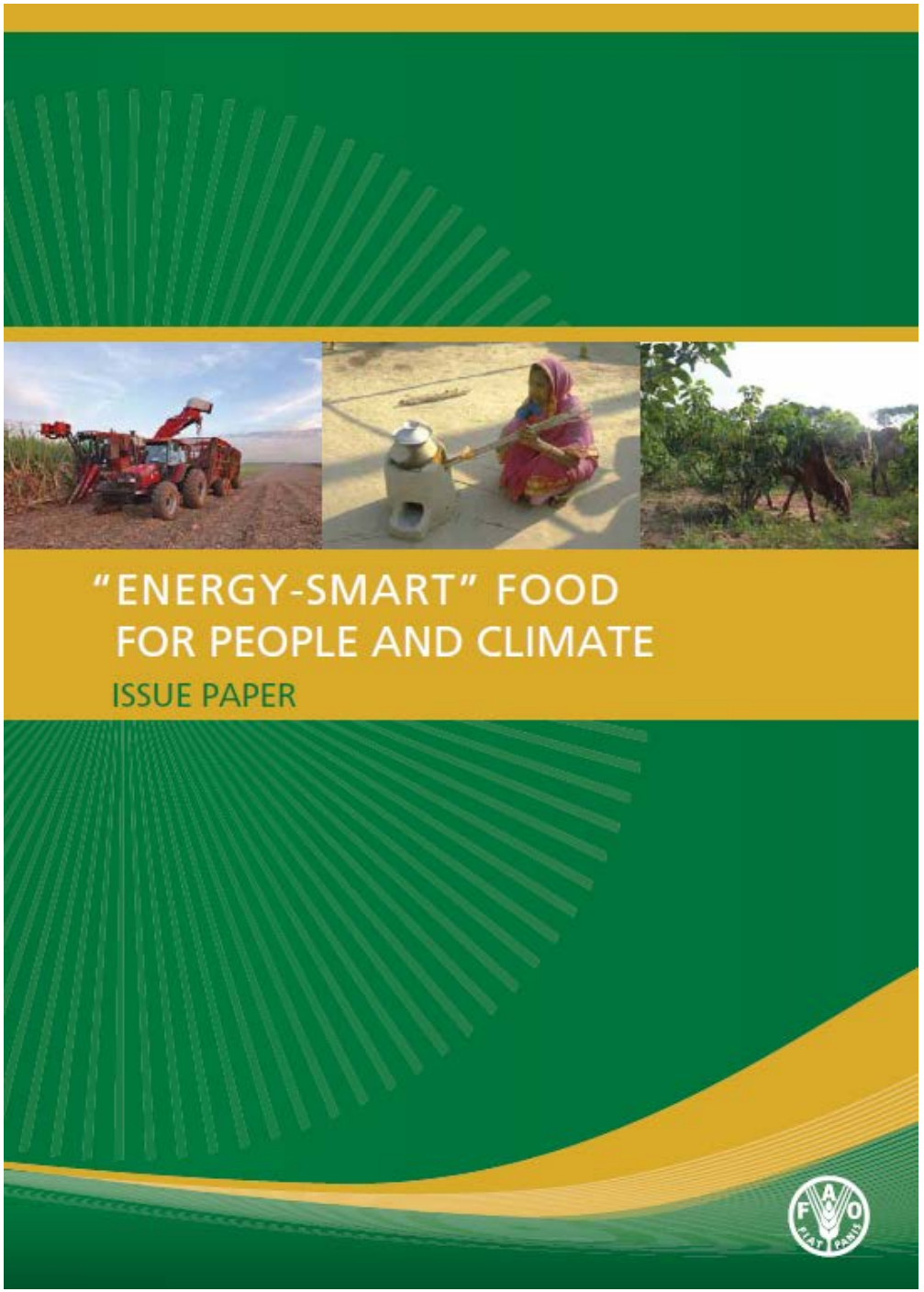
EMAN410 Seminar Series
Otago University, 17 August, 2012

Energy-smart food policies for NZ - a world leader or a world laggard?

*E*nergy and agri-food systems = *M*eals x *C*limate *C*hange

Professor Ralph Sims,
Massey University
R.E.Sims@massey.ac.nz



Issue paper at

http://www.fao.org/docrep/014/i2454e/i2454e00.pdf

Policy brief: "The Case for Energy Smart Food Systems" at

http://www.fao.org/docrep/014/i2456e/i2456e00.pdf

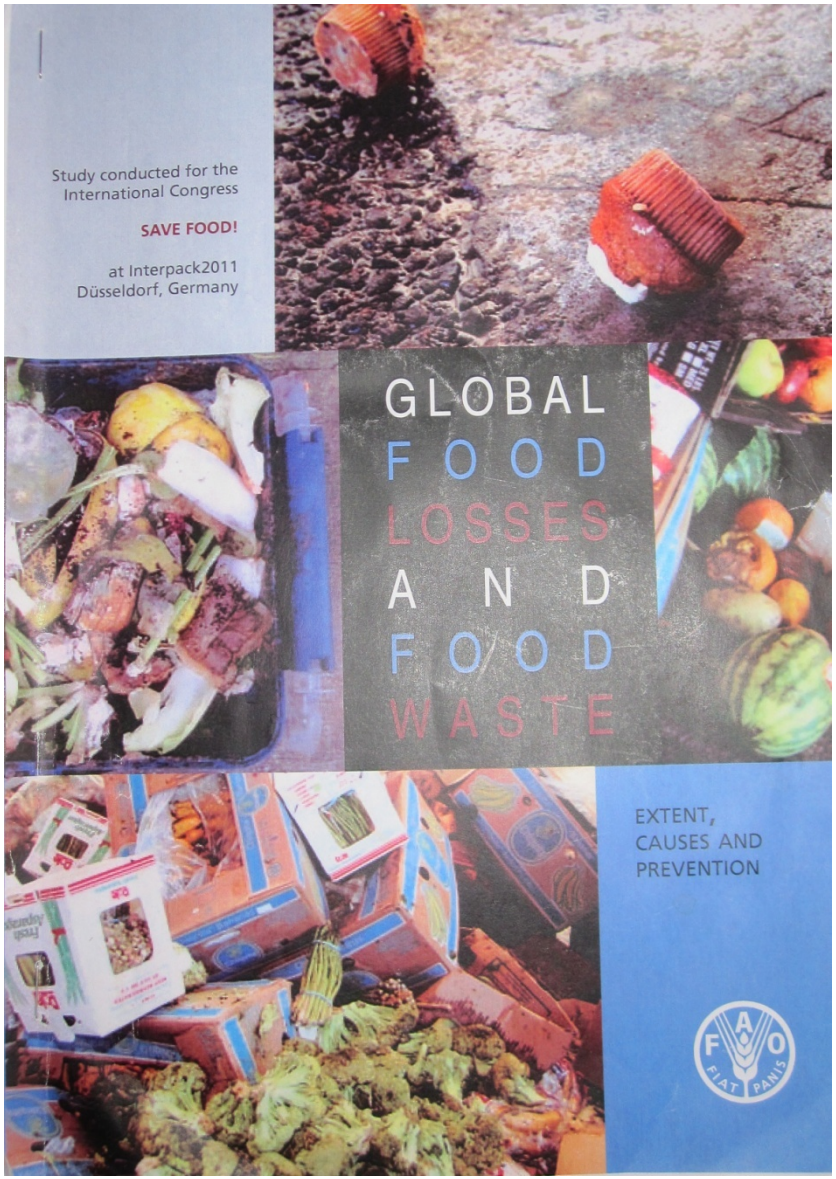
What is the FOOD-ENERGY problem?

- The global agri-food supply chain (from "paddock-to-plate") is heavily dependent on fossil fuel inputs – both direct and indirect.
- The post-war Green Revolution for OECD countries was largely based upon abundant supplies of cheap energy.
- Current concerns are mounting over oil/gas/coal reserves and related greenhouse gas emissions.
- Modernizing food systems in developing countries today simply by increasing fossil fuel inputs may no longer be feasible.
- Reducing fossil fuel inputs could be an option to improve food supply systems and food and water security in all countries.

Why is the problem complex?

- All agri-food systems depend upon energy inputs regardless of scale.
- Scales of an agri-food system range from
  - subsistence farmers growing food or fishing for their own consumption,
  - family units supplying local markets,
  - small businesses employing a few staff,
  - large corporate companies supplying huge supermarket chains across the world.
- They each have different energy use priorities, but both low- and high-energy systems can also use renewable energy.

Global food losses and food waste



We fail to consume around one third of all food produced.

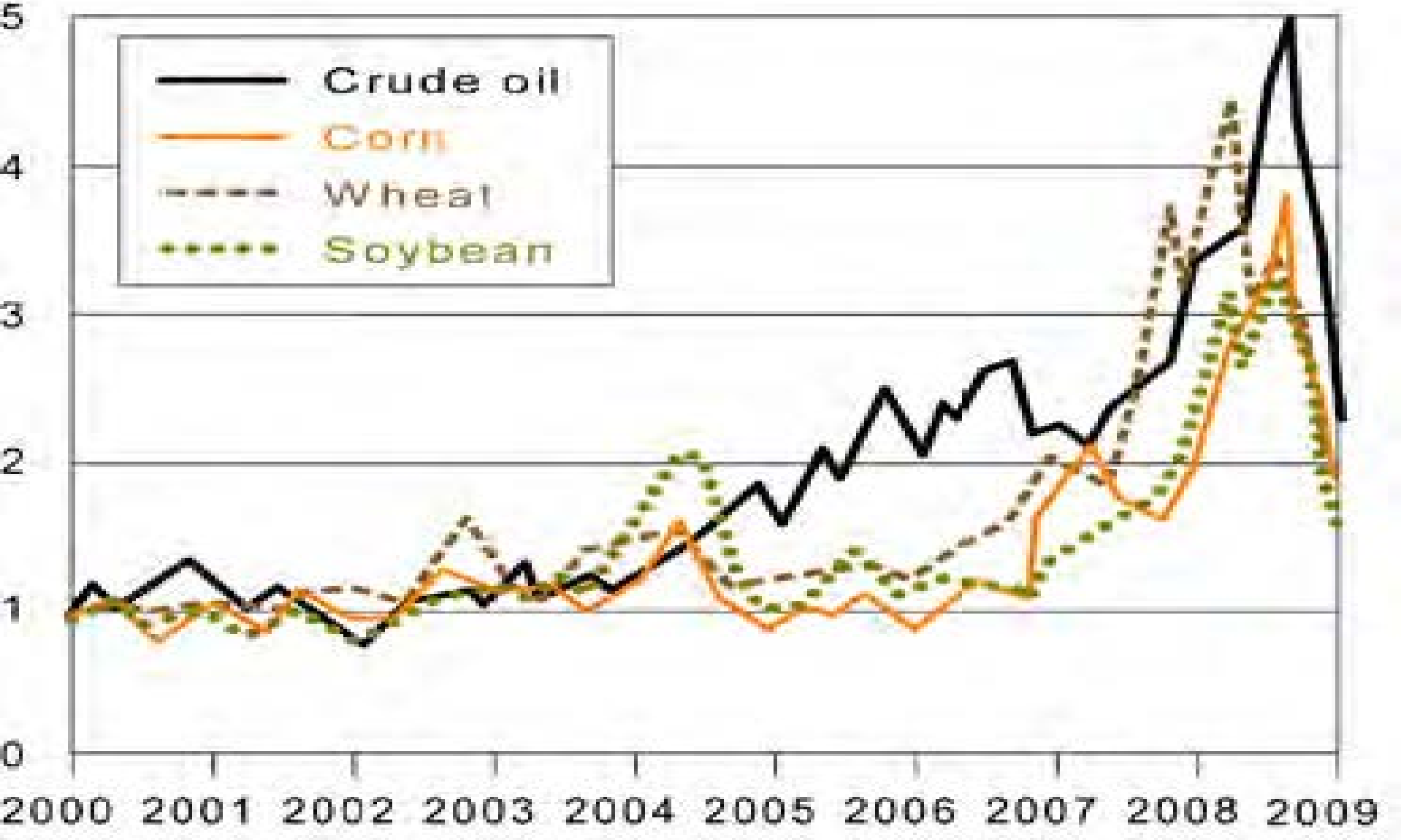
This wastes scarce land, water and energy resources.


BEST BEFORE PL1
03 DEC 11 09:53
NOT SUITABLE AS A COMPLETE MILK FOOD FOR CHILDREN UNDER THE AGE OF 2 YEARS
pams®
fresh
NATIONAL HEART FOUNDATION APPROVED
CERT TM
slim
reduced fat 1.5% milk* 1 litre
*55% lower fat content than Pams standard milk
Nutrition Information
Servings per pack: 10
Serving size: 100mL
Avg. Quantity per 100mL
Energy 203kJ
Protein 3.6g
Fat, total 1.5g
- saturated 1.0g
Carbohydrate 5.1g
- sugars 5.1g
Sodium 41mg
Calcium 128mg (*16%)
*RDI: Recommended Dietary Intake
Ingredients:
Pasteurised reduced fat milk.
Man. No: 1309
FOB0846 / 0211
9 415077 068517
If you're not happy with our product please let us know. Write to us @ Customer Services, Pams Products Ltd, P.O. Box 27-480, Mt Roskill, Auckland 1440 or free-call us on 0800 245 114.
www.pams.co.nz Marketed by: Pams Products Ltd, 60 Roma Rd, Mt Roskill, Auckland 1041. ® Registered Trademark.
CERT TM used under licence. Refrigerate at or below 4°C. Product of New Zealand

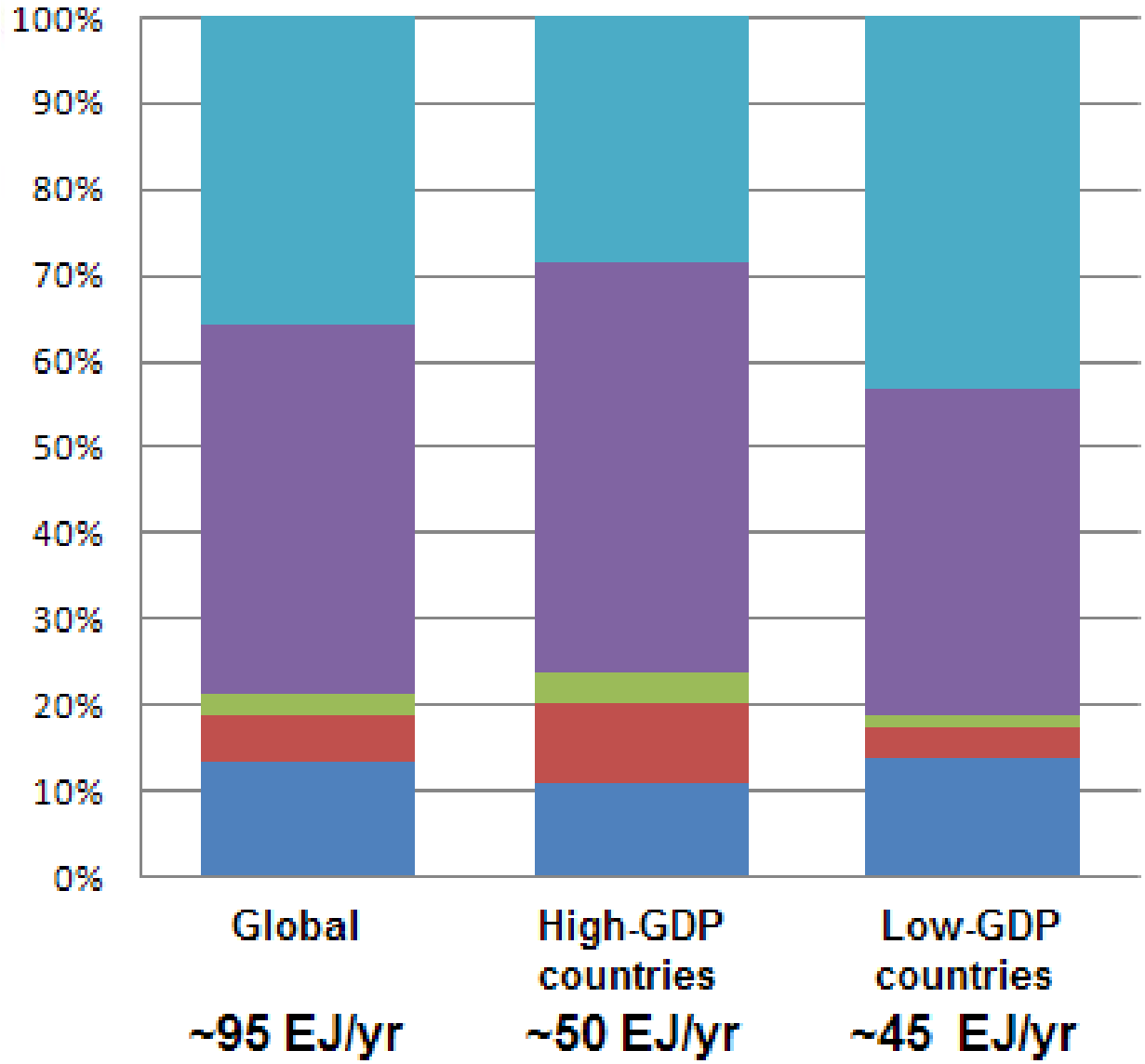

HAM
HCUR
570kg
Cook No15027
STORAGE INSTRUCTIONS
during the heating.


Attractions
Diet?
Healthy food?
Obesity?

Food prices have recently become strongly linked with oil/gas prices.



Shares of energy in Agri-food supply chain



NOTE: Data taken from literature is uncertain – so graphs are only indicative.

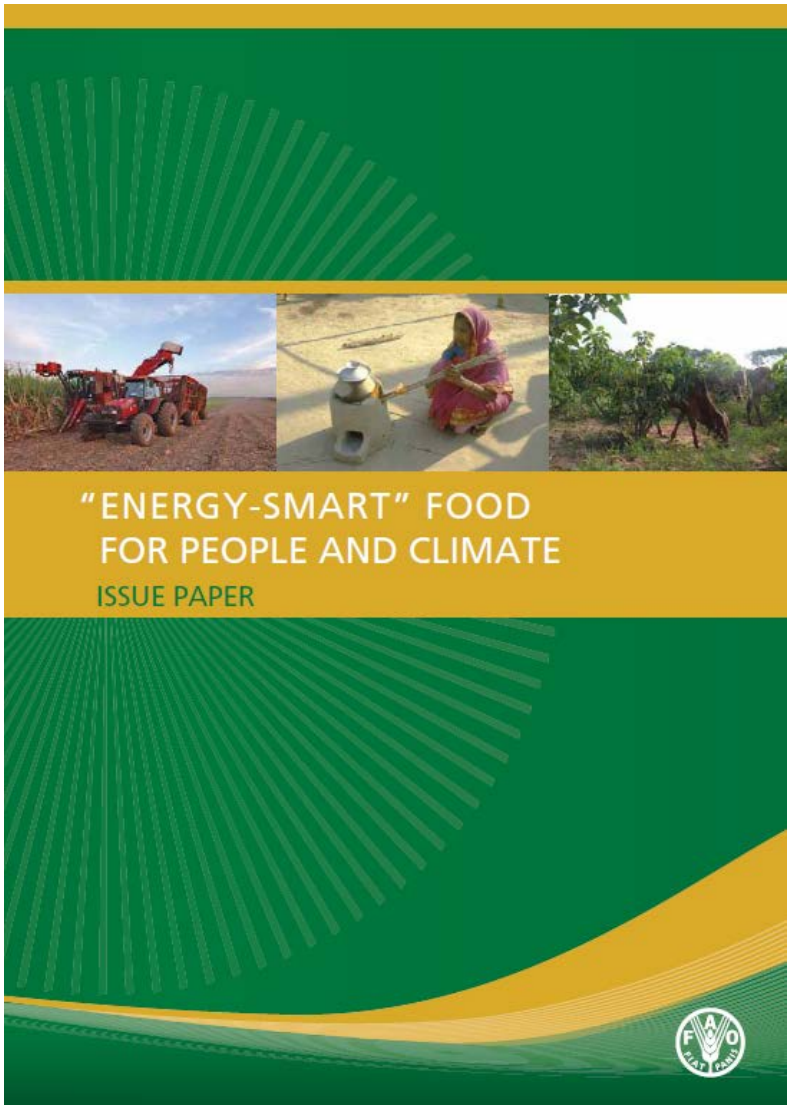
High-GDP countries ~ 35 GJ/capita/yr.

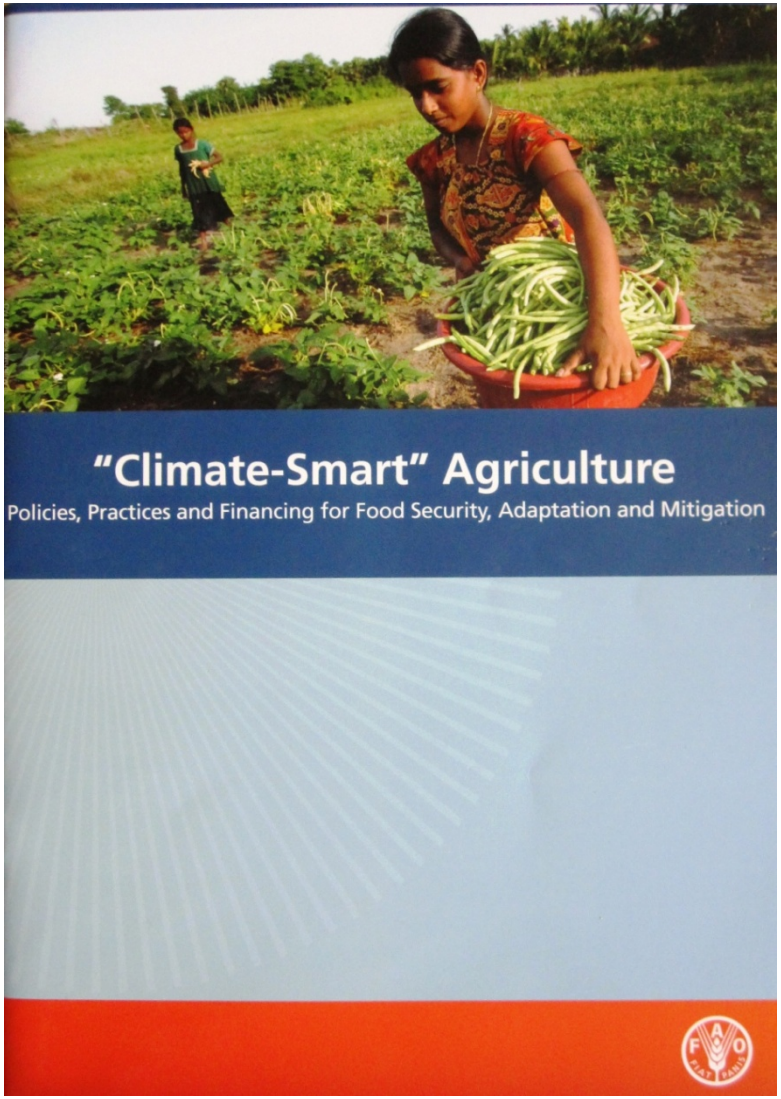
Low-GDP countries ~ 8 GJ/capita/yr.

Around 32% of the total global end-use energy demand of ~300 EJ/yr is used for providing food.

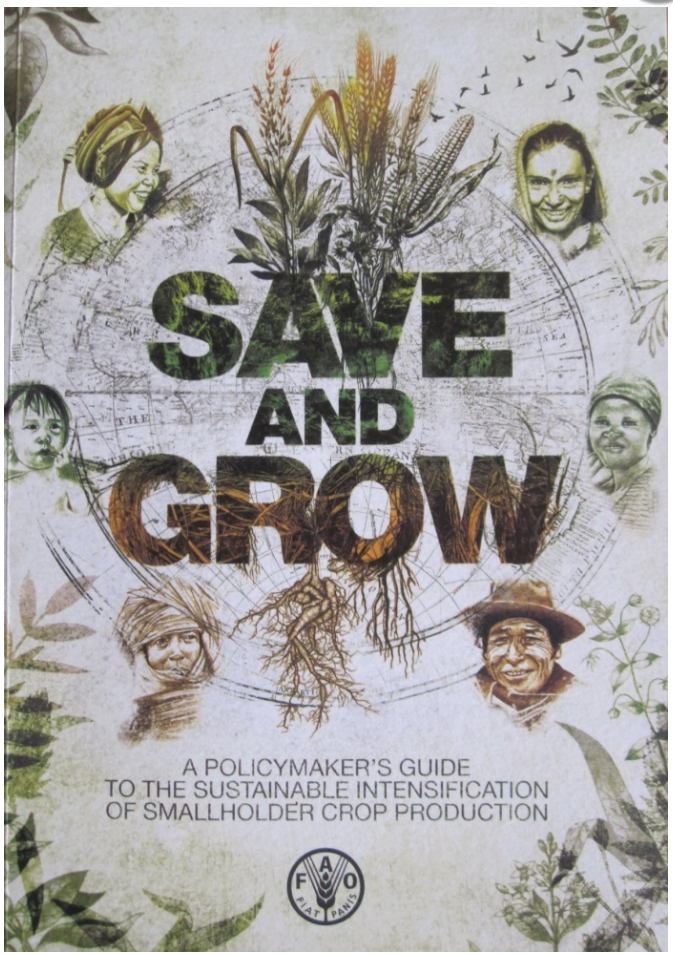
What is the solution?

"Energy-Smart is Climate-Smart"





Making the agri-food supply chain Energy-Smart and Climate-Smart is part of a larger paradigm shift to "*do more with less*" being promoted by FAO and partners as "Save-and-Grow"



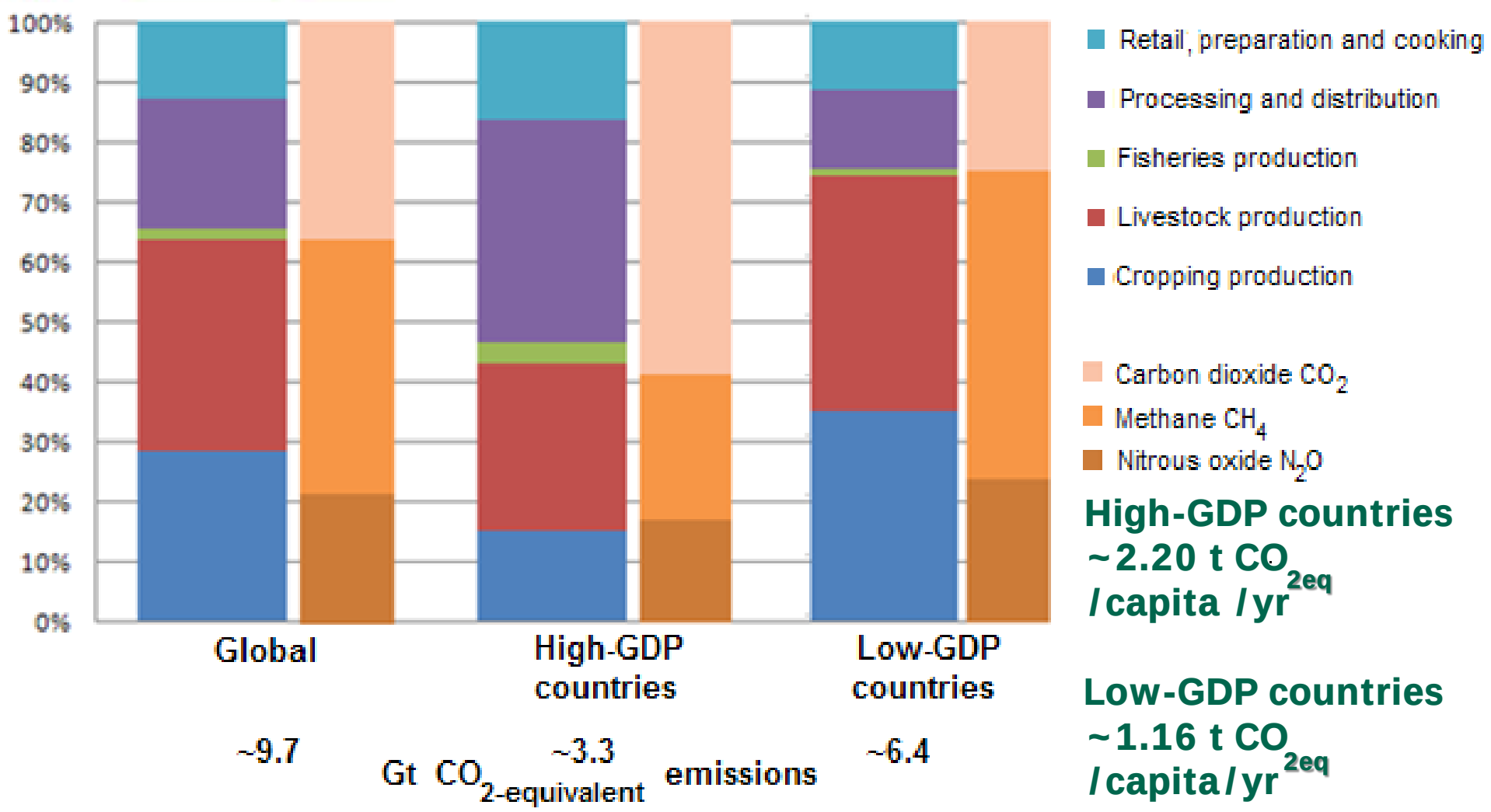
"Making agriculture more productive and resilient will demand better management of our natural resources – land, soil, water and energy."

Energy-Smart food:

- Ensures energy inputs, from whatever sources, are used more efficiently than at present along the entire agri-food supply chain.
- Reduces the energy intensity (MJ / kg of food product) of both direct and indirect energy inputs.
- Captures the renewable energy sources available and uses them to displace fossil fuels.
- Improves access to modern energy services for energy-poor subsistence farmers and fishers to provide increased food supply and security.
- Simultaneously enhances food security, sustainable development, climate change mitigation, and resilience and adaptation by reducing GHGs.

Shares of greenhouse gas emissions

Around 22% of total global GHG emissions (~45 Gt $CO_{2\text{-equiv}}$ /yr) arise from the agri-food chain.



High-GDP countries ~2.20 t CO_{2eq} /capita /yr

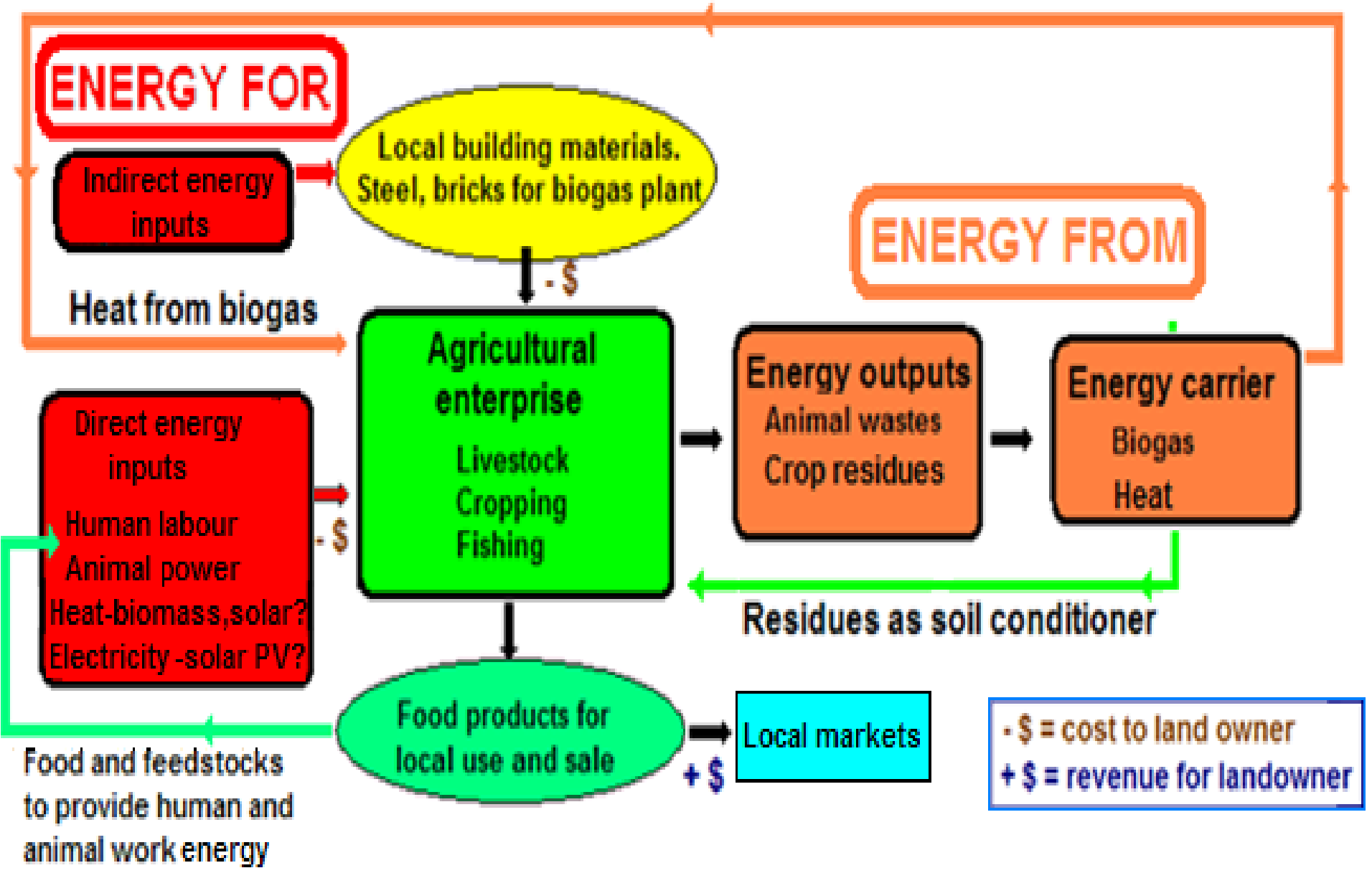
Low-GDP countries ~1.16 t CO_{2eq} /capita/yr

A *low input* agri-food / energy system


50

Solar cooking

A *low input* agri-food / energy system

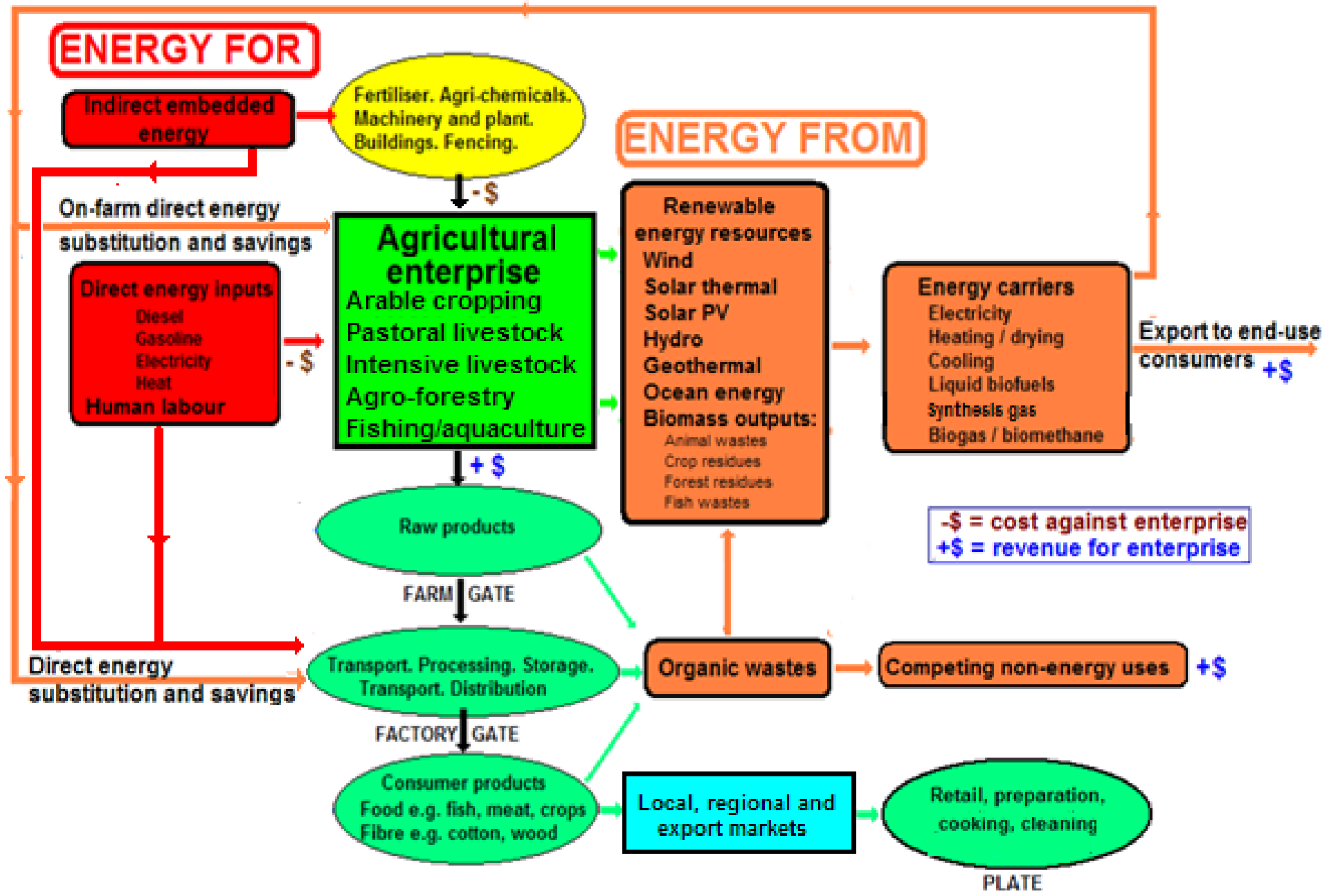


A *low input* agri-food / energy system

A *high input* agri-food energy system

Community-scale biogas plant

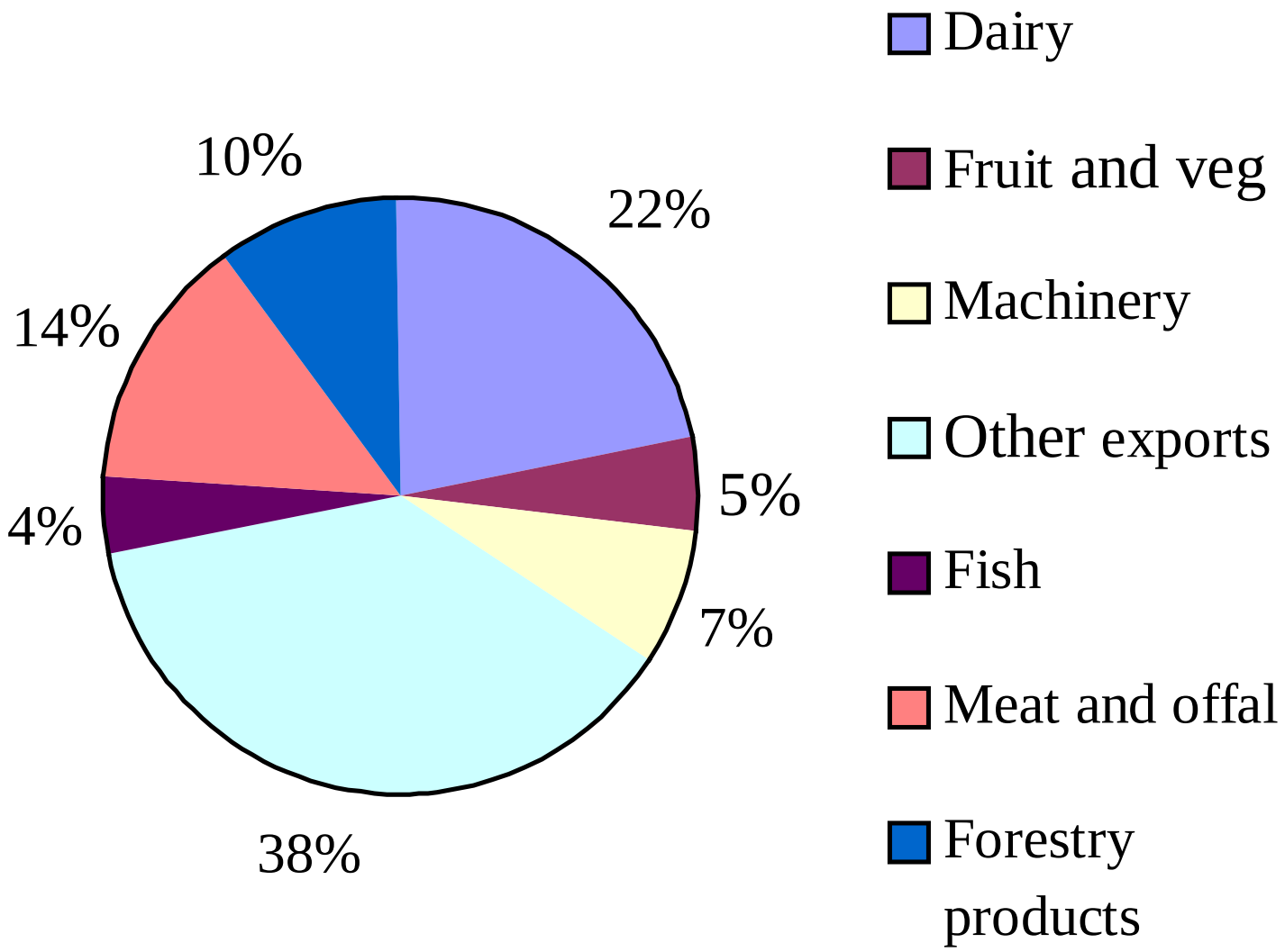
A *high input* agri-food / energy system



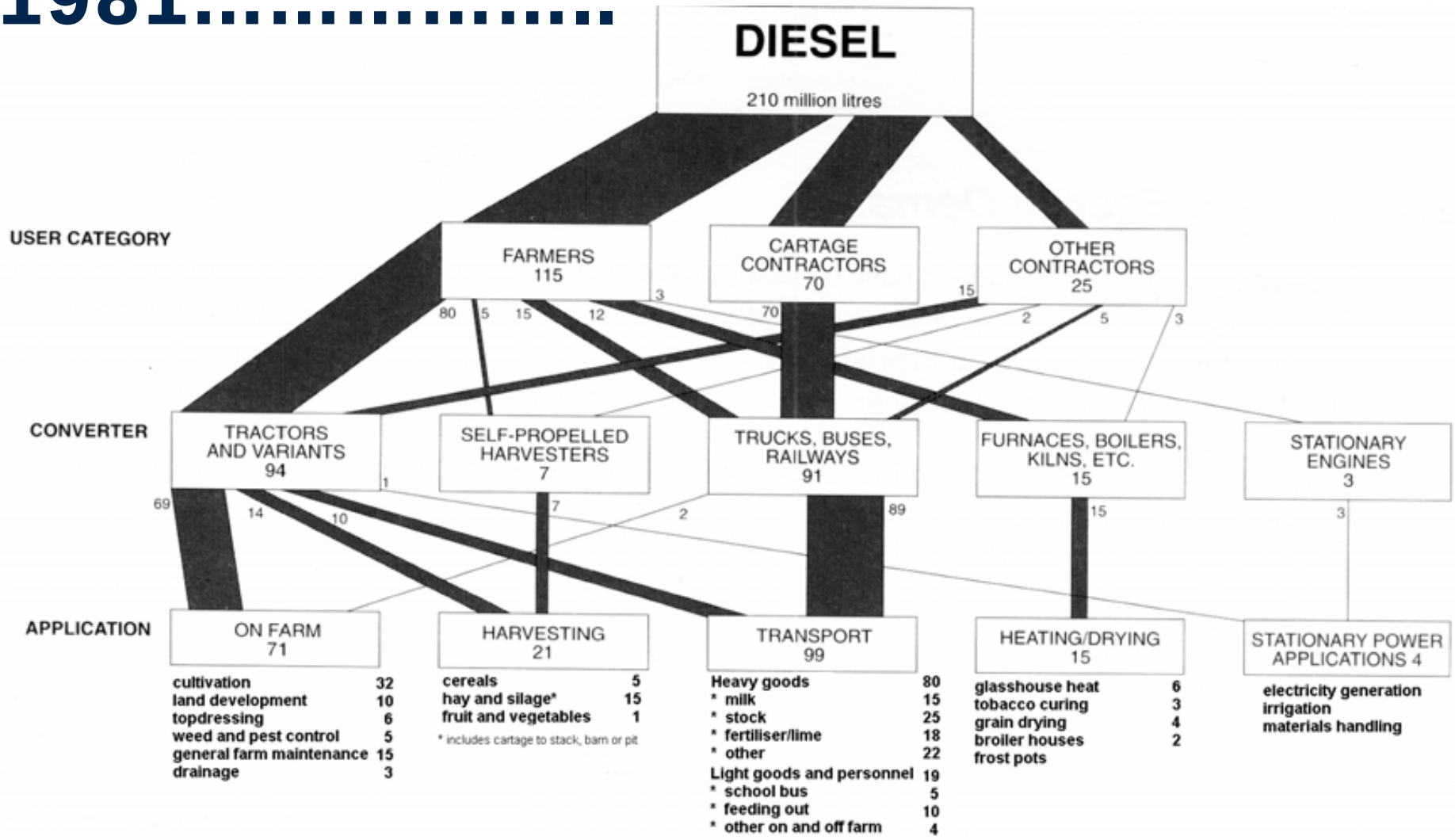
Energy efficiency opportunities are widespread throughout the agri-food supply chain


Energy efficiency opportunities are widespread throughout the agri-food supply chain

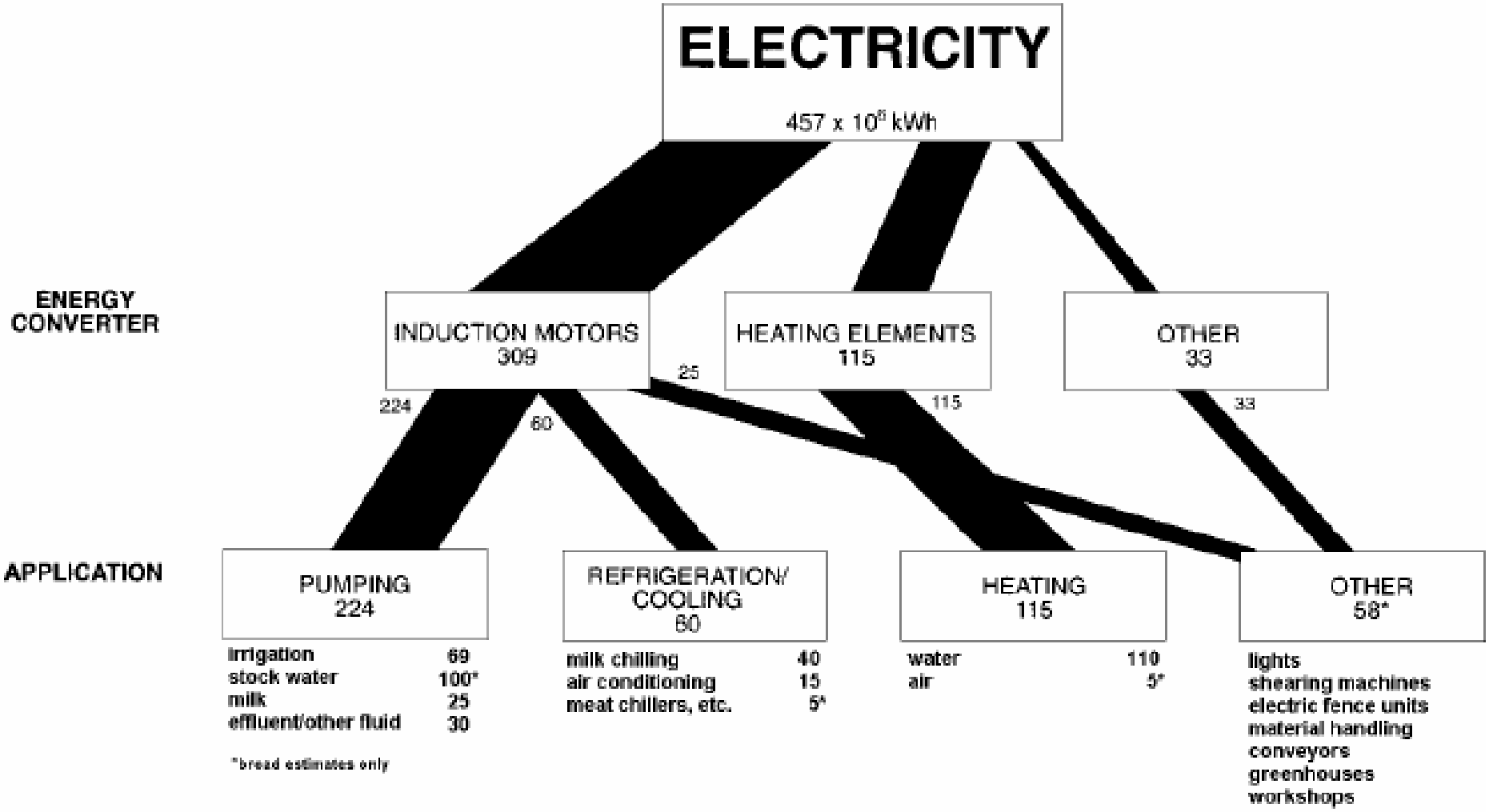
Indicative shares of NZ export earnings

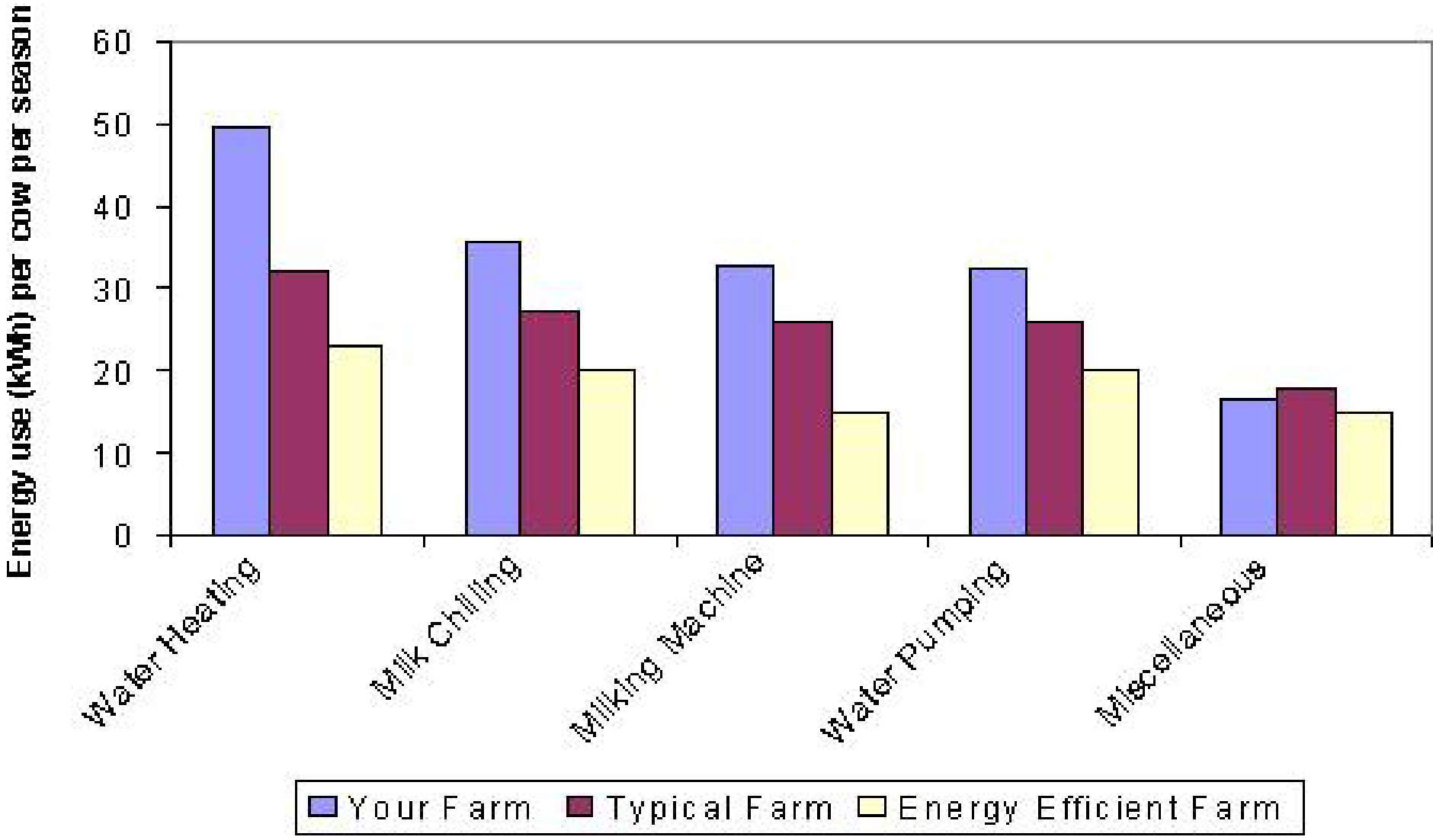


On-farm and farm transport annual total diesel demand in New Zealand, 1981……



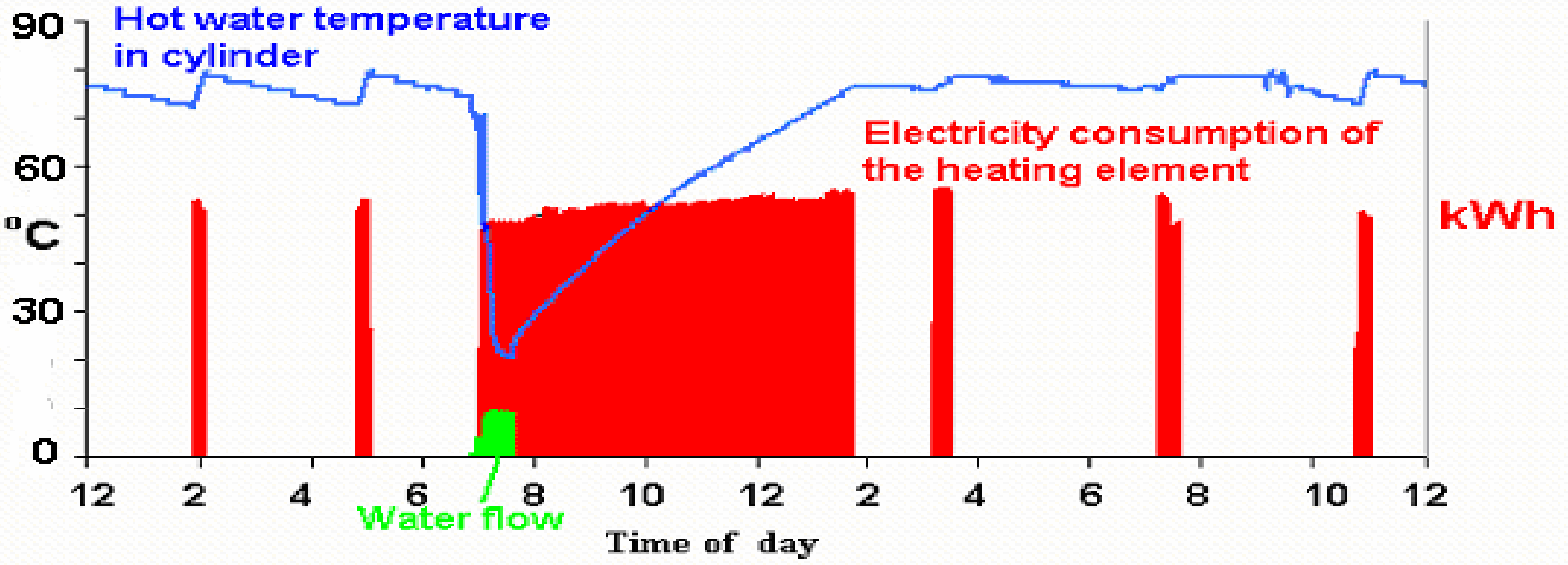
On-farm annual total electricity demand in New Zealand





Example of output from the Meridian Energy dairy farm energy analysis programme.

Manage hot water systems



Dairy Farm A. New 310 litre tank. Well insulated.

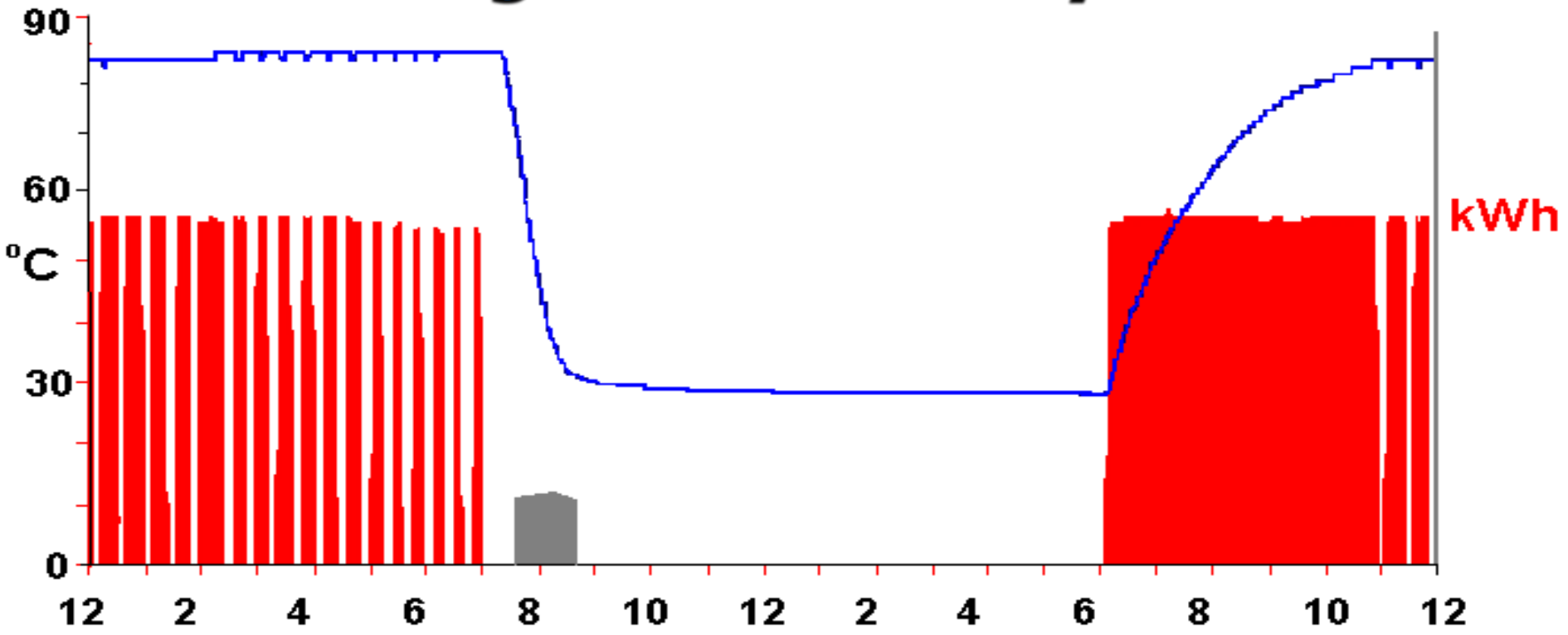
Hot water wash at 7am. Reheat to 78°C

. Uses 20.5 kWh to heat the water.

4.8 kWh to keep it hot during the day.

Total: 25.3 kWh/day.

Manage hot water systems



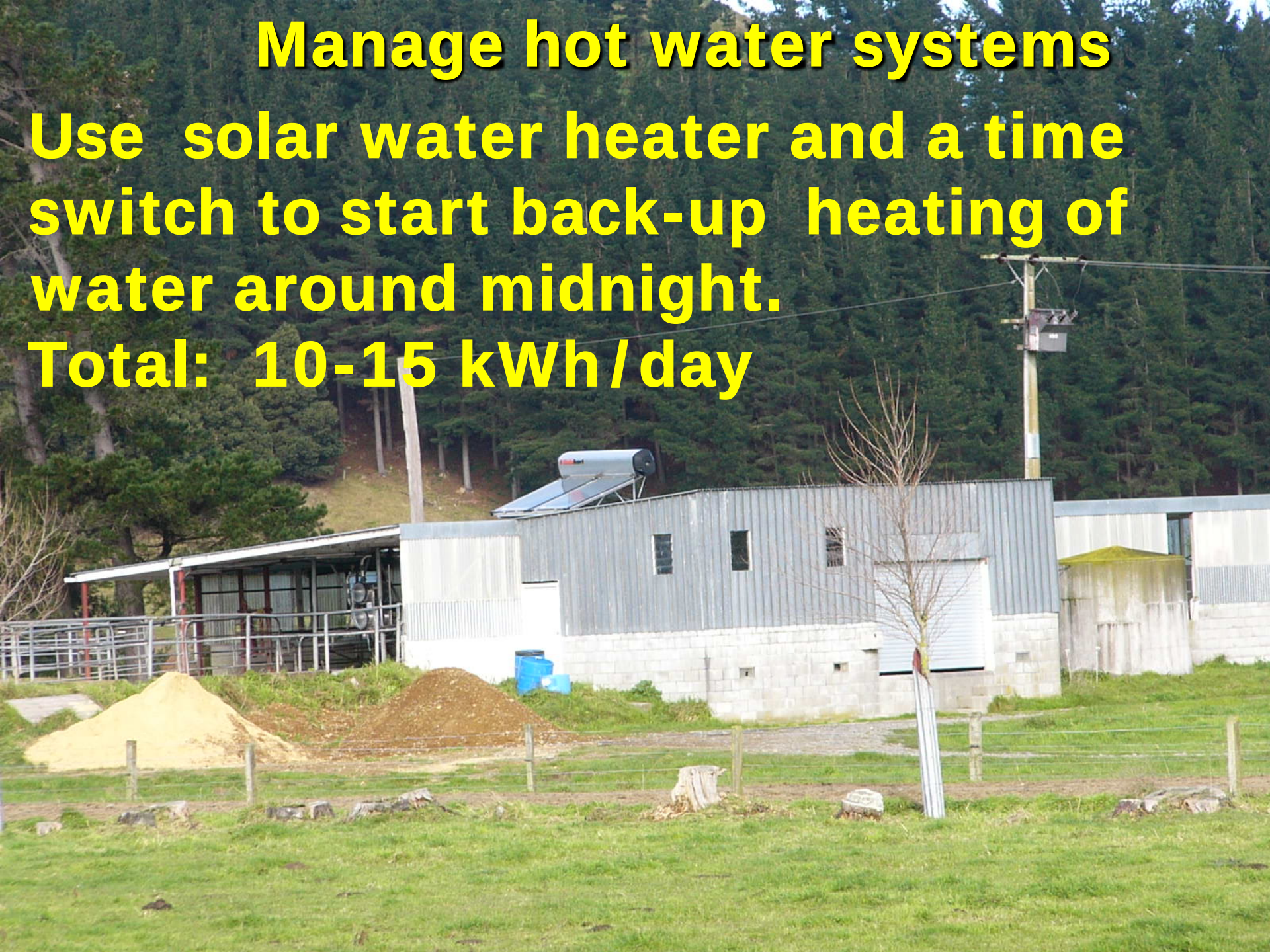
Dairy Farm B. Old 240 litre tank. Poorly insulated.

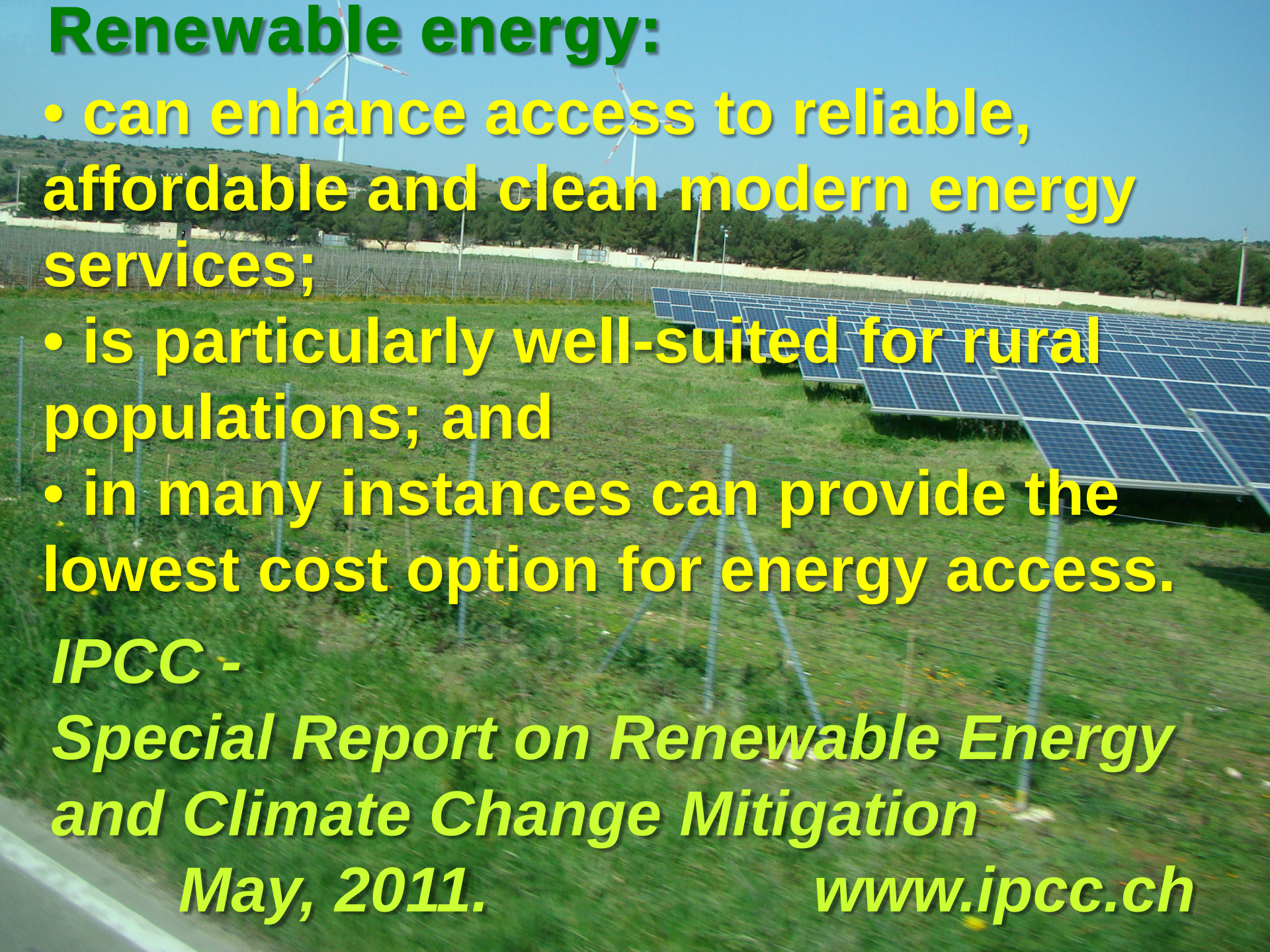
Hot wash at 7am. Heater turned off till 6pm.

Uses 16.2 kWh to reheat water to 82°C.

12.7 kWh to keep the water hot overnight.

Total: 28.9 kWh / day.


Manage hot water systems
Use solar water heater and a time switch to start back-up heating of water around midnight.
Total: 10-15 kWh/day



Renewable energy:

- can enhance access to reliable, affordable and clean modern energy services;
- is particularly well-suited for rural populations; and
- in many instances can provide the lowest cost option for energy access.

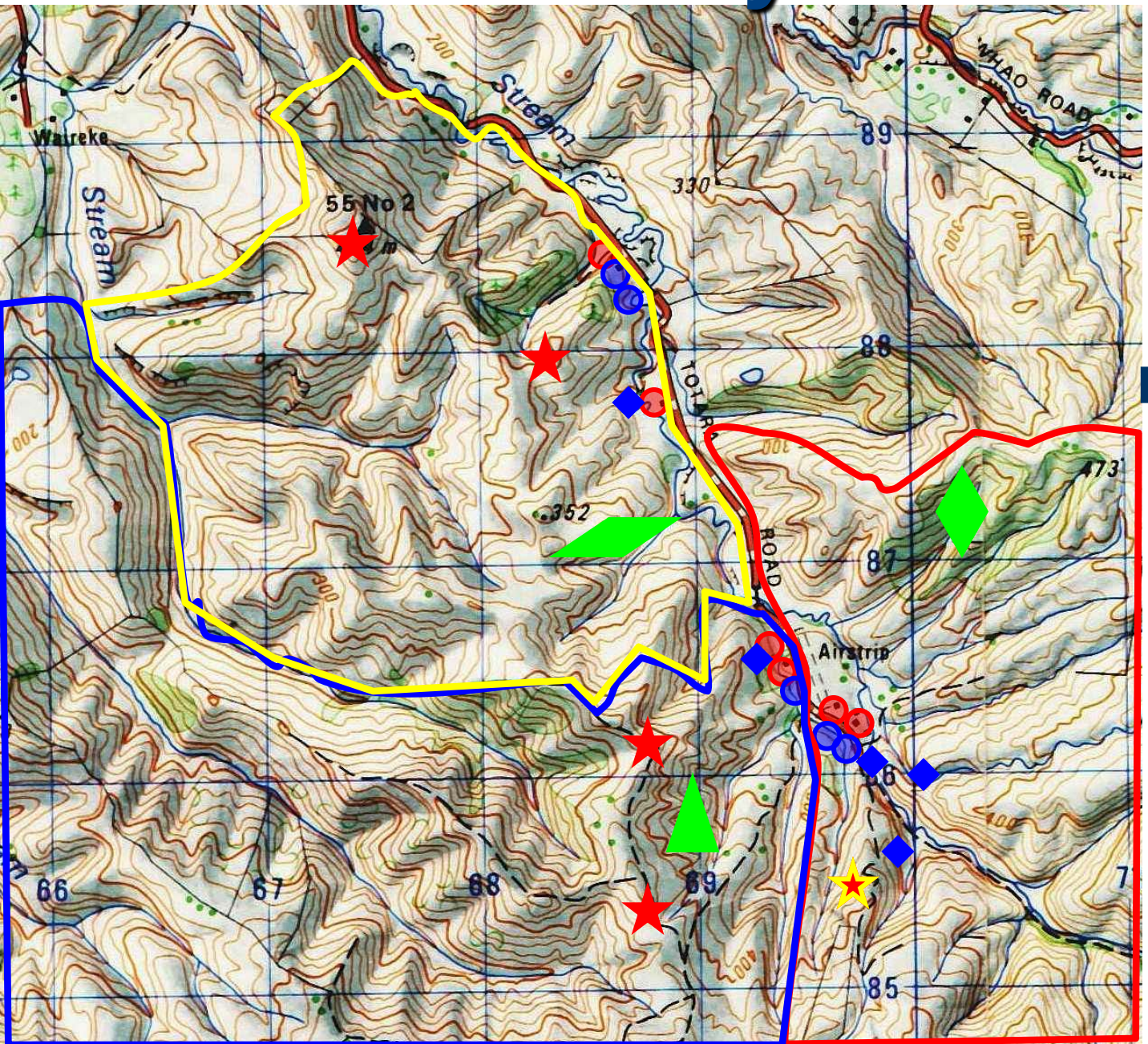
IPCC -
Special Report on Renewable Energy and Climate Change Mitigation
May, 2011. *www.ipcc.ch*

Distributed Energy

Totara Valley community

- Three farms with 6 houses and several farm buildings.
- Good wind resource, 2000 hours per year of sunshine, and a good stream for micro-hydro running all year round.
- Several forest plantations.
- Strong interest by the community in developing renewable resources.

The Totara Valley community



3 farms

Houses

Farm buildings

Wind sites

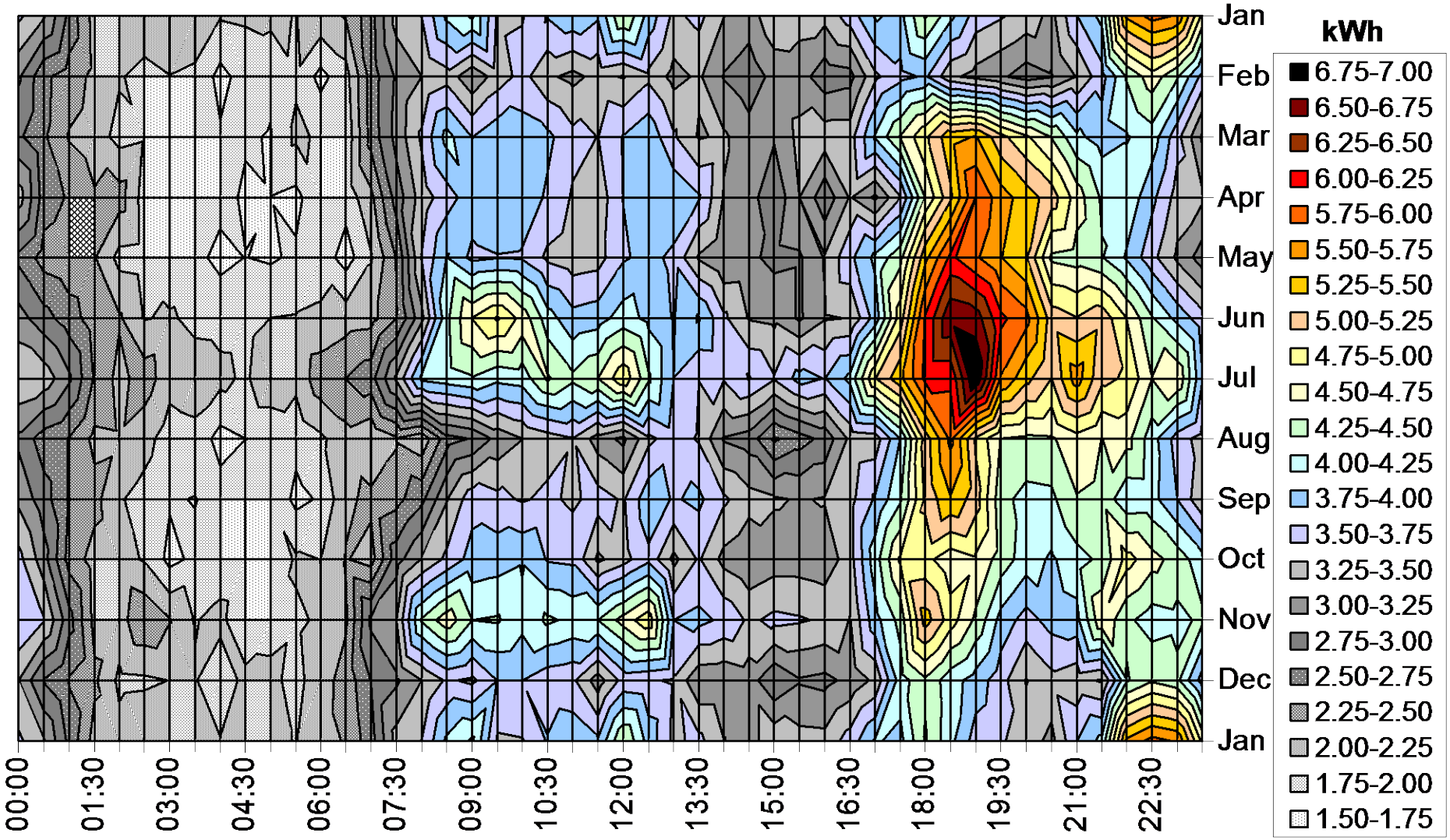
Solarimeter

Hydro sites

Forest plantations

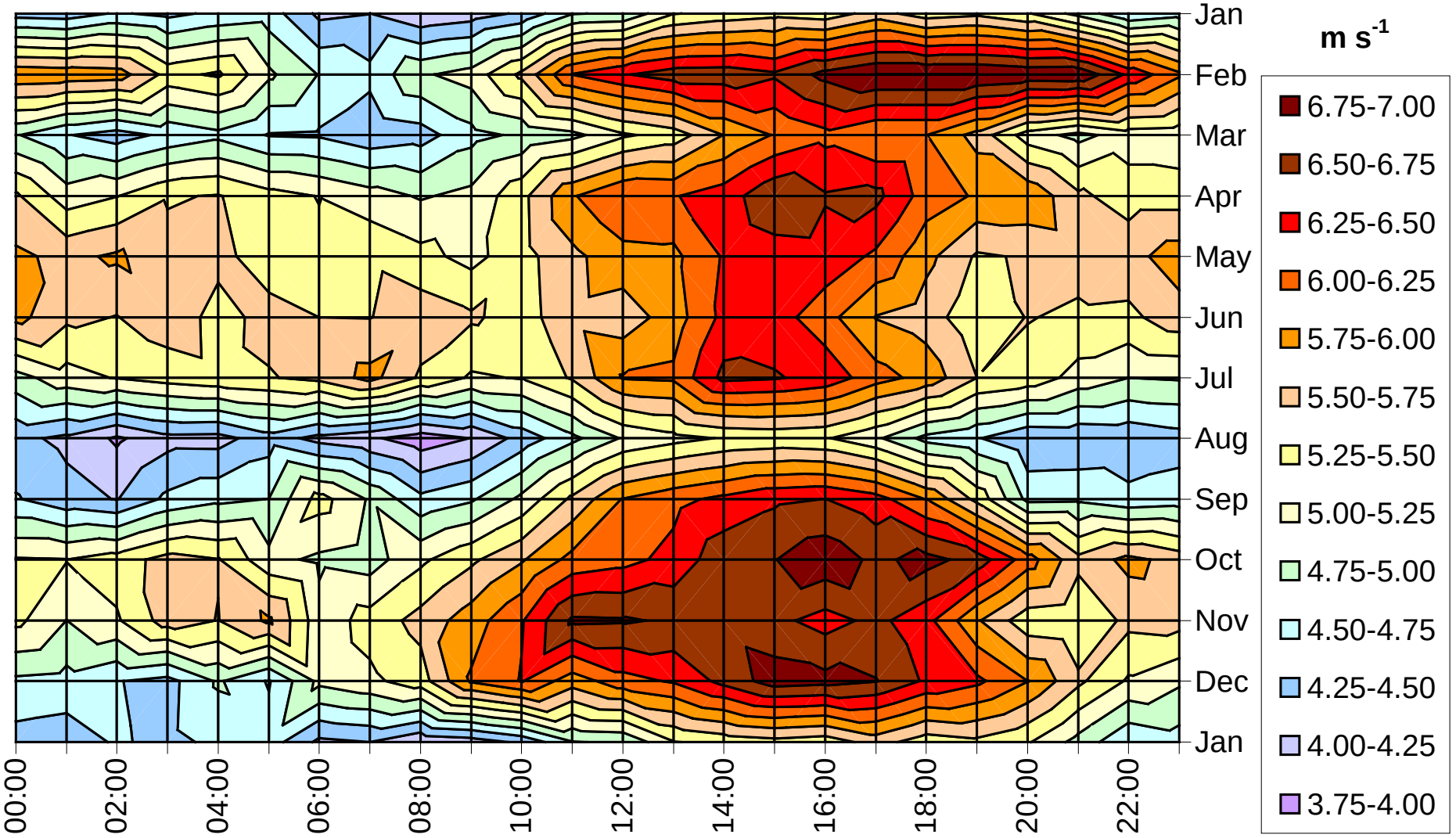
Electricity profile – whole community

- Typical peak in the evening
- Mid afternoon and night troughs



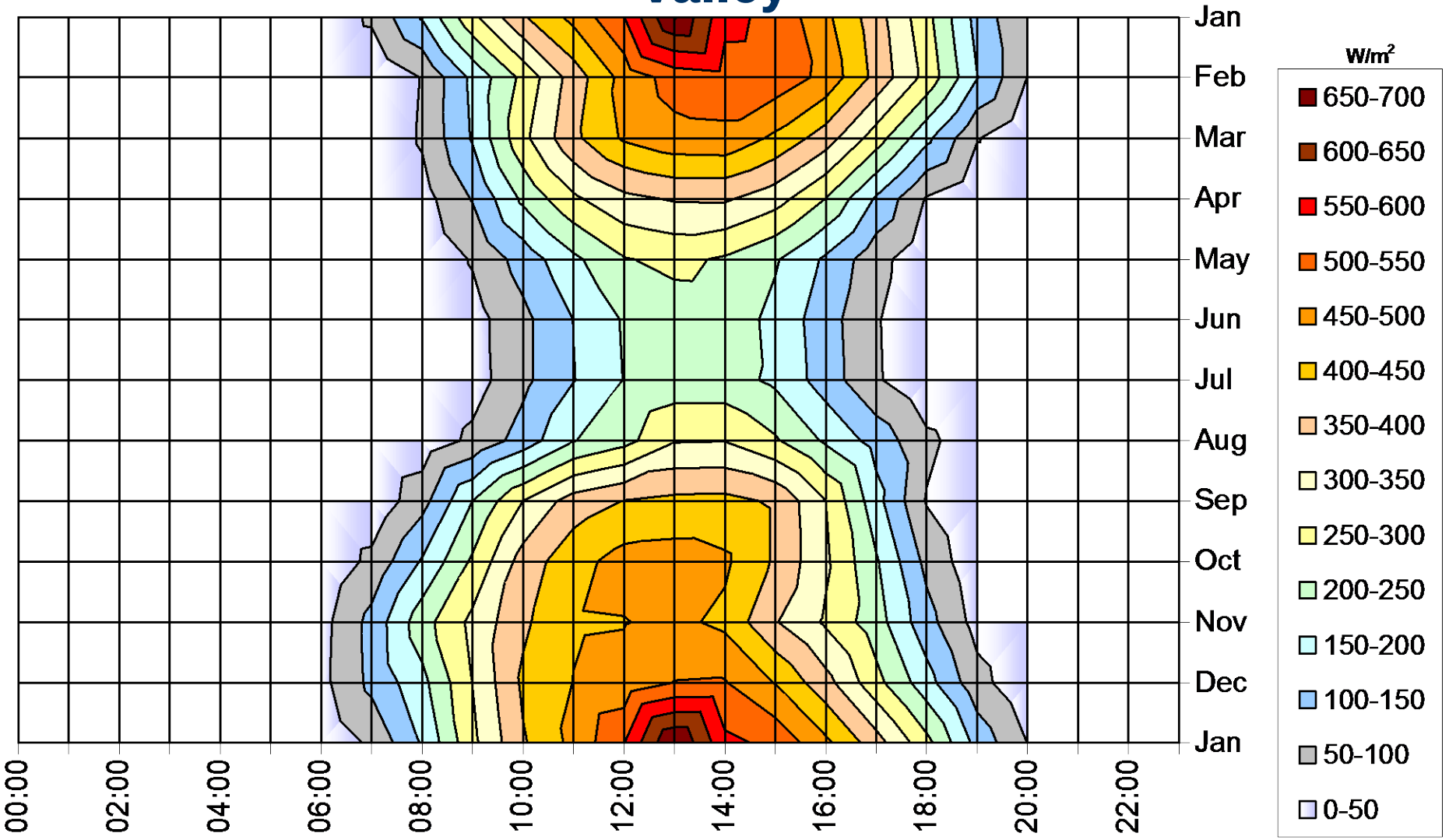
Wind resource

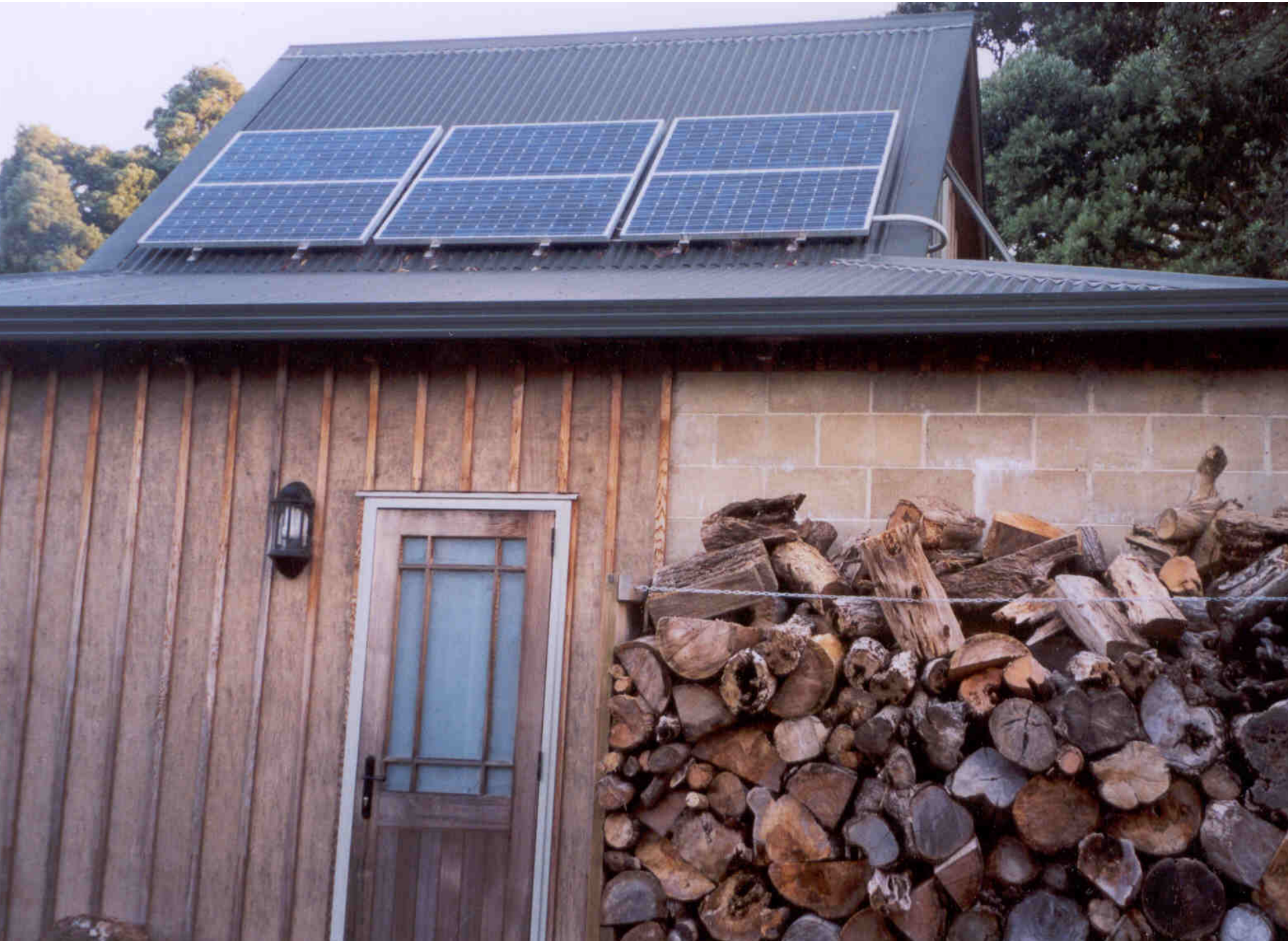
- **Windiest in late afternoons and evenings and in spring and late summer.**

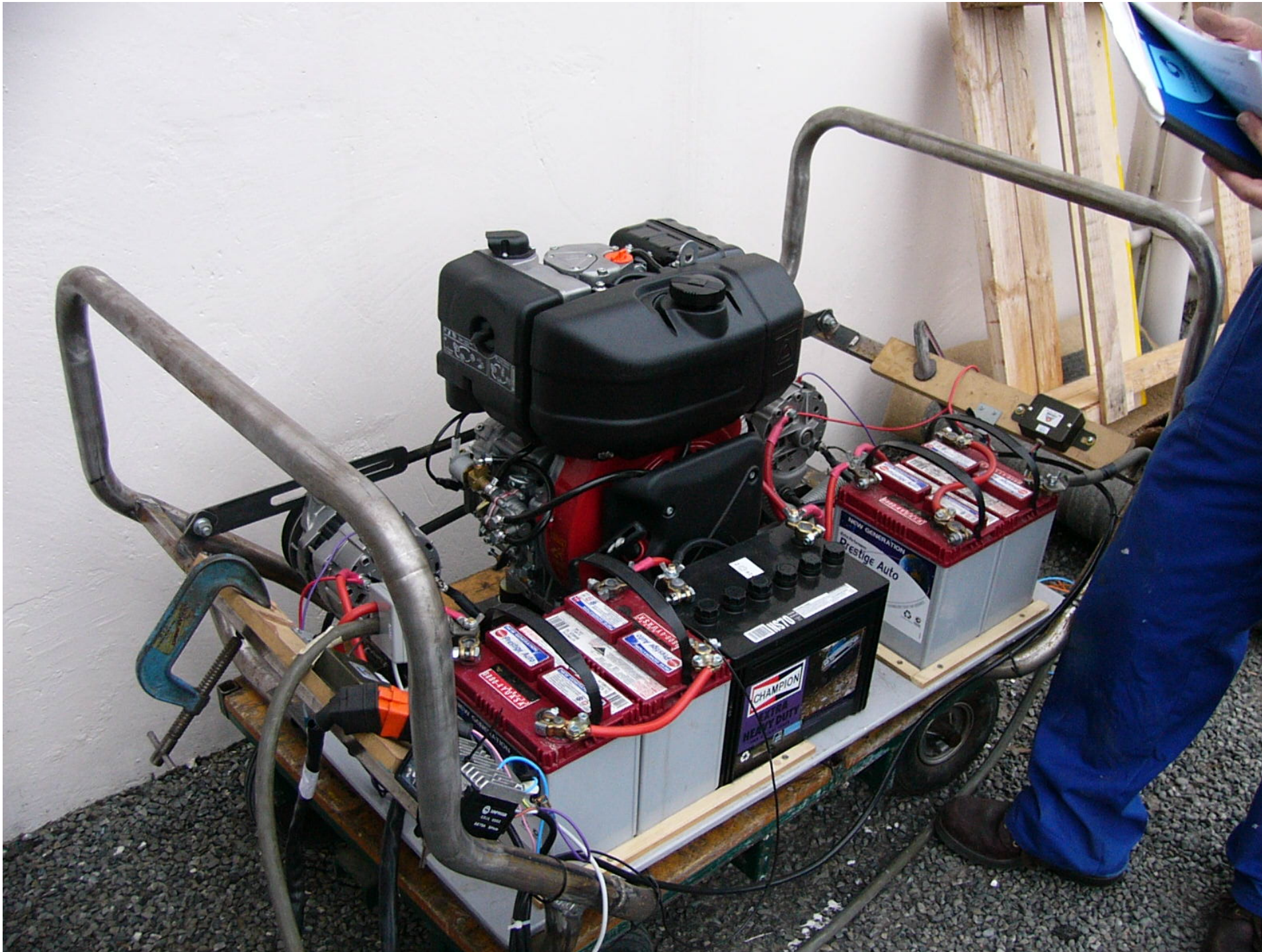


Solar resources

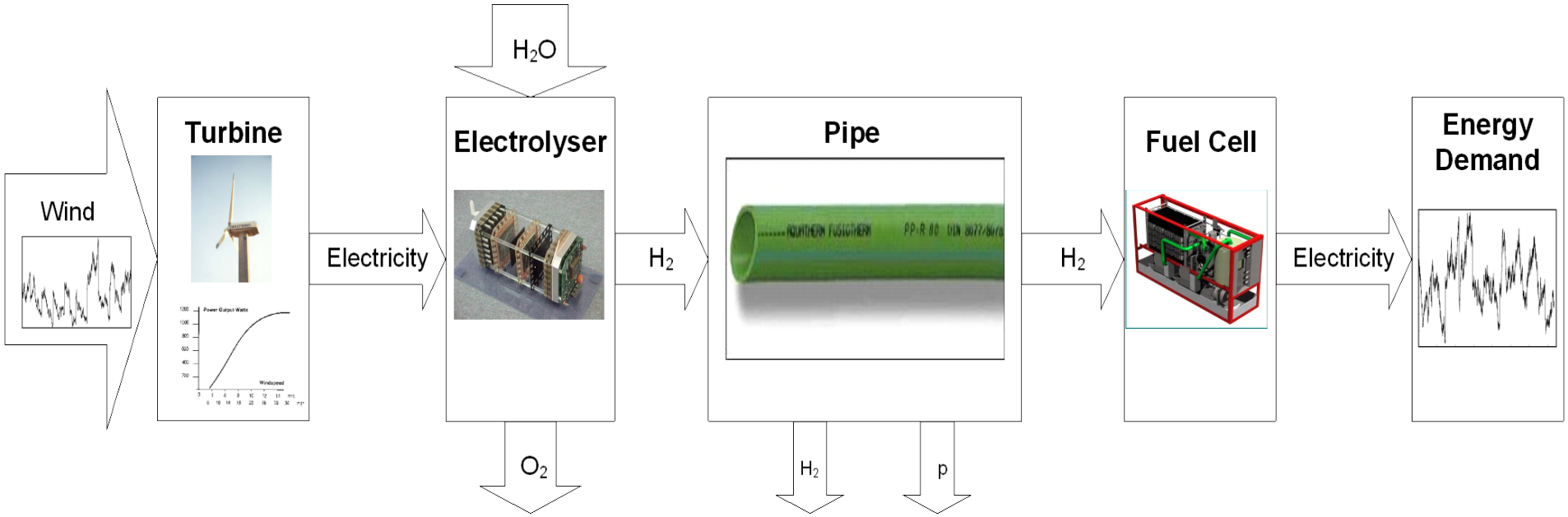
- Low winter resource
- Not corrected for shading effects in the bottom of the valley






Prestige Auto
CHAMPION

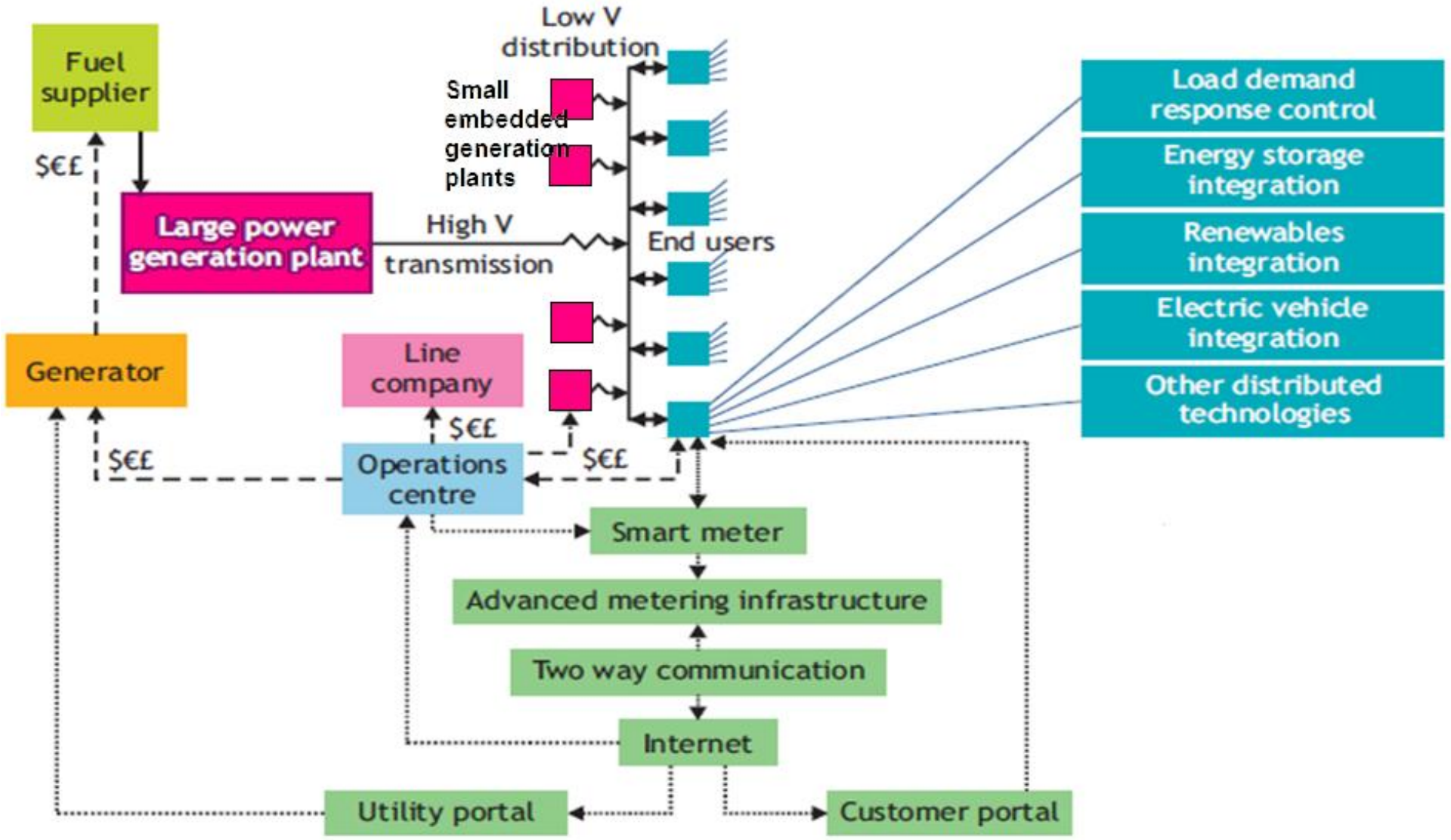
Wind /hydrogen energy system



The problem is that the wind does not always occur when the energy services are needed

– so storage is required - in the pipe.

The digital energy revolution



So is NZ leading or lagging?

- Analyses of on-farm and food processing energy demands undertaken in 1980/90s still hold.
- Dr Colin Wells acknowledged.
- Food miles being questioned.
- Fonterra reduced energy input by 13.9% /t of product and on-farm GHG emissions by 8.5% /l milk.
- Major opportunities remain to reduce energy and carbon intensity along the whole food supply chain.

What policies could help drive the transition to Energy-Smart food?

- A long-term view is needed to gain the paradigm shift to Energy-Smart food systems.
- We need to get started in order to make gradual and steady progress.
- Policies for supporting renewable energy uptake are diverse but well understood.
- Policy formulation regarding energy and food should be co-ordinated amongst government ministries responsible for food, agriculture, energy, health, transport, economic development and environment.
- UN FAO is aiming to assist member countries to address the food/energy/climate/water nexus.

In summary

- The global agri-food supply chain can be decoupled from its dependency on fossil fuels in order to meet future food demands.
- Reducing energy intensity is technically possible at all levels along the chain.
- Renewable energy technologies can help improve energy access, food security, price fluctuations and climate change impacts.
- Policy development to drive the transition to Energy-Smart food and reduce food losses needs a long-term vision.
- We are running out of time……