

*Appropriate Technologies,
using the presents of the Sky and nature*



Fehler! Textmarke nicht definiert.

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Light from a Plastic-Bottle

<http://isanglitrongliwanag.org/>

Solar-Electric-Systems

Mini-Solar-Systems

Small Charging-Units for Charging Batteries; After approx. 1 day full (AAA or AA-Types are very cheap)
 Solar-Radio, also with mechanical Wind-up; For remote areas, only a Short-wave-Radio will work!
 Also TV only works close to the Transmitter-Station.
 LED-Torches, Head-Lamps. Batteries last very long;

Medium Solar Systems

Checklist:

How many Devices should be connected? How many Watts they do have and how long they are on?
 Voltage (12V for small, 24V for bigger Plants);
 How many days without sun should be managed by the Solar-System?
 Is there a roof directing to South available?
 Risk for the Panels to get stolen? There are ways with a moving-detector and a loud Horn or high-voltage Generator (not dangerous) for protection.
 Gel-Type Batteries are a good choice; They don't need to be refilled with distilled water.
 Is Caustic for the Batteries available? (For the first filling; later distilled water is enough)
www.smart-powersystems.com: Compact Solar-Systems, including Wind-Energy, Hydro-Power

How much Power you can get from Solar?

Demand

- 3 Energy Saving Lamp 13W for 4 hours
- 3 Energy Saving Lamp 17W for 4 hours
- 3 LED-Lamp 1,5W, 110-230V, 21 LED for 4 hours
- 1 Radio 25 Watt for 3 hours
- 1 TV/Notebook 70 Watt for 3 hour

makes

- = 680 Wh
- + 35% losses
- = 550 Wh

For that you need

- = 2 Solar-Modul with 100 Watt, 12V (400 Euro)
- = 220 Ah Battery (498 Euro)
- = 20 A Charge-Controller (85 Euro)
- = 10 mm2 cable-diameter at 10 m length Solar-Modul / Charge-Controller (3% losses)
 (50 Euro + 50 Euro Lamps and Switches)
- = Inverter 300 Watt (Sinus for 140 Euro)
- = **1223 Euro Total**

**Calculation-Sheet at http://www.alternative-technology.de/Solar_System/solar_system.html
www.alternative-technology.de/Solar_System/solar_system.html**

List of Parts for a Solar Home-System
 Calculation and List of Items for a bigger Solar System

Solar-Panel:



Mono/Poly/amorphous-Type: amorphous-Type is cheapest but look for Guarantee. Amorphous-Type Solar-cell have more Power at cloudy days. Solar cells should have at least 5 cm distance to the roof for cooling. Grounding is not necessary. Solar-Cells should be mounted in a way that no partial

shadowing will occur (by a tree or a Tree-leaf etc). Outdoor you must use UV-resistant cable. Take care, Solar-cells might easily be stolen! Cleaning of the surface is not necessary, this will be done by the rain, if the Solar-cells are mounted a little bit sloping. Should have at least 15° angle for self-cleaning. But really self-cleaning happens only if it is sloping more than 40°. Otherwise clean it regularly (2-3 month). Ideal is a angle which is the same like the latitude in °.

Frames can be readjusted two times a year in order to improve Performance up to 25%.

From a 100W Modul you get 360 Wh per day in Germany; 100 W approx. 350-450 Euro

www.sat-solar.ch

Charge Controller

Is necessary for not to Overcharge and Deep-discharge Batteries. That reduces lifetime of the Batteries drastically. So it should have deep-discharge Protection for the Battery.

MPP-Charger are suitable only for big-size Plants. Should have a cycle charge to a higher voltage (f.e.14,4 Volts) against Sedimentation. Some charge-Controller have a Interface for Data-Logging.

Devices

Low-Voltage 12V/24V-DC-Devices: good for Pumps; Lamps are pretty expensive in 12V Version; Most Devices only exist in 220V Version or are much more expensive in 12V-Version.

Also simple 12V Fridges are available, but also need considerable Power. Try to get a Energy-Saving Fridge, that will use much less Solar Power.

Lamps: Halogen-Type Lamps are better than normal Lamps but still use 3 times more than Energy-Saving-Lamps; If you have 12V-Lamps wires have to be thicker if the length of the cable is long!

Inverters

Transforms 12V / 24V from Batteries to AC 110 V / 230 V. They start from 30 Euro on.

- Install the inverter as close as possible to the battery.
- Do never reverse connect the positive and negative pole of the battery to the device.
- Install in a well ventilated, cool and dry places. Never install the unit in sealed battery boxes together with lead-acid batteries because these batteries can produce dangerous explosive hydrogen gas that could explode by a spark. Keep the machine away from flammable substances such as gases and also of the reach of children
- The 230V AC output must never be connected with other active 230V AC power sources, because this will destroy the inverter inevitably.

Sinus-Inverter are more expensive, but do not generate noise in the radio or TV and are suitable for all Devices. You need Sinus-Wave for Copy-Machines, Drilling-Machines with variable Speed, Video, FAX, Radio.

Modified sinus are more cheap and suitable for fridges, washing-machine, light, that means most Devices except those with Power-regulation.

Modified Sine Wave Inverter have a higher efficiency (90-95%) as a pure sine wave inverter (85%) and are cheaper (about 30%).

But equipment with speed control (eg vacuum cleaners, dimmers, washing machine, heating pump, gap motors, microwave) have problems with non-sinus-inverters (often referred to as "modified sine wave").

Motors get warm (fan etc) and energy saving light bulbs burn out sometimes.

Radio and television produces a noise. Sometimes a coil or filter can help (f.e. for a copier).

For bigger Units there should be an automatic-Switch-on Device for not loosing too much energy in Standby. Keep in mind that Fridges and Pumps need much more Power when starting than during running. So Inverter must have a good Surge-Power (short time deliver 50% or more additional Power).

Calculation

Inverter needs some ability for overload. Problem: when running a Desktop-computer and another device (refrigerator, vacuum cleaner) is turned on, the computer may crash because the inverter goes into current limit. So the inverter should briefly be able to provide a high overload (1.5 – 2 times).

Power of all Devices (in Watt) + 30%; If PC takes about 350 Watts so use a Inverter with 400-500 Watt Inverter takes a lot of Power from the Battery, so connect them direct to the Batteries and not through the Charge-Controller Load-Output.

A television with 80 W would need an inverter of at least 400 W

A hair dryer is a great burden for the inverter, as only one half-wave is used if switched to 50% power.

Take care: By wrong connecting of the Battery the inverter will be destroyed immediately!

- Keep the cables to the battery short due to high currents (but at least 1 m away from batteries).
- Twist Battery cables if they generate interference.
- Connect Cable at the inverter first, then at the battery.
- Automatic Switch on/off is very useful. But there is a problem with long cables (> 30m) and very low current rates (phone charger)
- Inverters may not be connected in parallel at the output! They get destroyed!
- Neither phase nor neutral may be connected to the earth! But connect earth potential with inverter earth if possible.
- Should have a good EMC radio interference protection

Questions

- Automatic switch on/off?
- Is there a switch for manual on/off?
- Efficiency (min. 85%)?
- How much Power in Stand-by?
- Starting current of the connected motors will be managed (eg fridges have up to 10 times!), so called Surge Power.
- Is the device Tropical proof?
- Is there after an error an automatic restart?
- Due to the poor efficiency at partial load there should not unnecessarily large inverter be purchased. Better build multiple subnets with its own inverter or a master / slave inverter-System.
- Inverter with a slave inverter is a nice feature (for low power-consumers)?

Quality criteria for a Solar-Inverter

- High efficiency, even at partial load
- Low standby losses
- High overload capacity
- Automatic switch on/off and automatic load detection.
- Stable output voltage and frequency
- output short-circuit ability
- Status indication
- Good noise suppression

For 12V systems battery should have 20% of the inverter power

eg: 1200 W Inverter at a 200Ah battery

For 24V a 120Ah Battery is enough

Because of the current peaks, a 1000 W inverter can operate a maximum of 300 W Energy-saving-lamps

Because of negative effect of the **ripple-current**, there should be a big capacitor of (100 mF capacitor for a 2000 W Inverter) parallel to the Inverter-cables +/-.

I can make sense, to use several smaller Inverters for several Lines. In this way you have less losses and also there is a redundancy if one Inverter fails.

Links

www.xantrex.com

Lead-Batteries

- Car-Batteries can be used for Solar, but they did not last so long. There are special Solar-Batteries. You get also maintenance-free Batteries. Lifetime approx. 4-10 years.
- Batteries are very sensitive for deep-discharge. Never discharge below 10,5 Volts (Gel: 10.1V)
- Never leave Battery deep-discharged for a longer time. There is normally a deep-discharge Protection integrated in the Charge-Controllers and Inverter, so connect your 12V Devices through the Charge-Controller.

- What size of the Battery? For a 50-80 Watt Solar-Panel take a 50-100Ah Battery.
- A 82Ah-Batterie can provide 10 hours with 8,2 A or 100 hrs with 0,82A.
- Keep Fire, Switches, 220V Plugs at least 1 m away of the Batteries, because **Batteries generate Hydrogen!**
- Connect Batteries parallel (Plus to Plus and Minus to Minus) only if they have about the same Age and the same Voltage. Otherwise you need Schottky-Diodes. Same capacity is not really necessary.
- Batteries can be recycled! Do not throw them away, they are poisonous!
- The level of the liquid has to be checked from time to time and refilled with distilled water to the Level-Marker.
- Batteries should not be in a too hot ambient (max. 43°C, best is 20°C). So not in the direct sunlight!

Charge Batterie: 10% of the Capacity (f.e. 36Ah with 3,6 A); in 12 hrs full (+ 2 hrs because of Energy-losses)

NiCd, NimH:

They last long and have a high density of Energy. But they are compared with Lead-Batteries expensive. The Capacity is the mAh-Value, written on the cell. Current values for Type AA is 2300 mAh.

Power-Generator

- Diesel-generator last much longer and are more efficient
- Diesel-generator should run for a longer time
- Diesel-generator might be more difficult to start.
- There a generator also available for gas.
- Bio-gas has to be cleaned prior to use it for a gas-generator.
- There are generators available for Bio-fuel (f.e. Changfa from China).
- Power-Generators have only a small internal Tank
- Generator often have a small charging output (5A) for to charge lead-batteries.
- Generator need maintenance in changing oil, checking cooling-liquid if available.
- Generator generates considerable noise and smoke and should be placed away of living people.

Generator with Battery-Backup

You can reduce running-time of the Generator by using a high-current charger and batteries and a Inverter. The Generator has to be switched on, only if the Batteries are empty.

You can increase life-Time of the Generator: First start Generator, switch on Load 3 minutes after Start.

At the End switch of Load 3 minutes before you Stop the Generator for better cooling down.

Is there a representation for the Generator in the country?

www.motorland.net

Hybrid-Systems:

Combination of a Solar-System and Generator. The Energy is 100% available. Cheaper solution than only with Solar. But Generator need maintenance. If you have Micro-Solutions (every family has its own Solar System), a mobile generator for about 10 households could be enough.

Hydro-Power

There are small Hydro-Power-Stations available, starting from 100W. But in spring when there is a lot of water, the Inlet-System and filter has to be cleaned from time to time. Water is enriched with Oxygen, good for the fishes. In some constructions fishes can pass the Hydro-Power downstream. Upstream a fish-stairs is needed.

www.smart-powersystems.com

www.maurelma.ch/download.htm

Gravitation water vortex power plant

<http://www.zotloeterer.com>

https://www.youtube.com/watch?v=oo_mP18IXMo

Geothermal power

In 99% of the earth we have Temperatures of more than 1000 °C; Can be used for households as well (100 m drill-hole or plastic flat-collectors. This one uses the sun as well). Geothermal Power-Stations in Germany 1000 m – 3000m deep. In Germany for 1000 50% of the energy

Especially in countries with a thin Earth-crust, where many volcanoes exist. For some countries (Island) good Potential. No ecological disadvantages found yet but there must be a good check of geological conditions before starting! It is expensive to build a power station but operating costs are low

Save Power-Supply

(for Computer, Hospital....)

Normally you use a UPS. But they provide Energy only about 30 minutes.

But you can also use a Battery-Charger, Battery and a Inverter and let the System (Computer) run all the time with the Inverter. Also you have a very accurate Voltage in this way, without High/low-voltage instability.

Only suitable for small-Size Systems (up to 1000 Watt) Otherwise Charger will be too big.

Calculation for a Battery: Load 200W for 5 hours; makes 1000 Wh. For 12V: Battery Ah = P (Watt) / U (V); 1000 Wh / 12V = 83 Ah; With 30% safety you need a 100 Ah-Battery.

http://www.alternative-technology.de/Safe_Power_Supply/safe_power_supply.html

Wind-Energy

You have to check the situation of the wind in your area. In coastal areas you have a relatively stable wind.

If you make it by yourself, you can also use a Generator from a car. They have an integrated regulator.

Take care: Wind-Turbines have to be constructed and fixed very stable. They make some noise and shadowing (Disco-effect!). Needs also a charge-controller. The biggest enemy of the Wind Generator is the wind! Actually more cost efficient solution than Solar-Power.

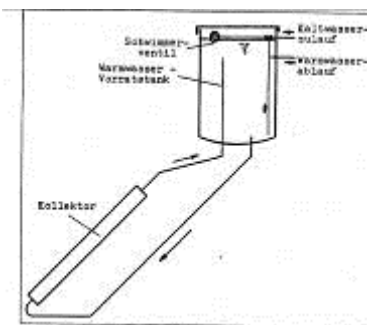
www.smart-powersystems.com

Windpump 400 for 700 Euro: <http://www.erdbohrer.de/mehr-Pumpen/Windpumpen/Windpumpe-400::279.html>

Windpump MW600 K for 1.381 Euro: http://www.solar-melzer.de/mw_600.htm

Making your own Wind-Turbine, plans etc. <http://www.i-love-windpower.com/>

Solar-thermal Systems



Could be produced by small workshops. Very reliable!

The Water could be used for shower, washing the body, cleaning, cooking, making tea and washing. Also the hot water is potable, due to pasteurization-effect, but does not taste that well if it stays long on this high temperature.

It works even if there is no direct sun.

Different Outtakes from the Tank for different Temperature-Levels are possible.

You have a Hot-Water-Buffer in case there is no more water available.

At full sun the water can boil and get steam! The System must be protected

against that.

Most Systems do not need an extra Pump, they circulate by gravitation.

Vacuum-Collectors are more efficient, especially in the cold season.

But they are more expensive. They are loosing the Vacuum sometimes after some time.

But

- Hot-water will be ready at noon or afternoon.
- If the pipes are longer it takes some time of hot water to come.
- If there is no thermal Regulation-valve, there is a risk of injury due to hot water.
- For Laundry an external Temperature-Regulation is needed to setup the right Temperature.

Links

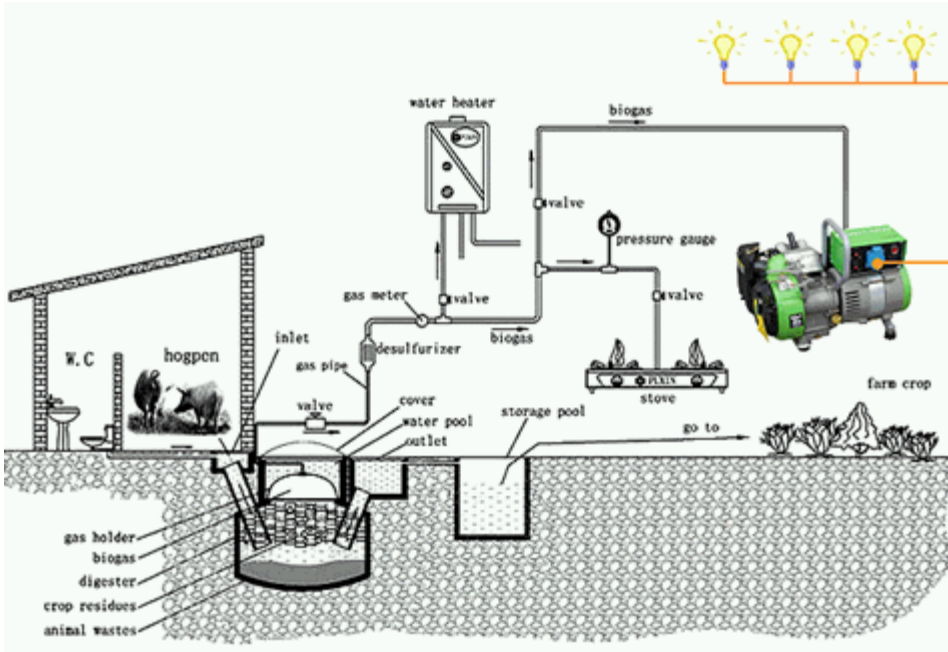
www.solarsysteme-mittermeier.de

<http://www.thesietch.org/projects/solarthermalpanel/index.htm>

<http://www.alternative-technology.de/Solar-Thermal-Systems/solar-thermal-systems.html>

and there see the document "Sizing of a Solar-System" for a calculation.

Biogas



Biogas typically refers to a gas produced by the biological breakdown of organic matter in the absence of oxygen. Works good in Tropical/Sub-Tropical Countries. (needs 20-30°). Provided with Human and Animal-Dung and Urine, Plants, agricultural Waste and Water. Dry Substance max 10%. The dung of a cow could produce after 14 days approx. 2,8 KWh Energy (same with 10 Pigs or 100 chicken). Could be build with local material. But they also

need additional water!

Gas could also be used for light, cooking, heating, and Energy (Gas-Motor, but needs cleaning before), even for gas-cars. Biogas lamps from China and Brazil. Many System in India, Vietnam; If it is made in the right way, it has very little bad smell or smoke. The harvesting of biogas is an important role of waste management because methane is a greenhouse gas with a greater global warming potential than carbon dioxide.

Good conditions are: according Humidity, air-locked (few air-exchange), no light, constant Temperature (min. 4°C; depending from Bacteria 25-40°C), pH-Value (depending from Type of Bacteria), additional food for Bacteria's like Vitamins, Minerals.

The biogas plant is part of a unit: the barn, the mixing tank, the plant, the sludge storage basin, the gas pipe and the gas utilization equipment

The calorific value is only about half the size of gas bottles

The digestion process requires a temperature between 20 ° C and 30 ° C. The higher the temperature, the faster the gas production and accordingly the shorter the digestion time

The container size is measured by the digestion time times of day filled Quantity.

The Dung must be fluid with about 8 -10 % of dry matter. In practice this means that fresh manure is mixed with approximately the same amount of water.

Thus, if the gas production is increased and decreased there is additional water demand: It is best to use the urine to reduce water demand.

The digested sludge leaving the plant is in a liquid state and is best placed on the fields in this form.

If no special burners are available, commercial gas cooker can be used when the nozzle is opened a bit more.

The gas may also be used for illumination.

Estimated cost to build a Nyasanda type biogas plant

- Digester 58 \$
- Gas container 28 \$
- Insulation structure 137 \$
- Tools 10 \$
- Sum 233 \$

4.2 years to earn back the investment.

Conditions for a Biogas-plant

Continuous biological agent available

Water is available

There is a way to dispose the residual (on the fields etc)

More Info: <http://publications.lib.chalmers.se/records/fulltext/100663.pdf>

Links:

Design and Construction: <http://www.ruralcostarica.com/biodigester.html>

<http://www.aidg.org/biodigesters.htm>

<http://www.i-sis.org.uk/BiogasChina.php>

<http://en.wikipedia.org/wiki/Biogas>

<http://biogas.wikispaces.com/>

https://energypedia.info/wiki/Electricity_Generation_from_Biogas

Ebook to buy: <http://www.completebiogas.com/toc.html>

Solar-Cooker



Cooking the food only with the sun. Solar-Cookers have a lot of advantages:

Reducing the demand of fire-wood, no more smoke of fire which can lead to many diseases, more free time for the children etc.

Although it is not that easy to implement the Solar-Cooker, may be because cooking-habits must change a little bit. Solar cooking can be realized only with Sun shine and in the day-time. But there are cookers with electrical Back-up. There must be a good Training-System.

For example a rent and buy-System, with people who give Support in the beginning.

There are different types of Solar-Cookers:

Parabolic-Solar cooker: high Temperatures (up to 650°C), could also be used for frying in Oil. Cooking times like the normal firewood-cooker.

Disadvantage: Not so easy to construct. Some material have to be imported. Only works with direct sunlight. Has to be tracked all 30 min to the Sun-Position. Risk of over boiling. To keep food warm you also need a Isolated Box. Only space for one Pot. Risk of damage of the eyes by concentrated sunlight (take sun-glasses).

This disadvantages are not with the **Box-Type Solar-Cooker:** Can be build easily and cheap with local material etc. The food can remain unattended, it does not get burned. The food stays hot in the Cooker for some hours (close the Lid), even if there is no sun. Good price / performance-Ratio. Tracking the sun only every 1-2 hours.

Disadvantage: Not usable for frying in Oil. Long cooking-hours (about double as with firewood). During cooking not easy to access the Pot.

www.solarcooking.org

www.eg-solar.de: Parabol-Solar-Cookers with a good acceptance world-wide

<http://www.ulog.ch/>

Plans at www.med.uni-magdeburg.de/~maercker/SolCook/slcot-en.html

<http://www.alternative-technology.de/Solar-Cooker/solar-cooker.html>

www.solar-papillon.de

Wood-saving stove

Advantages of Wood Saving Stoves

They use less than half the wood of an open fi re

They save time used for collecting wood

They save time for cooking food because they cook faster

They save money because less is spent on buying wood

They are safer to use because the fi re is contained

They can be carried even when the fi re is burning

They are cleaner and easier to use

They are sturdy and robust products

It costs approximately €55 to build a wood-saving stove.

Links

Essential Guide for Today's Stoves: <http://stoveguide.net/>

Contact: E-mail: johndebar@gmail.com

<http://ip.com/patfam/de/45524543>

<http://www.friendsofthemexicancloudforest.org/wood-saving-stoves.html>

How to use

http://www.drfn.info/docs/cbend/energy_factsheets/wood_saving_stoves.pdf

http://en.wikipedia.org/wiki/Cook_stove

http://www.id-ong.org/cn/import/Leaflet_ID_ecostove_English_display.pdf

How to build:

https://www.engineeringforchange.org/news/2011/09/08/how_to_build_a_wood_burning_institutional_stove.html

<http://www.cowfiles.com/resources/pdf/Energy-Saving-stove.pdf>

Solar Dryer



- Dried foods are tasty, nutritious, the nutritional value and flavor of food is only minimally affected by drying
- Dried foods are high in fiber and carbohydrates and low in fat, making them healthy food choices
- Vitamin A is retained during drying
- Storage space is minimal, easy-to-store
- Transportation costs are reduced; dried Products weigh only about 1/6 of the fresh food product
- The energy input is less than what is needed to freeze or can
- easy-to-prepare; solar food drying is a very simple skill
- longer storage of dried products (because of more complete drying)
- Can open new markets and income and is a good start-up technology. It improves the bargaining position of farmers. Sometimes farmers sell at very low prices during the harvest season
- You can have up to 50% more productivity in agriculture
- For diabetics dried fruit prepared without adding sugar is a healthy choice instead of desserts.
- Dried fruit can be used in stews, soups and casseroles or enjoyed as snacks. It can also be added to cereals for breakfast or used in making ice cream and baked products

Links:

http://www.alternative-technology.de/Solar_Dryer/solar_dryer.html

www.efn.org/%7Eitech/Solar%20tunnel%20dryer/Solar%20tunnel%20food%20dryer%203_2008.pdf

www.solare-bruecke.org/Bauanleitungen/Tunnelrockner_dt.pdf

Reforestation



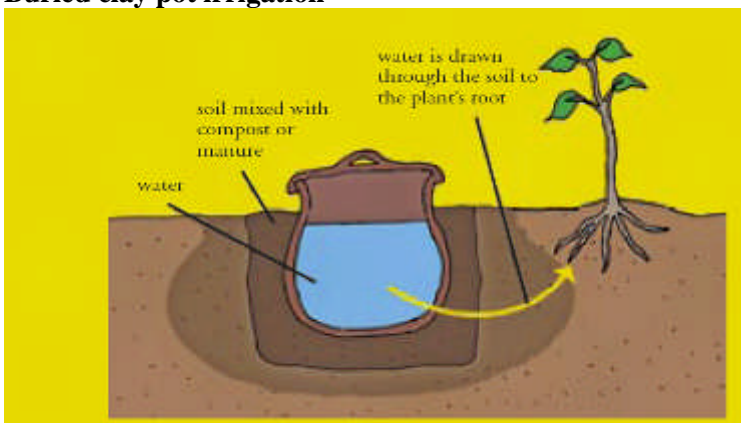
- Trees provide a wide range of products (timber, fruit, medicine, beverages, fodder, oils) and life supporting services (carbon sequestration, erosion control, soil fertility, shade, beautification).
- The very soil we need to grow our food crops, and the health of our water resources and sources, depend on the number of trees we have on the planet, and how healthy they are.

- Trees make the soil more fertile, increase soil moisture and reduce erosion.
- They also help prevent desertification.
- Trees give us shade, also for young plants
- Trees act as windbreaks to protect crops from strong winds
- they provide us with fruits and animals
- Trees supply us with wood that we use to build houses, make furniture, build fences, and burn for heating and cooking.
- Trees save money on fuel wood, fodder and stakes
- They generate about 40 per cent of the world's oxygen (in one year, an average tree inhales 12 kilograms (26 pounds) of CO₂ and exhales enough oxygen for a family of four for a year.)
- Forests provide significant income and livelihood options
- The World Agroforestry Centre (ICRAF) recommends the planting of deciduous trees where water scarcity is a problem. They consume less water than evergreens during critical periods of water shortage and compete less with crops.
- As the forest grows, trees can be thinned out or pruned and used for timber or fuel. People can collect fruit, seeds, nuts and medicines from the forest.
- Birds and animals will return to areas they had left when their habitat is restored
- You can grow many food crops—on a large scale to sell, or in a garden to eat at home. These foods provide us with carbohydrates, protein, fats, vitamins and minerals.
- they encourage rainwater to sink into the soil instead of causing floods
- Fertilizer trees make the soil richer so crops grow better! And thus reduce the need for chemical fertilizers
- Trees control weeds such as the parasite striga! It's good to leave an open strip for to prevent fire and harmful animals and for irrigation.
- Fast growing trees need a lot of water
- Tear furrow (groove, Furche) in the slope of a hill, fill with loose soil and plant the trees. The roots fix the soil!

<http://www.jesuitenmission.org/jesuitenmission/weltweit-helfen/watershed-programm0.html>

<http://www.alternative-technology.de/Reforestation/reforestation.html>

Buried clay pot irrigation



Mix the soil you dug out of the hole with 1/3 as much compost or wellaged manure. Place enough mixture in the hole so the pot sticks up 2 cm above the surface.

- Put the covered pot in the hole and fill the hole around it with soil. Press the soil down firmly.

Plant your seeds or plants about 1–3 cm from the pot. Dilute liquid manure and compost and add to the clay pot.

As the soil dries, suction develops and the water slowly seeps out from inside the pot and into the soil around it (the suction force is created by soil moisture tension and/or plant roots themselves. This is a naturally automatic system, if it's been raining, the soil is wet so there is no moisture tension and the pots don't release any water. The soil gets just what it needs, right when it needs it with no gadgets or sensors required!

To keep the system working optimally, add more water to the pots as needed and avoid letting them dry out completely. Dig the pots up at the end of the growing season to prevent breakage over cold winter months.

Because the soil is kept moist inches below the soil surface, this helps reduce the growth of weeds (also means less water consumption and less maintenance)

Cleaning of Water



World-wide, soiled water is an enormous problem. UNICEF estimates that 60% of the rural population and 23% of the city-population in the poorer countries have no access to clean water. It is estimated that from diarrhoea-illnesses caused by impure water, 2 millions die annually and approximately 900 millions get sick.

-2-4 weeks storage can reduce bacteria from 50-90 %. Many people dislike the taste, because the water is old.

Sodis: the easiest way: Just put some transparent plastic-bottles of water in the direct sun for about 5 hours, and you can drink it. But the Turbidity has to be low (leave it for some hours to sediment)

See www.sodis.ch for more information

Ceramic-Filter: If the water is not too turbid. The flow of water is very slow. Reduces Bacteria and Protozoon. If the pore-size smaller than 1.5 um, the pathogens get removed also. Bigger pores only macro organisms as cysts and worm eggs are removed. The rest can be removed by boiling afterwards. Cleaning of the filter: brushing under running water, boiling the candle. Could be produced easily in the countries of the South. But only with Silver-Ions it is antibacterial.

Clay-filters with silver: with Silver-Ions it is also antibacterial. Excellent results! Also removal of bacteria; 2,14 l/day; Lifetime 1 year; Made of 55-65% loam, 30-35% crushed feldspar or 20-40 % sand, 5-10% sawdust, 3,2% colloid silver; Guatemala 7,70\$; Silver inhibits further growing of bacteria

Charcoal -Filter: Critical if he is used too long. No indication when he has to be replaced. Reduces chemicals, better taste. If not used for longer, breeding ground for bacteria.

Upflow filter: at low filtration-rates and sufficient oxygen content of raw-water reduction of 50 - 70 % of organic and inorganic coarse and fine particles.

Filter-medium: coarse sand 3-4 mm; cleaning of the filter, 5-10 min every day, to prevent the filter-bed of clogging; better results: decreasing grain-size to top;

-slow sand filtration: also anti-bacterial, but slow flow, sufficient oxygen in the raw water, steady temperature, constant flow is necessary!

-chemical treatment: chlorine (best and most tested but not easy to get and store this chemicals), iodine, bromine, ozone;

-boiling destroys pathogenic germs like bacteria, viruses, spores, cercera, amoeba cysts, worm eggs etc. Let the water sit for a few hours after boiling in a vessel, the water picks up air and loses its bland taste. Improve the taste by flavoring plant materials adding during boiling. If done properly, boiling is a very effective and simple disinfection method, but requires a significant amount of energy, if not used the sun directly. A **Solar-Cooker** could be used for cleaning water as well (by Heating up to $> 65^{\circ}$ for some time). Some devices exist to verify whether the water is potable (WAPI from www.solarcooking.org)

-UV-treatment: thin water films are necessary! Many substances inhibit the transmission of the light. The water must be pre-filtered. The UV lamp requires replacement annually. Expensive special Lamps must be used! Eliminate waterborne pathogens (germs, viruses, and molds). UV disinfection does not kill giardia or have a residual effect on bacteria that may be reintroduced into the water after UV treatment.

-Deep tubewells. Because the wells are more than 200 feet deep, the water has been sealed beneath an impermeable layer of earth for a long time and is commonly bacteria-free. One disadvantage of obtaining water from a deep tubewell is that many people dislike the taste. Because the water is old, it has a high dissolved salt content, and many people prefer the taste of fresher, surface water. Additionally, deep tubewells can be expensive and time-consuming to construct because of the specialized deep-drilling equipment that is required.

Chlorine disinfection kills all pathogens, including giardia. In addition, chlorine has a residual effect; that is, if bacteria are reintroduced into a chlorinated water supply, the new bacteria will die. Although chlorine disinfection is a well-proven technique, it has a few disadvantages. Often, people dislike the taste and smell of chlorinated water. In addition, because it is easy to overdose water with chlorine, it is necessary for a trained person to test chlorine levels before water is consumed. Silver+Chlorine: 20-35min contact;

ozone-treatment: A water treatment with Ozone also removes Bacteria, Virus and Germs.

filtering also by a fine meshed cloth, let the water settle before;

Reverse-Osmosis: An excellent way for cleaning water, you can even take salt-water and convert it in potable sweet-water. Filters have to be changed at least every year (20-50 \$). There are no minerals in the

water after that, so be careful if the food does not provide enough minerals. Or add 10% of untreated Water to it.

<http://www.advancedwaterfilters.com>

<http://www.freedrinkingwater.com>

Pasteurization with the Sun

Also a good and easy way to get water potable. Can be realized in the Solar cooker!

See <http://www.alternative-technology.de/Solar-Cooker/solar-cooker.html>

Refrigerator, freezers

- Old refrigerators need 5-10 times more energy like new ones
- 12V refrigerator are 2-3x more expensive as 220V Version, but need considerable less power.
- 220V versions need usually a 1000 watt inverter for the start-up current because starting current is up to 10 x of the rated current
- Absorption refrigerators need at 12V 5 times more energy than compressor refrigerators
- Deep Freezes need much energy. May be switch off with timer at night
- "Frost-free" devices do not need to be defrosted, although, they need a lot of power for making a "frost free" cycle.
- Operating hours compressors about 25%
- Refrigerators need about 300-500 Wh / day (T = 32 ° C); 200-400 Wh / day (T = 25 degrees)
- There are Solar-fridges available which run direct from Solar-Panels. But what happens if there is not enough sun? May be make a backup by a small generator.
- Suppliers of solar refrigerators: www.wemo.info

You can increase the cold storage-Time by putting bottles in the fridge with a mix of Salt and water. It works by latent-Heat, a lot energy is saved by the process of liquid / solid and reverse.

Calculation of the quantity of Salt:

If you multiply -15,71 g/° with the desired temperature you get the quantity of salt / kg water.

Example: Temperature -18° C

$$m = T \times (-15,71 \text{ g/}^\circ)$$

$$m = -18^\circ \times (-15,71 \text{ g/}^\circ)$$

$$m = 280 \text{ g}$$

Put 280 g Salt in 1 l Water. Deep-freeze point is at minus 18 °C.

According to different sources, 10 °C is enough for the deep-freeze.

Cold chain

How to maintain the cold chain for medicine?

Alfalfa (Lucern)

Good for feeding young children! All what is necessary is inside. Problem: Taste is not good. Can be eaten or a drink can be mixed, may be with other (good taste) ingredients.

<http://en.wikipedia.org/wiki/Alfalfa>

The Moringa-tree, not only for cleaning water

Can be cultivated for its leaves, fruits, and roots for a variety of food and medicinal purposes. Moringa leaves could practically wipe out malnutrition on our planet.

They contain

2 times the Protein of Yogurt

7 times the Vitamin C of Oranges

3 times the Potassium of Bananas

4 times the Vitamin A of Carrots

It's like growing multi-vitamins at your doorstep.

Vitamin A, Vitamin B1, Vitamin B2, Vitamin B3, Vitamin C, Calcium, Chromium, Copper, Fiber, Iron, Manganese, Magnesium, Phosphorus, Potassium, Protein, Zinc

Experts agree that the long-term solution to malnutrition is the use of foods rich in the essential nutrients often lacking in people's diets. Modern scientific research is proving that Moringa leaves are one of the



richest sources of such nutrients. Even small amounts of the leaves could protect thousands of people from suffering and death.

The young fruits can be cooked in a number of different ways. An excellent oil is derived from the seeds, which is used for cooking and lubrication of delicate mechanisms. The leaves are extensively used as a vegetable in many parts of the world, and the root can be made into a condiment similar to horseradish. *M. oleifera* is also of interest because of its production of compounds with antibiotic activity. Can be used for cleaning water as well.

Links: www.treesforlife.org/our-work/our-initiatives/moringa/moringa-tree
www.tfljournal.org

Biochar

Biochar is a 2,000 year-old practice that converts agricultural waste into a soil enhancer that can hold carbon, boost food security and discourage deforestation. But the agricultural waste must be pre-processed to a carbon like material.

The process creates a fine-grained, highly porous charcoal that helps soils retain nutrients and water.

It improves water quality and quantity by increasing soil retention of nutrients

It improves soil health to filter and retain nutrients from percolating soil water and to provide carbon storage

www.biochar-international.org

Also a good resource for Information: www.organicfarmermagazine.org

Using rainwater, the Water Cistern



Rain-Water is a water of good quality. But store it covered (no sun and Mosquito can go in) and cold if possible. Good for washing (you need less washing-Powder!), Toilette, Irrigation. For drinking only in countries with no air-pollution and there should be a good filter system installed, because there is air pollutants that poison the water. If possible do not use the first water when it starts raining. Use mechanical filters like screens and closed gutters, French drains, gravel, sand, sumps, grates, and wire mesh, and first flush units

Storing the rainwater for drinking safe, solid and sealed. Safe, is water that comes into the storage facility after being fully filtered. Solid, is water that cannot escape or cannot be tainted by anything from outside the container. Sealed, is water that does not float away due to evaporation

You can spare using rainwater up to 50% of the daily water. The tank should be UV-resistant and no light should can go in

Internet: http://en.wikipedia.org/wiki/Rainwater_harvesting
www.rain-barrel.net/drinking-rainwater.html

Nature does not have waste. Using waste to build houses

Not only does increasing energy efficiency serve to reduce brickmakers' fuel costs and hence increase their income, it also reduces the emissions of carbon dioxide and other pollutants per brick produced.

<http://www.scidev.net/en/agriculture-and-environment/news/researchers-make-bricks-from-waste-desert-sand.html>

<http://www.sciencedaily.com/releases/2012/12/121219084058.htm>

Fuel for Free? Waste Materials in Brick Making ISBN 978-185339-625-0

Latrines

At least 50-100 m away from the next spring. Hole max. 1m above Ground-Water level. Never flood the Hole. Rain should not come into the hole. Lid from wood hat flies may not come in. Air-Pipe should have a mosquito-net at the end. If possible put sand or ash in the hole after using, to reduce smell and coming of the fly.

Sometimes you can also use grass, leaves or waste from the kitchen for it. Never put water or old Oil or disinfection-material in the hole.

www.komposttoilette.de

www.berger-biotechnik.de

Computer

Laptops for countries of the South are very suitable as they have an integrated Battery. There are pretty cheap second-hand Laptops available at Ebay in the Internet starting with 150 Euro. Problem: German Keyboard, Battery, German Windows. Before joining Ebay you must sign in with your Email-Address. Office is a Licence-Product. There is Open Office as Freeware available, works like Office www.ebay.de

Spectacles, glasses

Getting second hand spectacles, glasses: <http://www.lunettes-sans-frontiere.org/english.htm>

Cold chain for Medicine

- Maintaining cold chain is very important for patient's health. Following few points elaborate its importance.
- If cold chain is not maintained the medicine will lose its efficacy and will become ineffective i.e.
- If the temperature of the medicine goes below 2°C, the medicine can freeze which would adversely affect its efficacy. Further freezing can also lead to cracking of vials / syringes leading to a possible contamination due to loss of sterility.
- If the temperature of the medicine goes above 8°C, it would again lead to reduction or loss of efficacy of the medicine making it ineffective. » -
- Not maintaining the cold chain will eventually result in ineffective treatment of disease which may also lead to death.
- Inconsistency in maintaining cold chain for doses administered could even make the complete therapy ineffective
- Always purchase cold chain medicine from those chemists / pharmacies / home delivery service providers, who directly buy such medicine from us. Check / enquire before purchasing that medicines are placed in a refrigerator.
- Select a pharmacy / chemist / home delivery service provider which has a 24 hrs power backup arrangement.
- Never accept cold chain medicines without proper packaging i.e. use of ice or ice packs in a carton or thermopore box.
- Always enquire from the chemist / pharmacy / home delivery service providers that for how long would the packaging maintain the temperature and make sure that the medicine is either used or stored within the given time.
- Never accept medicine with broken seals.
- Medicine must be placed in a manner that it must not be in direct contact with ice / ice packs. Use carton sheets / bubble wrap or polythene bags when travelling long distances.
- Protect the medicine from exposure to direct sunlight during transportation
- If you wish to store cold chain medicines at home, please note that such medicine must be stored in a refrigerator.
- Do not place cold chain medicines in the freezer. It will make the medicine useless due to freezing.
- Do not keep cold chain medicines in the door of the refrigerator. Storage at the door is not recommended because during opening and closing of the door the medicine will be exposed to room temperature immediately.
- Do not place cold chain medicines in direct contact with inner walls of refrigerator as it can lead to frosting.
- If you need to store cold chain medicine for a long time, we recommend you to monitor the temperature of your refrigerator using thermometers.
- If there is no electricity for up to half an hour do not open the refrigerator.

<http://www.coldchaintech.com/>

Solar Aircon

Look in google for solar air conditioner and you find for example

<http://www.energor.com/Solar%20Air%20Conditioner.html>
www.china-aircon.com

grey-water reusing

- **Greywater** is wastewater generated from domestic activities such as laundry, dishwashing, and bathing, which can be recycled on-site for uses such as landscape irrigation and constructed wetlands.

Greywater is largely sterile, but not potable (drinkable)

www.sswm.info/sites/default/files/reference_attachments/OTTERPOHL%20ny%20b%20Waste%20Water%20Reuse%20in%20Buildings.pdf

Natural building

Building compactly and minimizing the ecological footprint. On-site handling of energy acquisition, on-site water capture, alternate sewage treatment, and water reuse. Adobe bricks, cob (or monolithic adobe), rammed earth and clay-straw infill are common choices for wall material. Roofing coverings often used include sod or "Living" roofs, thatch, and wooden shakes or shingles. Rubble trench foundations are popular, as they do not require concrete; Likewise, dry-stacked or lime mortared stem walls are common.

Finance

There are different organisations, where it is possible to get money for Projects

<http://www.forseo.eu/english/home.html>: forseo is a capital procurement and investment company for environmental technologies

www.kfw.de: Kreditanstalt für Wiederaufbau KfW

www.dbu.de: Deutsche Bundesstiftung Umwelt

www.eib.org: Europäische Entwicklungsbank (EIB), for Energy:

<http://www.eib.org/products/elena/index.htm>

www.worldbank.com: The World Bank

www.gefweb.org: Global Environmental Facility GEF

all Organisations in a Data-Base: www.foerderdatenbank.de

The Good Planet Foundation finances "clean development": www.goodplanet.org

Micro-Credit

There are quite a number of organisations, who provide Micro-Credits for good conditions

Getting Micro-Credits look at:

<http://www.oikocredit.org/site/en>

www.grameen-info.org

www.banmujer.gob.ve

www.microenergy-international.com

More Links:

Actual Version of this Document: http://www.alternative-technology.de/Download_and_Links/download_and_links.html

(Script of the Presentaion: Hints and Infos for appropriate Technologies and Solar Systems)

Infos about Solar Electrical Systems: http://www.alternative-technology.de/Solar_System/solar_system.html

www.appropedia.org good Information about Appropriate Technologies!

www.wikipedia.org : in many Languages about all Topics

Appropriate Technologies: www.aidg.org/water.htm

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