RUBBER FARMER
PREFERENCES FOR
ADAPTIVE MEASURES TO
CLIMATE CHANGE
A CASE STUDY IN SOUTHEAST
VIETNAM

Quang Minh Bui, Oscar Cacho, Rene Villano, David Hadley

Contributed paper prepared for presentation at the 59th AARES Annual Conference,
Rotorua, New Zealand, February 10-13, 2015

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3 LEADING AGRICULTURAL PRODUCTS IN EXPORT VALUES OF VIETNAM

1: RICE
2: COFFEE
3: RUBBER
RUBBER FARMER PREFERENCES FOR ADAPTIVE MEASURES TO CLIMATE CHANGE
A CASE STUDY IN SOUTHEAST VIETNAM

Quang Minh Bui, Oscar Cacho, Rene Villano, David Hadley

59th Annual Conference of the Australian Agricultural and Resource Economics Society, at Rotorua, New Zealand, 10–13 February 2015
Lancaster (1966) developed a consumer choice model by assuming that consumers derive their satisfaction:

- not only from the goods themselves
- but also from attributes the goods give

Diagram:

- Rubber farmers
- Attributes
- Adaptive measures
Literature review

- Farmers have heterogeneous preferences for various adaptive measures
- Many solutions through technologies and cultivation practices, but inconsistent adoption patterns
- Adoption depends on attributes of technologies in combination with socio-economic conditions of farmers
- Assessment of the farm-level adoption of adaptive strategies for formulating policies (micro-level analysis of decision-making processes)
Context in Southeast Vietnam

• **Rubber trees**
  - Important strategic plant (high earnings, poverty reduction)
  - Planted rubber area: 56%
  - Harvested rubber area: 65%
  - Affected negatively by climate change and variability
  - Require rubber farmers to adapt

• **Small-scale rubber farming**
  - Rubber farm households: 56% of the country
  - Contribution: 40–50% of natural rubber production
  - Highly vulnerable to market uncertainties
  - Requires special attention of formulating adaptive strategies
Research questions

Heterogeneity of adoption preferences at the farm level is an important research question of relevance in Southeast Vietnam

1. How are farmers likely to respond to climate change?
2. What are the attributes related to different adaptive measures?
3. Why do farmers choose some adaptive measures, but not others?
Methodology

- Identification of adaptive measures and attributes
  - Using a structured questionnaire to measure attribute preferences (through stated preference)

- Reliability analysis helps identify a reduced set of attributes

- Factor analysis helps identify the optimal number of farmer preference types
## Table 1: Adaptive measures being practiced and applied at the farm level and their attributes

<table>
<thead>
<tr>
<th>No.</th>
<th>Adaptive measures</th>
<th>Rank</th>
<th>Short-cut attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Proper ground preparation</td>
<td>1</td>
<td>Resistance to drought</td>
</tr>
<tr>
<td>2</td>
<td>Proper clones, planting materials and establishment</td>
<td>2</td>
<td>Resistance to heavy winds</td>
</tr>
<tr>
<td>3</td>
<td>Alter the fertiliser application strategy</td>
<td>3</td>
<td>Resistance to plant disease</td>
</tr>
<tr>
<td>4</td>
<td>Employ spray and drip irrigation technologies</td>
<td>4</td>
<td>Skilled labour availability</td>
</tr>
<tr>
<td>5</td>
<td>Water conservation techniques</td>
<td>5</td>
<td>Capital availability</td>
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<tr>
<td>6</td>
<td>Soil conservation techniques</td>
<td>6</td>
<td>Time availability</td>
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<tr>
<td>7</td>
<td>Rain guard technology</td>
<td>7</td>
<td>Property rights</td>
</tr>
<tr>
<td>8</td>
<td>Correct tapping techniques</td>
<td>8</td>
<td>Knowledge</td>
</tr>
<tr>
<td>9</td>
<td>No adaptation</td>
<td>9</td>
<td>Institutions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>Market access</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td>Early yields</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>Latex yield</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>Latex quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14</td>
<td>Technical and economic efficiency</td>
</tr>
</tbody>
</table>
Adaptive measures

Measures and initiatives

• Are undertaken through adjustments or interventions over time

• To diminish the vulnerability of small-scale rubber farming to actual/potential impacts of climate change (through manage the losses or take advantage of the opportunities caused by climate change)
Attributes

• Latent variables
• Not directly observable

Farmer preference levels to an attribute

• 5-point Likert scale
• Measuring preference of the most important measure
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<td></td>
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</tbody>
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Results

• Sample size: 430 rubber farm households in 3 provinces (Binh Phuoc, Tay Ninh and Dong Nai)
• Field surveys: from January to April 2014
• Nearly all of them conducted some combinations of the measures
• 3 most preferred measures
  • Proper rubber clones, planting materials and crop establishment (chosen by 32.6%)
  • Rain guard technology (23.7%)
  • Correct tapping techniques (26.3%)
Results: Reliability Analysis

- Considered 10 attributes when formulating the preference
- Importance of each attribute varied across rubber farmers
Table 2: Reliability analysis for measuring the adaptive attributes

<table>
<thead>
<tr>
<th>No.</th>
<th>Rank</th>
<th>Short-cut attributes</th>
<th>Cronbach’s alpha if attribute deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Cronbach’s alpha of full model</td>
<td>0.71</td>
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<tr>
<td>1</td>
<td>1</td>
<td>Resistance to drought</td>
<td>0.68</td>
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<td>Resistance to heavy winds</td>
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<tr>
<td>3</td>
<td>4</td>
<td>Skilled labour availability</td>
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<td>5</td>
<td>Capital availability</td>
<td>0.66</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>Time availability</td>
<td>0.69</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>Property rights</td>
<td>0.70</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>Knowledge</td>
<td>0.69</td>
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<td>8</td>
<td>10</td>
<td>Market access</td>
<td>0.67</td>
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<tr>
<td>9</td>
<td>11</td>
<td>Early yields</td>
<td>0.71</td>
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<tr>
<td>10</td>
<td>14</td>
<td>Technical and economic efficiency</td>
<td>0.71</td>
</tr>
</tbody>
</table>

(i) resistance to plant disease,
(ii) availability of institutional support,
(iii) better latex quality and
(iv) higher production and yield
Results: Factor Analysis

10-attribute set

7-attribute set

Best explanatory power

Distinguishing the heterogeneous preferences

Resistance to drought (1) and heavy-winds (2)

Availability of skilled labour (3) and capital (4)

Timeliness (5)

Effects on harvest time (6)

Technical and economic feasibility (7)

Group 1: Resource

Group 2: Biology

Group 4: Early return

Group 3: Efficiency
Table 3: The rotated component matrix in the factor model

<table>
<thead>
<tr>
<th>No.</th>
<th>Rank</th>
<th>Short-cut attribute</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
</tr>
</thead>
<tbody>
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<td>1</td>
<td>Resistance to drought</td>
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<td></td>
<td>0.95</td>
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<tr>
<td>2</td>
<td>2</td>
<td>Resistance to heavy winds</td>
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<td>0.95</td>
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<tr>
<td>3</td>
<td>4</td>
<td>Skilled labour availability</td>
<td></td>
<td>0.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>Capital availability</td>
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<td>5</td>
<td>6</td>
<td>Time availability</td>
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<td>0.73</td>
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<tr>
<td>6</td>
<td>11</td>
<td>Early yields</td>
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<td>0.83</td>
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<td>7</td>
<td>14</td>
<td>Technical and economic efficiency</td>
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<td></td>
<td>0.86</td>
</tr>
</tbody>
</table>

KMO measure of sampling adequacy 0.65
Bartlett’s test of sphericity 1403*
Cumulative % 68.99

(i) **land-use rights**,  
(ii) **appropriate techniques and application knowledge**,  
(iii) **market access**
Discussion

**Group 1 - resource attributes**

Concerns 3 attributes
(i) skilled labour availability
(ii) ability to obtain investment capital
(iii) ability to conduct tasks at the suitable time

Related to availability of economic inputs

This group is willing to adopt adaptive measures when there is availability of financial and labour resources.
Discussion (cont.)

**Group 2 - biological attributes**

Concerns 2 attributes
(i) drought resistant ability
(ii) heavy wind resistant ability

Related to clones and methods that improve drought and heavy wind resistant ability

This group expects to deal with forecasted climate risks.
Discussion (cont.)

Group 3 - *efficient attribute*

Concerns 1 attribute

(i) technical and economic feasibility

This group expects the feasibility of the method
Discussion (cont.)

**Group 4 - early return attribute**

Concerns 1 attribute
(i) harvest timing

Concentrates on obtaining early income (e.g. applying latex stimulative materials)

This group expects to earn early profit.
Discussion (cont.)

Groups 1, 2 and 3: risk averse
  Group 4: not risk averse

Group 1: looks to achieve input efficiency
Groups 2, 3 and 4: more concerned with output efficiency

Groups 1 and 2: driven by risk minimisation
Groups 3 and 4: by profit maximisation
Contributions

- Formalising the study of adaptive strategies at the farm level
- Providing a background for further research on factors affecting the probability a farmer becoming a membership of a given group
Thank you for your attention!