WILLINGNESS OF FARMERS TO ENGAGE WITH RIPARIAN BUFFER ZONES ACROSS SMALL SCALE CATCHMENT AREAS IN THE REPUBLIC OF IRELAND

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Background

• Source reduction and source interception are the two principle strategies of abating diffuse pollution from agriculture

• Source interception – Intercept along pathway after mobilisation

• Riparian Buffer Zone
  – Vegetative strips of land which extend along the side of a watercourse
  – Goal of excluding nutrients, sediment and other organic matter from entering a watercourse
Benefits of Riparian Buffer Zones

• Reduce sediment, pathogens, and nutrient loads into a watercourse
  – Bank side stability & river ecology (plus other ecosystem services)

• Downsides
  – Pollution swapping
  – Hydrological bypassing

(Heathwaite et al., 1998; Line et al., 2000; Beltman et al., 2002; Reed & Carpenter, 2002; McKergow et al., 2003; Sharply et al., 2003; Polyakov et al., 2005, Young & Briggs, 2005; Cors & Tychon, 2007; Haygarth et al., 2009; Wilcock et al., 2009)
Willingness of farmers to adopt?

- Adoption - Supply side analysis
  - Landowners preferences
  - Economics incentives

- Factors which influence Riparian Buffer Zone supply
  - Economics incentives
  - Environmental and social values
  - Farm and socio-demographic variables
  - Conditions of implementation
  - Experience with agri-environment schemes

(Lynch et al., 2001; Ducros & Watson, 2002; Rhodes et al., 2002; Ryan et al, 2003; Kabii & Horowitz, 2006; Ghazalian et al., 2009; Mante & Gerowitt, 2009; Patrick & Barclay, 2009; Christensen et al., 2011; Yu & Belcher, 2011)
Riparian Buffer Zone scenario

• Attitude survey
  – 12 Catchments: N=247 (Land beside water)
    ➢ Average Catchment size = 800-1200 hectares
  – Attitudes, farm practices, socio-demographics and willing to adopt a riparian buffer zone.

• If a 5 year scheme was introduced → 10 metres fenced buffer zone, capital cost covered. Participation?

  A = I would not participate in such a scheme
  B = I would participate in the scheme on free-of-charge basis
  C = I would participate if I was provided with an appropriate financial incentive
Buffer Zones – Willingness to adopt

<table>
<thead>
<tr>
<th>Decision</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Would not participate</td>
<td>132</td>
<td>53</td>
</tr>
<tr>
<td>Participate free of charge</td>
<td>17</td>
<td>7</td>
</tr>
<tr>
<td>Participate only with appropriate financial incentive</td>
<td>98</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>247</td>
<td>100</td>
</tr>
</tbody>
</table>
## Rationale - Not willing to adopt

<table>
<thead>
<tr>
<th>Reason</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interference with farming system / loss of production</td>
<td>75</td>
<td>57</td>
</tr>
<tr>
<td>Nuisance</td>
<td>26</td>
<td>20</td>
</tr>
<tr>
<td>Buffer zone too large</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Other</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>132</td>
<td>100</td>
</tr>
</tbody>
</table>
Field Structures

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Attitude and Peers Factors

• Principal Component Analysis
  – Mathematical procedure that transforms a number of possibly correlated variables into a smaller number of uncorrelated variables called principal components or factors

• Attitude Factors
  – Environmental protection
  – Production & resource maximisation
  – Bureaucratic load

• Peer Factors
  – Regulators
  – Other farmers
### Probit Model: Willingness to adopt

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agri-environment scheme history</td>
<td>0.514***</td>
<td>(0.168)</td>
<td>3.07</td>
<td>*** p&lt;0.01</td>
</tr>
<tr>
<td>Environmental protection attitude</td>
<td>0.188**</td>
<td>(0.086)</td>
<td>2.18</td>
<td>** p&lt;0.05</td>
</tr>
<tr>
<td>Regulators – peer influence</td>
<td>0.167*</td>
<td>(0.092)</td>
<td>1.84</td>
<td>* p&lt;0.1</td>
</tr>
<tr>
<td>Gross margin ha⁻¹</td>
<td>-0.028**</td>
<td>(0.014)</td>
<td>-2.13</td>
<td>** p&lt;0.05</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.081</td>
<td>(0.151)</td>
<td>-0.54</td>
<td></td>
</tr>
</tbody>
</table>

Observations (N) = 248

(*** p<0.01, ** p<0.05, * p<0.1)
Compensation – What is the farmers price?

- Price demanded by those willing to adopt
  - 98 landowners (40% of the sample) want payment
  - 17 farmers (7%) willing to adopt on a free of charge basis

- Hypothetical scenario
  - Contingent valuation methodology
    - Non-market valuation
    - Validity – Direct use values
  - Estimating farmers marginal WTA in € ha$^{-1}$ for change of land use from agricultural production to an environmental public good → Riparian Buffer Zone
Level of payment offered

• Bids developed from:
  – Teagasc NFS (FADN based)
  – Questionnaire pilot phase

• Generalized Tobit model
  \[\text{(Daniels et al., 2005; Hynes \\& Hanley, 2009)}\]
  – Point estimates (WTA for free \(= €0\) per \(\text{ha}^{-1}\))
  – Intervals (€501-800 per \(\text{ha}^{-1}\))
  – Right truncation (>€2500 \(\text{ha}^{-1}\))

<table>
<thead>
<tr>
<th>Level of Payment Offered</th>
<th>Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>€1 - 300 per (\text{ha}^{-1})</td>
<td>equivalent</td>
</tr>
<tr>
<td>€301 - 500 per (\text{ha}^{-1})</td>
<td>equivalent</td>
</tr>
<tr>
<td>€501 - 800 per (\text{ha}^{-1})</td>
<td>equivalent</td>
</tr>
<tr>
<td>€801 - 1200 per (\text{ha}^{-1})</td>
<td>equivalent</td>
</tr>
<tr>
<td>€1201 - 1800 per (\text{ha}^{-1})</td>
<td>equivalent</td>
</tr>
<tr>
<td>€1801 - 2500 per (\text{ha}^{-1})</td>
<td>equivalent</td>
</tr>
<tr>
<td>&gt; €2500 per (\text{ha}^{-1})</td>
<td>equivalent</td>
</tr>
</tbody>
</table>
## Willingness to Accept Model – Payment Level

<table>
<thead>
<tr>
<th>Category</th>
<th>Estimate</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bureaucratic load</td>
<td>195.0**</td>
<td>(88.58)</td>
</tr>
<tr>
<td>Financial planning</td>
<td>596.2**</td>
<td>(240.7)</td>
</tr>
<tr>
<td>Dairy</td>
<td>646.6*</td>
<td>(357.8)</td>
</tr>
<tr>
<td>Cereal crops</td>
<td>-636.8**</td>
<td>(253.6)</td>
</tr>
<tr>
<td>Constant</td>
<td>1341***</td>
<td>(178.0)</td>
</tr>
</tbody>
</table>

Observations (*** p<0.01, ** p<0.05, * p<0.1) 102

- Mean WTA = €1513 ha\(^{-1}\) → €1.51 per linear metre
Conclusion & Discussion

• Acceptability of a Riparian Buffer Zone Scheme / Policy
  – Farmers are split nearly 47/53 on adoption
  – Not a lot of spatial continuity
  – Average cost = €1513 Ha$^{-1}$ or €1.51 per linear metre

• Targeting of instrument
  – Catchment hydrology
  – Critical source areas
  – Least cost marginal abatement
  – Linking of biophysical and economic
Thank you

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- ACP Team & Expert Steering Group
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www.teagasc.ie/agcatchments