ORGANIC RICE DEVELOPMENT: HOW SOCIAL-ECOLOGICAL SYSTEM PERSPECTIVE COULD CONTRIBUTE

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Abstract

In line with growing awareness towards healthy life, economic viability and environmental sustainability, organic rice development has become one of the most influential interests in Indonesian agricultural development. Several programs have been delivered by the government in order to foster this development. Organic rice development brought about integrating a complex relationship between social, economic, political, ecological and biophysical aspects to guide actors’ decision making. This paper aims to briefly describe the process of organic rice development at a sub district in Purwakarta Regency, an organic rice development area in West Java, from social ecological system perspective using system thinking approach. The research shows that integration among actors, institutions and learning processes is necessary. It is started from the description of technology needed, social relation and interaction among involved actors, and ultimately describes how social ecological system perspective could contribute to improve organic rice development in the location.

Keywords: organic rice, social-ecological system, system thinking

Introduction

Social and environmental problems are systemic, resulted from complex situations, from interrelation processes among actors. They are difficult to be understood only by an academic discipline (Scholz & Steiner, 2015), as well as need sustainable and coordinated solutions. They can only be solved through integration of actors, institutions, networks, interactions, productive processes and learning processes, and commitment to adopt systemic perspectives on human element with its environment (Chairatana, 2000).

As an Indonesian staple food and determinant of food security, rice is always having high demand. Along with an increase on level of living, demand to better quality of rice will also increase. Quality, today, is not only defined as physical better quality, but also related to lower cost, shorter time delivery, and higher safety, which ultimately support sustainable production. Hence, demand towards safer and healthier rice is also unavoidable situation. Organic rice development is an important response to answer this phenomenon.

From systemic point of view, interrelation between human and non human elements determines the success of organic rice development. From human side, several social relation patterns motivate farmers to cultivate organic rice. They are economic rationality, friendship bonding, relatives/family support, patron-client relation, and “support” from external/government through several organic rice development programs (Sukayat, 2013). Therefore, sustainability of organic rice development system is highly depended on the human factors. On the other hand, from nonhuman side, physical environment support in organic cultivation with its limitation must be also sustainable. Hence, human and environmental/non human aspects are very important to determine organic rice development sustainability.

In addition to other regencies such as Tasikmalaya, Ciamis and Bandung, Purwakarta is one of the regencies in West Java that developed organic rice cultivation. In order to maintain competitive agriculture and to prevent local cultures from distinction, Purwakarta local government released Purwakarta Act Number 11/2012 about Regional Planning of Regency of Purwakarta 2011-2031. This...
local policy is in line with efforts to develop integrated and environmental friendly agriculture, in order to develop a plan to protect agriculture land existention in Purwakarta.

One of the organic rice development locations in Purwakarta is Sub-district Pondoksalam. Information from Office for Agriculture, Plantation and Forestry of Purwakarta (2015) showed that among 17 sub-districts in Purwakarta, Pondoksalam is the second largest of paddy harvesting areas after Sub-district of Darangdan. In addition, based on data from Office for Agriculture, Plantation and Forestry of Purwakarta, from 2004 to 2010 Sub-district of Pondoksalam has become a location for organic rice development in Purwakarta. These facts reflected several efforts and programs to develop organic rice in the area. The question are whether organic rice development in the area has considered human and non human elements appropriately, or it was only technological intervention that was disseminated linearly? Furthermore, whether this organic development has considered an integration of actors and has optimized potentials in the location, properly and sufficiently.

Materials and Methods

Methods used in the research was qualitative using case study technique (Kerlinger, 1990). Analysis is focused on organic rice development area in Sub-district of Pondoksalam, Regency of Purwakarta, from social ecological system perspective using system thinking approach.

Results and Discussion

Organic rice has been developed in Sub-district of Pondoksalam since several years ago, through several trainings and workshops initiated by the local government. At the farmer group level, this effort just been started since the last two years. Several farmers cultivated in organic ways consistently even though it was not related to the government programs anymore.

At program management level, i.e. extension officers, as well as several farmers and farmer leaders, a philosophical viewpoint of organic development is established. In spite of organic rice is attractive economically, they believe that organic rice development in the location should be directed to fulfill local consumption need. On the other word, instead of sell organic rice (whis is healthier, and having potential to improve quality of live) and then buy conventional rice (which is not also economical), produce and consume organic rice by themselves are actually much better. The product (organic rice) only be sold while over production. In order to fulfill other farmer living needs, production of other commodities can be carried out or doing other possible efforts.

However, far for this philosophical viewpoint, farmers and government officers’ mindset towards organic rice development in several aspects are also needed to change. The government has supported and initiated organic rice development and directed it to fulfill organic rice demand (national and global). Government plan to distribute packaging machine, give packaging plastic, build rice drying floor, and build rice milling unit that were dedicated only to process organic rice for farmer group showed that organic production will directly focus on external demand fulfillness. In the situation that land ownership of farmers is only 3.000 m² on average, farmers will tend to sell their organic rice and buy conventional rice for their consumption. Similarly, feedstock provision program plan that was initially aimed to produce organic fertilizer for farmers’ rice plant, tend to be misused for selling fertilizer instead of for their own consumption. The previous circumstances show that two main problems are faced by organic rice development in Sub-district of Pondoksalam, namely first, farmer mindset change and motivation improvement, and second, knowledge, skill and creativity improvement.

In general, organic rice farm management in Sub-district Pondoksalam, in particular technology needed can be brief in the Table 1. In this context, technology is not only defined as physical technology, but also human, information and organisation elements.
Table 1. Technology needs for organic rice development in location

<table>
<thead>
<tr>
<th>Farming System</th>
<th>Technology Used</th>
<th>Identified Technology Need</th>
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<tbody>
<tr>
<td>I. Organic Rice Cultivation System</td>
<td></td>
<td></td>
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<tr>
<td>1. Cropping pattern</td>
<td>Paddy-paddy-“palawija”, paddy-paddy-paddy, and paddy-paddy-recess/“bera”</td>
<td>Effectivity and efficiency of best cropping pattern, according to nature condition</td>
</tr>
<tr>
<td>3. Tillage</td>
<td>- 20% human</td>
<td>Best technical tillage technology (need further research and developed by farmer group)</td>
</tr>
<tr>
<td>4. Seeding and planting</td>
<td>- 60% machinery</td>
<td>Best planting techniques (test at farm level is needed)</td>
</tr>
<tr>
<td>5. Organic fertilizer provision</td>
<td>Use local ingredients: cow, goat, buffalo stem, husk, sawdust, starch</td>
<td>Socialize best composition of local paddy nutrient need more intensively, and introduce several local potential ingredients</td>
</tr>
<tr>
<td>6. Root growth regulator provision</td>
<td>Use local ingredients: bamboo shoots, coconut water</td>
<td>Socialize intensively about best composition of paddy nutrient need for growing root, leaf and fruit locally, and introduce the potential use of local ingredients</td>
</tr>
<tr>
<td>7. Leaf growth regulator provision</td>
<td>Use local ingredients: bamboo shoots, coconut water</td>
<td>Introduce the potential use of local ingredients</td>
</tr>
<tr>
<td>8. Fruit growth regulator provision</td>
<td>Use local ingredients: snail egg, fruit waste, starch, coconut water</td>
<td></td>
</tr>
<tr>
<td>9. Organic pesticide provision</td>
<td>Introduction and development of antagonistic bacteria (corynebacterium, tricoderma, tricogama, etc.)</td>
<td>Introduce the potential use of local ingredients</td>
</tr>
<tr>
<td>10. Harvest and Postharvest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Harvest</td>
<td>Serrated sickle</td>
<td>Socialize effectivity and efficiency of using agricultural machinery</td>
</tr>
<tr>
<td>b. Postharvest</td>
<td>Traditional technic (gebot), power thraser</td>
<td></td>
</tr>
<tr>
<td>II. Organic Rice Farming System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Farmer institution</td>
<td>Farmer group, 46 members</td>
<td>Better group management (values and norms, group management skill)</td>
</tr>
<tr>
<td>12. Information provision</td>
<td>Extension office and extension officer at local level</td>
<td>Develop interaction and triangulation between farmers, extension officers and research institution</td>
</tr>
<tr>
<td>13. Source of capital</td>
<td>Independent</td>
<td>More effective mechanism for source of capital, from need assessment to its distribution and management</td>
</tr>
<tr>
<td>14. Marketing</td>
<td>Mostly subsistence</td>
<td>- own consumption is very encouraged</td>
</tr>
<tr>
<td></td>
<td>Direct selling to certain consumers</td>
<td>- Over production for better marketing orientation, such as for modern markets or exports</td>
</tr>
</tbody>
</table>

Interaction, conceptually results in associative forms (cooperation and accomodation) and dissociative forms (competition and conflict). Several actors interacted in organic rice development in location. They are farmers, government officers at local and regency level, organic rice traders, and personal buyers. According to Sukayat et al. (2013), relation pattern among farmers and other actors can be categorized into five reasons, namely economic rationality (contract), friendship bonding (emotion), relatives/family support (genealogy), patron-client relation (power), and “support” from...
external/government through several organic rice development programs (power). In Sub-district of Pondoksalam, organic rice development initially was a government program, which means related to power of the government and for some reasons related to “financial and facility opportunities” for farmers and farmer groups. However, when the program was closed, several farmers decided to continue their “organic way” cultivation method, and their reason was not the same as what Sukayat et al. stated previously. Surprisingly, their reason was because of environment and health considerations. They think cultivation and consumption of organic rice has positive impacts to their health and environment. They cultivated organic was not because other people insisted them to do that, it was not because their friends or family asked them to do that, and even it was not because price of organic rice is higher than conventional rice. From human and non human relation related to sustainability consideration, this farmer behavior was very positive.

Analysis towards organic rice development can also be approached by social ecological system perspective. Social ecological system consists of a “bio-geo-physical unit and its associated social actors and institutions” (Glaser et al. in Jahn et al., 2009). Jahn et al., (2009) go on to say that social ecological system can be categorized into three system elements, namely “natural, social and hybrid” entities, it is related to natural and social sciences, and the field research of human ecology. In order to express the relations and dynamics, this system is also recognized the concepts of network, feedback loops and causal chain. Furthermore, in order to achieve sustainable governance of SESs, better understanding of decomposable, multilayer governance systems that bridges the separations of biophysical and social science research is needed (Ostrom, 2007)

As a working definition, Halliday and Glasser (2011) states that “a social-ecological system can be considered as a system composed of organized assemblages of humans and non-human life forms in a spatially determined geophysical setting”. Halliday and Glasser develop a decision making model to implement social ecological systems from “a management perspective, as arena of practice rather than as discipline-specific objects of study”, which can be applied by people from a range of applied and theoretical disciplines. Furthermore, Halliday and Glasser indicated an intention to consider social, biological and physical aspects at the same level. Therefore, definition of social and ecological (ecological = biological + physical) describes a same management level of a system. Figure 1 describes the generic model of social ecological system.

![Figure 1](image-url)

**Figure 1.** Generic model of social ecological system (Checkland in Halliday & Glasser, 2011)

According to Checkland (1984) in Halliday and Glasser (2011), four basic subsystems consisted in SSE: (1) Natural subsystem (N): natural substances and process building system, including humans and their interaction with bio-geo-physical environments. This means human is “a part of nature”. (2) Management subsystem (C): activities aimed to manage these bio-geo-physical and social environments. (3) Worldview subsystem (W): it includes knowledge, believe, and value systems that guide human activities. (4) Technology subsystem: machine (which impacts directly to N), information (impacts to C and W), and T that can influence value system and knowledge.

System diagram of organic rice development in Subdistrict of Pondoksalam can be drawn in Figure 2. Figure 2 shows description of four subsystems in the model. W shows the ideas of cultivating organic or conventional, as well as values towards healthy life, holism and sustainability. N includes natural system of the farm and elements of the physical, biological and social situations.
which are important to the system. C shows that “even when the decision making unit is very simple the structure of the decision making system is quite complex” (Halliday & Glasser, 2011). The elements are goals of the system and a set of hypotheses regarding behavior of N that influences decisions. T presents two technologies used, namely traditional agricultural technologies, and modern/cutting edge technologies. This systems diagram describes a quite complete systemic view of organic rice development. It also shows the boundary of the system. However, it does not show linkages between the farm system and the surrounding system environment.

Figure 2. System diagram of organic rice development
(Adapted from Halliday & Glasser (2011))

In order to show linkages among activities and entities in the system, in this paper, social ecological system perspective approaches organic system development through three aspects, which relates one another. They are social, economy, and ecology aspects. From ecological aspect, organic rice provision is very dependent on organic production process and productivity of organic rice cultivation. This production process is determined by organic input provision, which is an economic aspect. Organic input provision is determined by farmers capital, farmers’ creativity to produce inputs at local level, and sometimes organic input provision program delivered by the government. On the other hand, sell organic rice will increase farmers’ income, which is influenced by organic rice price and cost of production. Organic rice cultivation will be successful only if together activities are conducted. From social aspects, a group will work together only if members have social capital each others. It included trust, network between and among members, and willingness to work together. The existence of the group is also demanding obligations that must be fulfilled, such as rules/norms. These norms are actually not only socially, but also economically and environmentally.

Above description shows that the development of organic rice will not be successful and sustainable if it is approached only from a single standpoint/aspect. This is the reason of the importance of a systems approach, in particular based on social ecological system perspective to analyse organic rice development.

Figure 3 shows relation among activities in organic rice development process. In the figure, green area represents ecology aspect, yellow area represents economy, and red area represents social. If we look at Figure 3, we can see that social aspect is relatively more problematic than economic and ecological aspects, which can lead to the success or failure of this organic development. For several reasons, we could say that human factors are determinants to the sustainability of organic rice development, even though both aspects are actually influence each others. Human influences non human, and vice versa. However in Subdistrict of Pondoksalam, farmers attention and awareness toward environment, and put economic consideration at the next priority bring about optimism that sustainability of organic potential will be reached.

Based on these two approaches, using generic model from Halliday and Glasser, and system thinking approach, we can see that even though it is a small unit analysis and simple issue, while we analyze systematically, the results can be more effective to help in solving potential problems. In
addition, systemic approaches including social ecological system are much more useful to find potential solution, in particular related to sustainability issues.

Figure 3. Relations among activities in organic rice development

**Conclusion**

Technology needed in organic agroecosystem (rice development) can be divided into two large categories, namely first, specific technology for organic rice cultivation, from seedling process to postharvest activities, and second, specific technology for organic rice farming system, including institution, finance, marketing, and information provision aspects. Technology intervention has improved farmer capability to doing organic and develop farmers’ network. However, it was not successful to develop impacts on farmer group development.

Social ecological system perspective has a significant role to describe elements involved in development process. It also helps to simplify complexity of the system. In addition, it explains interrelation among activities in order to achieve sustainability.
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