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Ministry of Natural Resources and Environmental Conservation
Forest Department**



Assessment of Participatory Afforestation Programs for Rural Livelihood Development and Forest Conservation and in the Dry Zone of Myanmar



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Abstract

This study identifies and compares Strengths, Weaknesses, Opportunities and Threats (SWOT) for three important participatory afforestation programs that are being implemented in a dry land area in Myanmar, namely the Departmental Village Supply Plantation (DVSP), the Community Forest Plantation (CFP) and the Household Development Plantation (HDP). The data were collected using focus group discussion to identify the positive and negative factors of each program and household survey to confirm the identified factors. Three separate focus group discussions were conducted with participants of each program, and a total of 120 households were surveyed. The Community Forest Plantation was found to have stronger positive aspects (strengths and opportunities), while the Household Development Plantation was found to have higher negative dimensions (weaknesses and threats). The important attributes that were found to influence participants' evaluation of the programs are institutional and biophysical factors such as the provision of fuel-wood and income, robustness and security of property rights, productivity of the plantation site, leadership, awareness creation about the programs, contribution for tree cover change and poverty reduction potential. To design successful forest management approaches, the current and future design of participatory plantation programs should build on the identified strengths mainly related to livelihood benefits and opportunities such as poverty reduction, improve neighbor communities' awareness while addressing the observed weaknesses including limited awareness, weak maintenance and high initial investment as well as threats such as insecure devolution, conflict with outsiders for each program.

Keywords: Devolution, Participatory Afforestation Programs, Property Right, SWOT-AHP Analysis

ပြည်သူပူးပေါင်းပါဝင်သော သစ်တောစိုက်ခင်းတည်ထောင်ခြင်းအစီအစဉ်များ၏ ကျေးလက် လူမှုဘဝဖွံ့ဖြိုးတိုးတက်မှုနှင့် သစ်တောပြုစုထိန်းသိမ်းခြင်းအပေါ် အကျိုးသက်ရောက်မှုအား သုတေသနပြုလေ့လာဆန်းစစ်ခြင်း(မြန်မာနိုင်ငံအလယ်ပိုင်း၊ အပူပိုင်းဒေသတွင် လေ့လာတွေ့ရှိမှု)

ခင်ရည်မွန်လှိုင်၊ ဦးစီးအရာရှိ
သစ်တောဦးစီးဌာန

စာတမ်းအကျဉ်း

မြန်မာနိုင်ငံအလယ်ပိုင်း အပူပိုင်းဒေသတွင် လက်ရှိဆောင်ရွက်လျက်ရှိသည့် ပြည်သူ ပူးပေါင်းပါဝင်သော စိုက်ခင်းတည်ထောင်ခြင်း အစီအစဉ်(၃) မျိုးဖြစ်သည့် ဌာနမှ တည်ထောင် ပေးသော ကျေးရွာသုံးစိုက်ခင်း(DVSP)၊ ဒေသခံပြည်သူအစုအဖွဲ့ပိုင် သစ်တောစိုက်ခင်း (CFP) နှင့် ကျေးလက်အိမ်ရာတည်ထောင်ရေးတစ်ရွာ(၁)ဧက စိုက်ခင်းတည်ထောင်ခြင်းနည်းစနစ် များ၏ အားသာချက်၊ အားနည်းချက်၊ အခွင့်အလမ်းနှင့် ဆုံးရှုံးနိုင်မှု ခွဲခြားနှိုင်းယှဉ်လေ့လာ ခဲ့ပါသည်။ အချက်အလက်များကို အုပ်စုဖွဲ့ဆွေးနွေးခြင်း နည်းလမ်းကို အသုံးပြု၍ စိုက်ခင်း တစ်ခုချင်း အလိုက်အားသာချက်၊ အားနည်းချက်များကို ခွဲခြားသတ်မှတ်ခဲ့ပြီး ၎င်းသတ်မှတ် ခဲ့သည့်အချက်များကို အိမ်ထောင်စု စာရင်းကောက်ယူ၍ အတည်ပြုခဲ့ပါသည်။ စိုက်ခင်း (၁)ခု ချင်းစီအတွက် အုပ်စုဖွဲ့ဆွေးနွေးခြင်း(၃)ကြိမ်နှင့် အိမ်ထောင်စု စုစုပေါင်း(၁၂၀)အားစာရင်း ကောက်ယူခဲ့ပါသည်။ ဒေသခံအစုအဖွဲ့ပိုင် သစ်တောစိုက်ခင်း(CFP)တွင်ကောင်းမွန်သည့် အားသာချက်နှင့် အခွင့်အလမ်းများ ပိုမိုများပြားပြီး ကျေးလက်အိမ်ရာတည်ထောင်ရေး တစ်ရွာ (၁)ဧကစိုက်ခင်း (HDP)တွင် အားနည်းချက်နှင့် ဆုံးရှုံးနိုင်မှုများ မြင့်မားကြောင်း တွေ့ရှိရပါ သည်။ ဒေသခံများ၏ စိုက်ခင်းအစီအစဉ်(၃)မျိုးအပေါ် အကဲဖြတ်မှုကို လွှမ်းမိုးနေသည့် အဓိက အချက်များမှာ အသက်မွေးဝမ်းကျောင်းအတွက် ထင်းနှင့်ဝင်ငွေ ထောက်ပံ့ပေးမှု၊ စိုက်ခင်းစီမံ ခန့်ခွဲနိုင်မှုဆိုင်ရာ ရပိုင်ခွင့်များ ခိုင်မာအားကောင်း စိတ်ချရမှု၊ စိုက်ခင်းတည်ထောင်သည့် သစ်မျိုး၊ စိုက်ခင်းမြေနေရာ၏ မြေအရည်အသွေး၊ ခေါင်းဆောင်မှု၊ စိုက်ခင်းတည်ထောင်ခြင်း နှင့်ပတ်သက်သော အသိပညာဖြန့်ဝေပေးခြင်း၊ သစ်တောဖုံးလွှမ်းမှုအပေါ် အကျိုးသက်ရောက်မှု နှင့် ဆင်းရဲမှုလျော့ချနိုင်သည့် အလားအလာတို့ ဖြစ်ကြပါသည်။ အောင်မြင်သည့် သစ်တောစီမံ

အုပ်ချုပ်မှုကို ဖော်ဆောင်နိုင်ရန်အတွက် လက်ရှိနှင့် နောင်တည်ထောင်မည့် ပြည်သူပူးပေါင်း ပါဝင်သော သစ်တောစိုက်ခင်းလုပ်ငန်းများသည် ယခုလေ့လာတွေ့ရှိရသော အားသာချက်နှင့် အခွင့်အလမ်းများဖြစ်သည့် အသက်မွေးဝမ်းကြောင်းဆိုင်ရာ အကျိုးကျေးဇူးနှင့် ဆင်းရဲနွမ်းပါးမှု လျော့ချနိုင်ခြင်းနှင့် ပတ်ဝန်းကျင်ရှိ ဒေသခံများ၏ အသိအမြင်တိုးတက်လာခြင်းတို့ အပေါ် မူတည်၍ တိုးချဲ့ဆောင်ရွက်သင့်ပြီး အစီ အစဉ်တစ်ခုချင်းစီ၏ အားနည်းချက်နှင့် ခြိမ်းခြောက်မှု များဖြစ်သည့် စိုက်ခင်းဆိုင်ရာသိရှိ နားလည်မှုနည်းပါးခြင်း၊ ရေရှည်ထိန်းသိမ်းစောင့်ရှောက်မှု အားနည်းခြင်း၊ ကနဦးအရင်းအနှီး မြင့်မားခြင်းနှင့် စိုက်ခင်းလွှဲပြောင်းမှုဆိုင်ရာ လုပ်ပိုင်ခွင့် မသေချာခြင်း၊ ပြင်ပလူများနှင့် အငြင်းပွားမှုများရှိခြင်းစသည်တို့ လျော့နည်းစေရေး ပြုပြင် ဆောင်ရွက်သင့်ပါသည်။

Assessment of Participatory Afforestation Programs for Rural Livelihood Development and Forest Conservation and in the Dry Zone of Myanmar

1. Introduction

The role of forestry for providing diverse environmental services, contributing to poverty alleviation and local livelihood improvement, is now well recognized (Gupta 2012). However, global forest cover is still declining, especially in developing nations. Many developing countries have shifted from centralized to a more participatory approach to manage the remaining forests as well as implement afforestation/ reforestation programs (Balooni and Inoue 2007; Persha et al. 2011; Mohammed and Inoue 2012).

Myanmar, one of the developing countries in South East Asia, is rich in forest resources. Forests play a vital role in providing important ecosystem goods and services. Nonetheless, the forest cover has been lessening alarmingly due to deforestation and forest degradation. At present, about 42.92% (71.76 million acre) of the country's area is covered with forests and ranks as the third most deforested country in the world (FAO-2015). Strict conservation of the forest has been quite difficult, if not impossible, because 70% of the rural population depends heavily on the forest for their basic needs and livelihood. To improve the situation, the Ministry of Natural Resources and Environmental Conservation is implementing forest conservation activities with the major six imperatives of Myanmar Forest Policy: Protection, Sustainability, Basic needs fulfillment, Efficiency, People participation and Public awareness. In particular, Forest Department is actively involved in the protection and management of the remaining natural forest, as well as reforestation and afforestation programs.

Currently, the Forest Department is implementing three types of participatory afforestation programs with the cooperation of local rural people. These are the Departmental Village Supply Plantation (DVSP), the Community Forest Plantation (CFP) and the Household Development Plantation (HDP). According to Myanmar's National Forest Master Plan, 370,000 acres of DVSP, and 2,267,655 acres of CFP are the targeted plantation area. For HDP, there is no fixed target. As of 2015, 89,991 acres of DVSP, 33,614 acres of CFP and 15,243 acres of HDP have been established throughout Myanmar.

The DVSP is established in reserved forests, protected public forest and unclassified forest (land at the disposal of the government) near villages by both Forest Department and Dry Zone Greening Department with funding from the national budget since 1981. The aim of the DVSP is to supply the basic needs of local people while promoting natural forest conservation. These plantations are planted and maintained by both departments in first 5 years. After 5 years, they are transferred to the respective village management committee with a handover contract. After the transfer has taken place, the village committee is authorized to undertake all types of utilization and management activities in the plantations, with the exception of conversion to other land-use types or selling and leasing, which are prohibited. Villagers can also request that the Forest Department help them with the plantation management. Species are 100% eucalypts or 40% local species and 60% fast-growing exotic species.

The CFP is established by interested local user groups with land rented for 30 years since 1996 in accordance with the Community Forestry Instructions (CFIs). The CFP aims to fulfill the basic needs of the local people. In the instructions, Community forestry is defined as "forestry operations in which the local community itself is involved in planting and utilizing the forest products and income under a 30-year legal grant" (FD 1995). Although

the Forest Department gives seedlings and planting techniques assistance, all maintenance and treatment operations are handled by the user group (Hlaing and Inoue 2013). The CF scheme in Myanmar can be characterized more as private land management by a group of interested CF users. Land is allotted according to an agreement between the community forest management committee and respective CF participants. Then, conservation, management and harvesting are done privately and the benefits such as fuelwood, timber and agricultural crops and non-timber forest products are enjoyed individually.

Finally, the HDP was started in 2007 after the central Forest Department had instructed the lower level offices to establish it. This approach involves establishing an acre of plantation by a village in village owned lands with the participation of local people. The species for the 1-acre HDPs is *Eucalyptus camaldulensis*.

All three afforestation programs are targeted to improve the livelihood of local people and to enhance the forest cover of the land. In addition, the local people are expected to minimize pressure on the remnant natural forest for household needs. Knowing the real condition of these programs takes part in an important role for effective forest conservation and livelihood development of rural community. Whether these programs are moving in the right direction towards achieving their forest conservation and development goals has not been assessed. Moreover, what attributes of the program or external factors are contributing positively or negatively towards achieving the programs' goal has not been evaluated.

Objectives

This study aims to fill the aforementioned knowledge gap with the following two objectives. First, it identifies the strength, weakness, opportunity and threat (SWOT) factors of the DVSP, CFP and HDP programs. Second, it quantitatively measures and compares the SWOT factors of the three programs using a SWOT-AHP analysis and substantiates by household survey.

2. Study Area and Methods

The Study Area

The research was conducted in four villages of Meikhtila district (N20° 30'- 21°25' and E 95° 25'-95° 35') which is situated in Mandalay region (Figure 3). The district was selected because firstly, it is a representative of dry zone, one of the highest deforested areas in Myanmar (Leimgruber et al. 2005). Secondly, all of the three participatory afforestation programs are implemented in the district. The Meikhtila district covers an area of 1430560 acres with 18.38% of forest cover. There are 21,431 acres of DVSP, 1,223 acres of CFP and 27 acres of HDP in the district as of 2015 (Meikhtila District Forest Management Plan, 2015). The major forest type is dry forest. The highest temperature is over 40° C and lowest temperature is 15° C and average temperature is 28° C. Average rainfall is 32 inches (81cm) and average moisture is 68%. The district consists of four townships such as; Meikhtila, Thazi, Wundwin and Mahlaing. Total number of households and population of the district are 175,597 and 877,785 respectively. About 81% of district population is rural people and dependence on forest resources is very high. From the district, Mezalikan village from Thazi Township, Yoesone village, Thabyaythar village and Magyoak village from Wundwin Township undertaking one or more of the participatory plantation programs were selected. A 100 acre each of DVSP is transferred to Mezalikan and Thabyaythar villages. A 122.8 acre of CFP managed by Mezalikan user group and 550 acres of CFP managed by YoeSone user group are selected for the CFP. For HDP, a 1 acre of HDP managed by participants from Magyoak village is studied. The major livelihood strategies in the selected villages are farming, livestock breeding, earthen ware making and forest products harvesting.

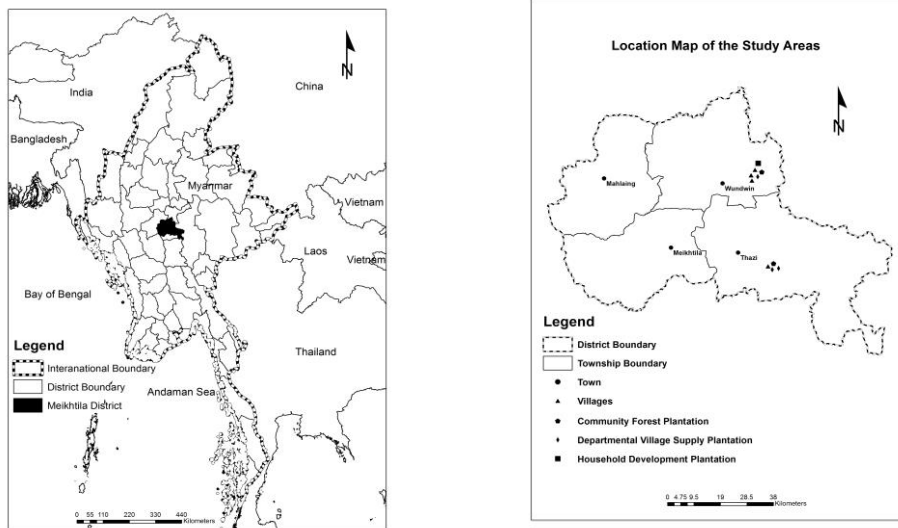


Figure 1. Location of the study sites

SWOT-AHP ANALYSIS

SWOT is a commonly used tool for systematic analysis of a project or program. The important internal and external factors that influence the success of the project or program are termed as strategic factors. In SWOT analysis, these factors are grouped into four categories called SWOT groups: strengths, weaknesses, opportunities and threats. When SWOT is used, the analysis does not comprehensively appraise the strategic decision-making situation. It remains at the level of merely pinpointing the factors. In addition, the expression of individual factor is often very general. Hence, the result of SWOT analysis is often only a listing or an incomplete qualitative examination of internal and external factors without concrete guidance for end use in the decision making process (Kajanus et al. 2012). These drawbacks of SWOT are resolved by augmenting it with the Analytical Hierarchy Process (AHP), which assigns a relative priority to each factor through pair-wise comparison (Saaty 1993). In addition to adding magnitude to the SWOT analysis, another advantage of AHP is that it can be conducted within a small sample of individuals or groups who are knowledgeable about the issue under investigation (Ananda and Herath 2003). As such, it is an analysis method that is different from statistical analyses, wherein large samples are required to derive confidence intervals around the means.

Kurttila et al. (2000) was the first study to combine SWOT analysis with AHP. SWOT provides the basic framework and the decision hierarchy, while AHP is used for quantitative comparison. Since then, it has been used by various scholars in area of natural resource management by Pesonen et al. (2001) and Groselj et al. (2011); in community-based forest management by Masozera et al. (2006) and Birendra et al. (2014) and in rural development by Stainback et al. (2012) and Kibria et al. (2015).

Kurttila et al. (2000) proposed the following three procedures for SWOT-AHP analysis. First, identify the possible SWOT factors relating to the proposed strategy or decision. Second, conduct a pair-wise comparison of factors within each SWOT group. For pair-wise comparison, the relative importance of one factor over the other is ranked using the commonly recommended 1-9 scale by Saaty and Vargas (2001) Table (1). Pairwise comparison is conducted separately for all factors, and a priority value for each factor is computed using the eigenvalue method. The factor with the highest priority value under each

SWOT group is brought forward for further comparisons. Third, conduct pair-wise comparison of the factors with the highest priority from each group to calculate the scaling factors for each group. The overall priority value for each factor is then calculated by multiplying the priority value of the factor with the corresponding scaling factor. The overall priority scores of all factors across groups sum to one and each score indicates the relative importance of each factor. Using these values, factors within each SWOT group can be compared.

Table 1. Pair-wise Comparison scale for SWOT factors Preferences

Rating	Judgments of preferences
1	Equally preferred
3	Moderately preferred
5	Strongly preferred
7	Very strongly preferred
9	Extremely preferred
2,4,6,8	Intermediate values between the preferences

Source: Saaty's scales for Pair-wise comparison

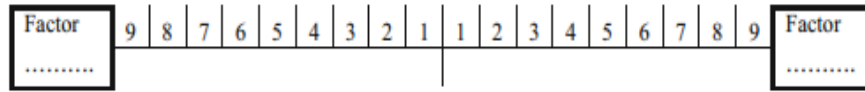


Figure 2. Scale for pair-wise comparison of factors

Study Method

The data were collected in three steps using key informant interviews, focus group discussion, and household survey. At the first step, the key informant interviews were conducted with knowledgeable people of the villages to select participants for the focus group discussion. Based on the key informant interview, focus group discussion participants composed of elderly people, CF committee members, village committee members and local villagers who participated in the time of plantation establishments and have knowledge about the plantation were selected. The second step was to conduct separate focus group discussions with participants from each of the three afforestation programs. The main objectives of the focus group discussions were SWOT factors identification and obtaining pair-wise comparison values for each of the identified SWOT factor. Three separate focus group discussions were conducted with 5- 10 members of participants from each plantation group. Before starting the focus group discussion, concepts of “strength” and “opportunity”, “weakness” and “threats” and the intention of the study were clearly explained to the participants. After that, they were asked to identify the strengths, weaknesses, opportunities and threats for the program in which they were participating. After the local people had identified the SWOT factors, they were rephrased for them for further verification. For pair-wise comparison of the identified factors, an explanation was given to the participants about the comparison scale of the factors. A rating scale of 1(equally preferred) to 9(extremely preferred), as illustrated by Saaty and Vargas (2001), was used to quantify the comparisons among the factors. The participants were encouraged to debate and come to consensus on their ratings.

The third step was conducting household survey. A total of 120 households, 54 from DVSP participant households, 36 from CFP participants and 30 from HDP participants, were randomly selected and interviewed. We used the stratified random sampling method for household survey. Sampling intensity could not be provided as the questions are asked only to the available number of participants (No all people from village know well about the

plantation). The questionnaire included the amount of fuelwood and income they received from the program, their bundles of property rights (access, withdrawal, management, exclusion and alienation) on the plantation, and their perception of the other factors identified through SWOT analysis.

For the SWOT-AHP analysis, an AHP Excel Template with Multiple Inputs that was developed by Goepel (2013) was used to calculate and compare overall priority of each factor. The same tool was also used to calculate as well as to check the consistency ratio (CR) which must be less than 10%. Using the conventional SWOT methodology, the scores of the strength and opportunity factors can be interpreted as positive aspects of the plantation programs, while the scores of weaknesses and threat factors can be taken as drawbacks of the plantation programs. For the household survey, the data were analyzed with descriptive statistics.

Data Collection and Analysis

The data were collected using key informant interviews, focused group discussion, as well as structured and semi-structured questionnaire interviews. The key informant interview was conducted with selected appropriate participants for the focus group discussion. Based on the key informant interview with knowledgeable people of the villages, participants composed of elderly people, CF committee members, village committee members and local villagers who participated in the time of plantation establishments and have knowledge about the plantation were selected. Three separate focus group discussions were conducted with local people involved in implementing the three plantation programs. The major objective of the focus group discussion was to identify important SWOT factors as well as to obtain pair-wise comparison values for each identified factor. Before starting the focus group discussion, the intention of the study was explained to the participants and they were asked to identify the strengths, weaknesses, opportunities and threats for the program in which they were participating (Figure 1). After the local people identified the SWOT factors, they were rephrased for them for further verification.

After identifying these factors, an explanation was given to the participants about the comparison scale of the factors. A rating scale of 1–9, as illustrated by Saaty and Vargas (2001), was used to quantify the comparisons among the factors (Figure 2). The participants were encouraged to debate and come to consensus on their ratings. The pair-wise comparisons were conducted separately for all factors, and from their ratings, a priority value for each factor was computed using the eigenvalue method by using an AHP Excel Template with Multiple Inputs (Goepel 2013). The same tool is also used to calculate the consistency ratio (which must be less than 10%). The factor with the highest priority value under each SWOT category was brought forward for further comparisons. Then, pair-wise comparison of the four factors that were brought forward was undertaken to calculate a scaling factor. The scaling factors and priority values were then used to calculate the overall priority of each factor. Finally, the overall priority values of each SWOT factor from each program were compared to find out the best plantation approach as well as the magnitude of the strengths, weaknesses, opportunities and threats for each program. Using the conventional SWOT methodology, the scores of the strength and opportunity factors can be interpreted as positive aspects of the plantation programs, while the scores of weaknesses and threat factors can be taken as drawbacks of the plantation programs.

The data were also collected using household surveys with a structured and semi-structured interview. A total of 120 households, 54 from DVSP participants, 36 from CFP participants and 30 from HDP participants, were randomly selected and interviewed. The questionnaire included the amount of income they received from the program, whether they

obtained fuelwood from the plantation or not, their bundles of property rights (access, withdrawal, management, exclusion and alienation) on the plantation, as well as their perception of the other factors identified through SWOT analysis. The data were analyzed by conducting descriptive statistics.

3. Results

3.1 SWOT-AHP analysis for Departmental Village Supply Plantation

The results in Table 1 show that the most advantageous aspect of the DVSP is its contribution to the improvement of tree cover (DS1), followed by its potential to minimize pressure on natural forests (DO1). Because DVSPs are not legally utilized and are still maintained as standing trees, participants perceive that the DVSP's main contribution is for tree cover improvement. The results of the household survey also show that 96% of interviewees believe that DVSP can improve reforestation of the area. However, in one research village called Mezalikan, the DVSPs are illegally being utilized by some villagers because of the village committee's reluctance to facilitate appropriate utilization of the DVSP. Nonetheless, local people are getting wood from it, albeit illegally, they mention fulfillment of basic forest-related needs from the DVSP (DS2) as the second strength of DVSP. Ninety-one percent of the interviewees also mentioned that DVSPs supply basic needs, while 48% of the interviewees agree that it also encourages participation in forest management (DS3). Although the participants in the DVSP have not received tangible benefits legally yet, only a small proportion (approximately 24%) state improved access right (DS4) as a strength factor of the DVSP.

On the other hand, limited awareness about the plantation (DW1) is perceived to be the major weakness of the DVSP (Table 2). This is mainly due to limited education and extension from the Forest Department (FD). Consequently, there is weak maintenance (DW2) and also weak protection (DW3) resulting in rampant illegal cutting. A staggering 98% of the interviewees mentioned that villagers do not know plantation management procedures, and there is no one who wants to take responsibility to manage and protect the DVSP. Finally, the plantation is mainly composed of acacia species, which is thorny and slow growing, thus limiting its usefulness. That's why, they point out less useful species (DW4) as the last weakness of DVSP.

Villagers state the minimization of pressure on existing natural forests as an opportunity of the DVSP (DO1) (Table 2). This view is also strongly reflected during the household interviews, where 94% of interviewees declare that the DVSP would minimize the pressure on existing natural forests. The other opportunities mentioned are improvement of neighboring communities' interest in DVSP (DO2), contribution to poverty alleviation (DO3), as well as improvement of the villagers–FD relation (DO4). The former two are agreed by 93% and 67% of the interviewees, respectively. They, however, also point out the need to improve the current property rights situation and the extension service if these opportunities are to be realized.

Table 2. SWOT-AHP analysis of Departmental Village Supply Plantation

SWOT group	SWOT factor	Scaling factor	Factor priority	Overall priority
Strengths		0.2287		
	DS1: Improve tree cover		0.5495	<u>0.1257</u>
	DS2: Basic need fulfillment from DVSP		0.2389	0.0546
	DS3: Encourage participatory forest management		0.1466	0.0335

DS4: Access right to DVSP		0.0650	0.0149
CR%			3
Weaknesses	0.5578		
DW1:Limited awareness		0.5292	<u>0.2952</u>
DW2:Weak plantation maintenance		0.2817	0.1572
DW3:Limited protection		0.1344	0.0749
DW4:Less useful species		0.0547	0.0305
CR%			2.1
Opportunities	0.1611		
DO1: Minimize pressure on natural forests		0.6127	<u>0.0987</u>
DO2: Improve neighbor community's interest		0.2198	0.0354
DO3: Poverty reduction		0.1160	0.0187
DO4:Better community-FD relationship		0.0515	0.0083
CR%			5.8
Threats	0.0524		
DT1: Insecure devolution		0.7582	<u>0.0397</u>
DT2: Encroachment by outsiders		0.1512	0.0079
DT3: Pest and disease		0.0905	0.0047
CR%			3.4
Positive factors (Strengths+ Opportunities)			0.2244
Negative factors (Weaknesses + Threats)			0.3349
CR%			5.5

The most important threat perceived by local people about the DVSP is insecure devolution (DT1) (Table 2). This is because firstly, most of the members are not aware of the newly enacted Village-owned Fuelwood Plantation (VFP) Law. Thus, they do not feel that there is legal protection of their future right on the DVSP. The second reason is that the VFP Law, unlike the CF instruction, does not include a lease. That's why, the participants are not sure for how long their right to the DVSP is secured, which was agreed on by 93% the interviewees. The next threat is encroachment by outsiders (DT2). Some of the DVSPs are located at a distance from the village. It is difficult for the villagers to monitor the DVSP. They worry about the threat from external encroachment will intensify when the value of the trees increases with time. Finally, the composition of the DVSP is mostly homogenous or less heterogeneous (only two or three species). Because of this, they are highly vulnerable to pest and disease outbreak (DT3) in the future.

Overall, analysis of the DVSP shows that negative factors outweigh the positive factors because the highest overall priority score is gained by the weakness factor, W1 "limited awareness in plantation management" (Table 2).

3.2 SWOT-AHP analysis for Community Forest Plantation

For CFP, the positive factors outweigh the negative factors mainly due to the strength factor (CS1), *contribution for livelihood*, which scores the highest priority value (Table 3). Out of the four strength factors, three of them, i.e., livelihood contribution (CS1), legal right to CFP benefit (CS3) and community development (CS4), are all related to benefits for the members at the individual or community level. The household interview also show that all of the interviewees perceive that the CFP contributes to their livelihood, while 83% and 58% of the interviewees reveal the CFP's legal assurance for benefits and its contribution to community development as its strengths. However, our analysis of yearly income from resin of Shaw Phyu (*Sterculiaversicolor*Wall) tree, plum seeds and agriculture crops planted in the

CFP area showed that the richer had a much better income (2,082,500 Kyats) compared to the middle class (1,588,571 Kyats) and poor class (1,000,000 Kyats). This is likely because the land is managed privately, and the rich can use advanced inputs compared to the middle and poor classes to improve their income from the CFP. The last identified strength is improved tree cover (CS2), which was also perceived by 97% of the interviewees.

Weak monitoring (CW1), initial budget requirement for establishment of the [CFP (CW2), low land productivity (CW3) and limited awareness of Community Forestry Instructions (CW4) are found to be the key weaknesses of the CFP. From the household survey, 92% mention that monitoring within the CF group as well as by FD staff is needed, as some of the members do not follow the commitments in the management plan, and this can cause unsustainable land utilization and conflict among CF members. In addition, 50% mentioned that the initial stage of the CFP is financially demanding. This is because the CFP under this study is a self-initiated plantation. The problem of poor productivity is mentioned by 20% of the members who said that shortage of water and poor soil conditions make it difficult to grow plants and trees. Overall, the sum of positive factors (Strengths+ Opportunities) is greater than negative factors (Weaknesses + Threats) (Table 3).

In line with the livelihood contribution and tree cover improvement strengths of the CFP, the three opportunities realized by members of the CFP are poverty reduction (CO1), minimization of pressure on natural forests (CO3) and potential inclusion in the REDD+ program (CO4). While all of the members from the household interviews mention livelihood improvement and 89% state enhancing natural forest conservation as the promising opportunities, only the committee members reveal the possibility to be included in REDD+ in the future. This is likely because most of the local people are not aware of REDD+ yet. Lastly, improving neighboring community awareness (CO2) about forest conservation emerged as the second-ranked opportunity of the CFP from the SWOT-AHP analysis and was also mentioned by 97% of the members during the household interviews.

Table 3. SWOT-AHP analysis for Community Forest Plantation group

SWOT group	SWOT factor	Scaling factor	Factor priority	Overall priority
Strengths		0.4908		
	CS1: <i>Livelihood benefits from CF site</i>		0.5051	<u>0.2479</u>
	CS2: Improvement of tree cover		0.3204	0.1573
	CS3: Legal right to CFP benefits		0.1198	0.0588
	CS4: Community development		0.05472	0.0269
	CR%			3.8
Weaknesses		0.3202		
	CW1:Weak monitoring		0.4354	<u>0.1394</u>
	CW2:Need initial investment		0.3407	0.1091
	CW3:Poor land productivity		0.1653	0.0529
	CW4:Limited awareness of CF Instruction		0.0586	0.0188
	CR%			3.9
Opportunities		0.1310		
	CO1: Poverty reduction		0.5328	<u>0.0698</u>
	CO2:Improve neighbor communities awareness		0.2724	0.0357
	CO3:Minimize pressure on natural forests		0.1393	0.0182
	CO4:Inclusion into REDD+ program		0.0556	0.0073
	CR%			6.8

Threats	0.0580		
CT1. Increase external pressure	0.5008	0.0291	
CT2. Institutional instability	0.2799	0.0162	
CT3. Poor biodiversity	0.1400	0.0081	
CT4. Conflict with outsiders	0.0793	0.0046	
CR%		1	
Positive factors (Strengths+ Opportunities)		0.3177	
Negative factors (Weaknesses + Threats)		0.1685	
CR%		2.79	

The most important threat associated with CFP is the potential increase in external pressure for land (CT1). Key informants mentioned that when income from the CFP becomes more attractive in the future, there will be a risk that outsiders such as rich businessmen would try to pressurize the members to sell the land to them. The other important threat is institutional instability (CT2). This is mainly due to the current political transition that the country is undergoing. Some interviewees mentioned that with the change in government, they could not be sure whether the CF instruction or their 30-year lease will be respected by the new government. Local people mentioned that only *Sterculiaversicolor* species is growing in the CFP area, it may lead to a homogenous landscape with poor biodiversity (CT3) in the long term. The last important threat is potential conflict with outsiders. Because CFP is benefiting members, the awareness of neighboring communities (CO2) is improving. Some of them have already applied to get CF land. If this application does not receive a positive response, the current CFP members are concerned about the potential conflict with jealous and resource-demanding neighboring villagers.

3.3 SWOT-AHP analysis for Household Development Plantation

The Household development plantation group scored the highest negative factor among the three plantation programs, and the sum of the overall priority of negative factors is greater than that of the positive factors (Table 4). The highest overall priority score in the household development plantation group, as well as the highest weakness score among the three plantations, is limited awareness of plantation management (HW1) 0.4119. Encouraging participation (HS1), improving tree cover (HS2), improving access right to HDP (HS3) and basic forest-related need fulfillment (HS4) are identified as important strengths of the HDP. Among the 30 interviewees of the HDP participants, 97% mention that it promotes participation, while 67% states that it improves tree cover/greening of the area. A small proportion 13%, also say that HDP contributes to basic need fulfillment.

On the other hand, limited awareness about plantation management (HW1), low productivity (HW2), poor leadership (HW3) and poor benefits (HW4) are identified as the major weaknesses of HDP. Ninety three percent of the participants mention that the purpose of the HDP was not widely known. The interviewees also mention that the productivity of the HDP area is very low. This is especially important because, unlike the DVSP, HDP is transferred to local people immediately after planting. Thus, it demands collective efforts from the participants to make up for the low productivity of the site to keep the establishment rate of the seedlings within an acceptable proportion. This again requires good leadership. Despite it is standing, the leaders are found to be less interested in the HDP, which was mentioned as the third most important weakness of HDP. Finally, the participants also mentioned that one acre of the HDP per one village is too small to provide sufficient incentive (benefit) among participants.

The perceived opportunities of the HDP are that it can minimize pressure on natural forests, improve community *awareness*, promote better community-FD relationship and

reduce poverty. More than half of the participants (63%) report that if it is successfully established and maintained, the HDP will contribute to minimizing pressure on the natural forest, while 53% mentioned that the program will improve awareness about the benefits of establishing plantations for neighboring villages that are yet to request HDP establishment. After the plantation is transferred, the villagers can request that the FD help them with the management of the forest. This will create a better network and communication between the two actors. Finally, the program might also contribute toward overall poverty reduction, which is also agreed by approximately 17% of the interviewees from the household survey.

Similar to the DVSP, the HDP also faces the problem of insecurity of devolution. The problem seems more serious in the HDP case, as the plantations are initiated with oral instruction of the government head. Currently, the target numbers are drawn in 10-year revised district forest management plans, with no legally binding documents. Approximately 83% of the participants mentioned this as an important threat for the program. The small area allocated for the program may also lead to conflict in the future, especially between those who are now participating in maintaining the plantation and those who do not. The last important threat is associated with the geography of the HDP location. As the program that is being implemented in the dry land of Myanmar, it may face serious problems with water stress in the future.

Table 4 . SWOT-AHP analysis for Household Development Plantation

SWOT groups	SWOT factor	Scaling factor	Factor priority	Overall priority
Strengths		0.1221		
	HS1:Encourage participatory forest management		0.5598	0.0683
	HS2: Improve tree cover		0.2757	0.0336
	HS3: Improved access right		0.0993	0.0121
	HS4: Forest related basic need fulfillment		0.0652	0.0080
	CR%			1.4
Weaknesses		0.6551		
	HW1: Limited awareness of plantation management		0.6288	0.4119
	HW2: Low productivity		0.2090	0.1369
	HW3: Poor leadership		0.0982	0.0643
	HW4:Small plantation area		0.0640	0.0420
	CR%			2.7
Opportunities		0.1663		
	HO1- Minimize pressure on natural forests		0.5436	0.0904
	HO2-Improve community awareness		0.2556	0.0425
	HO3-Better community FD relationship		0.1038	0.0173
	HO4- Poverty reduction		0.0971	0.0161
	CR%			2.2
Threats		0.0566		
	HT1- Unsecured devolution		0.4579	0.0259
	HT2- Conflict between participant and non-participants		0.4161	0.0235
	HT3- Water stress		0.1260	0.0071
	CR%			0.4
	Positive factors (Strengths+ Opportunities)			0.1587
	Negative factors (Weaknesses + Threats)			0.4378
	CR%			4.8

3.4 Comparative SWOT-AHP Analysis for the Three Programs

The comparison of the overall positive aspects (the strengths and opportunities) and negative aspects (weaknesses and threats) of the three programs showed that the CFP is superior over the other two programs, while the HDP was the lowest performing (Figure 3). The ranking of the overall positive factors for the three groups is HDP (0.1587) < DVSP (0.2244) < CFP (0.3177), and the negative factor ranking is HDP (0.4378) > DVSP (0.3349) > CFP (0.1685) (Figure 3).

The CFP's superior performance in terms of strength factors such as secured property right as well as the ability to provide income and fuel-wood were also confirmed from actual data collected (Figure 4). The result from ranking all of the interviews from the three programs on whether participants agree or disagree on the contribution of each program to livelihood and tree cover improvement, the two major goals of the programs, showed that the CFP can contribute the dual benefit of livelihood and the forest, while the other two programs currently are performing well only for improving the tree cover (Figure 3). The limitation of this comparison is that it is solely based on the perception of the local people and may not be taken to reflect all the key factors that should be used in the comparison of the programs

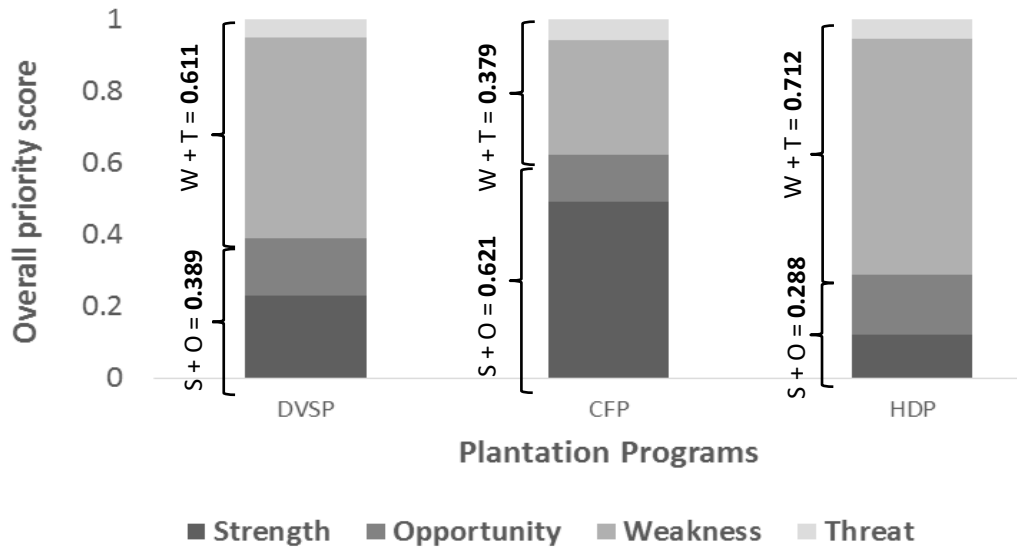


Figure 3. Comparison of SWOT factors among the three plantation programs

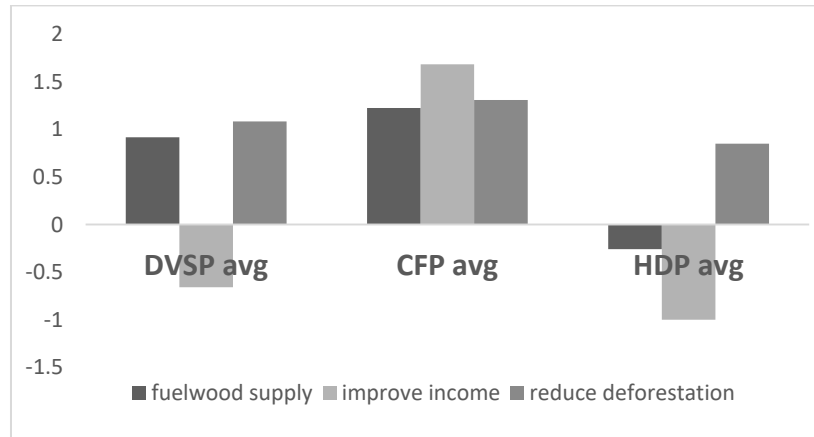


Figure 4. All the three plantation participants (120 members) ranking of fuel-wood, income and tree cover contribution of the three programs (2 is strongly agree while -2 is strongly disagree)

2 strongly agree, 1 agree
 0 neutral, -1 disagree
 -2 strongly disagree

4. Discussion

The evaluation of the three major participatory afforestation programs in the dry zone of Myanmar showed the CFP to have better strength and opportunity compared to the DVSP and HDP. The first step to evaluate the effectiveness of a given participatory approach is by accounting for the actors involved and the type of power devolved to them (Agrawal and Ribot 1999). In particular, the power they have over the different bundles of property rights is vital in determining the social and environmental outcome (Mohammed and Inoue 2014a, 2014b). By bundles of property rights, we are referring to access, management, withdrawal, exclusion and alienation, as proposed by Schleger and Ostrom (1992). In the case of the CFP, except for the alienation right, all of the other property rights are devolved to local people. As argued by Agrawal and Ostrom (2001), it is not necessary to have the alienation right for successful management. Although in developing countries, most forests are still owned by the government, there are ample examples of success given that local people have the other four bundles of property rights, i.e., access, withdrawal, management and exclusion.

In addition to robustness (in terms of the bundles of property rights), duration and security are also additional vital dimension for devolution success. Duration refers to the temporal extent of devolution. The devolution should provide a sufficient time horizon to reap the benefits of the investment in managing the forest (Meinzen-Dick et al. 2002). The security and sustainability of devolution rest largely on the means used to transfer power (Ribot 2002). The SWOT-AHP ranking of the three programs was similar to the ranking of security and strength of property right devolved in the three programs. In the case of the CFP, which received higher scores for its strengths than the other two programs, a 30-year lease is passed to the participants through the Community Forestry Instruction.

In the case of the DVSP, Forest regulation (1995) No. 42 provided information about the instruction such as the role of the FD and the village, as well as the rights and duties of the village. In the instruction, however, there is no clear mentioning of how long the plantation area will be under village management and protection. According to the Republic of the Union of Myanmar 2008 constitution, local governments (region/state government) also have authority to promulgate laws regarding the DVSP and HDP. The Mandalay region Village-owned fuelwood plantation Law (VFP-law) enacted in 2012 also does not clarify the duration of management of the DVSP and HDP plantation.

The written handover contract made at the time of transfer included the future management plan as well as the responsibilities of various personnel such as village headman (Chairman), local Forest Department staff (secretary) and the plantation management committee. It also stated that all conservation and management activities would be done with assistance of the Forest Department. However, follow-up to the statement in this contract is weak from both sides. As the village head is not so much interested in the plantation, he does not take any action and the FD is also weak to encourage the utilization and management of the plantation. In the case of the HDP, the plantation is transferred to the village headman in the first year after planting but future management plan is absent.

Without enforcing responsibilities such as protection and management, however, the security and robustness of access and withdrawal rights may not guarantee ecological success (Bromley 1992). Hence, the institutions and actors on whom power is vested should be able to enforce responsibilities and regulations (to control rule breakers, and bring those rule

breakers to justice). When the power is devolved to leaders and committee members, as in the case of the plantation programs of Myanmar, strong, skilled leadership with problem solving capacity is vital (Pagdee et al. 2006). In the case of the CFP group, strong leadership with skillful and technically experienced committee members who can manage and solve the internal and external problems is the positive factor. However, in the other two plantation programs, the village committee or the committee formed to manage the HDP was performing very poorly in terms of skill, as well as the enforcement of rules and regulations and monitoring. Therefore, the management and protection of the plantations are poorly undertaken.

Unlike conservation and management of already existing forest, the establishment of a plantation is demanding in terms of labor and finance. In addition, local people may need technical advice. In all three plantation programs, the support for the initial stage of the program establishment was weak. For the CFP, the plantation was established by the community itself, and hence, the high initial cost was one of the important weaknesses. In the case of DVSP and HDP, the FD incurred most of the initial establishment cost. However, local people still need continuous technical and material support for successful establishment of the plantation in the harsh environment of the dry zone of Myanmar. This is not possible, as the FD has limited staff. Thus, the villagers mention poor management techniques as a weakness of the programs.

5. Conclusion and Recommendation

By considering the involvement of the local community in decentralized forest management for sustainable forest conservation and rural livelihood development of the dry zone of Myanmar, three participatory forest plantation programs, i.e., the Department Village Supply Plantation (DVSP), Community Forest Plantation (CFP) and Household Development Plantation (HDP), are being implemented. To improve the effectiveness and success of these programs, this study identified and compared the Strengths, Weaknesses, Opportunities and Threats of them by using the SWOT-AHP method. According to the result, the CFP was found to have stronger positive aspects (strengths and opportunities), while the HDP was found to have higher negative dimensions (weaknesses and threats). The important attributes of the programs influencing participants' evaluation of the programs are the provision of fuelwood and income, robustness and security of property rights, productivity of the plantation site, leadership, awareness creation about the programs, contribution to tree cover and poverty reduction potential.

For the plantation programs to be successful, some of the weaknesses, such as political instability and poor land productivity are not easily amendable within a short period of time, while the others can be improved through appropriate design and interventions (limited awareness, weak protection and monitoring through intensive extension and training programs; initial investment through international assistance). In the case of the CFP already having greater strengths, the FD should help the village participants improve the variety of tree species being planted and also protect them from external pressure. Training on the provision of CF instruction would also help improve their awareness of the instruction.

For the DVSP and HDP, the current instruction, especially the Village-owned Fuelwood Plantation Law (VFP law), should be modified to include for how long the devolution of property rights to local people on the plantation will be maintained (leased). It also should provide specific guidelines on what will happen to the area once the current crop is harvested. For the implementation of the program, we recommend that discussion should be held, not only with the village head or some selected committee, but with all who want to participate in the program and learn about the details of the program objective, plan, implementation

procedure, what would be the right, duty and responsibility of FD and the villagers and what is the expected outcome. The discussion should be two directional allowing villagers from each segment to give their own opinion. This will help to create common understanding and avoid lack of awareness about the program. After getting consent from the villagers, a user group with management and security committee should be created to ensure the protection and management of the plantation. There are prosperous models of community forestry programs in Myanmar and other countries that can be used to institute the participatory plantation program. Initial intensive training and other support are vital, even for the CFPs that are self-initiated similar to the one under this study. After the initial stage, continuous information exchange should be kept between the FD and the villagers.

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