Project Introduction/Overview

Aprovecho Research Center

- 4 decades of experience designing, implementing and monitoring improved stoves
- First stove design was mud chimney stove –
  - Designed without proper knowledge of design principles and testing
  - After the fact found to not be acceptable to users and to consume more fuel than traditional stove
- Importance of knowledge of stove design and testing for successful implementation

Project Introduction/Overview

- Purpose: Increase partner capacity for stove design and testing of improved stoves
- Supported by U.S. EPA and Winrock International
- Primary partners: SNV Vietnam, Gira Mexico, StoveTeam International (Mexico, Honduras, Guatemala, and El Salvador), and CRT/N Nepal

Project Introduction/Overview

Build on many successful past trainings

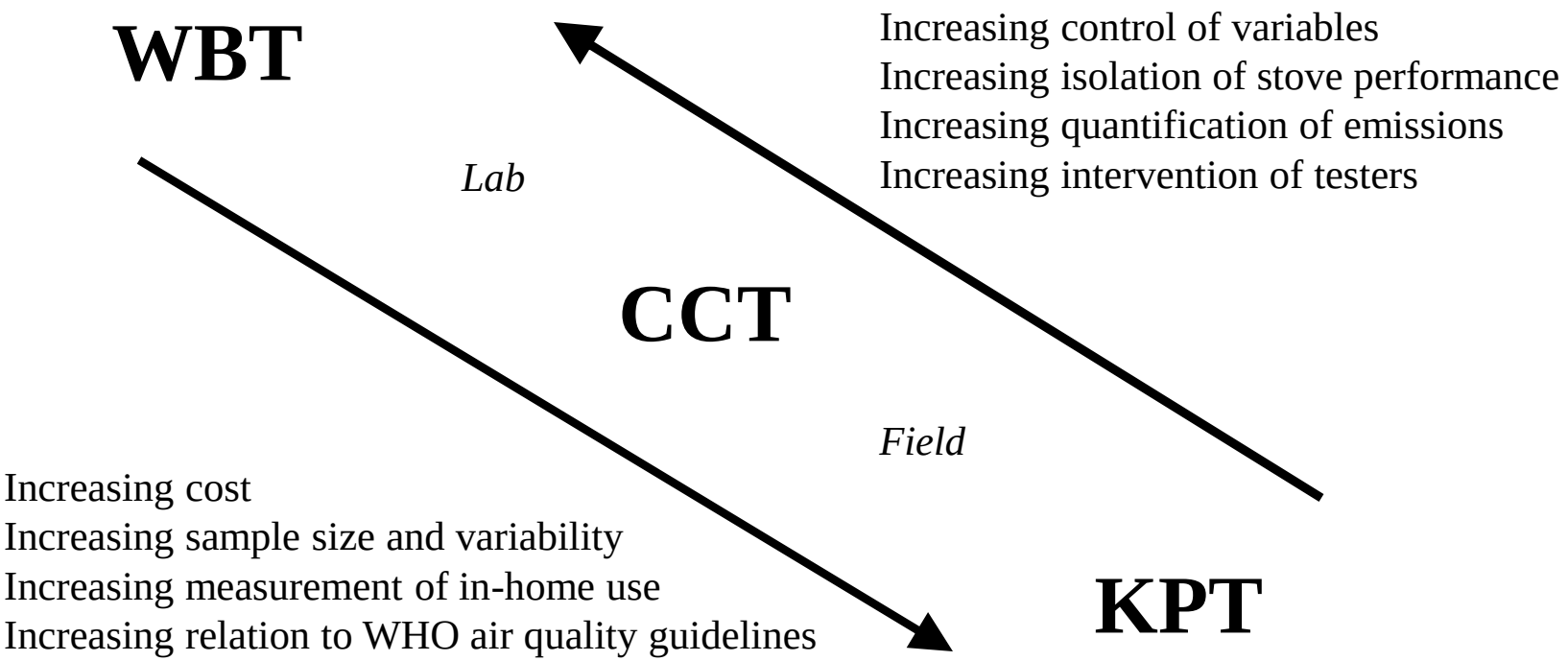
- Care Rwanda
- SNV Lao
- VERC Bangladesh
- Central Philippine University-Approtech Center
- Yayasan Dian Desa-Indonesia

Project Goals

- Perform training with other organizations in region to create networking opportunities and further build capacity in region
- Build capacity of chosen partner organization in stove design and testing methodologies (particularly WBT and CCT)
- Use WBT and CCT testing results to give feedback on stove designs being implemented by partner organization
- Add to data set of comparison between lab and field testing

Controlled Cooking Test Basics

Stove Testing Continuum



Controlled Cooking Test Basics

1. Compares two stoves
2. Local cooks, local fuel, and local food
3. Main goals are:
    a. Evaluate difference in fuel use
    b. Evaluate difference in time to cook
    c. Get feedback from potential stove users
    d. Possible evaluation of difference in emissions
4. Output metrics:
    a. Fuel consumption (e.g. kg fuel/kg food cooked)
    b. Qualitative assessment of stove by cooks
    c. Emissions
5. Often the first glimpse into potential of stove in field
6. Most economical evaluation in real world setting

Controlled Cooking Test Basics

CCT Procedure (Over)Simplified

Before testing review protocols thoroughly. Latest protocols and sheets can be found at www.aprovecho.org

1 – Determine a common meal

2 – Have a cook use one of stoves

3 – Weigh food cooked and fuel used

4 – Repeat steps 1-3 two more times

5 – Repeat steps 1-4 with 2nd stove

6 – Ask cook's opinion on stove

7 – Repeat steps 1-6 with 2nd cook and 3rd cook

8 – Results: Time to cook, fuel use/food cooked, qualitative assessment by cooks of stove, and possibly emissions

Controlled Cooking Test Basics

CCT Advantages

- Realistic – real meal, real cook
- Some controlled variables
  - Fair comparison
  - Small, affordable sample size
- Stove design tool – useful design info by observation and interview of cook

CCT Disadvantages

- Testing with only one meal does not represent the real range of performance requirements
- Testing with only a few cooks does not represent all cooks
- Cooks may use stove differently than they would in their own kitchen because of different environment

Project Methodology

- General training on design and testing (3-4 days)
- General training followed by focused training on field testing staff (10 days)
- Lectures on theory followed by adequate hands on testing
- Key component of training – participants leading testing and processing of results

Training in WBT/CCT

Well over 100 participants, 30 different organizations from Vietnam, Cambodia, Laos, Thailand, Mexico, Honduras, Guatemala, El Salvador, Nicaragua, Peru, Bolivia, and Nepal.

Training in WBT/CCT

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And USA!

Vietnam CCT Test Results

Percent Reduction of SNV Intervention stove CCT (n=9)		
Time to Cook	%	18
Specific Fuel Consumption	%	-31
CO Emissions	%	49
PM Emissions	%	-50

Results in red not statistically significant

SNV intervention

Vietnam Comparison

Biomass stoves

Three stone fire

Mexico CCT Test Results

Percent Reduction of Patsari Chimney Stove CCT (n=9)		
Time to Cook	%	-13
Specific Fuel Consumption	%	30
CO Emissions	%	-27 (100)
PM Emissions	%	24 (100)

Results in red not statistically significant

Traditional

Patsari Chimney stove – Tortillas only

Note: Indoor emissions from Patsari were not measured but undetectable by senses

Patsari

Stove Team CCT Test Results

Percent Reduction of Stove Team Rocket Stove CCT (n=9)		
Time to Cook	%	-4
Specific Fuel Consumption	%	29
CO Emissions	%	68
PM Emissions	%	86

Results in red not statistically significant

Traditional

Stove Teams factory rocket stove

Ecocina

Nepal CCT Test Results

Percent Reduction of Improved Stove		CCT (n=9)
Time to Cook	%	-4
Specific Fuel Consumption	%	33
CO Emissions	%	44
PM Emissions	%	5

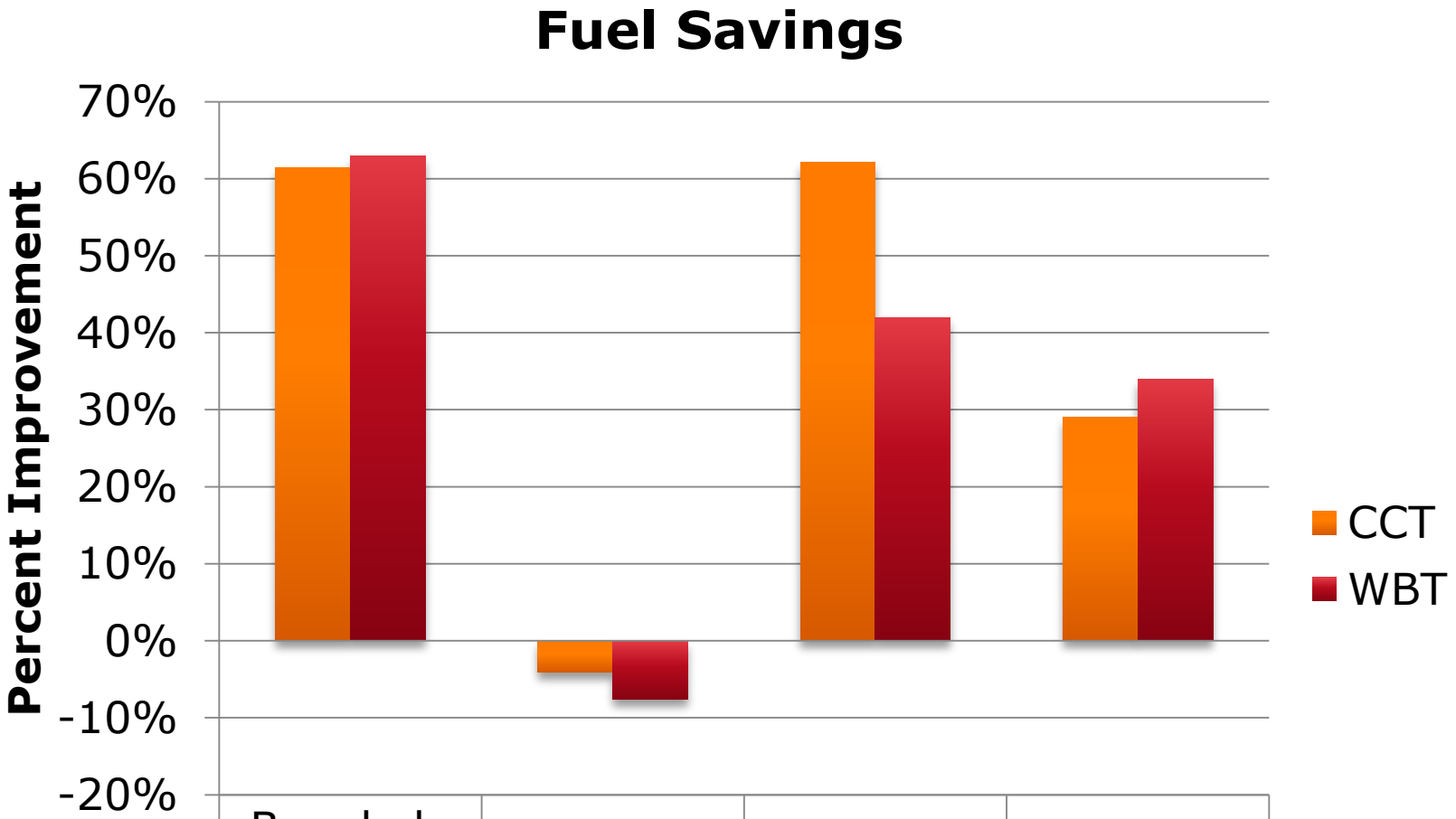
Results in red not statistically significant

Three stone fire

CRT/N Nepal

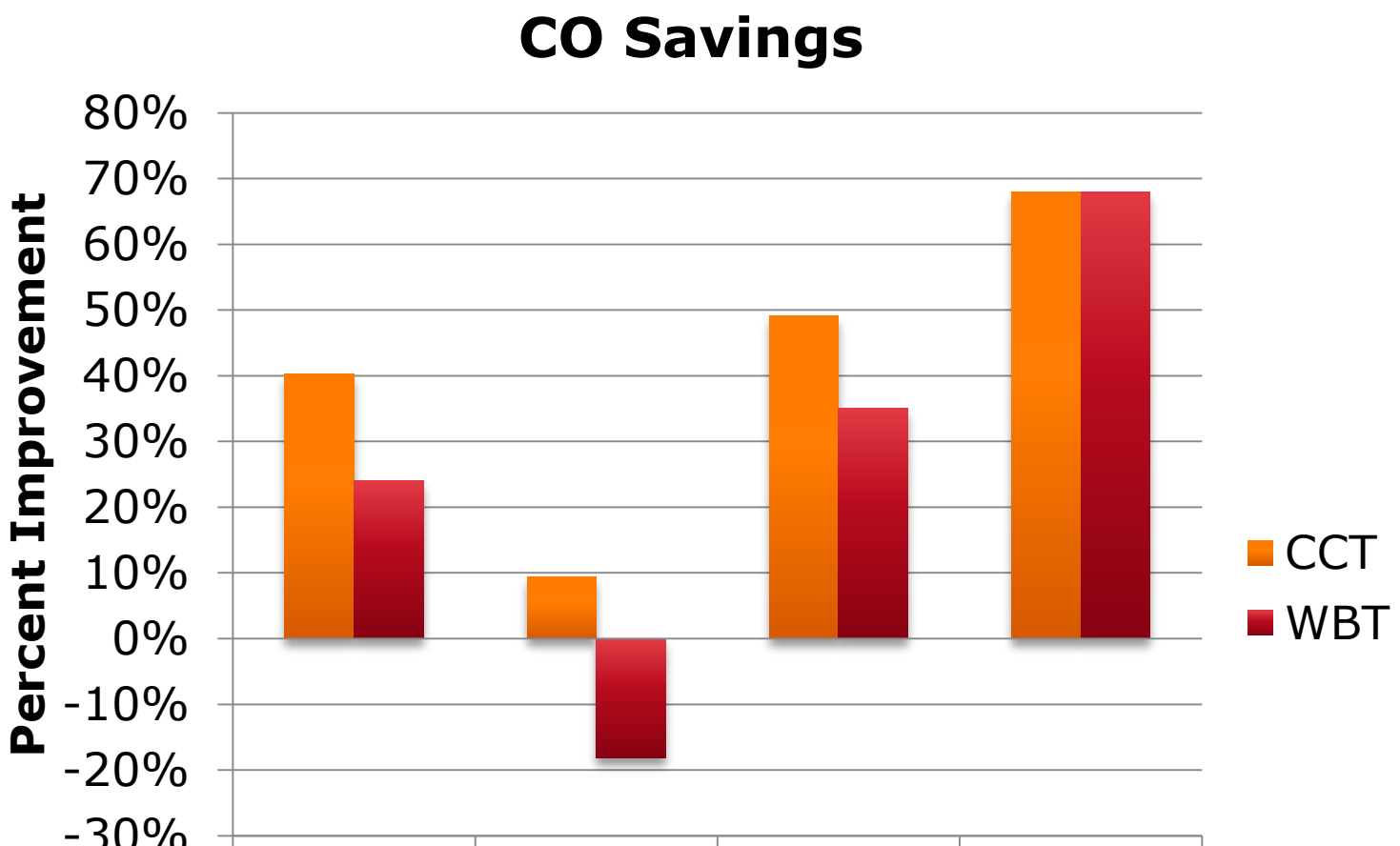
CRT/N Rocket Stove

WBT-CCT Comparison



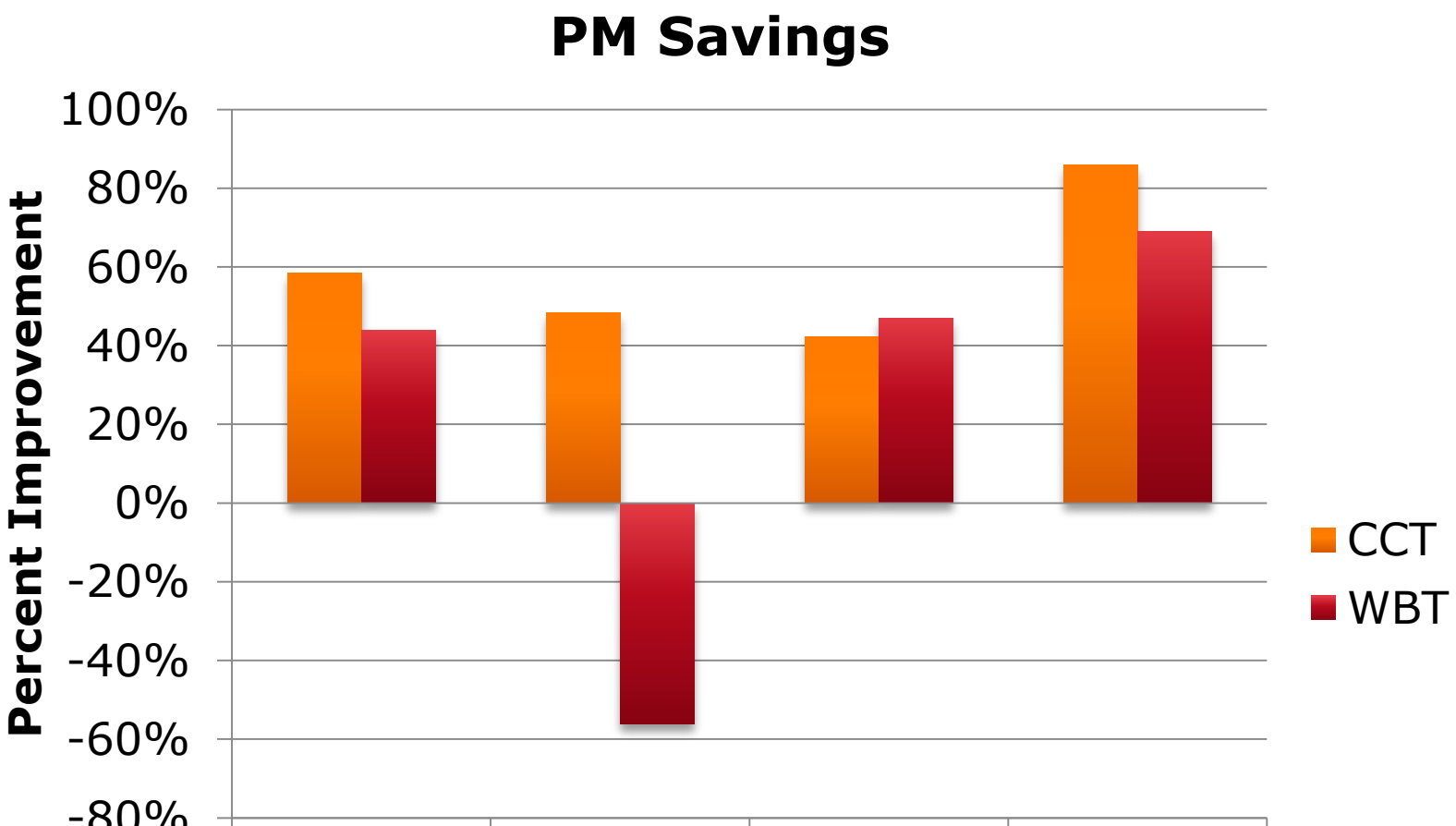
	Bangledesh	Laos	Rwanda	Ecocina
CCT	61%	-4%	62%	29%
WBT	63%	-8%	42%	34%

WBT-CCT Comparison



	Bangladesh	Laos	Rwanda	Ecocina
CCT	40%	9%	49%	68%
WBT	24%	-18%	35%	68%

WBT-CCT Comparison



	Bangladesh	Laos	Rwanda	Ecocina
CCT	58%	48%	42%	86%
WBT	44%	-56%	47%	69%

Lessons Learned

Language/technology barrier

Protocols are mostly in English and require computer proficiency

Multiple language groups and limited English spoken was a common issue

Future trainings need emphasis on computer and English proficiency (or more adequate translating)

Conclusions – Testing results

1. There are stoves designs being promoted that show reduced fuel use and emissions both in the lab and in the field but lack of testing has led to stoves that may not have reductions
2. Design principles and testing methodologies for charcoal stoves are less well developed by stove community, though progress is being made
3. Emissions monitoring important for ICS developers but difficult to perform
4. Lab and field may be correlated at times but more study is necessary

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