Good Practice and Lessons Learned

Enhancing Livelihood Resilience to Climate Change Project
Chey Commune, Kampong Svay District, Kampong Thom Province

Field work conducted by Mlup Baitong
8/18/2016
## Contents

1. Introduction ................................................................................................................................. 2

2. Context ........................................................................................................................................... 2

   2.1. Demography ............................................................................................................................. 3

   2.2. Education and Culture ............................................................................................................. 3

   2.3. Economic Situation .................................................................................................................. 4

   2.4. Climate Change ....................................................................................................................... 4

   2.5. Gender ..................................................................................................................................... 5

3. Prioritized Resilience Activities ...................................................................................................... 5

   3.1. Climate Change Awareness Raising ......................................................................................... 6

   3.2. Adaptation Farming to Climate Change ..................................................................................... 6

       3.2.1 System of Rice Intensification (SRI) Practice ................................................................. 6

       3.2.2 Integrated Farming System (IFS) Practice ........................................................................... 8

   3.3. Small Scale Irrigation System Construction ............................................................................ 10

   3.4. Solar Energy System installation ............................................................................................ 11

4. Recommendations on Resilience Options, Enabling Factors and Barriers to Implementation ....... 12

   4.1. Recommendations on Livelihood Resilience Options .............................................................. 12

   4.2. Enabling Factors for Implementation ...................................................................................... 13

   4.3. Barriers to Implementation .................................................................................................... 14

5. Concluding Remarks ....................................................................................................................... 15

References ......................................................................................................................................... 17
1. Introduction

Based on USAID Mekong ARCC’s report, climate change impacts in the Lower Mekong Basin (LMB) will result in significant changes in temperature and rainfall, as well as sea level rise by 2050. Deforestation and more rain cause flooding. Cambodia faces drier conditions during the dry season, increasing the annual period of drought, despite the overall increase in total annual rainfall. Average temperatures are expected to increase in the future. For instance, temperature increased from a maximum of 30°C in 2014 to 34°C in 2015 and to 41°C in 2016. According to the Cambodia Climate Change Strategy plan, climate change affects the lives and livelihoods of the people in the country who depend entirely on agriculture the most. The families who are holding ID Poor 1 (IP1) seriously suffer from climate change impacts.

In an effort to increase the adaptive capacity of the people in rural areas of Cambodia to the impacts of increased temperature and rainfall, the Mlup Baitong project brought together communities and local authorities in Chey commune, Kampong Svay district, Kampong Thom province, to design the Enhancing Livelihood Resilience To Climate Change project. Livelihood resilience to climate change was created by consulting farmers, authorities, and WFP. The assessment of resilience to climate change is indicated in the context below. Based on this context MB and WFP decided to introduce selected strategies and implement them in six villages of Chey commune for a period of 13 months from June 2015 to July 2016.

The overall objective of this report is to capture good practices and lessons learned from the implementation of livelihood resilience to climate change in Chey commune. The audiences for this report are farmers, local authorities, NGOs, donors, and other organizations working towards climate change adaptation looking for information on climate change resilience activities in order to help scale such options, and project implementers interested to learn about barriers and enabling factors that can influence adaptation projects. The report focuses on identifying Chey’s context (e.g. demography, education and culture, economic situation, climate change, gender) and enabling factors and barriers to implementing the resilience activities during an El Nino year, which posed extra challenges. El Nino is the result of an increase in temperature in the Pacific Ocean, which leads to a change in weather patterns. In Cambodia, El Nino led to an increase in warm temperatures and droughts, which negatively affected agriculture and fishery. Droughts have continued in Cambodia in 2015 and early 2016. El Nino was a factor that affected the extent to which project beneficiaries have benefited from the resilience activities in light of unusual droughts and high temperatures in Cambodia.

This report analyzes data and information from the community livelihood resilience implementation report, and integrates findings from an external evaluator who conducted interviews with project beneficiaries in the six villages of Chey commune.

2. Context

Chey commune is one of 11 communes of Kampong Svay district in Kampong Thom province. Chey was regarded by the district councils, NGOs and other development partners as a commune prioritized for development. It has developed a Commune Development Plan (CDP) and Commune Investment Plan (CIP). These plans have been funded by the government. Chey also
received project based support from other partners. This enabled Chey commune to improve its social-economic situation and environment as follows:

2.1. Demography

Chey consists of six villages with 1,034 families and 5,749 people, of which 2,895 (50.35%) are women in 2014. In 2013 the population consisted of 6,105 people, indicating a population growth rate of -5.8%. About a third of all families (28%) are considered poor, and 33.1% of families are headed by women who have to take full responsibility of their families in absence of men. Of all people aged 18-60 years, only 40% are economically active.

![Chey Commune Map](image)

2.2. Education and Culture

Chey commune has two primary schools and one lower secondary school. Women usually stay at home taking care of their families and households and have only few opportunities to engage in income generating activities. The commune has 404 primary pupils, 150 lower secondary students, 94 high school students, and 9 university students. Although Chey commune has many children attending primary school level, schools could not maintain the same attendance to complete higher grades. Based on information from the commune data base in 2015, there were 273 illiterates aged 15-45 years of whom 150 were women, indicating an illiteracy rate of about 12% in this age group. This affects more women (13%) than men (11%).

Most of families favor their sons over their daughters when deciding which children to send to high school or to receive skill trainings. They regard daughters as housekeepers and men as economic activists for families. When men and husbands migrate for jobs, women are not able to engage in income generating activities, and instead focus only on housework. Farmers still follow traditional ways of life to try to improve their living conditions (e.g. they pray for getting higher outputs rather than using new technologies instead).
2.3. Economic Situation

The main economic activity in the country is agriculture. A large proportion of Cambodians are engaged in the primary-sector (72.3%), followed by the service sector (19.2%) and the industrial sector (8.5%).

In Chey commune, 40% of the total population are economically active (aged 18-60 years). Of those, 86.2% work in the agricultural sector (42.4% women), 21% work in the industrial sector, and 13% in the service sector. 40% of families live in houses with leaf and thatched roofs, and 30% live in houses roofed with less than 20 sheets of zinc. 2.5% of households use electricity, 73% use batteries which are regularly recharged against a fee, 8% use solar energy, and 0.3% use bio-gas.

Agricultural practice:
Agriculture activities are depending on rainfall, traditional techniques, and seeds. Using the traditional cultivation method, farmers cultivated one crop per year in rainy season and left the rice field empty in dry season. This caused farmers to receive a low yield (2 tons of rice per hectare), to lack food to eat year round, and to migrate to cities and abroad in search for jobs. None of the families applied SRI, 546 families own rice fields less than 1 hectare in size, and 85 families do not have their own rice field.

Infrastructure:
Most of the commune funds were used for road reconstruction. All six villages in Chey commune are connected by the laterite roads. In Chey commune there is no rice field access to irrigation systems.

2.4. Climate Change

In Chey commune, a scientific study projects a 2°C to 4°C increase in daily maximum temperature for the coming five years. In a changing climate, daily maximum temperatures will typically exceed 35°C in Mach-April which will have serious effects on agriculture, other livelihood sectors, and livelihoods in general. Heat stress will also affect the productivity of non-timber forest products, which many people in the villages rely on for their income and for subsistence purposes. Community members observed that during the last 10 years rainfall became more and more irregular, particularly at the beginning and the end of the rainy season, the number of rain days decreased, extended periods of drought became more frequent, and the temperature in the dry season increased from 30°C in 2014 to 34°C in 2015 and raised up to 41°C in 2016 due to El Nino.

A scientific study reveals that in Chey commune, droughts will occur at the end of the dry season, which will affect the availability of critical fishery habitats because water availability will decrease between 3% and 10% during the dry season. Community members state that they are concerned about more intense and longer droughts in Chey commune.
Moreover, there were no specific climate change analysis tools used in the process of commune investment planning, and climate change resilience and adaptation therefore not integrated into the Commune Investment Plan (CIP).

2.5. Gender

Although Chey commune conducted workshops on gender concepts for villagers, gender was still a critical issue within the commune as a whole, as well as in individual households. Less numbers of women than men were involved in the process of commune investment programming (CIP).

3. Prioritized Resilience Activities

Based on Chey Commune Investment Program (CIP) and MB’s observations, we found that Chey faced some problems which were needed to be addressed: low rice yields (1 ton per hectare), shortage of irrigation systems and water for household consumption, small sizes of agricultural land (57% of families owning less than 1 hectare), lack of agricultural skills and adaptive seeds to climate change, sandy soil, droughts, and increasing temperatures. This affected Chey commune as follows

a) 16% of the economically active population migrated to cities in the country and abroad, which left women, elderly people, children, and handicapped people in the villages;
b) Small plots and low yields led to very small profits which could not support family consumption a whole year, causing families to rely on migrated family members’ profits to fill the gaps;
c) Food shortages which impacted the nutrition and health status of the community members, especially children under 11 years old and nursing mothers.

In order to address these issues, MB in cooperation with WFP introduced common choices for all villages in Chey commune, focusing on enabling farmers to adapt to climate change. This includes raising awareness on cause, effect, and adaptation to climate change in order to make farmers understand and get involved in climate change adaptation; building capacity of farmers for adaptation farming to climate change such as composting, System of Rice Intensification (SRI), Integrated Farming System (IFS), and plastic fishpond building; constructing small scale irrigation systems to address draughts; and installing solar energy systems to light homes at night; and to create water storage and distribution systems for cropping. These adaptation
strategies to climate change were undertaken by MB over a period of 13 months (Jun 2015 to Jul 2016). During the implementation of these strategies MB collected good practices and lessons learned:

3.1. Climate Change Awareness Raising

The project provided training on climate change for 452 farmers of whom 95% were women (including youths, female household heads, disable people, and elderly people) in the six target villages. Farmers have learned the causes and impacts of climate change. The training also showed how to adapt livelihoods, and particularly agricultural activities, to climate change such as by planting crops consuming less water, saving rain water for the dry season, using organic fertilizer to improve soil quality, raising fish and poultry for increasing family protein consumption, and improving home environments and natural resource protection for slowing down climate change.

The training introduced initiatives and concepts of climate change to make farmers understand the reasons for climate change mitigation and adaptation. The training also declared the farmers as the project owners, which increased farmers’ satisfaction, encouraged them to get involved in the project implementation, and led to a successful and sustainable project.

3.2. Adaptation Farming to Climate Change

In Chey commune, farmers have been facing droughts that have affected their food security. In order to support the sustainable growth of crops, MB supported farmer field school (FFS) trained farmers to use System of Rice Intensification (SRI), Integrated Farming System (IFS), construct small scale irrigation systems, and to install solar energy units.

3.2.1 System of Rice Intensification (SRI) Practice

Farmers in Chey commune normally cultivate rice by sowing seeds onto wide rice fields when the rain falls. They use long- and medium-term rice although they are facing shortage of water in light of shorter raining periods than before. This way, farmers spend a lot of seed and only obtain low yields of rice (1 ton per hectare). Afterwards they leave their rice fields empty of crop for a period of 6 months (dry season). This leads to unsustainable food security.

To adapt to the changed rain fall period and low food security, MB targeted 60 farmers in total and formed six groups/farmer field schools (FFSs) with each FFS consisting of 10 members including model farmers. To ensure we involve the right farmers to implement the right SRI project, MB invited farmers in the six villages to participate in meetings and introduced them to the purpose of SRI-FFS and asked them to voluntarily participate in this practice. MB did not force or assign farmers to be members of SRI-FFS. Though farmers are voluntary members, they should meet the criteria of FFS selection (e.g. ID poor 1 and 2, women are the first priority, high commitment and industrious, has land for practice, time available). As a result, we selected farmers who really need to implement such activities and who are highly committed. After selecting SRI-FFS members, MB selected model farmers among the FFS members to use his/her rice field and home as FFS location.
SRI is a rice cultivation technique that uses less input to produce higher yields (productivity), and FFS is a process of training farmers (learning by doing) over a life cycle of a crop. For this project we encouraged FFS members to practice 2 or 3 crops per year (e.g. cultivate rice in rainy season, plant secondary crops like water melons in dry season). In the series of trainings, the FFS model farmers and members have learned the SRI technique, discussed it, and learned how to apply the SRI methodology, e.g. by using the drum seeder.

Seed quality and selection – Farmers learned about characteristics of seeds, which are a living product that must be grown, harvested, and processed correctly in order to realize the yield potential of any rice variety. Good quality seed can increase yields by 5-20%, using good seed leads to lower seeding rates, higher crop emergence, reduced replanting, more uniform plant stands, and more vigorous early crop growth. Good seed is pure, full and uniform in size, viable, and free of weed seeds, seed-borne diseases, pathogens, insects, or other matter.

Soaking Seed – After selecting quality seed, farmers discussed how to soak seed and seeding. We soak the seeds in water to prep them for planting, and allow them to soak for at least 12 hours but not longer than 36 hours. After removing the seeds from the water we keep them in a warm place until seeds germinated.

Land preparation – We explained to farmers that before rice can be planted, the soil should be in the best physical condition for crop growth and the soil surface be level. Land preparation involves plowing and harrowing to ‘till’ or dig-up, mix and level the soil. Tillage allows the seeds to be planted at the right depth, and also helps with weed control.

Seeding by drum seeder - Farmers learned the importance of the drum seeder, and that the drum seeder is made of fiber material and hence requires low pulling force to operate. It allows one person to sow one hectare in five to six hours compared to three to four days of transplanting by 30 - 40 people in case of the traditional cultivation method, and no cost of nursery.

Water use and management – The training explained to farmers that cultivated rice is extremely sensitive to water shortages. To ensure sufficient water, most rice farmers aim to maintain flooded conditions in their field. This is especially true for lowland rice in Chey commune. In adapting to climate change, good water management in Chey should conserve water while ensuring sufficient water for the crop.
Nutrient and crop health management – Farmers discussed each growth stage and learned the rice plant’s specific nutrient needs. Nutrient management is a critical aspect of rice farming. Because of prolonged flooding and sandy rice fields in Chey, farmers are able to conserve soil organic matter and also receive free input of nitrogen from biological sources, which means they need little or no nitrogen fertilizer to retain yields. Therefore FFS supported 107 farmers to make compost for improving quality soil. Farmers also learned to tailor nutrient management to the specific conditions of their field to increase yields.

Crop health - The rice plant has a wide array of ‘enemies’ in the field. Farmers were interested in discussing enemies of rice plants such as rodents, harmful insects, viruses, diseases, and weeds. They also learned and practiced to manage weeds through water management and land preparation by hand weeding. Moreover, farmers understood the interactions among pests, natural enemies, host plants, other organisms, and the environment, so that they now can determine what if any pest management may be necessary. FFS did not encourage using pesticides and herbicides.

Harvest – This is the last stage of rice production. Farmers learned the process of collecting the mature rice crop from the field and noted that it reaches maturity at around 90 – 105 days after crop establishment.

All farmers were interested in the SRI methodology. They learned the whole process of rice cultivation through SRI-FFS. We observed that female farmers can use the drum seeder (direct seeding) to sow seed onto soil surface in shorter time than single seedling transplanting, and that they can manage this labor by themselves. Drum seeders also do not require the need to prepare a nursery. SRI-FFS also motivated farmers to use short-term rice seed (110 days) adapting to climate change instead of medium-term and seasonal rice seed (135 days). Due to using compost to improve the quality of soil and crop establishment it can increase rice yields to up to 2.5 tons per hectare. Thus it is 1.5 tons higher compared to the traditional transplant method, which yields 1 ton per hectare. A kilogram of paddy rice costs about 1,000 riels (US$ 0.25), meaning that farmers can get an additional profit of US$ 375 (1,500 kg x US$ 0.25) per hectare per season if they apply SRI methods. Farmers also learned the different use of SRI and traditional transplant techniques. It is more beautiful to apply SRI if a small scale irrigation system available, particularly in dry season for the second crop. This allows farmers to produce more in dry season in order to increase profit and maintain food security.

3.2.2 Integrated Farming System (IFS) Practice

Farmers in Chey commune usually plant one crop (rice) per year and leave the rice field empty the rest of the year. They plant only few kinds of vegetable at home due to shortage of water in dry season, no agricultural skills, and lack of materials and seeds. Most farmers did not obtain much income from their farms (including home gardening), but instead rely on financial assistance from their family members who migrated to cities or abroad (used e.g. for food, clothes, medical care, education etc.). The project dealt with this problem by motivating farmers to use their home yards to plant crops as follows:
After the training on climate change, farmers learned about farming adaptation, particularly about Integrated Farming System (IFS). To get farmers in the target villages involved in this action, the project identified poor farmers by choosing farmers who are holding ID Poor (IDP) one and two. The project chose 129 IDP 1 and 2 for the IFS-FFSs.

The project started by providing water sources to the poor households, and this constructed ponds and wells (one well per household). To ensure wells have enough water, the project constructed ponds and wells in dry season (March and April). As a result, these ponds and wells have water to use in dry season. Meanwhile, the project provided trainings on compost making and some materials to farmers, and then facilitated farmers to construct compost houses in order to support vegetable planting and growing. They collected compost every day for at least 3 months to create their first compost, and also made liquid compost before starting to grow vegetables. This not only improves the households’ and villages’ cleanliness and sanitation, but also makes the garden green.

Access to water supply and compost making were strong incentives to encourage farmers to plant vegetables. Therefore the project provided trainings on how to grow vegetables (e.g. morning glory, long bean, cucumber, eggplants, gourd, and herbs) and chicken raising to build farmers’ capacity. The trainings were delivered by the qualified project staff and the national model farmer (learning by doing). The farmers also visited the national model farmer’s integrated farming system in Takeo province. During the trainings and the field visit the farmers discussed and learned a lot of different styles of vegetable planting (e.g. floating garden, less water garden, and sky garden). As a result, they planted different kinds of vegetable every season. Besides using the vegetables for personal consumption, farmers were able to sell surplus to the market, yielding a profit of about US$ 120 per year.

This year Cambodia, particularly Chey commune, faces El Nino’s impact. All existing ponds and lakes dried up, but ponds and wells constructed in the El Nino time still have water to serve garden and household consumption. Most family laborers had migrated to cities and abroad for work. This had mainly left women, children, and older people to live in the villages. The remaining labor forces were not strong enough to carry water from ponds or wells for watering gardens. To deal with this concern the project provided batteries (one per family) and battery water pumps to farmers. Women, children, older people, and handicapped persons can now use water pumps to pump water from wells and ponds for watering their gardens. Farmers can recharge their battery at the village solar energy stations against a small fee of around US$ 0.15 per charging.
Farmers in Chey also faced a shortage of natural fish to eat. They bought pork from the mobile market instead of fish in dry season, spending a lot of money for their daily meals. To reduce expenses and increase protein food, the project encouraged IDP 1 and 2 farmers to construct plastic fish ponds and raise about 400 fish per each of the 60 ponds. At the same time, the project supported farmers to build chicken coops and raised at least ten chickens per family. Three months later farmers could catch fish and chicken for daily meal preparation and sell any surplus to the market for a return of about US$ 15 from fish and US$ 75 from chicken per cycle of fish/chicken raising. This improves the households’ nutrition status as well as income.

3.3. Small Scale Irrigation System Construction

Water is the main source for human beings, plants, and animals to survive. In dry season all meet a shortage of water, particularly water for irrigating crops. This part will explain how we managed to provide water for irrigation in Chey commune.

Chey is located in a climate change hot spot area defined by USAID Mekong ARCC Study. It was found that each household, especially IDP 1 and 2 households are challenged by a shortage of food and water, high heat, and migration for work. Some well-off farmers have existing wells, but even they face a shortage of water in dry season. Therefore farmers grow nothing in dry season. Based on this situation, the project supported 60 poor farmers to dig wells and seven poor farmers to construct ponds. The project selected well constructors who live in Chey and have experience of identifying underground water to construct ring wells. The best time for constructing ring wells and ponds is in dry season from March to April. This ensures wells have enough water in dry season. Soil in Chey is sandy and easy to be eroded. The farmers’ concern is that water erodes the ground making the ponds shallow soon. To reduce water eroding the pond banks and slopes, farmers were encouraged to plant grass and other plants on the banks.
3.4. Solar Energy System installation

Chey commune has no electricity. Most households use batteries and the rest use fuel lamps to light their houses. They usually recharged batteries at a private generator, paying US$ 0.5 per charging. The charged battery life lasts two to three days of lighting homes. Due to these costs, it is difficult for IDP 1 farmers to access the battery charging services. To support the poor farmers in Chey commune, the project delivered some interventions as follows:

The project formed six groups of poor farmers for installation of solar energy stations. Each group is composed of 20 FFS members. All members of each group identified suitable places for installing solar energy stations and established solar energy station management committees (SESMC) with five members each (head, deputy head, accountant, and two members). The Village Head has been selected for playing the role as advisor to the SESMC.

When the six committees were ready, the project started selecting the best solar company to install solar energy stations (one station per village). The project installed solar stations with 12 solar panels each, producing 1,620 W in total. One station can charge 12 batteries for a period of six to eight hours depending on the sunlight available. The project facilitated the solar installation company to train all members of the solar energy station on how to maintain the station, and how to charge and maintain batteries, and provided trainings on bookkeeping (income and expenditure, income statement). After installation and training, the SESMC and members started providing battery charging services to members and non-members in the villages. The cost of charging batteries varies from 500 riels (US$ 0.17) for members to 1,000 riels (US$ 0.25) for non-members. Each solar station generates an income of 10,000 riels (US$ 2.5) on average per day. This amount is used for maintaining the solar energy stations and paying members who take care of the stations. The farmers (members and non-members) now reduced their expense from 3,500 Riels (US$ 0.875) to 1,000 Riels (US$ 0.25) compared to recharging a battery at the private generators.
4. Recommendations on Resilience Options, Enabling Factors and Barriers to Implementation

Based on the knowledge and experiences of implementing livelihood resilience to climate change activities outlined in section 3, section 4.1 will describe our recommendations on different types of resilience options, and section 4.2 will discuss enabling factors and barriers to implementation.

4.1. Recommendations on Livelihood Resilience Options

This part aims to share recommendations with stakeholders such as sub-national governments, NGOs, implementing agencies, and donors on livelihood resilience options to climate change, in order to propose what type of activities are most viable to build and scale up the adaptive capacities of farmers in the plane areas in Cambodia. Livelihood resilience is the most common strategy to adapt to climate change among farmers in Chey commune. Because most people in Chey are farmers they rely heavily on agriculture as a source of income and food security. We would therefore recommend the following points for consideration:

Parties who are involved in livelihood resilience practice should try to minimize the risk of total crop failure due to climate change as much as possible. Successful methods include breeding heat tolerant fish varieties such as catfish and climbing perch, planting crops which require little water, have short-term growth, high yields, and are demanded on the market. Examples include Phka Rumdoul and Sen Pidau rice. Diversification also entails planting new crops such as okra, chaya plants, egg plants, morning glory, gourd, long bean, onion leaf, lemon grass, cucumber, and herbs. Diversification offers an additional source of income when other crops fail due to climate change. Such practice will enable farmers to maintain a source of income and reduce their vulnerability in times of climate pressure.

Responding to diversifying family agriculture crops and livestock production, small scale water infrastructure to improve watering, storage, and consumption is a way to combat draught. Small scale irrigation construction (ponds and ring wells) and filtration of rainwater are means to improve rural livelihood resilience. Though small scale irrigation costs can be a challenge, integrating this activity into Commune Investment Plans could help to fund construction, and to efficiently use and maintain water supplies.

In communities with sandy soils like in Chey, using organic fertilizers (compost) to improve the soil condition and seedling emergence can help adapt to effects of climate change. Organic compost contributes to improved soil structure, helps soil absorb moisture, promotes growth of plant roots, increases crop yields, reduces waste, and reduces plant diseases and insect pests. Using organic compost enables farmers to reduce costs of crop production and reduce vulnerability in times of climate stress and droughts.

Furthermore, solar energy utilization can contribute to reduce the negative effects of climate change. Because it is a clean and renewable energy source, it can be produced free of charge, causes no pollution, and makes absolutely no noise at all. Farmers use solar power stations to charge batteries and use battery motor pumps for watering home gardens. Though solar
installment cost can be a challenge in rural and remote areas, establishing solar power station management committees and collecting fees for maintenance as in the case of the six villages in Chey commune could help to efficiently use and maintain solar power stations. Once they are able to save larger amounts of money, the committees may be formed as village saving and loan groups. These groups can provide credit services with low interest rates to their members for family business establishment and support in order to increase family income.

4.2. Enabling Factors for Implementation

In order to implement the livelihood resilience activities, project implementers need to be aware of various enabling factors and barriers which could either help or hinder implementation of livelihood resilience activities.

**Capacity building** – Training, knowledge, and experiences are crucial factors for adopting livelihood resilience interventions to climate change. Farmers in the six target villages of Chey commune received training through Farmer Field Schools (FFS) by agriculture experts on System of Rice Intensification (SRI) and Integrated Farming System (IFS), including vegetable growing techniques, fish feeding, and livestock raising, which are tolerant to climate stress. Farmers also received training on causes and impacts of climate change and how to handle climate stress (e.g. droughts, floods, storms). FFS model farmers and members who received trainings have played a critical role in disseminating knowledge and experience to other farmers to take up certain resilience practices through farm visits and formal/informal village meetings. Without training and knowledge dissemination, farmers would not be aware of beneficial agriculture practices in the face of climate change. Therefore project planners and implementers, are recommended to draw up livelihood resilience projects that have a significant learning and capacity development component (e.g. training, reflection/dissemination meetings, awareness raising, study visit, study circles etc.).

**Community based implementation** – Development of community by community for community. Project implementers should work closely with communities or vulnerable families to build support for resilience strategies. This project followed this approach in each of the six target villages of Chey commune. For example, the project merely installed solar power stations for each village, but the target group of each village helped select the sites, and put down their time and money to establish battery charging huts in communities. It is also important that the project implementers get religious leaders involved in the project implementation. Religious leaders are still an important part of rural societies and enjoy a credible reputation. Therefore they can educate people about the causes and effects of climate change and how to challenge climate stress.

**Cooperation/partnership** – All stakeholders should work together to invest their ideas and financial support in order to meet the communities’ objectives. The agriculture capacity building would not have been possible at the project site without cooperation between sub-national authorities and communities. In the case of agriculture capacity building in Chey commune, partnership between the District Agriculture Office and project implementers was not established due to a lack of means and time. The project implementers should instead facilitate the development of strong cooperation between communities and sub-national governments. On the
other hand, MB and other project implementing agencies tried their best to tie the livelihood resilience to climate change project into the Commune Investment Plan (CIP) in order to obtain support from Commune Council and to raise awareness among communities and Commune Councils that the ownership of the project lies with the communities themselves. This leads to long term sustainability of the project.

4.3. Barriers to Implementation

While project implementers should be aware of enabling factors to implementation, they also need to consider barriers which may hinder the implementation of livelihood resilience activities.

Financial costs – A main barrier has been financial costs and low returns on investment. In Chey commune, poor farmers in the target villages found it difficult to establish fishponds to diversify their livelihoods because of the costs of constructing ponds and purchasing fingerlings. When it came to installing solar power stations, farmers received external funds of US$ 5,670 (costs for solar power station, batteries, and motor pumps) per target village for this activity, but it is questionable if such solar power and irrigation systems can be expended due to the costs of installment. Financial costs might be more burdensome after the WFP-Mlup Baitong project concluded its mission and farmers are no longer able to use outputs (motor pumps and watering systems) and to access subsidized inputs. Moreover, low return on investment on vegetables and chickens due to low market prices and diseases in the target villages might become a problem. In order to implement successful projects and to scale them, the project implementers should consider inputs and market prices and form farmer cooperatives to facilitate farmers to diversify their livelihoods and to influence market prices in the villages.

Illiteracy – Chey commune is not a remote area. It is located about 20 km from the provincial town of Kampong Thom, but nevertheless 13.7% of people aged from 15 to 45 are illiterate, especially in Koun Tnaot village with 31%. Trapeang Areaks village has 2.6%, Mohar village 0.7%, and the other three target villages have no illiterates in this age group. Farmers in the six villages received trainings and awareness raising meetings to diversify their livelihood. Farmers in Koun Tnaot village found it especially difficult to learn new agriculture techniques and to implement the project. Therefore project planners and implementers need to factor in simple and applicable training materials and training methodologies such as handbooks illustrating vegetable growing, livestock and fish raising, use video clips, study tours, stimulation methods, role play and so on when designing capacity development for communities with low literacy rates.

Lack of participation – Famers are busy due to a wide variety of reasons and therefore may not have the time or the means to engage in project activities or solar power station governance. This may affect the sustainability of solar power station management and may also limit the use of battery motor pumps for watering home gardens. In such a situation, project implementers should consider identifying motivation factors for persons who are dedicated to help govern common solar power stations. Moreover, project implementers have to work closely with local authorities including village leaders and motivated farmers to maintain solar power station management committees.
5. Concluding Remarks

Chey Commune Council has drawn up several livelihood resilience to climate change projects in their Commune Investment Plan (CIP) and Commune Development Plan (CDP). Most commune funds for the CIP have been used for investment projects such as road, dam, and canal constructions. Because of migration, Chey commune has retained mainly women, children, and older people who find it difficult to implement agricultural activities. Therefore, the Enhancing Livelihood Resilience to Climate Change (ELRCC) project designed by Mlup Baitong and WFP, responded to Chey’s existing CIP and vulnerable peoples’ needs. It provided battery motor pumps, solar power stations, ponds and wells, enabling female and elderly farmers to easily practice home gardening.

Furthermore, the project selected the right beneficiaries (the poorest of the poor farmers) who are especially challenged by the impacts of climate change. The interventions the project used are responding to the effects of climate change and all interventions are systematically linked with each other. For instance, the project provided capacity building, water sources and watering tools (battery motor pumps and pipes), as well as solar power stations to charge batteries. Without these interventions, vulnerable farmers in Chey would find it difficult to enhance their livelihood resilience to climate change. The ponds and ring wells were used for home gardens and consumption by owners and other farmers living around them.

SRI-FFS motivated farmers to use short-term rice seeds (110 days) instead of medium-term and seasonal rice seeds (135 days). Using compost to improve the quality of soil and crop emergence, farmers can increase rice yields to up to 2.5 tons per hectare, being much higher compared to the traditional yield of 1 ton per hectare. Using SRI methods, farmers can earn additional profits of US$ 375 per hectare per season.

Vulnerable farmers learned a lot about vegetable planting, compost making, chicken and fish raising, and how to use battery water pumps for irrigation of plants through IFS-FFS (they change their Attitude - improved feeling/knowledge). The trained farmers started growing different kinds of vegetables, using compost to improve products, raising chicken and fish (they change Behavior -improved doing). Farmers have enough food to cover their own consumption and are able to sell any surplus for a profit of US$ 210 per family (they change Characteristic – improved family economy/reduced IDP 1 and 2). This project could bring big positive change to the communities.

MB identified some crucial factors which make the project sustainable: 1) The project provided non-seasonal seeds to farmers allowing them to use these seeds to grow the next crop; 2) The project showed people where they can buy fish for breeding and how to breed, so that they can continue their fisheries independently during the next seasons; 3) WFP’s school feeding program has motivated farmers to grow vegetables and raise fish and chicken and sell them to nearby schools; 4) The model farmers have capacity and promised to share knowledge and experiences with other farmers in the villages; and 4) Commune Council is interested to integrate this project into the Commune Investment Plan for financial and structural support.
For scaling up the project, MB and WFP propose to establish community based organizations (CBOs), particularly farmer cooperatives (FCs). This set-up would allow close cooperation between farmer representatives, communities and local authorities, and enable farmers in Chey commune to further develop their capacity and adapt additional mechanisms for sustainable livelihood improvement.
References

Kampong Thom province: Economic and Social in Year 2015

Chey Commune: Commune Data Base 2015 for Commune Development Plan


Lovear Village: Village Data Base 2015 for Commune Development Plan, Chey commune

Trapeang Areaks Village 2015: Village Data Base for Commune Development Plan, Chey commune

Prey Tob Village 2015: Village Data Base 2 for Commune Development Plan, Chey commune

Lovear Village, Chey commune: Village Data Base 2015 for Commune Development Plan

Koun Tnaot Village, Chey commune: Village Data Base 2015 for Commune Development Plan

Ta Theav Village, Chey commune: Village Data Base 2015 for Commune Development Plan

Mohar Village, Chey commune: Village Data Base 2015 for Commune Development Plan


Soun Sokheng, Consultancy Service 2016: End ELRCC Project Evaluation Report, Phnom Penh

USAID Mekong ARCC 2016: Lessons from Implementing Adaptation Plans in the Lower Mekong Basin, Development Alternatives, Inc (DAI) and World Resources Institute (WRI), Bangkok