# RICE-BASED WATER SERVICE FEE ASSESSMENT IN TIDAL LOWLAND AGRICULTURE

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## INTRODUCTION

- WSF is considered a key factor for successful agricultural water management.
- Supposedly collected from water users on volumetric base, crop base, area base, or tradable water right (Cornish et al., 2004), current WSF was collected based on neither one of these due to the absent of objective measure of WSF and poorly defined role and function of water users association.
- Water service has been valued in various different ways including fixed and variable cost estimation (Gonzalez-Alvarez et al., 2006; Tarimo et al.,1998), marginal (social) cost of water delivery (Bar-Shira et al., 2006), environmental cost internalization (Esteban et al., 2008), water market instrumentation (Goetza et al., 2008), price elasticity prediction (Schoengold et al.,_2006), and production function (Pagiola et al., 2004).
- This study was designed to assess the financial value of water service using rice production function in order to estimate WSF.

## METHODOLOGY

- Method: Survey.
- Location: Telang, South Sumatra, Indonesia. Telang is among the most productive reclaimed tidal lowland areas.
- Sample Size: 500 farm households randomly drawn from approximately 10,000 farm households.
- Data Collection: Field Observation and Structured Interview.
- Valuation of water service in rice cultivation was carried out using a Cobb-Douglas production function (Coelli, 1995):

$$\ln Yi=\beta_0+\beta_1 \ln SEE+\beta_2 \ln CHE+\beta_3 \ln FER+\beta_4 \ln LAB+\beta_5 \text{ Dws}+\varepsilon i$$

where $Y_i$ = total rice production in Tons; $SEE$ = seed used in Kg; $CHE$ = chemical used in Rupiah; $FER$ = fertilizers used in Rupiah; $LAB$ = labor used in man-days; $D_{ws}$ = dummy variable water service for 0 = without and 1 = with water service.

## RESULT AND DISCUSSION

***Production and Productivity of Rice***

- The production and productivity of rice cultivation in the study area were presented in Table 1. These figures were estimated based on on-farm dried paddy.

Table 1. Production and productivity of rice

| | Mean | SD | Min | Max |
|---|---|---|---|---|
| Cultivation area (Ha) | 1.84 | 0.99 | 0.25 | 12 |
| Production (Tons) | 9.75 | 5.70 | 1.5 | 79.2 |
| Productivity (Tons/Ha) | 5.35 | 0.88 | | |

***The Value of Water Service in Rice Cultivation***

- Based on t-test, chemicals, fertilizers, labor and water service have significant effect on rice production (Table 2).
- Rice production of the farmland with water service is 4 percent higher than that without water service (exponentiated 0,040 is 1.0408, subtracting 1 from this gives 0.04, multiplying this by 100 gives 4 percent).

Table 2. Result of regression analysis

| Variables | β | SE of β | t | Sig. |
|---|---|---|---|---|
| (Constant) | -3.712 | .387 | -9.592 | .000 |
| Seed | .017 | .028 | .595 | .552 |
| Chemicals | .032 | .019 | 1.693 | .091* |
| Fertilizer | .122 | .027 | 4.473 | .000*** |
| Labor | .767 | .037 | 20.532 | .000*** |
| Water Service | .040 | .013 | 2.944 | .003*** |

Note: All variables are in logarithmic, except water service
R Square = .936; F-test = 1209.697; Sig. of F-test = .000
*Significant at 10%; **Significant at 5%; ***Significant at 1%

- Taking the mean productivity of the farmland without water service (5.3180 Tons/Ha) as the basis, the change from without water serv ice to with water service in rice production will increase the productivity by 0.217 Tons/Ha.
- In monetary term, this increase in productivity is equal to Rp 455,700 per hectare, assuming the price of on-farm dried paddy at local market is Rp 2,100 per kg. This is considered to be the value of water service in rice cultivation.
- In comparison, WSF estimated using the cost of water service varies from Rp 315,000 to Rp 391,500 per hectare per year (Table 3). Therefore, the value of water service (assuming only one crop per year) is higher than the cost of water service. This value is sufficient to cover the highest WSF (that covers the external cost of water service) by which current agricultural water management in tidal lowland can expectedly be sustained.

Table 3. Costs of water service and WSF estimates

| Type of Cost | Cost Components | Total (Rp) | WSF (Rp/ha/year) |
|---|---|---|---|
| Supply Cost | OM cost<br>Depreciation and replacement cost<br>Management cost | 80,580,000 | $WSF_1$ = 315,000 |
| Economic Cost | Opportunity cost | 88,644,000 | $WSF_2$ = 346,500 |
| Full Cost | External cost | 100,164,000 | $WSF_3$ = 391,500 |

## CONCLUSION

- Water service is required to provide water properly according to crop water requirement. In tidal lowland agriculture where water management is a key factor, water service has been proved to be a statistically significant contributor in rice production.
- The present of water service in rice cultivation contributes to an increase in income. This increase is considered to be the financial value of water service upon which a fee may reliably be imposed.
- The value of water service is higher than any estimates of WSF such that it may cover the highest cost (the full cost) that can sustain current agricultural water management in tidal lowlands.

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