Symposium Climate Protection and Regional Development

Botschaft der Bundesrepublik Deutschland
Deutsches Institut für Japanstudien
Waseda University

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Agenda

1. **Satoyama in Japan and Germany: Problems (Opportunities???)**
2. Regional value creation
3. Key Success Factors
4. Conclusion

Problems with Japanese Satoyama

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Snow isolates villages and heating costs rise

- Low childbirth, aging & declining population
- Limited scale of agriculture, low efficiency
- Declining forestry (market price, labor)
- High energy costs
- Stagnating or declining economy
- Bad investment climate
- Untapped farming and forestry resources

Bark sits unused despite it being able to fetch 40 yen + tax / kW

Wood drying has high energy and cost needs

German Satoyama Issues

- German villages had mostly the same issues: But some use this as an opportunity for change
- German villages are even smaller than in Japan
- Farmers and villages took the lead in taking advantage of the new renewable energy support laws and funds to revive village economy
- German bioenergy revolution was led by farmers and forestry people
- Business planning and economics went beyond energy production – more holistic including employment, creating and promoting related industries and education opportunities to bring young people back to the village (example Rettenbach)

Farmers, former farmers, and villagers help operate a methane fermentation plant providing community heat

Heat is also used for barn heating, chip drying, and byproducts cycled into farming as fertilizer

The farmer-led bioenergy revolution does not only depend on selling electricity, but helps initiate new business.

Avoid negative impact of current biomass usage…

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Loss / Waste

Methane	Water	Energy	CO2	Water	Energy
Greenhouse Gases (20x impact vs. CO2)	Nutrients	Carbon	Carbon Balance Issues	Nutrients	Limited Efficiency

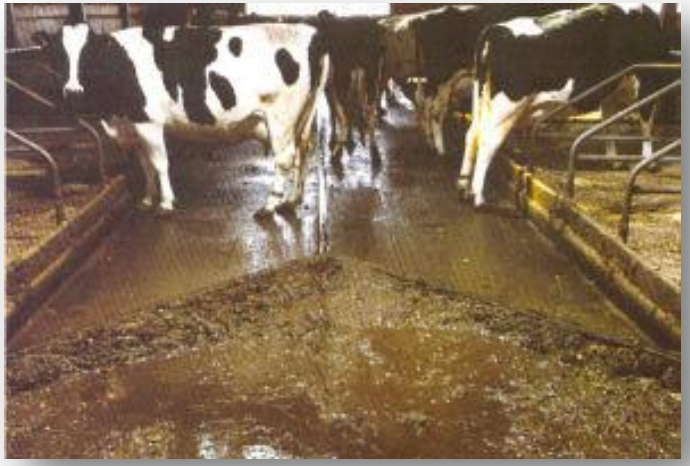
Conventional Methods

Compost

Cheap, Known

Food Waste

Manure



Organic Waste (proteins)

Conventional Methods

Combustion

Cheap, but less efficiency and added value

Forest Resources

Lignocellulose

… and use farming and forestry resources effectively

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- Gasification of Wood and BioCokes
- Biocokes from HydroThermal Carbonisation (HTC) = Reverse Photosyntesis
- Energize the BioWaste (Biotonne, Green Cut etc.)
- Biodiesel/Ethanol
- Methane fermentation
- Bioplastics

Reduction of Greenhouse gases by energy conversion of biological materials

Strategic heat use is crucial for profitability and also making real results – community heat from renewables is key.

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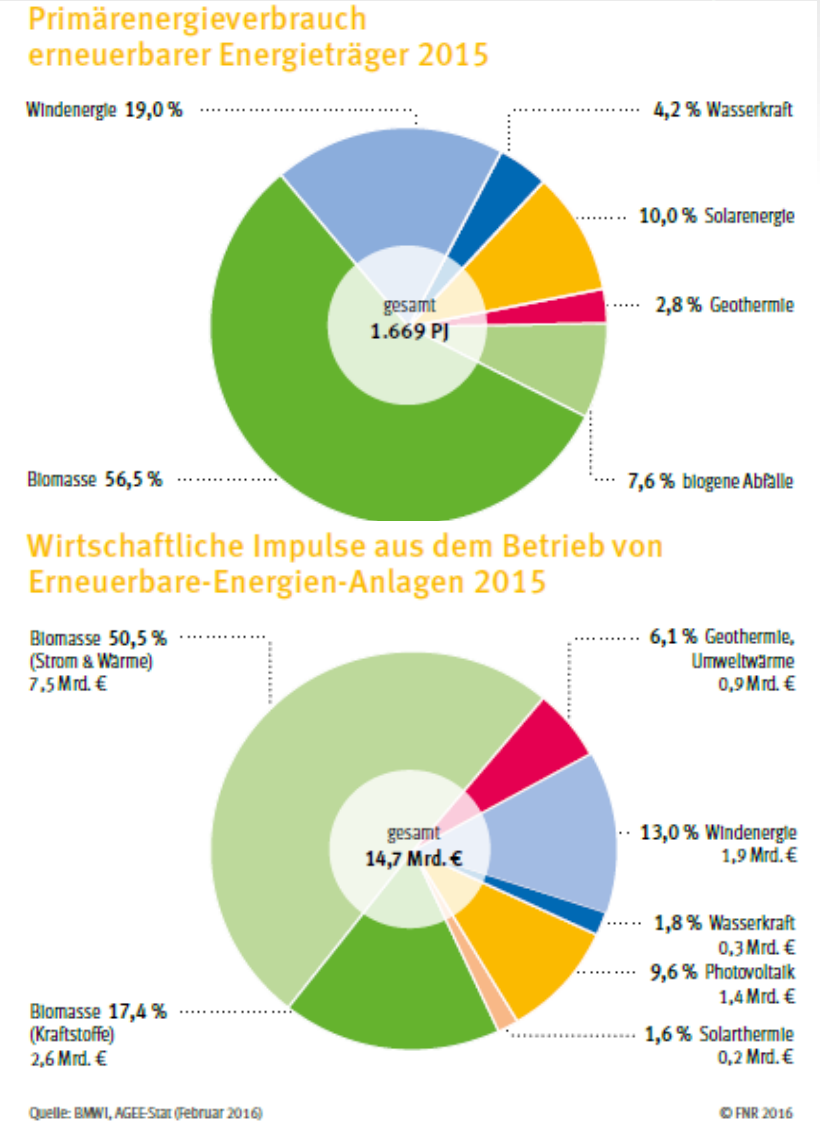
Renewable Energy Revenues – Biomass a big factor !!!

- 67% of revenues and 64% of Prime Energy Production is biomass energy

- Farmers and foresters benefit most of the energetic use of biomass resources



Biomass – Value Added, at the end cheaper than oil

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- **Value of woody materials per ton:**
  - Freshly cut wood log (long): 6.300 Yen (solid cubic meter)
  - Freshly cut wood log (short): 10.000 Yen (solid cubic meter)
  - Dried wood log (short): 14.000 Yen (stacked cubic meter)
  - Wood chips (dried): 23.000 Yen (stacked cubic meter)
  - Wood pellets: 32.000 Yen (lose cubic meter)

- 1kWh of **oil** energy costs appr. **8 Yen** and 1 KWh of **biomass energy** costs based on wood chip* **19 Yen** (full cost base) oil:wood =**1 : 2,375** times *300kg per stacked meter

- **Local value added**: Wood Chips dried vs. Freshly cut wood = 23.000 Yen – 6.300 Yen = 16.700 Yen per stacked cubic meter =**14 Yen** per kWh

- Net Cost:
  Oil 8 Yen per kWh vs. wood chips (19 Yen-14 Yen = 5 Yen)
  oil:wood = 1 : 0,55 times *300kg per stacked meter)

Based on RenEn calculation

Including local value added wood chip utilization for energy production is cheaper than oil

Growing number of BioEnergy Villages

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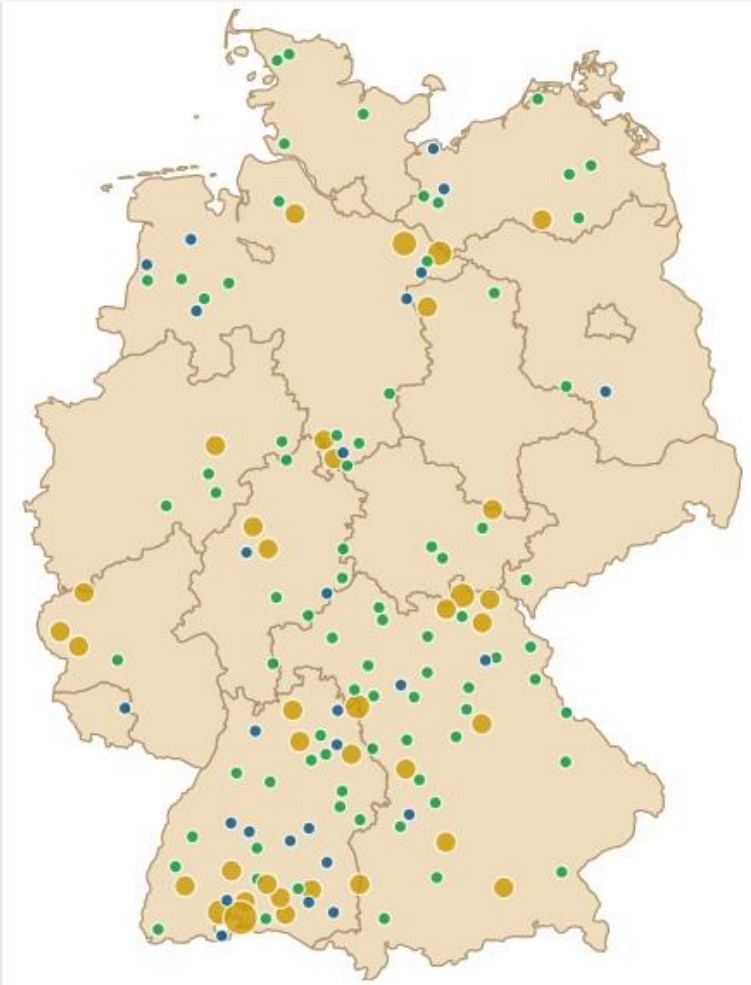
- Often produce more than 100% of their own energy need
- Are community driven
- Local Resources
- Private households take responsibilty to produce, to sell and to use energy
- Revive local pride
- Offer additional local job opportunities

185 BioEnergy Villages



Quelle: FNR 2016

St. Peter - BioEnergy Village in Black Forrest

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Bürger Energie St. Peter eG — Energieversorgung in Bürgerhand

Power Consumption: 7 Mio kWh/a
Power Production: 21 Mio kWh/a

Heat Consumption: 12.000 MWh/a
Heat Production: 9.600 MWh/a

- **Energy association has 230 members**
- **20 farmers supply biomass**
- **Own forestry used**

A mix of Renewables to produce heat and power

- Photovoltaik (1.18 Mio. kWh/a power)
- Solar Thermal (40.000 kWh/a heat)
- Hydro Power (400.000kWh/a power)
- Wind Power (18,4 Mio. kWh/a power)
- Biomass
  - Wood Chip Boiler (7.500 kWh/a heat)
  - Pellet CHP
    (2.100 MWh/a heat, 1.400 Mio. kWh/a power)

Citizens participate in Community Power

Bürger Energie St. Peter eG (eingetragene Genossenschaft)

BioMass Boiler and CHP

- Est. in 2009 by 11 citizens (e.g. forester, farmer, banker)
- 80 interested citizens, today appr. 250 members
- 220 House connection (80% of village center)
- Honorary Board, Mayor is Chairman

Wind Energy

- First Wind Energy Generators were built by a farmer (Mr. Weber)
- Other Wind Farm was built by citizen participation

Rettenbach: ‚Leadership' as Community Power

Before:

- Shrinking population
- Young people leave
- Shrinking Economy

Today:

- Increasing population, young families move to Rettenbach
- New companies (e.g. forest machinery
- Own Community Center
- New Pride in the Community

Farmer Fischer (later mayor) started solar energy and biomass

- Farmer Fischer was the first to build PV
- Others followed
- Rettenbach became many times German Champion for Solar Energy

Forestry can give rise to forestry related industry and education – an industry that one can take pride in.

Triesdorf/Merkendorf: Village and Farming School towards energy autonomy

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BioMass Energy for Heat Production Near Heating Network for University of Agriculture (Triesdorf)

BioMass Energy for Power Production (Merkendorf)

2011	PV-Anlagen		Biomasse		Wasserkraft		Windkraft		Strom	Deckungsgrad Strom
	Anzahl	[kWh]	Anzahl	[kWh]	Anzahl	[kWh]	Anzahl	[kWh]	Summe [kWh]	Prozent
Mittleschenbach	121	1.864.110							1.864.110	43
Wolframs-Eschenbach	212	9.730.959	5	13.556.637			3	1.881.818	25.169.614	262
Weidenbach	132	1.944.403	3	2.213.947					4.158.350	61
Ornbau	97	1.150.808	2	4.432.068	1	21.768			5.604.644	125
Merkendorf	295	5.966.148	9	26.578.690	1	9.819			32.554.657	247
AMR (gesamt)	857	20.656.428	19	46.781.542			3	1.881.818	69.351.375	180

Distributed sources and aggregated management: Realizing a Carbon Cycle

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Agricultural Waste

Manure, methane sludge

Forestry, Wood Mills, etc.

Bark, branches, etc.

Decentralized Sewerage

Sewerage sludge

Efficiently making use of what was once discarded

Utilization of Wet Organic Feedstock

Fermentation Gas

Waste Sludge

HTC Reactor

Biocokes

Gasification

Fuel

Gas engine, CHP

Biogas Trains

Biogas Bus, etc.

Heat & Electricity

Energy for Local Industry

Heat and Electricity to the local community & Employment and Innovation

Wood Chips, Pellets

Thermal Power

Boiler

Realizing the Resource Cycle with HTC: Biocokes for Fuel and Process Water

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HTC-produced Biocokes

"Unwanted" Feedstock to high-calorie Fuel

2600~6000kCal / 15-30MJ achievable**

Water content 15% after production steps

Brown coal-like consistency and can be used as feedstock inwood gasifying systems**

Adjust mix to make water content between **50-70%**

Organic Resources Available in the Community

Rice husks and other agricultural waste

Sewerage and fermentation sludge

Manure

Wood Bark

Roots, Branches, etc.

（D・E wood also 40¥/kWh）

Process water purposed for hydroculture or liquid fertilizers

*Chicken manure, wood can increase revenue and calories

**Tested with GRENOL and AHT gasifiers

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3. **Key Success Factors**
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Key to Success

- Existing of unused biomass resources
- Strong will and leadership of individuals
- Support from local government and councils
- Identification of and collaboration with diverse stakeholders (local government, forestry and farming individ., non-profits, etc.)
- Local development aid and funds
- Effective heat production and use, including options for heat exchange (providing cooling)
- Joint planning with and employment of young people from in and outside the region

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Conclusion:
BioEnergy is a great contributor to regional development

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It is:

- Sustainable (nearly unlimited)
- Economical (new income, labour, investment)
- Social (community based, collaborative)
- Democratic (decentral)

It provides a great opportunity to support and revive economic (re-)development of rural areas

➡ **Rural Economies can lead the energy revolution (!!!)**

Food Waste

Carbon Negative Farming

Biochar & Biocoal

Soil Nutrient Circulation

技術に関するお問い合わせやお見積もり依頼など、お気軽にご連絡下さい

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地域発、循環型バイオ経済の未来へ

Rural Leadership towrads a Circular BioEconomy

Gasification

Rural Industry Revitalization

From Linear, Recycling, to a Circular Economy

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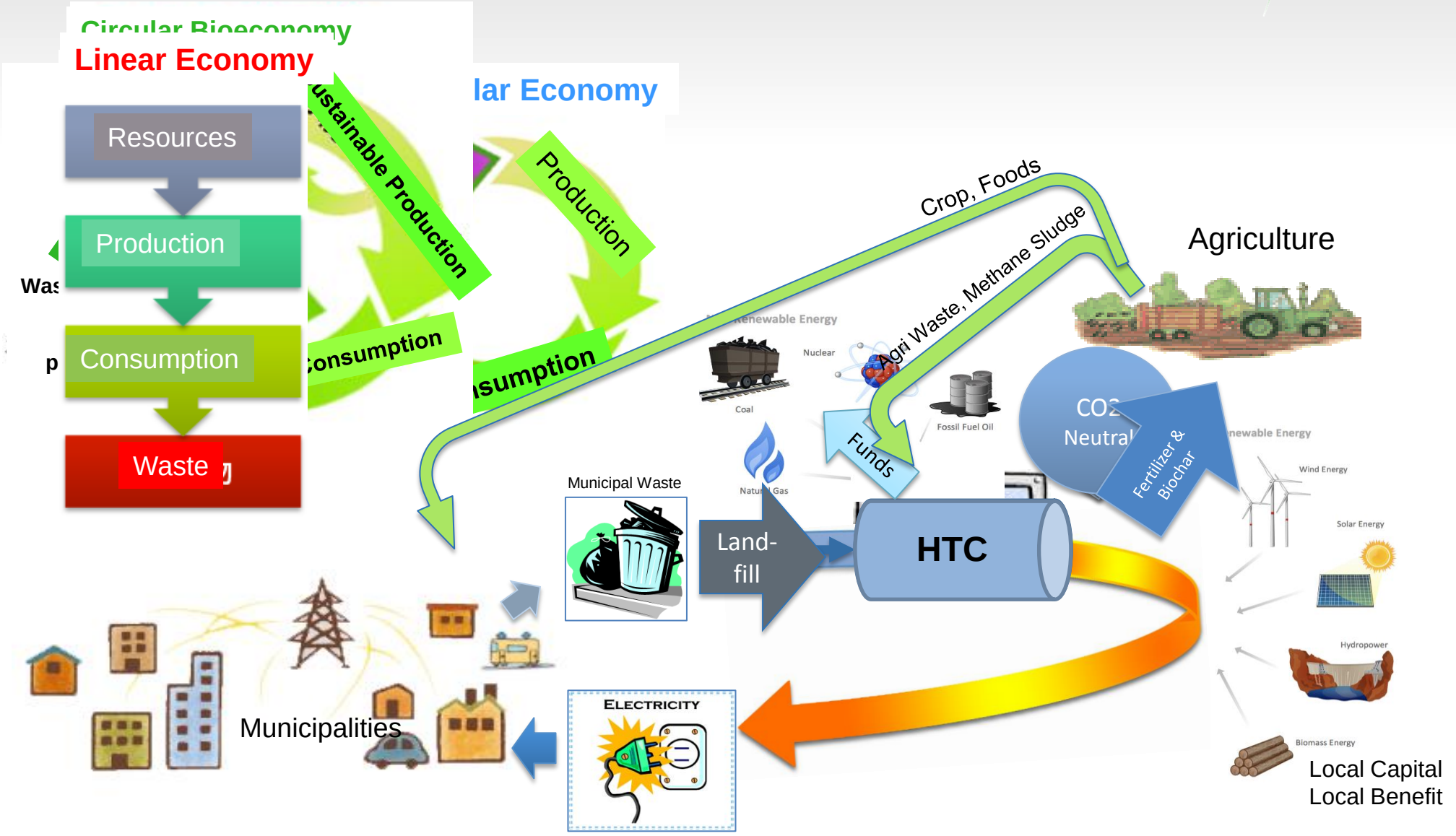


Potential Biomass (Wood): Win-Win for Environmental and Social Infrastructure

Source: MAFF White Paper 2010

Typical Japanese Mountain with Forest

A Comparison:

Germany
32% forested
growing stock: 3.4 bill. m³

Japan
> 60% forested
growing stock: 6 bill. m³

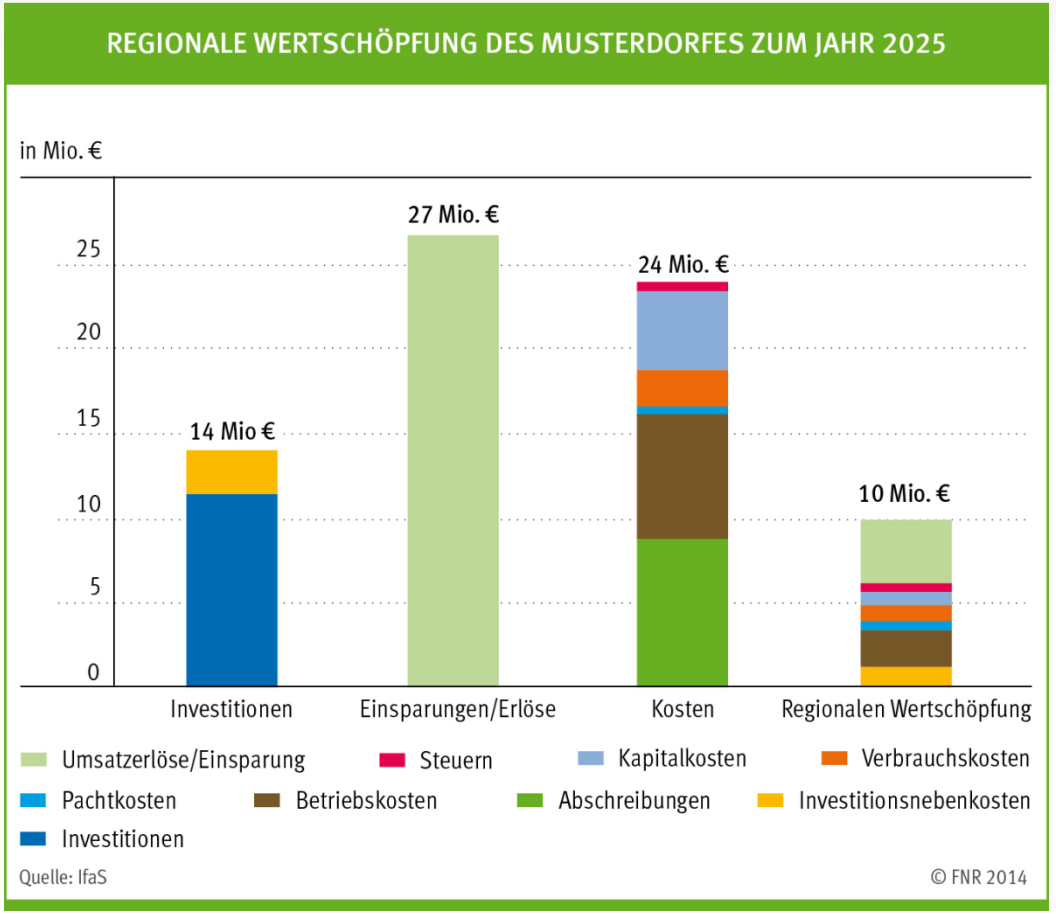
But:

- Forestry has been neglected for 50 years in Japan
- Low use of Biomass Energy

Forestry and Biomass Energy creates great benefits

Environ-ment	• Need to develop the Forest Sector (aging forests)
Employ-ment	• Great Job Opportunities
GDP	• Strengthen Rural Infrastructure and Economy

BioEnergy Village – A model case of Federal Ministry of Food and Agriculture (20 years)



- Village with 450 people
- 150 houses
- 450 MWh power consumption
- 4,5 Mio kWh heat consumption
  - Investment of 14 Mio. Euro
  - Savings/Income 27 Mio. Euro
  - Additional cost 10 Mio. Euro
  - Regional Value Added 10. Mio euro

Conclusion

- Limitation of bioenergy is not feedstock or cost
- The true limitation is when the potential of local biomass resources do not match project design and objectives
- Scale of project key to sustainability
- Sustainable projects can circulate resources and matches the potential and needs of local communities such as employment and energy needs
- Key to success is understanding local needs and holistic planning by identifying all potentials and chances (including non-energy)
- Now time also to look into innovation and new technology to spur change and economic activity