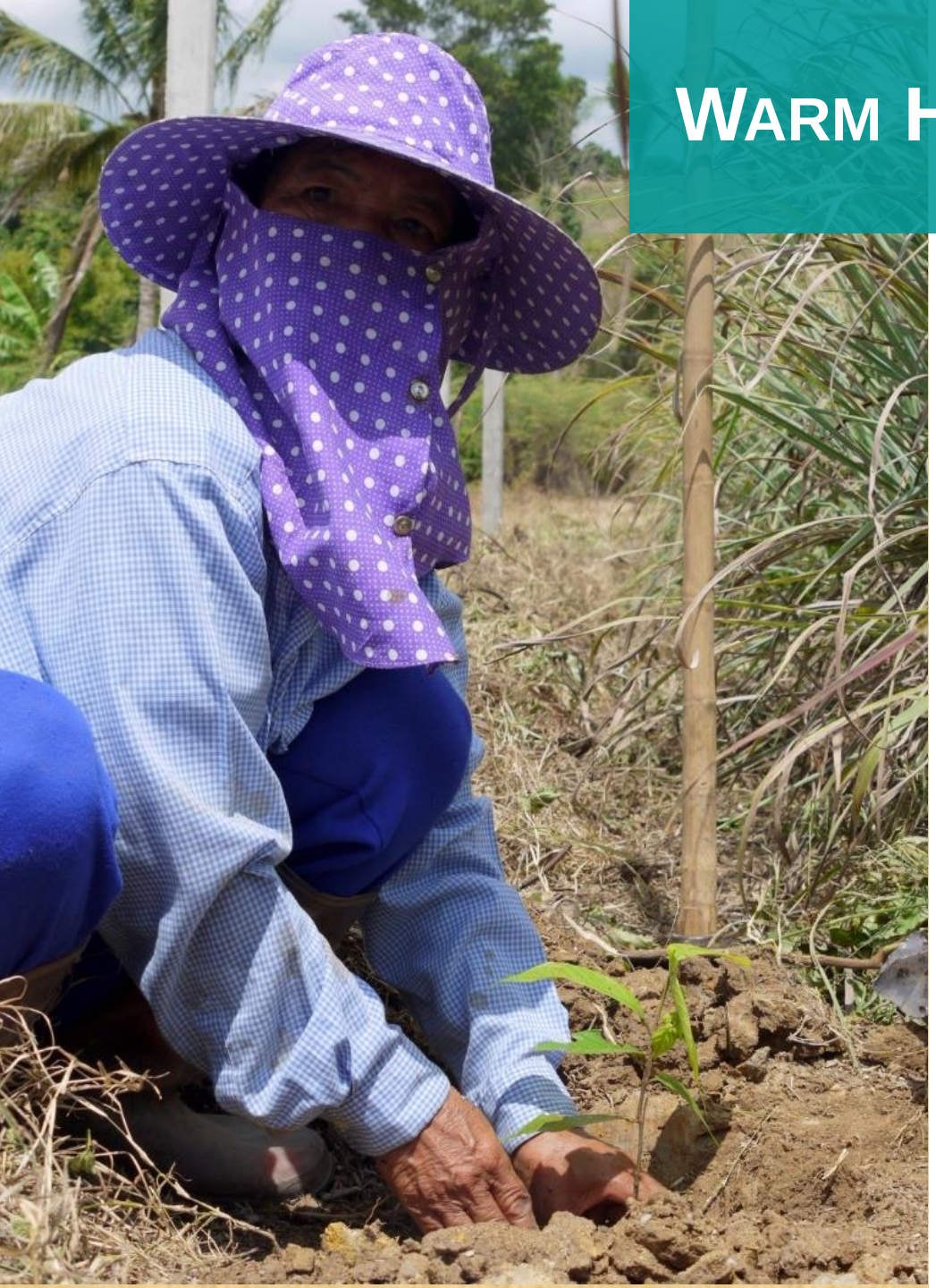


Warm Heart Foundation

About Warm Heart Foundation:

Warm Heart is a grassroots community development organization serving the rural poor of North Thailand. Warm Heart seeks equal opportunity for all. It provides equal access to education, public health, jobs in microenterprise, and extension services in sustainable agriculture.

WARMHEART
มูลนิธิอุ่นใจ

DESIGNING FOR SUCCESS: TECHNOLOGY AVAILABLE TO ALL

- **Cost:** Equipment must be inexpensive for government and citizens
- **Materials:** Equipment must be constructed from materials readily available everywhere, ideally in recycling yards
- **Manufacturability:** Equipment must be so simple to manufacture that can be made anywhere using the simplest of tools
- **Portability:** Equipment must be easily transported to wherever it is needed in nothing bigger than a small pickup truck
- **Ease of use:** Equipment must require no special training, strength or labor
- **Safety:** Equipment must to safe to operate without special safety equipment and must pose no risk of fire or injury to children
- **Effectiveness:** Equipment must remove virtually all particulates and long-term greenhouse gases and smog precursors, and produce high quality biochar
- **Usefulness of product:** Biochar must have immediate value to producers

WARMHEART
มูลนิธิอุ่นใจ

WARM HEART EXPERIMENTAL FARM

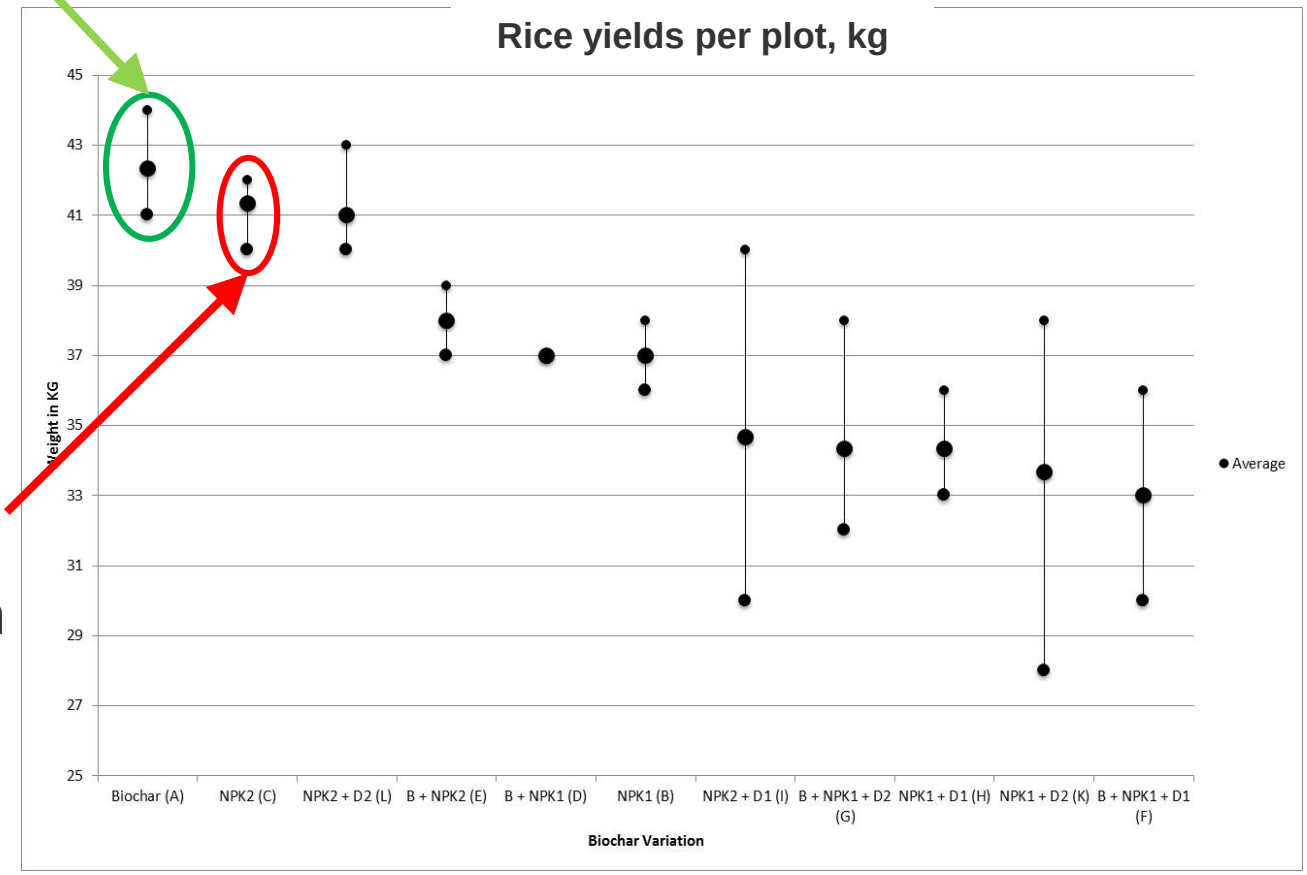
5 rai currently divided into 35 100 m^2 test plots with capacity for 20 more. Open to collaboration on biochar related research projects.

WARMHEART
มูลนิธิอุ่นใจ

YEAR 1 EXPERIMENTAL FARM TEST RESULTS

Biochar fertilizer

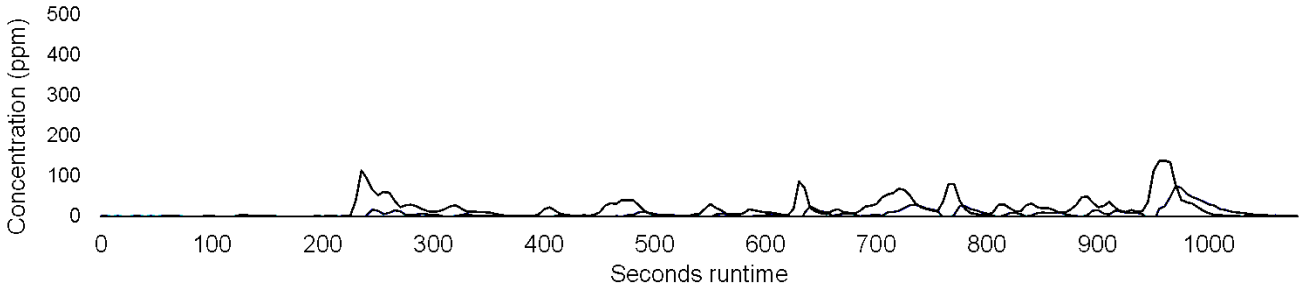
NPK fertilizer, normal farmer application

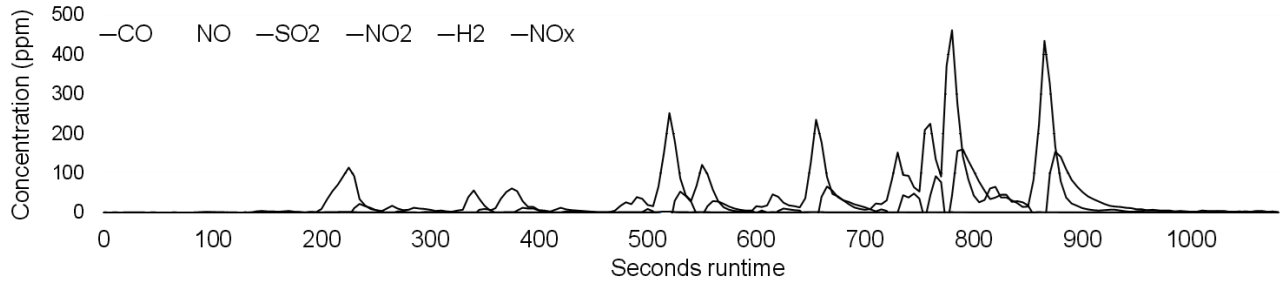


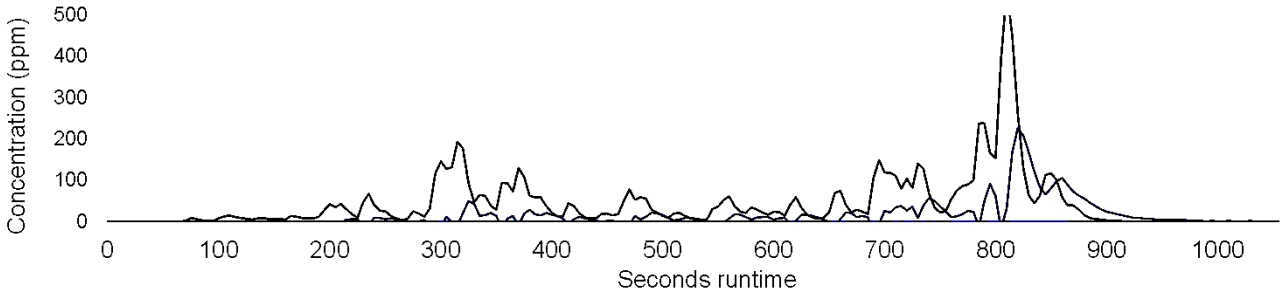
WARMHEART
มูลนิธิอุ่นใจ

GHG emissions from TLUD extremely low

3 Runs, CO (high), H_2 (next), So_x & No_x (too low to measure)



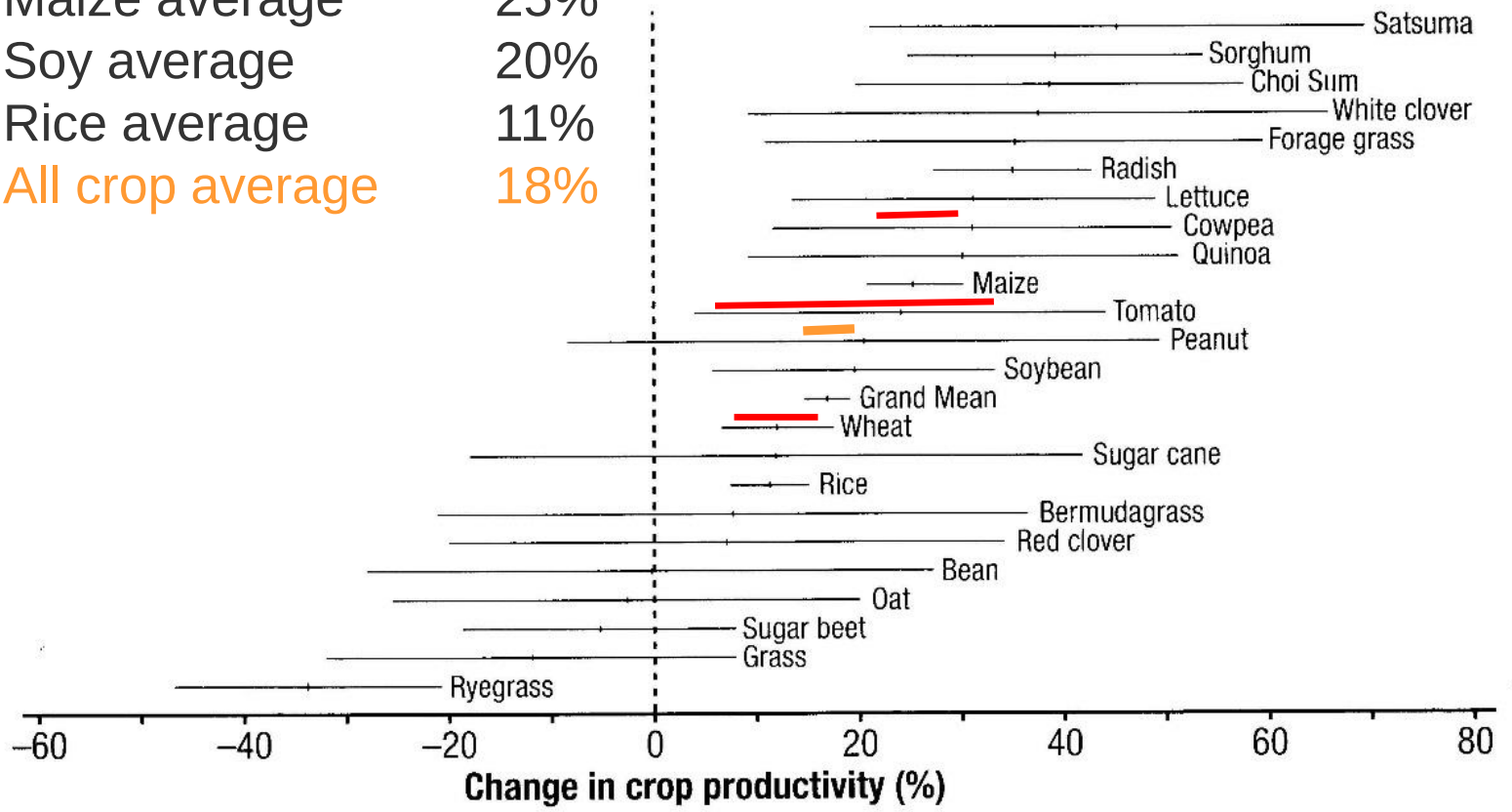




WARMHEART
มูลนิธิอุ่นใจ

AVERAGE INCREASE BIOCHAR PRODUCES IN DIFFERENT CROPS

- Maize average 25%
- Soy average 20%
- Rice average 11%
- All crop average 18%



These are ***global averages*** including developed world results. The worse the soil, the better the results. In North Thailand, we have very bad soil so ***our results should be much better than average***.

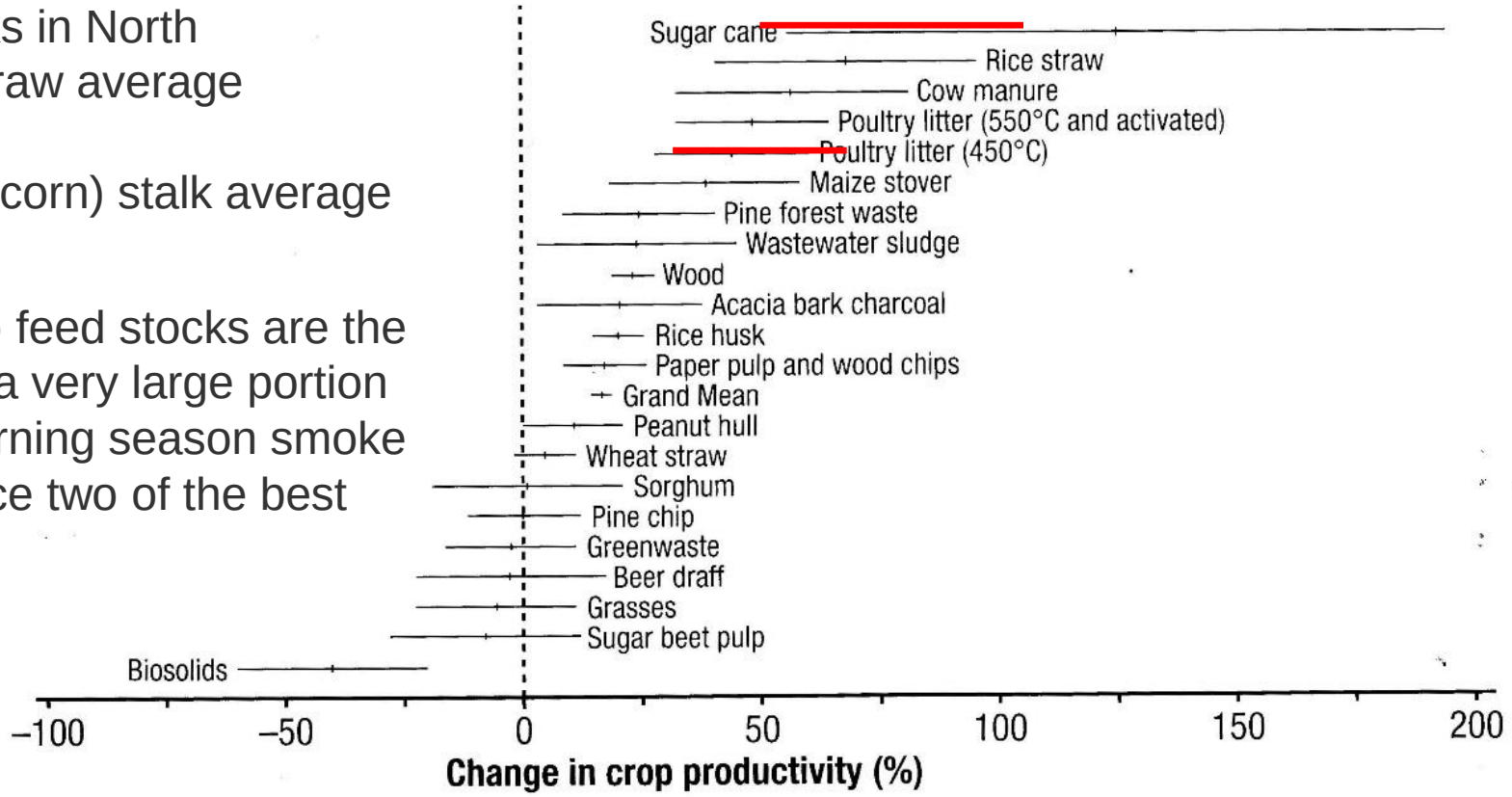
AVERAGE INCREASE IN CROP YIELDS FROM BIOCHARS MADE FROM DIFFERENT FEED STOCKS

WARMHEART
มูลนิธิอุ่นใจ

Benefits from most common feed stocks in North

- Rice straw average 75%
- Maize (corn) stalk average 45%

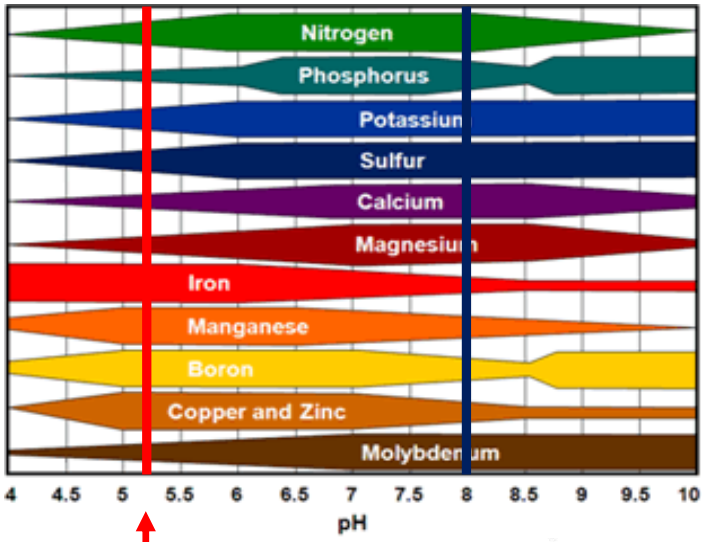
These two feed stocks are the source of a very large portion of total burning season smoke but produce two of the best biochars.



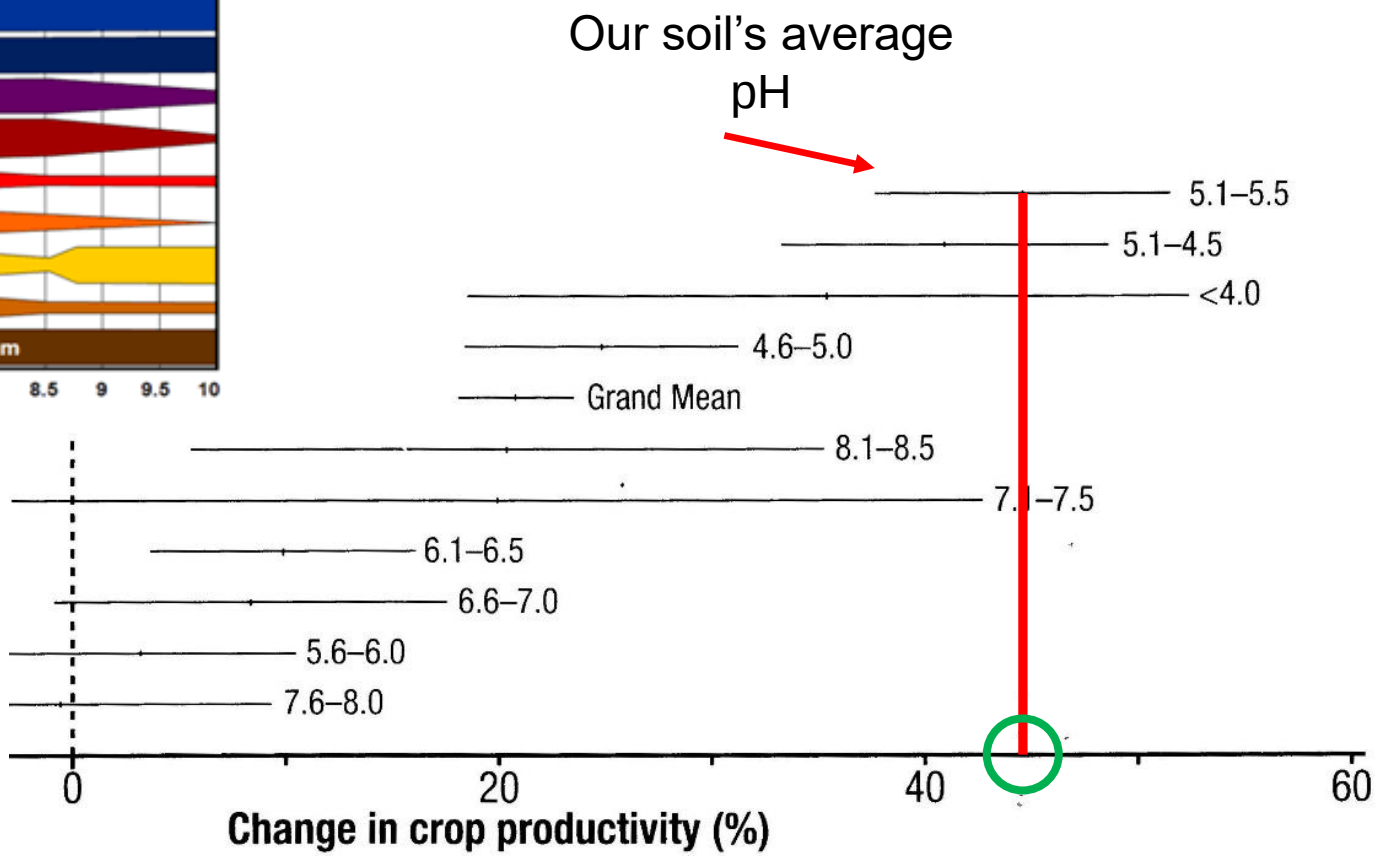
These are ***global averages*** including developed world results. The worse the soil, the better the results. In North Thailand, we have very bad soil so ***our results should be much better than average***.

AVERAGE INCREASE IN CROP YIELDS RESULTING FROM ADDING BIOCHAR TO SOILS OF DIFFERENT PHS

WARMHEART
มูลนิธิอุ่นใจ



Nutritional consequences of soil with pH levels as low as ours



Reducing acidity (raising pH) may be the single best way to improve crop yields in North Thailand. Using traditional means it is costly, time consuming and temporary; biochar is cheap, quick and permanent.

TECHNOLOGY AVAILABLE RIGHT NOW

	Single Barrel	Merry-Go-Round	FU3
Volume m^3	0.2	1.2	9
Cob kg	40	240	1,800
Stalk kg	N/A	N/A	172*
Straw kg	N/A	N/A	341
Biochar, cob kg	10.8	64.9	450
Biochar stalk kg	N/A	N/A	43
Biochar straw kg	N/A	N/A	85

WARMHEART
มูลนิธิอุ่นใจ

TECHNOLOGY AVAILABLE BY MARCH

	Super-Merry-Go-Round	Small Trough	Large Trough
Volume m^3	4.6	.5	2
Cob kg	920	Continuous feed	Continuous feed
Stalk kg	N/A	Ditto	Ditto
Orchard prunings kg	Not tested yet	Ditto	Ditto
Biochar, cob kg	258	Not tested yet	Not tested yet
Biochar stalk kg	N/A	34	133
Biochar orchard prunings kg	Not tested yet	Not tested yet	Not tested yet

WARMHEART
มูลนิธิอุ่นใจ

USES FOR BIOCHAR

- Smokeless cooking charcoal
- Soil amendment that increases yields
  - Improves soil structure
  - Improves water penetration
  - Improves water retention
  - Raises pH
  - Encourages healthy soil life
  - Improves organic matter content
- Animal feed enhancer
- Manure smells absorbent
- Water filtration
- Agro- and industrial chemical immobilization in soil, mine waste cleanup

WARMHEART
มูลนิธิอุ่นใจ

LOCATIONS FOR CHARRING

Ampure – direct administrative authority under Plan

- **Dump** – Ampures currently field burn all tree prunings and other organic matter at Ampure dump
- Hospital, police stations, clinics, schools currently field burn all tree burnings and other organic matter

Tambons – direct administrative authority under Plan

- Main office, roads, Tambon administered land all tree prunings and other organic matter is now field burned

Villages – direct administrative authority under Plan

- **Dump** – Organic matter left at village dump in field burned
- **Households** – Households open burn all organic matter

Farmers

- Unutilized field waste – often field burned
- Unutilized orchard prunings – often field burned

WARMHEART
มูลนิธิอุ่นใจ

REFERENCES

- Biochar and agrochemical, industrial chemical, mining run-off and other forms of contaminants, database and bibliography: Biochar Adsorbtion Database (http://www.aqsolutions.org/?page_id=1430)
- International Biochar Initiative, biochar in soils: http://www.biochar-international.org/biochar/soils
- International Biochar Initiative, biochar in soils bibliography, http://www.biochar-international.org/biblio
- International Biochar Initiative, biochar and sustainability: http://www.biochar-international.org/sustainability
- International Biochar Initiative, biochar in developing countries: http://www.biochar-international.org/developingeconomies

WARMHEART
มูลนิธิอุ่นใจ

CONTACT INFORMATION

DR. D. MICHAEL SHAFER

info@warmheartonline.org
www.warmheartworldwide.org

Warm Heart Worldwide, Inc.
434 Cedar Avenue
Highland Park, NJ 08904

Warm Heart Foundation
61 M.8 T.Maepang A.Phrao 50190
Chiang Mai, Thailand

WARMHEART
มูลนิธิอุ่นใจ