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Farmer field school: Non-formal education to enhance livelihoods of Indonesian farmer communities

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Farmer field school: Non-formal education to enhance livelihoods of Indonesian farmer communities

Abstract

Indonesian agricultural sector provides a high proportion of employment for the rural community, but the livelihood of the farmers is relatively low. Sending the farmers to non-formal education will enhance the livelihood of the community. In this study, we analyze the impact of farmer field school on the rural community livelihoods in Indonesia. Data were collected using a participatory approach from 270 farmer groups that completed farmer field school in Sumatra, Java, and Bali. The results show that the farmer field school generated positive impacts on five capitals. Farmers realized the benefits of participating in the field school. They could increase the efficiency of farming by applying technology innovations, knowledge and skills obtained from the field school. Shortly speaking, farmer livelihoods in the community have substantially enhanced.

Keywords: empowerment of human resources; livelihood capitals; rural community; sustainable livelihood framework; vegetable farming

Introduction

Indonesian agricultural sector is a resilient economy of the country. The contribution share of the agricultural sector to national income progressively declines from around 16% in 2000 to 12% in 2014. In magnitude, the amount of national income from the sector rises substantially from IDR 220 T to IDR 350 T during the same times. McCulloch (2008) reports that 75% of the poor in rural areas works in agriculture agricultural and employment is still dominated by 58% of the non-poor. The contribution of agricultural sectors in employing Indonesian people declines from

nearby 44% in 2004 to approximately 30% in 2014. The number of workforces absorbed by agricultural sector is still significant, in spite of a slow decrease during the same periods.

Vegetables are high-value crops or cash crops and have the potential of higher income diversification for rural communities. High-value vegetables produced Indonesia include shallot, chili, eggplant, cabbage, potato tomato and other leavy vegetables. The commodities are vital parts of daily foods and livelihoods and contribute essential function in the agricultural economy of the country. During periods of 2000-2019, top five vegetables: shallot, chili, cabbage, tomato and, potato productions increased progressively. Production other vegetables: eggplant, cucumber, yard-long bean, and string bean were stagnant (BPS, 2019). Despite increases in the production of the main vegetables, the productivity of vegetables in Indonesia is still far below the potential production. Compare to that of China, Indonesian vegetable productivity is just one-fifth (Vanitha, Chaurasia, Singh & Naik, 2013). Various factors affect the low productivity.

Despite the government efforts to improve agronomic technology, vegetable productivity is still low. Inadequate human resources, the farmers, might be one of the causes. Human resources are crucial because it determines the success of technology adoption (Xayavong, Kingwell & Islam, 2016). In Indonesia, human resource in agricultural sectors is weak. Farmers' education level is low, and farmers lack access to education in rural areas (Mangowal, 2013; Titimiranti, Sasongko & Widiyani, 2016). Farmer empowerment using innovation technology and skills managerial in farm management can improve their livelihoods. Another alternative to empower farmers is to send them to a formal school, but it might be ineffective and too late. One of the suitable options is to engage them in non-formal education model through adult education and training programs that can contribute to community development (Mayombe, 2018). The

government of Indonesia and non-governmental organizations provided farmers with non-formal education to increase their capacity.

Farmer field school (FFS) is one of the terms of non-formal education. For rice farming, the FFS started equipping farmers with a new concept of crop protection strategy through a program called integrated pest management (IPM) executed by central government in 1990 (Röling & van de Fliert, 1994). The program terminated in 1999 because of political and economic reasons (Resosudarmo, 2014; Resosudarmo & Yamasaki, 2010). The FFS on rice farmers has been fruitful to improve rice productivity and to reduce pesticide use (Agro-Chemical Report, 2002; Bond, 1995; Yamazaki & Resosudarmo, 2008). Globally, the impacts of FFS on the use of pesticides and production of rice and other food crops have been documented and systematically reviewed by Waddington et al. (2014).

Along with government programs, collaborative projects have conducted training for vegetable farmers using FFS. More than 350 units of FFS on vegetables (e.g., chili, tomato, and cucumber) spread in Northern Sumatra, Central and East Java, and Bali. A unit of FFS trained about 30 farmers, and thus about 10,000 farmers cultivating vegetables have completed the training through FFSs. This study raises research questions as follows: (1) to what extent does the FFS provide impacts on the livelihood of farmers, (2) in what aspects farmers perceive the expected impacts. In this study, we evaluate the developmental impacts of FFS on farmer livelihoods and categorize the improved aspects of livelihoods due to participation in FFSs.

Literature review

Since the success of FFS in the introduction of IPM technology in Indonesia, there have been various impact studies on technology dissemination implemented in Indonesia through the FFS approach. There are two primary measures the impacts of FFS, i.e., immediate impacts and

developmental impacts. The immediate impacts are decreases in pesticide use and related costs, and increases in crop production, farm efficiency, and profitability. The developmental impacts relate to human resource development (van den Berg & Jiggins, 2007). Larsen and Lilleør (2014) show that FFS affects positively food security, resulting from labor resource reallocation to smoothing of their improved production and agricultural production. Mancini and Jiggins (2008) find that FFS group farmer members were significantly prosperous compared to the counterparts, and the FFS-trained farmers were also better handling of pesticide applications.

In the vegetable sector, Norvell and Hammig (1999) find that farming became more sustainable after IPM training through FFS. Sustainability relates to the reduction in the use of agrochemicals. Based on individual crop, FFS leads to a fall in quantity of pesticides applied in onion farming (Yorobe, Rejesus & Hammig, 2011), increases in potato productivity in Peruvian Andes (Godtland, Sadoulet, De Janvry, Murgai & Ortiz, 2004; Ortiz, Garrett, Health, Orrego & Nelson, 2004) and tomato production in China (Cai, Shi & Hu, 2016), escalation in African farmers' income by about 60% (Davis et al., 2012). A recent study shows that Indonesian farmers in Bali and East Java could increase the productivity of chili and tomato after completing participation in FFS on chili and tomato (Luther, Mariyono, Purnagunawan, Satriatna & Siyaranamual, 2018). FFS introduced farmers with improved agronomic technologies and crop protection strategy along with knowledge and skills. The improvement of farmers' knowledge is gained after participation in FFS (Yang et al., 2008).

The developmental impacts of FFS are possible when farmers adequately gain knowledge. Such short-term impacts continue to generate other much longer-term effects on the wellbeing of the farmer participants and farmers' livelihoods. FFS is a kind of empowerment approach and adult education frequently applied in many extension programs. Farmers in a group learn

mutually. They analyze production environment and constraints and identify and develop solutions for the problems in their own lands. This method highlights problem-solving, learning, and joint problem analysis. Farmers perform these activities in the fields directly. FFS is considered very useful in equipping farmers and building clear management. It is a participatory initiative where farmers arrange collectively to understand more about agricultural system at any selected locations of their preferences (Anandajayasekeram, Davis & Workneh, 2007; Godtland et al., 2004).

Activities in FFS are intended to discovery-based understanding methods to enhance farmers' knowledge related to agriculture and capacity to generate decisions of both on-farm and off-farm. FFS improved knowledge of pest management and agroecosystem effectively (Guo Jia, Huang, Kumar & Burger, 2015). FFS has been able to empower farmers in terms of improved capability (Duveskog, Friis-Hansen & Taylor, 2011). Briefly speaking, FFS is capable of empowering farmers via regular meetings in the field as demonstration sites to encourage production of agriculture due to discovery learning (Mfitumukiza et al., 2017). Despite the objectives of production or food security, projects intervention using FFS also have empowerment purposes (Waddington & White, 2014). FFS aims to train farmers on good agricultural practices and develop farm management skill. The objectives of FFS are to move farmer communities to accomplish a collaborative and communal analysis aimed at initiating actions in addressing their problems (Mweri, Mombasa & Godrick, 2001). The particular goals can be detailed into five means as follows. First, to endow farmer communities with skills and knowledge. Second, to enable them as agricultural experts in their own fields and to polish farmers capability. Third, to create informed and analytical decisions rendering the profitable farming in sustainable manners. Fourth, to increase farmers' sensitivity in problem-solving and

new ways of thinking. Last, to assist farmer communities in learning the ways to organize themselves in the communities.

A manual designed by the UN-FAO describes FFS as "a school without walls" where farmer communities learn together by preparing new ideas in their own fields. The process directly equips farmers to advance their answers to their existing problems. FFS has a robust didactic process constructed in for both individuals and communities. This is aimed at reviving the process of life-long education to improve community livelihoods. FFS is a part of the comprehensive sustainable development processes. It is substantiated in the education and empowerment of farmer communities, enlightening people's capabilities to find good methods on how to work in groups and as individuals to realize their self-defined goals (Machacha, 2008). A study shows that high number of women participations in FFS and its expected outcome related to the food security at household level (Westendorp & Visser, 2015). It reviews the gradual process of acceptance associated with gender issues in training. The process of farmer empowerment is viewed as a development process rather than as a outcome someone or a group.

The most substantial impact of FFS is capacity building of local community, such that they can make proper decisions leading to better access to market facilities and other services and agricultural innovation uptake (Friis-Hansen & Duveskog, 2012). Such a condition implies that FFS has benefited farmers through and developmental impacts (van den Berg & Jiggins, 2007). A broader analysis shows the impacts of FFS on livelihoods and suggests that farmers' well-being has improved in many countries due to an amalgamation of knowledge, innovation and farmer empowerment through experience of experimental learning in FFS groups (Lilja & Dixon, 2008). Deviations in the chance composition also facilitated the empowerment through a reformation of government staff at local level, development of non-government service

providers, and formation of farmer-driven local institutions. Information on broader impacts of FFS on livelihood would be of more interest to development planners and rural development sector decision-makers. The impact has been factual to increase farmers' capacity (van den Berg, 2004).

In Indonesia, the impacts of FFS were seen as immediate outcomes, which only included the reduction of pesticide use, keeping the yield unchanged or slightly increase. FFS is not merely targeted to crop protection but to help farmers become capable of organizing themselves, of becoming experts and competent trainers of other farmers, and capable of field research (Bartlett, 2004). Questions framed along these lines would then be able to judge if indeed farmers have benefited from an IPM program where they desire to improve themselves through increased income, to have self-confidence and to become useful citizens, contributing to the well-being of the community and the country (Ooi, 1998). For the most part, Van den Berg and Jiggins (2007) discuss some pieces of literature and conclude that the developmental impacts of FFSs are still inconsistent and unclear. Many empirical works on such impacts in articles published in reputable journals still provide contradictory conclusions on effectiveness (Waddington et al., 2014). As FFS implementation expands, growing concerns and interests emerge among interested parties about the impact of FFS. In Indonesia, facts that systematically document a broad impact of FFSs on the farmers' livelihood are relatively limited. This current study will partly fill the gap.

Methodology

Theoretical framework

This study adopted a framework of the sustainable livelihoods approach (SLA) suggested by Serrat (2008; 2017) to evaluate long-term impact of FFS on empowerment of the farmer

communities. The empowerment can be represented by the improvement of five livelihoods capitals, which consist of human capital, financial capital, social capital, natural capital and physical capital,. This approach has been employed to assess the impacts of FFS on the livelihoods of farmer communities in India (Mancini, van Bruggen & Jiggins, 2007), Pakistan (Butt, Gao & Hussan, 2015) and Indonesia (Mancini & Jiggins, 2008; Mariyono, 2018). In the Pacific Islands, the method of SLA can be combined with agroecology as guidance to analyze projects related to development processes (Addinsall, Glencross, Scherrer, Weiler & Nichols, 2015).

SLA is "an analytical structure to facilitate a broad and systematic understanding of the various factors that constrain or enhance livelihood opportunities and to show how they relate to each other" (Krantz, 2001, p. 19). Approach of SLA provides a worthwhile theoretical foundation because it allows for multilevel, actor-centered, and holistic identification of dynamic behaviors in which farmers can familiarize strategies of livelihood to address transformations related to modern life (Scoones, 1998). While covering a wide range of factors will be problematic to achieve in one single study (Adato & Meinzen-Dick, 2002), implementing a comprehensive framework allows scholars to identify subjects applicable to the livelihoods of community members (Krantz, 2001). Specifically, SLA enables community members to improve their livelihoods by developing existing activities, assets, and capabilities while also guaranteeing resources for the current generation (Krantz, 2001). The SLA can make specific aspects influencing sustainable livelihood products. Hence, FFS evaluation can adopt SLA as a tool. In this context, this study adapted the SLA framework and FFS impact assessment methods to document perceptions of changes in the livelihoods of farmers' communities.

[FIGURE 1 HERE]

Based on the components of livelihoods capitals, the SLA shows that FFS impacts the continuum terms starting from short- to long-term impacts. A pentagonal diagram in Figure 1 presents five livelihoods capital assets. In general, the SLA holds an assumption that the more and stronger sustainable capital assets, the more empowering outcomes. The SLA is suitable for analyzing community development as a result of an intervention program (Ansell, Hajdu, van Blerk, & Robson, 2016).

Research method

This study took the place of regions where potential vegetable production of Indonesia. The regions included Eastern Java, Northern Sumatra, and Bali. Surveys were carried out immediately after the completion of FFS. In Sumatra (North Sumatra and Aceh Special Region provinces) FFS was in 2009. In Java (Central and East Java provinces), FFS was in 2010 and 2014. In Bali, FFS was in 2014. The total sample of the survey was 270 farmer groups, which consisted of 120 groups in Java, 90 groups in Sumatra, and 60 groups in Bali. Every group of FFS was represented by around ten farmers, which included 3-4 women.

Data were gathered using focus group discussions (FGDs), which are acceptable to agricultural extension and agricultural economics to collect information related to practices of farming system (Mancini & Jiggins, 2008). FGDs were employed to acquire points of view and ideas of the targeted communities on the enumerated research issues, to evaluate, analyze, and prioritize targets' requirements, to formulate appropriate interventions, and to examine the respondents' level of acceptance/rejection of new technologies, knowledge or ideas. This study selected FGDs to discover the opinions, experience, views, and perception of the aspects of new technological packages for farming practices of vegetables. The justification for utilizing FGDs was that the population members were relatively homogenous regarding age, social class,

cultural character, and knowledge level. It also creates an atmosphere where participants feel relax with others and feel free to express their ideas. FGDs were conducted after the last cropping season completed.

Data collected using FGDs portray actual communities as invited participants provide information about standard farming practices. When a participant provides erroneous information, others will counter with correct facts. When there is a disagreement, the average is approved. The use of participatory approaches can discover social and institutional, and qualitative impacts of FFS (Mancini & Jiggins, 2008). Many patterns can be analyzed using this method (Purushotham & Paani, 2016). The content of the FGDs was inspected and interpreted (Janis, 2009). Krippendorf (2004) endorses this approach for its simplicity.

During FGDs, the five components of livelihood assets were indexed to quantify the impact of FFS. The index of sustainable livelihoods has been adopted in research (Kamaruddin & Samsudin, 2014; Liu, Huang, Wang, Luan & Ding, 2018). The facilitator asked farmers in a group to provide an answer YES or NO to questions related to the improvement of livelihoods capitals after participating in FFS. The improvements were indexed in percentage changes using a formula: $I = \frac{n}{N} \otimes 100\%$, where I is the improvement index, n is the number of farmer groups providing YES, N is the total number of farmer groups in the survey.

Results and discussion

FFS is likely to favorably impact the livelihoods of the farmer community, which can be detected in the changes in five livelihood assets comprising natural capital, financial capital, physical capital, human capital and social capital. Overall, the livelihood capitals increased by approximately 40 % after the participation of FFS (Figure 2).

[FIGURE 2 HERE]

The impacts of FFS on individual components of livelihoods capitals were positive. This means that the benefits of FFS were gained by farmers. This finding corresponds the fact that worthwhile impacts, i.e., training undertaken by farm family leads to a better condition in terms of the households' human capital and key cropping technology and innovations. The synchronized skills of farmers, unique environmental features of the farm, the farmers' involvement in business planning, and organizational management also act a role significantly in inducing the farm performance (Xayavong et al., 2016). The highest increase was physical capital, which accounted for 41%, and the lowest increase was natural capital, which accounted for 33%. Farmers recognized that improvements in physical and financial capitals were direct and immediate benefits resulting from farming activities after the participation of FFS. While other capitals were identified as indirect and gradual benefits. The scale and level of perceived benefits vary across FFS sites. Several internal factors, as well as external ones, in the communities might affect the variation. Tables 1-5 present the specific increases in the elements of each livelihood capital.

[TABLE 1 HERE]

Table 1 summarizes the significant impacts of FFS on the physical capitals of participants. Over two-thirds of the surveyed farmers perceived that they reduced agrochemicals in their vegetable farming. These components of physical are the immediate outcomes of FFS (Van den Berg, 2004). Many studies have shown that FFS improves farm productivity and efficiency of input use (Luther et al., 2018; Kuntariningsih & Mariyono, 2013; Yamazaki & Resosudarmo, 2008; Pananurak, 2010). FFS has contributed to lowering insecticide use (Tripp, Wijeratne & Piyadasa, 2005). Botanical pesticides partly substituted the synthetic ones. Organic materials for composts and green manure replaced inorganic fertilizers. About 60% of farmers showed

increased production levels. These positive changes in physical capital were considered positive impacts of FFS. The percentage of farmers in Java and Sumatra who were able to reduce agrochemicals were higher than those in Bali. Different intensity of farming could be the factor affecting the gap (Luther et al., 2018).

After graduating from FFS, the need for more labor input because it requires a higher number of paid laborers to apply organic material preparation, and increasing the number of periodic monitoring and field observation of diseases and pests. This condition confirms a finding of Larsen and Lilleør (2014) that farmers reallocate labor resource to improvement of agricultural production leading to increased food security. When labor force in rural areas is uncontrolled, the creation of new jobs is a good outcome for social purposes related to development. Since the high level of job in neighboring urban areas is uncertain, it is unlikely for these farmers to migrate to urban areas immediately. Overall, many farmers in the community felt that the benefits of FFS were more favorable than the detrimental effects. The increasing number of workers employed in agriculture because of new technology adoption can be perceived as positive outcomes for some households because of the additional income from extra work.

[TABLE 2 HERE]

The FFS improved physical capital because it closely connects to financial capital resulting from the monetary value of the physical capital valued at the prevailing price and wage rates in the market. Table 2 indicates encouraging influences of FFS in relation to reduced costs allocated for materials use. In particular, agrochemicals of which the farmers were not able to locally produce and they should buy from the local markets. Its replacement with organic material perhaps conserves capital scarcely used for farming practices in the communities. The improvement of financial capital is advantageous to the communities as the capital provides multiplier effects that

increase other forms of capital (Meikle, Green-Pimentel & Liew, 2018). Malual and Mazur (2017) show a positive association of financial capital with social capital in a community. Eventually, the increase in social capital leads to the happiness of the community members (Rukumnuaykit & Pholphirul, 2016). In general, farmers noticed an augmentation in the production value after the FFS. Farmers enjoyed extra earning resulted from a decrease in costs of external inputs and improvement in the productivity of crops simultaneously. The total costs of fertilizers and pesticides decreased by about 15% to 25%, respectively. At the same time however, the production value (or gross return) increased by about 25%. Ultimately, the efficient use of agrochemicals consisting of fertilizers and pesticides, and improvement of productivity increased the level of profit. The average increase in the value of production was approximately 20%. The reduced total cultivation costs allow for farmers repay debt and physical assets. The participants perceived that the production system has been more economically resilient than counterparts when they faced adverse environment (Mancini et al., 2007). The FFS familiarized new techniques and improved technologies to farmer participants. The technologies have increased farmers' incomes (Mariyono, 2019).

The opportunity costs associated with increases in labor and wage structures were perceived as adverse effects of FFS related to financial capital. Wage rate increased in due to increased time and labor allocated for the preparation of botanical pesticides and collecting organic materials for compost increased. Overall, farmers after FFS earned 45% higher than before. Labor costs associated with the collection of organic materials were offset by cash resulting from the reduced use of external materials.

[TABLE 3 HERE]

Table 3 shows that FFS positively impacted human capital. The rise in human capital intensely associated with the enhanced knowledge of vegetable production. Considerable accomplishment in human capital mainly due to the improvement of crop management and plant protection knowledge. The improvements in human capital are intangible, such that it is difficult for farmers to provide precise values of change for components of human capital. Overall, these components represent the desirable impact on the increase in the skill and farming know-how of vegetable cultivation (Thiele, Nelson, Ortiz & Sherwood, 2001; Quizon, Feder & Murgai, 2001; Guo et al., 2015; Luther et al., 2018). David and Asamoah (2011) suggest the subjects for improvement of FFS and pay full attention to how to enhance human capital in the communities for wider activities. Farmers' expectation of the advantageous impacts of FFS on human capital almost similar across the study sites. Improved knowledge of pest and disease management and soil ferritization were the most substantial impacts. Similarly, the identification of insect pest and disease types, and beneficial organism were other advantageous resultants of FFS participation. Sumatran farmers felt the best in pest and disease management.

There were no adverse impacts of FFS perceived by farmers regarding the elements of human capital. A few farmers noticed the undesirable impacts on human capital in terms of jealousy among farmers in the community who have not joined in the FFS training.

[TABLE 4 HERE]

The impact of FFS on social capital is presented in Table 4. The cohesiveness of farmers in the group as well as between groups, which represents social relationships, became strong and coherent after completing FFS. Many activities in FFS have made social relations among farmers cohesive and enhanced the skills of the community. The farmers generated social networking to exchange knowledge and information. FFS also encouraged the formation of farmers' groups and

improved farmers' confidence to operate farm more efficiently and effectively in the community (David & Asamoah, 2011). The improvement of human and social capital has represented the empowerment of farmers (Müller, Guenat & Fromm, 2010). The indicators are the most visible impact on the social relationship, as the neighborhood social cohesion tended to sustain community development (Cheung & Leung, 2011) and potentially build community together (Olberding & Miller, 2018).

[TABLE 5 HERE]

Table 5 provides information on how FFS positively impacts natural capital. Constructive impacts on this capital were represented by improvements in soil fertility, biodiversity, environmental quality, and human health. The improvement in natural capital is important because "the concept of natural capital has been increasingly promoted within environmental governance as part of an expanding coalition of the world's most influential environmental organizations and corporations" (Fletcher, Dressler, Anderson & Büscher, 2018, p. 5). Pretty and Bharucha (2014) highlight the improvement of the sustainability of farming. FFS has played an essential role in delivering IPM (Van den Berg & Jiggins, 2007; Pretty, Toulmin & Williams, 2011).

Overall, the expected impacts on the agroecosystem were due primarily to a balanced population of pests and diseases, and beneficial organisms. FFS also led to soil fertility conservation in terms of balanced soil structures resulting from the increase in the content of organic materials. Farmers have learned many techniques to reduce the use of agrochemicals (synthetic pesticides and inorganic fertilizers) and to avoid possible poisonous contamination to the agroecosystem and the health risk of pesticides. Javanese and Balinese farmers perceived deeper impressions of FFS than those of Sumatran. Engagement in FFS provided useful

contributions to human health. Nevertheless, a few adverse impacts of FFS might arise due to farmers' belief that attack incidences of pests and diseases tend to increase if farmers neglect monitoring the field regularly and do not implement suitable control strategies.

Based on the development of the livelihood capitals, this study verifies hypotheses claiming that farmers' participation in group-based FFS can empower farmer communities and increase welfare. The linkage between FFS participation and empowerment in daily livelihood was clear in the country. This link shows an association between FFS membership and uptake of technology and innovation, resulting in increased access to extension service providers. FFS provided optimistic impacts on the capacity of the household in decision-making and critical thinking at a household level (Duveskog et al., 2011). It is also confirmed in this study that high training quality in practices promote vital process of empowerment. The literature recognizes well the reduced quality training during scaling up processes of empowerment (Cooke & Kothari, 2001; Parkinson, 2009). Rural and agricultural development programs need to concentrate more on the empowerment processes of farmers than technical aspects agriculture that pronounce intervention programs to generate a balanced mixture of social and technological progression to achieve sustainable development (Friis-Hansen & Duveskog, 2012). Successful farming system enable farmers to realize economic independence and improved livelihoods, leading to empowerment (Khanum & Al-Mahadi, 2015). Mula and Sarker (2013) show that sustainable livelihood empowerment is a positive impact of improved agronomic techniques or technology. Overall, FFS is promising in promoting empowerment at the personal and structural levels (Dzecoa, Amilaia & Cristóvão, 2010; Molesworth et al., 2017). The training through FFS equips farmers with skills, knowledge, and innovations to improve their crop husbandry, productivity, as well as empowerment level, and leadership skills. It is recommended that to train

farmers in FFSs is affordable, effective and sustainable in transforming farmers' behavior. Interested parties are recommended to increase financial support and adopt FFS to educate farmers (Maina, Gowland-Mwangi & Boselie, 2012). Scoones (2009) points out that the perspectives of livelihoods describe an imperative lens for the investigation of multifaceted inquiries of rural development. Livelihood perspectives must deal with more curiously and concretely inquiries across the four themes of dynamics knowledge, politics, and scale. Kay (2009) suggests that a strategy that generates and augments a synergy between agriculture and other sectors goes beyond the rural-urban continuum that provides the greatest projections for creating a progression of rural development.

Conclusions and implication

Production of high-value vegetables in Indonesia is the challenge coming from the low level of farmers' education. This condition leads to the low capacity of farmers in operating farming in rural areas. Various development projects launched training programs for vegetable farming and disseminated the technology to farmers through FFS. Based on a theory of sustainable livelihood framework, the FFS is expected to empower farmers through the improvement of farmer livelihoods.

Using a sustainable livelihood framework offers evidence if the FFS contributes to improvement in farming capacity in terms of improved five livelihood capitals. Empowering impacts of FFS in the study sites appeared. At the community level, the FFS provided positive impacts on all five livelihood capitals. After participating in the FFS, farmers efficiently used agricultural inputs, without significant losses. They could reduce the level of agrochemical inputs, which were environmentally detrimental, and replaced them with environmentally friendly inputs. The farmer participants also reduced the cost of vegetable production by about

one third. The total costs decreased due merely to the adoption of some techniques learned at the FFS, which would guarantee high productivity and turnover from vegetable farming. Similarly, FFS gives positive social implication, in terms of good interaction among farmers, high solidarity in a group, close communication with agricultural extension officials. Sharing of information became intense, particularly on crop production. Progress of extension became effective due to substantial increase in frequency of farmers' group meeting. These impacts were also due to enhancement in the human capital in terms of enhanced knowledge and innovations of the participants.

To sum up, FFS successfully empowered farmer communities. Farmers conveyed their interest to keep asking for FFS as training media in the future. Farmers have realized the value and benefits of such FFS for augmenting livelihoods, as reflected by their willingness to provide the cost for its implementation partially. Farmers and gave feedback suggestions on the improvement of the FFS process. Farmers revealed that topics and materials of the school required adjustments to local needs and issues. Results of this impact evaluation will be useful for next implementation of FFS programs of agricultural production in the study sites and other parts of Indonesia. Since agricultural research institutions proactively improve technology, policymakers can introduce and spread technology through FFS. FFS is still one of the best approaches to empower farmers and to disseminate agricultural knowledge and innovations simultaneously.

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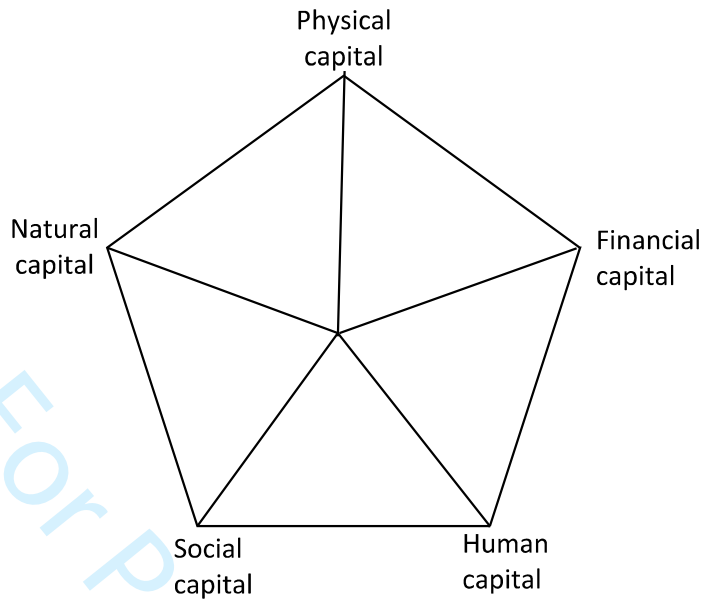

Source: Serrat (2008)

Figure 1. Pentagonal diagram for sustainable rural livelihoods

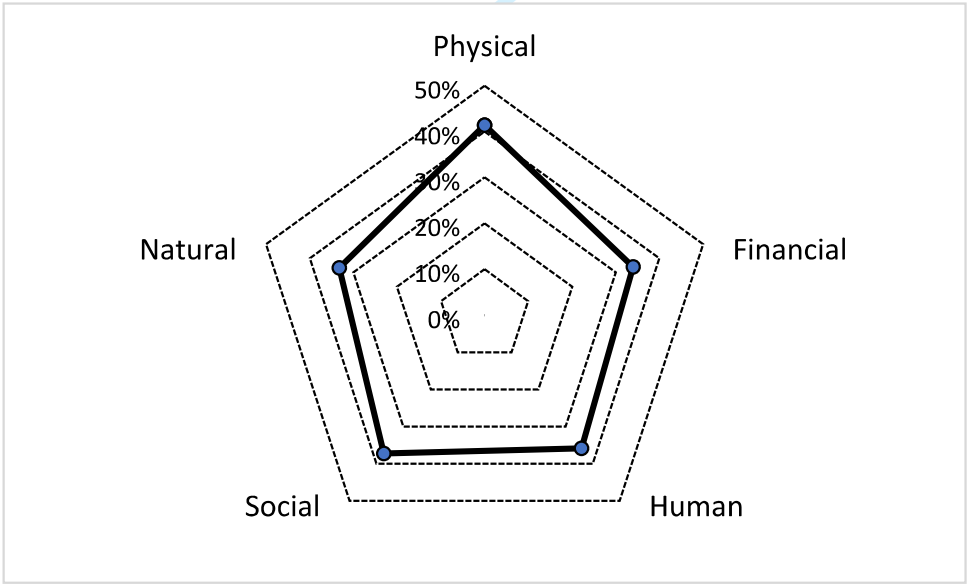

Figure 2. Percentage changes in livelihood capitals resulted from FFS

Table 1. Physical capital changes resulted from FFS.

Physical capital components	Java (N=120)		Sumatra (N=90)		Bali (N=60)		Total (N=270)	
	n	%	n	%	n	%	n	%
Increase in use of bio-pesticides	15	13	20	22	10	17	45	17
Decrease in use of inorganic fertilizers	80	67	55	61	25	42	160	59
Decrease in use of synthetic pesticides	85	71	72	80	15	25	172	64
Increase in vegetable production	35	29	55	61	25	42	115	43
Increase in use of organic fertilizers	25	21	15	17	25	42	65	24

Note: n is the number of groups responding to the respective variables/physical capitals.

Table 2. Financial capital changes resulted from FFS.

Financial capital components	Java (N=120)		Sumatra (N=90)		Bali (N=60)		Total (N=270)	
	n	%	n	%	n	%	n	%
Reduction in fertilizer cost	45	38	18	20	27	45	90	33
Reduction in pesticide cost	52	43	19	21	9	15	80	30
Reduction in production cost	75	63	35	39	0	0	110	41
Increase in gross revenue	25	21	33	37	12	20	60	22
Increase in profit/income	50	42	60	67	10	17	120	44

Note: n is number of groups responding to the respective issue

Table 3. Human capital changes resulted from FFS

Human capital components	Java (N=120)		Sumatra (N=90)		Bali (N=60)		Total (N=270)	
	n	%	n	%	n	%	n	%
Seed technology	20	17	30	33	10	17	60	22
Pests and diseases	70	58	90	100	40	67	200	74
Soil fertility and fertilizers	40	33	20	22	30	50	90	33
Natural fertilizers and pesticides	60	50	20	22	0	0	80	30
Value chain and marketing	20	17	20	22	0	0	40	15
General farming on vegetables	70	58	20	22	20	33	110	41

Note: n is number of groups responding to the respective issue

Table 4. Social capital changes resulted from FFS

Social capital components	Java (N=120)		Sumatra (N=90)		Bali (N=60)		Total (N=270)	
	n	%	n	%	n	%	n	%
Communication	12	8	39	44	19	33	70	26
Sharing information	11	8	29	33	10	17	50	19
Social cohesion	108	92	32	33	60	100	200	74
Contact with extension officials	40	33	20	22	20	33	80	30

Note: n is number of groups responding to the respective issue

Table 5. Natural capital changes resulted from FFS

Natural capital components	Java (N=120)		Sumatra (N=90)		Bali (N=60)		Total (N=270)	
	n	%	n	%	n	%	n	%
Agroecosystem	62	50	38	44	0	0	100	37
Soil fertility	52	42	69	78	49	83	170	63
Beneficial insects	20	17	0	0	0	0	20	7
Human health	28	25	21	22	21	33	70	26

Note: n is number of groups responding to the respective issue