Economic valuation of flood control/water flow regulation of agricultural land and forest in Japan

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Two major studies for valuation of ecosystem services at national scale

• Conducted by the Ministry of Agriculture, Forestry and Fisheries (MAFF) in around 2000
  – To assess the value of multifunctionality of agricultural land and forest

• A research project led by Kobe University (KU) during in around 2016
  – To estimate economic value of ecosystems (mainly forest and wetland) for SEEA-EEA
MAFF 2000 study

• Assessed economic values of flood control and water flow regulation
  – Agricultural land (paddy and arable)
  – Forest

• Valuation techniques
  – Replacement cost (RC):
    • Construction cost of flood control dam
    • Construction cost of water utilization dam
Valuation technique of flood control

• Flood control of paddy field
  – Amount of water stored in paddy = additional height to store water \times \text{area of paddy}
Valuation technique of flood control

• Flood control of arable land
  – Amount of water stored in paddy = thickness of soil * porosity * area
Valuation technique of flood control

- Land in the upper stream
  - Large number of beneficiaries

- Land in the lower stream
  - Small number of beneficiaries

Have same value?
Valuation technique of flood control

• Paddies are grouped into two
  – Standard area location
    • Assume all paddies have beneficiaries
  – Lower stream area location
    • Assume 25% of paddy has no beneficiaries
      – Share of paddies which have beneficiaries in all paddies: 0.75
    • Amount of water stored paddy in lower stream area =
      additional height to store water * area of paddy * 0.75

• For arable land, location is ignored
Valuation technique of flood control

• Price per hectare
  – Construction cost of flood control dam per storage capacity (JPY/m³)
    • Legal durable period: 80 years
    • Legal interest rate: 5%
    • 2.34JPY/m³ (≒0.02 USD/m³)
## Results

<table>
<thead>
<tr>
<th></th>
<th>MAFF 2000</th>
<th>KU 2016</th>
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<tbody>
<tr>
<td><strong>Flood control</strong></td>
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<tr>
<td>Agricultural land</td>
<td>3.5</td>
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<td>(RC: Flood control dam)</td>
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<tr>
<td>Forest</td>
<td>6.5</td>
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<td>(RC: Flood control dam)</td>
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<td><strong>Water flow regulation</strong></td>
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<td>(Water storage)</td>
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<tr>
<td>Agricultural land</td>
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<td>Forest</td>
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But more detailed identification of beneficiaries is needed