

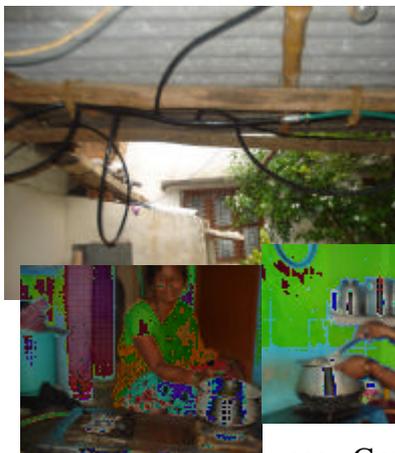


News from IEI's Asian Regional Initiative in Bangalore (India) – December 2015

### Value-addition to food crop processing: converting banana plant-waste to cooking fuel – up-scaling strategy

Rural regions of the developing world still lack clean and efficient energy services. State efforts have increased the accessibility of village families to better energy, but the supply is still inadequate, the source is largely fossil-fuel-based and subsidies continue to be required. To address these challenges, we have been demonstrating how clean energy services can be derived sustainably, along with other benefits, through the efficacious use of resources. Farm activities that generate income/employment are initiated and their residues converted to usable fuel. In this case, currently being up-scaled through demonstrations in new villages, banana plantations have been developed with efficient resource use and the plantation-waste is being used for the generation of biogas for providing stove-fuel to local homes.

The demonstrations are taking place in four villages within Ramanagara district, Karnataka state. A banana plantation of 0.5 acres has been developed at one small farm in each case, with efficient practices (particularly conservative water use). Adjacent to the farmer's cottage/homestead and as conveniently close to other potential users, a biogas plant has been constructed. Each plant consists of a floating-drum digester, and inlet and outlet tanks. The floating-drum digester consists of a cylindrical masonry-lined pit with a metallic gas-holding-drum balanced on a frame fixed to the digester walls; the drum rises as gas is accumulated within. The particular model in use (designed at the Indian Institute of Science) has been successfully constructed by the project team for other projects and in other locations.



The banana-plantation-waste – the main stalk after harvest as well as the additional (“pseudo”) stems that develop around each fruit-bearing stalk – is being used as digester feedstock. These stems are chopped, mixed with measured amounts of water in the appropriate solid-to-water ratio, and inserted in the input tank. After about two months of regular digester-loading, enough gas is accumulated to be used for stove-fuelling by each set of homes. The biogas-digester capacities were planned to suit the availability of residues (biogas-feedstock), and the cluster of families choosing to share the source. Each gas-holder has been linked to the homes sharing the

gas. Currently, gas is drawn by each set of users during mutually-agreed-upon periods, for cooking. *The photographs show multiple pipelines drawn to each home from a particular digester and two of its users.*



The first crop of bananas has been harvested and the fruit sold at the produce markets. Selling prices differ according to the supply received and specific demand spikes (e.g. at festivals), but the revenue from the varieties grown (*Robusta*, the local *yellaki*, etc.) appears to justify the investment. *The photograph shows a local fruit market.*

While the first phase of the project demonstrated “banana plantation (with efficient micro-irrigation) => gas generation” at the community-scale in one village, with large digesters linked through pipelines to houses around the community, this up-scaling strategy extends the model to small groups in different locations. The purpose is to prove that even if entire villages/hamlets cannot be served, or all homes are unable (or unwilling for any reason) to participate, groups of families willing to commit to a joint endeavour can derive benefits. It is also intended to evaluate whether or not an entrepreneurial model can function, i.e. if a family can accumulate revenue from the sales of bananas, gas (and possibly manure, when available in excess of its own needs), to pay back the capital costs of the integrated system. Financing possibilities are being studied to identify the opportunities for obtaining funding for investing in such integrated schemes.

Apart from the increased production of a nutritious food source and enhanced local income from banana sales, additional value is being added through the replacement of indoor-air-polluting solid-biomass-fuelled stoves with clean gas-fuelled stoves and the consequent impacts on local health and the quality of life, and availability of organic manure from digester effluents. However, access to water remains a critical pre-requisite: for sustainability, it is imperative that water is available either from surface sources or from groundwater that is not already over-exploited.

Both phases of this project -- the initial village-based demonstration and this extension – have been financially supported by the Wuppertal Institute for Climate, Environment, and Energy, Germany, through their Wisions-SEPS programme.