Agricultural and Plantation Residues for Sustainable Social and Economic Progress of Villagers

H. N. Sharan

Agricultural and Plantation Residues for Sustainable Social and Economic Progress of Villagers

H. N. Sharan

Adequate quantities of agro-residues are available for meeting the needs of clean cooking of most of Indian villagers.

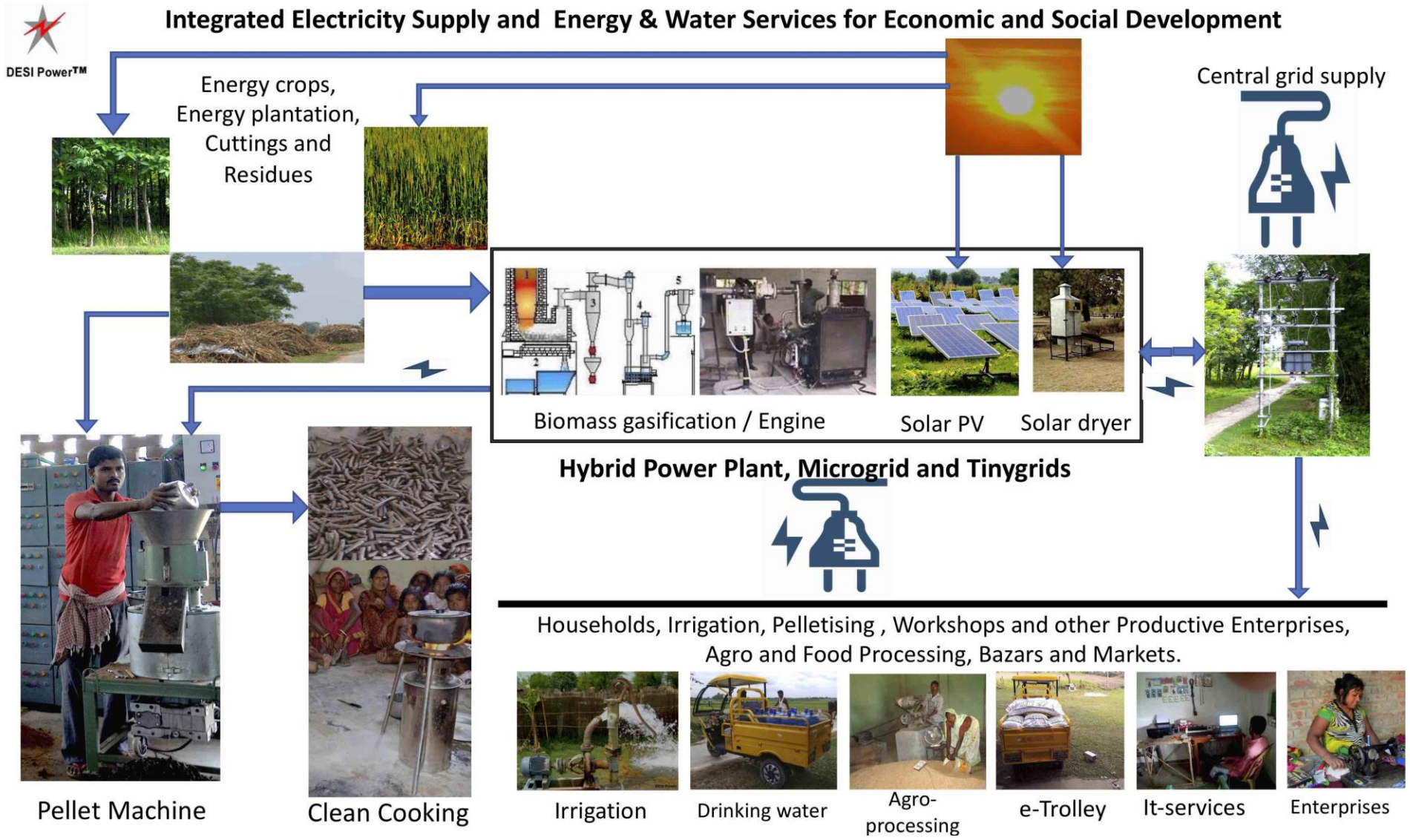
	Agro-residues for producing pellets and using them for clean cooking	(For 164 million families living in villages in India)	
	Potential pellet production from total agro-residues		
	Total agro-residues potentially available in India	mill.t/y	200
	Argo-residues for making pellets	kg ar/kg p	1.1
	Pellet production from total agro-residues	mill. t-p / y	182
	Power generation potential using total available agro residues		
	Specific power consumption of agro-residues for producing pellets	kg-p/kWh	1.25
	Annual hours of generation	h/y	5'000
	Power potential using total available agro residues	kW	29'090'909
		MW	29'091
	Demographic Data India. Source: Wikipedia		
	Demographic Data India: Wikipedia	Year	2020
	Total population	millions	1370
	% in villages	%	60%
	Pop. In villages	millions	822
	Avg. per/family	No/fam	5
	No of families in villages	Millions	164
	Average pop of villages (assumed)	No.	1500
	No. of villages	No.	548000
	Pellets for cooking energy for all village families	(5 persons/family @ 0.5 kg-p/person per day)	
	Daily consumption of pellets / fam	kg-p/d.fam.	2.5
	No. of days / y	d/y	365
	Annual consumption of pellets / fam	kg-p/y.fam	912.5
	Annual consumption of pellets / fam	t/y.fam	0.9125
	Total No. of families in Indian villages (as above)	million	164
	Pellets needed for cooking by all families	mill.t-p/y	150
	Pellets needed for generating power for producing pellets		
	kWh needed to produce pellets (from pellet sheet)	kWh/kg-p	0.075
	kWh needed to produce pellets	kWh/y	11'251'125'000
	Running hours of m/c	h/y	2640
	Power for Pelletising	MW	4'262
	Power for Pelletising (% of total potential of power from agro-residues)	%	15%

In addition to clean cooking fuel, hybridising agro-residues and other suitable local renewable energy sources can provide power and energy services for social and economic development of villagers.

German RETech Partnership
Recycling & Waste Management

Agricultural and Plantation Residues for Sustainable Social and Economic Progress of Villagers

H. N. Sharan

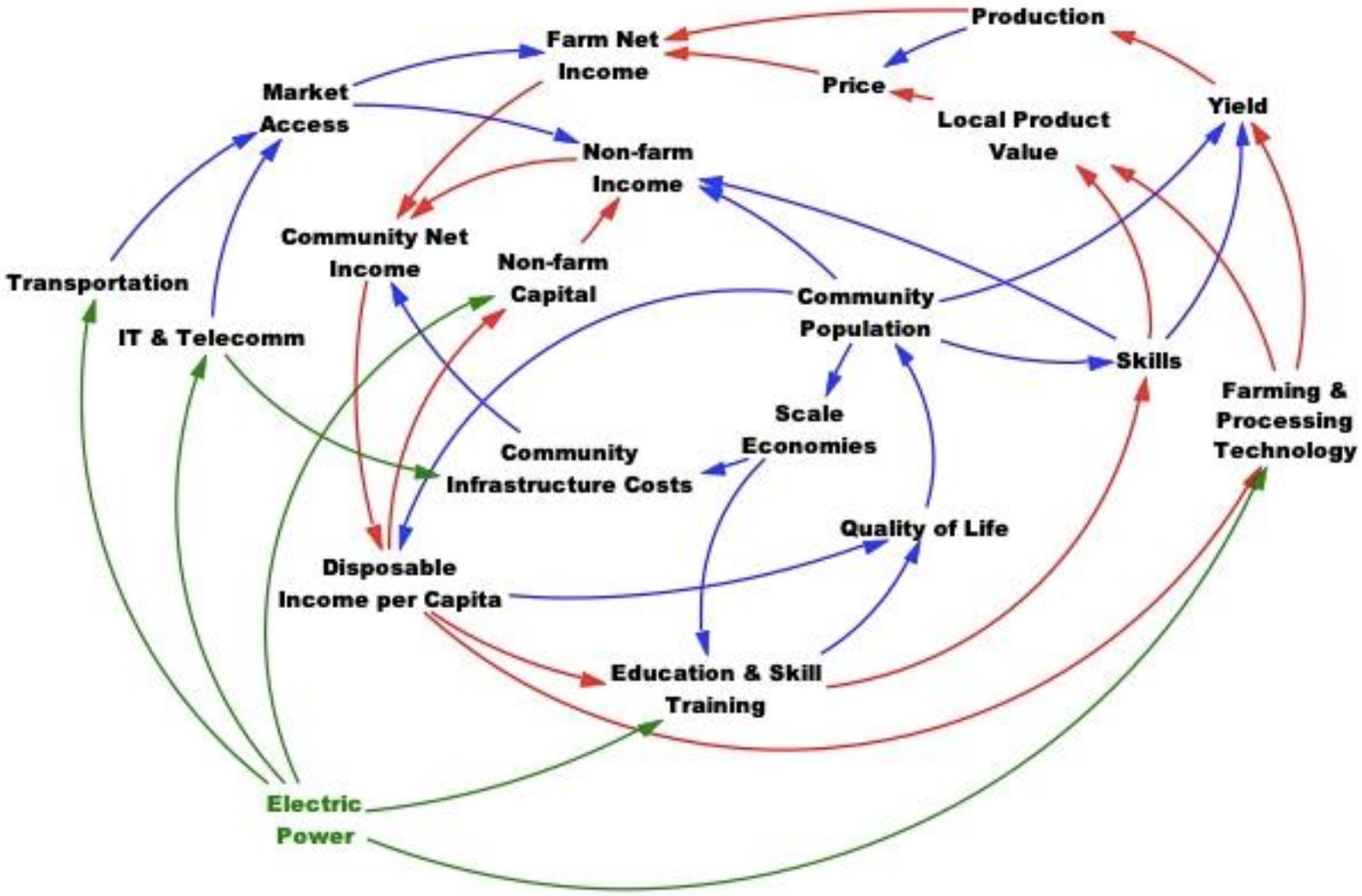


German RETech Partnership
Recycling & Waste Management

Agricultural and Plantation Residues for Sustainable Social and Economic Progress of Villagers

H. N. Sharan

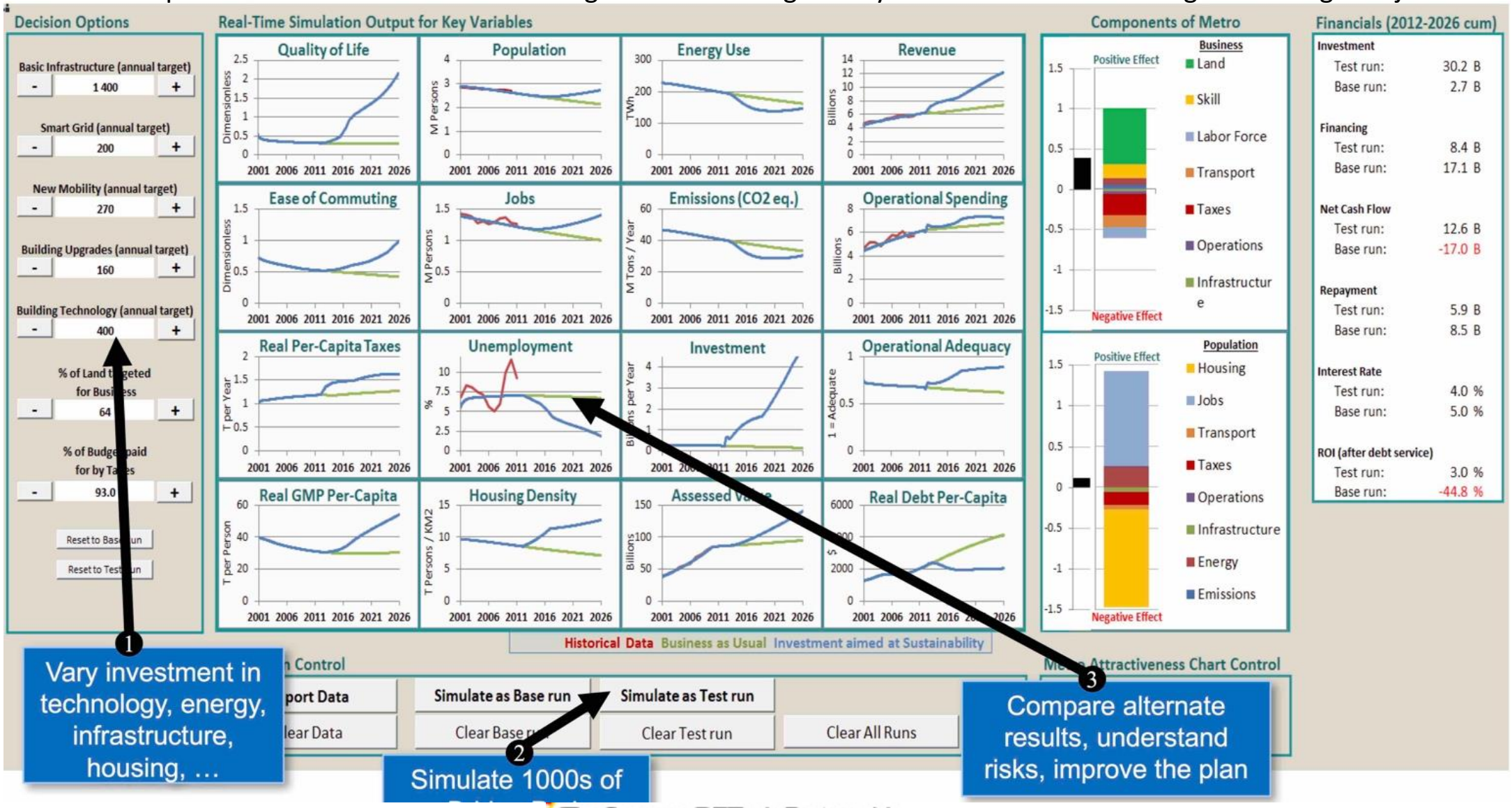
Example of the Modelling Process for Planning a Complex System using Vensim Software



Agricultural and Plantation Residues for Sustainable Social and Economic Progress of Villagers

H. N. Sharan

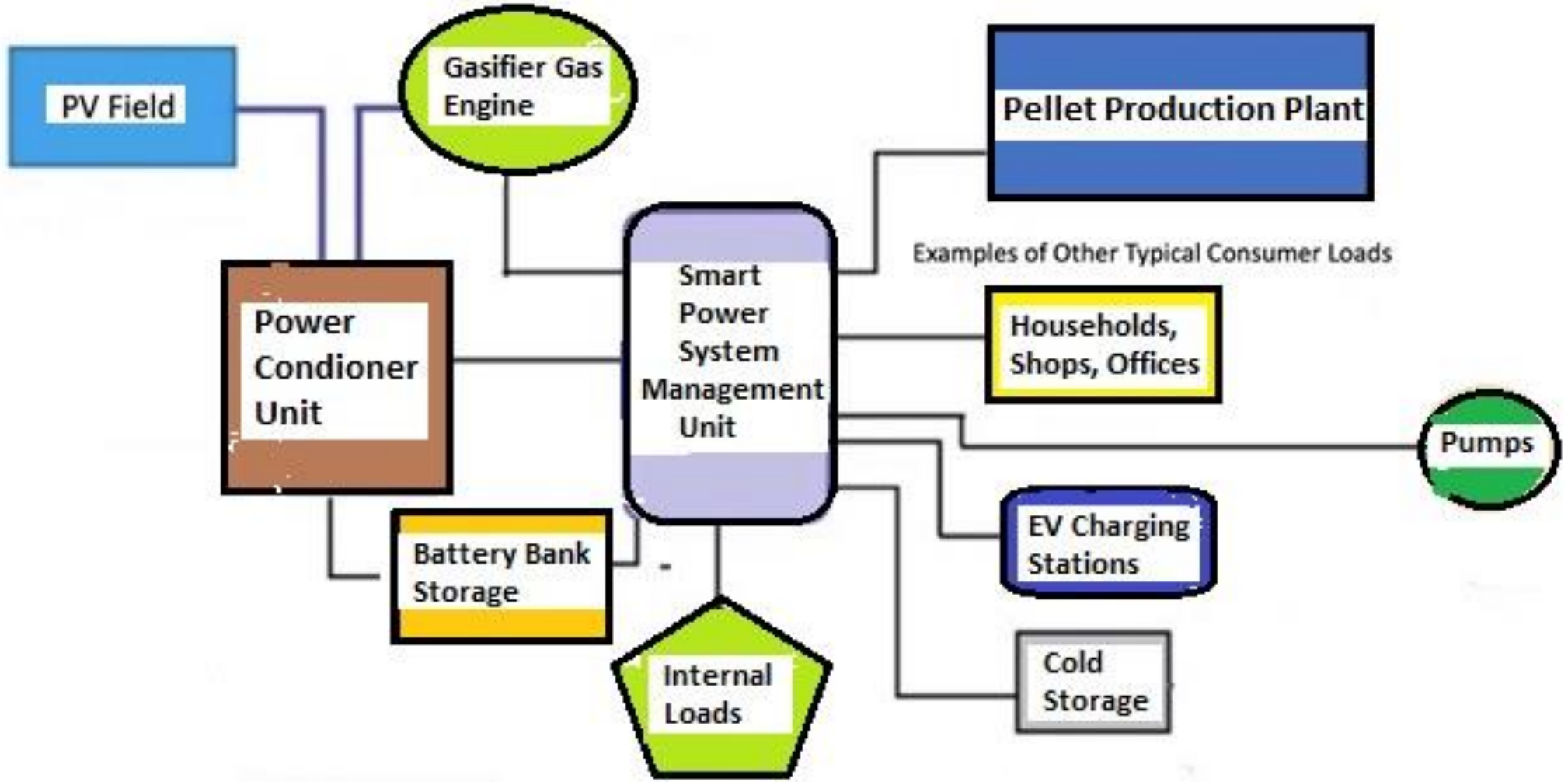
An Example: Results of Simulation Modelling for the Planning of a Hybrid Power Plant for Integrated Village Projects



German RETech Partnership
Recycling & Waste Management

Agricultural and Plantation Residues for Sustainable Social and Economic Progress of Villagers

H. N. Sharan



Total Cost (used in the example shown)

Agricultural and Plantation Residues for Sustainable Social and Economic Progress of Villagers

H. N. Sharan

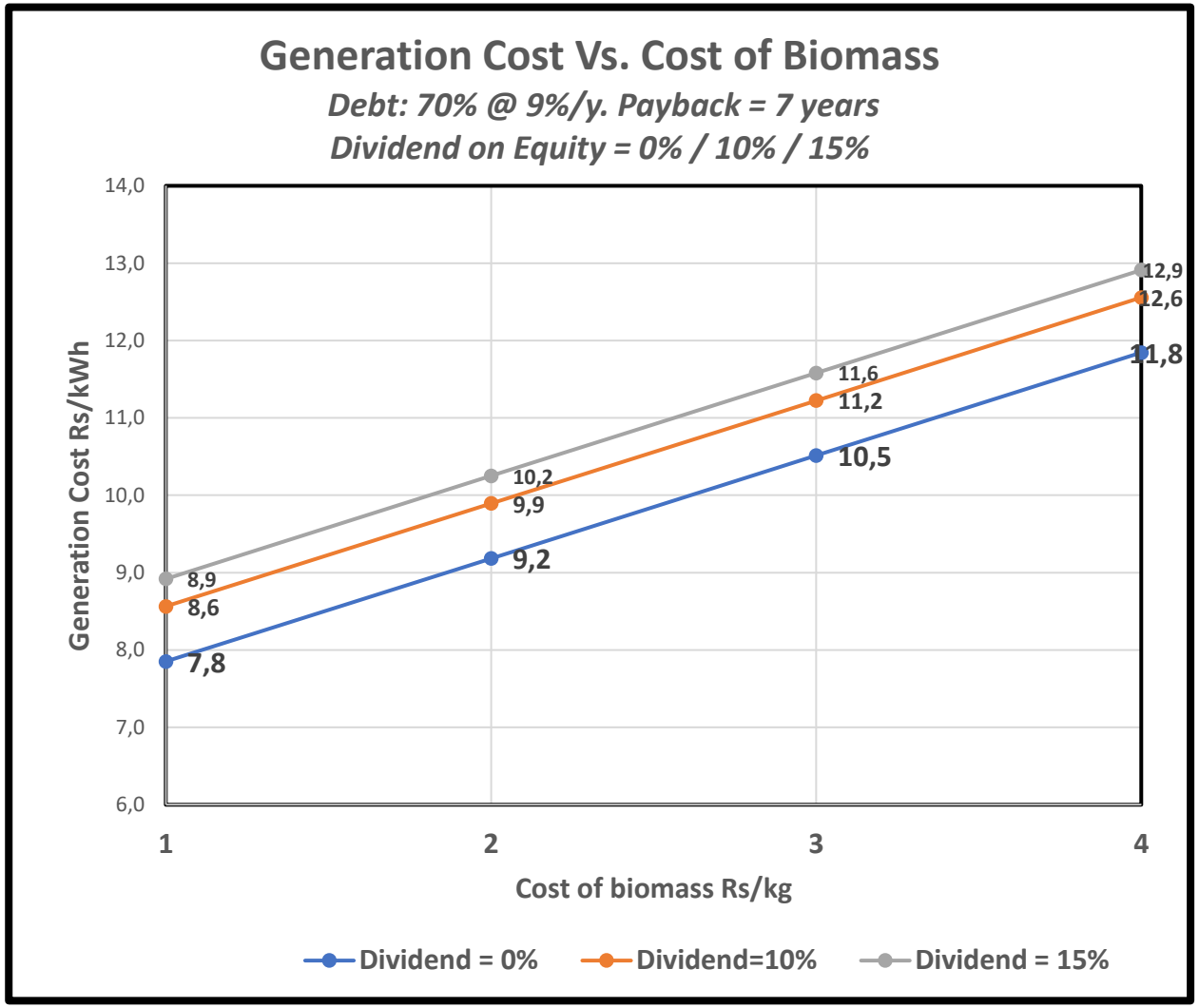
The example given below is of a non-optimised Hybrid Power Plant and a Pelletising Unit for a Clean Cooking Fuel Business.

Biomass PV Hybrid Power Plant of (65 kW + 10 kWp) rating.
Consisting of:
• **Gasifier, PG Engine and Auxiliaries**
• **PV Plant**
• **Battery Bank**
• **Auxiliary Systems**
• **Microgrid Distribution Network**
Not included:
• **Smart Control System**
Pelletising Plant Complete: 500 kg-pellets/h

Total Project Cost (used in the example here):
9.5 million Rs / 106’000 Euro

Agricultural and Plantation Residues for Sustainable Social and Economic Progress of Villagers

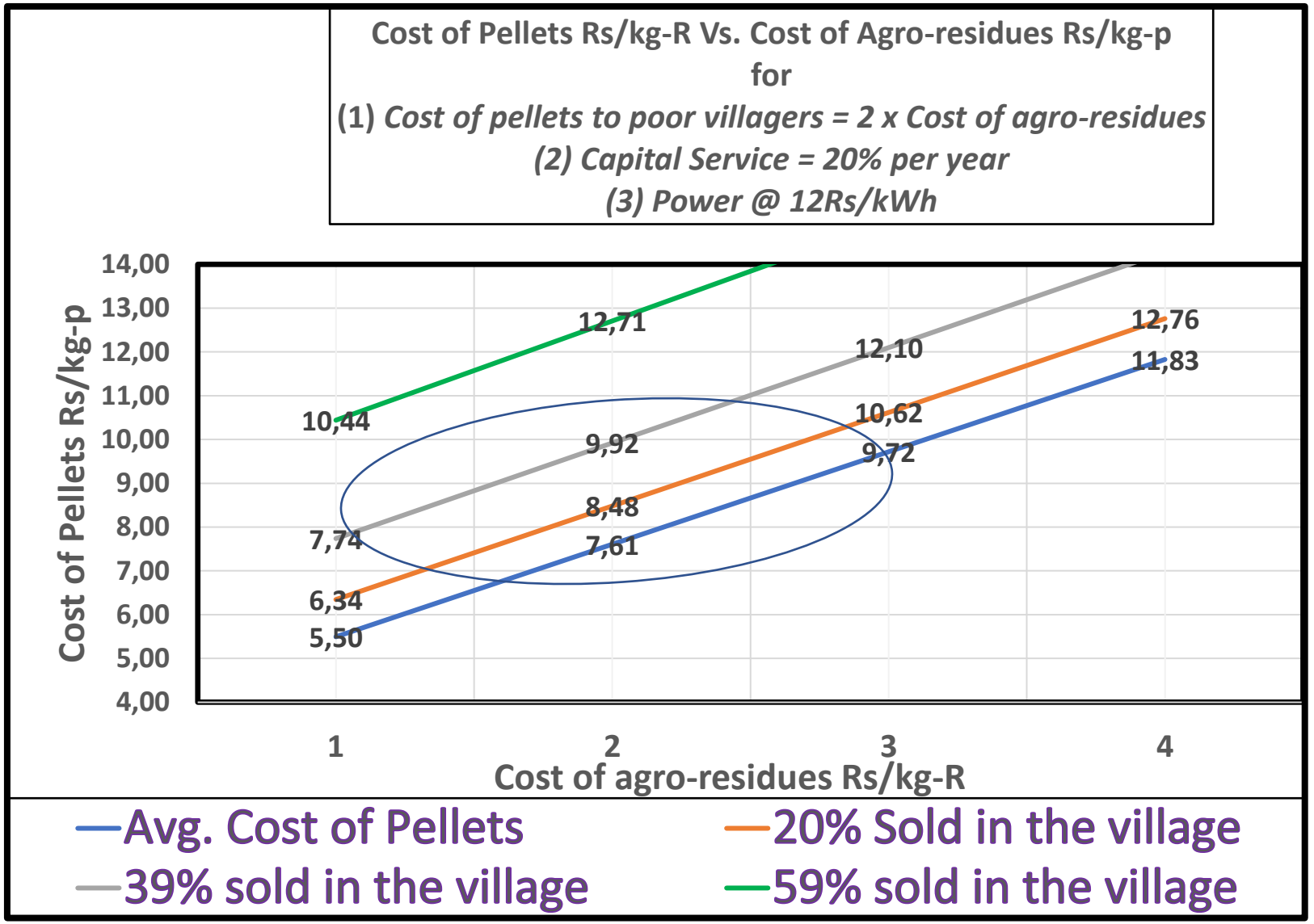
H. N. Sharan



German RETech Partnership
Recycling & Waste Management

Agricultural and Plantation Residues for Sustainable Social and Economic Progress of Villagers

H. N. Sharan



German RETech Partnership
Recycling & Waste Management

Conclusions

The most effective, profitable and sustainable way of recycling of agro-residues is their commercialisation as pellets for clean cooking.

Our studies show that:

- Adequate quantities are available for meeting the needs of most of Indian villagers.
- Pellets used with energy efficient stoves can compete locally with other source of clean cooking (induction cooking, natural gas, LPG, clean biofuels and others under an equitable policy regime.
- Integrated with local power generation and micro grids, they will eliminate pollution and smoke-linked diseases, create local jobs, provide water services for farmers and electricity for households, shops and productive usage, e-transportation and IT services.

Conclusions

The most effective, profitable and sustainable way of recycling of agro-residues is their commercialisation as pellets for clean cooking.

Our analysis shows that large-scale commercialisation will not be achieved unless:

- Integrated projects are planned and optimised for local conditions.
- Commercial-pilot projects are optimised, built and successfully operated in different regions of the country.
- The most promising locations for commercial-ilot projects are plantations and “Aspirational Villages” in agro-intensive parts of India where some of the poorest Indians live.
- Prospective owners, investors and equipment suppliers are convinced that policy frameworks, regulatory regimes and financing sources will be available for large scale commercialisation if commercial-pilot projects are successful.