The TLUD cookstove system with low-cost Biochar production aggregating to large volume

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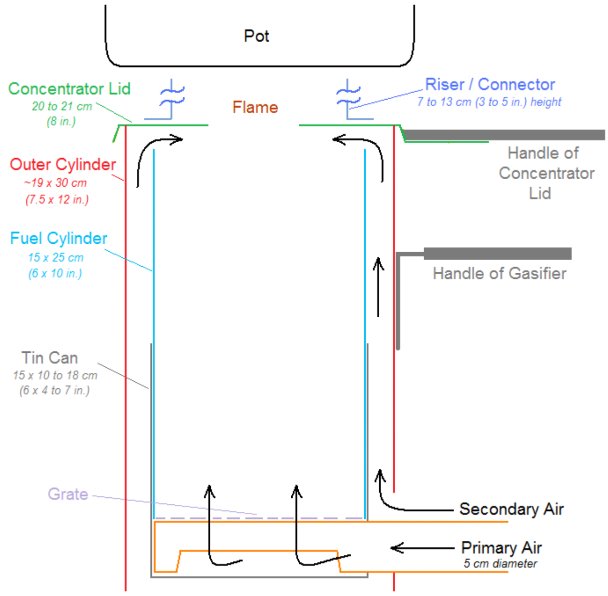
Making Biochar in Households

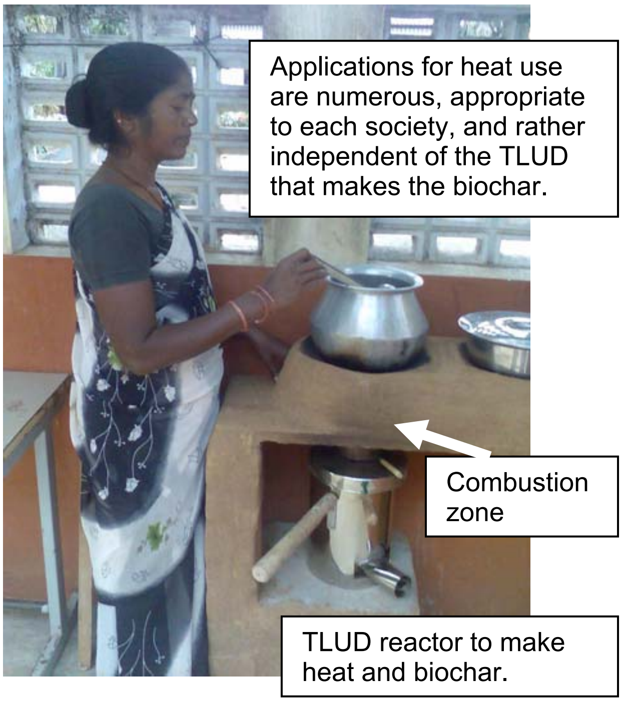
While preparing a meal in rural Africa, Asia or Latin America, the cook almost effortlessly transforms low value biomass into quality biochar because her stove is a fuel-efficient Top-Lit UpDraft (TLUD) pyrolytic gasifier. The collected biochar can be easily crushed and applied to the land when convenient.

By prior arrangement, a "biochar assessor" from the area could document the placement of the biochar onto the field either during dispersal or by soil sampling even years later, justifying payment for carbon credits. Alternatively, weekly or monthly biochar production could be purchased (or traded for fuel) by a centralized entity that manages the full project.

TLUD Technology

Gasifiers are devices in which dry biomass is transformed into combustible gases in processes distinctly and controllably separate in time and location from the eventual combustion of the gases. Within the TLUD type of gasifiers, flaming pyrolysis in the pyrolysis zone at the top of a column of chunky dry biomass is starved of oxygen, resulting in pyrolytic gases ("smoke") moving upward to where fresh secondary air enters, resulting in clean combustion of the gases.





•TLUDs can utilize a wide range of biomass fuel types that should be in chip or chunk sizes, including briquettes, pellets and seeds.
•TLUDs are "gas burners" that produce their own supply of gas on demand via pyrolysis of biomass, creating charcoal as an optional by-product to be easily collected.
•TLUDs can provide continuous heat when using two fuel containers.
•TLUDs consistently have significantly lower emissions of CO and particulates than do most other biomass cookstoves. In the least developed societies, indoor air pollution (IAP) is the fourth worst cause of poor health and avoidable deaths of women and small children. (WHO study, 2004), adding to TLUD appeal.

Biochar Yields

Depending on cooking styles and biomass supply, each household produces between half and one kilogram of biochar each day, accumulating 180 to 400 kg of biochar per year, easily equal to one ton of CO_2 *removed* from the atmosphere. The biochar is sufficient to apply 1kg/m^2 to a 20 x 20 meter agricultural plot. Additional dry biomass wastes could be pyrolyzed in larger TLUDs. The poorer the soil, the greater the favorable impact on the family's crops in all subsequent years.

The biochar benefits can be directly multiplied by the number of participating households. Annually a village of 100 households could create 30 tons of biochar, improve 3 hectares of cropland, and earn their share of 100 carbon-credit-tons. At least three hundred million households that burn solid fuels (mainly wood) in developing societies are candidates for this system. A multitude of small, locally sensitive, decentralized projects combine to create large volumes of biochar. This vision by UBI and others is totally realistic.

Realities

-- TLUD biochar-making cookstoves of several designs have been constructed, tested, and found to have extremely low emissions, generating interest by health-focused allies to participate in dissemination efforts of improved cookstoves.

-- TLUD stove production costs and fuel flexibilities are advantageous for the target communities.

-- Tested TLUD biochar is average to superior in adsorption and other characteristics, depending on the specific device and how it is operated.

-- Pilot projects of TLUD stoves (without a focus on biochar) are starting in Costa Rica, Mongolia, Thailand, India, Nepal, and six African countries. These will gather important data on stove acceptance, fuel issues, and environmental impact (less deforestation).

-- TLUD technology can be sized larger and smaller to suit the needs of the heat users and to increase the production of biochar by increased usage for diverse tasks, including water heating, room heating, and small industrial needs.

Challenges

-- Without the trial sites for the stoves, there is currently no TLUD biochar production for field testing.

-- Without incentives for saving biochar, most of the produced char will be consumed in char-burning stoves.

-- Carbon credit funding for cookstoves has not reached the TLUD or biochar level.

Conclusions

All indications are that the TLUD technology and cookstoves can accomplish or at least significantly contribute to **NINE WINS.**

1. Families **use low-value biomass,** save money, cut fewer trees, reducing deforestation.
2. Society accomplishes **less CO_2 entering the atmosphere** (via charcoal co-product).
3. Kyoto/CDM **"carbon credit" is generated** by this charcoal and reforestation.
4. Impoverished **families receive improved cookstoves** to motivate A & B.
5. **Reduced Indoor Air Pollution** yields better health for biomass users.
6. **Verifiable permanent sequestration** of carbon via scattered burial.
7. **Soil characteristics improve**; crops are better (w/ improved food & health).
8. Appropriate sustainable technology **creates employment** & capacity building.
9. De-centralized implementation allows **maximum localized adaptations** and minimal transportation costs.

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www.bioenergylists.org/
andersontludconstruction (dimensions)
Mclaughlintoucan (dimensions)
Andersontludcopm (emissions data)
Tludhandbookdraft-1 (background & links)
content/pyrolysis-temperatur (large TLUD)

http://terrapreta.bioenergylists.org/content/all-biochars-are-not-created-equal-and-how-tell-them-apart
(characteristics of TLUD biochar)

www.hedon.info/Micro-GasificationWhatItIsAndWhyItWorks