

# Case Study of Acceptance of Champion TLUD Gasifier Stoves in the Deganga Area, Ganges Delta, India

[Data as of early 2016; released in September 2016]

<http://drtlud.com/deganga-tlud-project-2016>

Paul S. Anderson, PhD, President, Juntos Energy Solutions NFP, 227 South Orr Drive, Normal, IL, 61761 USA, +1-309-452-7072, [psanders@ilstu.edu](mailto:psanders@ilstu.edu) ( Website: [www.drtlud.com](http://www.drtlud.com) )

Sujatha (Mukundan) Srinivasan, Director, Servals Automation Pvt Ltd, Chennai, India, [sujatha@servals.in](mailto:sujatha@servals.in) ( Website: [www.servals.in](http://www.servals.in) )

Moulindu Banerjee, President, Moulindu Consultancy, Kolkata, India, [sapientinfo1970@gmail.com](mailto:sapientinfo1970@gmail.com)

Katrin Mikolajewski, PhD, CDM Project Manager, atmosfair gGmbH, Zossener Strasse 55-58, 10961 Berlin, Germany, [mikolajewski@atmosfair.de](mailto:mikolajewski@atmosfair.de) ( Website: [www.atmosfair.de](http://www.atmosfair.de) )

**Notice of Publication:** An earlier version of this article was accepted for publication by *Boiling Point*, but a seven-month delay for peer review and printing prompted its withdrawal, revision and independent release in September 2016 with digital distribution via the Internet. New developments and project expansions in 2016 will be reported early in 2017, with preference given to *Boiling Point* for publication.

**Acknowledgments:** The authors and their organizations express profound appreciation to the thousands of families that have adopted the Champion TLUD micro-gasifier stoves for their residential cooking. The people of Deganga and surrounding areas have made this “Deganga TLUD Project 2016” a success. They have become a model for others to follow. Thank you!!

## Summary:

With field data to document earlier challenges and current success, as of early 2016 the Deganga TLUD Project in the Ganges Delta has over 11,000 Champion micro-gasifier stoves in a small rural area. In seven villages, between 25% and 40% of households have adopted the stove. Factors contributing to the success include funding via carbon offsets, attaining critical mass of households, adequate supplies of appropriate fuel, fuel cost savings, installment payments for the BOP (Base of the Pyramid), and stove maintenance services. Unique to this project, and very well received by the households, is the creation of household income from the sales of charcoal byproducts produced in the stove while cooking. Similar results should be possible in other communities in developing societies.

**Keywords:** Micro-gasification; TLUD; Champion; Cookstove; Enabler; Carbon credit; Biomass fuel; BOP; Charcoal; Deganga.

## Introduction:

From 2008 through 2012, fewer than 2000 Champion TLUD-ND micro-gasifier stoves were distributed or sold by manufacturer Servals of Chennai, India. This was a modest emergence for the world’s second commercially-produced natural draft TLUD stove. (The first was Paal Wendelbo’s artisan production of 5000 Peko Pe TLUD-ND units in Uganda in the 1990s (Anderson, Schoner 2016).) But from 2013 into 2016, over 11,000 Champion TLUDs were sold in a small rural area around Deganga in the Ganges River Delta. Market penetrations of 25% to 40% of households in seven villages indicate the strength of acceptance.

During the struggling years up to 2013, the exact same Champion TLUD stove offered clean emissions, fuel savings, and made charcoal as a byproduct of cooking. What changed in Deganga?

The prerequisites for such emergent success include a good stove design, a scalable capacity for stove production, and appropriate fuel supplies. The design was from Paul Anderson's creation in 2005 of an award-winning, low emissions natural draft (ND) Top-Lit UpDraft (TLUD) micro-gasifier stove for residential-size cooking (the "Champion" stove) (Anderson et al 2007). In 2007 Anderson introduced the technology to P. Mukundan, the head of social-service-minded Servals Automation Pvt Ltd in Chennai, India. The resultant stainless steel Champion TLUD stove [Figure 1] has distributors on five continents, is widely known, and quite favorably tested (MSME 2010). Most TLUD micro-gasifier stoves can use a wide variety of fuels and can reduce fuel consumption by over 50% while creating charcoal as a byproduct (Roth 2014, pp 112 - 113).



Figure 1: One Champion TLUD gasifier cookstove in use in Deganga, India. Two gasifier fuel chambers are included with each stove sale, allowing continual cooking when alternated under the tripod stove structure.

The Deganga TLUD Project identifies two pre-requisite conditions (financial backing and critical mass), one cluster of "attention to householders" services, and a distinctive capability to "earn while cooking" by making charcoal. These enabling characteristics are intertwined in the project.

### **Prelude for success:**

In 2011, Servals director Sujatha (Mukundan) Srinivasan realized that promoting the wood-saving and char-making capabilities of TLUD stoves did not yield increased sales, mainly because stove users were not sufficiently clustered geographically to have "critical mass" to support a fuel supply chain and charcoal monetizing operation. The numerous NGOs she approached were unwilling to take the start-up risk, so she shifted to finding an "enlightened implementation partner". From previous field staff employment in the Gallop Organization, she re-connected in Kolkata with Moulindu Banerjee, who was starting up his own Moulindu Consultancy business for product marketing. He quickly learned TLUD stove operations and became a believer in TLUD potential.

Together they conducted a pilot study in March 2012 with 50 Servals Champion stoves and fieldwork usage research by Moulindu in the Sunderbans (wet mangrove delta of the Ganges). The 52-slide "User Feedback...." report (Servals, Sapient 2013) is an excellent introduction to the Servals – Moulindu efforts. Stove users reported very high (over 90%) levels of satisfaction.

Soon after receiving the pilot report in June 2012, Germany-based atmosfair gGmbH, a travel-focused climate protection organization, agreed to finance a carbon credit project of 1000 TLUD stoves. Founded in 2005, atmosfair is a not-for-profit company with cash flow from donors who voluntarily offset their carbon footprint from airline flights. The Deganga TLUD Project and 14 other atmosfair-

managed projects are compliant with the Gold Standard (GS) Foundation, and the majority are also compliant with Clean Development Mechanism (CDM) standards for carbon credits for climate protection efforts. Monitoring by external United Nations-accredited auditors provides assurances that the data presented here are accurate (atmosfair 2014).

Unfortunately, the project that launched in August 2012 in the Sunderbans Forest communities was not successful. Seven months later (March 2013), only 300 stoves had been sold, despite their low price of \$9. (All monetary calculations are based on INR 66.7 = US\$ 1.) A holistic analysis showed that the abundant availability of free but non-renewable firewood in the Sunderbans rendered unimportant to the households the fuel savings offered by the stove. And long term benefits like improved health because of low emissions were not given much importance by the users.

#### **Attaining success:**

Moulindu Consultancy then conducted another area analysis to locate a more suitable project site where communities buy firewood instead of gathering it. Barely 40 km to the north, the Deganga Community Development Block (CDB) in the Ganges River Delta was selected. It is in the approximate center of the 60 km between Kolkata and India's border with Bangladesh. Averaging 6 to 10 meters of elevation above sea level, this is firm agricultural land with a population density of 1000 to 1500 persons per square kilometer (Wikipedia articles).

Over 300 stove sales per month (at the higher price of \$15) around Deganga finished the first phase of 1,000 stoves in April 2013. atmosfair developed a carbon credits program for 28 years for at least 18,000 stoves in the Deganga area. Internal data from atmosfair and Moulindu from 2016 show 11,000 TLUD stoves sold and in use, representing sales averaging 400 per month for nearly three years.

#### **Pre-requisite Conditions: Financial support and reaching critical mass:**

The Deganga TLUD Project is largely financially sustainable, with the following explanations:

A. atmosfair has invested approximately \$60 per stove, including \$240,000 for the critical mass threshold of 4000 stoves (atmosfair 2014). This must cover the one-time 50% price subsidy, costly annual CDM and GS certifications, initial and ongoing operational expenses and monitoring in India, and administrative expenses.

B. The project receives 2 carbon credits for the reduction in wood burning per stove per year, and 2 carbon credits/stove/yr for sustainable charcoal production (discussed below). The market value of each carbon credit varies, and specific values are proprietary information. atmosfair faces competition with credits being sold at \$2.20, which would be \$8.80 per certified participating household per year. [NOTE: For project replication at other times and in other regions and circumstances, the value per carbon credit could be less or substantially higher.]

C. To "break even" requires much more than 7 years because of substantial recurring expenses. As a not-for-profit entity, atmosfair works to recover its investments, covers ongoing expenses, and uses any surplus funds for further climate protection efforts. Meanwhile, thousands of households have years of financial and health advantages while the Earth's environment is also benefited.

D. Simply putting money into a stove project does not assure success, but is a necessary preparatory condition. In a non-typical approach, atmosfair's investment was done *before* the stoves began creating carbon offsets, greatly increasing its financial risk.

#### **Services that give "Attention to Householders":**

A. Supply of appropriately-sized wood fuel: While planning scale-up efforts in June/July 2013, users in new areas raised significant resistance against the additional task of sizing of fuel wood, a necessary effort most stove users initially consider a major inconvenience of TLUD stoves. Planners realized that if a household (HH) uses the stove for at least 7 continuous days, the user(s) develop

appreciation for the various conveniences and cost-saving features of the stove, and then continue to use it. So the continuing sales efforts include providing 7 days of correctly-sized wood free with every stove to induce initial usage.

Some users started asking for ready-to-use fuel for the stoves. In September 2013, a small saw mill was acquired (for \$6250 after upgrade) with capacity up to 8000 kg/day of bulk firewood, specifically to strengthen the project credibility in the early months before establishment of the charcoal buy-back activities.

However, most households became willing to size their own wood or purchase from fuel processors. Bulk firewood is purchased from the government-managed energy plantations; also, prunings come from the big mango plantations of West Bengal. Appropriately processed firewood became available at the user's doorstep at a rate slightly lower than prevailing market rates in the region. Firewood is sold to users for \$0.075 (INR 5) per kg, including home delivery. All totaled, the wood supply business for 11,000 TLUD stoves is approximately \$900,000 per year, as private enterprise.

**B. Awareness of the financial savings of using less fuel:** The stove users are reminded by project staff, fuel sellers, and their neighbors that with the TLUD stove, fuel usage is less than half, down around 1100 kg/yr/HH, (which is about 3 kg/day/HH, with savings of \$116/yr/HH., or nearly \$10 per month).

**C. Reaching the BOP (Base of the Pyramid):** In October 2014, a detailed user profile analysis showed that most purchasers were of the more affluent class (but still of relative low income) that could make the one-time full payment of \$15. The BPL (Below Poverty Line) population was not able to afford the full payment. A rural business named Quality Enterprise was formed (with the 4 project team leaders as partners) and took up the challenge of offering the stove via an installment plan. The subsidized price of the stoves was increased to \$18.80 with the aim of reducing the subsidy. The down payment was reduced to \$9.80 with the balance of \$9 recovered in 3 monthly installments of \$3 each, which was adjusted against the charcoal buy-back payment of a similar amount (discussed below). This approach helped the project make clean cooking available to the BOP. As of February 2016, 4000 (36%) of the 11,000 users are from the BOP; they appreciate the stove as an up-scale, aspirational purchase for their homes.

**D. Service:** After-sales service is provided by Quality Enterprise via the charcoal collectors who received stove maintenance training. With every new iteration of a stove part, all old stoves are upgraded free of cost. Servals provides unconditional hardware support for the warranty. The average time to resolve a stove complaint or service request is 3 hours. With such maintenance, the stove life (or replacements) is expected to match the 28-year timeline of the carbon credit project.

For each stove sold, the seller receives a one-time commission (\$6), and upon successful annual monitoring of his stove cluster, he is rewarded per stove in use. [The amount is considered to be proprietary business information.] This incentive motivates the seller to ensure that the stove is properly used by providing user training, user hand-holding, and prompt after-sales service.

### **Capability for households to “Earn while you cook”: The Charcoal buyback program:**

TLUD stoves enable households to collect and sell the char created during cooking. Charcoal buyback from stove users started in June/July 2013, with monthly pickup since September 2013. On average, each household generates monthly around 20-25 kgs of charcoal (nearly one-third ton/yr/HH). The cost of the fuel wood is already expensed, so all income is pure profit. Almost every household participates and receives \$0.12 per kg of charcoal (approx. \$2.40 to \$3.00 per month, or \$29 to \$36 per year). For 11,000 households, this amounts to approximately 10 tonnes of char per day.

Quality Enterprise independently operates the charcoal chain that sells to local small and medium industries and restaurants. Quality Enterprise has an annual cash flow of over \$640,000 and employs 33 charcoal collectors and 33 vehicle drivers (Figure 2).

This new charcoal supply chain replaces charcoal made by traditional, less efficient, more polluting methods, and receives two carbon credits per verified household. The estimated potential for char sales to restaurants and industries would sustain 20,000 TLUD stoves in the area.

**Limitations:**

The carbon credit agreement places three limitations on the outreach of the project:

1. Only one subsidized stove can be sold to each household.
2. The one available TLUD stove size is not large enough for the numerous households larger than 7 people.
3. The produced TLUD char cannot generate credits if it is burned by the household or used as biochar for soil amending.

The more affluent households tend to reject TLUD stoves because of noticeable pot blackening (compared to LPG). This is not a factor with the BOP households.

The subsidy funds from carbon credits currently limit new stove sales to 300 to 500 per month.



Figure 2: Charcoal collection in the Deganga area, West Bengal, India.

**Summary / Conclusion:**

Each TLUD stove has approximately \$150 favorable impact to its household each year (\$116 savings of fuel costs + \$34 income from charcoal) plus \$9 carbon credits to atmosfair for project implementations.

Having attained critical mass, sustainable fuel supplies, and established char marketing, the principals (Servals, Moulindu Consultancy, atmosfair and Quality Enterprise) are motivated to do the following: a) gradually reduce the stove subsidy but b) maintain within the project’s cash flow the continual maintenance, repair, and replacement of the TLUD cookstoves. This reduces the impoverished households’ financial burden to attain advanced improved cookstoves (AICS). This success also delivers at virtually no extra cost the benefits of improved health and safety and less deforestation while contributing toward the reduction of atmospheric CO2 and methane.

The Deganga TLUD Project clearly demonstrates that the barriers associated with TLUD stoves (high purchase price, supply of appropriately-sized fuel, resistance to handling the created char, stove height, marketing, etc.) can be and largely have been overcome. With key enablers now identified, Servals, Moulindu Consultancy and atmosfair have embarked in 2016 on a replication project in the Assam area of India. Results are scheduled to be released in 2017, including an article in *Boiling Point* journal, along with updates about the Deganga area TLUD project.

Other individuals and entities concerned about cookstoves, economic development, health, safety, forests, biochar, and climate change should consider replication projects with TLUD stoves in diverse situations around the world, including efforts that are not dependent on carbon credit financing.

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## Profile of the authors:

Paul Anderson, PhD, is internationally known as Dr TLUD, one of the “pyroneers” of micro-gasification. Since his 2003 retirement (after 30 years of university teaching of geography), he works full-time on all TLUD issues, including design, fuels, pyrolysis, acceptance and biochar. He actively assists people and projects around the world.

Sujatha (Mukundan) Srinivasan, a Director at Servals Automation Pvt Ltd, has been associated with R&D, commercialization, market leadership and continuous market creation. She previously worked for the Gallup Organization, both in India and USA, with leadership roles involving research, writing books and papers, managing project teams and delivering presentations regarding customer feedback.

Moulindu Banerjee’s career in management and marketing includes years of direct sales, distribution management and marketing research with Indian branches of large international companies (Unilever and the Gallup Organization). As a private management consultant since 2009, the skills of Moulindu Consultancy have been fine-tuned for Improved Cookstove (ICS) distribution in India.

Katrin Mikolajewski is a Geographer with a PhD in Ecology. She is an expert in GHG monitoring, CDM and GS project implementation and management. For atmosfair she (with Mr. Bratschke) is responsible for registration, verification, and other management of all atmosfair’s cookstoves projects, including overseeing the cook stoves programmes in Nigeria, Ethiopia and India.