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Developing for Water Resources Incentives to Support System of Rice Intensification (SRI) in Jatiluhur Irrigation Area

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Abstract: *Generally, System of Rice intensification (SRI) well known as paddy cultivation which are environmentally friendly and water-saving method. Its application has many advantages beside some obstacles. The choice of paddy cultivation method depends on risk factor and farmer. Incentives and compensation for farmer groups will support farmer interest to apply SRI method. Incentive for environment service, in relation with benefit transfer between the user of water resources in rural and urban area, can be the solutions of self finance alternative. The result of dynamics analysis explains that incentives for environmental services gives immediate effect againt the interest of farmer in applying SRI method than incentive from goverment and incentive for SRI grain price. One of the effort to reduce the problem of SRI application through incentives mechanismis developing institutional arrangement in macro ad micro level. The incentives scheme involves farmer group and agriculture stakeholdesr in micro level and the Ministry of State Enterprises and PAM Jaya in macro level.*

Keyword: *water resources, incentive, system of rice intensification*

I. Introduction

Rapid economic growth has been accompanied by significant structural changes, including for agricultural sector and its unique natural environment. Recently questions have been raised about the impact for agricultural, industrial, trade and environmental policies on sustainable rural development. The nature of interactions between the economic activities of different sectors and the intersectoralenvironment need system-wide perspective for assessing them. Recenteconomic activity and population growth will increase water demandand trigger water deficit. That condition required water resources management with hydrological unity through cooperation between regions and users (agriculture, domestic and industrial). Less developed water governance will result in resource crisis and food insecurity.

Therefore, water resources must be used more efficiently. Several efforts related to efficiency of water using for paddy cultivation can be start from land and plant preparation in some phases of paddy growth. One of the method to save water is irrigated and dried paddy field as known inttermiten method. The System of Rice Intensification (SRI) method for paddy cultivation gained popularity among rice farmers in several country for its potency to save water and increase yields through inttermitten method. Center for Rice Research at Sukamandi West Java implemented intermittent method to dense soil texture by reducing total water supply up to 16-20%. The result is the reduced water did not cause declining paddy production (Balai Irigasi. 2008).

Paddy production that support food security still depends on water availability beside the other factors. Table 1 illustrated that water requirement for conventional paddy cultivation about 4.8 million liters/ planting season while for about 2.4 million liters/planting season for SRI method. It means that SRI method used water efficiently and enlarged irrigated area. Another effect is that other user can take benefit from the excessing water like user in domestic an d industry.

Table 1. Paddy Growth Period (Per Season / Hectare)

Activities	Conventional Method	SRI Method
Planting time until maturation (day)	90	65
Water demand unit* (liters / sec)	0,61	0,42
Total water necessity (million liter/hectar)	4,8	2,4
Coverage Area Of Irrigation services 1 Pump Capacity 3 Liters / Sec (Hectares)	8	16

Source:[BBWS] Balai Besar Wilayah Sungai Citarum. PPK Pendayagunaan Tata Guna Air (PTGA). 2012
*(water demand unit) x (amount of time watering in a day, in seconds) x (number of days)
** Measurements were made in Cihea irrigation areas, Cibarengkok Village, Bojong Picung District, Cianjur Regency in 2009. The purpose is to know the difference between irrigation water use of conventional and SRI method.

According to Anugerah et al (2008), SRI application in Garut and Ciamis Regency had shown that (1) SRI method would increase paddy production higher than conventional cultivation; (2) increased farmer's income; (3) financial efficiency for production and farming; (4) higher rice price if using SRI method especially with organic input. Furthermore, Juanda B et al. 2010 stated that SRI method has some characteristic such as (1) increased paddy production although it descreased in the beginning application; (2) larger young paddy straw because of single plant method, (3) more resistance against pest; (4) better soil structure. Beside the excellent of SRI method above, there are some obstacles for that applied such as (1) production would increases after 3 to 4 planting season; (2) high opportunity cost for organic fertilizer; (3) it need more time for take care and monitoring; (4) its gives opportunity to better price in the market.

SRI method faced many constraint and obstacles beside all benefit and advantages above, so that requires proper strategy. Generally, the choice of farming depends on level of risk and farmer factor. Comprehensive and holistic policies would encourage farmer to apply SRI method. Farmer would be interested applying SRI method if there are suitable incentives and compensation. Goverment has policies and strategies to solve the problem for food security how to tackle limited water supply,many technological innovation and many agribusiness and infrastructure problems. The payment for environmental services for water resources benefit transfer became one of financing alternatif but this method has not been applied widely. Its implementation requires cooperative mechanism, information value of environmental services, role and involvement of public, private and government . Therefore, this paper developed the analysis and study of water resource governance to formulate incentives system that supports farmers to applied SRI method.

Water resources Governance is expected to achieve: accountability, transparency and information sharing, policy dialogue and encourage community participation. The inability of government to implement policies caused failure and institutional destruction (institutional breakdown). Credible institutions with low transaction costs and high public would redused the risk of this failure. Improvement of water resources governance requires dynamic analysis and linkage among related stakeholders.

II. Location And Method

The research was conducted in Jatiluhur irrigation area with agricultural water user representation in Karawang Regency which has the largest irrigation area in West Java. DKI Jakarta was select as representatif area for water users for domestic and industrial user that received raw water through WTC (West Tarum Canal). The following figure describes the location of the study that based on water hydrology system.

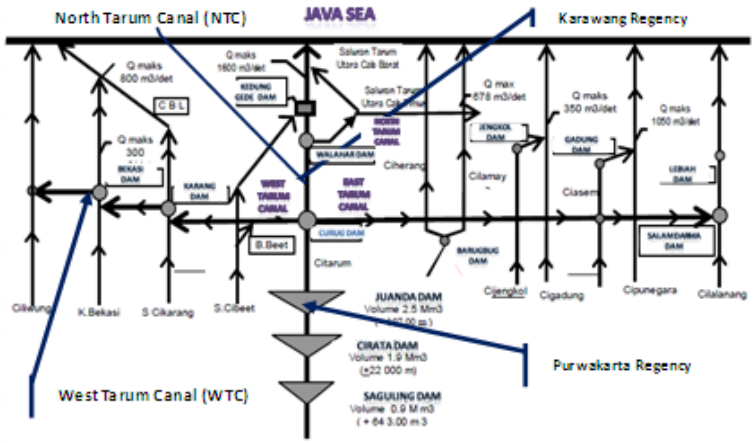

Figure 1. The Location of Research

The purpose of the research developed a water resource governance mechanisms to supportSRI (System of Rice Intensification)policies widely and independent.The incentive system was design to provide stimulant for stakeholder. It use discriptive analytical method and combine dynamic analysis that use Powersim Studio 5 software to analyse water governance system. Dynamic modelling analysis will predict the effect of several incentives to increase SRI paddy field. Some steps to achive the research objectives as follow :

1). The arrangementof model which is consists of issues, problems and causal loops

a). The issue: how to increase paddy SRI fieldby giving incentives of payments to environmental servicesthat has transfer benefit of water resources.

b). The Problem: it need to strengten farmer institutionso that they want to apply SRI method

c). It use causal loop model based on some stakeholder who involves in this model. Among thise are rice farmer groups in Karawang as agricultural water users, PJT/Perum Jasa Tirta II as a provider of water resources and PAM JAYA as the urban water users. The lingkage between variables are described in the

following causal loops scheme.

Causal loop Scheme of SRIPES model in figure 2 describes stakeholders interaction based on their role in applying SRI method. SRIPES models changes of SRI application by using various incentives. The difference in profit margin between SRI and conventional methods and incentives would determine the changes of paddy field in Karawang. The level of SRI profit margin will increase the rate of SRI application which will give changes conventional paddy field to SRI Fields. That changes would effect on water use efficiency in North Tarum Canal(NTC) so that the excess water can allocate to any other usersespecially in the Jakarta as the capital of Indonesia.The water transfer process involves PJT II's role as a provider and operator of raw water and PAM Jaya as a water user for Jakarta. The additional raw water would increase PJT II profit through water selling. Similarly, for PAM Jaya, additional raw water from PJT II would increase profit though increasing capacity of water services. The incentives can be give based on several scenarios which is suitable with social, economic, institutional and biophysical condition.

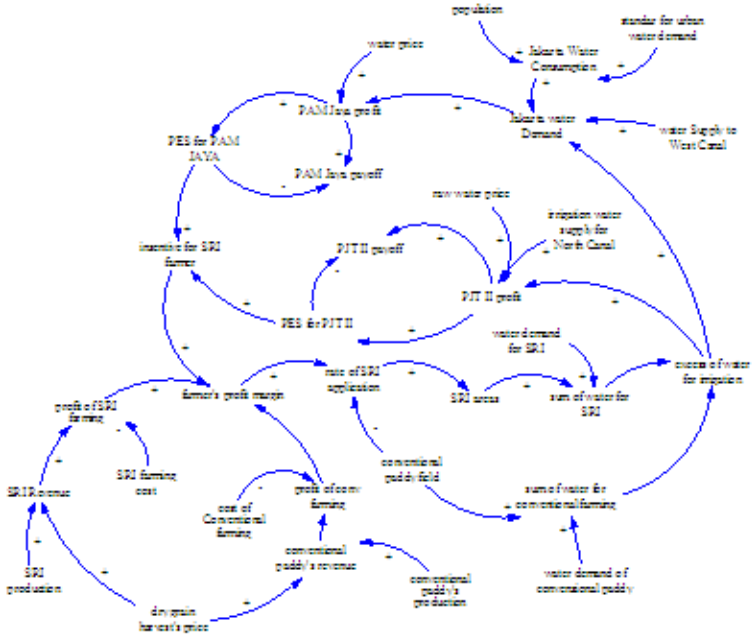

Figure 2. Causal loopScheme of SRIPES Model

2). The research developpolicy scenario simulations for measure changes in paddy field as follow:

a). Incentivesof payments for environmental services (PES) if farmers apply SRI method.Incentive payments for environmental services in line with increasingthe quantity and price of raw water. PES percentage of PJT II and PAM Jaya to farmers determines the rate of paddy field changes. Payment incentives can increase the percentage of raw water supply to Jakarta.

b). Financial credit support from government (Ministry of Agriculture). Farmers would get financial guarantee or other facilities that reduced cost of farming related transaction costs of SRI method. This facility is expected will increases the farmers profit margins for SRI application.

c). Purchasing Contract. The farmers need market and price guarantee if they apply SRI method. Government or private corporation can give this guarantee facility such as crop purchase. The higher SRI cropprice, the higher profit of SRI is expected will increases the farmer profit margin of SRI.

Table 2. Some Policies Scenarios to support SRI application method

policies	description	existing condition	Scenarios
Insentive	Incentive Payments for Environmental Services (PES)	No related incentives PES	compensation based on the percentage of profits received by PJT II and PAM Jaya on additional raw water
support from the government	financial credit support	financial aid program of SRI application to farmers' groups with a 20 hectares as minimum paddy field and 20 farmer members. Each farmer groupwould receivedRp. 40 millions.	financial support based on (a) risk probability for the decline in paddy production; (b) opportunity improvement to develop irrigation infrastructure and (c) planting one

			field area.
contract Support	market and price guaranteed	There was a private company that provides marketing collateral through the purchasing cropwith pricethat higher than usual	price of paddy grain when applying SRI is higher than market price

III. Result And Discussion

The Incentive Policies Scenarios to Support SRI Method

There are several strategies for water resources shortage to ensure food security and anticipate global climate change. The Strategies includes several options those are (1) improving plant varieties that isresistant to drought or flood; (2) improving the water supply system; (3) improving system of plant cultivation and rotation, and (4) optimising planting field by adjusting water availability.The purposes of SRI method application is not only to anticipate of climate change-related water shortage but also ensuring food security due to population and economic growth. Water resources Governance through SRI method with intermittent water management was expected to increasepaddy productivity.

There are two types of policy instruments namely regulation and market incentives. Regulation focuses on policy instruments to regulate the interactions among institutions.Market incentives is a stimulant to achieve certain goals. The role of incentives and regulation to support SRI method would analyze with dynamic modelling. This analysis measure the effect and role of incentives and governance regulation through aspects that causesof paddy fields changes. Measurement of changes in paddy fields involving four interrelated sub model that arePJT water allocation sub model, Jakarta water demand sub model, paddy fieldssub model and incentivessub model. The construction of dynamic systems and the interaction among sub models discribes as follow.

1). PJT II Sub model

PJT II Sub model discribes management of water resources allocation in Jatiluhur Area. PJT II has balancesystemto allocate water demandto irrigation, domestic and industrial user with priorityfor paddy fields.The calculation of water supply and demand started on upstream (Jatiluhur Dam) until downstream on Curug Dam. The average of water allocation from Curug Dam to Bekasi Dam which supplies for PAM Jaya is about 6.2 million m3 / year. Water supply from Bekasi Dam to Jakarta area is still far from standar demand of Jakarta people. otherwise the use of water for irrigation is higher than the actual need. For example paddy field in NTC use water irrigation more than 95% from water supply about 2,7 billion m3 / year.Irrigation water supply in NTC depends on area of irrigation water for paddy field with approximately 87.209 hectares. The figure below discribe water allocation in three dams in Jatiluhur Irrigation Area.

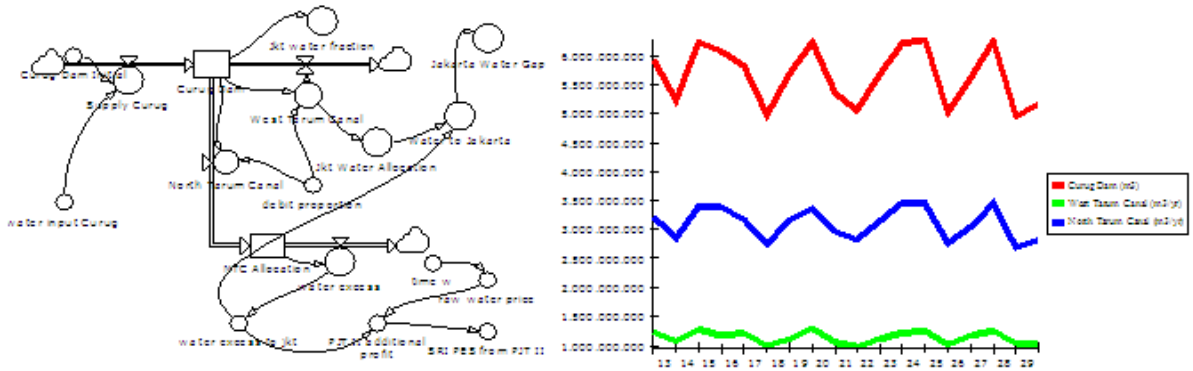

Figure 3. PJT II Sub model and water supply to Curug Dam, North Tarum Canal and West Tarum Canal

Figure 3discribes water resources allocation linkage inthree dams in Jatiluhur irrigation area. The graphic shows linear pattern that followswater supply and region balance system. The rise of economic activity lead to increasingof urban water demand. Efficiency of irrigation water in rural area became one solution for demand inurban. For example if 50% of paddy fields in Karawang using SRI method than other users will excess water.Providing incentives through SRI method application will support farmer to use water efficiently. PJT II and PAM Jaya is able to provide an incentive from the procentage of profit they earn from raw water excess.The scheme can transfer water by managing water allocation from Curug Dam.

2). Jakarta Sub model

Jakarta sub models describes water supply and demand for Jakarta. PJT II provides raw water for domestic, municipalities and industry in Citarum watershed area, especially for Jakarta as the capital city. PAM

Jaya supplied raw water for about 465 million m^3 per year which is covering almost 80% of water distribution in Jakarta. Figure 4 describes the influence of population growth in relation with birth rate and mortality to Jakarta water demand.Based on water standard for metropolis, each individu in Jakarta needs about76.6 m^3 /year water for healty life. So that if Jakarta population in 2012 is approximately 9.8 million, it requires about 757,409 million m^3 / year. These conditions indicate the shortage of water supply. Therefore, Jakarta requires additional water minimum about 274, 877 million m^3/year with the increasing 1% per year. The following figure explains theshortage of raw water based on domestic demand and water supply allocation from West Tarum Canal (WTC).

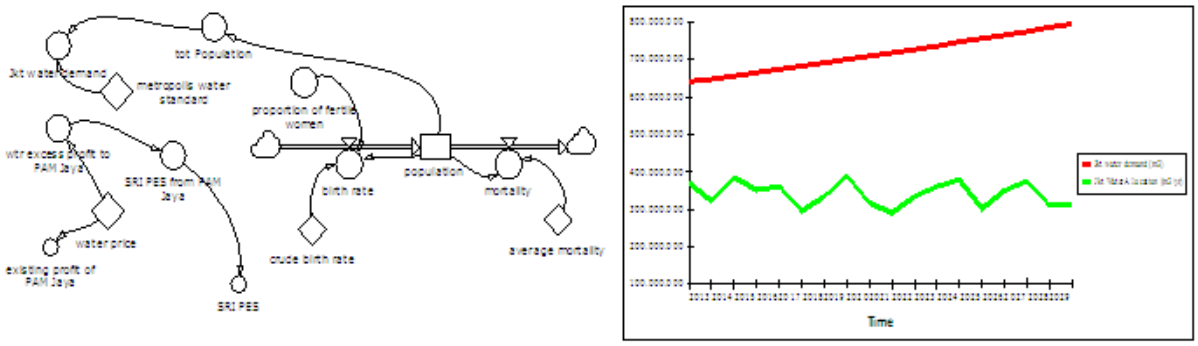

Figure 4. Jakarta Sub model and Projection of Water Demand

Projection of water demand in Figure 4 indicates that Jakarta needs additional water supply. Most areas in Jakarta suffer water shortage especially in North Jakarta. Most of people in that area highly dependent to water private seller with expensive price. According to Ansofino research (2005), water expenditure of Jakarta family is about Rp. 15,000 per day equivalent whith Rp. 450,000 per month. The water price that is describe above is relatively expensive compared with water price from PAM Jaya as regional enterprise.People in most areas in Jakarta want more for water, but PAM Jaya is not sufficient to meet the water demand. One of the factors that cause inability of PAM Jaya are water balance system and infrastructure problems. PAM Jaya is able to add water by giving incentive for water efficiency to other users. The implementation of incentive for water efficiency need right governance arrangement. The difference of water price among domestic, industry and irrigation sectors becames the reason to set proper regulation. Domestic and industrial water users pay for water, while irrigation users are free of charge.

3). Incentives Sub Model

Incentive sub model describes the effect of several incentives to support SRI methods application. The insentive will determine farmer interest to change cultivation method from conventional to SRI application. The value of incentives is obtained from payments for water environmental services, profit margin between SRI and conventional methods and government financial aid. The profit fractionof SRI method (calculated from profit margin + PES + incentives per hectare divided by SRI profit) wouldadded SRI fields. The greater ofSRI profit fraction, is the greater would be SRI fields that is cultivated by farmers. Otherwise, the conventional method fraction which is calculated from conventional profit margin is divided by conventional profit. It would contribute to reduce farmer interest for applying SRI method. This following figure describe the incentive for SRI farmer if they apply SRI method.

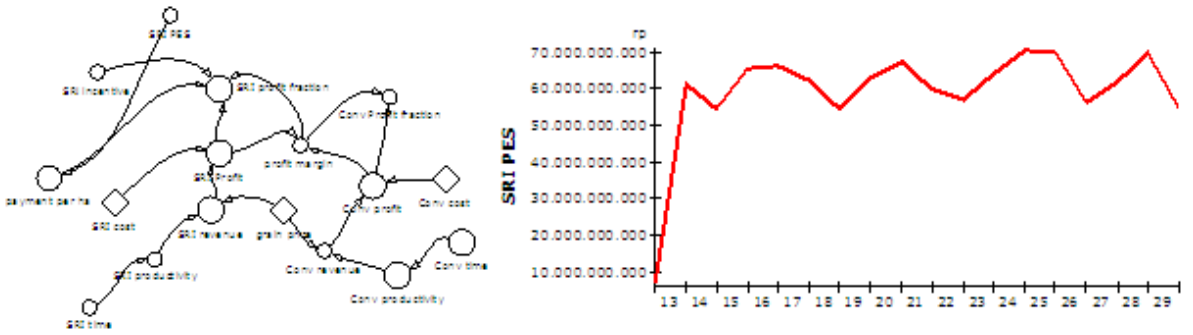

Figure5. Incentives Sub Model and The Effect of Payments for Environmental Services (PES) to SRI Farmers In Karawang

Figure 5describes farmer insentives for applying SRI method in Karawang. It seems that the value of incentives increase after 2 years application. The stability price of paddy and the incentive for farmer will increase the application of SRI method. The increasing of paddy production would have effect for regional rice surplus and food security.

4). Paddy Field Sub model

Paddy fields sub model describes rice farming methods and its changes from conventional to SRI fields in Karawang. Initial condition showed that only less than 10% of total paddy fields in Karawang that was applying SRI method.Karawang Regency isthe largest agriculture region in West Java with paddy as dominance crop for food security. Most irrigation water for paddy fieldsis supplied from Jatiluhur Dam. The water shortage prediction due to Climate change and increasing water demand needs farmer adaptation and waterefficiency. SRI application with water saving method has givenopportunity for water efficiency on North Tarum Canal.The graphs in figure 6 explain the area of SRI fields if farmers get incentives for environmental services IDR. 2,700,000 per hectare per year and government incentives between Rp. 1,000,000 / ha / year up to Rp. 4,000,000 / ha / year. The result of interaction showed that declineingof SRI fields in first year application. The incentives would increase SRI fields significantly at fourth year approximately 1,500 hectars.The effect of 3 type incentiveswould increase SRI fields up to 21,650 hectars at the end of simulation period in 2030.

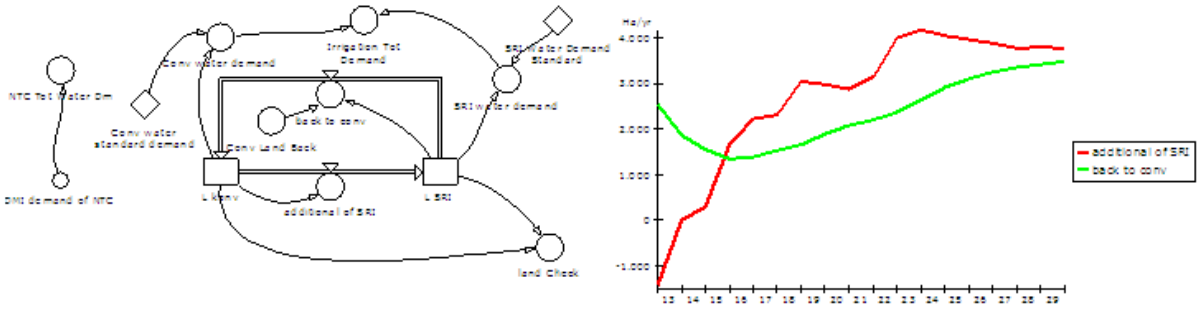

Figure 6. Paddy fields Sub Model and the effect of incentives

The interaction among sub model describe the effect of incentives for the changes of SRI paddy fields considering socio-economic, institutional and biophysical aspects. The effect of each insentives scenario is discribed below :

1. Scenario 1: The application of SRI method without any incentives
   The initial area of SRI paddy fields in Karawang was 15,000 hectars in 2013. If the condition is without any incentives it will descrease SRI fields up to 1,800 hectares in first 5 year. SRI fields will increase,start from 400 hectares in the sixth year.The stage can be achieved if farmers is consistentin applying SRI methods. Land improvement will increase paddy production in line with farmer profit margin. Without any incentive, a change of SRI fields takestimes 10 years. At the end of the simulation in 2030 with no incentive and fixed paddy grain prices, there are about 17,000 hectares fields which will apply SRI methods.
2. Scenario 2: price incentives for paddy that use SRI method
   Thisscenario is gives guaranteefor the higher price if farmer using SRI methods.The difference in paddy grain prices is between Rp. 200 - Rp. 500 perkg, it would give incentives for farmers to apply SRI method. The effect of scenario 2 is the declining of SRI fieldsat first three years, but in fourth year it will raisestart from 1.000 hectares per year. The rapid increasing of SRI field is happend if government or private companies continually bought SRI paddy grain with higher price than conventional methods. The SRI grain price incentive will increase SRI fields up to 20.481 at the end of the simulation in 2030.
3. Scenario 3: PES incentives without financial aid from government
   this scenario, the farmers that apply SRI methods will receive incentives for environmental services as much as 30% of profit margin from PJT II and PAM Jaya.Farmer will receiveincentivesabout Rp. 3,400,000 per hectar / year.The effect of this incentive is the descreasing of SRI fieldsstart from 1,700 hectares at the beginning of the year. In the fourth years SRI fields will increase of1.150 hectares significantly. At the end of the simulation, there are about 20.197 hectares of SRIfields in Karawang.
4. Scenario 4: the financial aid from government without incentives for environmental services
   In thisscenario, farmers that apply SRI methodwill get financial aid from government startsfrom Rp. 1,000,000 / ha / year up to Rp. 4,000,000 / hectare / year. The implementation of this scenario requires government policies continually with funding system.By assuming that government's policy goes continually, the simulation show SRI fieldto descrease in the first year about 1,600 hectares. SRI fields begin to increase starting in the sixth year by1,300 hectares.At the end of the simulation in 2030, the

application of SRI fields method predicted is about 18,457 hectares.

5. Scenario 5: The incentives for environmental services with water price adjustment

The farmers who apply SRI methods willreceive incentive about Rp. 3,500,000/ hectar / planting season. The incentives depend on commitment of stakeholders to give a part of their profits from additional raw water. The implementation of incentive depends on credible agreement amongthe involved stakeholders. The simulation result that use this scenario shows the declining of SRI fields in first year. SRI fields in second year will increasing because the incentives dependson the excess of water supply and water price. At the end of the simulation, the number of total SRI fields is 20,447 hectares.

The application of several scenarios to increase SRI fields isillustrated in Figure 7.It shows that the highest SRI fields will achieve the ideal scenario though 2 types of incentives. Those are payment of environmental services of water resources (about Rp. 2,700,000 / hectares / year) and SRI financial support from government (start from Rp. 1,000,000 up to 4,000,000 / hectares / year). However, the other scenarios such as payment of environmental services without goverment financial aid (scenario 3) and water price adjustment (scenario 5), givingsimilaryeffectalthough with different time of achievement. The governance aid also be an alternatif of incentives with differences prices between SRI and conventional dry grain (scenario 2).

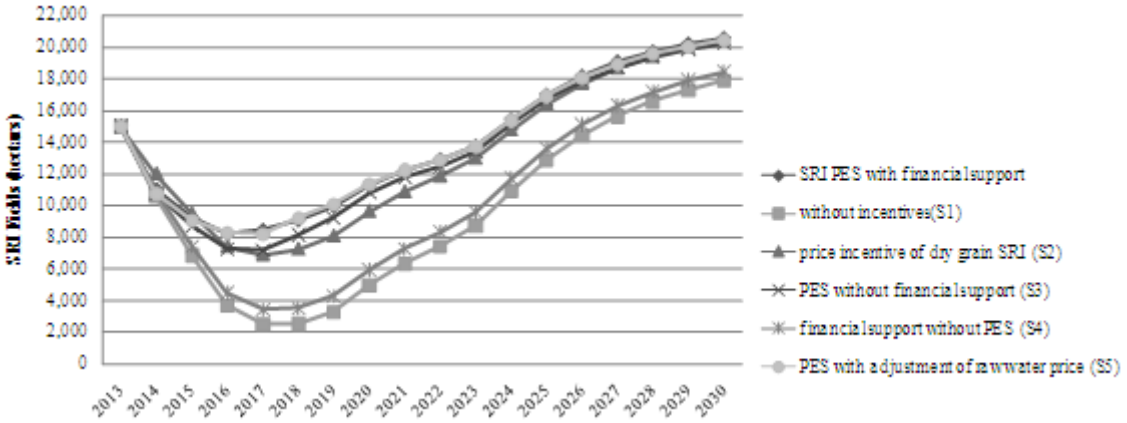

Figure 7. Prediction of Several Incentivesfrom Water Benefit Transfer Between Rural and UrbanArea

Several incentives scenario that are describes in figure 7 require regulatory intervention. The role of goverment is mobilizing private enterprise and public participation. Public Private Partnership (PPP) mechanism among goverment, private entreprise and farmers become one of solutionsto support SRI method application.The partnership is an effort to increase the role of private sector in public services to reduce the budget and risk of goverment. The benefit of Public Private Partnership (PPP) is financial available mechanism with long runefficient cost. Some policies below are expected to became instruments to increase SRI fields ie :

1. PJT II and PAM Jaya increasing percentage of incentive frompayment of environmental services (PES) to farmers who apply SRI method.
2. Every stakeholder must contribute to reduce farming costs related of SRI transaction costs so that it will increasing farmer profit margins.
3. Stakeholders must consider the adjusment of water price including water conservation cost.

Governance Mechanism of Water Benefit Transfers Among Stakeholders

In general, the term governancehas been used to describe a wide array of situations that incorporate concerted or directed actions and behaviours, structural elements, institutional settings, legal or statutory instruments and idealised participative or collaborative processes. Many of these descriptions of governance have also been linked to specific considerations, where governance is seen either as a process, a structure, a system of values, or a specific product or outcome. While each of these uses may be entirely appropriate and legitimate within the specific circumstances under discussion, the sheer diversity of these uses has created considerable confusion about the underlying meaning and purpose of governance as a process and, in particular, good governance as a product (AR Turton et al., 2007).

In these paper, water resources governance idea includes the ability of stakeholdersto design public policy that is acceptable and effective. The design of water resources governance that uses incentives of payment for environmental services is expected to improveland and water resources that caused food security problem.Water resources Governance is associated with regulation, direction or control. Itrequires cooperation among regions and stakeholders due to dynamic nature and boundaries of water resources.PES governance for

water resources is vulnerable to institutional issues such as free riders, moral hazard and high transaction costs. Therefore, all stakeholders should build cooperation that is based on common interest rather than hierarchical structural framework.

The cooperation of water governance should pay attention toauthority distribution among stakeholders. The problem of water supply among region and stakeholdersis howto implement plan and coordination. The solution is by creating a coordination among institutions to the solve the problem. Water resources institution can be formed by involving ofDKI JakartaandKarawanglocal government. The involvement of PJT II and PAM Jaya will strengthen its cooperation. The cooperation may utilize mediator such as the National Water Resources Council or BKSP (Badan Kerjasama Pembangunan/Development Cooperation Agency) Greater Jakarta.

Incentives through Payment for environmental services (PES) scheme have to consider legal aspects for the application. Incentive mechanism can bedesignedthrough contract between PJT II (water provider) and PAM Jaya (urban buyer) for water pricing. Furthermore, PJT II make an insentive contract agreement with farmer groups as irrigation user for applying SRI method. Processes and governance design of PES has a purposes to provide incentive for farmer to apply SRI method. Scheme in figure 8 describes the collaboration scheme of incentive mechanism among farmers, PAM Jaya (water buyer) and PJT II as the mediator.

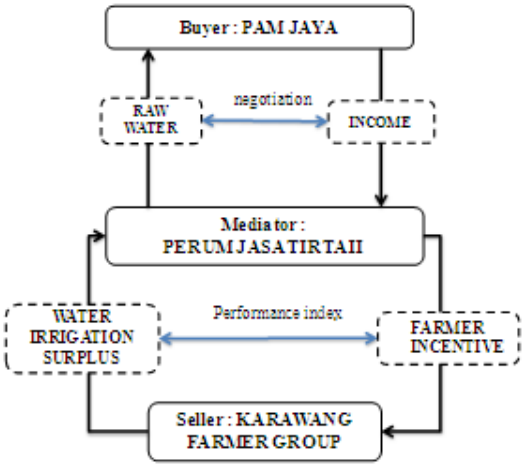

Figure 8.Design Collaboration and IncentivesMechanisms of SRI Application

Payment for environmental services (PES) transfer of water resources from farmers to urban users (DKI Jakarta) involves PJT II as the mediator with mandatory control. National Planning Agency will arrange appropriate policy to realize Citarum Roadmap commitment. One of the commitments in Citarum Roadmap is socialization SRI application for irrigation water efficiency and providing additional water supply for Jakarta. PJT II will socialize some activities at farm level in collaboration with Agriculture Infrastructure Ministry (Dirjen PSP) and other relevant stakeholders.

The relevant stakeholders will monitor and evaluate the activities on each line as describes in figure 9. Department of Agriculture and Agricultural Extension have assigned to socialize and monitorthe evaluation at farm level (micro level).Ministry of State Entreprise has duties infinancial system, management and dissemination activities of PJT II as a mediator of incentives.Ministry of Public Works has responsibility for water resources infrastructure and would monitor incentives activities. These ministries have some roles in determining the rate of water resource fee through negotiation process between PJT II and PAM Jaya.PAM Jaya will determine water price through Cost components of water resource conservation National Planning Agency will arrange conflict mechanism among stakeholders for Citarum Roadmap implementation.

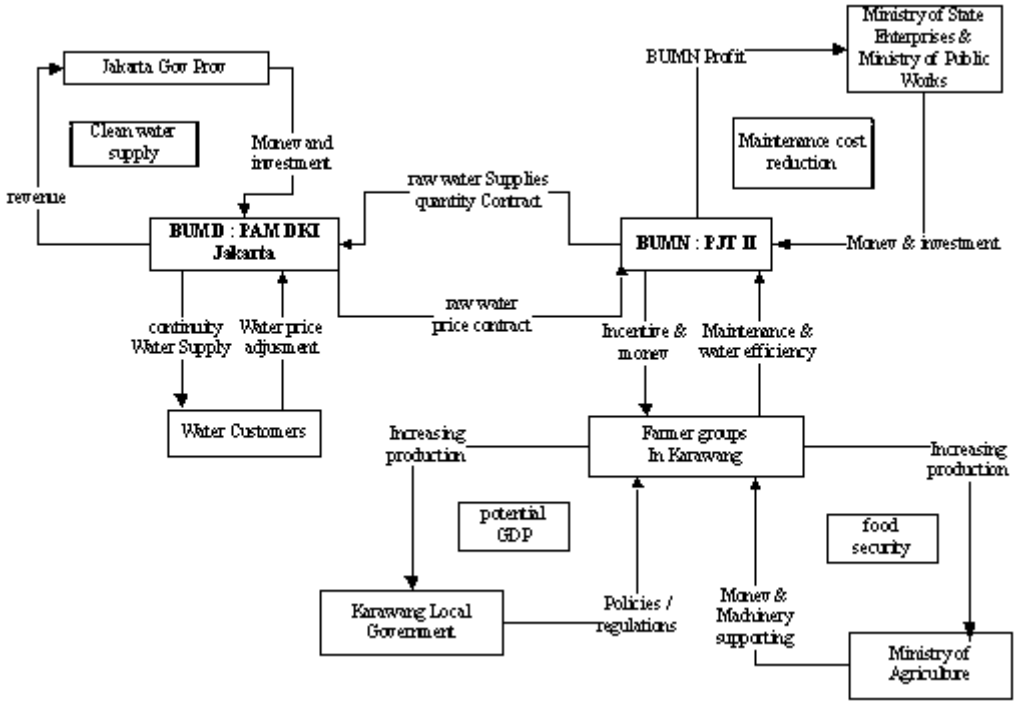

Figure 9. Water Transfer Mechanism of Payment for Environmental Services (PES)

Transfer mechanism of water environmental services requires a negotiation process through consensus among the related stakeholder. TheImplementation requiresthe role of regional forum to reduce uncertainty aspects. The role of regional forum at district level is monitoring irregularities, avoid conflicts and ensure the achievement of incentive agreement. Regional forum may consist of multi-actor organizations such as watershed authority or Watershed Management Committee, government representatives, private institutions and NGOs to ensure transparency and neutrality. The payment of incentive for environmental services to farmers' groups rwquires Irrigation Commission for feasibility assessment. The following figure describes the application of incentive mechanisms at regional level.

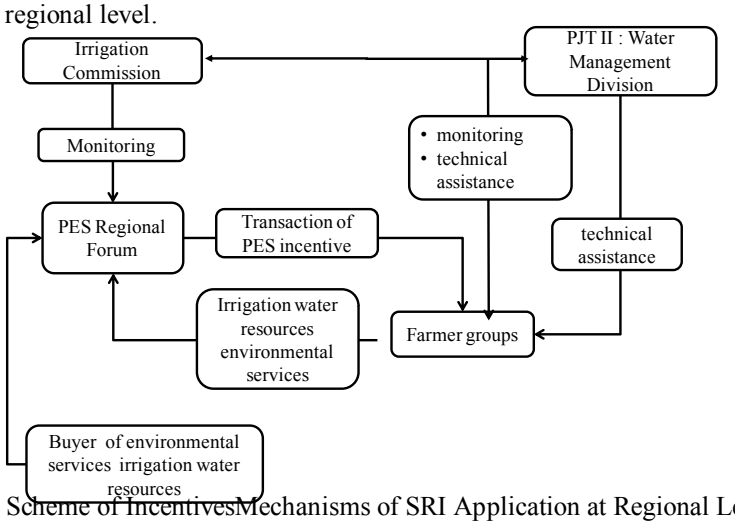

Figure 10. The Scheme of IncentivesMechanisms of SRI Application at Regional Level

Figure 10 describes the mechanism and role of regional forums in relation with incentives for farmer to apply SRI method through water environmental services. Regional forum will coordinate the activities with other stakeholders such as the PJT II and PAM Jaya. Time duration of incentives is expected to adapt with farmers resources and infrastructure facilities of other stakeholders. The problem of risks and funding system need daptation phase during early implementation. Financial regulation for incentive scheme followed several laws such as Law about Protection and Environmental Management (UU No. 32/2009), Law No. 41/2009 about Protection for Agricultural Land, Law about Fiscal balance (UU No.33/ 2004), law about Regional Government (UU No.32/2004), Regulation about Local Taxes, Regulation and financial Management of Public Service.

IV. Conclusion

1. Payment for Environmental Services for efficiency of water irrigation became solution to support farmer in applying SRI method. The scheme can be done betweenamong farmer groups as agricultural water users, PJT / Perum Jasa Tirta II as a provider of water resources and PAM Jaya as urban water users. Incentives for environmental services through water benefit transfer between rural and urban user has effect that is faster than other application in increasing SRI application. .
2. Water resources governance to support incentive mechanism requires coordination and monitoring of multiple stakeholders. Coordination on macro level requires PJT II/ Perum Jasa Tirta II role as mediator between water resources buyer (PAM Jaya) and irrigation water resources user(Farmer). Water governance at micro-level requires the role of the regional forum under the supervision of Irrigation Commission..

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