COMMUNITY BASED CLIMATE CHANGE ADAPTATION THROUGH AGRICULTURE:

EXPERIENCES FROM CAMBODIA

May 2018

Cover photo: ***Farmers using mulch to grow vegetables in Siem Reap***

FOREWORD

Cambodia is one of the most vulnerable countries to climate change, given the low adaptive capacity of its communities and high reliance on climate sensitive sectors such as agriculture and water resources. In recent years, high rainfall during the wet season brought more frequent and intense flooding. The occurrence of drought, especially in the dry season, has become more evident. These changing climate patterns have affected traditional cropping practices, and have greatly impacted agricultural productivity and rural livelihoods.

About 80% of Cambodia's population lives in rural areas, and more than 70% of the population depends on agriculture for their livelihood. In 2011, floods affected around 350,274 families in Cambodia, with economic losses amounting to $624 million. Around 267,000 hectares of rice fields were damaged. The 2016 drought has affected at least 260,000 families, and 18 out of 25 provinces in Cambodia faced water shortage. In 2015, dry conditions reduced rice production, leading to food shortages in some provinces. Under future climate projections (2025 and 2050), most of Cambodia's agricultural areas will be exposed to intense flooding in the wet season and to higher drought risks in the dry season (Cambodia's Second National Communication Report, 2015). It is, therefore, critical to identify interventions that will enable vulnerable farmers and local communities to cope with current and future impacts of climate change.

Cambodia was one of the first batches of nine countries selected for the Pilot Program for Climate Resilience (PPCR), which aims to demonstrate ways in which climate risk and resilience can be integrated into development planning. The Royal Government of Cambodia, with support from the Asian Development Bank, prepared the Strategic Program for Climate Resilience, comprising seven investment projects and an overarching technical assistance on Mainstreaming Climate Resilience into Development Planning.

Communities are at the forefront in the fight against climate change. Awareness raising and capacity building initiatives, combined with programs that promote local adaptation, are needed to help communities manage current and future climate risks. But for local actions to be sustainable, community ownership is important.

In Cambodia, Civil Society Organizations (CSOs) play an important role in working with local communities to cope with current and future climatic risks and develop locally appropriate solutions to climatic variability and change. CSOs shape the response to climate change in three ways: they influence how households are affected by impacts of climate change, they enhance the ability of households to respond to climate impacts and to pursue different adaptation practices, and they act as intermediaries for external support to adaptation.

A civil society support mechanism was launched as part of the technical assistance to strengthen the capacity of local CSOs to implement community-based adaptation and disaster risk reduction projects, and to mainstream climate resilience into CSO operations. The Asian Development Bank engaged Plan International Cambodia to coordinate and administer the civil society support mechanism. One hundred and thirty six CSOs expressed interest, of which 19 CSOs in 17 provinces were selected. This report presents case studies of various community-based adaptation initiatives in agriculture, the lessons learned, and the opportunities for scaling up and replication.

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Students helping in their school's vegetable garden, Prusat

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We would like to especially thank the communities and individuals who proactively participated in the program, shared their thoughts, anecdotes and leanings; the volunteers who supported data collection and translations and the field staff without whom this document would not have been possible.

PARTICIPATING CSOs	ACRONYM
Bandos Komar Association	**BK**
Culture and Environment Preservation Association	**CEPA**
Community Managed Development Partners	**CMDP**
Cambodia Rural Development Team	**CRDT**
Community Resource Improvement for Development	**CRID**
Child Rights Foundation	**CRF**
Children and Women Development Centre in Cambodia	**CWDCC**
Human Resources and Rural Economic Development Organization	**HURREDO**
Kraing Serei Community Forestry	**KSCF**
Kampuchea Women's Welfare Action	**KWWA**
Live and Learn Cambodia	**LEC**
Learning Institute	**LI**
Life with Dignity	**LWD**
Mondulk Kiri Indigenous People's Association for Development	**MIPAD**
Ockenden Cambodia	**OC**
Samatapheap Khnom Organization	**SKO**
Sovann Phoum	**SP**
Song Saa Foundation	**SSF**
Women's Organization for Modern Economy and Nursing	**WOMEN**

CONTENT

ABBREVIATIONS AND ICONS

Asian Development Bank	**ADB**
Climate Adaptive Agriculture	**CAA**
Community Based Organization	**CBO**
Climate Change Adaptation	**CCA**
Climate Investment Fund	**CIF**
Commune Investment Program	**CIP**
Climate Smart Agriculture	**CSA**
Civil Society Organization	**CSO**
Civil Society Support Mechanism	**CSSM**
Disaster Risk Reduction	**DRR**
Farmer Water User Committee	**FWUC**
Mainstreaming Climate Resilience into Development Planning	**MCRDP**
Pilot Program for Climate Resilience	**PPCR**
Vulnerability Reduction Assessment	**VRA**
Water, Sanitation and Hygiene	**WASH**

DRIVERS OF TRANSFORMATION

BEHAVIOURAL

TECHNICAL

INSTITUTIONAL

ECONOMIC

POLICY

EXECUTIVE SUMMARY

Communities are at the front line in the fight against climate change. Across Asia and the world, the agriculture sector must deal with growing uncertainty due to changing climatic conditions. Extreme weather coupled with weak agri-infrastructure and knowledge can destroy lives and livelihoods. In Cambodia, where most of the population works in the agriculture sector, the speed at which climate change is unfolding is compromising the capacities of communities to cope with its effects such as droughts, floods.

There is a critical role for civil society to play. Since 2015, Plan International Cambodia has partnered with local Civil Society Organizations (CSOs), financing various local projects in rural and urban areas. This document focuses on adaptive agriculture-based interventions affiliated with this program. By sharing lessons and insights from this experience, others can learn about entry points for community-based adaptation programming, replicate successes and avoid pitfalls.

The document is divided into three sections. Section 1 provides a background and overview of the program. Section 2 discusses agriculture-related interventions from some of the sub-grant projects, and Section 3 highlights lessons from the project, paired with general recommendations.

Key takeaway messages evolve around why and how there is a strong opportunity to help farmers acquire better understanding of climate change, learn alternative farming solutions, and make the decisions and small investments necessary that will help them manage risk, improve productivity, and diversify their produciton. There is also a strong need to invest in building the capacity of local government, community leaders, and institutions for them to properly understand and support community ownership and resilience. This 'investment' needs to be coupled with efforts to close gaps in the farmer to consumer supply chain with commercially sustainable solutions, while ensuring fair distribution of value, especially for small-scale and remotely located farmers. Ensuring that climate change adaptation projects are sustainable requires long-term adaptation centric projects, concrete policy implementation, and tactical partnerships. Here CSOs can play an intermediary role of building capacity and bringing stakeholders together, community members, government, and private entities, who can complement each other's strengths and expertise to work more effectively towards transforming communities.

Looking more broadly, climate change is not just an environment or infrastructure issue, the ripple effect of climate change and dependency on rain-fed agriculture cannot be ignored in programming. The loss of livelihood and food security stemming from a failed harvest, in turn, has various socioeconomic and cultural effects in communities such as poor health and nutrition which leads to increased expenditure for medical intervention; forced migration for work breaks family units and reduces school attendance in children who take on some of the responsibilities of the missing family member.

This document hopes to be an entry point to understanding climate change and improving the role civil society plays in adaptive agriculture in Cambodia. The recommendations and insights in this paper can help CSOs mainstream climate change into their work. For efforts to be overall more effective and responsive to climate change, continuity of funding is necessary so that key CSO resources are not lost or reshuffled at the end of every short term grant. Inclusion, partnership and shared responsibility matters, especially when paired with a carefully timed combination of 'soft' capacity development and 'hard' physical interventions, technical skills, and genuine respect for target communities.

INTRODUCTION

Irrigation system beneficiary, Pursat

Cambodia evokes an image of green expanses dotted with houses on stilts. In the past, this might not have been far from reality, with paddy fields and countryside palms gently swaying in the wind. However, in recent years the weather has become increasingly unpredictable, slowly shifting a lush countryside to a dryer, dustier landscape. Longer, hotter summers have brought droughts to most provinces. Changing weather patterns have also affected agriculture, with altered temperatures, erratic rain patterns, and shifting seasons making it harder for farmers to maintain traditional crop cycles and grow enough food.

Cambodia's economy relies heavily on climate-sensitive sectors such as agriculture. A primarily rural society, around 80% of the population live in rural areas, surviving on subsistence farming. Many farmers have tried to adapt to climate change by delaying or altering their planting cycles, or becoming seasonal workers at larger farms or on construction sites. However, the speed at which climate change is affecting communities is overwhelming villagers' capacities to cope.

Cambodia is one of the world's 15 most climate-vulnerable countries (Eckstein 2017). Thus it is one of the focus countries of Climate Investment Funds' Pilot Program for Climate Resilience (PPCR). As part of this program, Plan International Cambodia has partnered with local CSOs since 2016 to finance various local projects. This document focuses on Climate Adaptive Agriculture (CAA) interventions affiliated with this program. It aims to demonstrate the program's impacts on various community members. It also discusses lessons for CSOs themselves, drawn from various stages of the projects. In doing so, it provides food for thought to help others replicate the success and avoid foreseeable challenges in future programming.

The document is divided into three sections. Section 1 provides a background and overview of the program. Section 2 discusses interventions, and Section 3 discusses lessons from the interventions. The data in this document reflects information collected from interviews with community members, CSO representatives, Plan International staff, local government officials, CSO surveys, and field visits.

CONTEXT AND OVERVIEW

SECTION 1

Irrigation canal under construction, Pursat

OVERVIEW OF CLIMATE CHANGE IN CAMBODIA

Cambodia is highly vulnerable to climate change, due to both high levels of poverty and frequency of disasters. Climate change is one of the most critical challenges facing Cambodia today. It threatens to undermine livelihoods and reverse the country's impressive economic development gains. It is commonly named as one of the most at-risk countries in the world – in 2014, for example, Standard and Poor's ranked its economy as the single most vulnerable to the effects of climate change worldwide (Kraemer and Negrila 2014). Both socioeconomic and environmental co-factors underpin this vulnerability. This section summarizes some of the most essential points.

- *Cambodia's vulnerability to climate change is exacerbated by high levels of poverty and inequality.* Despite impressive economic growth surpassing 7% per year since 2011, per capita GDP hovers around US$1,000 per year, but the poorest 10% hold only 4% of the nation's income while the top 10% accounts for 27% of it. As of 2011, 43% of the population subsisted on less than $2 per day (PPP). Despite high rates of internal migration, eighty percent of the population remains rural (World Bank 2014), and 65% works primarily in agriculture (FAO 2014), although some 20% of rural households are landless (USAID 2014). Major demographic and land use changes are underway: 22% of the country's land mass have been declared "economic land concessions" (LICADHO & The Cambodia Daily 2012), including for large plantations. These changes also influence capacities to adapt to climate change: agribusiness companies "are largely responsible for this massive clearance for agricultural purposes" (Taylor 2011: 78) which has dispossessed farmers of both their land and to the ways that they previously supplemented their livelihoods. Environmental degradation and poor natural resource management also compromise farming.

- *Rice and fish are the traditional staples of the Cambodian diet. Rural livelihoods and nutrition are largely dependent on subsistence agriculture and small-scale fishing, which are both highly sensitive to both gradual climatic changes and extreme weather events.* Some 80% of the population is rural, and 65% engages in agriculture – primarily rain-fed agriculture. Meanwhile, Cambodia is also home to one of the world's richest freshwater fisheries, particularly the Tonlé Sap. Fish constitutes 80% of the population's protein intake (Baran et al 2009. Climatic changes are likely to compromise both rice harvests and fish yields.

- *Cambodia is one of the most disaster-prone countries in the world.* The primary hazard is variable rainfall, which will almost certainly be exacerbated by climate change. Cambodia already has the world's highest exposure to

flooding: 12.2% of the population is affected annually (PreventionWeb n.d.), and more than 70% of Cambodia's rice production loss between 2004 and 2008 was attributed to floods (Heng & Pech 2009).

It should be noted that Cambodia is characterized by very high frequency of disasters, but it has largely been spared from very extreme disasters such as typhoons. Cambodia's coastline is only 440 km and unexposed. However, the country's population is crowded into low-lying plains and river basins, and subject to annual flooding. Cambodians are well-adapted to these conditions. However, climate change is ushering in more erratic rainfall which may trigger more frequent and severe floods and droughts, beyond their coping capacities.

It is not unusual for both drought and flooding to occur within a single agricultural year. There are often short 'dry spells' in the middle of the rainy season which, if protracted or severe can compromise crops. The heaviest rains, however, occur at the end of the rainy season. If rainfall continues to become more extreme, it is likely that farmers will struggle with both disasters within a single growing season.

- *Rising sea levels pose a serious threat to Cambodia.* Although Cambodia has only four coastal provinces, Cambodia's low-lying central plains would be highly affected by rise in sea levels (Thevongsa 2012). The seasonal 'pulse' of the Tonlé Sap river system is likely to exacerbate the effects of sea-level rise. Not only will flooding be more frequent and severe, but the 'pulse' will flush in salty water, compromising both agriculture and fish stocks. Salinity is extremely difficult and expensive to manage.

TABLE 1: OVERVIEW OF CLIMATE CHANGE EFFECTS IN CAMBODIA

FACTOR	CHANGE PREDICTED	TREND *	REMARK
Temperature	+0.3° to +0.6° by 2025	↗	SP, CWDCC, KWWA, CRDT, KSCF
Rainfall in wet season	+3% to+35%	↗	
Rainfall in dry season	No change or decrease	↘	Direction of change certain but magnitude uncertain
Extreme events	More frequent and more intense	↗	
Runoff	+21%	↗	Extreme events floods, drought, storms
Tonle Sap level in rainy season	+2.3 meters	↗	Higher sediment load in water, impact on fishery productivity
Tonle Sap level in dry season	+0.1 meter	↗	Increased rainfall in wet season will raise flood levels

*The thickness of arrows indicates the degree of certainty in findings.

Baran et al 2009: 3

- *Rising temperatures can have dramatic effects on agriculture, horticulture, aquaculture, and natural fisheries.* Even small changes in average temperature can affect both crops and fishes. For example, if temperatures climb to 95F for more than an hour during flowering, rice becomes sterile and produces no grain (Senapati, Behera, and Mishra 2013).

- *The negative effects of climate change are being compounded by more immediate threats to the integrity of Cambodia's natural environment,* which are usually seen as more urgent concerns (CCCN 2014). Cambodia has the third-highest deforestation rate in the world: over 7% of its forest cover was lost between 2002-2012 (Hansen et al. 2013, as cited by Milne & Mahanty 2015). This alarming loss, coupled with threats to aquatic ecosystems (e.g., unsustainable fishing, upstream hydropower dams, etc.) is further compromising rural livelihoods and capacities to adapt to climate change. Ecosystems which are already under stress are less able to withstand climatic changes. It may be useful to be aware that climate change as a global problem has emerged as a discourse in some quarters to shift the blame for environmental degradation in Cambodia to international actors, and thus sidestep responsibility for the impact of deforestation and other natural resource management problems. (Käkönen et al. 2014, Christoplos et al. 2014).

- *Climate change in an inherently uncertain process.* While climate change itself is almost certainly inevitable, the pace and extent of specific changes and cascading environmental effects on cannot be fully predicted – especially at the local level. There is more certainty about global climatic trends than precise local impacts, and the temptation to fixate on specific climate projections can serve to mask how much is in fact unpredictable. Climatic variance also interacts with other local-level factors. The integrity of a watershed, for example, depends on much more than simply rainfall. It is now considered good practice in climate change adaptation to embrace that uncertainty as an inherent characteristic of climate change. Instead, thinking in terms of 'adaptation pathways' is encouraged (Pringle 2011).

THE CSSM PROGRAM

56612 BENEFICIARIES

52.8% FEMALE

34.4% CHILDREN

17176 HOUSEHOLDS

26 SCHOOLS

45 COMMUNES SUPPORTED TO INCORPORATE CCA INTO THEIR INVESTMENT PLANS

55% MEMBERS OF PROJECT LEADERSHIP BODIES WERE WOMEN

17 PROVINCES

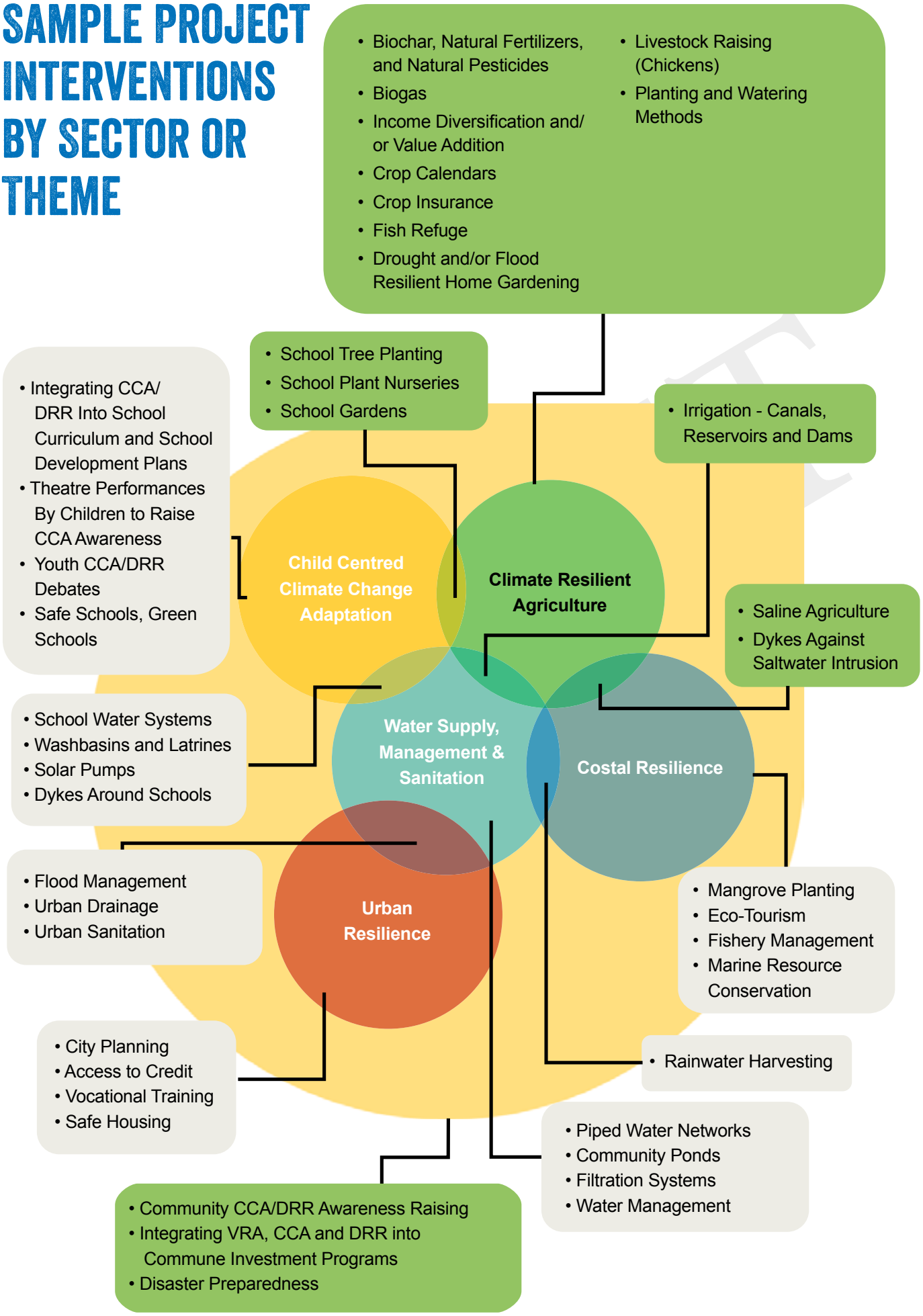
19 CIVIL SOCIETY ORGANIZATIONS

For the last few decades, experts have warned about the impacts of climate change, including the threat to global habitats, intensification of "natural" disasters, and the forced changes to the ways people live. Measures to adapt to and prevent climate change were part of this message.

To help raise climate change awareness and adaptation capacity of climate-vulnerable Cambodian communities, Plan International's Civil Society Support Mechanism (CSSM) operated from April 2015 to April 2018. It financed grants to nineteen different Cambodian CSOs to implement 18- to 20-month projects. The CSSM program managed by Plan International, received its funding from the Asian Development Bank (ADB) Technical Assistance Project -- *Mainstreaming Climate Resilience into Development Planning (MCRDP)* program, supported by the Pilot Program for Climate Resilience (PPCR) of Climate Investment Funds. This undertaking was supervised by the Ministry of Environment of Cambodia.

The CSOs received project grants ranging from USD 40,000 – USD 100,000. Various Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) interventions were implemented across seventeen provinces in Cambodia.The diagram on the next page maps out sample project interventions implemented by partners, along various sectors and themes covered by the project. Each project was designed based on findings from site-specific participatory community Vulnerability Reduction Assessments (VRAs). Care was taken to ensure that vulnerable groups, including women, children, indigenous people, and ethnic minorities, benefited.

SAMPLE PROJECT INTERVENTIONS BY SECTOR OR THEME



CLIMATE CHANGE ADAPTATION AND DISASTER RISK REDUCTION (CCA/DRR)

Adaptation:

Adaptation "refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change." (p 4)

Climate change:

(a) The Inter-governmental Panel on Climate Change (IPCC) defines climate change as "a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persist for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use". (p 6)

(b) The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods".(p 6)

Disaster Risk Reduction:

"The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to eleven hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events." (p 10)

-**UNISDR** (2009)

Adaptation is not a new concept. It has always been part of the successful development of human civilizations and cultures, allowing people to successfully live on almost every terrain on earth. Historically, the food eaten, the houses built, and human bodies have all adapted to the local environment. People learn from experience and change over time.

So, why are concentrated efforts for CCA so crucial? Simply put, the sheer speed at which climate change is happening is likely to outpace the ability of humans to smoothly adjust. We are not prepared for what lies ahead.

CCA/DRR projects enhance people's resilience, so that they are better able to cope with the hazards that accompany climate change. They are different from climate change mitigation strategies, which seek to reduce climate change itself (for example, by reducing use of fossil fuels or conserving forests). CCA/DRR addresses the effects, rather than the causes, of climate change. CCA/DRR can span many kinds of activities. It is not specific to any one sector or group of people.

DRIVING TRANSFORMATION

Vulnerability "is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity"(ECAP, n.d.) To improve the ability of Cambodians to tackle climate change, all these factors need to be addressed simultaneously.

The CSSM program focused on transformation from the ground up, explicitly concentrating on communities and the aspects of local ecosystems that exacerbated a community's vulnerabilities. Because realities vary by location, every community assessment was informed by a Vulnerability Reduction Assessment (VRA). This methodology was developed by UNDP. A handbook (UNDP 2015) was subsequently tailored to the Cambodian context and made widely available in both English and Khmer. It has been formally endorsed by the government for all community-based CCA interventions. It rests on a fully participatory four-step process to systematically investigate vulnerability and adaptive capacity to climate change in a given location. Our partners each conducted a VRA using this methodology, to identify potential projects to fund with sub-grants. Proposals were then developed with an aim towards implementing a short-term community-based project that would contribute to long-term transformation in the communities.

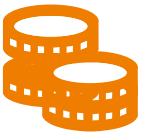
To drive this transformation the program focused on contributing to five key aspects or drivers of transformation across sectors and communities:

BEHAVIOURAL

Factors and approaches which influence individual, and community behaviour towards CCA and DRR

POLICY

Policy factors and approaches influencing local, sub national and national level CCA/DRR



ECONOMIC

Market, economic and financial conditions locally, nationally and internationally that influence CCA/DRR ability

INSTITUTIONAL

Internal and external factors influencing institutions and organizations, and their ability to support communities in CCA/DRR

TECHNICAL

Technical and scientific factors including project design

The aim of the transformational perspective towards climate adaptation is to collaborate on all levels from local to international, directly or indirectly, on climate change policies, strengthening institutions, building understanding, improving capacity around climate change, and emphasizing on integrating adaptation into development planning (Rufo 2016).

Chicken coops, Takeo

AGRICULTURE IN CAMBODIA AND THE CIVIL SOCIETY SUPPORT MECHANISM

Model farmer growing salad in raised beds, Ratanak Kiri

From the Mahidharapura dynasty in 1080CE to the present, rice has been the silent companion to Cambodia's history. Sometimes referred to as "white gold", rice is a staple for Cambodians, whose eyes search for rice upon sitting down for a meal. In fact, Cambodians often use the word for rice, *bai*, to refer to food itself.

Agriculture accounts for almost a third of Cambodia's gross domestic product, with the most significant portion of it from rice (IFC 2014). The agriculture sector employs 57.6% of the employable (National Climate Change Committee 2013); most rural Cambodians grow rice. However, Cambodia is not considered a competitive rice producer in the world market because of the more developed labor markets, plantation agriculture, and infrastructure in its neighboring countries of Vietnam and Thailand (IFC 2014).

Still, Cambodian agriculture has seen advances in the last decade. Farm wages grew 206% between 2005-2013 (Eliste, et al 2015), and it has been estimated that successes in Cambodian agriculture have helped four million people out of poverty. Between 2004 and 2011, the poverty rate dropped from 52.2% to 20.5% (World Bank 2013), a drop that is correlated to the growth of the agriculture sector.

However, the decrease in poverty does not necessarily indicate a reduction in climate vulnerability. A lack of up-to-date techniques and infrastructure, especially among smallholders (i.e. the poor and near poor), makes their activities particularly sensitive to climate change. In Cambodia, most rice farmers plant once a year, and their ability to sustain themselves depends heavily on their ability to harvest it successfully. A majority of farmers depend on the timing and intensity of rains occurring as expected. Further, increasingly intense floods and prolonged droughts have compromised farmers' livelihoods (Hijioka, et al 2016). Both floods and droughts destroy crops, leading to "perpetual vulnerability" for communities who occupy the floodplains (Hijioka, et al 2016).

Although rice crops occupy more than 80% of the harvested area, only 14% is irrigated (Murphy, et al 2013). Approximately 13% of cultivated land is used for corn, cassava, soybean and mung bean. The remaining area is used to grow vegetables, sesame, peanut, sugarcane, potato, tobacco and jute (National Council for Sustainable Development 2015).

VRAs were conducted to pinpoint promising pathways for reducing vulnerability. They showed that communities and livelihoods were increasingly exposed to warmer temperatures, variable precipitation and extreme weather events like storms. The VRAs indicated declining crop yields were the number one impact on communities from climate change, followed by poor health, then a reduction in family income and livelihoods. The target communities had low adaptive capacity, and little or no understanding of climate change in the scientific sense, but they were certainly aware of changing weather patterns, and took measures to cope as best they could. The most popular strategies were shifting to planting a short-cycle rice variety, or migrating to work as laborers.

Exposure:
The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected. (WGII)

Sensitivity:
The degree to which a system or species is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea level rise).

Adaptive capacity:
The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.

-IPCC 5th Assessment (2014)

CLIMATE SMART AGRICULTURE AND CLIMATE ADAPTIVE AGRICULTURE

The CSSM's main focus was adaptation, even though agriculture interventions touch on all three pillars of CSA, including mitigation. All the interventions explicitly worked towards building immediate adaptive capacity, while also laying the foundation for more resilient communities in the long-term. Hence, it can be said that the program concentrated its efforts on Climate Adaptive Agriculture (CAA).

On the other hand, Climate Resilient Agriculture (CRA) goes beyond adaptation by including the idea of seizing the opportunities that come with climate change to achieve renewed transformation and long-term growth.

Most projects funded under the CSSM contributed to strengthening institutional processes and capacities for better long-term adaptation planning at the local government and community levels. However, it would be an exaggeration to claim that local stakeholders and communities fully achieved long-term resilience, given the local and short-term nature of the projects.

Table 1 on the next page shows the extent to which various agricultural interventions contributed to increased productivity, mitigation, and adaptation, according to project representatives. Contributions to adaptation are mapped in table 2 on the following page.

"**Climate-smart agriculture** (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible." (Food and Agriculture Organization of the United Nations n.d.)

The three main pillars of CSA are productivity, adaptation and mitigation. (Research Program on Climate Change, Agriculture, and Food Security n.d.)

Productivity: Increase agricultural productivity and incomes from crops, livestock and fish, without having a negative impact on the environment.

Adaptation: Reduce the exposure of farmers to short-term risks, while strengthening their resilience by building their capacity to adapt and thrive.

Mitigation: Whenever possible, help reduce or remove greenhouse gas emissions.

TABLE 1: CONTRIBUTIONS OF INTERVENTIONS TO PRODUCTIVITY AND MITIGATION

INTERVENTIONS	PRODUCTIVITY/ SHORT-TERM FOOD SUPPLY	MITIGATION	IMPLEMENTING CSOS
Awareness raising	★	★	All CSOs
Biochar, natural fertilizers and pesticides	★★★	★★★★	LWD, CRF
Biogas	★★★	★★★★	CRID
Crop calendars	★★★★		LI, CEPA, LWD, SP, CRF, OC, KSCF, WOMEN, MIPAD, CWDCC, CRDT, KWWA, SSF, LEC, HURREDO
Crop insurance	★★★★		LWD
Fish refuge	★★★		HURREDO
Flood and/or drought resilient- home gardening	★★★★	★	LI, CEPA, LWD, SP, CRF, OC, KSCF, WOMEN, MIPAD, CWDCC, CRDT, KWWA, SSF, LEC,HURREDO
Irrigation – canals, dams and ponds	★★★★		OC, LEC, BK, LWD, HURREDO, KSCF, LI
Livestock/chicken-raising	★★★★		HURREDO, KSCF, KWWA, WOMEN, CRDT
Mainstreaming into commune investment plans			All CSOs
Planting and watering methods	★★★★	★	LI, CEPA, LWD, SP, CRF, OC, KSCF, WOMEN, MIPAD, CWDCC, CRDT, KWWA, SSF, LEC, HURREDO
Post-harvest handling (rice mills)	★★★★	★	KSCF
Resilient seed distribution	★★★		LWD, HURREDO, WOMEN, LI, KWWA, CRF, SP
Saline agriculture	★★★		CWDCC, SSF
School gardens	★★★		CRF, SP, BK
Soil conservation and preparation	★★★	★	LI, CEPA, LWD, SP, CRF, OC, KSCF, WOMEN, MIPAD, CWDCC, CRDT, KWWA, SSF, LEC, HURREDO
Tree planting and nurseries	★★	★★★	LEC, OC, LWD, CWDCC, SSF
Women-led animal feed co-operative	★★★★		WOMEN

Climate vulnerability is a combination of three factors: exposure to climate hazards, sensitivity to the hazards and their impacts, and capacity to adapt to changing circumstances. Based on a review by the CSSM team, Table 2 indicates the extent to which interventions reduced communities' vulnerability to climate change through reducing exposure and sensitivity, or increasing adaptive capacity.

TABLE 2: REDUCTION OF COMMUNITIES' VULNERABILITY TO CLIMATE CHANGE

Interventions	Vulnerability reduction through...		
	Reduced Exposure	Reduced Sensitivity	Increased Adaptive Capacity
Awareness raising	★★	★★	★★★★
Biochar, natural fertilizers and pesticides	★	★	★★
Biogas			★★★
Crop calendar	★★★	★★★	★★★★
Crop Insurance	★	★★★	★★★★
Fish refuges	★★	★★	★★★
Flood/drought resilient home gardening (chemical free)	★★★	★★★	★★★★
Irrigation – canals and dams	★★★	★★★	★★★★
Livestock and chicken raising	★★	★★	★★★
Planting methods	★★★	★★★	★★★
Post-harvest (rice mills)	★	★★★	★★★
Resilient seed distribution	★★	★★	★★★
Saline agriculture	★★★	★★★	★★★★
School gardens	★★★	★★★	★★★
Soil conservation and preparation	★★	★★	★★★
Tree planting and nurseries	★★★	★★★	★★★
Women-led animal feed co-operatives	★	★	★★★★
Mainstreaming into CIP	★★	★★	★★★

The table above highlights how, according to project stakeholders, various interventions:

★ Minimally contribute,
★★ Contribute,
★★★ Significantly contribute,
★★★★ Very significantly contribute,

to reducing sensitivity, reducing exposure, and increasing adaptive capacity to climate change.

MEASURING RESILIENCE AND CLIMATE ADAPTIVE AGRICULTURE

Biochar equipment beneficiary in her vegetable garden, Kampong Chhnang

The CSSM intended to increase community resilience by strengthening the capacity of its partner CSOs in CCA/DRR and reducing vulnerabilities, while keeping with national level policies and efforts. Measuring the impact of this program proved to be complex, given its multiple layers, partners, sectors, and target beneficiaries. The monitoring and evaluation framework is best understood when split into the umbrella program and CSO sub-project levels

At the **umbrella program level,** the indicators and objectives emphasized the capacities of the CSOs themselves. They also aligned relevant activities with key indicators of the official monitoring, reporting, and evaluation frameworks of the PPCR and Ministry of Environment.

CSOs at the **sub-project level** developed their own sets of indicators specific to each sub-project, supplementing a short set of standardized indicators imposed by the CSSM, which were uniform across all CSOs.

OUTCOME INDICATORS

Because "resilience" is complex and conceptual, it has no standardized indicators. The most common indicators for resilience at the sub-project level were:

- Change in perceived vulnerability to level and ranking of climate hazard - and associated impact - between baseline and endline VRAs, by VRA participants (men, women, boys, girls)
- Improvement in centrally issued Commune Vulnerability Index (CVI) generated from commune census data before and after the projects.

Like all broadly measured development indicators, there are some attribution challenges associated with the use of such indicators.

OUTPUT INDICATORS

Quantifying adaptation is a necessary part of monitoring and evaluating a program focused on CAA. Project outputs are usually used, and can be understood as specific actions and activities that are implemented over the course of a program or project, undertaken by the project, CSO partners, and/or beneficiaries. Output indicators can be clustered into 'soft' activities (e.g., capacity building, awareness/ education, mainstreaming) and 'hard' activities (e.g., digging wells, distributing chickens, school building maintenance, etc.). However, because adaptation is a complex, contextual, and multi-dimensional process, there are no specific metrics to count. Individual adaptation activities – especially 'hard' ones – do not necessarily look different from other development activities. A water pump is, after all, still a water pump! Adaptation activities are distinguished from "business as usual" activities because of how they work together to effectively advance a climate change adaptation strategy.

Women's Self Help Group, Siem Reap

"Soft" activity indicators for CAA used by CSO partners included those that are more generic to climate change and disaster awareness. These include level of understanding of the causes and impacts of climate change, and improvement in institutional capacity. Below are some project-specific indicators drawn from the different sub-projects

SAMPLE SOFT INDICATORS

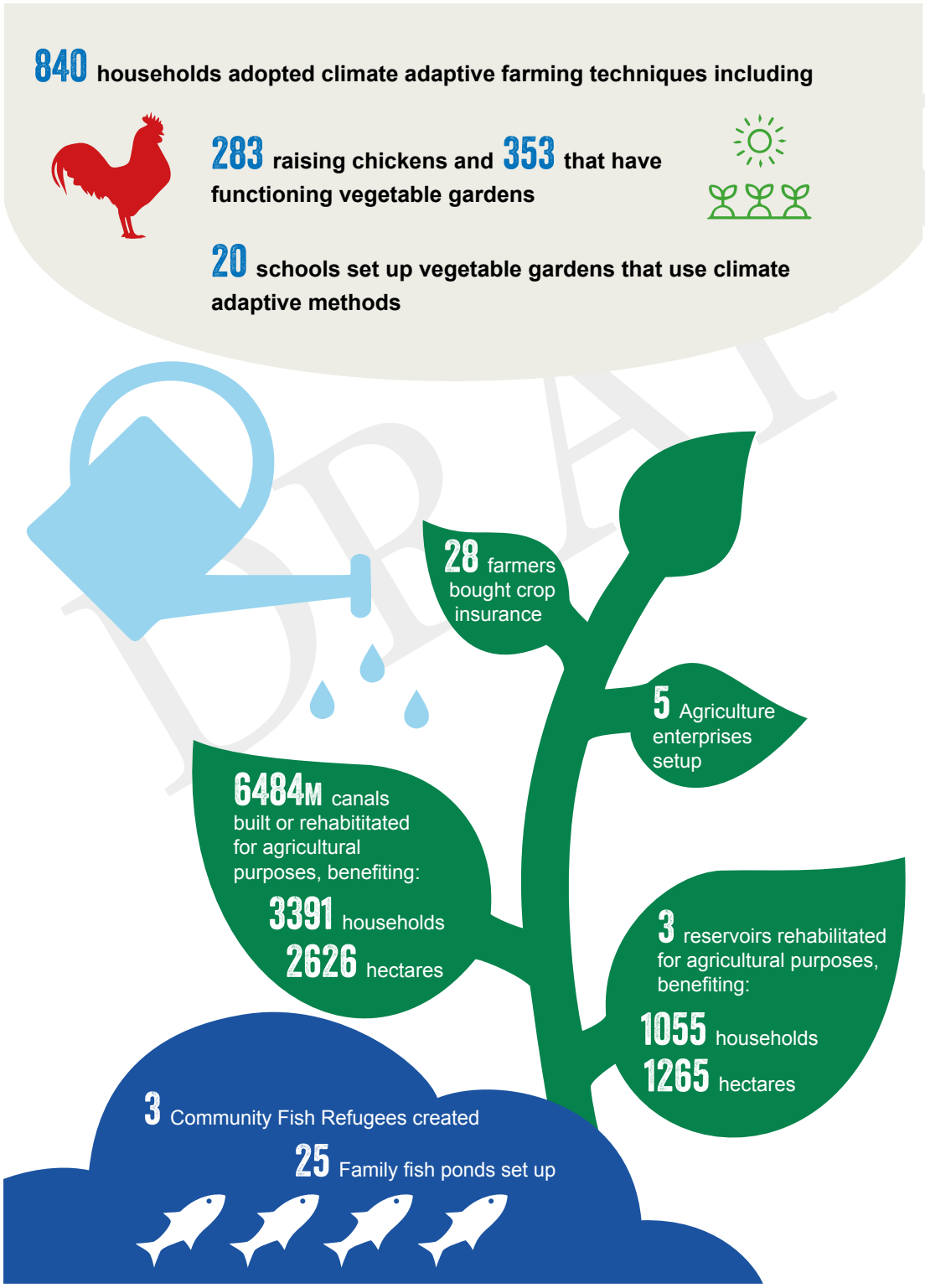
850 FARMERS TRAINED ON VARIOUS FORMS OF CAA TECHNIQUES. **67 %** OF THE PARTICIPANTS IN VARIOUS CAA TRAININGS WERE WOMEN

40 FARMERS TRAINED IN INTEGRATED PEST MANAGEMENT WITH SUPPORT FROM THE PROVINCIAL AGRICULTURE DEPARTMENT

10 SCHOOLS TAUGHT HOW TO USE DRIP LINE IRRIGATION SYSTEMS IN THEIR VEGETABLE GARDENS

"Hard" activity indicators used by CSO partners relevant to CAA included number of trained farmers and households who adopt CSA techniques, and percentage of households in a target village that have a home garden. These activities were achieved through trainings, field schools, local development planning support model farmer schemes, access to credit, and access to self-help groups, among other things. Sample indicators drawn from the different sub-projects are shown below.

SAMPLE HARD INDICATORS



Other indicators were also developed, some examples are listed in Appendix 1 to this document.

The purpose of this section is to highlight the impact and contributions of specific interventions within a project

CASE STUDIES

SECTION 2

BIOCHAR FOR EFFICIENT WATER USE IN KAMPONG CHHNANG PROVINCE

INTERVENTION DETAILS :

Objective:

To enhance sustainable agriculture productivity through innovation.

Output :

Innovative system (biochar) trialled in vegetable cropping and fruit tree plantations.

Beneficiaries: 60 farmers (97% women).

DRIVERS OF TRANSFORMATION:

Technical: Biochar technology for improvement of soil quality and reduction in watering needs.

Behaviour: Reduction in usage of chemical fertilizer and pesticides while improving product quality as a result of using biochar, coupled with piloting of chemical free alternative solutions.

Using a sharp knife with impressive precision and speed, Mear does not look down as she peels thin and even strips of bamboo for weaving. The finished product, fish traps, hang from one of the stilts that hold up her traditionally styled home. “I sell these in the market to make some money on the side but I am essentially a farmer,” says Mear. “I grow vegetables that I sell in the market. I grow rice only for household use.”

Biochar and equipment, Kampong Chhnang

Mear and her 18-year-old son live in the water-scarce region of Kampong Chhnang where Live and Learn, Cambodia (LEC), locally known as 'Le-La', piloted their biochar project. Mear volunteered to be a model farmer and is very happy with her decision. LEC provided a total of 60 people, including Mear, 57 other women, and 2 men in her commune with custom-made equipment and training to produce biochar and improve vegetable farming skills. During technical development, LEC kept in mind single women-led households like Mear's, choosing to make the equipment out of steel canisters light enough to move around. "[The equipment]

is light and easy enough for me to use… The material I need to make [biochar], I can get from in and around my farm and our house," Mear explains as she demonstrates how the equipment works.

Biochar is obtained from burning biomass in very low oxygen or oxygen-free conditions. It is a carbon-rich and porous material that has the potential to benefit soil quality, improve soil water retention, and help plant growth. Some research suggests that adding biochar to the soil can help in greenhouse gas mitigation since the dense carbon particles in biochar take longer for microorganisms in the soil to digest and release into the atmosphere as CO2, compared to regular biomass (Shackley 2015).

LEC taught beneficiaries to make biochar from biomass and mix it with the soil before planting vegetables. The biochar was usually sufficient for one harvest cycle, depending on local soil quality and vegetable type. If the beneficiaries saw that the soil quality was dwindling they could make and top up the soil with additional biochar. Producing biochar was often coupled with guidance from project staff in producing compost and chemical fertilizer.

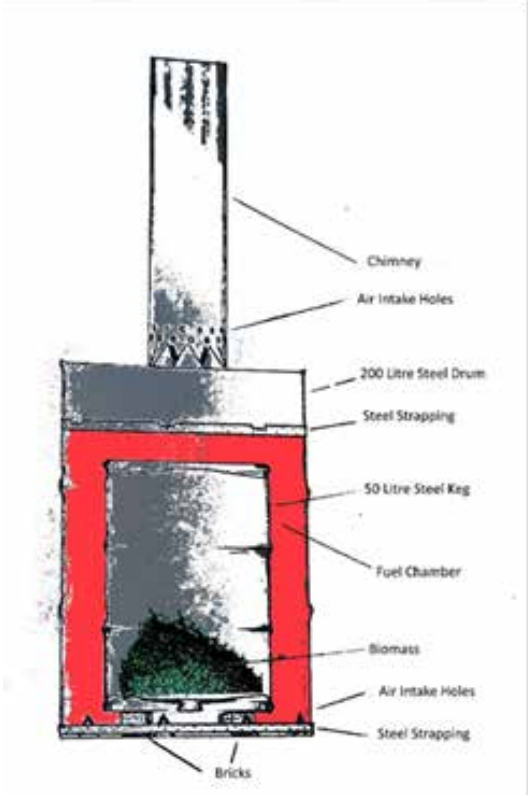
According to the local council, the most useful aspects of biochar and the vegetable growing techniques taught by LEC was that much less water is now needed to grow their plants. Mear waters her plants only once every 10-15 days, compared to before when she would water her plants once every two to three days. Still, the local council is aware that the increasing severity of droughts will require improved water supply to supplement the biochar project. "Biochar reduces the need for water; it doesn't eliminate it." explained the commune chief. Another benefit is that fewer weeds grow near vegetables because less manure is used. Additionally, using improved farming techniques means that Mear spends less time plucking out grass growing near her vegetables, time that she now uses to weave fish traps to sell. However, like the local council, the community is realistic in their expectations of biochar. In fact, half the villagers feel that given the changing weather, there is less uncertainty in working for garment factories. Soposh, who uses biochar in his vegetable garden, says that his wife prefers not to help with making biochar and vegetable gardening because the increasingly hot and sharp sun darkens her skin faster than it used to, and garment factories jobs are appealing because they are indoors.

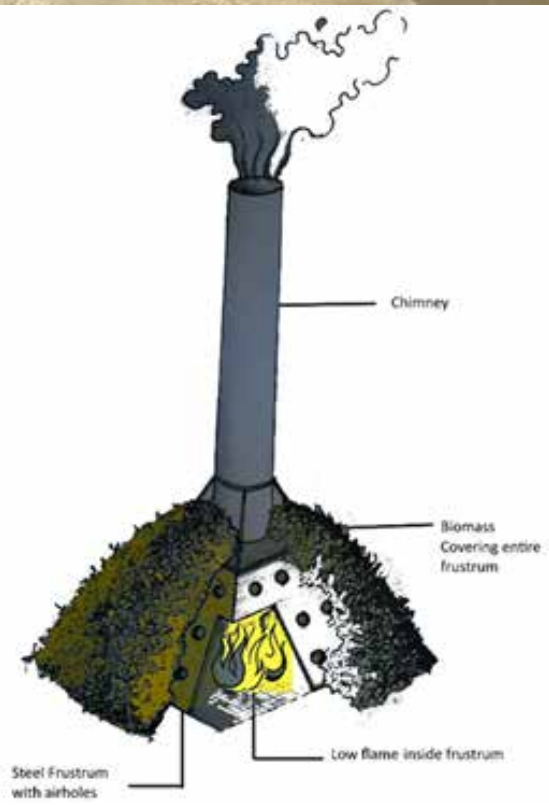
Mear, however, says that she is open to buying the "machine" herself, once this one has reached the end of its usable life -- around a year or two. It costs LEC 45-55 USD per unit, almost a third of Mear's current monthly income. She plans to improve the longevity of the current "machine" by using the equipment maintenance tips LEC gave her and the community.

The local council chief is appreciative of LEC's interventions in the area. "People don't simply curse their luck now and hope for better days. They know that the hotter, drier days are because of climate change and that they actively need to do things to adapt to it."

COMPARISON OF BIOCHAR EQUIPMENT PILOTED BY TWO CSOs:

The following diagrams and table display two different biochar solutions, one adopted by LEC's project, and another adopted by another CSSM partner, CRF. Both are being displayed to show how designs can be adjusted to fit local needs; one solution is not fundamentally better than the other. In the cases below, decisions were made weighing cost of the equipment against flexibility in usage of various biomass, as well as flexibility in process monitoring.





Biochar Equipment: LEC Model/CRF Model

TABLE 3: COMPARISON OF BIOCHAR MODELS PILOTED BY TWO CSOs

Biochar features:	LEC model	CRF model
Province	Kampong Chhnang	Kandal
Type of use	Home gardens	School vegetable garden
Durability	1-2 years depending on usage and upkeep	1-2 years depending on usage and upkeep
Degree of difficulty in use	Can be left out overnight as the burning fuel is not in direct contact with biomass so there is no chance of biomass fully burning	Needs to be watched as one needs to ensure that the rice husk is being smoked and not burnt
Quantity produced each time (approx. in kilograms)	20-25 kgs	13-15 kgs
Quality of biochar	High	Medium (the outermost layer does not burn in low oxygen conditions)
Material used to make biochar (biomass)	Rice husk, twigs, fallen leaves, palm flowers, palm fruit, palm branch, coconut branch, coconut fruit and other woods	Rice husk
Material used for combustion	Oil, Barrel fuel	Firewood
Material used to make equipment	Steel	Steel
Average weight of equipment	25-35 kgs	5 kgs
Cost of producing equipment	45-55 USD	10-15 USD
Ease of reproduction of equipment	Moderate: Steel barrels need to be procured and modified from a basic blueprint by an experienced blacksmith	Easy: perforated, steel fulcrum with narrow chimney

Avenues for scaling up:

WHAT: A local entrepreneur or agricultural cooperative can go into biochar equipment production, but affordability and durability of equipment still need to be improved. This could be done by setting up a larger, more technical manufacturing entity, such as by adding onto an existing welding business. Alternatively, an individual or agricultural cooperative could access equipment for producing biochar on a larger scale, and sell the output to farmers in the villages and communes.

ROLES and STAGES: This is conditional on finding a suitable and interested entrepreneur or cooperative. It requires support of a CSO or other specialized entity to conduct a market study, develop business plans, further technical design and testing, and facilitate access to financing or credit.

VECTOR: CSO can replicate the same entrepreneur or cooperative-centered model in other provinces.

Interventions undertaken by LEC to support target communities:

Pilot biochar systems; encourage vegetable cropping and tree planting; produce compost and natural fertilizer; rehabilitate irrigation system; provide training on CRA; conduct training of trainers for community members and officials on CCA and DRR; mainstream CCA and DRR into development plans and investment plans; and conduct CCA/DRR awareness campaigns.

Mear standing in her vegetable garden where she uses biochar, Kampong Chhnang

SUSTAINABLE RICE FIELD FISHING IN SIEM REAP PROVINCE

INTERVENTION DETAILS :

Objective: Reduce vulnerability to climate change via the enhancement of adaptive capacity from better natural resource management.

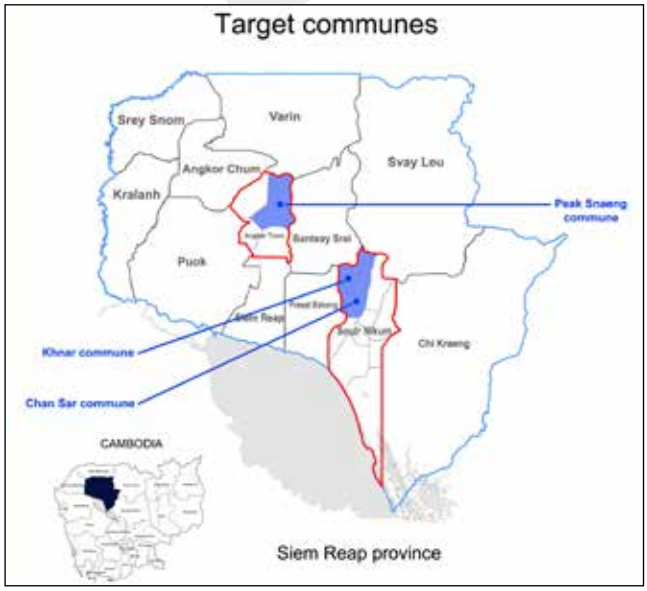
Output: Three Community Fish Refuges (CFR) established with committees trained on natural fish breed conservation (25 Committee members, 32% women).

Beneficiaries: 376 families (1963 people, 53% women).

DRIVERS OF TRANSFORMATION:

Institution: Formalizing and strengthening CFR committees, in collaboration with local authority.

Behaviour: Strengthening CFR committees and raising community awareness to reduce poaching and improve fishery resource protection and monitoring.



The streets on the outskirts of the provincial capital of Siem Reap are lined with shacks selling simple cane fishing gear. Tourists sometimes buy them as souvenirs, but they are mainly there to cater to the needs of one of the most intensive freshwater fisheries in the world, with more catch annually than most countries in the world (Joffre 2012). Generating a small income from fishing requires very little investment, making it a viable livelihood option for low-income households.

During flood season in the Tonle Sap region, the rivers, lakes, and ponds overflow into the

Committee members keeping an eye on the CFR to avoid illegal fishing, Siem Reap

surrounding lowlands, including many rice fields. These then become ripe fishing grounds. Fishing in and around rice fields is an age-old practice and serves as an alternative source of food and income for poor farmers, especially when floods destroy crops.

Human Resource and Rural Economic Development Organization (HURREDO) has worked with rural communities in Siem Reap since 1999. For this subproject, HURREDO consulted with the communities in Soutr Nikom and Angkor Thom districts, for whom fish is an important source of protein and nutrients. Having stable access to fish, both now and in future, is vital for the long-term health of the communities. Based on this, and building on other projects, government initiatives, and strategy documents, HURREDO came to the conclusion that the communities might benefit from Community Fish Refuges (CFR). A CFR can be an artificial or natural catchment of water, such as a pond, used to improve fishing productivity in rice fields while keeping the fish population in the area stable. In the dry season, the refuge acts as a safe place for broodstock. During flood season, the fish can swim into the rice fields, where community members can catch them for food or sale.

With support from ADB and Plan International, HURREDO helped restore and clean three natural ponds to create CFRs. They also provided villages with a total of 51 kg of fingerlings to breed in the ponds.

Houe, the health focal point of her village, says erratic weather has affected not only rice yield but also community health. She is also clear on how to properly manage the CFR in her

community; unsurprisingly, Houe is an elected member of one of the CFR committees, which maintain, manage, and patrol the CFRs. “People aren’t allowed to go fishing in the pond now; it’s too soon. The fish are still young. We will benefit from the ponds in the long-term,” says Houe. Since the pond is near her house, Houe keeps an eye on it during the day. Male committee members take turns to do night patrol using a wooden patrol station built as part of the project. They do this to prevent illegal fishing, especially when fishing is restricted.

Houe says there haven’t been any significant problems with people adhering to the CFR rules. However, since CFRs are a community resource, maintained by elected members of the community, the project staff wanted to ensure that the committees had the tools to manage the diverse opinions and interests of various community members after the life of the project. So, committee members were provided training in basic conflict management. They are all also recognized by the government, which empowers them to manage any problems that may arise in the future.

The implementation of the intervention was mostly smooth because of HURREDO’s experience and positive reputation in the communities. However, limited understanding of the benefits of long-term conservation among community members meant that the intervention encountered scepticism. In response, HURREDO conducted awareness raising drives on management, fish conservation, and fishery laws in Cambodia in its target villages. However, even with increased community awareness some community members might overlook the importance of conservation for short-term gains. Legitimizing the CFR through formal government recognition and involving the local authorities provided a necessary ‘watchdog’ measure, in place until the community fully understood the benefits of sustainable fishing. Whether the CFR committee members continue to meet regularly and maintain the pond after the project ends remains to be seen. Nevertheless, given that the selected committee members have historically participated actively in community development - as in the case of Houe – the ponds are likely to flourish.

The HURREDO project officer says that the community plans on having a prayer ceremony in the village around Khmer New Year, to pray for a good harvest of fish and rice. By then, the fish in the CFRs will be big enough to eat, and the community can use them to prepare a meal for everyone to eat at the ceremony.

Figures:

- Construction of three channels that allow fish to swim from the ponds to rice fields during rainy season to lay fish eggs — 1,020 USD.
- Construction of two patrol stations — 1,000 USD

CFR process and rules:

- Fingerling release months: September - December annually.
- Fishing can only be done using traditional fishing equipment, as stated in Cambodian fishery laws.
- Fishing allowed in rice-potholes, lowlands, and small ponds outside CFRs.
- Average catch 1-3 kgs.

Patrol station for Community Fish Refuge, Siem Reap

Avenues for scaling up:

WHAT: It is already part of traditional culture and government policy to practice CFR, and technical knowledge already exists. Support is needed to increase awareness and knowledge on: preserving and monitoring sanctuaries, controlling use of chemicals in areas surrounding refuges and rice fields where the fish swim to; and enforcing sustainable fishing techniques.

ROLES: CSO and/or Provincial Department of Agriculture and communities to cooperate to promote program.

VECTOR: Government program or grant to local CSO to replicate practices in suitable sites; increase visibility and demand by marketing to a consumer market that prefers natural fish over farmed fish; and facilitate promotion as a tourist attraction.

Interventions undertaken by HURREDO to support target communities:

CFRs, WASH training, home fruit & vegetable gardening training, chicken and fish raising support and training, self-help groups for climate adaptive livelihood activities, raising awareness in communities about climate change and disaster risk reduction, and building climate resilient irrigation systems.

Houe who is a member of the CFR committee stands in front of the pond (CFR) in her village, Siem Reap

RESTORATION OF IRRIGATION SYSTEMS TO IMPROVE COMMUNITY ADAPTIVE CAPACITY IN BATTAMBANG PROVINCE

INTERVENTION DETAILS:

Objective: To identify, pilot, and document the implementation of 'hard' interventions and/or CCA practices to increase water availability and access in the commune.

Output: Pilot the implementation of selected activities [such as irrigation canal], including in most vulnerable households, in line with a defined Water Management Plan

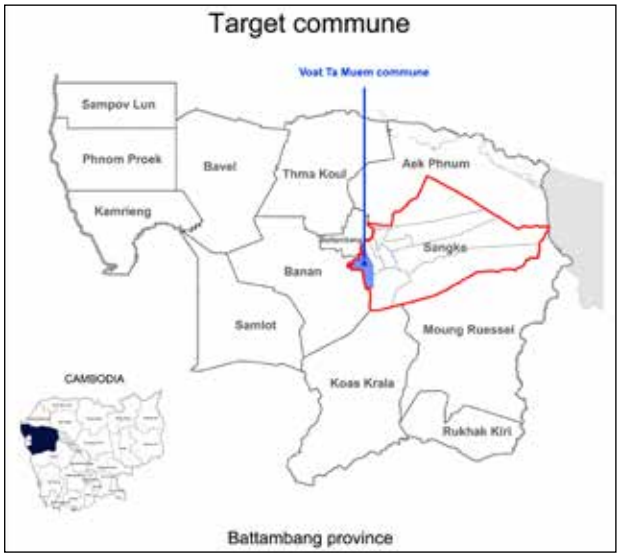
Beneficiaries: 4,317 households

DRIVERS OF TRANSFORMATION:

Technical: Improved water management infrastructure with three canals and one water gate.

Institutional: Water management workshops and water management committee strengthening.

Behavior: Reduction of water-related community conflict.



Once a primary school teacher, Samvan now spends his time tending to the paddy and oranges in his field. His field is near a green pond of water -- Boueng Khna -- that forms the chief irrigation source for farmers nearby. In 2016, the pond had been dry for three years due to prolonged droughts.

Battambang is sometimes known as the rice bowl of Cambodia due to the presence of very fertile soil. However, it is a highly drought-prone area. Extensive research conducted by the Learning

Irrigation canal, Battambang

Institute (LI) in the first few months of its project confirmed that rainfall in Voat Ta Muem commune in Battambang had been lower than normal. Villages in the area have seen a consistent decline in rainfall over the last 10 years.

Droughts create a shortage of surface-water supply, compromising water security for both consumption and agricultural use, and increasing conflict around water resources. They also lead to increased costs associated with irrigation and/or a decrease in crop yields or demand for agricultural labor. The research revealed that some villagers in the commune thought that drought was a natural phenomenon, while others saw water shortages as the result of a mismanagement of water resources by the responsible authorities (Otdam 2018).

Samvan, his wife, and their three children live in Voat Ta Muem. By 2016, he and the other people in his village had long believed that Boueng Khna would stay dry, and would even leave their livestock there to graze. The possibility of seeing filled with water seemed unlikely. Instead, the farmers used alternate water systems to get water for their farms. This was a two- or three-day process which involved submitting a formal request to the commune, gathering money for 70-80 liters of gasoline to transport water, manual cleaning of the weed-filled waterways, and constant arguments.

When LI came to the commune as part of the CSSM project, it conducted extensive participatory research to analyze and account for the natural and human activity in the area, and identify technical, social, economic, political, and institutional factors, which "may exacerbate negative impacts of climate change within the interplay of the natural and human systems" (Otdam 2018).

Based on their study and with support from the local commune council, LI decided to rehabilitate 2800m of canals locally known as Ou Sralau, Ou Kchas, and Slor Kram. This was done primarily to support the rice and fruit farmers in the area.

In less than six months, the canals were rehabilitated and the once dry Boeung Khna now has water for farm irrigation. The farmers use private water pumps to bring water to their farms. The efficiency of the individual pumps varies, but the water is instantly available for use. According to LI, the construction process took longer than expected due to certifications and approvals that were required, but this formed the cornerstone for establishing healthy relations with local authorities.

To ensure that the canal water supports the villages in the commune through harsh droughts in the future, three water usage workshops were set up for the villagers. The workshops discussed water and climate change, water management, and efficient water use, among other things. These workshops saw a steady increase in villager participation through the course of the project with around 15 attending the first workshop to 41 participants by the last workshop. Because the first workshop took place during harvest season, many farmers could not leave their field for a workshop on a concept they did not fully grasp the importance of. The second and third workshops saw improved numbers due to better timing and word-of-mouth.

The workshops also served as foundational training formembers of the Farmer Water User Committees (FWUC), which included respected and community members like Samvan and a retired commune chief. The FWUCs span the three canals and consist of 17 members, 30% of which are women. Committee members received additional training on water management, conservation, and community resource management to ensure that they would be able to function effectively beyond project completion.

Figures:

- Cost of rehabilitation of three canals – 15,000 USD.
- Water gate at Ou Sralau to keep water from flowing out in dry season – 3,019.87 USD.
- 3 Village water management workshops, 2,117 households benefiting.
- Command area: approximately 1,750 ha (70% of 2,500 ha).
- Other CSO's from the CSSM program that undertook irrigation focused interventions are, LEC, BK, LWD, HURREDO and KSCF. In total 6484m canals were built or rehabilitated for agricultural purposes benefitting 2626 hectares of land and 3 reservoirs were built benefitting 1265 hectares of land.

Boueng Khna after rehabilitation of three canals, Battambang

Avenues for scaling up:

WHAT: Theoretically, model is already scaled up as it is fully in place and is backed up by government regulations and an official FWUC strengthening model by the Ministry of Water Resources and Meteorology (MOWRAM). However, infrastructure, quality of government service, and incentives are lacking. This is compounded by farmer perception of shortfalls in quality of field-gate irrigation service delivery. They are unwilling to pay fees as a result. The opportunity lies in coupling infrastructure investments with improving both government and farmer incentive systems, as well as water distribution pricing and technical measurement, to ensure better equity between upstream and downstream landholders within the command area.

ROLE: Government must lead through MOWRAM, disseminated through the Provincial Departments of Water Resources and Meteorology. At the community level, FWUCs can be diversified to include more commercial and income generating activites such as an agricultural cooperative, and more easily raise funds for irrigation system operation and management.

VECTOR: National level program to i) incentivize government service delivery, coupled with ii) supporting government investments in irrigation water control and measurement technology, and iii) strengthening community ownership, management systems, and capacity to ensure operational cost recovery and routine downstream operation and management.

Interventions undertaken by LI to support target communities:

Canal and pond restoration, strengthening of village workgroups, water committees, Water Management Plans for water user groups, farmer field schools in collaboration with the local agriculture department's integrated pest management program, and climate change adaptation workshops.

Bi is a well respected community member who played an active role in encouraging participation in project activities, Battambang

HATCHERY FOR CLIMATE RESILIENT CHICK PRODUCTION IN TAKÉO PROVINCE

INTERVENTION DETAILS:

Objective: Enhancing adaptive capacity of communities to improve livelihoods in target villages.

Output: Chicken raised to adapt to climate change in order to generate additional income in the community

DRIVERS OF TRANSFORMATION:

Behaviour: Promoting more systematic chicken vaccination practices to reduce chicken vulnerability to disease during floods or droughts.

Technology: Incubator and chicken farm shelters for higher chick survival rates at birth and better protection from weather related threats.

Economics: Income diversification through agribusiness ventures, such as chick selling and vaccination extension.

Twelve rooms, seven hens, and a rooster in each room. An incubator and warm, cozy coops for chicks of different ages. All in a clean, wooden structure with a thatched roof. This is the hatchery that 52-year-old Saran, a man who calls himself a rice farmer, runs with his wife and daughter, with technical support from Plan International and its partner Sovann Phoum (SP).

SP came to Saran's village in June 2016. They spoke to the community about climate change and involved the community in assessing how they could adapt to climate change. This

Chick hatchery, Takéo

community, primarily farmers in a frequently drought-affected area, needed to diversify livelihoods. The increasingly hotter summers and intense rains meant that more poultry were lost to diseases and exhaustion, which contrasted sharply against a steady increase in the demand for meat and poultry in Cambodia, especially in the neighboring city of Phnom Penh (Ministry of Agriculture, Forestry, and Fisheries 2017). The value in a system that would allow the community to raise healthy, climate resilient poultry was obvious.

Saran's house was selected for a hatchery because of his interest and the availability of space on his land. In the hatchery, the eggs are incubated, hatched, and raised in a hygienic environment conducive to optimising chick health. The chicks are properly vaccinated for Newcastle's disease and Fowlpox. They are kept safe from aggressive natural elements in a roofed enclosure for at least twenty one days, giving them time to build their strength and immunity.

Now, Saran earns around 250 USD a month, which is comparable to what he earned prior to 2016 selling chicken for meat. While he says his gross earnings have increased three-fold, he now spends more on electricity and vaccinations. He also spends more time tending to the chickens and following scientific chicken-raising processes compared to before, when he just let his chickens roam in the open and find food for themselves. In return, he has healthier chickens and has not lost any poultry in his hatchery to diseases in the last year.

"The people from the village can buy chicks from Saran to raise and sell. They can be sure they are healthy and more likely to survive the erratic climate," said a project officer from SP. "The demand for these chicks is already very high and may even surpass current supply very soon," he added. People can ask Saran for technical advice on chicken-raising once the project is complete, advice that he is happy to give. He periodically organizes a vaccination

session to which fellow farmers are invited to learn from him. He also goes to other people's farms to dispense vaccinations. He is, however, a cautious soul. When asked about the future, he says, expressionless, "I don't think it's wise to predict the future, given the erratic weather [changing climate]. One important benefit I got from this activity is that I don't need to migrate to look for seasonal work like I used to before, and it is less tiring".

Figures:

- Investment in chick hatchery physical assets: 3,200 USD, including 500 USD for each of the two incubating machines.
- Vaccines provided for poultry:

Age	Name of Vaccine	Frequency
1 - 3 days	Newcastle *First dose given in hatchery*	Repeated every 4-6 months
10 days	Fowl pox *First dose given in hatchery*	
2 and a half months	Fowl Cholera	Repeated every 4-6 months

- Age of chicks before they can be sold: 21 days.
- Additional chicken-raising training: 20 villages – (441 participants, 301 female).
- Chicks sold in first year of operation 2016: 3,169 at 1.25 USD per chick to 41 members of the community

Hatchery volunteer selection criteria:

1. Have experience raising animals and caring for animals
2. Have vacant land for hatchery (at least 20m x 30m) with access to electricity
3. Can spend on equipment, vaccines, and animal feed long-term
4. Commits to planting vegetable gardens for organic chicken feed
5. Have patience, is industrious, and is responsible
6. Family is willing to support farmer in hatchery activities
7. Commits to attend trainings as needed
8. Is proactive and able to contribute ideas to the pilot plan
9. Is willing to share experiences with other farmers
10. Can be a member of the project self-help group (preferred)

Avenues for scaling up:

WHAT: Replication of investment by individuals or community based organizations, motivated by higher chicken survival rates and steadier farm cash flow, provided infrastructure is available. ROLE and STAGES: Mainly farmer or CBO driven, with technical support and funding from CSOs, and eventually microfinancing. If fully successful, the technical advisory role can be taken on by government, and disseminated through Provincial Departments of Agriculture instead of CSOs.

VECTOR: CSO program to create a good environment for community-driven enterprises (technical skills, access to credit, market information, access to electricity, etc.).

Interventions undertaken by SP to support target communities:

Establish model community hatchery and chicken demonstration farms, establish and train on vegetable farms in schools and in the community, establish school and community water supply system using solar panels, establish safe drinking water/filtration systems in schools, strengthen self-help groups, train on CSA and WASH, provide awareness raising activities on CCA and DRR.

Saran standing next to the incubator , Takéo

CROP INSURANCE FOR DROUGHT-PRONE COMMUNES OF KAMPONG SPEU PROVINCE

INTERVENTION DETAILS:

Objective: Objective: Enhancing adaptive capacity of communities by improving agricultural production using effective drought coping strategies.

Output: Introduction of Insurance scheme.

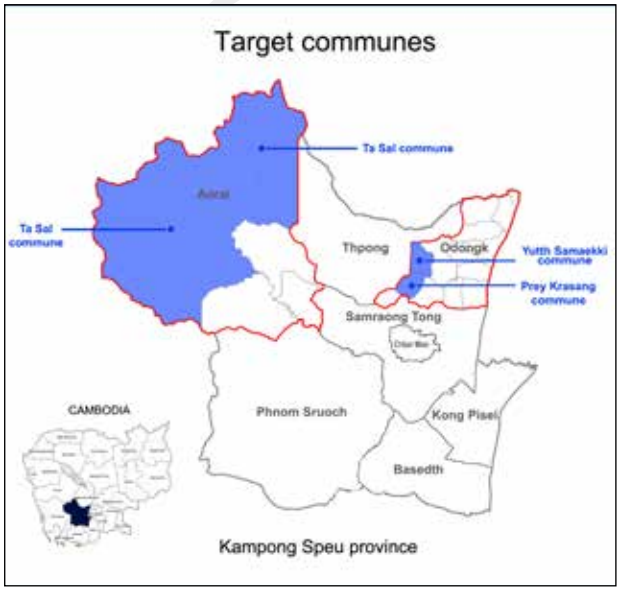
Beneficiaries: 28 farmers (45% women).

DRIVERS OF TRANSFORMATION:

Economics: Financial insurance tool to soften the impact from climate-related yield losses.

Institution: Establishment of self-contained savings and insurance mechanism within existing agricultural cooperative entity.

Behavior: Farmers experience and learn about risk management, associated costs, gains, or losses through small scale and progressive cooperative insurance pilot.



The Ta Sal commune in Aoral District sits close to the Cardamom mountains and forests.

Kong, a village chief in the commune, says he has lived here all his life. He has fond memories of cooler weather when he was a child. Although the commune never had plenty of water as the mountains block much of the rain, there used to be sufficient rainfall for the community to farm their own rice once a year. However, over the last 10 years, the rains have been increasingly erratic. 2015 was an especially bad year – villagers had to go the forests to dig out root vegetables to eat.

Mao lives in Kong's village. Mao and her family predominantly eat rice they grow themselves. When their crop fails, it places an immense burden on their finances. The family normally supplements its income by collecting and selling palm juice and bamboo shoots, but during harvest season it is too tiring for them to do any work other than tend to their farm. She and her husband insured their farm this year for the first time, as part of the crop insurance scheme piloted by Living with Dignity (LWD), under the CSSM.

LWD set up crop insurance to reduce some of the risk farmers face when growing rice. LWD received technical support from the Cambodian Micro Agriculture Insurance Scheme run by the Centre for Study and Development in Agriculture (CEDAC), which has been piloting a crop insurance model in several Cambodian provinces.

A CEDAC advisor ran a workshop for community members, local government representatives, and members of local Agriculture Cooperatives (AC). AC members were requested to attend the workshop to consider the viability of running the insurance scheme as part of their cooperative entity. The CEDAC advisor also ran an awareness campaign in the villages to help the communities understand how crop insurance works. The awareness campaign was well received, which prompted LWD to set up the scheme.

The AC that ran the insurance scheme was selected because they had government recognition, proper legal structure, and sufficient capital and capacity. A lot of time was spent setting down the rules, processes, and procedures for the scheme. Along with the scheme, LWD also invested in training the villagers on resilient agriculture to ensure better yield.

28 farmers bought insurance at 800 Cambodian riels (KHR) (or 0.2 USD) per 1600 m2 (1 Rai). With a total of 11.25 hectares insured, the Rice Insurance Agent (RIA) collected 821,600 KHR (approx. 2,000 USD) for the agriculture committee after evaluating and measuring the farms. 24 farmers incurred losses and the committee estimated pay-outs would theoretically reach a total of 2,715,400 KHR. Since the scheme's policy states that a maximum of 85% of the capital accumulated by the committee can be used for pay-out, at the end of this first year 698,360 KHR was spent on pay-outs on a pro rata basis. The remaining money was reserved to cover administration and monitoring costs.

LWD project staff Sray thinks the crop insurance scheme is important and has a lot of potential, especially in places where there is little to no irrigation systems. He says that the initial set up took longer than expected, leaving the project with less than desirable time for implementation. Sray says that with increased publicity and planning, the crop insurance scheme could be successful over time. If 100 to 200 villagers sign up, then the program would have the necessary capital to make proper pay-outs. The AC stated that it would review the payback policy, promote the scheme more, and try to run it for the next crop cycle. The committee knows more about what to expect and can plan timelines better. The local council has also committed to providing support when needed. Community members are also supportive. Mao thinks that she and her husband will buy the insurance again. The increasing unpredictability of rice yield makes it a sensible investment.

INSURANCE DETAILS:

15% of the money collected is allocated for administration and monitoring, and insurance pay-out is capped at 85% of AC's accumulated capital from premiums.

Pay-out policy:

% of Crop Lost	% of loss reimbursed (Pro–rata, capped at 85% of amount received as insurance premiums)
0-20%	Nil
21-25%	5%
26-30%	10%
31-40%	20%
41%-50%	30%
More than 50%	37%

Crop loss in 2017:

No of People	% of crops lost in 2017
4	Less 20%
10	21-50%
14	More than 50%

Avenues for scaling up:

WHAT: To better hedge risk, the stand-alone community level insurance pilot should be joined under a wider insurance scheme spanning multiple provinces.

ROLES: The insurance could exist under a government model which could provide a subsidy until the scheme is sustainable, or via a civil society provider. In the latter case, CEDAC needs to expand and adapt the offer to higher risk districts. Alternatively, it could exist under an AC network such as provincial level AC unions, which could organize and join communes, districts, and eventually provinces together.

STAGES: While strengthening systems and service penetration over time with pilot commune level schemes, gradually bridge individual schemes at provincial and ultimately national levels with clear and robust risk transfer mechanisms.

VECTOR: CSO or umbrella insurance outreach body to strengthen and replicate commune level models in order to build market demand, until provincial or national level scheme is in place.

Interventions undertaken by LWD to support target communities:

Organize workshop and prepare awareness raising materials on an agricultural crop insurance scheme for local authorities and communities; provide training to farmers on agricultural techniques including soil improvement, livestock, and crop activities; introduction of drought-resistant crops/ rice seed to trained farmers to cope with drought; rehabilitate dam and community ponds to address vulnerability of household water supply to climate variability and change; awareness raising events for farmer water user communities on irrigation systems and water use; training and awareness raising activities on CCA and DRR for children and youth including provincial level and national level youth debates; planting trees.

Mao with the harvest for the season, Kampong Speu

DROUGHT AND DISEASE RESISTANT RICE SEED VARIETY HELPING FARMERS COPE WITH CLIMATE CHANGE IN PREY VENG PROVINCE

INTERVENTION DETAILS:

Objective: Increase the capacity of community and local authorities to apply integrated approaches to CCA, and promote more efficient and effective water uses for agriculture purposes.

Output: Demonstration of CAA techniques and seed varieties, as well as rehabilitation of water storage infrastructure and water management in target communities.

Beneficiaries: 100 farmers trained in seed selection and grain storage, and three demonstration farmers.

DRIVERS OF TRANSFORMATION:

Technical: Resistant seed demonstration and growing techniques (tram seeder versus cultural seed showing) coupled with better irrigation and water management infrastructure.

Veth's family has practiced traditional rice farming for generations in Theay, a commune in Prey Veng. The rain gods have not been kind to his commune for the last 30 years. When Plan International and its local CSO partner Women Organization for Modern Economy and Nursing (WOMEN) conducted VRAs in Theay and Prey Kandieng communes, they found that rural communities were highly vulnerable to drought and floods.

Most community members relying mainly on rice farming for their livelihoods were concerned about the changing climate and its impacts on

Dram Seeder usage training, Prey Veng

rice yield. In addition, the canals, which used to bring water from nearby Beoung Snea Lake to the rice fields, were filled with silt, and the water gate had fallen in disrepair.

In Veth's village, there is a reservoir big enough to store water for agriculture, but the water gate is broken, needlessly sending precious water to lowlands where it remains unused, or evaporates.

When WOMEN collaborated with the Provincial Department of Agriculture to provide training on climate resilient farming, Veth was more than happy to volunteer as a model farmer.

In the past, Veth worked 160 days, twice a year, to harvest his rice crops. He used to collect two to three tons of rice per hectare. Prolonged droughts and crop disease were a constant threat to his family's food security, adding to already progressively declining crop yields. "If the ponds stayed full because of floods, rice diseases occurred and infected the rice in the fields; if the crops managed to stay healthy, but the ponds dry up and no rainfall, the whole crops would be eventually destroyed" writes Mr. Ham Hak from WOMEN, when describing Veth's situation.

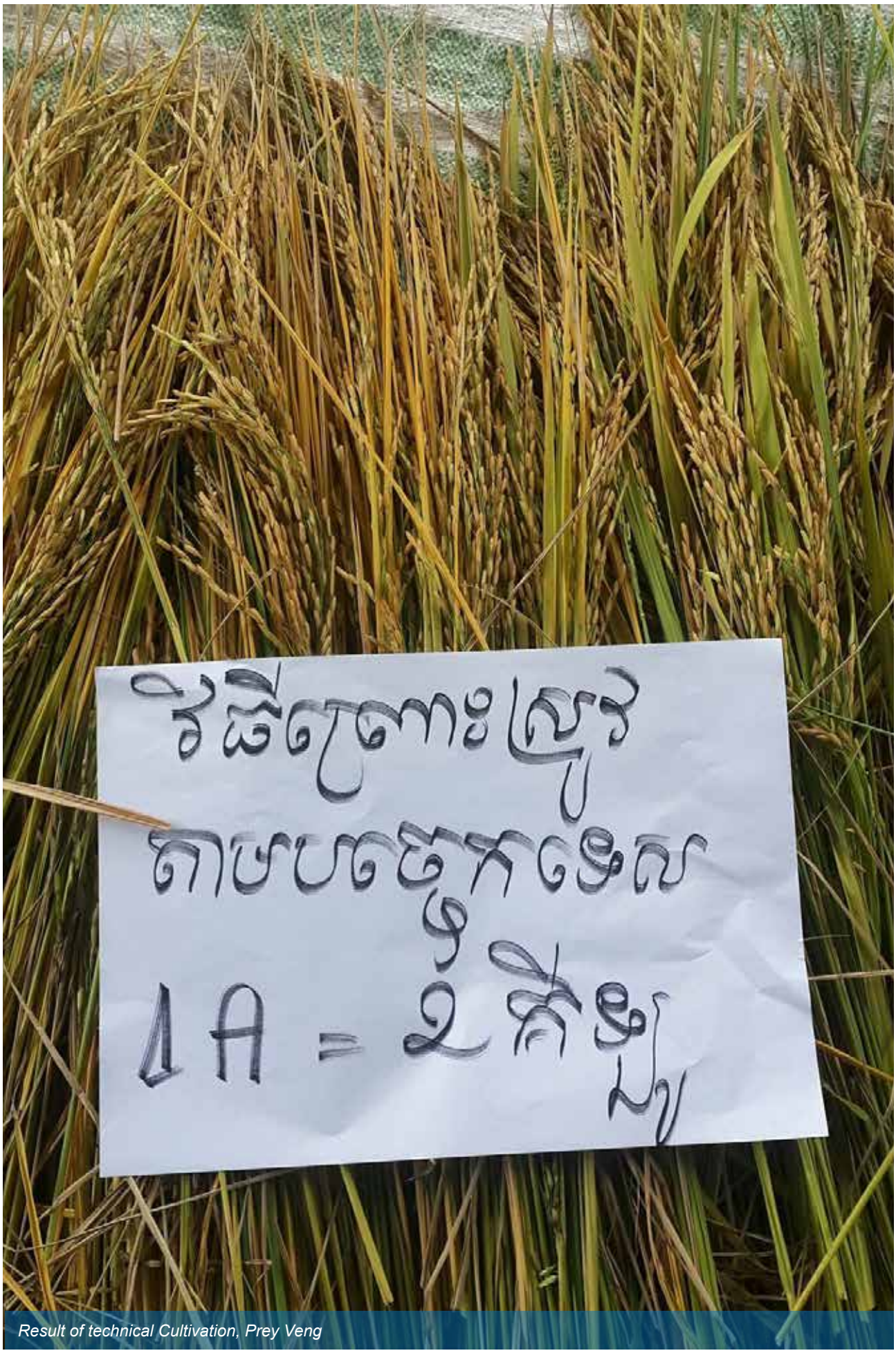
Mr. Chum Saban, an agriculture technical officer, showed Veth and other volunteer farmers how to grow rice effectively. "I advised all farmers who joined in the project to apply new techniques and skills, and use Car14 rice seeds because these seeds consume little water and are resilient to the weather. They are also more resistant to pests than most other varieties", he says. "In this region, the rice can yield crops up to 9 tons (wet seed) per hectare, if the farmers follow guidelines and techniques properly, as recommended by the provincial department of agriculture," he stressed. Through farmer field school, 119 farmers improved their knowledge about seed selection and grain storage. The farmers were taught the proper usage of natural and chemical fertilisers without relying on pesticides.

Proper harvesting methods, Prey Veng

Veth has followed Mr Chum's advice and has experienced significant increase in rice yield, which is very happy with. He harvested approximately eight or nine tonnes (wet seed) per hectare in his recent harvest. The cropping cycle is also down to 105 days, giving farmers more flexibility in optimizing planting times with changing seasons, and now making it possible for farmers in the areas to plant rice up to three times a year provided there is sufficient water available. "Rice demonstration on resistant seed and planting techniques including tram-seeder versus traditional practice for seed sowing, all of farmers are satisfy with the Car14 seed and using tram-seeder in context of drought location," Mr Chum said.

To ensure Veth and other target beneficiaries the maximum opportunity to adapt, WOMEN also invested in adding capacity to the reservoir and fixing the water gate. The reservoir is now filled up in the wet season, and a functioning gate means that farmers in the command area can more judiciously regulate the flow of water based on actual needs and seasonal variations, conserving water when it is less needed.

Various partners under the CSSM undertook similar adaptation interventions through seed variety selection and planting techniques, mainly for rice and vegetable production. For instance, CWDCC and SAMAKI piloted traditional rice variety PhKa Rumdoul in the saline environments of Kampot, while HURREDO and LWD promoted Phka Rumdoul rice to 119 housholds in Siem Reap and 66 households in Kampong Speu respectively. LI promoted integrated pest management solutions using the farmer field school model in Battambang, and CEPA promoted using elevated salad beds in the flood-prone zones of Rattanakiri. KSCF, CRDT, HURREDO, and SP also promoted vegetable seeds and/or planting techniques in Kampong Speu, Stung Treng, Siem Reap, and Takeo.



Result of technical Cultivation, Prey Veng

Figures:

- 119 farmers trained in rice production techniques, 48 farmers trained in vegetable growing techniques.
- Three demonstrations and two rounds of seed distributions to farmers done in coordination with the Provincial Department of Agriculture (district office).
- 100m of dyke built to prevent the primary school campus from flooding.
- One water gate and 250mx250m of reservoir area rehabilitated and excavated.

Technical training in:

Agricultural inputs: Fertiliser application; land management; water management; seed selection, including education about long and short-life seeds, and grain storage.

Planting techniques: Traditional practice; manual planting with tram; planting using a line.

Avenues for scaling up:

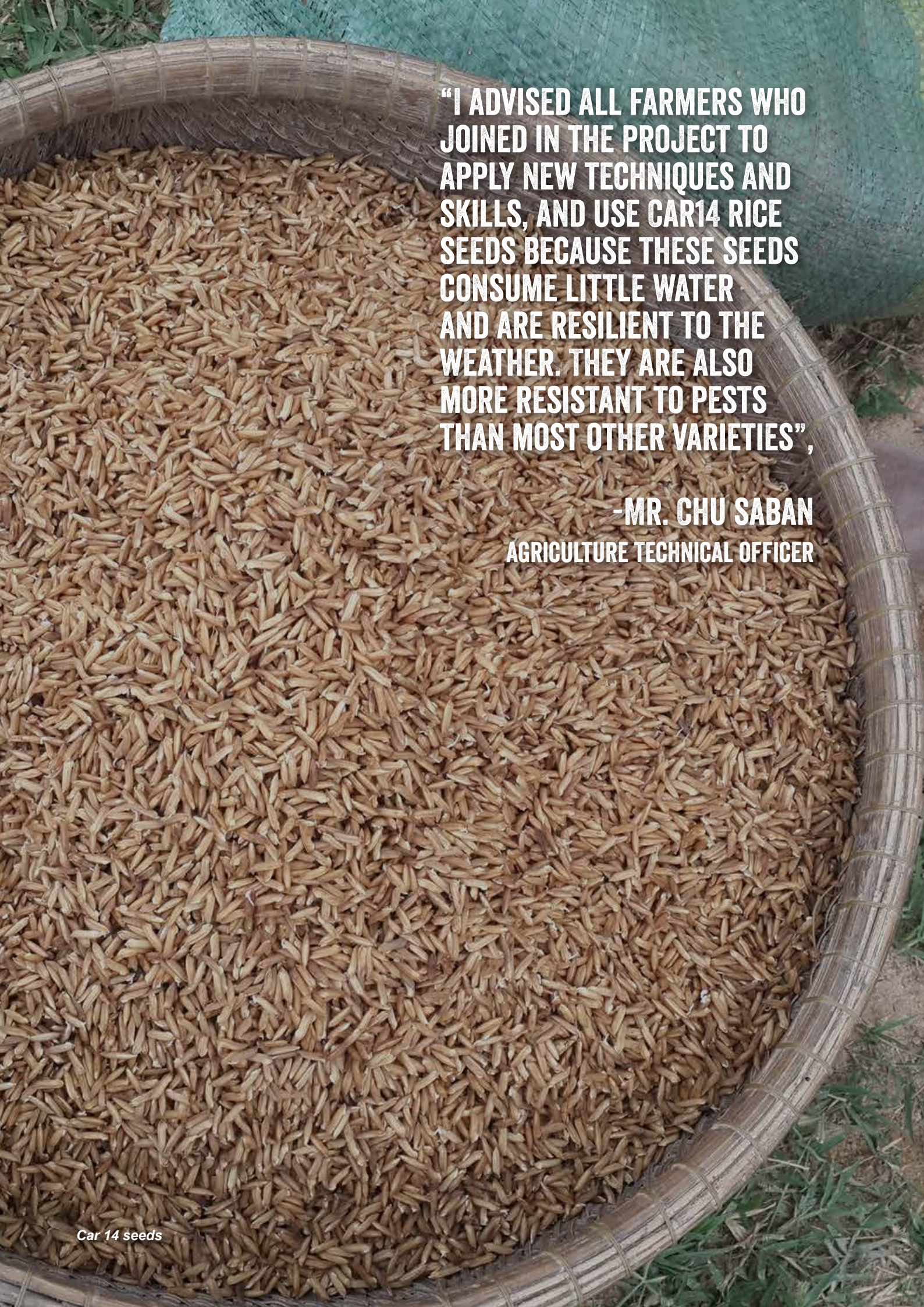
WHAT: Agricultural extension service and investment in infrastructure such as the ones implemented in this project normally fall under the responsibility of the Provincial Departments of Agriculture and Water Resources and Meteorology. These bodies have the capacity to deliver these services but the hurdles are a lack of incentives for government personnel, and insufficient local government funding -- typically through the National Council for Democratic Development -- to prioritise and meet all water infrastructure investment needs.

ROLES and STAGES: Once pilots such as the project implemented by WOMEN are showcased, responsibility for service provision should be reinforced through normal government channels, with the help of improved public service performance mechanism such as citizen report cards or performance bonuses, and supporting additional investment capital for local governments to extend for adaptation initiatives.

VECTOR: A donor-driven program to government agencies (Ministry of Agriculture, Forestry, and Fisheries; Ministry of Water Resources and Meteorology, National Council for Democratic Development) could play the role of building momentum, sharing models, extending supplemental capital to initially top up standard government funds, provide technical assistance to government agencies to review performance incentive mechanisms for provincial level line agency personnel, and continue to strengthen local planning mechanisms taking into consideration CCA and DRR.

Interventions by WOMEN to support target communities:

Rehabilitation of community pond, reservoir, and water gate; training on climate resilient farming; rice seed distribution; CCA/DRR awareness raising; children's swimming classes; integration of CCA into CIP; building a dyke around a school for flood prevention; setting up and strengthening women-led animal feed enterprises.



“I ADVISED ALL FARMERS WHO JOINED IN THE PROJECT TO APPLY NEW TECHNIQUES AND SKILLS, AND USE CAR14 RICE SEEDS BECAUSE THESE SEEDS CONSUME LITTLE WATER AND ARE RESILIENT TO THE WEATHER. THEY ARE ALSO MORE RESISTANT TO PESTS THAN MOST OTHER VARIETIES”,

-MR. CHU SABAN
AGRICULTURE TECHNICAL OFFICER

Car 14 seeds

This section discusses observations collected over the life of the project both from CSO project and CSSM umbrella program representatives. They cover both CSO level and community level observations and are to be used to strengthen future efforts to drive transformation towards adaptation and vulnerability reduction in Cambodia.

LESSONS

SECTION 3

LESSONS

The primary objective of the MCRDP-CSSM project, as its title states, was to enhance the capacity of CSOs to implement community based adaptation. As a result, a lot of the lessons generated in the immediate aftermath of the project primarily focus around the approach these CSOs took to implementing their projects. Drawing broader conclusions about how rural communities in Cambodia best adapt to climate change must take in a wider perspective and comparative analysis over larger populations and a longer time frame. In this section, we highlight a few more practical observations from the two individual sub-projects implemented in rural areas. The various lessons are structured around the five drivers of transformation listed at the beginning of this document.

BEHAVIOUR

- **Early awareness and understanding** of CCA/DRR and pilots were effective in prompting community action for adaption, as was the case with HURREDO.
- Allow for **slow initial adoption**. Although difficult given short grant implementation periods and competing time constraints for farmers, ideally new practices should be easy to adopt and taught in multiple, incremental phases over the course of a few months or harvest cycles.
- **Adopting new solutions takes time.** Expect reluctance, including reversion to more familiar but less efficient traditional practices, especially when faced with even slight difficulty or trouble. As in the case of LWD, the agricultural cooperative was taught to use mobile phones and GPS to estimate plot size for insurance purposes, but they continued to use physical measuring tapes.
- Adjust project cycles and plan for **reduced farmer availability during harvest season**.
- **Maximize local support and ownership** for sustainability. Commune chiefs, elders, and local authorities can help to overcome challenges and motivate community members post project closure. Use demand-driven and needs-based design (VRA), all-stakeholder capacity building, participatory implementation, and harmonize with national policies and land development plans. Select committee members carefully, and develop mechanisms to generate revenue to cover activity costs like agricultural input supply and services.

TECHNICAL

- **Erratic weather,** especially unseasonal rains, **caused delays** in construction as in the case of LI in Battambang. When possible, write weather-related delays into construction plans, and time construction to occur in dry season and when nearby fields lay idle. This may be difficult with short project lifecycles, or unseasonal rains.
- **Systematically check and test new equipment** distributed to communities to prevent equipment going prematurely obsolete and harming trust and goodwill. Although training community members

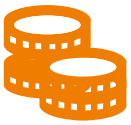
about equipment upkeep may be helpful, note that despite training, some community members left their biochar equipment out in the rain and did not clean it regularly. Genuine interest from communities may help, as may community financial or in-kind investment for interventions may assist.

- There is a lack of sufficently reliable and accessible **climate data** in Cambodia that is suited to farmers' needs. There is liability potential if CSOs provide advice that is unsuited to a particular situation. Support risk management but emphasize that there is no single solution or hazard response. The VRA process is helpful for this.
- Most CSOs felt that the **pilot project should have been longer** to give everyone more time to learn and improve. Similarly, endline VRAs were done too early to properly reflect the effects and contributions of the project interventions.
- Although challenging to oversee and monitor, the variety of projects under the Plan International umbrella allowed **complementarities and maximized learning opportunities** for CSOs.
- **Simplify the VRA.** The knowledge gained from conducting VRAs is well appreciated by the Commune Councils, but it is currently too complex for the councils to do themselves and for participants to grasp the finer details and created confusion at times.
- **Balance between Donor and Community Demand.** The capacity of communities to distinguish between climate and non-climate driven impacts and related needs is very limited, and hinders their ability to express demand for adaption services specifically. Similarly, the fine line that exists between resilience building and development as usual, and difficulty for many development practitioners - including CSOs- to distinguish between both, makes it difficult to isolate exclusively adaptation interventions as prioritized by climate finance, from generally supporting development interventions. The broad and rigorous use of the VRA tool and good coordination between different government and non government investment programs help overcome this challenge somewhat.
- **CSOs learning from each other:** Although the CSSM was intended to allow CSO partners to build on their own project experiences and technical expertise in community based CAA work, the work of one group may also be useful for another. This was the case of KSCF and HURREDO, who replicated the Chicken incubator model first demonstrated by SP, all within the timespan of the CSSM.
- Projects take time to mature, **'endline' data may underreport impact if it is conducted too soon.** Donor agency timeframes should fit needs: for example to allow for endline data and reporting to be done after implementation closes, rather than concurrently.

INSTITUTIONIAL

- **Collaborating and partnering with local authorities** and government agencies is crucial, despite challenges. It builds the sustainability of the projects and expands project lifespan. Project stakeholders can be reactive, and a good relationship with the local authorities helps to smooth activities.
- **High CSO staff turnover can delay implementation.** This causes delays in project implementation, accompanied by a loss of institutional knowledge and capacity.

- There are **knowledge disparities** between CSO management and CSO on-the-ground staff. Targeted one-on-one trainings help to supplement initial formal training sessions, especially on procurement and other aspects of operations and programming. Try to ensure that the staff to be trained will stick around, and time trainings appropriately.



ECONOMIC

- **Financial tracking and money saving is not common for community members,** it make any economic assessment of an adaptation intervention more difficult The savings groups help them understand the concepts better and get into the habit of tracking finances.
- **Livelihood diversification is effective** in reducing risk exposure and smoothing income. Interviewed farmers were also appreciative of training in this area. Strengthen diversification by ensuring that different income generation options and community food supply are not all sensitive to the same climatic factors. For example, when floods ruin rice crops in Siem Reap, the fish from the CFR thrive, providing food and income to farmers.
- Many CSOs have observed that adaptation interventions have been accompanied by **a reduction in economic migration.**
- **Competition** from suddenly cheaper imports of vegetables and livestock puts a production initiative, like the Women's Cooperative in Prey Veng selling organic pig feed, at risk. Initiatives need to respond to changing realities.
- Many interviewed farmers had **difficulty accessing a market** for their vegetables. Product design and market access need to be strengthened.
- **Commercial adaptation solutions,** like the chicken incubators, are attractive and were replicated successes.
- **Promote adaptation incentives that also appeal to the private sector.** The best adaptation decisions may not always align with **short term** commercial and productivity decisions. Filling the information gap on adaptation will also better align decisions.

POLICY

- Almost all CSOs worked with local government to **mainstream CCA/DRR into commune investment program planning.** In the short-term, CSOs can help local government implement national policies and guidelines, while supporting the communes' larger CCA/DRR goals.
- **Turnover in local governing bodies** for political reasons, or electoral campaign priorities caused delays in permissions and approvals. Re-establishing communication channels and goodwill between CSOs and local governing bodies and careful timing of decision and approvals can be necessary.
- **National commitment to adaptation is strong,** but service delivery at the line agency level can be inadequate. Further planning, capacity building, government incentive structures,and better resourcing are necessary.

CONCLUSION

Community based agriculture interventions that are adaptive to climate change do not need to be complicated. Most of the interventions described in this document are not technologically complex, but instead are carefully coordinated actions that build on tradition in order to affect behaviour, agriculture techniques, economics, and institutions within communities vulnerable to climate change.

Community understanding and buy-in, adequate support from trusted members of the community and local government, and projects developed with community inputs were crucial for success. Without these so-called “soft” interventions, the “hard” physical investments would not have been viable. Increasing communities’ understanding of climate change and its impacts on agriculture, along with strengthening the associated institutions and relationships, created the necessary conditions for investment in adaptation.

Opportunities for growth, in the form of scaling pilot projects up and out, depend on whether the relevant assets and responsibilities of a project fall under the domain of local communities, private sector, or the government. Regardless, in the short term, there is a continued role for CSOs to measure, support, replicate, and advocate for adaptive agriculture interventions beyond the life of the pilot project, especially until understanding and capacity is further developed in the community institutions, private sector, and/or government entity that will eventually play a stronger role.

Vegetable farmer who uses Climate adaptive techniques in his vegetable garden, Takéo

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APPENDIX

APPENDIX 1

SAMPLE OUTCOME INDICATORS

- % families in project consuming three meals a day (example from SP)
- % of target families having more diversified income sources of at least 2-3 sources per family (example from HURREDO)
- Increase in % of children attending classes regularly and safely (example CRF)
- % of extreme poor households with debts to multiple creditors decreased (HURREDO)

Some partners also used a combination of output indicators associated with their project activities:

- % of target community has increased adaptive capacity on access to water, apply adaptive agriculture techniques, and practices WASH (example from KSCF)

SAMPLE SOFT OUTPUT INDICATORS

- Strengthened capacity of Commune and Village Chiefs, Agricultural Cooperatives, Commune Councils, Community Fisheries or Community Forestry committees etc... for: implementation, maintenance, and outcome monitoring of (selected) interventions/practices.
- # of women taking management or leadership roles in self-help groups and Farmer Water User Committees; are model farmers, Self Help Groups, or are on selection committees.
- # of women or # of vulnerable families who diversify their economic activities by adding at least one income source or value adding activity as a result of the project.

SAMPLE HARD OUTPUT INDICATORS

Sample 'Hard' Adaptation Indicator Used for Urban Resilience Interventions	CSO using the indicator	Achieved Performance
• # trained farmers and households who adopt CAA techniques	HURREDO, SP, LEC, LI CRDT, KWWA, LWD, WOMEN, CEPA, OC, BK, CRID, MIPAD, CWDCC, KSCF,	840 households
• # schools set up adaptive/ resilient gardens	CRF, BK, SP	20 schools
• # resilient home gardens established and performing well and/or enhanced by the use of adaptive technology • % households in target villages have home gardens.	KWWA, SP, CRDT, WOMEN, CEPA, SP, KSCF	353 households
• # or % of farmers know how to select suitable rice seed adapted to their needs (short cycle, drought…) or weather forecast	WOMEN, HURREDO	85hh /60Bsl 70% of 122hh
• # m of canal built or rehabilitated/upgraded • # households and hectares benefiting from rehabilitated canal for agricultural purposes	BK, LWD, LI, LECBK, LWD, LI, LEC	6484 meters 3391hh & 2,626ha
• # of farmers and #ha insured through crop insurance	LWD	28 farmers 9.58ha
• # of farmers and #ha insured through crop insurance	LWD	28 farmers 9.58ha
• # of Housing repair loans accessed • Loans are being repaid regularly on schedule	SKO	12 loans 50% with late payments, and (of which) 16% expected payment default all together
• # of agricultural enterprises established and strengthened	WOMEN, KSCF, SP, HURREDO	5 enterprises
• # trees planted	MIPAD, KSCF, OC	13,552 trees (858 fruit trees)
• # of fish ponds / fish reserve demonstration plots • # of hh using pond for fish-farming		3 community fish ponds+ 25 family ponds 167 fishing hh in total
• # hh earning $10+/day income from legal & sustainable fishing practices • % family raising income from fishing (fish pond or rice field fishing) • % increase fish catch of fisher-folk per year	CWDCC HURREDO CWDCC	1,740 25 family fish ponds, 23% incr 6.7%, 15%, 40,% and 50%
• % coastal dwellers (esp. women) increase income from fishing/farming as a result of fishery conservation & saline agriculture	CWDCC	85% within target area

APPENDIX 2

CSO SPECIFIC CHALLENGES

CSO	Challenges	Corrective action and Suggestions by CSOs
HURREDO	The project cycle is too short to ensure intended impact	Local authorities and communities WERE encouraged to take up ownership of the project. The success of the interventions will rely heavily on the motivation of individual communities and local authorities
LEC	The local market's demand for produce is low	The CSO suggested that focal farmers to form an agriculture cooperative
	The rains came early causing delay in the canal rehabilitation.	The construction timelines were extended with a written letter approved & signed by local authorities, CBO committee and PDoWRAM
LI	Process of design, design approval, and bidding processes took longer than expected due to limited technical capacity	Cooperated with district technical official for assistance and input
	Project started implementation during famers' harvesting season and related agricultural activities, impeding villagers' participation in project activities. Some activities took more time as a result	Worked closely with local authorities and a commune extension worker to mobilize villagers
	Turnover in local government offices slowed down intervention implementation	
LWD	Significant staff turnover at project beginning delayed activities by up to 6 months	The team was restructured, the agriculture corporation and local authorities were asked to take up a more active role
SP	The budget first requested was insufficient to fully implement community water supply system	The project addresses the issue by reducing number of beneficiaries, and procured materials from local suppliers
WOMEN	Collaborating with local authorities took more time and persistence than expected	Project staff took the lead to convene meetings with local authorities (Commune Concil) proactively and persistently
	Some of the activities meant for children were first set up on weekdays and hence saw low participation	Project staff shifted to conducting meetings that required participation from from children to the weekend

COMMUNITY BASED CLIMATE CHANGE ADAPTATION THROUGH AGRICULTURE: EXPERIENCES FROM CAMBODIA

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