Landowner total income from working rangelands: an accounting application to oak woodland case studies in Spain and California

Jose L. Oviedo\textsuperscript{1}, Lynn Huntsinger\textsuperscript{2} and Pablo Campos\textsuperscript{1}

\textsuperscript{1} Institute for Public Goods and Policies, Spanish National Research Council (CSIC)
\textsuperscript{2} Department of Environmental Science, Policy and Management, UC Berkeley
Introduction

• Previous studies showed that these systems offer low or negative commercial net return on investment (Martin and Jefferies, 1966; Agee, 1972; Workman, 1986; Campos and Riera, 1996; McGrann, 2000; Torell et al., 2001; Forero et al., 2004; Ovando et al., 2015; USDA, 2016).

• However, land prices have steadily increased at least over the last 20 years
Average annual cumulative land revaluation rate
Andalucía (1994-2013): 5.0%
California (1999-2013): 6.2%
Motivation

• What does explain this gap between land market prices and commercial production?

• Amenities and lifestyle values are important for landowners in Spain and California (Martin and Jefferies, 1966; Smith and Martin, 1972; Pope, 1985; Liffmann et al. 2000; Rowe et al., 2001; Torell et al., 2001 and 2005; Gentner and Tanaka 2002; Campos et al., 2009; Huntsinger et al., 2010; Wasson et al., 2013).

• Conventional income accounting does not fully consider the amenity values that landowners benefit from
Objectives

✓ We extend the concept of economic production beyond market commodities, valuing private amenity returns for ranch and dehesa landowners.

✓ We measure the total private income and profitability rates from six case studies: three in Spain (dehesas) and three in California (ranches).

✓ We integrate three components in total income measurement: commercial operations, private amenities and capital gains.
Agroforestry Accounting System (AAS)

- Market data on costs, output and capital goods (assets) except land
- Account books, in-depth interviews and field data: 2007 for ranches, 2010 for dehesas
- Private amenities (non-market)
- Surveys of landowners: 2004 for ranches, 2010 for dehesas
- Land prices
- Average annual cumulative rate: 1999-2013 for ranches, 1994-2013 for dehesas
- Rangeland price statistics
- Land revaluation (appreciation)
- Case studies
- Contingent valuation studies
The economic value of amenities

- Market value: premium in land market price because of amenities (both buyers and sellers) → capital (stock) value

- Non-market value: the annual consumption of amenities by landowners is not subject to a market transaction → production (flow) value

- We need non-market valuation methods to estimate the production value and integrate it in economic analysis
Methodology

• 765 face-to-face surveys with private forest and dehesa owners in Andalucía.

• Random sampling made over the Andalucía forestland map (using GIS)

• Long survey (1 hour on average) → contingent valuation question to value the consumption of private amenity product in a year
Amenity motivations?

Reasons for land ownership

- Legacy options
- Enjoyment of recreation and landscape
- Commercial profits
- Lifetsyle
- Enjoyment of working in operations

Andalucia (n=765) vs California (n=248)
Contingent valuation question

Consider that you are offered the possibility to invest in an alternative non-agrarian investment to your current land property that would increase your monetary benefit in [€75 * hectares; €140 * hectares; €240 * hectares; €450 * hectáreas] per year.

Would you sell your land property to move to this investment and get this annual benefit increase?

☐ Yes  ☐ No  ☐ Do not know/do not answer
### Willingness to pay function

**Censored Log-Logit regression (n= 458)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>St. error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>3.8629***</td>
<td>1.1884</td>
</tr>
<tr>
<td>Property size (hectares)</td>
<td>-0.0004*</td>
<td>0.0002</td>
</tr>
<tr>
<td>Presence of eucalyptus in the property (&gt;30%)</td>
<td>-1.6468*</td>
<td>0.9517</td>
</tr>
<tr>
<td>Presence of Aleppo pine in the property (&gt;40%)</td>
<td>-1.3387***</td>
<td>0.5132</td>
</tr>
<tr>
<td>Log of the distance to the closest urban center</td>
<td>0.5292*</td>
<td>0.2821</td>
</tr>
<tr>
<td>Log of the bid offered</td>
<td>-1.3808</td>
<td></td>
</tr>
</tbody>
</table>

Average WTP per hectare for privately-owned forest and dehesas in Andalucía: **€364.7/ha**
Willingness to pay and property size

The graph illustrates the relationship between property size (in hectares) and the willingness to pay (WTP) per hectare as well as the total willingness to pay (Total WTP). As the property size increases, the willingness to pay per hectare decreases, approaching zero at very large property sizes. Conversely, the total willingness to pay increases as property size increases, reaching a peak at around 2,000 hectares and then levels off, suggesting diminishing marginal WTP at larger scales.
## Private amenities and land prices

<table>
<thead>
<tr>
<th>Case</th>
<th>Private amenities</th>
<th>Land price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dehesa A</td>
<td>680.26 $/ha</td>
<td>8,807.4 $/ha</td>
</tr>
<tr>
<td>Dehesa B</td>
<td>502.16 $/ha</td>
<td>9,934.4 $/ha</td>
</tr>
<tr>
<td>Dehesa C</td>
<td>78.06 $/ha</td>
<td>6,903.5 $/ha</td>
</tr>
<tr>
<td>Ranch A</td>
<td>110.38 $/ha</td>
<td>3,495.1 $/ha</td>
</tr>
<tr>
<td>Ranch B</td>
<td>209.76 $/ha</td>
<td>3,527.9 $/ha</td>
</tr>
<tr>
<td>Ranch C</td>
<td>106.67 $/ha</td>
<td>3,108.6 $/ha</td>
</tr>
</tbody>
</table>

$/ha for 2010
### Profitability Indicators

<table>
<thead>
<tr>
<th>Class</th>
<th>Dehesa A Commercial</th>
<th>Dehesa A Private amenity</th>
<th>Dehesa A Total</th>
<th>Dehesa B Commercial</th>
<th>Dehesa B Private amenity</th>
<th>Dehesa B Total</th>
<th>Dehesa C Commercial</th>
<th>Dehesa C Private amenity</th>
<th>Dehesa C Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating profit (%)</td>
<td>-0.9</td>
<td>4.9</td>
<td>4.0</td>
<td>-1.7</td>
<td>3.9</td>
<td>2.2</td>
<td>-0.1</td>
<td>3.7</td>
<td>3.6</td>
</tr>
<tr>
<td>Capital gain profit (%)</td>
<td>-0.7</td>
<td>2.1</td>
<td>1.4</td>
<td>0.6</td>
<td>4.4</td>
<td>5.0</td>
<td>-0.1</td>
<td>3.3</td>
<td>3.2</td>
</tr>
<tr>
<td>Capital income profit (%)</td>
<td>-1.6</td>
<td>7.0</td>
<td>5.4</td>
<td>-1.1</td>
<td>8.3</td>
<td>7.2</td>
<td>-0.2</td>
<td>7.0</td>
<td>6.8</td>
</tr>
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<table>
<thead>
<tr>
<th>Class</th>
<th>Ranch A Commercial</th>
<th>Ranch A Private amenity</th>
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<th>Ranch B Commercial</th>
<th>Ranch B Private amenity</th>
<th>Ranch B Total</th>
<th>Ranch C Commercial</th>
<th>Ranch C Private amenity</th>
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<td>Operating profit (%)</td>
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<td>0.1</td>
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<td>0.5</td>
<td>1.7</td>
<td>2.2</td>
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<td>5.5</td>
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<td>7.8</td>
<td>10.5</td>
<td>0.8</td>
<td>9.4</td>
<td>10.2</td>
<td>0.2</td>
<td>7.0</td>
<td>7.2</td>
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- Commercial operating income: -2% to 2%
- Operating income (including private amenities): 2% to 5% (amenities adds around 4%)
- Capital income (operating income plus capital gains): 5% to 10% (gains adds around 4-5%)
- Real profitability (no inflation): 3% to 8%
CONCLUSIONS

✓ Private amenities are the main contributor to landowner total income

✓ The case studies are competitive with alternative investments when we consider private amenities and capital gains

✓ These values can be integrated in a consistent accounting framework that considers both commercial and environmental production

✓ While private amenity consumption allows the persistence of these systems in the short term, traditional operations are needed to avoid fragmentation and other land use threats
Thanks!!

jose.oviedo@csic.es