



# Economic Valuation of Multifunctionality of Agriculture and Rural Areas in Japan

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1



## Contents

- Definition and type of multifunctionality of agriculture and rural areas (MFA)
- Overview of economic valuation methods of MFA
- Case Study
- Additional topics

2



## Definition of multifunctionality

- Non-commodity outputs that are jointly produced with commodity outputs
  - No markets or inappropriately functioning markets for the non-commodity outputs
- ➔ Policy intervention is needed to maintain MFA appropriately.

3



## Examples of MFA

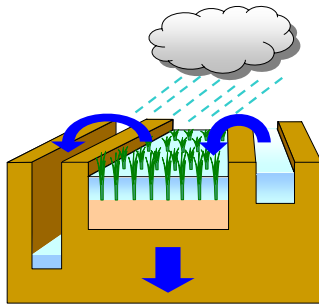
- Food security
- Floods prevention
- Landslide prevention
- Soil erosion prevention
- Groundwater recharge
- Water purification
- Decomposition of organic waste
- Climate mitigation
- Conservation of resources
- Conservation of biodiversity
- Land conservation
- Landscape formulation
- Rural viability
- Local community formation
- Cultural heritage
- Recreation and relaxation etc.

4



## Floods prevention function

- Paddy fields store water temporarily and prevent the drainage of excessive water to the river during heavy rainfall.



5



## Landscape formulation function

- Agricultural activities in rural areas maintain and conserve the landscape.

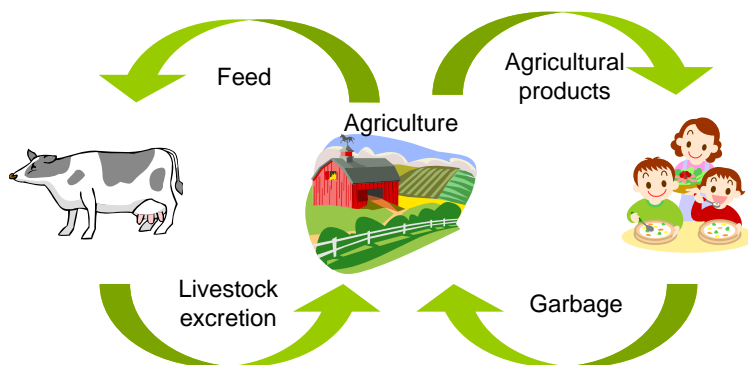


6

## Decomposition of organic wastes function



- Organic wastes such as garbage and livestock excretion are composted and recycled as resources.



7

## Recreation and relaxation function



- People visit rural areas in order to seek the nature, landscapes, and environment that cannot be found in the urban areas



8



## Reasons for economic valuations

- In order to inform the public of the importance of MFA.
  - It is easy to understand the importance of MFA when its value is expressed in monetary unit.
- In order to formulate an appropriate agro-environmental policy that maintains MFA efficiently.
  - The monetary value of MFA is essential for a comprehensive assessment of the agro-environmental policy.

9



## Types of economic value

- Total economic value derived from MFA is divided into two components:
  - Use value
    - Direct use of MFA.
    - e.g. Individuals visiting a rural area enjoy the landscape of that area.
  - Nonuse value
    - Individuals are willing to pay for preserving MFA that they never use.
    - e.g. Individuals bequeath the landscape for future of a rural area to future generations.

10



## Economic valuation methods (1)

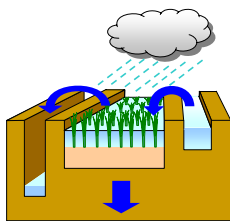
- Cost-based method
  - Replacement cost method (RCM)
- Demand-based method
  - Revealed preference method
    - Travel cost method (TCM)
    - Hedonic pricing method (HPM)
  - Stated preference method
    - Contingent valuation method (CVM)

11

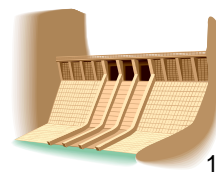
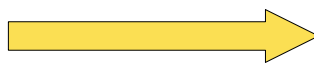


## Economic valuation methods (2)

- RCM estimates the value of MFA based on market prices of goods and services that are traded on the markets and are related to MFA.
  - Economic value of the flood prevention function of paddy fields is estimated based on the depreciation and maintenance cost of a water controlling dam.



The floods prevention function can be replaced by a water controlling dam.

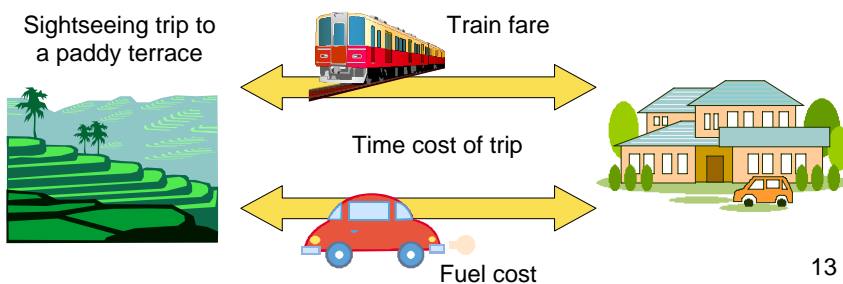


12



## Economic valuation methods (3)

- TCM estimates the value of a site based on the travel costs of visiting the site.
  - The use value of a rural area is estimated from the visit cost.

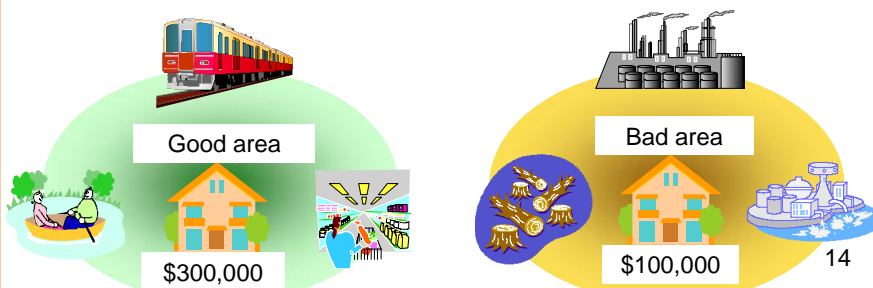


13



## Economic valuation methods (4)

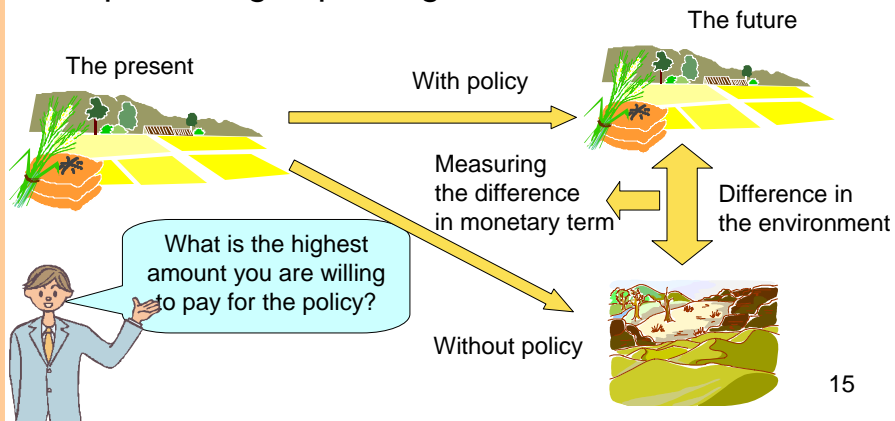
- HPM estimates the value of an area based on the individual choice behavior with regard to housing
  - When purchasing a housing, prospective buyers consider the environment around the house as well as the price of house. Therefore, their evaluations of the environment around the house are reflected in the house prices.



14

## Economic valuation methods (5)

- In CVM, individuals who benefit from MFA are directly asked how much they are willing to pay for protecting/improving the MFA.



15

## Comparison among the methods

- RCM, TCM, HPM
  - Advantage
    - Based on data related to the markets or economic activities.
  - Disadvantage
    - Only measure the use value and some MFA.
- CVM
  - Advantage
    - Nonuse value as well as the use value and almost all MFA are measurable.
  - Disadvantage
    - Many kinds of biases have been reported.
    - The reliability of the estimated value of MFA is considerably diminished when an inappropriate questionnaire is used.

16

# Valuing MFA in Japan by CVM

Source: Aizaki et al.(2006): Contingent valuation approach in measuring the multifunctionality of agriculture and rural areas in Japan, Paddy Water Environ, 4:217-222.

## ■ Objective

- ❑ To measure the willingness to pay (WTP) for implementing a policy that would maintain a level of multifunctionality corresponding to a 20% decrease in the farmland area in Japan, by using CVM.
  - The rate of decrease was decided based on the trend observed in the farmland areas in Japan during past 40 years.

## ■ Data

- ❑ A questionnaire was mailed to 2,500 households across the country in November 2003.
- ❑ 2,140 households returned the questionnaires.

17

# Questionnaire for CVM (1)

## ■ First, the following eight functions were explained.

- ❑ Flood prevention
- ❑ Recharging ground water
- ❑ Water environment conservation
- ❑ Soil erosion prevention
- ❑ Organic resource utilization
- ❑ Development of favorable landscapes
- ❑ Recreation and relaxation
- ❑ Wildlife protection

18



## Question for CVM

■ Second, the following hypothetical scenario was explained.

- Suppose approximately 30 years hence, the farmland area will decrease by an additional 20% and the level of multifunctionality (the aforementioned eight functions) will decline proportionally.
- Suppose the non-agricultural measures are being examined to supplement the weakening of the functions due to the decreasing farmland area; this policy would help maintain the current level of multifunctionality.



## Questionnaire for CVM (3)

■ Finally, the respondents were asked the following questions.

Q1 If the tax increase required for the policy implementation is X1 yen per household annually, do you agree to the implementation of the policy?

1. I agree

2. I disagree



Q2 If the amount of tax is, X2 yen, do you agree to the implementation of the policy?

Q3 If the amount of tax is X3 yen, do you agree to the implementation of the policy?

1. I agree

1. I agree

2. I disagree

2. I disagree

Note: The amount of money represented by X1 was randomly stated and ranged from 500 to 30,000 yen. X1 was lower than X2 but greater than X3.



## Question to determine the weights

- The total WTP is estimated from the responses to the aforementioned CVM questions.
- The weights is needed to be assigned to divide the total WTP with respect to each function.
- The respondents who answered “I agree” to the first and/or second CVM question (s) were asked to rate each of the eight functions in terms of their importance such that the weights add up to 100 points.
- The average points of each function were considered to be the degree of that function’s relative importance and were used as a weight for calculating individual WTPs.

21



## Estimated WTPs

\*Unit: yen / household / year

Function	Degree of relative importance	WTP*
Total	100	4,144
Flood prevention	15.7	649
Recharging ground water	12.2	505
Water environment conservation	15.5	642
Soil erosion prevention	10.7	445
Organic resource utilization	14.0	579
Development of favorable landscapes	9.5	394
Recreation and relaxation	7.0	290
Wildlife protection	15.5	641

22



## Additional topics



## Identifying the size of the population

- Demand-based valuation studies provide the per-capital or per-household value.
- In order to calculate the population value, it is necessary to know the size of the population affected by the policy (the scenario in the CVM question).
  - Population value  
= the per-unit value \* the size of the affected population
- The population value varies depending on the size of the affected population.

## Estimating the WTP for each of the functions



- The methods of estimating the WTP for each of the functions separately
  - Each WTP is estimated independently.
  - Total WTP with respect to each function is estimated, and then the WTP for each function is obtained by dividing the total WTP.
- Which of these methods is appropriate?

25

## Benefit transfer



- Economic valuation costs, which include the cost of preparing and implementing the survey and the cost of estimating the value of MFA, may be very high.
- This may lead policy-makers to defer the implementation of the economic valuation of MFA.
- Benefit transfer is used to decrease the cost by applying the results of a particular study to another site.

26



## Estimating environmental costs

- Agricultural production processes have negative impacts on the environment.
- In order to make an appropriate agro-environmental policy, it is necessary to estimate the environmental costs of agricultural production as well as the monetary value of MFA.

27



Thank you for your attention.

28