Watershed based agricultural land use management for the future inter-regional sustainable development

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PURPOSE: This study addresses the social issue of regeneration of collapsing rural in Japan from a standpoint of watershed common management. A comprehensive model is developed to clarify the policy design of a good relationship between agriculture and watershed for sustainable development and water quality related environment.

INTRODUCTION

What did raise the collapse of rural community ?

- Market principle chiefly, & resultant depopulation

What issues will the rural collapse next bring to the watershed?

- Vulnerability of water pollution, flood damage & warming

What do we need to solve this problem ?

- Institutional degisn of cross-regional management of rural resources

What should be clarified for this ?

- Policy-making of sustainable cultivation & environmentally conscious farming, Watershed based policy assessment

A POLICY ASSESSMENT MODEL is developed, however

Feasible policy must be in good relations between

- Econmic development & water pollution impact,
- Agriculture sector, rural & watershed.

METHODOLOGY

Proposed Economic-Environmental-Policy model

Consists of four elements (Fig.1)

- **Rice cultivation policy model**
- **Environmental conscious farming policy model**
- **Watershed dynamic CGE model**
- **Watershed COD emission model**

Rice cultivation policy model is characterized as

- **GIS-based, Nsted logit model classified into three cultivation abandonment stages (Fig.2)**

With these, subsidy policy is examined as for

- **Sustainable cultivation,**
- **Subsidy effect on watershed economiy & environment.**

Three plans of subsidy policy are

- **No subsidy, Current subsidy , Optimal subsidy to attain cultivation abandonment ratio in 2030 below 2000 level under the minimum subsidy cost.**

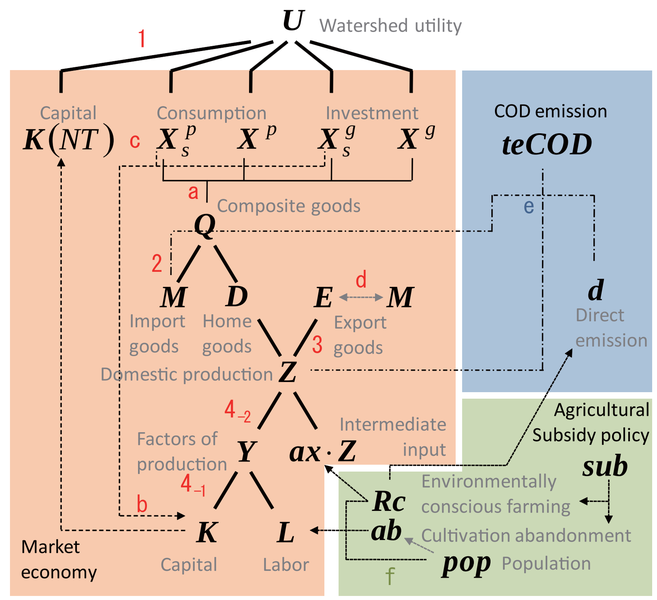

Fig.1 Economic-environemntal-policy model concept

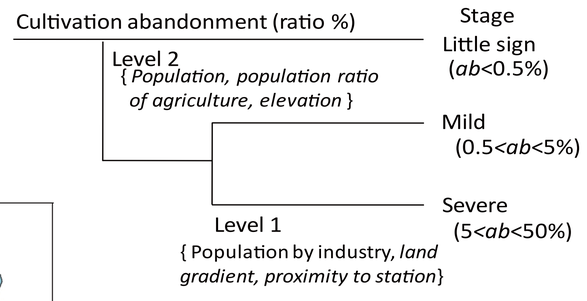

Fig.2 Cultivation abandonment model structure

DISCUSSION

Low agricultural worker density is seen in hilly & mountainous area of Katsura river basin, Kyoto (Fig3).

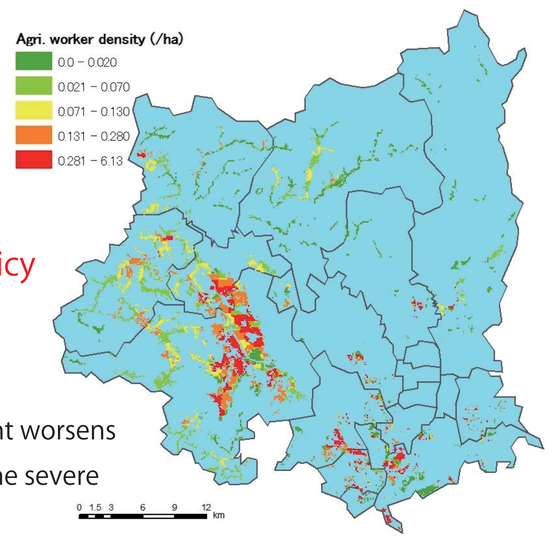

Fig.3 Agricultural woker density in 2000

Current policy issue

- Cultivation abandonment worsens to increase the severe stage except the iinitial improvement (Fig.4) due to the decreasing agricultural worker & the flat amountof subsidy payment .
- More serious is the hilly & mountainous area being in the severe stage at first (Figs.4, 5b).

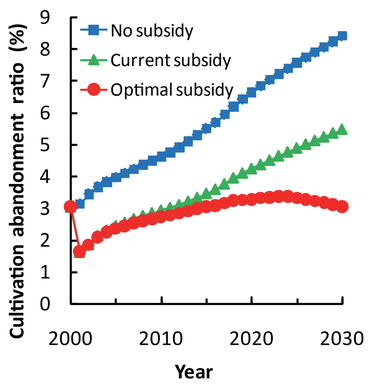

Fig.4 Long term cultivation abandonment behavior

Subsidy policy plan for sustainable cultivation

- The optimal subsidy policy is suitably late-acting to improve the cultivation abandonment of the hilly & mountainous area being in the severe stage at first (Figs.4, 5b).
- The cost is a just 23% increment of the current policy & nominal to the watershed value of production.

However, we should raise anew question of this policy ability to encourage the economic growth and reduce the environmental burden in both agriculture and watershed.

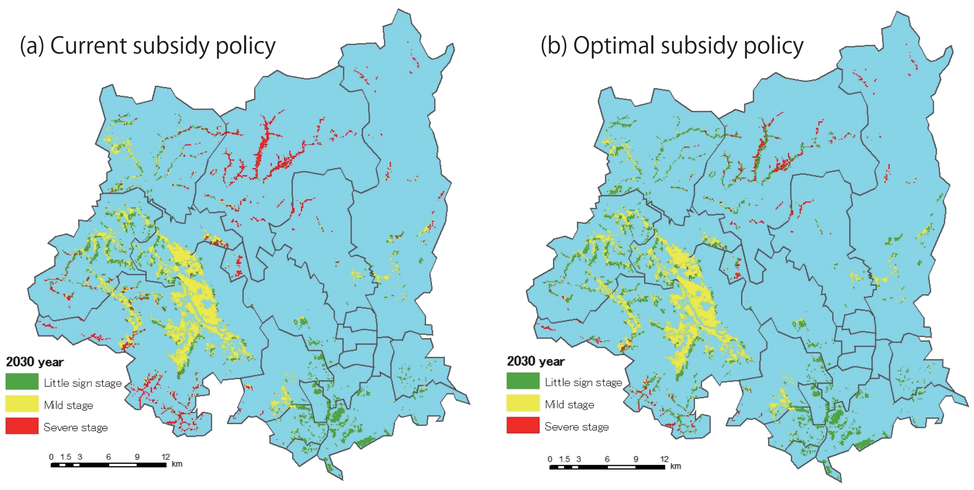

Fig.5 Cultivation abandonment state in2030

Subsidy effect on watershed economic growth

In optimal subsidy policy,

- The greatest watershed value of production is predicted with 5.1% increase for 30 years compared to the no subsidy policy (Fig.6).
- Agriculture sector shows the same level of economic growth as watershed.

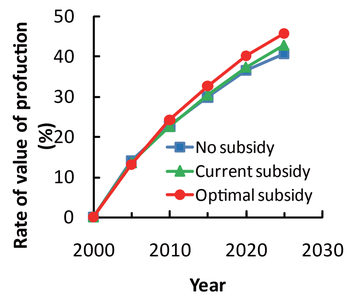

Fig.6 Watershed value of production rate

Subsidy plan and COD emission In Watershed

- Any agricultural subsidy policy doesn't always work well on COD emission reduction.
- Current subsidy plan realizes COD emission redution but optimal subsidy plan again increases the amount of COD emission (Fig.7).

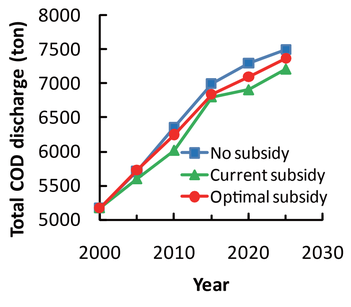

Fig.7 Watershed COD emission

In Agricultural Sector

- Subsidy policy attains COD emission below a level of no subsidy policy.
- Optimal subsidy policy gives a smaller decrease rate of COD emission (Fig.8) due to the production expansion in the market principle.

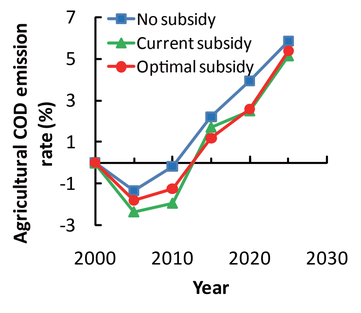

Fig.8 Agricultural COD emission rate

CONCLUSION

Agricultural subsidy policy contributes to building an economic & environmental good relationship between agricutultral sector and watershed.

However, there remains **trade-off relation** between **sustainable cultivation** & **watershed COD burden**, i.e.,

Current flat amount of subsidy plan is

- Insufficient to implement the sustainable rice cultivation state and the agricultural & watershed economic gap,
- Effective in more environmentally friendly economic growth.

Optimal subsidy plan allows a greater environmental burden compared to the current subsidy plan.

Optimization of agricultural policy-making which only watches agricultural economy may raise fears of additional water pollution.

FUTURE SUBJECT

We shoud discuss **additional policy regarding COD emission control** to support sustainable rice cultivation and watershed COD emission reduction.