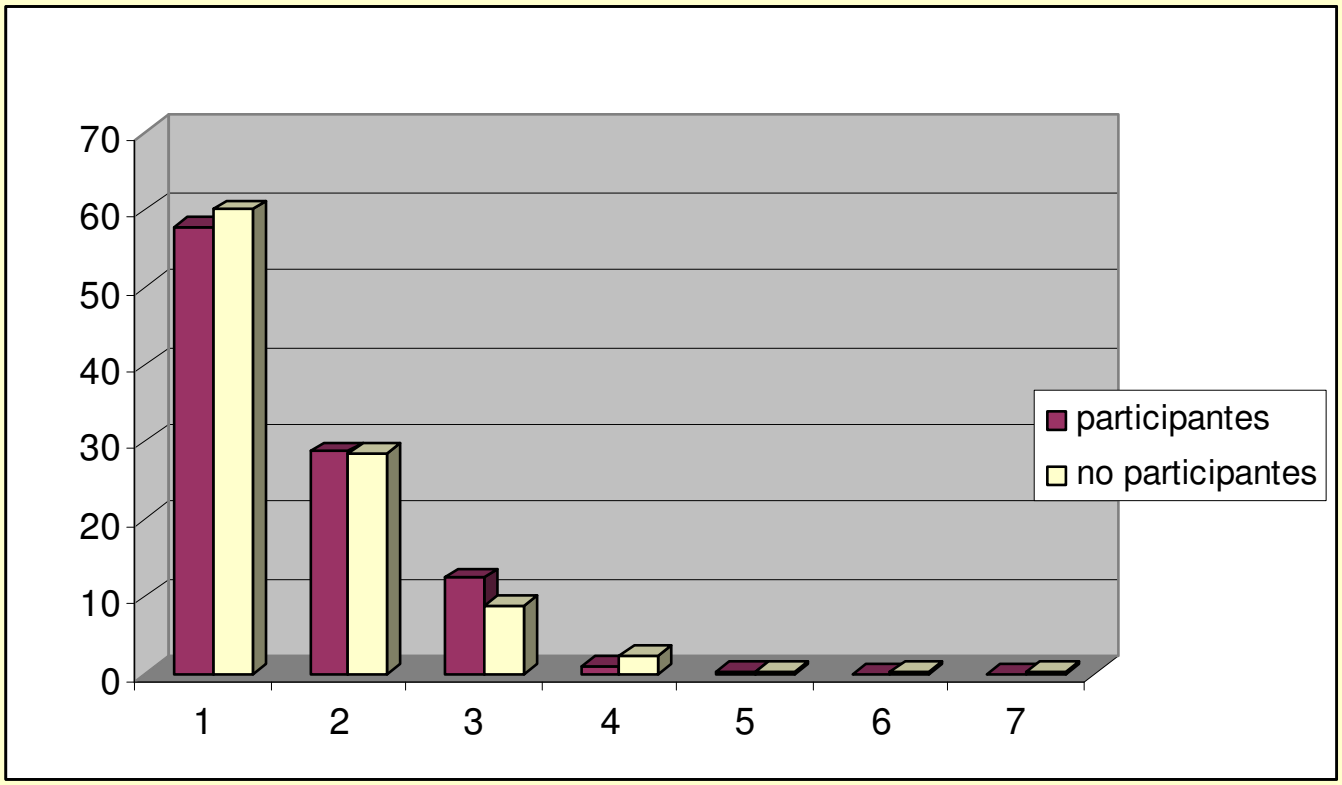
Main varieties used: Frequency

% of HH growing the following main potato varieties



significative Difference : High: ** , moderate *

Biodiversity: % of HH that use x nr of varieties

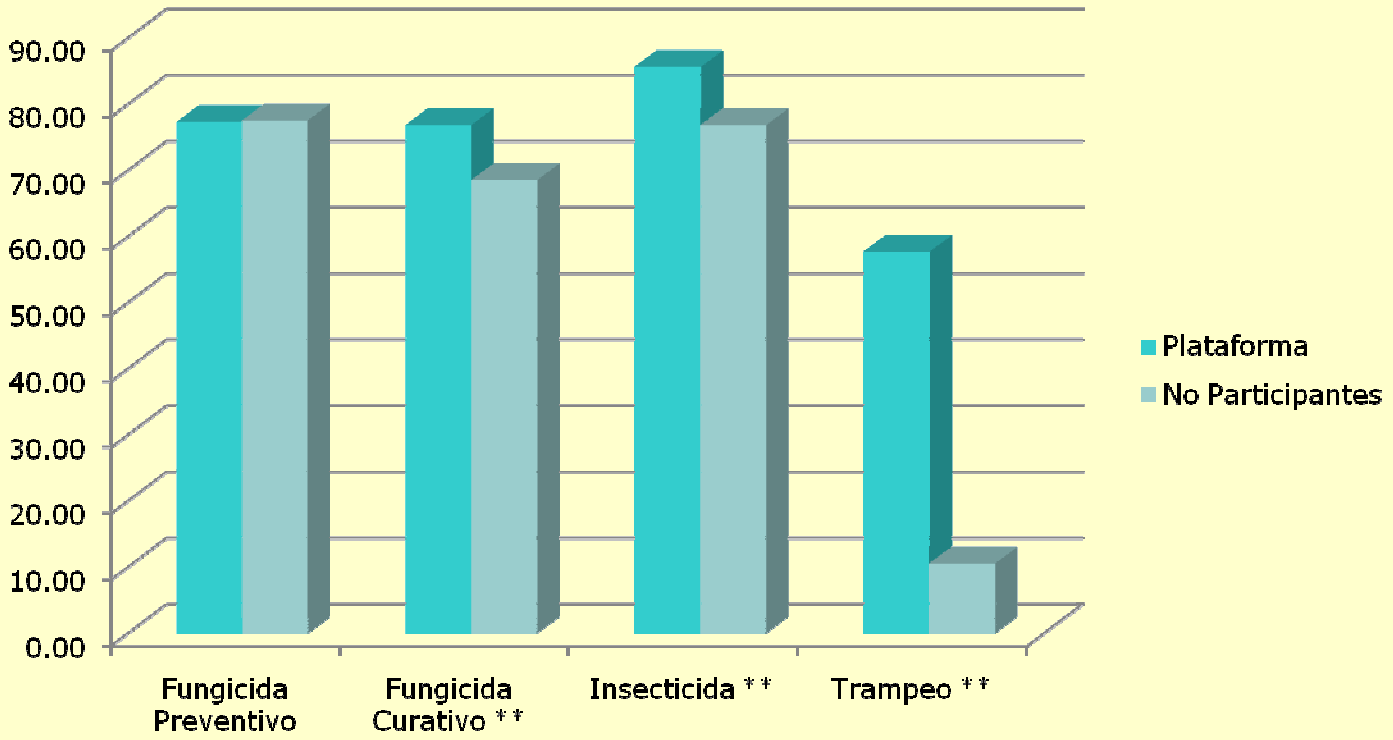


Biodiversity indexes

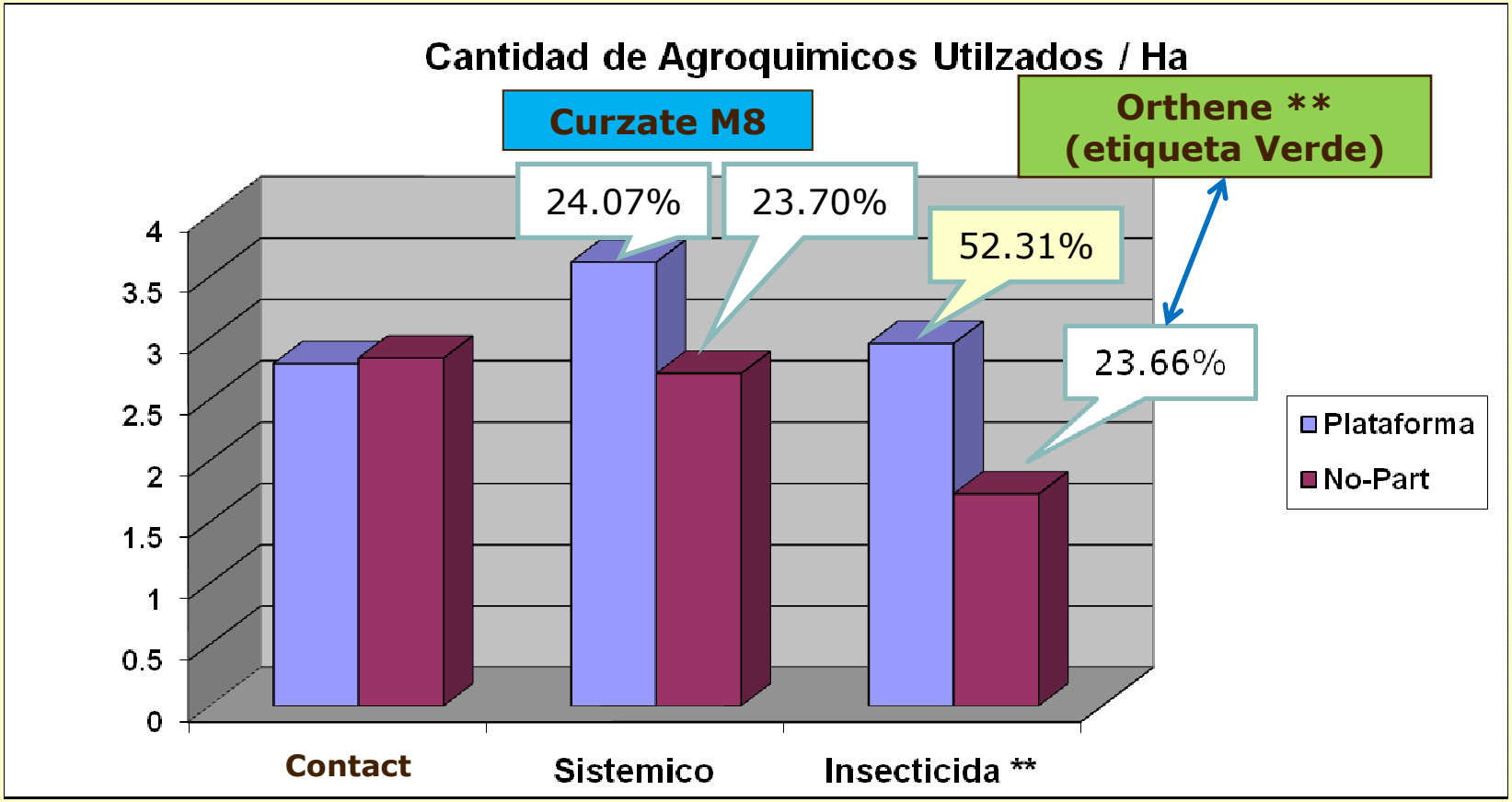
Variable	Participants	Non participants
Totpapavar *(nr total of potato varieties)*	1.57	1.56
Shannon (0<=s) *Measures the evenness and proportional abundance taking into account the proportion of land into each different variety*	0.32	0.3
Berger (1<=b) *Measures the relative abundance of the most common variety*	1.39	1.39

Agrochemicals

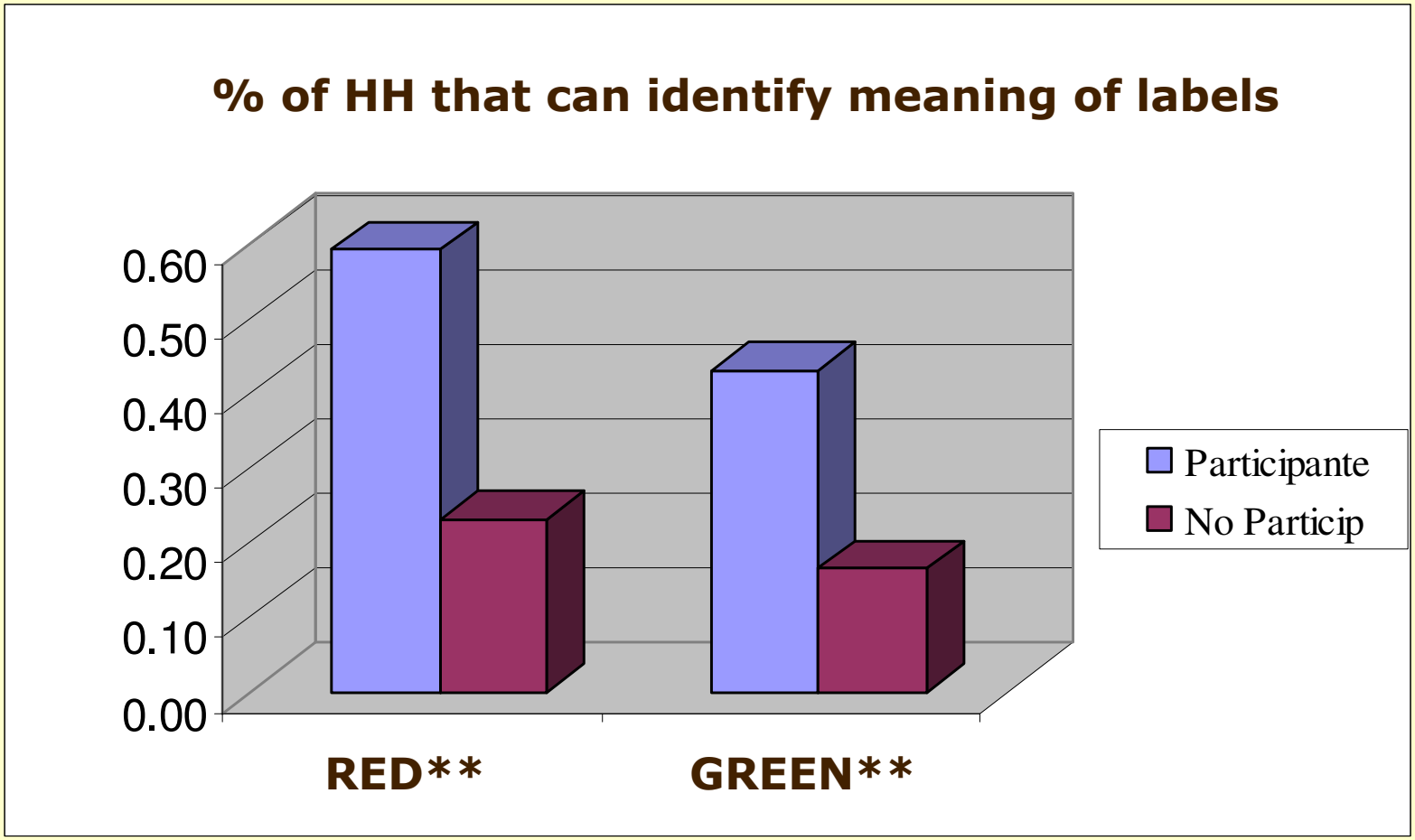
% of HH using Agrochemicals



Agrochemicals: Quantity (Kg o L)/Ha.

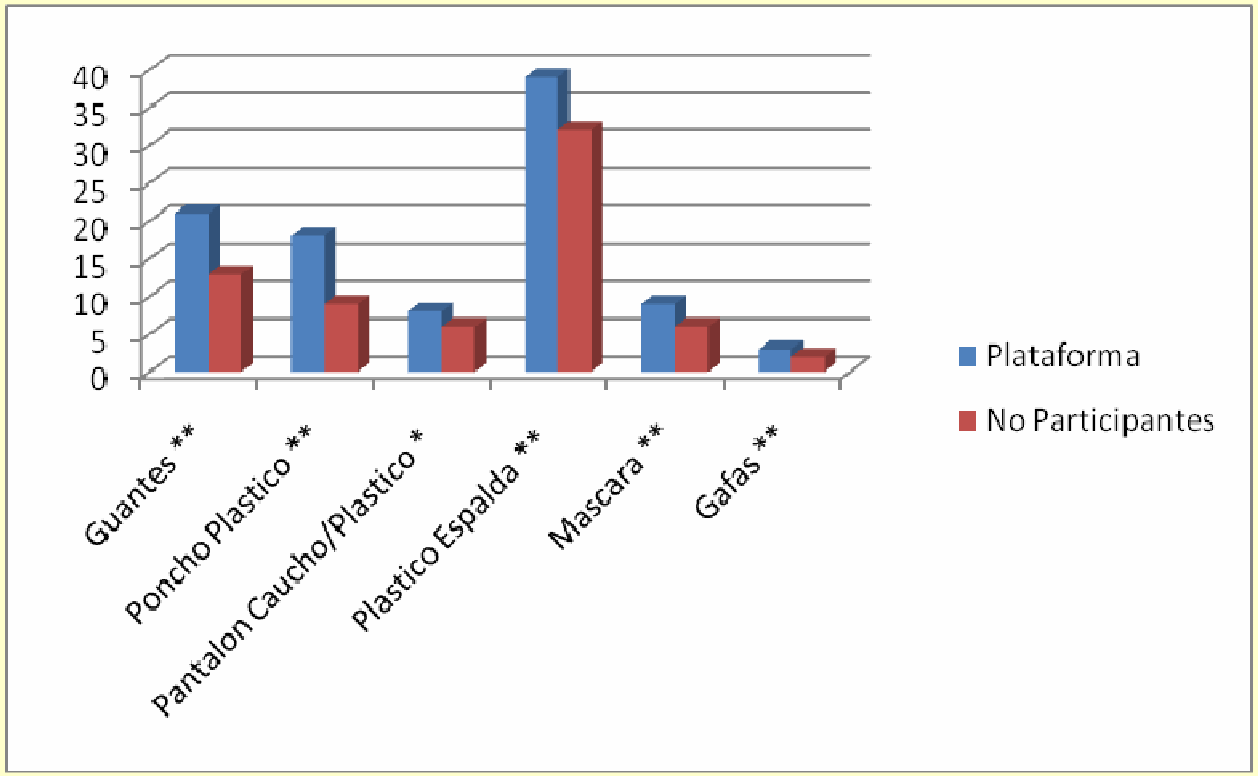


Knowledge of pesticides' hazards

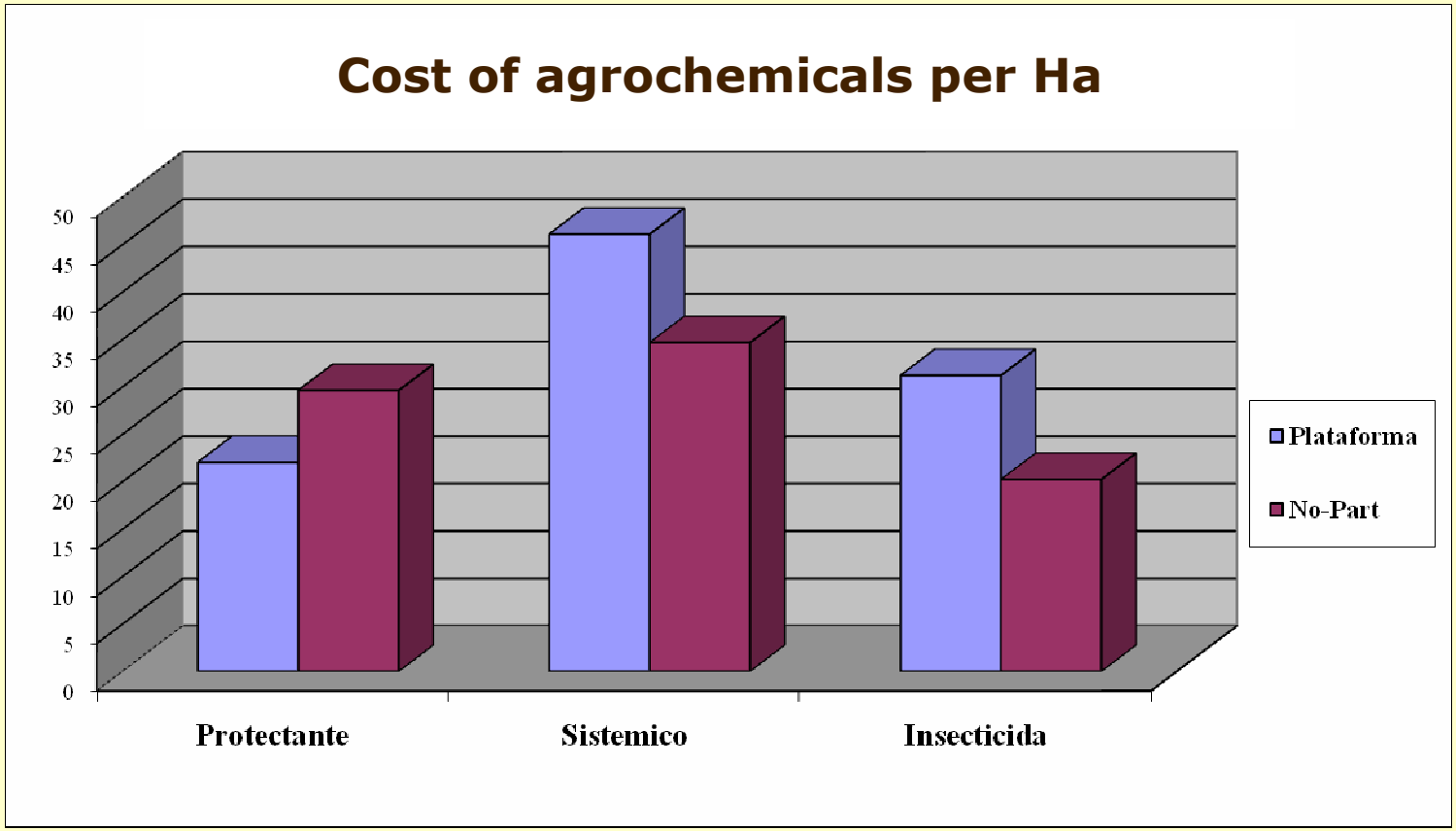


Using protection when applying pesticides

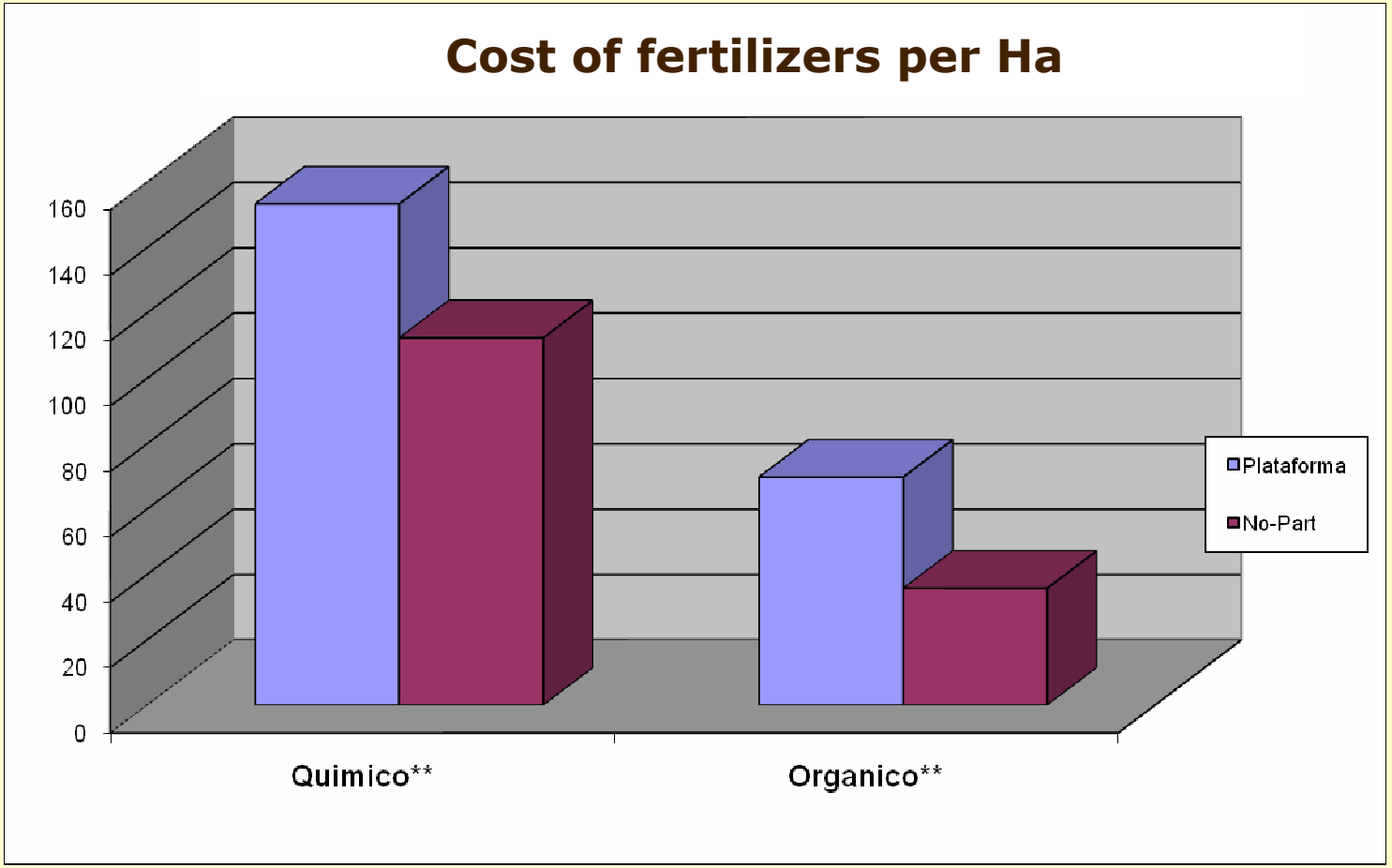
Percentage of farmers that always use the following precautions



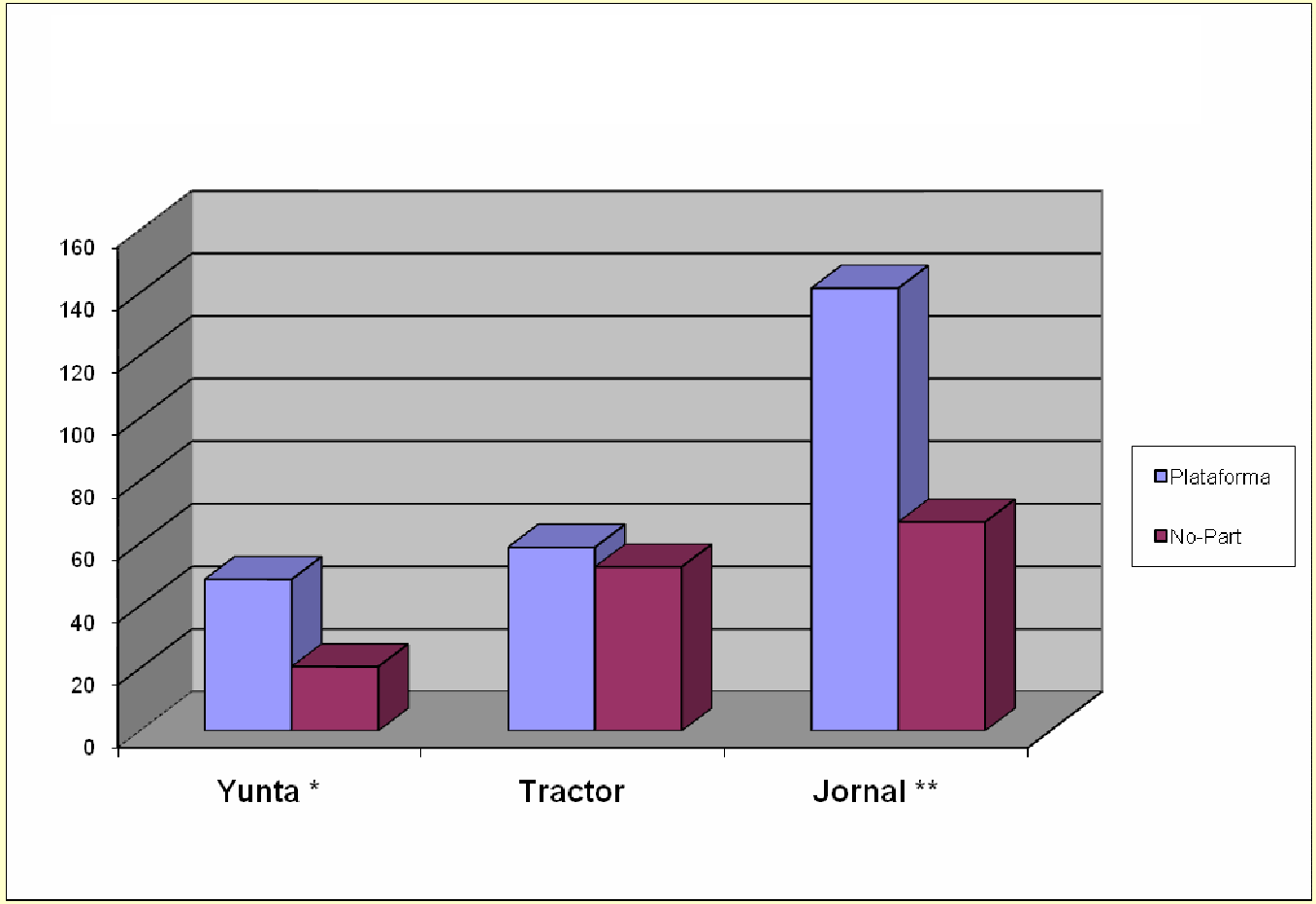
Costs per Ha of agrochemicals



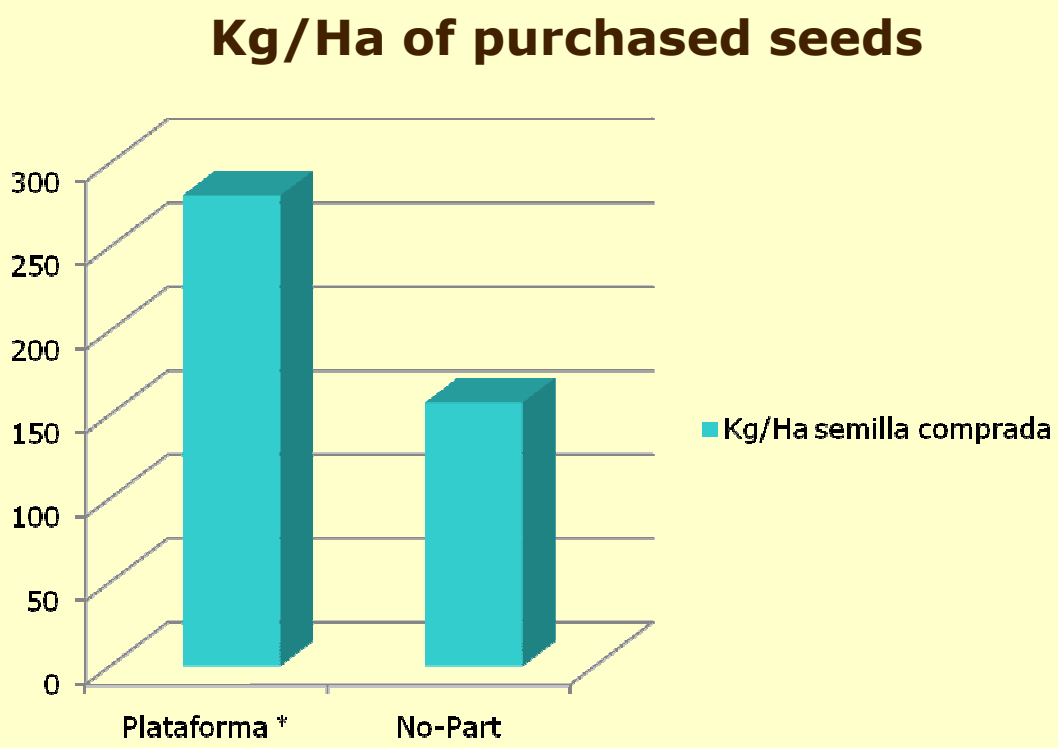
Fertilizers



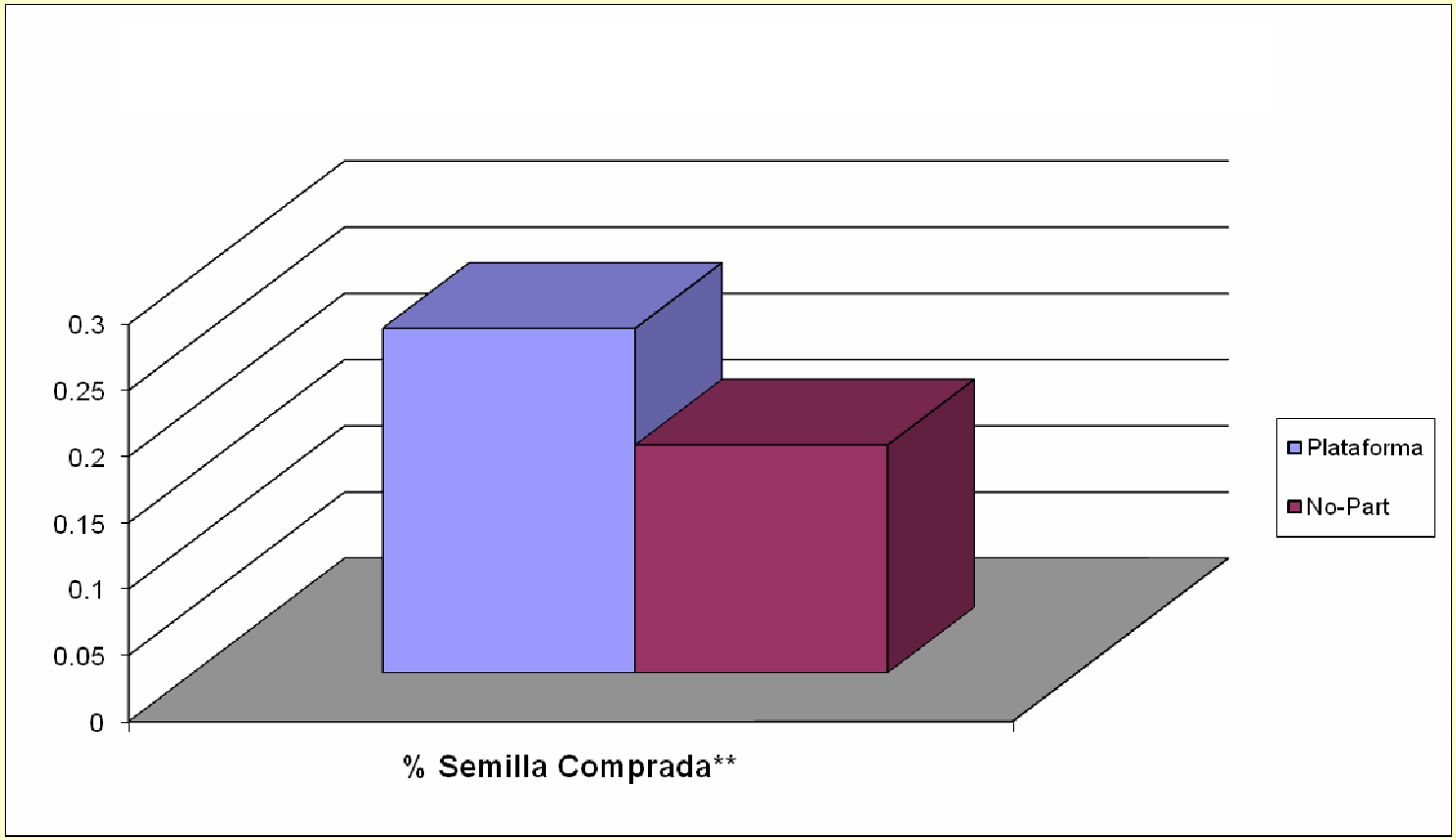
Costs of other inputs per Ha



Seeds Bought



% of purchased seeds per HH



Variety source	% No part	% Part
CONPAPA / Plataforma/INIAP	**5.07**	**37.07**
Family/friends/neighbours	**62.05**	**41.31**
Mercado local/traders	**19.76**	**10.34**
Shareholders	2.59	0.19
Daily workers	2.68	1.93
Other NGOs	2.22	4.44
Don't remember	1.11	1.35
Other	4.52	3.37

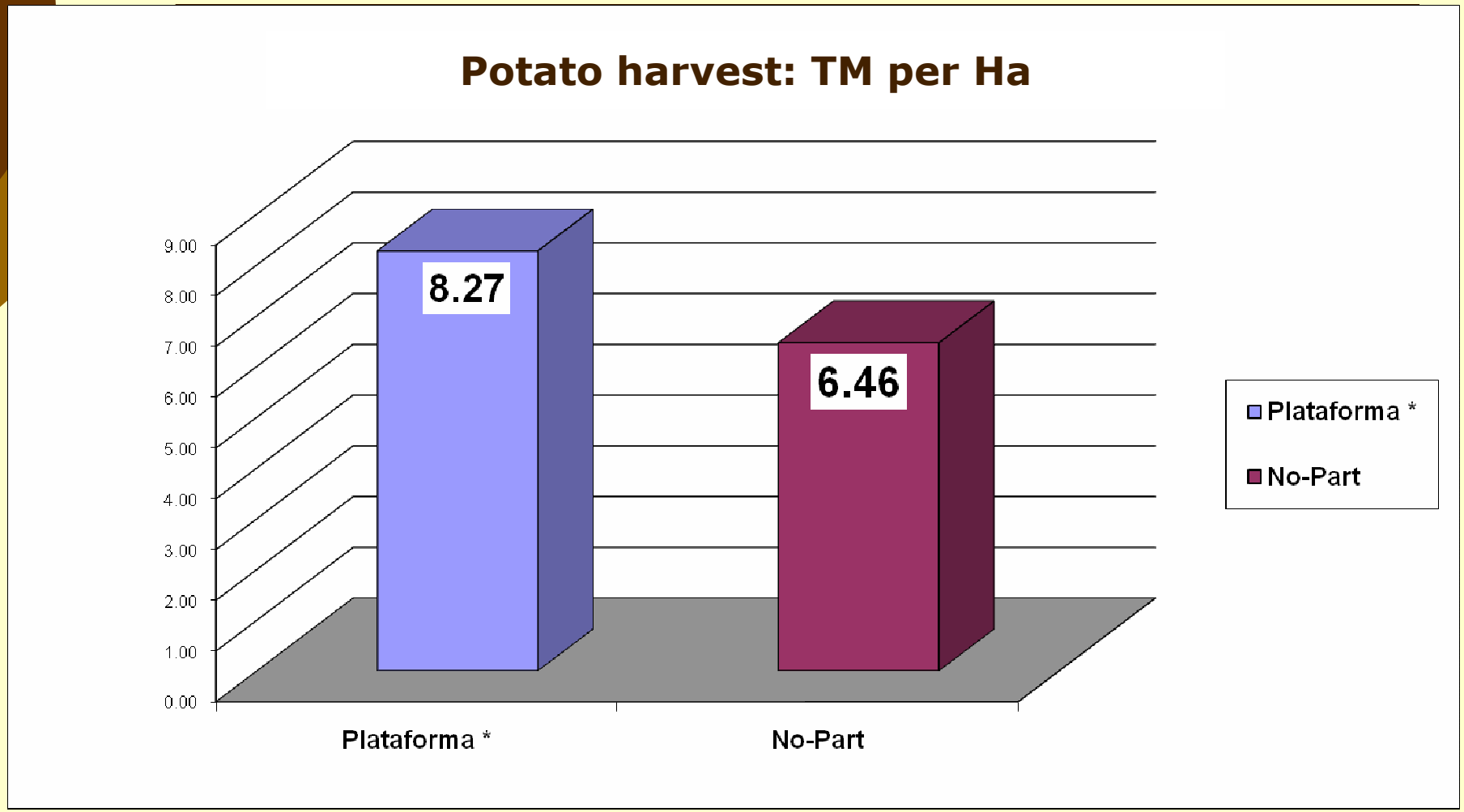
Total costs of inputs

	Plataforma	No-Part	Diferencia	
Input costs Imputed ‘/ Ha	**815.48**	**531.03**	**284.45**	**
Input costs / Ha	**651.54**	**408.48**	**243.06**	**

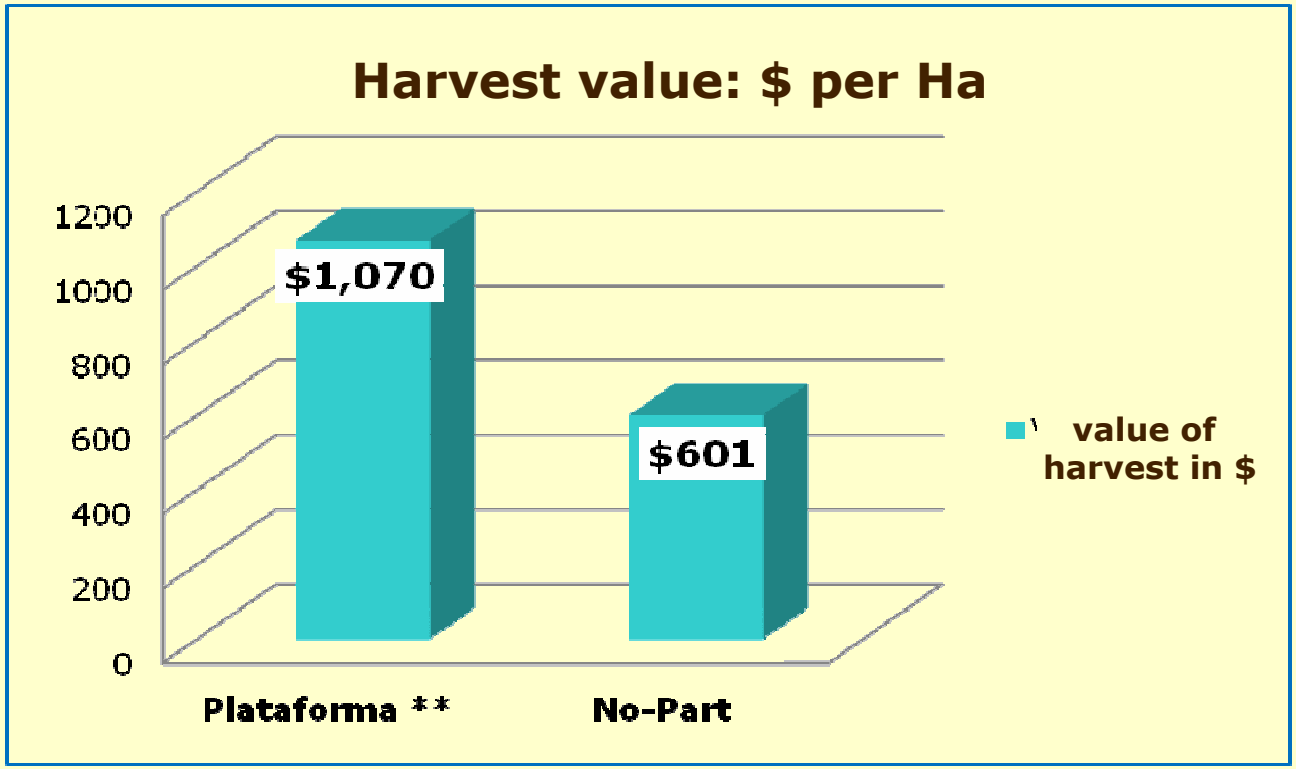
` inputed costs includes the owned seeds’ value

Yield and Productivity

Productivity: T/Ha



Produce value per Ha



Sale price per Quintal	1.30	**

Gross Margin $ / Ha

	Participant	No-Participant	Difference	
Gross Margin	**254.71**	**70.02**	**184.69**	**

Results

- Substitution of Gabriela variety with Fripapa among platforms' participants. In general the level of biodiversity is not different.
- A higher percentage of participants apply agrochemicals. However, the insecticides used are only by contact and thus do not get into the system.
- 57.72% of participants utilize traps as compared to 10.72% of non participants.
- Important to notice that most of the insecticides used by participants are less toxic (green or blue labels) and are associated to using traps.

Results

- A higher percentage of participants identify labels correctly.
- Similarly a higher percentage of participants utilize protection equipment in applying agrochemicals.
- Platforms' participans spend more on seeds and other inputs but they also earn more thanks to higher productivity, higher yields and higher price of sale.
- Transaction costs also play a role

Conclusions and policy implications

- Importance of good control group
- Importance of quality seeds
- Of the 7 most used varieties only 2 are native variety. There's a concern for genetic erosion but programs to create a demand for native varieties need to be implemented
- Despite participants show a good knowledge of agrochemicals and connected risks, they use more precautions but not necessarily apply less.
- Importance of information diffusion and organization to connect to the market and avoid marginalization

Next Steps

- Transaction costs paper
- Group chemicals by their main ingredient
- Differentiate sample on altitude
- Calculate the Environmental Impact Quotient and include in the analysis
- Suggestions?

Thanks for your attention

http://www.fao.org/es/ESA/lisfame/es/index.htm