

Community Development Methods Toward Food Security: The System of Rice Intensification in Zumalai Subdistrict, Covalima, Timor-Leste

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ABSTRACT. The study was conducted in Zumalai subdistrict, Covalima in Timor-Leste to analyze the contribution of the System of Rice Intensification (SRI) program. The program was implemented through community development methods, namely: community education, community organizing, and community resource management to achieve rice security. Using the Slovin's formula, 24 farmer-groups from Raimea village and 17 from Tashilin village were selected through draw lot sampling. From each farmer-group, five members were randomly chosen to comprise 205 respondents to participate in the household survey. Data were analyzed through descriptive and inferential statistics.

The findings revealed that majority of the respondents attended various components of the SRI training. The purposes for joining the SRI group included having access to government facilities and incentives, exchanging experiences, sharing resources and labor among members, and working together. The SRI practices were able to secure the communities' environment and maximize the utilization of local resources. The program, which could be sustained with the existing resources in the study sites, could increase rice production. With the increase in rice production, most farmer-respondents did not experience rice shortage after their involvement in the SRI program. Rice production had been sufficient to feed their families all year round.

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The correlation analysis using the Pearson Chi-square test showed that rice security, measured in terms of indicators of rice availability, rice accessibility, and rice utilization, was significantly correlated with some indicators of the community development methods. Some mechanisms to sustain SRI as a community development strategy are recommended.

Keywords: *community development methods, food security, System of Rice Intensification (SRI)*

INTRODUCTION

Timor-Leste is mainly an agriculture-based economy with more than 80 percent of the population engaged in agriculture as their primary occupation. Despite this, the share of agricultural sector accounts for about 25 percent only of the country's gross domestic product (GDP). This is largely because agriculture in Timor-Leste is primarily traditional and based on subsistence cropping. Farming mostly involves shifting cultivation in shallow soils, which is usually the characteristic of the country's terrain (UNWFP, 2005).

The negative impact of harmful practices and ways of thinking, coupled with external factors, such as droughts and floods, poor market access and increasing prices, and lack of agricultural inputs, greatly influence household incomes. The result is that harvests only meet household consumption needs for around 7–8 months each year (Viegas, 2001).

The traditional farming system in Timor-Leste has resulted to food security problems. This includes a history of crisis and dislocation, environmental degradation, disrupted land tenure and farm practices, severe seasonal weather fluctuations, and a pattern of food import dependence. The most critical period of food availability and normal period of hunger is usually 2–4 months within a year in an average farming household. The macro-deficit in production reflects that the household's produce

sustains its food needs only for eight months a year. Productivity is low as a result of subsistence farming. Natural disasters are recurrent in most parts of the country, thereby affecting the three dimensions of food security (UNWFP, 2005).

The above mentioned food security problems led the Timor-Leste government to set goals geared towards achieving food security. The government is enhancing the production of diverse staple foods and restoring household and village crop storage facilities. In addition, the government is improving the production of niche crops and animals, promoting internal markets and alternative income generation, providing cash income for subsistence communities, and improving swidden farming system in the uplands to improve livelihoods and reduce environmental degradation (Viegas, 2001).

Rice is the preferred staple food of the East-Timorese. The local demand is at 90 kg per capita, which amounts to 77,200 tons annually (MAFF, 2008). The local production was estimated to be 27,000 tons of milled rice (FAO, 2003), equivalent to 45,000 tons of paddy at 60 percent milling efficiency. The shortage of about 50,000 tons plus the estimated need for cross-substitution for other staple food is being filled with rice imports, with government spending of US \$58.5 M annually (MAFF, 2008).

To increase rice production and address food security problems, the Ministry of Agriculture, Fisheries and Forestry (MAFF) endorsed the Gesellschaft für Technische Zusammenarbeit (GTZ)-funded system of rice intensification (SRI) in 2007. The SRI is one of the strategies to attain sustainable growth in agriculture through intensive and extensive cropping in Timor-Leste's Covalima and Bobonaro districts.

Within two years, the number of farmers practicing elements of the SRI increased from around 50 to almost 1,300. The average yield increased from about 3 tons/ha to around 5 tons/ha (around 60%). In 2008, the total rice production area covered 5,004 ha in the Bobonaro district and 4,015 ha in the Covalima district (MAFF, 2008). In terms of percentage to national rice production, the Bobonaro and Covalima districts are the first

and fifth most important districts of all 13 districts of Timor-Leste with about 21 percent (5.67 tons) and 10 percent (2.70 tons) of the harvest, respectively (MAFF, 2008).

Thus, it is believed that one of the effective means to address food security problem and to increase rice production in Timor-Leste is to introduce new agriculture innovations through community development approach. Community development (CD) as an approach highlights community education, community organizing, and community resource management methods in addressing problems in the community such as poverty and low agriculture productivity (Luna, Ferrer, Tan, & Bawagan, 2004). The primary outcome of community development is improved quality of life. Effective community development results in mutual benefit and shared responsibility among the community members. It recognizes the connection between the social, cultural, environmental and economic matters, the diversity of interest within a community and its relationship to building capacity (Frank and Smith, 1999).

Low production in the country is attributed to subsistence agriculture, thereby affecting food security, household income, and environmental degradation. In this context, community development methods are urgently needed to address the pressing issue on food security.

Objectives of the Study

The general objective of this study was to analyze the contribution of the SRI program through community development methods to achieve rice security in the Zumalai subdistrict. Specifically, it aimed to:

1. Describe the SRI implementation in the Zumalai subdistrict;
2. Describe the socio-demographic characteristics of the SRI program participants;
3. Discuss the community development methods of the SRI;

4. Determine the rice security situation in the Zumalai subdistrict;
5. Analyze the effects of SRI community development methods on rice security in the Zumalai subdistrict; and
6. Recommend sustainability mechanisms for SRI as a community development strategy.

Conceptual Framework of the Study

Community development methods include, among others, community education, community organizing, and community resource management (Luna et al., 2004).

Community education is concerned with the enhancement of people's potentials and capability. It enables them to translate their consciousness into operational and effective actions. They have to be equipped with the necessary skills for community work such as community organizing, education and mobilization, human relations and communication, conflict resolution, planning, and management of community resources. Under the SRI program, community education was implemented by the GTZ, Department of Agriculture-Ministry of Agriculture, Fisheries and Forestry (DA-MAFF), and program partners. The implementers conducted various intensive trainings, plot demonstration, formal education of extension workers, and cross-site visits to familiarize and enhance farmers' capacity. The indicators that were measured included attendance to SRI training before and after program involvement, participation in cross-site visits, and sharing of knowledge and skills.

Meanwhile, community organizing refers to the activities aimed at grouping people to struggle for their common needs and aspirations in a given locality. In the context of SRI, community organizing involves mobilization of farmers into groups brought about by their individual interest on the new and alternative technology initiated by the GTZ and MAFF. The establishment of the farmers' organization enables individual households to accommodate one another's needs. It also increases their

access to and sharing of the service systems or incentives of the Department of Agriculture and program partners. Some of the variables included the following: purpose in joining the SRI group, advantages in joining the SRI group, awareness of the group's weaknesses and needs, stability of the group, accommodation of ideas and suggestions, and active participation of the farmers.

Community resource management includes the acquisition, generation, production, development and conservation, protection, and rehabilitation of community resources (Luna, 2009). In the context of the SRI, this was done by GTZ and MAFF to identify possible local resources, which the community can utilize, access, and share in order to develop SRI projects. The indicators for this variable included the following: maximization of forest resources, organization of SRI program, sustainability of SRI methods, conflict resolution, and awareness of issues on resource utilization.

With regard to the financial aspect, the SRI program received package grants from the GTZ and the Second Rural Development Project (RDP II) during its five years (2007–2012) of implementation. Institutionally, it is being implemented by the DA-MAFF and program partners. Meanwhile, its technical implementation is being adjusted according to resource availability and on the farmers' capacity and capability.

Based on the conceptual framework (Figure 1), this study was a step towards conceptualization of community development methods used in the implementation of the SRI as an innovative strategy to contribute to rice security in the study areas. These three CD methods work together to bring about the following: organized groupings of farmer-participants, capacity development among the SRI participants, and management of local resources as inputs into the SRI program.

On the other hand, institutions, organizations, and technical and financial support are considered components of the support system. These contribute to the adoption and implementation of the SRI through community development strategies.

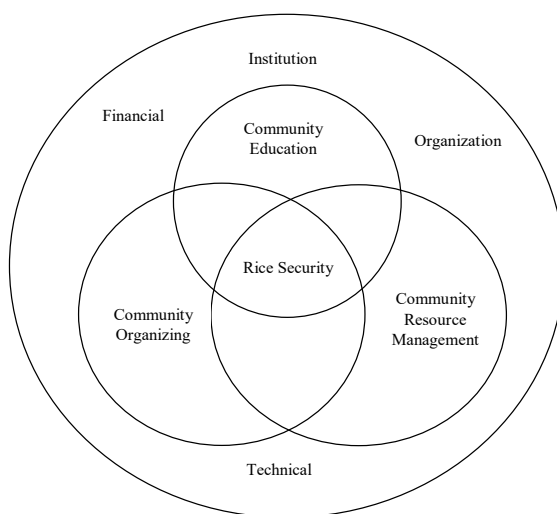


Figure 1. Conceptual framework of the study

Rice security, which is at the center of the interacting circles, was measured in terms of rice availability. The indicators of the latter were occurrence of rice shortage before joining the SRI program, sufficiency of rice production since their involvement with SRI, experience of rice shortage with SRI, and sufficiency of rice stock.

Another component of rice security is rice accessibility, which refers to the respondents' access to rice. This was measured in terms of concurrence with price of rice, whether the respondents considered the price of rice either high, low, or just enough; access to rice; and rice shortage remedy.

Lastly, rice utilization refers to the respondents' use of rice as a primary food staple, sale of rice as a source of family income, number of meals taken per day, and sufficiency of rice for family consumption.

METHODOLOGY

The study was conducted in Zumalai subdistrict consisting of two villages, namely: Raimea and Tashilin. The two study villages were chosen based on the following characteristics: 1) they are located in lowland agricultural areas, 2) rice production is their primary source of income, and 3) they were selected by MAFF and GTZ as SRI pilot sites since 2007 when the SRI was first implemented. The program ran from 2007 to 2012.

The study used multi-stage sampling wherein the two villages were chosen based on the aforementioned criteria. The sample groups from the Raimea village and Tashilin village, which were composed of 32 and 20 groups, respectively, were determined using the Slovin's formula. From each farmer-group, five members were randomly selected to serve as the respondents of the study. Based on the calculation, there were 120 respondents from the Raimea village and 85 from the Tashilin village, or a total of 205 respondents from the two villages.

Primary and secondary data were collected. Primary data were gathered through interview of farmers involved in the SRI program using a structured research instrument. The research instrument for the individual farmer-survey was pre-tested and revised accordingly to generate accurate data for the study. The research instrument was translated into Tetum, which is the local language in the villages to facilitate the interview process.

The study also used key informant interviews (KIIs) and focus group discussions (FGD) to validate the household data. KIIs were done with community leaders, extension workers, and key officials of the Department of Agriculture, program partners, and donors. On the other hand, an FGD was conducted among 8–10 farmer-leaders in each village as well as some members who did not serve as respondents in the individual survey.

Secondary data were gathered from institutions such as the donor agencies, program partners, and MAFF. These secondary sources included annual reports, program evaluation reports, official records, research papers, among others.

The results were analyzed using descriptive and inferential statistics. Descriptive statistics included frequency counts, percentages, mean, and range of data obtained. The effect of the SRI program on rice security was determined using non-parametric Pearson Chi-square test (test of independence) given that variables observed were categorical. The community development methods and other SRI selected variables that might have effect on rice security (dependent variable) served as the independent variables. The alpha of 0.05 was employed for reliability of statistical test.

RESULTS AND DISCUSSION

SRI Implementation in the Zumalai Subdistrict

Technical practices and rice production. Of the 205 respondents, 84 (41%) have been involved in the SRI program for three years and 30 (15%) have been involved for six years. Nevertheless, only 21 percent have applied the complete SRI package in their farms. The majority (79%) who only adopted the basic or main components of SRI cited the difficulty in applying the full technology. They said that they needed to focus and devote much time to adopt all the components.

Despite the constraints mentioned, majority (98%) of the respondents were willing to adopt all the SRI components (Appendix 1). Almost all (99%) believed that the SRI methods could increase rice yields. Based on the given estimates, applying SRI methods could increase rice production up to 3 percent as compared with traditional practices or any other methods. With the use of SRI methods, majority (78%) believed that yield could fall within the range of 2–4 tons/ha or at an average of 3.31 tons/ha, ranging from 1.5 to 5.5 tons/ha. In fact, two respondents estimated that yield could go up to 7 tons/ha. The traditional practices could only yield an average yield of 0.83 ton/ha ranging from 0.50 to 1.00 ton/ha. More than half (55%) of the respondents estimated having yield above the average from traditional rice production. Timor-Leste's average yield is about 3 tons/ha as reported by MAFF in 2009 (Deichert, 2007).

Components of SRI Implementation. The MAFF recommended seven components to be introduced to the farmer-participants. These included seed selection, nursery management, transplanting age, distance of transplanting, water management, weed control, and soil nutrient.

Findings show that majority of the farmers did not practice all the recommended components. As they were shifting from traditional practices to a new and unfamiliar system, they decided on what components to adopt only based on their own practices and experiences. However, more farmers are expected to adopt the complete technology package. The technology assures them of rice supply so that they will not experience shortages just like before the introduction of SRI in their village.

Community response to the SRI Program. The introduction of SRI methods in Zumalai subdistrict is transforming the farmers' knowledge, skills, attitude, and practices. They are undergoing the four phases of change and adoption mentioned by Mchombu (2004), namely: awareness, interest, examination and testing, and adoption/rejection.

As an innovation, farmers assumed that the SRI program would always provide them free access to the facilities even if they were not seriously involved in the activities. But only a few farmers agreed that there were times when the government had to look into their problems and respond positively to their practices. The farmers also needed more information to raise their awareness about the SRI technologies and to compare the benefits over their traditional practices.

Perceptions about the SRI practices compared with other methods. Two practices in Timor-Leste can be compared with the SRI methods, namely: the traditional practices and the integrated crop management (ICM), which was introduced lately at the eastern part of Timor-Leste.

The use of traditional practices such as the use of cow or carabao for land preparation and seed sowing yielded low produce of about 0.4–1 ton/ha. In contrast, ICM requires more

inputs such as chemical fertilizer to maximize production. On the other hand, the SRI technology uses organic fertilizer, which is readily available and can be produced by the farmers.

Difficulties encountered with program implementation. The program's concern was more on its sustainability. Many of the farmers did not really perceive it as assistance to address their needs and problems. Rather, its components were perceived as 'freebies' from the government and program partners; hence, they did not really participate fully in the activities.

Another difficulty was the farmers' attitudes and behavior. The farmers did not develop a sense of ownership of the SRI program. This was because most of the decisions have been made by the funding agency and MAFF. The farmers were mainly asked to fulfill project requirements, accept, and adjust themselves to be part of the program whether they needed the specific projects or not. Engendering a sense of ownership and sustainability was addressed through community development methods.

Profile of the Respondents

Socio-demographic characteristics of the respondents.

Majority (60%) of the respondents were from 40 to 59 years old, male, and married with an average number of four children. One-fourth (25%) of the respondents were elementary undergraduate. Almost half (46%) of them have lived in the area for more than 20 years. They have been involved with the SRI program from three to six years with an average of four years. Majority (72%) of the respondents were members of the SRI group, while the rest (28%) were officers who held positions as chief of the group, vice-chief, secretary, and treasurer. The total members in the group under the SRI program varies. Majority (66%) said that they had 10 members, while the rest (34%) said there were more than 10 members.

Natural resources of the study sites. Two rainfall peaks in the study areas appear between December and March and between May and July. Almost all (99%) of the respondents

answered that there are rivers near their village. The two main rivers in between the two villages are Lo'omea and Mota Mola. These rivers serve as the main source of irrigation water supporting the rice fields in the study area. About 89 percent of the respondents said that the irrigation system was built by the government, while 11 percent said that NGOs built the irrigation system to support the SRI program. Before the presence of the SRI program in both study sites, there was no irrigation system available although the locality has two rivers. Meanwhile, majority (79%) of the respondents regarded the soil condition as fertile.

Agriculture-related information. Appendix 2 shows that majority (78%) of the respondents had their own land for rice cultivation, and only 22 percent were landless. Accordingly, majority (94%) of the landless used their family land, 4 percent were into shared income through public land/tribe, and only 2 percent cited renting land to cultivate rice.

For the SRI participants, almost all (99%) of them devoted 0.01–1.0 ha of land to the SRI program, while only one percent planted on 1.01–2.0 ha. Majority of the SRI participants planted rice twice a year. Likewise, majority (65%) of the non-SRI participants planted also on 0.01–1.0 ha (Appendix 2). Data show that although the SRI was already introduced to the farmers, they still practiced their traditional way of planting rice. They used the small area planted to rice under the SRI program for practice and to gain more experience and familiarity with the new model and technology.

All the lands were used, according to majority (72%) of the respondents (Table 1). However, 28 percent of them said that they did not use all of their land for the program for different reasons. Half of them (50%) pointed out that their present area was already enough to produce rice for their family's consumption. About 15 percent said that they shared the land with their relatives for the planting of rice. The rest (35%) revealed that they did not have sufficient time and labor to cultivate all their lands.

Table 1. Agriculture-related information of Tashilin and Raimea villages

AGRICULTURE-RELATED INFORMATION	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
Have used all land for rice farming						
Yes	68	33.2	79	38.5	147	71.7
No	17	8.3	41	20.0	58	28.3
Reason for unused land for rice farming						
Enough area for rice	6	10.3	23	39.7	29	50.0
Shared with relatives	6	10.3	3	5.2	9	15.5
Labor is insufficient	2	3.4	8	10.3	10	17.2
Not enough labor to use and share to relatives	3	5.2	5	8.6	8	13.8
Not enough manpower and time	0	0.0	2	3.4	2	3.4
Planted other crop aside from rice						
Yes	11	5.4	17	8.3	28	13.7
No	74	36.1	103	50.2	177	86.3
Raised livestock						
Yes	15	7.3	27	13.2	42	20.5
No	70	34.2	93	45.4	163	79.5

Aside from rice, only about 14 percent of the respondents planted other crops such as corn, vegetables, and cassava. Majority (86%) of them planted rice only for home consumption. A few (20%) of them raised livestock such as swine, cow, and buffalos to augment household savings (Table 1).

Community Development Methods

Community organizing. The community organizing approach was top-down, but by enhancing farmers' participation, the latter's awareness and sense of ownership of the SRI program increased. Under the SRI, the formation of farmers' groups enabled the extension workers to monitor farmers' activities, to help them share facilities provided by the Department of Agriculture, and to assist them in influencing and learning from each other (i.e., aside from labor sharing). The farmers became empowered; hence, enabling the sustainability of the program with minimal assistance from the government.

The process of community organizing mentioned above was quite different from what Luna (2009) calls community organizing. Luna refers to activities aimed at grouping people to struggle for their common needs and aspirations in a given locality. Community organizing involves the following activities: integration with the community, social investigation, problem/issue spotting, ground work, meeting, role playing, mobilization, evaluation, reflection, and setting up of the organization.

The major reason for joining the SRI group was to have access to government facilities and incentives. Table 2 shows that of the 549 responses, 44 percent cited "sharing of experiences, resources, and labor among members, and working together" as an advantage of joining the SRI group. About 27 percent cited "access to government incentives and the sharing of government facilities, materials, or equipment," while, 18 percent cited "increased rice production and land use." Furthermore, 7 percent cited "improved skills and knowledge, learned new model, technology, system, skills, knowledge, or innovation."

Majority (81%) of the farmers were aware of their group's future needs, i.e., to achieve group development or be self-organized and learn more about the SRI components. They also cited that their group could be sustained in the future based on the identified advantages of the SRI technology and their needs.

Table 2. Respondents' perceived advantages of joining SRI group

PERCEIVED ADVANTAGE OF JOINING SRI GROUP	TASHILIN (n = 85)		RAIMEA (n = 120)		TOTAL (n = 205)	
	No.	%	No.	%	No.	%
Awareness of the advantages of joining SRI						
Yes	85	41.5	119	58.0	204	99.5
No	0	0.0	1	0.5	1	0.5
Advantages of joining SRI group						
Sharing experiences/ resources/labor/skills/ knowledge among members; working together	115	21.0	135	24.6	250	44.5
Increased rice production; increased land use	39	7.1	60	10.9	99	18.0
Incentives; sharing/free access to government facilities, materials, incentives, equipment; government support	52	9.5	97	17.7	149	27.1
Improved skills and knowledge; learning new model/technology/system/ skills/knowledge/ innovation	14	2.6	22	4.0	36	6.6
Maximized use of local resources	5	0.9	0	0.0	5	0.9
Increased/improved capacity	9	1.6	1	0.2	10	1.8

Community education. Community education methods were applied to introduce SRI techniques to the farmers after they have formed into groups. There were three main components of community education, namely: training on SRI elements, cross-site visits, and plot demonstrations.

Training activities focused on the seven SRI components as recommended by the MAFF. These components were divided into two parts, namely; 1) basic components, which involved seed selection, nursery management, age of seedlings, and distance of transplanting; and 2) water control, weed control, and soil nutrients.

Following the training activities, the farmers were allowed to practice directly in a communal demonstration farm assisted by an extension worker. Furthermore, farmers were encouraged to have their own plots measuring 0.5 ha so that they could be familiarized with SRI techniques, generate data, and compare among treatments.

Cross-site visits were conducted so that farmers could learn from different SRI groups that were more advanced in adoption. Most of the cross-site visits happened in the Bobonaro district. These were intended to groups that were not well-developed so that it would stimulate their practices and gain more experiences.

Table 3 shows that almost all (99%) of the respondents attended various components of the SRI training. However, majority (64%) of them still needed trainings related to SRI components. As part of community education, some of the respondents attended cross-site visits to the Bobonaro district for one (27%) to two (60%) weeks.

Majority (92%) preferred skills and knowledge on all components of the SRI that may be useful in improving their rice production in the future. Majority (92%) of them also shared these skills and knowledge among the members and non-members of SRI groups. Nevertheless, they felt that they still needed outside trainers as it was rather difficult to generate local trainers. Almost a third (34%) of them said that they needed a trainer to improve

Table 3. Trainings attended of the respondents since involvement in SRI

TRAINING	NO. OF TIMES ATTENDED		CROSS-SITE VISIT		LEVEL		SPONSOR	
	1	2	1 week	2 weeks	Basic	Advanced	GO	NGO
Full package (seed selection, nursery management, transplanting, distance of transplant, water control, weed control, soil nutrient)	115	6	13	106	119	2	104	0
Basic package (seed selection, nursery management, transplanting, distance)	27		21	5	27		26	0
Combination of any of the components	35	3	18	8	36	2	26	2
Any of the individual components	34	8	4	4	36	6	32	2
Total	211	17	56	123	218	10	188	4

Note: Multiple responses

their skills and knowledge, and assist group needs; enhance their ability; and to learn more. A total of 18 percent said that they needed more trainings on SRI and other related topics; 16 percent wanted to assist/facilitate group needs; and 15 percent wanted to be familiar with all SRI components and other relevant trainings.

Community resource management. The SRI sites were identified by MAFF based on the area’s local resources and socio-economic conditions. These resources included abandoned lands that could be suitable for planting rice even without irrigation systems. These had many local materials for composting to maintain land fertility as well as plants that could produce herbal pesticides for pest control.

The respondents cited that the SRI program could maximize the utilization of local resources (98%) (Appendix 3); that it was well organized to secure the communities’ environment (98%); and that it could be sustained with the existing resources (99%) (Table 4).

Table 4. Respondents’ perception on SRI program’s capacity to secure environmental sustainability

PERCEPTION ON SRI PROGRAM	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
SRI project organized?						
Yes	83	40.5	119	58.0	202	98.5
No	2	0.9	1	0.5	3	1.5
SRI method sustainable with existing resources?						
Yes	84	41.0	120	58.5	204	99.5
No	1	0.5	0	0.0	1	0.5

Since all local resources were available to supply the farmers' needs, they no longer need to invest much to achieve rice security. In this case, the SRI methods were considered locally-based innovations that could enhance the utilization of local resources. The methods required low inputs and were environment-friendly to ensure sustainability and attain maximum outputs. Hence, the technology enabled farmers to survive and empowered them in many ways.

Rice Security in Zumalai Subdistrict

Main issues of rice security in Timor-Leste. The national rice demand in Timor-Leste is increasing as rice is the primary staple food in the country. Domestic production is not sufficient and natural disaster, such as drought and floods, cause harvest failure. Other factors of rice insecurity include the practice of traditional farming that leads to low outputs. In the absence of alternative technology to intensify production, traditional farming had been considered to be the best strategy. Also lacking were agricultural facilities and infrastructure to support rice farming that limit the maximum utilization of local resources as well as potential lands for planting of rice.

To address the issues on rice security, MAFF adopted in 2002 two strategies (short-term and long-term) in cooperation with the Ministry of Tourism, Commerce and Industry (MTCI). First, the MTCI was responsible for food aid through rice import to meet the gap of domestic demands. The MTCI provided rice to the villages at the lowest price at US \$13.00 per sack (0.34 USD/kg). Second, MAFF was responsible for seeking new innovations to be introduced and for building infrastructure to support long-term planning to improve domestic rice production and to achieve sustainable agricultural growth.

The MAFF, in cooperation with GTZ, introduced ICM at the eastern part of Timor-Leste in 2002-2007 as one of their strategies. Later, the SRI was endorsed in the western part in 2007

up to the present. With the SRI program, there was a comparative model with ICM. The SRI model included innovative technologies to increase paddy production area as well as rice productivity in order to limit rice importation.

Rice availability. More than half (52%) of the respondents professed that they have experienced hunger or rice shortage before joining the SRI program. With the introduction of SRI in both villages, majority (73%) stressed that rice production had been sufficient since their involvement with the program. As a result of the increased rice production, majority (71%) did not experience rice shortage after their involvement in the SRI program, although about a third (29%) still experienced it one to three times a year. Among the reasons cited for insufficiency of rice were many members of the family to feed (44%) and low volume of production (26%). Other reasons included not enough land to plant rice, occurrence of diseases, effect of climate change on production, and insufficient labor.

Majority (87%) of the rice farmers estimated that their current stock of rice would last for a year, and only some (13%) estimated otherwise. They expected their stock to last for an average of 9.92 months ranging from 9.00 to 10.50 months. Meanwhile, more than half (56%) of the respondents presumed that their stocks would last for 10 months.

Rice accessibility. In the Zumalai subdistrict, the average price of rice was US \$0.25 per kilogram. Whenever there was a shortage, almost half (49%) of the respondents would buy rice in the market and/or borrow from their relatives. According to the majority (88%), rice was their staple food. In the absence of rice, the respondents preferred corn as an alternate staple food.

Despite the rice shortage being experienced by some, all the respondents had access to rice during shortage. Those who experienced rice shortage bought rice from the market and borrowed from relatives (49%), or they simply borrowed from their relatives (44%). Majority (65%) of those who bought

rice in the market during shortage borrowed money from their relatives and co-group members. Others (15%) resorted to selling of livestock and availing of credit, while some (5%) well-to-do farmers used their savings.

Rice utilization. In both Tashilin and Raimea, majority (88%) of the households ate two meals per day. Almost all (99%) of the respondents considered that rice was enough for their family's consumption, with an average of 0.76 kg/day. Two-thirds (69%) fell within the low consumption of 0.01–0.76 kg/day, while the remaining one-third (31%) fell within the high consumption range of 0.77–3.00 kg/day.

Contribution of SRI Program to Rice Security

Generally, the project sites achieved rice security when the SRI program was introduced. One of the indicators was the increase in yield, which averaged 3 percent as compared with the yield obtained using traditional farming practices. Many farmers no longer experience rice shortage. However, there were still some farmers who did because of poor stock rice management. Rice shortage was somehow unavoidable because many ceremonies were held during the summer season requiring more finances and food. Rice was the main source of household income. The farmers had to sell their rice to get cash for these ceremonies and for other needs, such as school fees, school uniforms, and others.

Increase in rice production can make rice more available and accessible to farmers. However, it is not enough to say that farmers are free from hunger because of the issue on food management. Ironically, some farmers sold their rice before harvest time at a low price based on their estimate that production would last more than enough for their home consumption. The estimate can be wrong if there are changes in the weather or occurrence of diseases. To avoid rice shortage at the household level, the farmers should be able to manage rice stock based on their daily calculation of household consumption.

Effects of SRI Program on Rice Security in Zumalai Subdistrict

Relationship between CD methods and rice availability.

The community development strategies for community education included attendance to SRI trainings before involvement in the program, attendance to SRI trainings after involvement in the program, attendance to SRI formal education, participation in cross-site visit, and sharing of knowledge and skills. For community organizing, the indicators included awareness on the following: purpose of joining the SRI group, advantages of joining the SRI group, group's weaknesses, and group needs. On the other hand, group sustainability indicators included accommodation of ideas/suggestions and active participation. The community resource management cut across maximization of local resources, organization of SRI program, sustainability of SRI methods, conflict management, and awareness of issues on resource utilization.

Meanwhile, the rice security variables, particularly for rice availability, included rice shortage before involvement in SRI, sufficiency of rice production since involvement in the SRI, sufficiency level of rice production, rice shortage during SRI involvement, and sufficiency of rice stock. In terms of rice accessibility, factors included concurrence with the price of rice, access to rice during shortage, rice shortage remedy, and source of money to purchase rice. For rice utilization, the indicators included whether rice was a primary staple food, selling of rice, number of meals taken per day, and sufficiency of rice for family consumption.

This study found no significant correlation between community development methods and sufficiency level of rice production (SLRP) and sufficiency of rice stock (SSR). It can be argued that many farmers avoided rice shortage through their own efforts. Second, having experienced hunger before their involvement in the SRI program, farmers responded by getting involved in the SRI program, which provided free incentives to increase rice production.

Table 5. Relationship between community development methods and rice availability

COMMUNITY DEVELOPMENT METHOD VARIABLE	RICE AVAILABILITY (p-value)		
	RSB	SRP	SR
Community education			
Attendance in cross-site visit	0.032*	ns	ns
Community organizing			
Group sustainability	0.004**	ns	ns
Community resource management			
Awareness of issues on resource utilization	ns	0.049*	0.025*

Legend: RSB: Rice shortage before joining SRI, SRP: Sufficiency of rice production since involvement in SRI, SR: Rice shortage with SRI, ns: not significant
*Moderately significant at P<0.05, ** Strongly significant at P<0.001
All p-values above 0.05 level are not significant and these are not included in the table.

Meanwhile, four variables were found to be significantly correlated with some community development method indicators. Experience of rice shortage before joining the SRI program (RSB) was moderately correlated with participation in cross-site visit (p=0.032) under community education, and highly correlated with group sustainability (p=0.004) under community organizing (Table 5). Members who did not experience rice shortage were more likely not to participate in cross-site visits as compared with those who experienced rice shortage. In like manner, members who did not experience rice shortage were more resolute in believing that their group could be sustainable by applying SRI methods in the future to avoid rice shortage.

The other rice availability variables, which were moderately correlated with community resource management indicator, specifically awareness of issues on resource utilization, were sufficiency of rice production since involvement with the

SRI program ($p=0.049$) and rice shortage with SRI ($p=0.025$). The respondents who were aware of the issues on resource utilization were more likely to have sufficient rice production since their involvement in the SRI program and will not experience rice shortage.

The findings are consistent with what was mentioned by Luna et al. (2004) — that exposure or field visit is one of the community education methods considered as more appropriate as compared with lectures and theoretical discussions. Field visits serve as avenues for participants to observe first-hand experiences of other organizations and to discuss with them about their observations.

As for the sustainability of the group, it can be argued that experiencing hunger/food shortage and the advantages of belonging to a group can have positive impact in addressing immediate needs. It takes into account future group sustainability and self-organization. The finding corroborates the results of Jones and Yogo's study (Sharma, 2000) that self-organizing capability of communities is crucial when utilizing the support from external sources. It is sometimes referred to as social resource, the community's self-organizing capability as the product of accumulated experiences in society over time. These experiences are reproduced in the community in the form of self-organization that may provide, for instance, the mechanism for receiving government assistance. Such organizing gives people the experience of working together towards a common goal. Effects of collective experiences accumulated over time provide the base for future organized activities.

Relationship between CD methods and rice accessibility. Access to rice (AR) and source of money to buy during shortage (SM) were not correlated with any of the indicators of the CD methods. This implies that access to rice during rice shortage depended upon the capacity of the farmers to substitute rice with other foods or to reduce the quantity of household consumption.

Table 6. Relationship between community development methods and rice access

COMMUNITY DEVELOPMENT METHOD VARIABLE	RICE ACCESS (p-value)	
	CPR	RSR
Community education		
Attendance to SRI training since involvement in the project	ns	0.039*
Attendance to cross-site visit	0.002**	ns
Sharing of knowledge and skills	ns	0.010*
Community organizing		
Awareness of group's weaknesses	ns	0.024*
Accommodation of ideas/ suggestions	ns	0.010*
Active participation	ns	0.015*

Legend: CPR: Concurrence with price of rice, RSR: Rice shortage remedy,
ns: not significant

*Moderately significant at $P < 0.05$, ** Strongly significant at $P < 0.001$

All p-values above 0.05 level are not significant and these are not included in the table.

Meanwhile, the respondents' concurrence with the prevailing price of rice in the market was highly correlated with the attendance in cross-site visit as a community education indicator ($p=0.002$) (Table 6). Members who were able to join the cross-site visits were more likely to consider that the current price of rice in the market was just enough, while those who were not able to join either considered the price as low or just enough. During the cross-site visit, farmers were able to know and compare the price of rice to be accessed especially during rice shortage.

The other rice access indicator which was correlated with CD methods was rice shortage remedy (RSR). This was found to be moderately correlated with various CD variables such as attendance to SRI training ($p=0.039$), sharing of knowledge and skills ($p=0.010$), awareness of group's weaknesses ($p=0.024$),

accommodation of ideas and suggestions ($p=0.010$), and active participation in group activities ($p=0.015$) (Table 6). Those who attended the SRI training were willing to share their knowledge and skills to non-members, knew their group's weaknesses, and were actively involved in every group activity.

The community resource management method, as measured by the different indicators, was not correlated with rice access. While community resource management did not directly influence access to rice, the proper use and management of local resources enhanced the increase in rice production.

Relationship between CD methods and rice utilization.

Among the rice utilization variables, sufficiency of rice for family consumption (SRC) was not correlated with any of the indicators of CD methods. This implies that farmers' experiences and knowledge on rice utilization were already sufficient. Only rice as primary food ($p=0.040$), selling of rice ($p=0.046$), and number of meals per day ($p=0.037$) were moderately correlated with accommodation of ideas and suggestions. In addition, number of meals per day was also moderately correlated with awareness of purpose in joining SRI group ($p=0.041$) and conflict resolution ($p = 0.027$) (Table 7). This implies that the management of rice was essential in enhancing the utilization of rice by the family.

The result of the correlation analysis using the Chi-Square test of independence revealed that the three variables of rice availability were correlated with indicators of CD methods, i.e., rice shortage before joining the SRI program with attendance to cross-site visit and awareness of issues on resource utilization; and sufficiency of rice production since involvement in SRI and rice shortage with awareness of issues on resource utilization.

Among the rice access variables, concurrence with prevailing price of rice in the market was correlated with attendance to cross-site visit. Meanwhile, remedy during shortage was correlated with SRI training since involvement in the program, sharing of knowledge and skills, awareness of group's weaknesses, accommodation of idea/s and suggestions, and

Table 7. Relationship between community development methods and rice utilization

COMMUNITY DEVELOPMENT METHOD VARIABLE	RICE AVAILABILITY (p-value)		
	PF	SR	NM
Community organizing			
Awareness of purpose in joining SRI group	ns	ns	0.041*
Accommodation of ideas/suggestions	0.040*	0.046*	0.037*
Community resource management			
Conflict resolution	ns	ns	0.027*

Legend: PF: Rice as a primary food, SR: Sell rice, NM: Number of meals per day, ns: not significant

*Moderately significant at $P < 0.05$

All p-values above 0.05 level are not significant and these are not included in the table.

active participation. As regards to the relationship between the CD methods and rice utilization, correlation was found between community organizing and community resource management variables such as primary food staple, selling of rice, and number of meals taken per day.

Sustainability Mechanism for SRI as a CD Approach

There have been significant achievements in rice production since the SRI was introduced in the Bobonaro and Zumalai districts. Based on the achievement, SRI methods should be expanded to other districts in Timor-Leste to increase rice production in order to satisfy domestic rice demands. The SRI is an alternative innovation that can provide low input rice production techniques suitable to the climate, limit utilization of high input technology, and address the lack of agricultural facilities. In order for SRI to be well-adopted and expanded, program implementers

should consider farmers' participation, enhance farmers' capacity (community education), organize farmers into groups (community organizing), enhance utilization of local resources (community resource management), and provide infrastructure support to address the farmers' needs.

CONCLUSIONS

The SRI program catered to farmers with different socio-demographic characteristics but involved more adult males, with low educational attainment, and with small size of land devoted for the said program. Since the SRI program was initiated in 2007 until the present time, most of the farmers have already attended trainings related to SRI practices, which would enhance their capacity in adopting the SRI components. Still, farmers did not practice all the components as recommended due to the difficulty in the application of the whole SRI package. The practice of several SRI components could increase rice yield as compared with traditional practices.

The formation of farmers' groups was the initial accomplishment of the program. Other accomplishments included group organization as well as the sharing of program facilities and other resources such as labor, land, skills, knowledge, and experiences among farmers. Future intervention and sustainability of community organizing could be acquired through capacity building, working together, building trust, adherence to the group's rules and regulations, self-organization and management, and ownership of the program. Sustainability of community organizing can be guaranteed from the group outputs, thereby resulting to positive impact in addressing the immediate needs of the community.

The SRI can enhance utilization of local resources, secure the communities' environment, and ensure sustainability with existing local resources because it does not require more inputs to increase rice production. Through the SRI program, rice production in both villages had been sufficient to feed the farmers' families at all times.

The correlation analysis revealed that the three variables of rice availability were correlated with CD methods, i.e., rice shortage before joining the SRI program with attendance to cross-site visit and awareness of issues on resource utilization; and sufficiency of rice production since involvement in SRI and rice shortage with awareness of issues on resource utilization.

Among the rice accessibility variables, concurrence with prevailing price of rice in the market was correlated with attendance to cross-site visit. Meanwhile, remedy during rice shortage was correlated with SRI training since involvement in the program, sharing of knowledge and skills, awareness of group's weaknesses, accommodation of idea/s and suggestions, and active participation.

As regards to the relationship between the CD methods and rice utilization, correlation was found between community organizing and community resource management variables with primary food staple, selling of rice, and number of meals taken per day.

RECOMMENDATIONS

Significant achievements in rice production have been observed, which can pave way to expansion, since the SRI was introduced in the Zumalai subdistrict. Based on the achievement, SRI methods should be expanded to other farmers in Timor-Leste.

In the future expansion of SRI, community development methods can be adopted to achieve effectiveness in the implementation and adoption of the innovation. Adoption of the SRI is a shift from traditional practices, which requires behavioral and attitudinal changes.

Likewise, in expanding the SRI methods, it would be better to involve the farmers from the beginning of the program. Through this, farmers could better appreciate their contribution, develop a sense of ownership, and enhance their belongingness in order to

be self-organized. Basic infrastructure such as irrigation systems and basic machinery (e.g., hand tractor or tractor) should be provided to support the SRI.

Moreover, expansion of the SRI methods through the adoption of community development strategy, MAFF should initiate and create a policy that can secure initiatives for future practices and adoption. The policy should also be able to encourage participation of relevant stakeholders to support and promote the adoption of the strategies. Technically, policy recommendations should be based on farmers' self-organization with support from MAFF.

Lastly, community development is an accepted approach and has been proven effective in technology transfer and in overall development work. Studies like these, which address specific programs, should be encouraged. However, caution must be exercised not to expect community development to bring about miracles in the march towards development.

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APPENDICES

Appendix 1. Respondents' application and adoption of SRI elements

APPLICATION & ADOPTION OF SRI ELEMENTS	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
Application of all SRI elements						
Yes	36	17.6	7	3.4	43	21.0
No	49	23.9	113	55.1	162	79.0
If no, farmers' practices						
Seed selection	15	3.2	51	11.0	66	14.2
Days and distance to transplant	18	3.9	79	17.0	97	20.9
Plowing	4	0.9	4	0.9	8	1.7
Nursery	44	9.5	96	20.7	140	30.2
Distance of transplanting	29	6.3	27	5.8	56	12.1
Water control/ management	15	3.2	22	4.7	37	8.0
Weed control	31	6.7	20	4.3	51	11.0
Days to transplant	2	0.4	3	0.7	5	1.1
Pest control	0	0.0	4	0.9	4	0.9
Reasons for non-practice						
Not introduced yet; do not know yet; not yet familiar	15	8.6	18	10.3	33	18.9
Basic key/main components of SRI; step by step in adopting all components	8	4.6	39	22.3	47	26.9
Labor constraint	7	4.0	6	3.4	13	7.4

Appendix 1. Respondents' application...(Continued)

APPLICATION & ADOPTION OF SRI ELEMENTS	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
Takes time to adopt all components; need more focus and time	24	13.7	40	22.9	64	36.6
Need to learn from experiences; still in the process of learning; more practice	11	6.3	7	4.0	18	10.3
Willingness to adopt all SRI components						
Yes	84	41.0	118	57.6	202	98.5
No	1	0.5	2	1.0	3	1.5
If no, reasons						
Labor constraint	1	33.3	0	0.0	1	33.3
Step by step process	0	0.0	1	33.3	1	33.3
No answer	0	0.0	1	33.3	1	33.3

Appendix 2. Size of land devoted to rice farming and frequency of planting

RICE FARMING	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
Land for rice farming						
With land	63	30.7	96	46.8	159	77.6
Without land	22	10.7	24	11.7	46	22.4
If none, land used in rice farming						
Hired land	0	0.0	1	2.2	1	2.2
Shared income	1	2.2	1	2.2	2	4.4
Public land/tribe land/family land	21	45.6	22	47.8	43	93.5
Total	22	47.8	24	52.2	46	100
Size of land devoted to rice farming (ha)						
0.01 - 2.00	49	30.8	65	40.9	114	71.7
2.01 - 4.00	10	6.3	15	9.4	25	15.7
4.01 - 6.00	4	2.5	12	7.6	16	10.1
> 6.00	0	0.0	4	2.5	4	2.5
Mean	1.98		2.48		2.28	
Range	0.50-6.00		0.50-7.00		0.50-7.00	

Appendix 2. Size of land...(Continued)

RICE FARMING	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
Size of land devoted to SRI (ha)						
0.01 - 1.00	63	39.6	94	59.1	157	98.7
1.01 - 2.00	0	0.0	2	1.3	2	1.3
Mean	1.00		1.02		1.01	
Range	1.00 -1.00		1.00 – 2.00		1.00-2.00	
Size of land devoted to non-SRI (ha)						
0.01 - 1.00	34	21.4	70	44.0	104	65.4
1.01 - 2.00	19	11.9	14	8.9	33	20.8
No answer	10	6.3	12	7.5	22	13.8
Mean	1.36		1.17		1.24	
Range	1.00 – 2.00		1.00 – 2.00		1.00-2.00	
Frequency of planting rice						
Once	5	2.4	22	10.7	27	13.2
Twice	76	37.1	94	45.8	170	82.9
Once or twice (depends on climate, water)	4	2.0	4	2.0	8	3.9

Appendix 3. Respondents' perception on the effects of SRI program on local resources utilization

PERCEIVED EFFECTS OF SRI PROGRAM	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
SRI project maximized utilization of local resources						
Yes	85	41.5	115	56.1	200	97.6
No answer	0	0.0	5	2.4	5	2.4
Local resources						
River/irrigation/ water	87	15.0	97	16.8	184	31.8
Land (unused, family labor)	72	12.4	68	11.7	140	24.2
Local materials/ resources	54	9.3	61	10.5	115	19.9
Local knowledge and skills/ experience	22	3.8	41	7.1	63	10.9
Local seeds	24	4.2	32	5.5	56	9.7
Community labor	17	2.9	0	0.0	17	2.9
Others (all we have contributed to the program, group facilities) land/family land	1	0.2	3	0.5	4	0.7
Purpose of utilization						
Irrigation	27	6.8	63	15.9	90	22.7
Compost/ fertilizer, pesticide/herbal pesticide	26	6.6	26	6.6	52	13.1

Appendix 3. Respondents' perception...(Continued)

PERCEIVED EFFECTS OF SRI PROGRAM	TASHILIN (n=85)		RAIMEA (n=120)		TOTAL (n=205)	
	No.	%	No.	%	No.	%
Improved/ maximized/ increased rice production; maximized land use; plant more rice	94	23.7	71	17.9	165	41.7
Support SRI program & group needs	0	0.0	10	2.5	10	2.5
Sharing among community; minimized dependency; sufficient labors; maximized work	20	5.0	2	0.5	22	5.6
Community experiences/ knowledge/skills complementary to adoption of SRI model	5	1.3	20	5.1	25	6.3
Using local seeds	14	3.5	12	3.0	26	6.6
Others (to support the needs, enhance utilization of local resources, supplement)	5	1.3	1	0.3	6	1.5

Note: Multiple responses