# FORESTRY: A POTENTIAL TO ENHANCE BIOBASED ECONOMY

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# Requirement and availability of wood

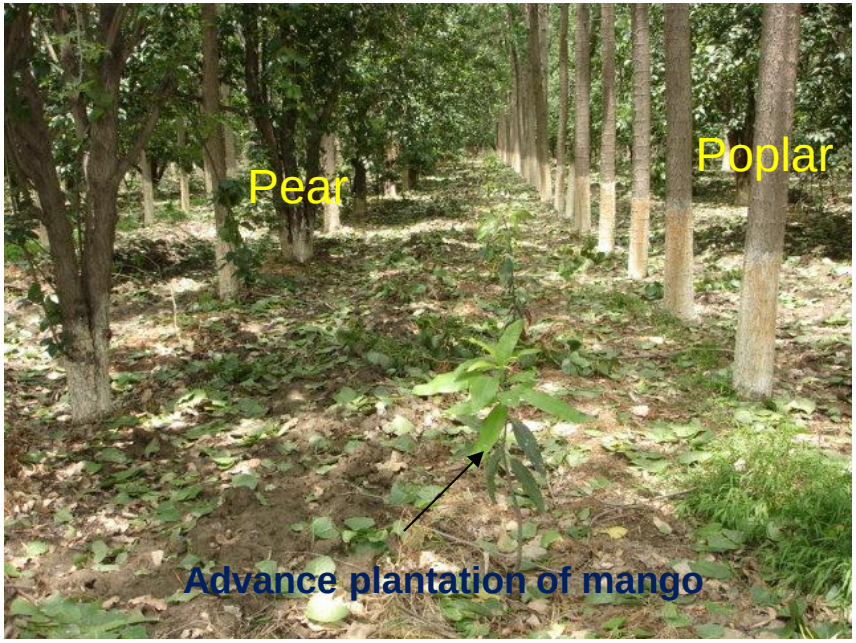
| | |
|---|---|
| Total requirement | 355million $m^3$ (297 fuelwood+58 timber) |
| Total availability | 205million $m^3$ (169 fuelwood+36 timber) |
| Deficit | 150 million $m^3$ |
| Forest area | 23.81% (21.05 and 2.76%) |
| Growing stock | 6047.15$mm^3$ (4798.73$mm^3$ + 1548.42$mm^3$) |
| Annual increment in growing stock | 87.62$mm^3$ giving the av. Productivity of 1.38$m^3$ per ha per yr |

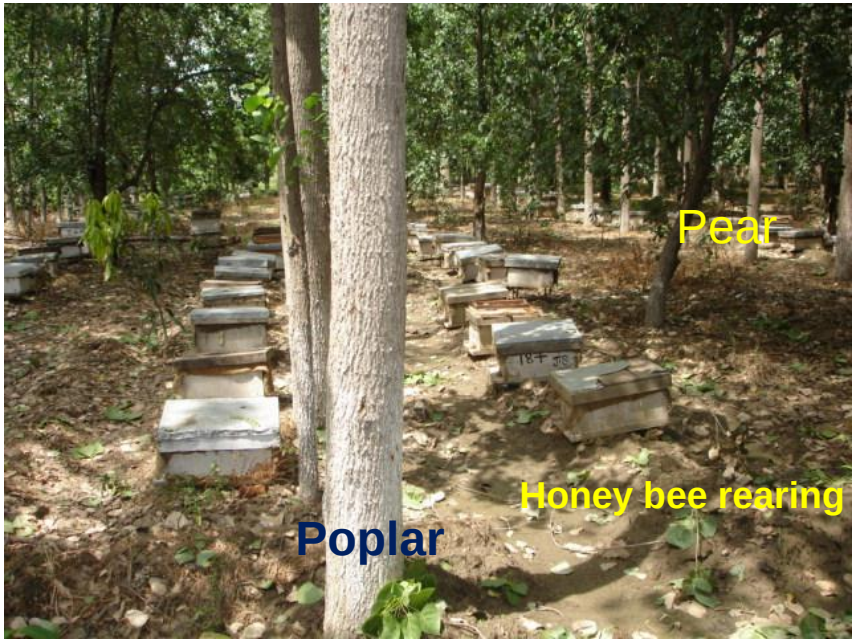
Annual production of wood from forest and TOF 3.175 and 42.77$mm^3$, respectively

Annual production of fuelwood from forest and TOF 1.23 and 19.25m tons, respectively

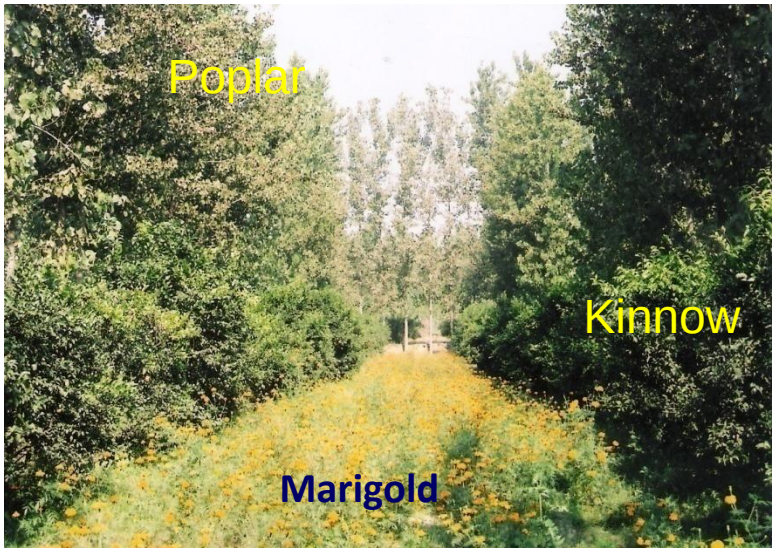
# Demand projection of industrial wood

| | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|
| Wood from SR species | 27.87 | 37.30 | 50.18 | 68.76 | 87.70 |
| Wood from LR species | 29.85 | 36.62 | 44.92 | 54.40 | 65.10 |







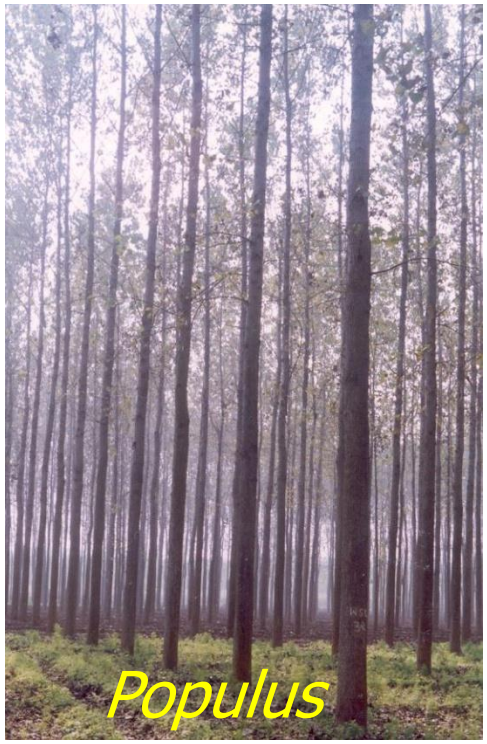

**Land pressure for multiple cropping : extend vertically little scope for horizontal expansion**

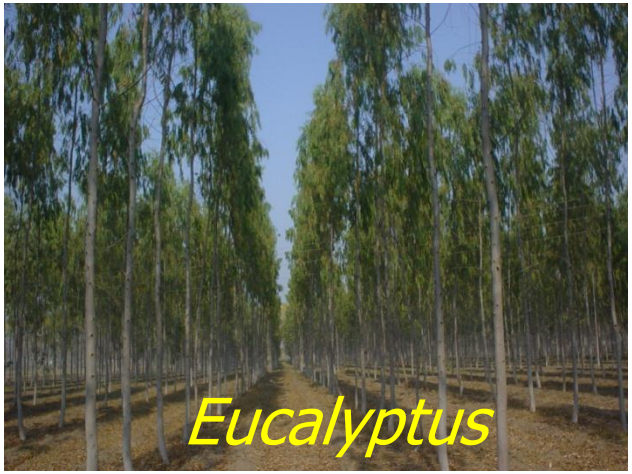


# Strategy to meet demand

Production from dense forests
Production from social and agroforestry programmes
Wood production from unutilized forest lands
Import of raw material










# Cultivating Fast Growing Trees : Future Forestry


Leaves are collected they affect wheat germination


Ply making


Litter addition


Coal making

Most of the photographs reflect that every part of the tree is utilized. The maximum possible biomass is taken away from the system. Thus, the projected estimates of plantations w.r.t. carbon sequestration are very different than the actual position. Though there are financial gains to the farmers with additional employment generation in the villages itself and enhanced landscape value.


Leaves and branches chipped at farm itself

Leaves and branches are chipped for energy


Pruning material transported fro energy

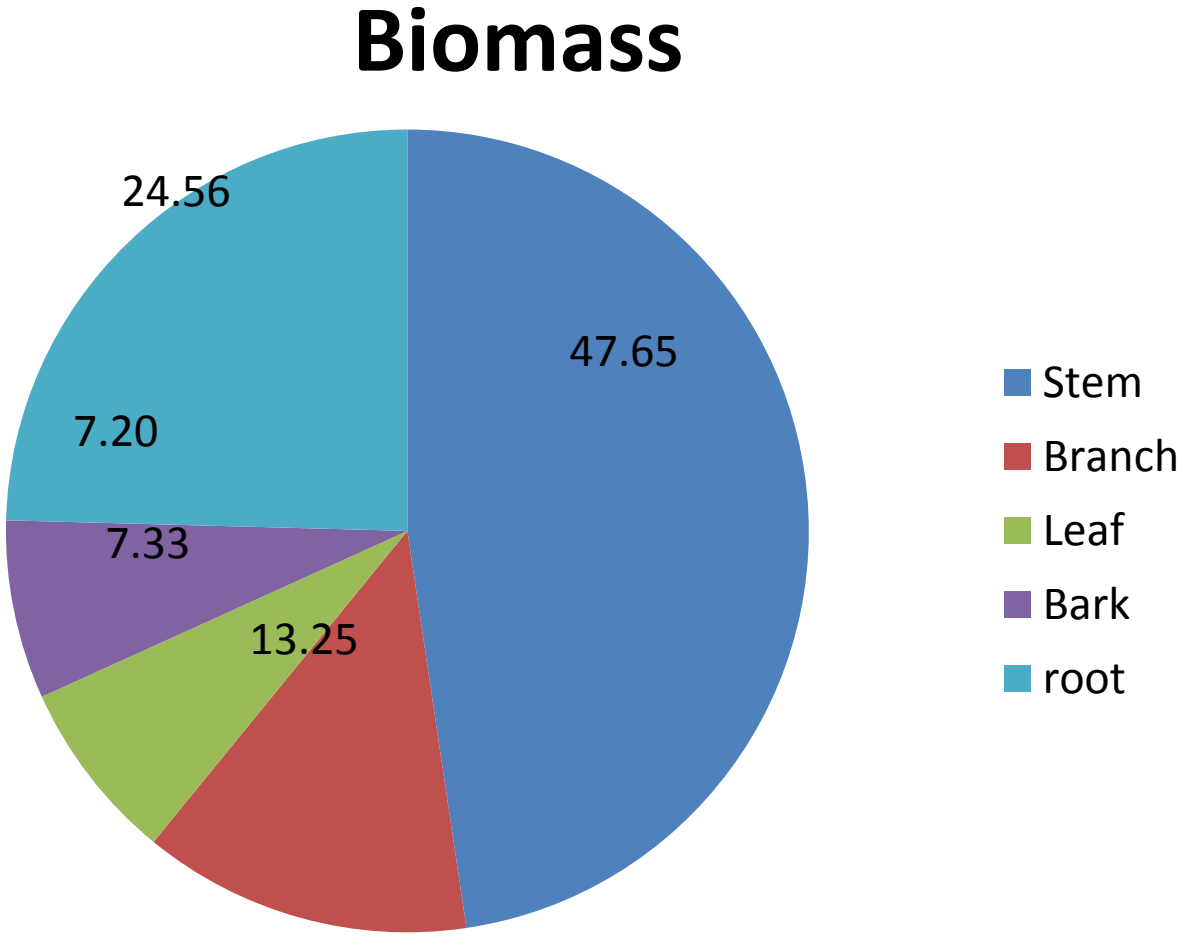

Bioenergy unit at Muktsar uses all plant waste including roots


Cooking fuel

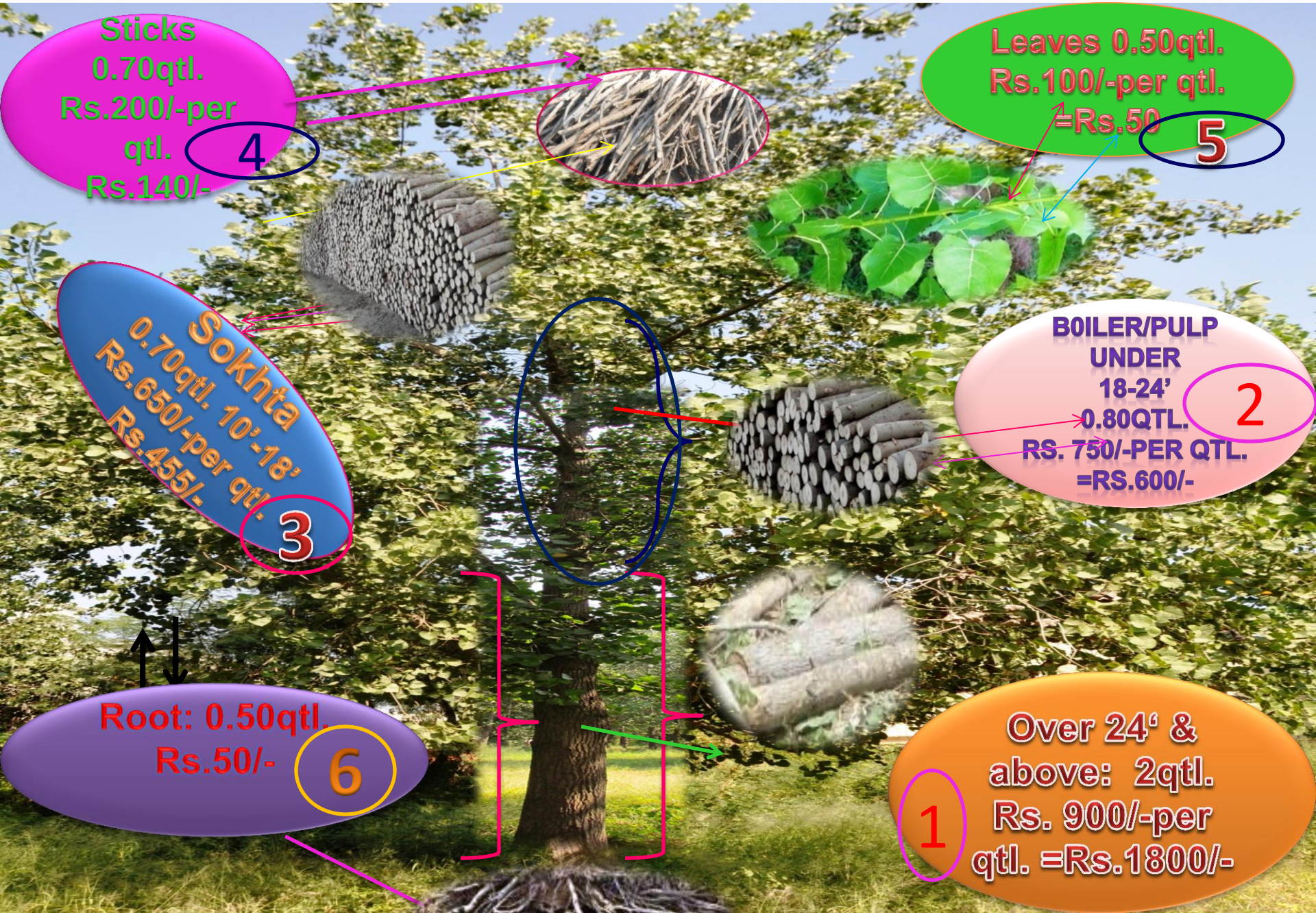
## Proportion of fresh biomass (kg) in the components of ten fast growing tree species

| *Species* | STEM BIOMASS | BRANCH BIOMASS | LEAF BIOMASS | BARK BIOMASS | TOTAL ROOT WT |
|---|---|---|---|---|---|
| *Acacia auriculiformis* | 176.5 | 85.0 | 57.5 | 22.2 | 142.0 |
| *P.ongamia pinnata* | 136.0 | 89.7 | 51.9 | 27.3 | 156.7 |
| *Ailanthus excelsa* | 410.0 | 158.7 | 58.5 | 124.2 | 290.8 |
| *Tectona grandis* | 281.5 | 92.8 | 72.7 | 91.5 | 295.7 |
| *A. cadamba (clonal)* | 238.5 | 52.3 | 42.5 | 37.0 | 186.1 |
| *A. cadamba (seedling)* | 224.7 | 51.3 | 40.5 | 28.2 | 148.3 |
| *Gmelina arborea (c)* | 402.2 | 80.2 | 68.3 | 40.8 | 186.7 |
| *G. arborea (s)* | 555.0 | 96.7 | 96.7 | 75.3 | 320.4 |
| *Acacia nilotica* | 370.0 | 236.5 | 27.0 | 63.0 | 137.2 |
| *E. tereticornis( wimco)* | 422.0 | 101.0 | 47.8 | 46.9 | 180.6 |
| *E. camaldulensis* | 254.0 | 50.7 | 32.1 | 33.8 | 106.1 |
| *E.Tereticornis* | 584.9 | 203.8 | 91.2 | 74.1 | 155.3 |
| *E.tereticornis var. t* | 262.3 | 74.6 | 47.1 | 42.6 | 93.6 |
| *Populus deltoides* | 511.3 | 81.7 | 77.3 | 50.4 | 192.0 |
| *E. Clone 288-14* | 750.7 | 96.7 | 46.9 | 86.0 | 284.5 |

# Proportion of biomass (%) in different components of ten fast growing tree species



# Monetary Value of one Poplar tree after six years of harvest is worth Rs 3095 (USD 57)



# Biomass Energy

**Estimated biomass resources in India is 500 million MT , which can generate 16,000MW power (50% from rice husk, 30% from wood and 20% from agricultural residue). There is realization gap of 95%.**

**Biomass produced for energy seek to maximize the harvestable annual yield rather than carbon. Therefore choose the SRF generating 2-3 times more biomass than LRF.**

**Low cost for wood biomass lowers down the raw material cost by one third.**

**Non-grain biomass will provide Rs 4000-5000 per acre per year additional income to the farmers and generate 100 person employment on per MW power generated.**

**Generates 6500CERs per MW amounting to USD78000.**

**Ministry of Renewable Energy has plan to generate 45000MW from biomass grown on 20mha wastelands, averaging 10MT/ha/year, thus generating huge rural employment.**




# Case Story – Biomass Based Power Plant

**In a small state of 5,05mha (Punjab), 29 biomass power projects (300MW) have been sanctioned and already 7 have been commissioned with total capacity of 62.5MW and rest are under implementation. 381MW under cogeneration have been added and another 70MW are under execution.**

| | |
|---|---|
| Project Activity | 7.5 MW biomass based Renewable Energy Generation for the Grid at Gulabawala, Muktsar,Punjab State. |
| Project Participant | Malwa Power Plant Pvt. Ltd., Muktsar |
| Additionality | Low return on investment and saving of coal |
| Envisaged CERs | 48,300 metric tonnes $CO_2$ equivalent per annum |
| Reality | Power purchased by electricity board under 20 years agreement at Rs 3.49 per unit. Biomass cost has increased over the years and so is the cost of unit power (Rs.5.20). |

# Agricultural residue utilization for power generation

## (7.5MW Gulabewala Project, Punjab)

| Name of fuel purchased | Quantity in metric tonnes |
|---|---|
| Cotton sticks | 16356 |
| Mustard husk | 4540 |
| Paddy waste | 18482 |
| Straw waste | 4854 |
| Fire wood | 22619 |
| Rice husk | 5881 |
| Total | 72732 |

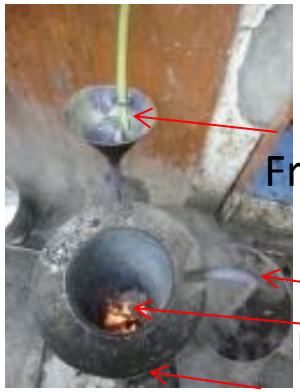
# Carbon sequestration

* Long lived carbon storage
* Heat from biomass combustion
* Carbon storage from coal combustion

| | Stem biomass (t/ha) | C storage (t/ha) | Long lived C (t) | Heat biomass ($x10^9$) | C storage from coal substitution (t C/ha) | Total C Seq. (t/ha) | C Seq. (t C /ha/yr) |
|---|---|---|---|---|---|---|---|
| **Block** | **49** | **22** | **9.30** | **516** | **8.67** | **17.97** | **3.59** |
| **Boundary** | **22** | **9.94** | **4.17** | **237** | **3.99** | **8.16** | **1.63** |

…… The beginning of the 21st century is marked not just by biotechnology, nanotechnology, multimedia technology, communication,
etc. but also by the elementary question of how we can meet **food and energy** requirements of our growing population……..

# Transform empirical knowledge to scientific knowledge




Water heater


**Modified from above water heater-needs to be popularized for energy efficiency**

***Lantana* spp. – worth resource for landscape value and environmental service but not utilized economically for Bioenergy (available in plenty)**

Traditional community cooking

# Thanks

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