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SHARING EXPERIENCES OF COCOA FARMER FIELD SCHOOL (FFS) IN SABAH

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ABSTRACT – *This paper is to share experiences of introducing the cocoa farmer field school (CFFS) program in Sabah, particularly in Togis Village, Ranau back in year 2016. The CFFS program was widely conducted in other cocoa producing countries such as Indonesia, Nigeria, Ghana and others. The reasons to introduce the CFFS program in Togis village, Ranau was due to low productivity among the farmers because of technical knowledge lacking and poor decison making in managing their farms. In order to overcome the issues, they were particularly in need of training which would give them the knowledge and confidence to make their own proper decision. The CFFS program was particpated by 19 farmers which took 16 weeks to the completion. The co-curriculum of CFFS program was designed in such a way to train the participants on Good Agriculture Practice (GAP) approach on their own plot. The main activities in the CFFS program involved Agro-Ecosystem Analysis (AESA) by observing the agroecosystem of cocoa trees in their plot by collecting data and presenting their findings and solution on how to manage pests and diseases problem. The facilitators for the CFFS program were the researchers and extension agents from MCB that have been well-trained by the expert from Centre for Agriculture and Biosciences International (CABI) and The International Cocoa Organization (ICCO). The activities implemented demonstrated that CFFS program could effectivey fill the gap in extension services and enable farmers to become more efficient and self-reliant managers of their agricultural resources as their yield increased.*

Key words: Cocoa Farmer Field School, Agro-Ecosystem analysis, Ranau, Farmers, Good Agriculture Practice

INTRODUCTION

Sabah was one of the major cocoa production back in 80s but went deep structural changes, from plantations to farmers starting 90s till now. Almost 100% of cocoa farm in Sabah now was owned by farmers compared to year 1983 where plantation still owned 79%. The drastic changes have an impact on the cocoa planting acreage and beans production in Malaysia especially Sabah as both figures in Sabah were dropped significantly from 132,729 hectares in 1983 to 6,847 hectares in 2015 meanwhile the beans production recorded drop from 29,954 tons in 1983 to 654 tons in 2015 (MCB, 2020a; MCB, 2020b). The reasons of the production declined due to the productivity among the farmers still low. Among issues were lack of technical knowledge and poor decison making among farmers in managing their farm. In order to overcome the issues, they were particularly in need of training which would give them the knowledge and confidence to make their own proper decision.

The training that could provide confidence for the farmers to make decision in managing their farm was farmer field school (FFS). The FFS which was first introduced in Indonesia in year 1989 by UN Food and Agriculture Organisation have participation of more than two million farmers across Asia (wikipedia, 2020). The early ideas of FFS was to develop the farmers knowledge in a participatory process with extension and research (Gockowski

et al., 2010). As compared to extension approach known as top down linear approach that has led to rigid bureaucracies and prevented systematic learning (Pretty, 1995), this FFS discovery learning approach encourages field observation and experimentation among the participants, usually in support of integrated pest management (IPM) practices (Gockowski *et al.,* 2010). There was advantage of FFS comparing to general recommendation make for farmers in IPM across large and highly areas as FFS will train farmers become (IPM) experts in its local specificity due to ecological heterogeneity (Braun *et al.,* 2006).

After the success of implementing FFS and its initiative Farmer-to-Farmer FFS program in Indonesia in 1990, the adoption of FFS was widely spread throughout several countries (CIP-UPWARD, 2003). Countries such as Bangladesh, Cambodia, India, Philippines and Vietnam have adopted the IPM – FFSs with support from the FAO Inter-country IPM Programme from 1991 to 1994 (Braun *et al.,* 2006). Later the FFS program expanded to China, Lao PDR, Nepal and Sri Lanka where a farmer-led FFS is now a standard element in most FFS programmes around the world (CIP-UPWARD, 2003). Now the concept of FFS has developed far beyond IPM in rice with at least a total of 78 countries involved from Asia, Sub-Saharan Africa, Latin America and the Caribbean, Near East and North Africa, and Central and Eastern Europe (Braun *et al.,* 2006). Example, FFS moving from primarily rice IPM in Asia to vegetable and cotton IPM (Ooi, 2003; Ooi *et al.,* 2004) in Asia to potato IPM in Latin America, cotton, rice, tree crops (cocoa) and vegetable IPM in Africa, vegetable and fruit IPM in the Middle East and now towards mixed systems in East Africa with crops, poultry and dairy cows (AGRIDAPE, 2003; CIP-UPWARD, 2003; LEISA, 2003a; LEISA, 2003b).

Therefore, Malaysian Cocoa Board (MCB) has taken a proactive approach to introduce the cocoa farmer field school (CFFS) program in Sabah. This paper is to share experiences of introducing the cocoa farmer field school (CFFS) program in Sabah.

METHODOLOGY

Location of CFFS Program

Malaysian Cocoa Board (MCB) has introduced the Cocoa Farmer Field School (CFFS) program in Togis Village, Ranau, Sabah as one of potential cocoa area in 2016. The cocoa planted area in Ranau was estimated 170 hectares in year 2014 with 307 farmers. The Togis Village in Ranau was chosen because of its farmers in Togis village and nearby are involved in the Ranau Highlands Cocoa Cluster Chain Project (RHCCCP). The RHCCCP coordinated cultivation of the crop in Togis area through an integrated effort in line with the "farms to table" concept.

Duration of CFFS Program

The duration of CFFS program was 16 weeks (9 May 2016 to 30 August 2016) that covered a whole cropping season. The first week of CFFS program involved classroom theory learning and practical activities. For next 14 weeks involved setting up Participatory Action Research (PAR) and conducting Agro-Ecosystem Analysis (AESA). The final week of CFFS program was the field day and participants graduation day.

Steps in Conducting CFFS Program

The implementation of CFFS Program involved four main steps (Batil, 2009; SUSTAINET EA, 2010):

a. Identify and assess the community problem in cultivating cocoa,
b. Participant selection from the cocoa community,
c. CFFS Program implementation and evaluation, and
d. Field day and graduation for the participants.

a. Identify and assess the community problem in cultivating cocoa

A site visit to the CFFS program to be conducted was initiated. Then, followed by the baseline survey on interested farmers from cocoa community before commencing the CFFS program. The baseline survey was conducted to collect the farmers' profiles, identify their field problems and design CFFS activities in such a way so as to solve the problems during the functions of the school.

b. Participant selection from the cocoa community

i. Participant selection

The CFFS program in Togis village, Ranau was participated by 19 farmers coming from seven villages located nearby Togis village, namely Togis village (2 farmers), Takutan village (2 farmers), Nalumad village (1 farmer), Perancangan village (3 farmers), Poring village (3 farmers), Napong village (5 farmers) and Laap Togis village (3 farmers). The farmers were selected based on their commitment to attend all sessions, and willing to work together as a team and share ideas. They were part of the Malaysian Cocoa Smallholder Development Program with activities described in Ramle *et al.* (2008).

ii. Training of facilitators

A total of nine facilitators involved in the CFFS program. The facilitators for the CFFS program were the researchers and extension agents from MCB that have undergo a special training under the CocoaSafe Project sponsored by Standards and Trade Development Facility (STDF) which collaborated with Centre for Agriculture and Biosciences International (CABI) and The International Cocoa Organization (ICCO) in year 2014.

c. CFFS Program implementation and evaluation

The implementation of CFFS Program were followed the manuals in Batil (2009) and Lee *et al.* (2015):

i. Plan and prepare CFFS activities and curriculum

The main activities of the FFS included the opening ceremony, Ballox Box Test (BBT), curriculum containing basic technical subject matters, insect zoos, discovery-learning exercises, farmer field studies, Agro-Ecosystem Analysis (AESA) on field monitoring, drawings and presentation, special topics, farmer field day and the graduation ceremony with awarding of certificates to the farmer participants on conclusion of the FFS. The topics covered in the co-curriculum of CFFS program are;

- Discussion on constraint faced by cocoa farmers,
- Discussion on pests and diseases problem in cocoa farmer's plot and post-harvest problem related to safety issues,
- Pest life-cycle such as cocoa pod borer (CPB) and Agro-Ecosystem Analysis (AESA) in cocoa,
- Cocoa black pod disease (CBPD) zoo,
- Pesticide application technology,
- Building the Dynamics group,
- Calibration and performance sprayers,
- Pruning and canopy control,
- Pod sleeving,
- Harvesting cocoa pods,
- Pods breaking,
- Alternative fermentation method,
- Storage of cocoa beans.

ii. Group formation

The participants formed small groups with each group having usually 4-5 members with the facilitator supervision. The role of facilitators were to ensure every group has appropriate balance of gender or professional expertise.

iii. Participatory Action Research (PAR)

Each group was involved in PAR activity where participants undertaking simple experimental study to find solutions to local field problems in each group for 14 weeks. Each group will identified one acre cocoa plot to be used in PAR. Then, the plot was divided into two subplots. Subplot 1 was named as Integrated Pests and Diseases Management (IPDM) plot and subplot 2 was named as farmer's practice plot. Decision making on pests and diseases

management on subplot 1 was based on monitoring and data recording done every week on 5 trees randomly selected from subplot 1 (e.g. number of pods infested by CPB and CBPD) while pests and diseases management in subplot 2 based on normal practise by farmer. The participants were compared both plots in terms of plot performance. The task was a learning strategy and not research work.

iv. Agro-Ecosystem Analysis (AESA)

A corner stone of the FFS methodology is AESA. It established by observation of the interaction between a crop and other biotic and abiotic factors co-existing in the field (Khisa, 2004). AESA also being used in PAR as an important decision-making tool for farmers in subplot 1 (Batil, 2009). AESA was done once a week for 14 weeks where each CFFS group were made observation on the cocoa trees and other aspects of the agroecosystem including disease and pest infestation, weather, weeds and soil. Then, they made a drawing to represent the data they collected and analyzed their findings. Each group made recommendations on what action should be taken on the farm to address production constraints.

v. Dealing with special topics

CFFS program has included the special topic that was lead by facilitators or invited experts to help participants to learn the field problems facing by farmers at various growth stages of cocoa. This was to enable farmers have a thorough knowledge about his field problems so as to be able to initiate timely action to solve them. The special topics were formation of group dynamics, technique of fertilization, how to make own fertilizer with cocoa waste, proper pruning, understanding CPB ecology and its control method, CBPD symptom and its control method, technique of fermentation and beans quality grading.

d. Field Day and graduation for the participants

CFFS participants were organised a Field Day combined with graduation at final week (16th week). All participants were involved in preparing field day where they became the facilitators by exhibiting their findings or learning discovery from their AESA throughout 14 weeks in the field. The farmers from nearby villages were welcome to join the field day to understand what actually CFFS program that can lead the farmers become an independent and able to solve the problem in the fields based on the PAR carried out.

RESULTS AND DISCUSSION

Demographic Profiles of Participants

The baseline study was carried out on the participants prior to the the CFFS program started. The CFFS program has 31.58% young participants with age less than 39 years old followed by 31.58% middle aged participants of 40 to 49 years old. Meanwhile there was 21.05% partcipants at aged between 50 to 59 years old and 15.79% at the age of above 60 years old (Table 1). As the CFFS program has more male participants (74%) compared to female (26%) (Table 1). Over 60% of the participants showed they received high school education while only 58% have knowledge on cocoa planting technology through the Cocoa Basic Technology Course (CBTC) organised by MCB (Table 1). Prior to attend the CFFS program, most of the participants have experiences in cocoa cultivation where 42% have less than 6 years, 42% have between 6 to 10 years and 16% have more than 10 years experiences (Table 1).

Farm Problems Faced by Participants

Almost 50% of the participants facing the problem of pests and diseases such as CPB and CBPD (Figure 1). Another major problem faced by the participants was weather change (high humidity due to highland in Ranau) that caused losses to the yield. Both CPB and CBPD have been reported as major problems in Ranau in year 2014 during the baseline survey conducted on farmers involved in Cocoasafe project (STDF, 2016). Other problems in the farms faced by the partcipants were mamalian pest, stem borer and

Vascular Streak Dieback (VSD) disease which recorded less than 30%. Therefore, the CFFS program was designed in such a way to facilitate the participants in handling the problems of both CPB and CBPD.

Knowledge Prior to CFFS program

Figure 2 showed most of the participants (above 80%) have knowledge on crop management which involved fertilization, field preparation and weed control. These knowledge was gained from attending CBTC. In terms of pests and diseases control, most participants have knowledge below 50% such as CPB (47.4%), CBPD (42.1%), mamalian pest (36.8%) and VSD (31.6%). Lack of knowledge on how and when actions should be taken to control CPB and CBPD has brought to the problems facing by the participants as reported in Figure 1. Another problems facing by the participants were very low knowledge in record keeping, cultural practice and field sanitation (below 22%). Both cultural practice and field sanitation were important especially in managing the losses due to CBPD.

Activities Carried Out in Pre-CFFS Program

The facilitators have early discussion on identifying the village to implement the CFFS program, its participants and planned the co-curriculum (Figure 3). Then, the facilitators were carried out the baseline study to gather information related to the community problems on cocoa as the information later can serve as important special topics in the CFFS program (Figure 4).

Ballot-Box Test (BBT)

This exercise also know as field-based test to evaluate participants' knowledge before joining the FFS to enable facilitators to assess the impact of training. This BBT can be adopted by illiterate participants. Twenty "balloting" stations (e.g boards with three small boxes and a multiple choice question attached) were placed around the edge of a study field (Figure 5). Participants went from station to station and place their answers in the boxes that are lettered according to the choices associated with each question (Figure 6). The questions were designed in such a way to measure the understanding of ecology cocoa, ability to identification of pests, natural enemies, diseases, and damage symptoms, and knowledge of crop management methods.

Table 1: Demographic, Educational, Knowledges and Experiences Status of CFFS participants

Variables		***N***	***(%)***
Demographic			
Age group:	Less than 39 years old	6	31.58
	40 to 49 years old	6	31.58
	50 to 59 years old	4	21.05
	Above 60 years old	3	15.79
Gender:	Male	14	73.68
	Female	5	26.32
Educational			
Level:	Primary	6	31.58
	Secondary	13	68.42
Knowledges			
Have attended course:	Yes*	11	57.89
	No	8	42.11
Cocoa cultivation experiences			
Number of years:	Less than 6 years	8	42.11
	6 to 10 years	8	42.11
	More than 10 years	3	15.79

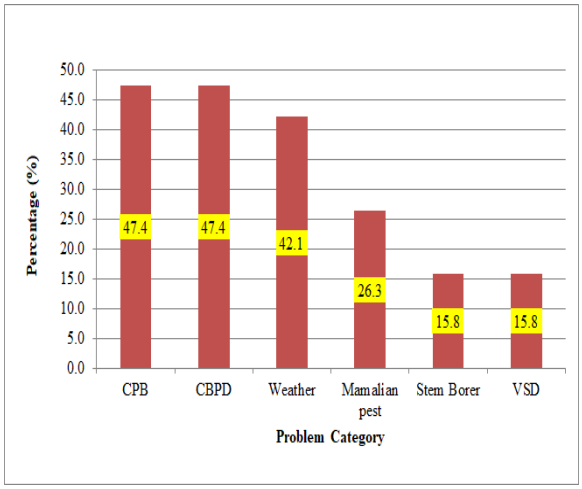

Figure 1: Problems faced by participants in the farms

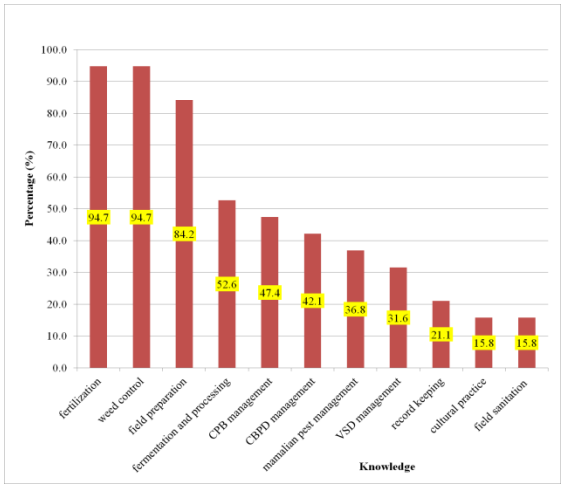

Figure 2: Knowledge prior to participate in CFFS program

Figure 3: Discussion among facilitators to understand the community problem in cultivating cocoa before conducting CFFS program

Figure 4: Interviewed participants for baseline study prior to CFFS program

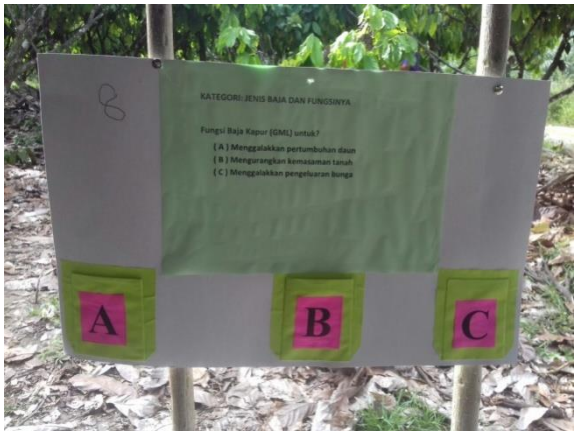

Figure 5: Example Ballox Box Test (BBT)

Figure 6: Partcipant placed his card contained his name in the box that are lettered according to the choices associated with each question.

Classroom Theory Learning in CFFS Program

The participants were divided into four groups having usually 4-5 members with help from the facilitators (Figure 7). It was important for the groups to work as a team to implement PAR since the management of pests and diseases often demands the group actions of farmers or requiring a community approach (Batil, 2009). For the first week, the participants were attended classroom theory learning organised by the facilitators that covered the cocoa cultivation and its technologies as mentioned in the methodology of this paper (Figure 8).

Figure 7: Forming the small groups among the participants

Figure 8: Classroom theory learning during 1st week CFFS program

AESA Practice During CFFS Program

The participants were briefed by the facilitators on how to carry out the AESA activities and each group were provided with tools such as polythene bags, vials, alcohol, cotton wool, hand lens, sweep nets, flip chart paper, notebook, pencil, colour markers, crayons, rulers, machete or knife to be used in the AESA (Figure 9). The AESA was involved three important activities, namely AESA observation, AESA drawing and AESA decision making (Lee *et al.*, 2015). The AESA activities were carried out in both subplots (1 and 2) in PAR.

AESA observation: Figure 10 showed the participants collected pod and leaves samples for insects and disease zoo study in both subplots. Among activties in AESA were observing and counting all insects found, both pests and natural enemies, observing 5 leaves and pods (if available), taken at random by recording how many leaves and fruits are diseased, and recording general condition of trees (healthy, moderately healthy, weak). Besides that, weather conditions (sunny, cloudy, going to rain) at time of making observations were recorded. Soil moisture levels (high, medium, low) and shade coverage (heavy, medium, light, or in % shade) were also recorded. The participants also need to estimate % flowers and counting number of cherelles on the tree. Lastly, number of pods (>10 cm), unripe and ripe pods were counted. Then, the collection of samples observed and identified in insects and diseases zoo study were kept in the container for displayed and share with other groups of their findings (Figure 11).

AESA drawing: All samples collected in the field were brought back to the meeting place, each group was drew all the main observations on a flip chart paper (Figure 12). The drawing showed the tree in its present state of growth, with the sun or clouds symbolizing the weather conditions. In the addition, observations of specific problems were also listed in AESA drawing with the possible causes and recommendations on follow-up actions.

AESA decision making: The participants also being taught on how to make decision making based on their findings in AESA as the final outcome of the AESA is the decision-making (Lee *et al.*, 2015). The action on what management decision to make was done after discussion within each sub-group. (For example, given the relative pest and natural enemy populations, disease levels, do we need to spray or are there other management options?). Each group was given opportunity to share their findings from AESA study and recommendations for problems in the field (Figure 13). They also shared their cocoa cropping calender used in farmer practices plot (Figure 14).

Figure 9: Participants ready for AESA study

Figure 10: Participants collected samples for AESA study

Figure 11: Collection of samples observed and identified in zoo insects and diseases study

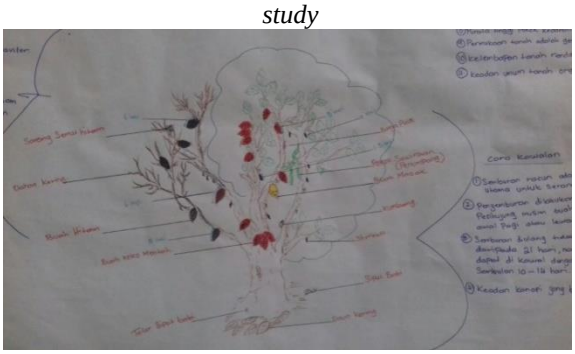

Figure 12: Participants recorded sample collected and draw the observations on the flip chart paper

Figure 13: Participants presented their findings and recommendations from AESA study

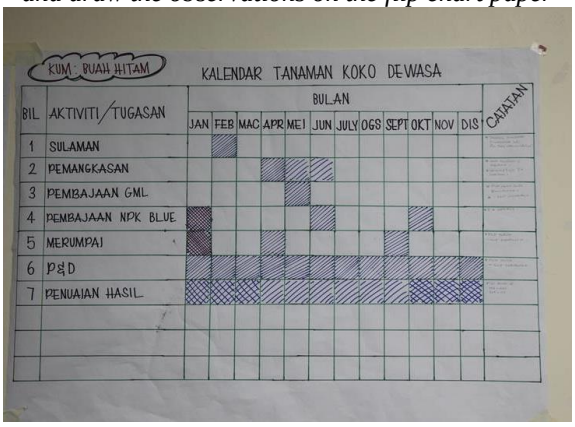

Figure 14: Cocoa cropping calender by group

Rational Pesticide Use (RPU) in CFFS Program

Participants were exposed to spray dye exercise (SDE). This activities was important as it helped to create awareness among farmers of the health dangers they faced when spraying pesticides. Awareness of these dangers may encourage them to better protect themselves and maintain and repair their spraying equipment. In SDE, the volunteers were completely wrap up (except for the eyes) in toilet paper (Figure 15) and followed by the volunteers filled his/her sprayer with the dye solution and then sprayed cocoa trees for 10 minutes as though using a pesticide (Figure 16).

Figure 15: Volunteer was wrapped up with toilet paper in SDE.

Figure 16: Volunteer sprayed cocoa trees with the dye solution in the sprayer.

PAR Activities Carried Out in CFFS Program

Participants were spent one day in each week for the rest of 14 weeks to meet their group members. During the meet-up, they were carried AESA in both subplots (Figure 17) as they learnt during the first week in CFFS program. Three steps as mentioned earlier in AESA activities (AESA observation, AESA drawing and AESA decision making) were carried out each week (Figure 18). The PAR was allowed the participants to understand the differences in yields in terms of total and mean weight of wet beans under the different plot conditions (i.e. IPDM plot vs farmer's practice plot). As IPDM plot (subplot 1) was practicing the Good Agriculture Practice (GAP) for example pruning the trees at correct way and height (Figure 19). This particular exercise should become a regular PAR activity in FFS until farmers are familiar and adopt good crop management practices. End of the day in each week, the groups were meet in specific location to share and present their findings in AESA in front of all faciltators and all particpants (Figure 20).

Participants also being exposed to special topics on certain week such as crop husbandry given by graduate FFS from Indonesia (Figure 21). This topic can help the participant to understand the importance of pruning and canopy height control for effective control of CPB infestation.

Figure 17: Subplots (IPDM plo and farmer plot) used in PAR.

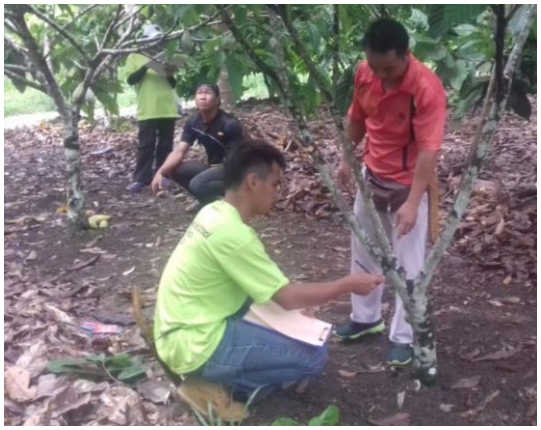

Figure 18: Participant was supervised by facilitator in recording data in PAR.

Figure 19: Participants doing prunning in suplot 1.

Figure 20: Leader of each group presented their weekly AESA findings.

Figure 21: Special topics on crop husbandry

Farmers Field Day and Graduation in CFFS Program

Close to the end of the CFFS program, partcipants were organised the farmer field day in conjunction to their graduation day. During the field day the CFFS farmers have the opportunity to show what they have learned to other farmers in their community and some key personnel (e.g. top management of MCB and District Officer) (Figures 22 and 23) who can help promote and setting up more field schools in the next season or in the future should be invited. The Director General of MCB was invited to give the certificates to the participants during the graduation ceremony for CFFS program (Figure 24).

Evaluation of the CFFS Program

The evaluation of the CFFS program showed an improvement based on the participants' dry beans yield increased between 2015 (164.96kg/ha) and 2016 (383.64kg/ha) with statistically significant at 5% level based on the paired t-test (Figure 25 and Table 2). This proven the participants have able to practice and make decision on how to manage their trees on time.

Figure 22: Participant showcase their CFFS plot.

Figure 23: Participant explained AESA findings to the Director-General MCB.

Figure 24: Graduation ceremony for CFFS program.

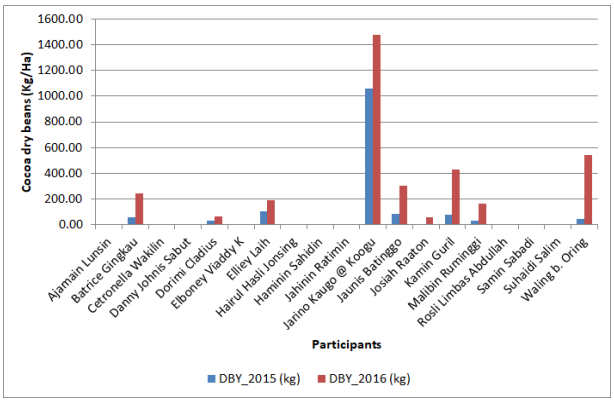

Figure 25: Dry bean yields among participants between 2015 and 2016

Table 2: Comparison participants' yield between 2015 and 2016 using Paired t-test

Number of participants*	Dry bean yield 2015 (kg/ha)		Dry bean yield 2016 (kg/ha)		*t Stat*	*P- value*
	Mean	**Variance**	**Mean**	**Variance**		
9	164.96	112775.35	383.64	192976.47	-3.949	0.004

*Only 9 participants farm have mature trees to bear fruits.

CONCLUSION

The CFFS program introduced by MCB has potential to be expanded to other cocoa planting areas in Sabah, Sarawak and Peninsular Malaysia. It has proven that the activities implemented demonstrated that CFFS program could effectively fill the gap in extension services and enable farmers to become more efficient and self-reliant managers of their agricultural resources as their yield increased. In the CFFS program, the farmer's role has changed and evolved from that of "a primary knowledge source to that of the facilitator of knowledge creation".

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