

# Living

Intelligent, integrated and holistic approaches that inspire.

# PERMACULTURE

**IDEAS  
FOR HOME  
IMPROVEMENT**

**HOW TO  
BUILD A  
SOLAR  
COOKER**

**ARE YOU AN  
INNOVATOR?**





The **“LIVING PERMACULTURE”** project is a participatory design and development initiative funded by the Southern African Innovation Support Fund (SAIS).

The project innovates and designs Permaculture inspired solutions together with shack dwellers in Windhoek, Gobabis, Dordabis and Lusaka, Zambia. It is an 18-months project (October 2019 – March 2021).

Dear reader,

Permaculture is a system of agricultural and social design principles for “human-centred” landscapes. Its intelligent, integrated and holistic approach has made Permaculture one of the fastest growing grassroots movements around the world. Permaculture minimizes external inputs and sets up closed systems – that’s a great approach for people who do not have money.

The “Living Permaculture” project brings this innovative design system to Namibia. In this handbook you find ideas for backyard gardening and home improvement that have been developed by shack dwellers.

Are you an inclusive innovator? If so, some of the solutions might inspire you to start a business.

We hope you enjoy the handbook!

**Ina Wilkie**

Project Coordinator

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## Living Permaculture

Permaculture is about creating real independence, starting at home. Permaculture design assists us to use inputs like energy, water, sun more efficiently and improve our environments, leading to better health all around. And it can help us save money! We have facilitated a Permaculture Course designed specifically for shack dwellers from Windhoek, Gobabis, Dordabis and Lusaka (Zambia). The project will continue working with our design champions, communicate the solutions we developed together, facilitate outreach activities through the Shack Dwellers Federation and Namibia Housing Action Group and seed funding for entrepreneurs.

## The Windhoek Tippy Tap Challenge

We came out of Milestone 1 of the SAIS Living Permaculture project with a group of highly motivated people who were excited to start inventing and building in their settlements. That's when the coronavirus stopped us in our tracks. While puzzling over how we can re-plan our activities, we came across the tippy tap and started the Windhoek 2020 tippy tap challenge. 28 producers built 2298 tippy taps in Windhoek's informal settlements in April to help people fight coronavirus. Our focus was on using recycled materials wherever possible and on inventing as we go. You can find more info and a gallery with tippy taps at <https://tippytapchallenge.wordpress.com>.



## Appropriate technology

The idea of appropriate technology is that people understand their own needs better than anyone else and can therefore invent the technological innovations necessary to meet those needs. The notion of appropriate technology goes back to the social movement led by Mahatma Gandhi whereby low-tech self-sufficiency or “village technology” was reclaimed to subvert and ultimately prevail over the British Empire. In this understanding, appropriate technology is a means to liberation.



## That's NIFTI!

Together with Nina Maritz Architects and supported by GIZ, we started the NIFTI initiative – Namibian Innovation for the Informal. The intention is to spur innovative thinking and design and to develop prototypes of solutions for everyday living, aimed at general problems found in informal settlement life – water supply, food security, sanitation, heat and cold in dwellings, etc. The process is participatory, involving community members in all stages – from identifying the main problems, through brainstorming and selecting solutions, to designing and making prototypes.



## Farm Okukuna

Farm Okukuna in Gorengab Extension 3 is partner and implementing site of the Living Permaculture project. The farm is a project of the City of Windhoek and the World Future Council. Community members run a market garden and compost businesses. Farm Okukuna is also a training centre around nutrition, growing food, and innovation for shack dwellers. Currently, the prototypes of solutions featured in this handbook such as grey water filters, solar oven, shack insulation and dry toilet systems are being tried and tested at Farm Okukuna. Follow us on: [www.facebook.com/GrowingFoodinWindhoek/](https://www.facebook.com/GrowingFoodinWindhoek/)





## Basic human needs

Humans need food, shelter, clothing, energy, love and a meaningful life in order to truly reach their potential. For most of the world, many of these needs are not met. At the moment, very few of us have any control over where our food comes from, how it is produced; nor over our sources of electricity, heat and water. We increasingly look to government, parastatals and industry to provide these needs. But if we take charge of what we need, we really can make sense of our lives.



### What does sustainability mean?

“Sustainable” is a buzz word that is used very loosely by people to describe many things. We look at sustainability as asking not only ‘can we sustain ourselves and thrive as human beings today?’ but ‘will our children’s children be about to sustain themselves far into the future?’. Sustainability is a long-term, future-thinking strategy, considering what will happen in the future as a result of the choices we make today.

One understanding of sustainability is to look forward seven generations. This means that the way we live now, how we use natural resources, land, and fossil fuels, should be done in such a way that our grandchildren seven generations from now can live in the same way, or better. This simple explanation of sustainability asks us to look at the consequences of our actions, and the fruits of our labour. It urges humans to change their behaviour and consumer patterns quite radically to ensure that there will be enough resources 140 years from now, for everyone.

Thinking and designing sustainably means that we take into account the impact our actions today will have on the future. If we plant a fruit tree today, perhaps our children and grandchildren will have fruit to eat. If we pollute our nearby river, then perhaps our children and grandchildren will struggle to find clean water to drink. Sustainability asks us to create a better world for our children than the one we have today.

**Permaculture has been described as the fastest growing grassroots movement in the world!**

## Permaculture ethics

Permaculture has ethics which are values that guide our thinking and decision making. We need shared or common values in order to make decisions together.

### Earth care

All our actions must avoid harming the earth, and we also need to actively regenerate and heal damaged ecosystems. All forms of life have a right to live as they play a critical role in the global ecosystem.

### People care

All peoples should be respected and cared for. This ethic also relates to caring for ourselves, our health and our mental/emotional wellbeing. It is also about reaching out to other people in a positive way.

### Surplus share

This ethic is about giving back. It essentially teaches not to hoard, and only to use what we really need! When we do have extra time, energy, knowledge or even money, we should dedicate them towards the first two ethics so that the world around us continually improves.

In some ways the society around us no longer upholds these values, and encourages us to value external things, like money, status and objects. Permaculture asks us to come back to the basic values that really matter and create a society more positive than the one we live in now. Another aspect of Permaculture is that we create a global nation which values the same ethics – this means we can create a global family that has nothing to do with political, economic or religious boundaries.





# Principles of Permaculture

These principles help us to think about how we are going to act and implement our designs.

<p><b>OBSERVE AND INTERACT</b> Beauty is in the eye of the beholder Your perceptions will influence what you see</p>	<p>People tend to think along the same thinking patterns. This principle asks us to change the way we look at the world. It also says that the attitude with which we look at the world will shape what we see. If we really observe what is happening around us, we will be able to assess our situations more clearly. Through a deeper understanding of processes and patterns around us we can really make positive changes.</p>
<p><b>CATCH AND STORE ENERGY</b> Make hay while the sun shines</p>	<p>All energy – wind, water, sunlight and nutrients must be used as many times as possible before it leaves the system. If we miss the incoming energy, we have lost an opportunity. The house is a good example of catching and storing energy. This principle asks us to be wide awake to opportunities, and to use them positively.</p>
<p><b>OBTAIN A YIELD</b> You can't work on an empty stomach</p>	<p>Self-sufficiency is the first step. Make sure that your system yields products. These can be food, harvested water, and medicines. Obtaining yields also keeps us motivated. Our understanding of yields has also changed, so we incorporate social and environmental benefits too in the category of yield.</p>
<p><b>APPLY SELF REGULATION AND ACCEPT FEEDBACK</b> The sins of the fathers are visited on the children unto the seventh generation Your actions follow you</p>	<p>Know the difference between needs and wants and limit unnecessary wants. Accepting feedback is about listening to the feedback or results you get from Permaculture systems (and humans), and adapting accordingly. On a broader scale, we always need to think about the impacts of our actions on the world now, and into the future. This principle emphasises sustainability and the need to set up systems that can provide for themselves.</p>
<p><b>USE AND VALUE RENEWABLE RESOURCES AND SERVICES</b> Let nature take its course</p>	<p>Use biological resources rather than non-renewable. In terms of gardens – this is about using compost and natural sources of fertility instead of chemicals. We also understand that nature provides services, and need to plan those into the designs too. Some natural services we can utilise are pest management, pollination and the cleaning of water through plants and wetland systems.</p>
<p><b>PRODUCE NO WASTE</b> A stitch in time saves nine Deal with problems as they arise so that they don't get worse</p>	<p>Absolutely every resource that can be, should be recycled into your system. Waste is any resource that is not being utilised, and therefore becomes pollution. Careful planning also means that energy (work, time and thought) is also not wasted.</p>

# Backyard Gardening

Compiled by Foibe Sakaria, Tresia Shikongo, Paulina Nghipandulwa

A backyard garden refers to a small portion of land that one can use to grow fruits and vegetables within a limited space.

## Why a backyard garden is important

- ✓ It can save us money by not spending too much on fruits and vegetables that we can grow ourselves.
- ✓ Gardening helps reduce stress and high blood pressure as it is very good for our minds.
- ✓ It helps us to save water by re-using it.
- ✓ It gives us easy access to fresh fruits and vegetables.
- ✓ Growing your own food gives you complete control over the chemicals used during the growing process.
- ✓ Gardening makes good use of space and protects the soil.



## Backyard Garden

- Decide what you would like to grow.
- Observe and find a suitable location (place) for your garden (sun, wind, water).
- Arrange your garden beds.
- Prepare the soil before you plant (level the soil and add manure).
- Plant your seeds.
- Add mulch to keep the soil moist.

## Pit bed

- Find a place with running water (can be from a shower or tap).
- Loosen the soil.
- Dig a hole in the center of the pit bed and pile the soil around the hole. This is the garden area.
- Throw dry leaves, green leaves and cardboard into the hole.
- Plant your seeds on the garden area.
- Add mulch to the garden area.
- Keep adding kitchen waste to the pit hole.



## Plant pool

- Use containers to plant in. These can be cut cool drink bottles, ideally not clear plastic because the roots like shade. Make some small holes in the bottom and fill container with earth. Plant seeds inside.
- Find a suitable place with morning sun.
- Dig a trench /pool.
- Cover the inside of the trench with plastic. Cut-open dogfood sacks work well.
- Fill the inside of the pool with water.
- Put the containers of the seedlings in the pool.
- Cover the water in the trench with mulch (cardboard) to avoid evaporation.

## Compost Bag

- Organise a bag.
- Choose your compost location (shade).
- Organise green leaves, dry leaves (can be grasses) and manure.
- Layer them accordingly: dry organic, then green leaves, then a bit of manure. Then continue the process until the bag is full.
- Add water to the bag regularly to keep it moist (but not too wet).
- Add kitchen waste regularly such as potato and carrot peels.
- When the compost is ready (turns brown in colour) then use it in the garden as manure.



# Living Permaculture in Namibia

Compiled by Stephan Eins, Eloolo Permaculture and Tariro Muparadzi



**1**  
dry toilet  
tree-planting  
system

**2**  
outdoor shower  
feeds plants  
with water

**3**  
fence and wire as trellises for  
climbing plants like grapes  
to provide shade from the hot  
summer afternoon sun

**4**  
roof overhang to  
provide shade in  
summer

**5**  
outdoor kitchen  
and garden with  
morning sun

The idea is to integrate the surrounding environment of the shack in its function and support, in other words to enhance the living experience through thoughtful intervention and adjustment of the immediate area.

**Before you start changing or influencing your immediate environment take the time to observe the movement of the sun, wind and other elements in your neighbourhood so that you can create a comfortable and supportive home.** Plans for permanent structures and plantings (like trees and hedges) should be carefully assessed before implementation so that they are placed well within the overall picture/design.

Think about how you and your family spend the day at home. Which activities take up most of your time and where would the best place be for this. Then you can imagine or sketch out a rough plan of where is the best place for the shower, cooking area, social/seating area, veggie patch etc.



## Sun & Shade

In summer we want to avoid the direct sun but in winter we need it to warm up and to grow food/plants. The connection here is sun/shade to either heat or cool.

We have a lot of local trees that are deciduous (leaves in summer and no leaves in winter), so by placing such plants we can create shade or sun as we need it.

For example: using wire, rope or sticks you can create a simple structure onto which climber like passion fruit grow and cover an outdoor seating area. Then in winter there will be sun coming through as the plant drops its leaves and in summer you will sit in the shade with lovely fruit hanging above your head.

## Water

Catch it as high up as possible and look at where you want most of it, so you can guide it in that direction. Please be cautious as water can be very erosive and create a lot of damage.

The connection here is water (rain, shower and laundry) with plants (vegetable, fruit, medicinal, shade and windbreak). For example: place your shower above (up- hill) most plants as this is a lot of regular water and gravity can take it where you want it. Now you can grow climbing plants or a taller hedge to create a long term visual but also productive barrier around your shower.

## Check

- ✓ **Growing food:** There are many different ways of growing food. Trees are more resilient than vegetables but they do take time to get to fruiting stage. So it is good practice to start with both! Start some of the fruits that grow well in your area in pots and at the same time a vegetable garden. There are a lot of veggies you can successfully grow in pots as well. Always start small and expand if needed.
- ✓ **Water:** Catch and store as much as possible – from rain water to grey water in containers and in the ground! Try to stop water runoff and store it in the ground. (Let the soil soak it up!)
- ✓ **Sun:** Think about summer and winter, as well as where you need or want sun and where you don't. Then create the shade you need. (Think temporarily and long term!)
- ✓ **Wind** is totally underestimated. As our winds are very dry 90 % of the year, we should try to keep it away from our plants. But you do want some air movement through the house or yard at some time in the year so place plants or structures in such a way that the wind gets blocked or channelled. (Evergreen shrubs make great permanent windbreaks!)
- ✓ Keep your bigger picture in mind, learn from your mistakes and successes, constantly re-evaluating the situation and make adjustments/changes when needed.

## Growing food

Vegetables and fruit trees need sunlight to grow, but especially vegetables don't want too much sunshine like we have in Namibia. **The morning sunshine is the best one for our veggies and young trees in pots.** In winter the sun is somewhat lower than in summer so the north eastern side of the house is a good spot. Mid-day and late afternoon in summer is the hottest sun and should be avoided/shaded out.

Our hard and direct sun is not only bad for the plant but also for the soil, so please try to always cover the soil with mulch (cardboard, paper, leaves, grass etc...). For the soil to be healthy and alive (so it can give the best support to your plants) it needs to be moist most of the time and you need to add organic materials regularly (leaves, grass, manure, kitchen scraps added to the soil regularly as mulch or in addition).



### Your or your neighbours' shower water is running downhill?

Now you can create a "pit bed".

Dig a hole and pile up the soil around it. The hole is your pit; the soil around it your berm. Pile organic materials into the pit and keep on adding very regularly. Make sure the shower water runs into the pit. On the berm plant 5 papayas, some beans, spinach and tomatoes.

As the water fills the pit, it slowly seeps into the berm and also keeps the organic matter moist so decomposition can take place which provides nutrients for the plants. Once the papayas have reached about 1.5m height, you can use the stems to hold up a wind and sun shade material as well as fence out the neighbourhood chicken.

## Are you an innovator?

Are you ready for inclusive innovation?

Do you want to start a business?

### Check out if inclusive innovation is for you!

...with these ideas and tips from BopInc ([www.bopinc.org](http://www.bopinc.org) )

#### Is this you?

Inclusive innovators often have the following qualities:

1. **They are purpose-driven:** They are relentlessly looking to address major issues with new solutions. They look beyond the financial return to understand the long term impact of their actions.
2. **They are observing:** Their empathy and strong observing skills enable them to understand their customers and identify the real job to be done by their innovation.
3. **They are able to cope with conditions of frugality:** They know how to deal with resource scarcity, complexity and non-optimal business environments.
4. **They are agile:** They do not cling on to their initial ideas and are ok with throwing all their plans out of the window and making new plans when conditions turn out differently or change along the way.
5. **They are true collaborators:** They interact and keep in touch with a diverse group of people, in order to extend their perspective on problems and leverage support from ecosystem partners.
6. **They are action-oriented:** They spend more time getting things done “in the field” than accepting trophies at philanthropic events.
7. **They think like designers:** They showcase creative problem-solving skills to overcome unforeseen challenges and are capable of connecting and linking seemingly unrelated questions, ideas, problems or information in new ways.
8. **They are not afraid to fail:** They try out new ideas as early as possible and embrace failures as learnings.
9. **They are self-disciplined:** They have the perseverance and self-accountability to not postpone unpleasant or difficult activities, but overcome obstacles and complete the tasks as they have planned them.



## Rate your business idea and discover where you stand

A good inclusive innovation mixes Impact, Desirability, Viability, Feasibility, and Suitability.



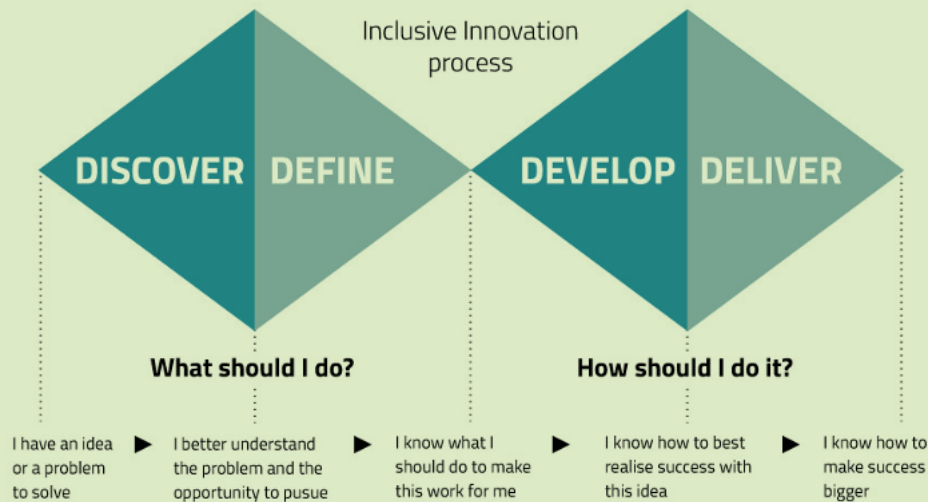
1. **Impact:** Does your innovation improve the lives of underserved communities? Does it create jobs and equal opportunities for women? Do you know the environmental risks and do you have a strategy to mitigate them?
2. **Desirability:** Does your innovation solve a problem or need experienced by consumers? Do customers want your innovation and are they willing to pay for it? The value of your innovation must be very clear and relevant for it to be desirable.
3. **Viability:** Can you make money from your innovation and is this sufficient to grow your business? Are you aware of competitors?
4. **Feasibility:** Is it technically and organisationally possible for you to manufacture your innovation and deliver the quality you promise to your customers? Do you have a marketing strategy? Are you aware of legal restrictions?
5. **Suitability:** Are you the right person to pursue this innovation? Does your team have a track record of business operation in the market? Do you have an open attitude and can you respond to changing market conditions?



## Designing

For many innovators, the most practiced approach takes a consumer problem as a starting point. This is usually the safest approach as well, particularly if your consumers are already expressing a desire to have this problem solved. When brainstorming and evaluating different ideas, ask these three questions for every idea:

1. **How many people** would be willing to pay for this idea?
2. **How would I get paid** with this idea?
3. **How much would I get paid** for this idea?



*Note how in this design process you first open up (discover), then limit your ideas down (define).*

## Bringing your innovation to market

- Every innovation needs a Go-To-Market strategy. An idea will not sell itself, particularly not in underserved markets.
- It is very costly and risky to take on all marketing and distribution activities yourself. Especially when you are new to a market, success lies in establishing the right partnerships.
- When selling something new, you will first need to gain the trust of consumers. They will only invest if the benefits are understood and, even better, experienced first-hand.
- Consumer retention is just as important as consumer acquisition. It allows you to build a steady consumer base that you can leverage as ambassadors to reach new consumers.

**Ask yourself the following questions:**

- **What are you good at and what are your ambitions as an entrepreneur?** You may want to keep your business small and outsource last-mile distribution and sales of your product altogether.
- **How much can you invest?** Do you have the capital to set up your own supply chains and sales teams? Or would it be better to partner with someone for this?
- **What is the level of control you want over sales?** How might this endanger your brand, value proposition or relationships with end-users?
- **Where would your consumers expect to buy your product or access your service?**
- **Do you need to provide a finance solution to your consumers?** Durables are often too expensive for people to buy at once, therefore you or your partners might need to provide credit.

## Why buy?

### Check your value proposition to your potential customer



#### **Pain**

What does your target consumer aspire to and what problem prevents him or her from reaching that aspiration? Using the insights gathered in your consumer research, identify your consumers' aspirations e.g. 'I want my kids to be well educated, healthy and successful', or 'I want to have privacy when I go to the toilet'. From these aspirations, clarify the pain experienced e.g. 'My kids have to walk 3 hours to reach the school' or 'the village latrines make me feel unsafe'.

#### **Gain**

How does your solution solve your consumer's pain? Make the functional and emotional gains of your proposed solution very clear. A functional gain

describes how your innovation will functionally solve the problem identified, e.g. a low-cost bike allows children to cut their time to school in half, allowing them to spend more time studying and helping in the household. An emotional gain describes how your innovation will make the user feel, e.g. a portable curtain to bring to the open toilet provides personal dignity. This is a crucial element and links back to the aspiration.

#### **Reasons to believe**

Why would your consumer believe you? Give evidence on how this innovation delivers on the stated gains and why it is better than its alternatives. Often this is what buyers refer to when they explain their choices.

# Creating a business that thrives

This tool can help you quickly assess whether your idea is worth pursuing from a financial perspective.

## Step 1: Make informed assumptions

1. *Expected costs:* What are your estimated monthly costs?
  - Think of the costs of labour, possible rent, materials, transport etc. You can find a lot of this information through market research.
  - Keep in mind that some of your costs are variable, which means they will increase or decrease depending on the number of units sold.
  - Do not forget to include a salary for yourself and your team in the estimation of costs.
2. *Estimated revenue:* How many units do you expect to sell per month?
  - Make monthly sales projections for each product/service that you offer. How many potential consumers are there, how many consumers will you realistically serve and how many transactions will your consumers make per month?
  - Key tip: To set your prices, do some research on competitors pricing and consider the price point you need to reach financial sustainability.
3. *Starting capital:* How much money do you have to kick-start your business?
  - You will need some capital to cover initial costs and make your first sales. How much capital do you have available to invest in the launch of your business idea? How much can you raise from friends and family?
  - Once you have your starting capital, refer back to your costs and estimate how many units you can and should initially produce and sell with this capital.
  - Key tip: If you are considering getting a bank loan, do not forget to include the interest repayments as monthly costs.

## Step 2: Explore different scenarios

Now that you have these estimated values, you can start evaluating your chosen revenue model(s).

- Calculate different revenue models that you want to test.
- Compare these different possible scenarios of revenue. Test and compare at least a one-time payment model (more rapid growth) and one recurring payment model (better cash flow).
- Allow for some time to try out different scenarios

## Step 3: Review your assumptions

Take some time to review your assumptions. Consider sharing them with someone who is familiar with your business and target group. Some questions that you can ask yourself are:

1. How long will it take until I can expect to reach the break-even point?
2. Can I raise the capital I need to cover the time until I expect to become profitable?
3. Can I realistically sell that many units per month at the chosen price point?

# NIFTI Simple Panel Solar Cooker

Making the NIFTI Simple Solar Panel Cooker (NSPSC) is as easy as A, B, C! It is the simplest kind of panel cooker that you can make and costs next to nothing. It works very well to cook small amounts of food. It folds up and is also ultra-portable.

The roofing insulation you need usually comes in 40 m rolls. Either get offcuts from a builder or club together with friends and neighbours to buy a roll. You can make about 44 panel cookers from such a roll. You might also want more than one cooker, so that you can cook more food at a time – rice in the one, sauce in another, veggies in a third?



**A. MATERIALS & TOOLS:** You need very little to make this.

- Some roofing insulation (Bubble-foil, Sisalation, or similar), as long as it is shiny and reflective on at least one side
- Some scissors
- One or two washing pegs
- Some very thick wire and thin wire, for making the pot stand
- A bucket or an old tyre
- A small black pot with a black or clear lid
- A clear plastic bag, larger than your pot

## B. MAKING THE NIFTI SIMPLE PANEL SOLAR COOKER

1. The insulation is usually 1,25 m wide. Cut off a piece of about 90 cm long.
2. On the long side, mark the edge at 40 cm from each corner.
3. Cut in at right angles from the two marks 40 cm deep, to make three flaps at the bottom.
4. Make a wire circle about 2 cm smaller than the opening in the bucket or tyre.
5. Bend the ends of the wire around so that the circle doesn't pull loose and tie it with binding wire.



6. Take more wire and weave it across the circle back and forth to make pot stand.
7. Tie the junctions with binding wire to make it stable. Your cooker is done!



### C. SETTING UP AND USING THE NIFTI SIMPLE PANEL COOKER

1. Safety first – do not look directly into the shiniest part of the box oven, as doing so repeatedly is bad for your eyes. If you can, wear polarising sunglasses.
2. When taking out pots or lifting lids, use oven gloves or a cloth to protect your hands from burning on the hot pots.
3. Slide the two side flaps of the panel inwards in front of the centre and peg them together with a washing peg.
4. Put the bucket or tyre in a sunny spot on flat ground and put the folded panel on it so that the hollow of the panel sinks a bit into the opening. Makes sure it faces the sun.



(If you use tyres instead of a bucket, you can always stack 3 or so on top of each other to put your cooker at working height).

5. Put the pot stand in the centre, put your pot of food with the lid tightly closed inside a plastic bag, and put it on the pot stand. Close the bag and make sure as much sun reflects on the pot as possible.
6. Leave it to cook for several hours. Move the panel from time to time to get the most sun on the pot. (Don't be tempted to open it every so often to check if it is cooking – if the heat is let out of the bag, it takes longer to cook!)
7. Here we use a black pot with a clear lid. You can see the carrots and tomato inside. We plugged the hole in the lid with a little chewing gum to make sure the steam doesn't come out – a steamed up bag lets through less sunlight.
8. When taking out the pot, make sure not to burn your hands. (Yes, it does get that hot!)



## D. HOW TO MAKE YOUR ALUMINIUM POTS BLACK

If you don't have black pots and don't want to buy new ones, you can paint your aluminium pots (Hart or similar) black.

- Sandpaper
  - Schoolboard paint - stir it well to get rid of any lumps before painting.
  - Paintbrush - don't let the paint dry in the brush
  - Turpentine (to clean your brushes)
  - Newspaper to protect your work-surfaces
  - A rag for your hands and brushes.
1. Before starting to paint, first roughen the outside surfaces of the aluminium pot and lid by rubbing it with sandpaper. Remember to do the bottom as well.
  2. Wash and dry the pot well. Dust and grease on the surface will prevent the paint from sticking to it.
  3. Paint a thin layer of blackboard paint on the outside and let it dry completely. Paint another thin layer on and let it dry, preferably overnight.

**TIP** – several thin coats of paint dry faster & are much more durable than one thick coat.



## E. SOME SOLAR COOKING TIPS AND TRICKS:

The cooking speed depends on how hot the day is, how much sun there is, how windy it is, how large the pots are, how much and what kind of food it is. (The more food, the longer it takes to cook, and beans/ lentils cook slower than wet vegetables, for example.)

1. Use only black or dark colour pots, as they need to absorb the sun's heat to cook the food inside. Light shiny pots will reflect the heat away.
2. Make sure the lid of the pot fits tightly, as otherwise too much moisture escapes and steams up the inside of the bag, resulting in less sun entering the pot.
3. Start cooking early to get the most out of the sun. Don't worry about the food burning – it won't burn easily.
4. Don't open the bag or the pot many times to check the food, as it will lose heat and then take much longer to cook.
5. Use less water than you would on a conventional stove, as less will evaporate from the pot.
6. Smaller amounts of food in smaller pots cook faster – rather make a second cooker to use than try to cook with too big a pot on the one.
7. Preparation - cutting the food in smaller pieces will make it cook faster and more evenly.
8. Practice and test with different kinds of food and get to know it. You'll learn quite soon what works and what doesn't.



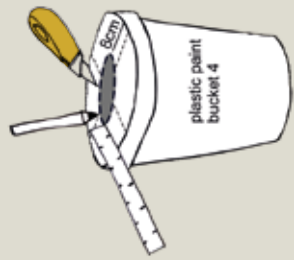
## Preparing the buckets



**BUCKET 2:**  
Make a few holes into the bottom. The small holes will slow the flow of the water.

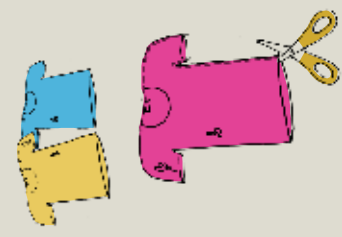


**BUCKET 3:**  
Cut a hole into the bottom and a bigger hole into the lid.

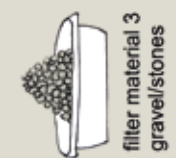


**BUCKET 4:**  
Cut a hole into the lid.

## Preparing the filter materials

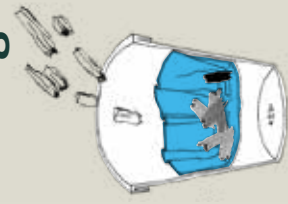


Cut 3 old T-Shirts.



Collect the filter materials. Wash them separately until the water comes out clean. The sand used needs to be similar to river sand (not clay or thick sand).

## Assembling the filtration system



Take bucket 3. Place the cut T-Shirt inside and add washed charcoal. Tie up the charcoal in the T-Shirt and turn upside down so that the knot is facing down. Repeat with sand and gravel. Around half of the bucket should be filled with charcoal and the other half equally with sand and gravel.



ruler



scissors



kokipen



cutting knife



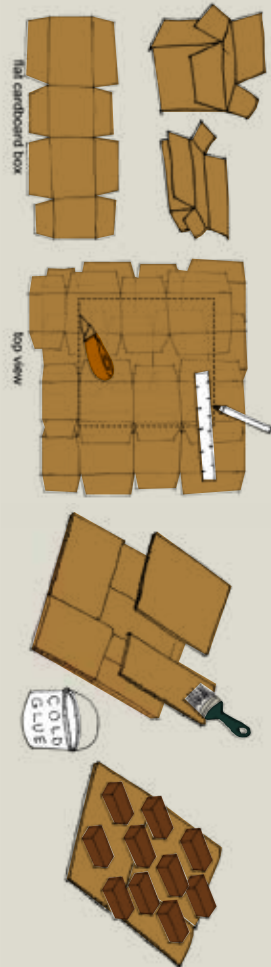
egg cartons



toilet paper rolls

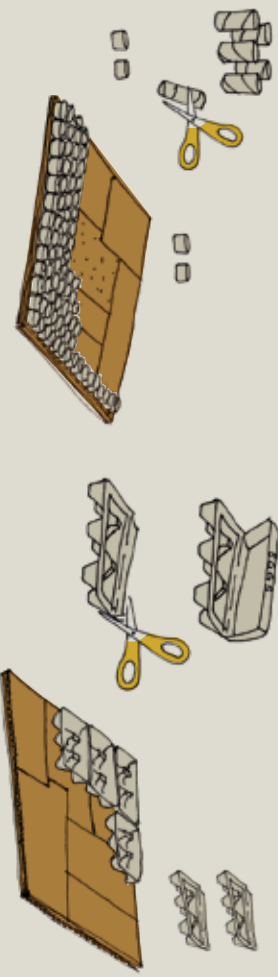


polystyrene/  
styrofoam



### Step 1: Make the side sheets

Each insulation panel needs two sheets of 1.2 metres by 1.2 metres, 2 cm thick. Flatten cardboard boxes and measure a sheet of 1.2 m by 1.2 m. Layer the cardboard until you have a combined thickness of 2 cm for each sheet. Cut out. Glue together. Place a brick or something heavy on top and leave to dry.



### Step 2: Fill the panel

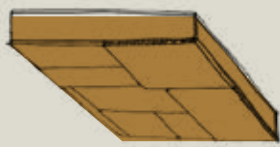
**Option 1:** Toilet paper rolls  
Cut the cardboard centre of a toilet paper roll in the middle. Apply glue to the sheet and stick down. Rolls must be close to each other.

**Option 2:** Egg cartons  
Cut the top section off the egg carton. Apply glue to the sheet and stick down next to each other.



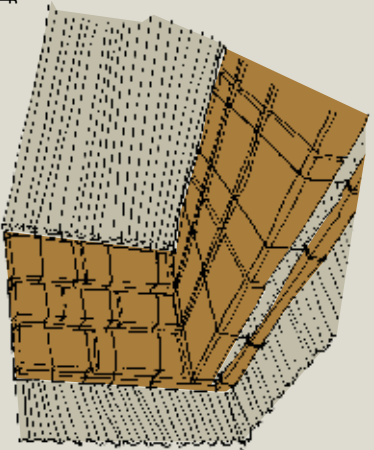
### Step 3: Close the panel

Cut 4 strips of cardboard which fit the thickness and the length of the panel and glue them onto the sides.



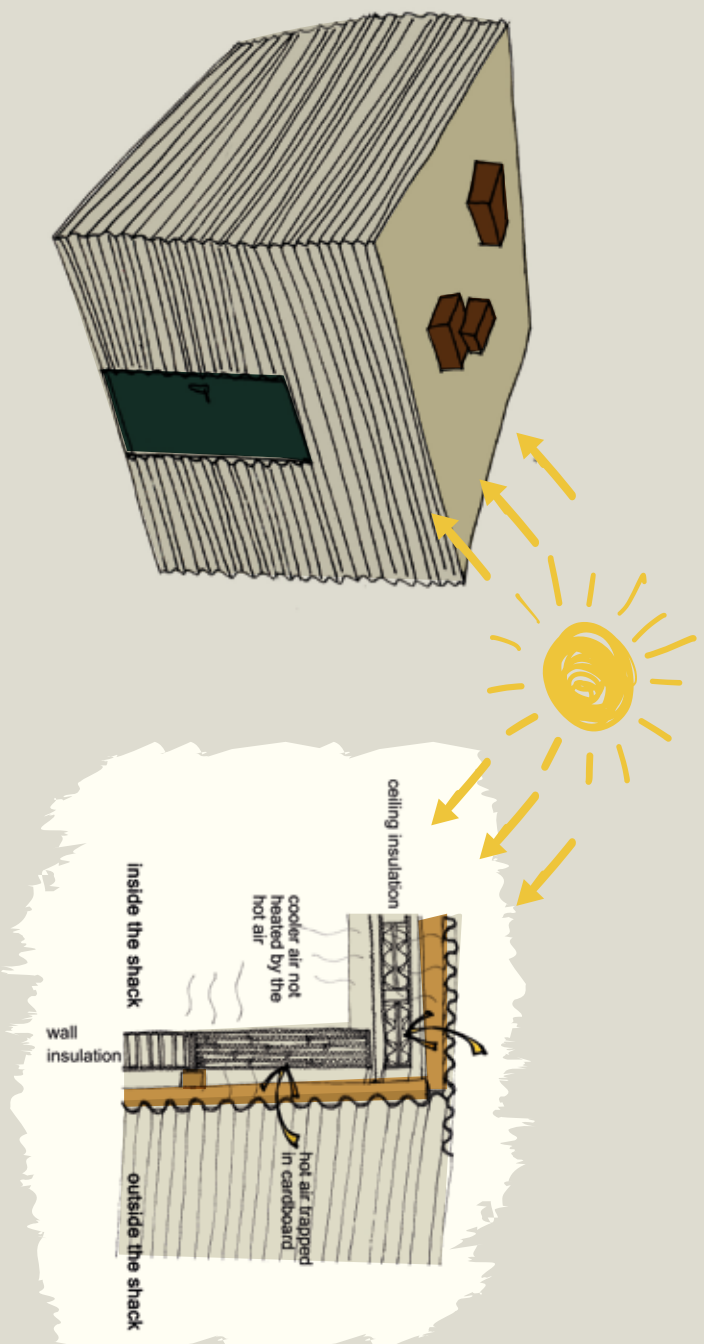
### Step 4: Installation

Install the finished panels inside the shack. Use wires or string to attach them to the roof and west and south facing walls.





# Shack Insulation



Shacks made of corrugated sheet metal get very hot inside in summer. The insulation panels made from cardboard trap the hot air inside them and so help cool the inside of the shack. In winter, they help keep the shack warm.

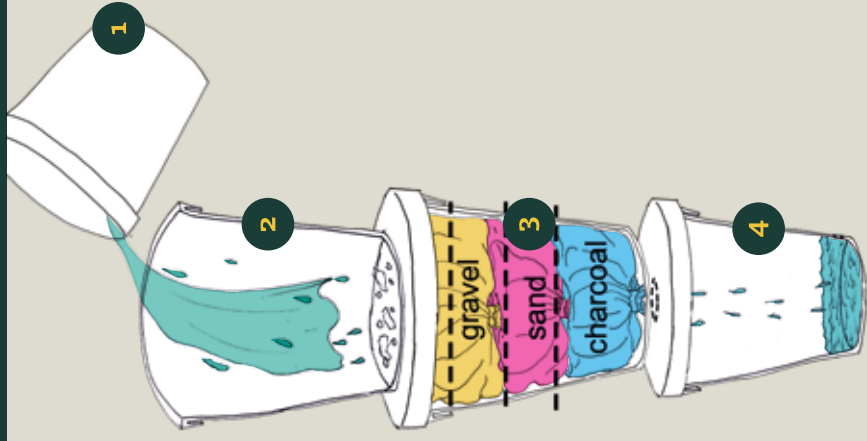
## Tools Needed



## Materials Required



# Grey Water Filter

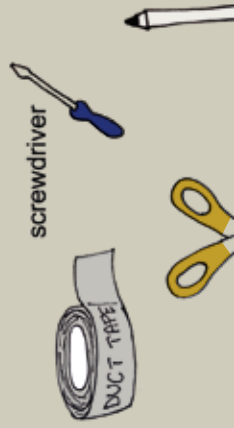


## How to use the Grey water filter

- Bucket 1: Collection
- Bucket 2: Supply
- Bucket 3: Filtration
- Bucket 4: Collection

With this filter, large dirt particles are filtered out of grey water (water used previously for washing). Use gravel, sand, charcoal and cloths as filter material. You can use the filtered water for garden watering, household cleaning or toilet flushing - but not for drinking or cooking!

## Tools Needed



## Materials Required



# NIFTI 3 Solar Box Oven

The **NIFTI 3** solar box oven is made from cardboard and does not have a door. Instead, the box lifts off the base. You put your pots on the base and then put the box over it. To access the pots again, lift the box.

The inside wall of the box shell has a different shape from the outside, to reduce the internal volume in proportion to the size of the solar collector, and improve the oven's efficiency. The reflector lid also has two wings to add more reflection from the sides.



## A. MATERIALS & TOOLS:

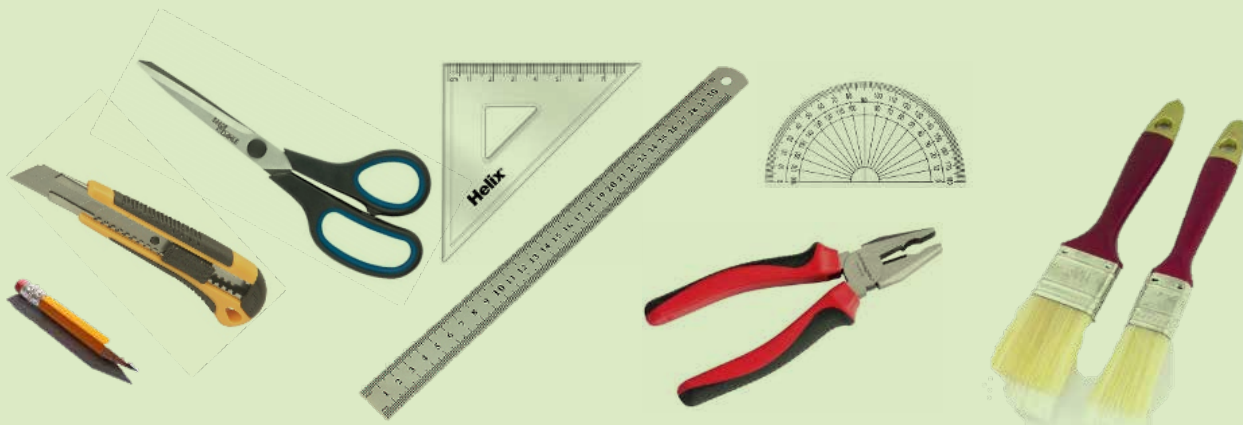
### 1. You can find the following materials for free or may have them already:

- Old **corrugated cardboard boxes** from grocery shops, bottle stores, furniture shops, etc. to make the shell of the box oven. (It should all be of the same thickness and thin enough to fold without breaking. Test it across the corrugations, as this will be the most difficult to fold).
- A damp clean cloth to wipe off excess glue if you make a mistake and another clean dry cloth to dry the glass and remove any residue of glue. You can use any old material if it is clean.
- **Insulation filler** to put inside the shell to keep the heat inside - like crunched-up newspaper, more cardboard, roof insulation offcuts, toilet paper rolls, recycled Styrofoam packaging (the white stuff that makes little round balls when broken – easy to find, works well, but messy and not good for the environment)
- **Empty tins** or plastic containers to mix your glue in & wash your brushes
- **Clothes pegs** to keep glued joints in place till they dry.



### 2. You may have to buy the following materials (see picture below):

- 2 sheets of size 52 cm x 69 cm clear 2 to 3 mm Perspex or 3 to 4 mm glass – just called glass in the instructions, for the collector. Perspex is more expensive, scratches easily, but is lighter and less breakable than glass.
- a thick roll of heavy-duty **kitchen foil**,
- 1 litre **white wood-glue** (also called cold glue, such as Ponal or Alcolin),
- some **string** to tie parts while drying,
- 2 or 3 rolls of very **strong white tape**,
- 4 smooth sticks, about 15 cm long, like sosatie sticks or chopsticks, or straight thick wire to use as spacing pegs for the props,
- some very **thick wire** and **thin wire**, for making the pot stand.



You will need the following tools (some are expensive, but well worth getting):

- a **pen** or **pencil**;
- some paper **scissors**;
- a **utility knife** with replaceable blades (like Stanley);
- a **steel ruler** (having both a 30 cm and a 100 cm one is easiest, but for the long one you can always use a flat strip of metal or wood, as long as it is straight);
- a thin **paintbrush** for painting glue into corners
- **pliers** to bend and cut wire;
- a **protractor** ("grade-boog") to measure angles with,
- a **set square** (triangle with one corner 90 degrees) to make sure that corners are square or a cut square of card with exactly 90 degrees corners;

**3. You will also need the NIFTI 3 paper pattern (pages 42-44):**

The pattern has the following sections:

- the main **box shell** - forms the walls of the oven;
- the solar collector spacers and frame pieces – spaces the glass apart for double-glazing, and securely fixes the glass onto the top of the box;
- the **reflector lid** with wings - reflects more sunshine into the box;
- the **base**, or floor - insulates from the bottom and is loose from the box.
- the props - adjusts the reflector angle and holds it in position.



**4. For cooking you will need, in addition to the solar box oven:**

- One medium and one small **thin-walled, black cooking pot**, like Kangol enamelled pots, or Hart aluminium pots, painted black with blackboard paint;
- very important – **oven gloves** or a cloth to use when taking out the pots (they get ULTRA hot!);
- also very important - a **pot stand** (can be made from wire), or some flat pieces of wood at least 5 cm high - lifts the pot 5 cm above the floor to get reflected heat from the bottom too;
- a **wooden spoon** for stirring and tasting; and of course; **your food**

**B. BEFORE STARTING TO MAKE YOUR BOX OVEN, READ THIS**

Following these recommendations will save you lots of time, effort and probably money as well. Safety is also critical, so take special note of those points.

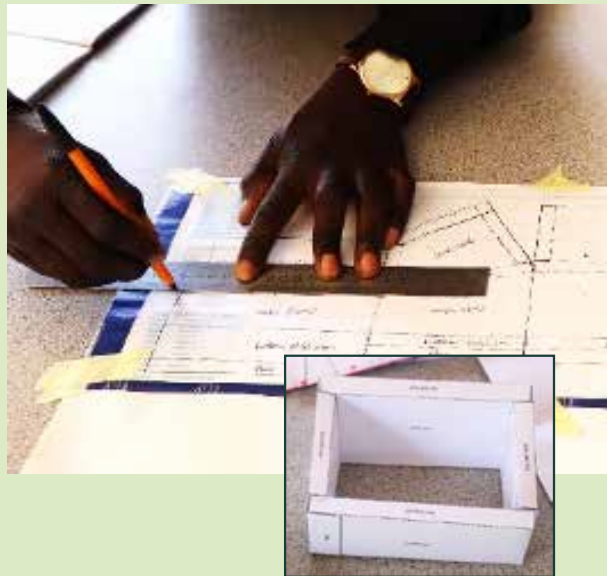
1. Try to build with a friend, rather than alone – it will be easier, and two heads are always better than one when it comes to following instructions.

2. Work on a long and clean flat surface (add some tables together or work on a clean floor). If you cannot find a long enough table or floor space, it is better to cut most parts separately and tape them together, rather than folding them.
3. Read all the instructions through completely first, to make sure you understand. While building, every now and again, re-read ahead, so that you know what is going to happen in the steps after the current one, to avoid mistakes.
5. **BE CAREFUL** when using the utility knife– **it is can cut off a finger!**
  - Put your forefinger and thumb (of the hand not holding the knife), as far away as from each other as you can, on the steel ruler, away from the edge, to press the ruler down and keep it stable. If the ruler slips, you can cut yourself, so be careful!
  - **ALWAYS** cut against the steel ruler to make sure your lines are straight and to protect your fingers.
  - **NEVER** put your fingers or any other body part in the way of the knife.
  - **ALWAYS** pull the knife towards you, do not try to cut away from you, as you will have less control and it can slip more easily.
6. Keep clean water, soap, a towel and some sticking plaster handy, so that if you do cut yourself, you can wash the wound and dress it to stop the bleeding. If someone gets cut, stop everything and first deal with the wound.
7. When cutting, do not try to press hard enough to cut the board with one stroke. Rather cut with a gentle shallow stroke and repeat it 3 to 4 times until you are through the whole cardboard thickness. This will both make it easier and result in a neater cut.
8. Put a thick piece of cardboard as a cutting mat UNDER any cardboard that you are cutting with the utility knife. This will make sure that you do not blunt or break your knife.
9. Mix the glue 50% with water, and apply it in thin even strokes. If it is too thick, it will spread out too much and there will be glue all over the place, not just where you want it – a sticky mess.
10. After applying glue, leave it for about half a minute, it will stick more easily.
4. **VERY IMPORTANT:**  
First fold all the pattern pieces and make sure it fits before gluing or taping anything. Having to remove tape or cut open again after gluing will mess up the parts and you may have to re-cut from the start.
11. Only apply glue to cardboard, NOT foil, as it will make the foil difficult to handle.
12. When you mark out any patterns, make sure that the lines are square (that they are 90 degrees with each other) and check frequently with the protractor or set square. If they are not square, the panels will not fit together, and you will struggle to get it all assembled.



### C. MAKE A TEST MODEL FROM PAPER

1. Before you start building the oven, first make a small paper model - take one of the two 1: 10 scale patterns and cut it out of normal paper with the scissors around the outside and on all the solid lines.
2. Now fold these pieces of paper along the dotted lines and put it together to make sure you understand how building the oven works. You can follow the steps for the large oven for the folding and putting together. This is much easier than doing the whole thing, making a mistake and having to start again.



### D. BUILDING THE REFLECTOR LID

You can start with the reflector lid, so that it can dry while you are building the box shell, but the sequence of the different parts is not critical. While glue is drying on one piece, carry on with another to save some overall time.

1. Tape together enough flattened cardboard boxes to get a sheet big enough for the pattern piece.
2. Mark out the whole pattern on the cardboard, using the ruler, even the lines that will be folded and not cut. Use a dash line for the fold-lines and a solid line for the cut lines, then you won't confuse them. Make sure everything is square!
3. Cut out the outline of the lid, as well as the slits shown between the main reflector and the wings. (Don't make the same mistake as we did of putting on foil before cutting the slits, which made a mess of the foil when we had to cut the slits.)
4. Fold along the lines of the lid inner and outer sides and outside edge. Make sure you fold to the correct side, (the wings fold the other way from the rest).
5. Glue the flaps to the sides and tape over the joints. Keep the inner edge open so that you can insert the insulation there.
6. Through the open inner edge, stuff the cavity with your insulation material. Make sure it is packed tightly enough that it will not shift over time, but not so tight that it makes the side of the box bulge.
7. Glue and fold in the flap that would seal the cavity. Tape it in place. Leave it to dry while working on another piece.



## E. APPLY FOIL TO THE REFLECTOR LID

1. Cut the foil to the right length and so that it slightly overlaps the long edge of the area to be foiled. You will need two strips for the wider sections.
2. Mix the wood glue half-and-half with water in small amounts (just as much as you need for the next task) and stir it well.
3. Paint glue on the cardboard in thin, even strokes & let the glue dry a few seconds till it is tacky & not so wet.

**TIP:** Make sure to wash the brushes well in water if you are not going to use them for some time (more than an hour or so), as the glue may set and permanently damage the brush).

4. Hold the foil piece you have cut to size on either side so that it sags in the middle. Gently lower so that the centre touches the cardboard first.

Then gently lower it more on either side so that the foil flattens out.

It is helpful to be two people - one holding the foil and another flattening it out.



5. Use a roll of soft clean fabric to smooth the foil away from the middle while it drops down and try to avoid making creases in the foil. Cover the entire inner lid and inner wings with the foil in this way.

6. Leave it to dry and carry on with one of the other pieces, like the box shell.

7. After the glue has dried, cut the edges off. There is no need to take it around the edges of the reflector lid, as the edges will be protected by tape.

8. First tape the rounded corners: Put the tape on the thin edge so that it stands up on both sides. Make 4 to 5 vertical cuts around the curve and fold each piece down in turn to the surface. This keeps the tape from bunching and gives stronger and neater corners.

9. Tape the sides by putting half the width of the tape along the edge on the foil, and folding it over onto on the other side. Overlap with the corner tape pieces to cover the entire edge.

10. Tape the slits by applying tape to the one side of the slit and pushing it through the slit to fold back on the other side. Do both sides, and then put tape on the ends that overlaps the slit by about 4 cm.

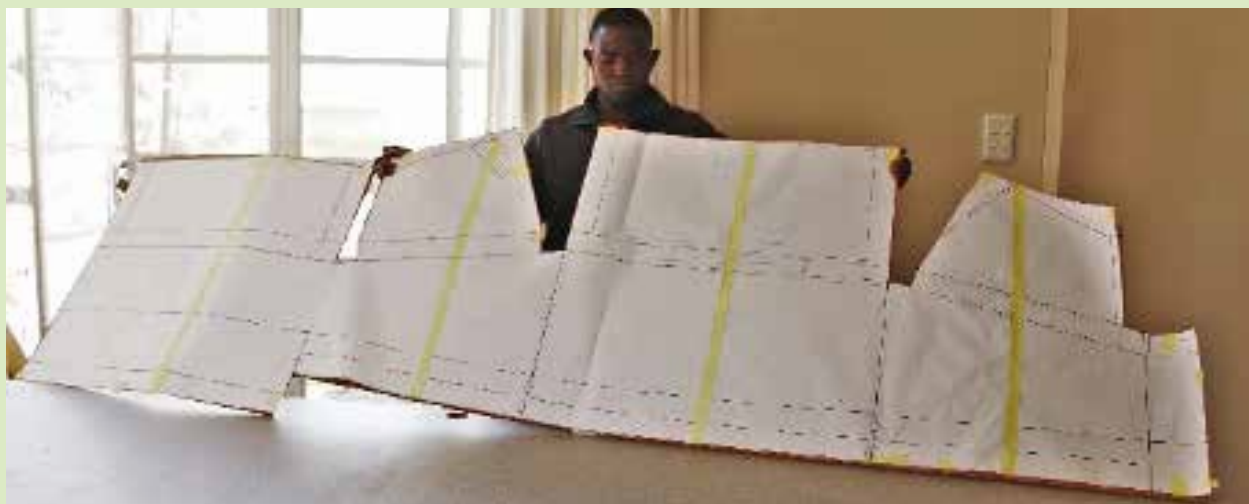
Split the tape with the utility knife along the slit sides and push the central portion through and stick it to the other side.



## F. BUILDING THE OVEN BOX SHELL

We are calling it a shell, because it is double sided and you put the insulation inside the two sides of the "shell".

1. Follow the same steps as 1 to 3 of the REFLECTOR LID. Here you can see the paper pattern on the cardboard after the outline is cut.





2. Cut out the outline of the box, but don't cut the notches or slits between panels yet. (Here Riaan is holding the outline, before the notches and slits between panels have been cut).



- Crease the cardboard along the fold-lines (see photos at step 6). Fold in the following sequence:
    - First make the bottom fold-over and bottom flap folds (fold to the back).
    - Then make the centre fold-overs (fold to the back).
    - Now do the box side folds and outer side flap (fold to the back).
    - Now do the side flaps for the inners (fold to the front)
3. You can now flatten the entire panel again to cut the notches and slits as in the photo.



4. Now only cut out the notches indicated on the pattern. By not cutting out before folding, you are making sure that the folds are all lining up across the panels.

5. Once all the notches and slits are cut, you can measure out the foil and glue it on the inner faces and fold-overs of the box, in the same way as for the reflector lid (steps 1 to 5).



6. Make sure that the foil is glued over the folds already folded to their maximum – i.e. in such a way that there is extra foil to go over the fold, otherwise it will tear when you fold it finally. (You can add another foil layer later, so not to worry too much if it does tear).



7. For the box, unlike the reflector lid, make sure that the foil goes over the edge, to waterproof the cardboard.
8. Cut slits in corners to make neat fold-overs in the foil, and glue the foil to the other side, about 2 cm wide.
9. Let it dry quite a bit before the next step while continuing with one of the other pieces.
10. Now assemble the box by folding in the sides to make the 4-walled box.



11. Glue the outer side flap to the front outer edge, make sure everything is square and tape over the joints. Leave it to dry a little before continuing.



12. Fold the top fold-overs and the inner sides to the inside.

**NB: Don't glue anything until you are sure everything fits as it should!**



13. Once you are sure it all fits well, now glue the flaps to the side panels on the inside of the cavity between the outer and inner panels.

If the cardboard is thin enough you can also staple it together after gluing. If so, ensure that the flat side of the staple faces the inside of the oven, so that it cannot break the foil liner later.



14. Use a washing peg to keep the joint in place and put some stones in to keep the two sides of cardboard together while the glue dries.

Do NOT do the bottom fold-overs yet! They must be open for the insulation to go into the cavity.



## G. INSULATING THE BOX SHELL

1. When the glue is dry, stuff the cavity with your insulation material like you did for the reflector lid (step D 6).
2. Now you can do the bottom fold-overs, then glue the flaps and slide them in to seal the filled cavity. Tape the edges to keep the surfaces in place while the glue is drying.
3. Line the inside and bottom of the box with another layer of foil (especially where the foil has torn on the fold line). It is crucial to take new foil over these tears, to protect the cardboard from getting wet .

(Here you can see Riaan putting foil on the underside of the box. The collector frame sides are tied to the box with string, while their glue is drying)

4. After this, tape along all the folded edges, to seal any gaps than might have occurred.



## H. FIXING THE SOLAR COLLECTOR IN PLACE

The solar collector is made of two layers of glass with a spacer between them to make double glazing, fixed to the top of the box with a cardboard frame. Less heat will escape the box through double glazing than through a single glass pane.

1. First cut the spacer pieces from cardboard. You need between half and one cm space between the two panes of glass, so, depending on the thickness of your cardboard, you must add more pieces and layer the card so that your combined spacer pieces at least half a cm or up to 1 cm thick.
2. Glue your spacer pieces in layers together to make a frame, making sure that you alternate the corner overlaps to make it stronger, and that they are completely square.
3. Now put tape around the inner edges of the spacer frame to protect it from moisture. (We used foil in the photos, but the tape should work better).
4. Put the first sheet of glass on the box and tape the edges to keep it in place. Make sure that the tape doesn't go over the inner edges and cast shadows on the inside.
5. Put the spacer frame on the first sheet of glass/ Perspex and tape to keep it in place. We used glue, and it makes a mess, so don't glue it – rather use tape.
6. Put the next sheet on top of the spacer (first make sure that both panes are completely clean, as you won't get the dirt out once it is sealed); and tape all round to secure it in place.
7. The size now depends on how the size of your folded box, which may be different from the pattern. Thus measure the size of the completed box and then mark out the frame pieces. Cut out only the basic outer frame pieces, without mitres or angles.
8. Fit the basic frame cut-outs to the box and mark the side angles and the mitres. Do not cut the 45-degree (mitre) corners off until you have checked it carefully.

You may have to fit and mark it several times before it is correct. You can use also a life-size paper pattern and tweak it until you have it just right, before using it to mark out and cut the cardboard.



9. Now you can glue on the frame over the double-layered glass to keep it in place on the box. First glue the top edges, let it dry with the box upside down, then do the sides one-by-one, each time putting weight on it while drying. Make sure the glue has set a bit before you put the pieces together, so that you do not get streaks of glue squeezing out or dribbling onto the glass from the joint. Put weights against the glued sides to keep it in place until it has dried.



### I. FIXING THE REFLECTOR LID TO THE BOX OVEN

1. Fold the reflector lids inwards to lie flat on the reflector. Put the lid with the wings on the underside on top of the box, with the long end piece folded down and fitting flat to the back of the box. Mark the line where the end piece meets the top of the box. This will be your reflector lid backwards fold line. Crease this line so that it can fold backward.
2. Put glue on the end piece of the reflector lid and on the back of the oven, and fix them together.
3. Let the box lie on its back so that you can weigh the glued panel down. You may have to tie the lid to the box so that it doesn't flap open, or support the end piece below. Here the lid is open on the right, with the wings folded in, and we used cardboard to support the end piece.
4. Let it dry thoroughly and then tape the joint between the collector and the reflector lid, to reinforce the joint and ensure that it doesn't open up the glued joint.



## J. BUILDING THE BASE

The base or floor of the solar box oven is like a tray, with the bottom insulated to keep heat from escaping downwards, and the edges raised to keep the box in place.

1. First make the top INNER cover of the base by cutting a rectangle which is 6 cm larger than the completed box bottom (measure the one you made – don't just use the pattern!). Fold up 5 cm for the sides and glue the corner flaps together. Hold in place with clothes pegs and let it dry.
2. Now make the bottom outer cover of the base by cutting a rectangle which is 11 cm larger than the completed box bottom (Again, measure the one you made – don't just use the pattern!).
3. Fold up 10 cm for the sides and glue the corner flaps together. Hold in place with clothes pegs and let it dry.

Fill the second tray 5 cm high with insulation material, packing it tightly so that it cannot shift.

4. The photo shows the sides of the tray only 5 cm high. They should be 10 cm high and stick out 5 cm above the insulation.
5. Put glue on the outside narrow side of the first tray and slide it into the second tray to cover the insulation. Peg the edges and let it dry.
6. Now glue foil to the inside of the inner tray, taking it up to the edges. Make sure that the foil goes right into the corner, otherwise it will tear when you put the box into the tray. You can also glue on a second layer of foil for durability.

7. Tape the top edge of both trays together to make a secure and waterproof edge.

Here the picture shows a wide edge, but if you followed the instructions, you will have a narrow edge.

8. You can now fit the box onto the base.

If you used the actual measurements of the box when making the base, it should fit perfectly, with about half to 1 cm between the base and the box. This tolerance is necessary to make sure that you don't damage the base by forcing in the box.



*Here we made fold-overs for the tray for a wide edge, but this is not necessary.*



## K. MAKING AND INSTALLING THE PROPS

The props are just long flat sticks to keep the reflector lid at the right angle and prevent it or the wings from blowing backward. If you cannot find flat sticks, you can use cardboard. You can also make a wire alternative from very thick wire with loops all along it to fit around the spacing pegs.

1. Cut out several pieces of cardboard 5 cm wide and 81 cm long, enough for 2 that are about 1,5 cm thick.

Glue them together in layers until they are thick and strong enough not to bend sideways. If the corrugations in each layer run in the opposite direction of the layer before, it will be stronger.



2. Make holes at 7,5 cm intervals from each other along the stick. Start the first one at 3 cm. Make sure that the second prop lines up with the first. Drill the holes with a hand or electric drill, or burn it through with a thick wire heated in a flame. Make sure that the hole is big enough for your pegs to stick through, but not too loose so that they fall out easily.



3. Make holes in the side of the reflector lid and the box on the 6 points shown on the pattern, and slide in the pegs. Make sure the hole is in a spot where there is insulation the whole way behind – don't make a hole through to the inside of the oven! (We used a hammer as the insulation was very thick).



4. Push the props through the wing slit and stick the sticks through the prop-holes into the box holes in the right position.

5. The angle of the reflector lid can be adjusted by moving the pegs to different holes.



6. The wing props are made by cutting at least 6 to 8 layers of card in strips about 8 cm wide by 81 cm long. Glue 3 or 4 layers together. & allow to dry.

7. Drill two holes into one end of each prop about 8 cm away from each other. You will later tie the two pieces together with string through these holes, so that the wing prop can be dismantled for storage.

8. Cut 2 cm long slits at right angles to the long edge and at 5 cm spacings from each other. The slit must be 2 or so mm narrower than the thickness of the wings.

9. Prop the wings by sliding the prop over the wing top edges and holding it in place through the slits.

Your oven is now ready to use, with the box and reflector all assembled, the base in place and the props ready to use.

The props and the spacer pegs are not fixed permanently to the box, to make it easier to transport the oven.

You can keep them at an angle inside the box when not in use, taking care not to make holes in the foil



## L. HOW TO MAKE YOUR ALUMINIUM POTS BLACK

If you don't have black pots and don't want to buy new ones, you can paint your aluminium pots (Hart or similar) black.

- Sandpaper
- Schoolboard paint - stir it well to get rid of any lumps before painting.
- Paintbrush - don't let the paint dry in the brush
- Turpentine (to clean your brushes)
- Newspaper to protect your work-surfaces
- A rag for your hands and brushes.

1. Before starting to paint, first roughen the outside surfaces of the aluminium pot and lid by rubbing it with sandpaper. Remember to do the bottom as well.
2. Wash and dry the pot well. Dust and grease on the surface will prevent the paint from sticking to it.
3. Paint a thin layer of blackboard paint on the outside and let it dry completely. Paint another thin layer on and let it dry, preferably overnight.

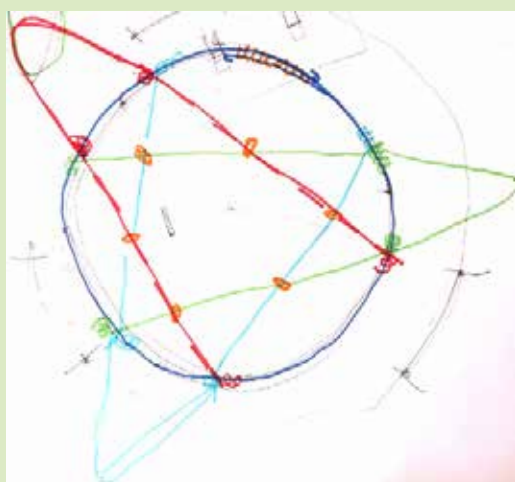
**TIP** – several thin coats of paint dry faster & are much more durable than one thick coat.





### M. MAKING POT STANDS OR TRIVETS

1. First draw a circle a bit smaller than your pot on a piece of paper. Then draw three loops as shown, sticking out between 5 and 10 cm out from the circle, and continue their lines across the circle to the opposite side. (We used different colour markers to help us work it out)
2. Now cut a piece of thick wire long enough to match the circle plus about 5 cm. Bend the ends of the circle wire back in small loops & use thin binding wire to tie it into a circle (the loops keep the circle from pulling loose).
3. Cut three pieces of thick wire as long as each full loop, plus about 6 cm.
4. Twist the loops around the circle wire to make the legs, take them across the circle and twist them there to secure them. (After you have done 1, you can weave the wire of the other 2 over and under to make it more secure and flatter).
5. Tie the intersecting wires to each other with binding wire to make it more secure.
6. Make sure that any ends of wire face inward into the circle, so that they do not cut the foil of your cooker during use.
7. Press on the stand or put a heavy weight on it to see if you made it strong enough to carry a pot full of food.



### N. HOW TO COOK WITH YOUR OVEN

1. Safety first – do not look directly into the shiniest part of the box oven, as doing so repeatedly is bad for your eyes. If you can, wear polarising sunglasses.
2. When taking out pots or lifting lids, use oven gloves or a cloth to protect your hands from burning on the hot pots.
3. Place the oven base on a level surface with its long side facing the sun (we used a pallet and some bricks to make it level).
4. Put your pot stands on the base and your pots on the stands. Make sure that the pots are about 10 cm away from the back of the base tray edge.
5. As you can see, we used some sticks initially, but the pot stands we made later are much better as they allow more reflection onto the bottom of the pot and much less shade onto the bottom of the cooker.



6. Lift the box over the pot and pot-stand and put it down on the tray, so that it fits snugly inside the side upstand of the tray.
7. Lift the lid and open out the wing reflectors, then push the props through the wing slits and peg them to the top hole in the side of the lid. Note the small red line on the peg – this is to show that the peg must not go in deeper, to make sure the prop doesn't pop out or the peg slides completely into the lid.



Adjust the angle of the lid until you can see a bright reflection on the front inner face of the oven, and push the other chopsticks through the props into the bottom hole in the side of the box, at the ideal angle.

8. You can now also adjust the wings to shine on the opposite inner sides of the box. Here you can see the lid is too low and casting a shadow on the glass, and the wings are not reflecting any sun into the box.
9. Turn the box towards the sun and adjust the reflector tilt about every hour to make sure that you get the maximum sun.



You can do it so that the best angle is reached a little later than when you do the adjustment.

10. After enough time has passed for the food to cook, close the lid and lift the entire box off from the base. Put the box bottom down on a clean surface, to keep as much heat inside and prevent damaging the underside.
11. Check your pots, stir, and put back the box if the food is not yet ready.
12. If the food is ready, but it is not yet time to eat, fold in the wings and close the lid to keep the food warm inside. The oven can also work as a 'hotbox' for ultra slow cooking.



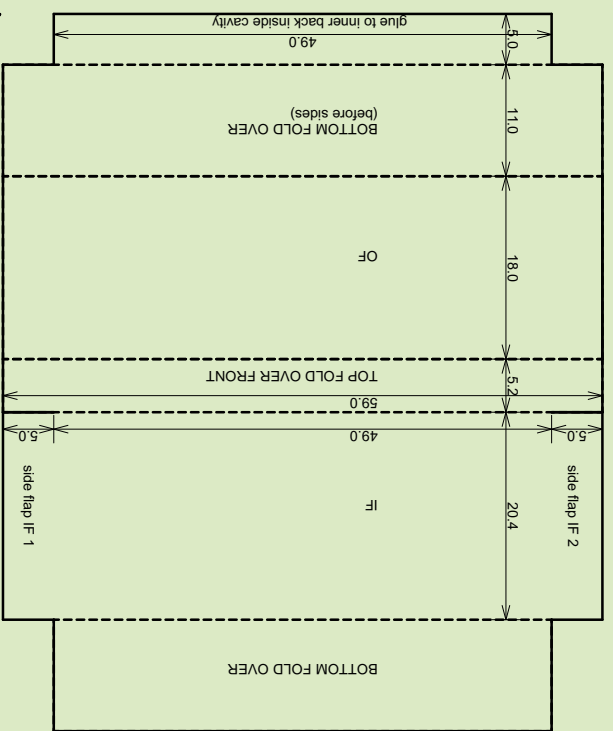
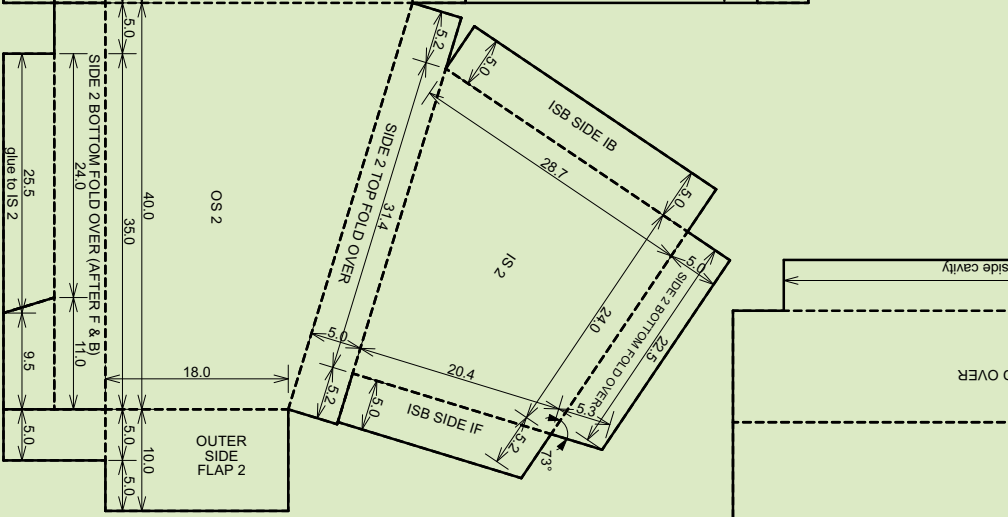
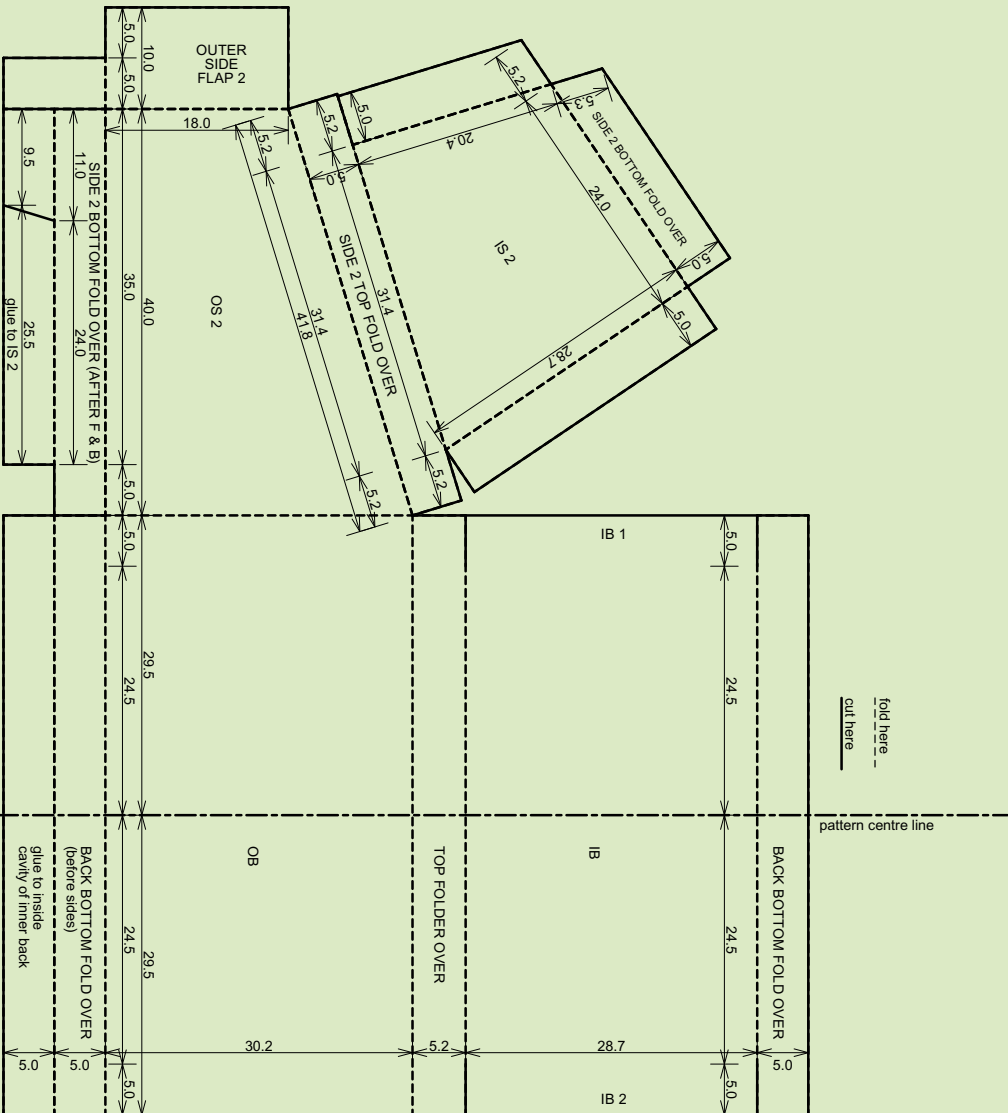
## 0. COOKING TIPS AND TRICKS:

The cooking speed depends on how hot the day is, how much sun there is, how windy it is, how large the pots are, how much and what kind of food it is. (The more food, the longer it takes to cook, and beans/ lentils cook slower than wet vegetables, for example.

1. Use only black or dark colour pots, as they need to absorb the sun's heat to cook the food inside. Light shiny pots will reflect the heat away.
2. Make sure the lid of the pot fits tightly, As otherwise too much moisture escapes and steams up the inside of the collector glass, resulting in less sun entering the box.
3. Start cooking early to get the most out of the sun. Don't worry about the food burning – it won't burn easily.
4. Don't open the oven a lot many times to check the food, as it will lose heat and then take much longer to cook.
5. Use less water than you would on a conventional stove, as less should evaporate from the pot.
6. Smaller amounts of food in smaller pots cook faster – rather make a second box oven to use than stuff the first too full.
7. Preparation - cutting the food in smaller pieces will make it cook faster and more evenly.
8. The solar box oven is ideal for dishes that need slow cooking – rice, stews, soup, etc.
9. Practice and test with different kinds of food and get to know it. You won't have instant success – a lot depends on how you use the box oven. You'll learn quite soon what works and what doesn't.

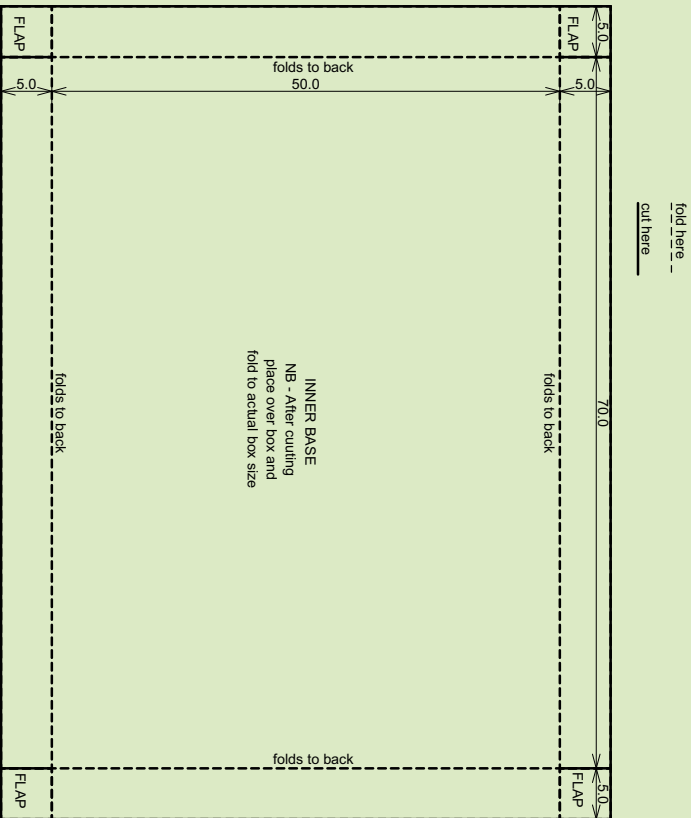
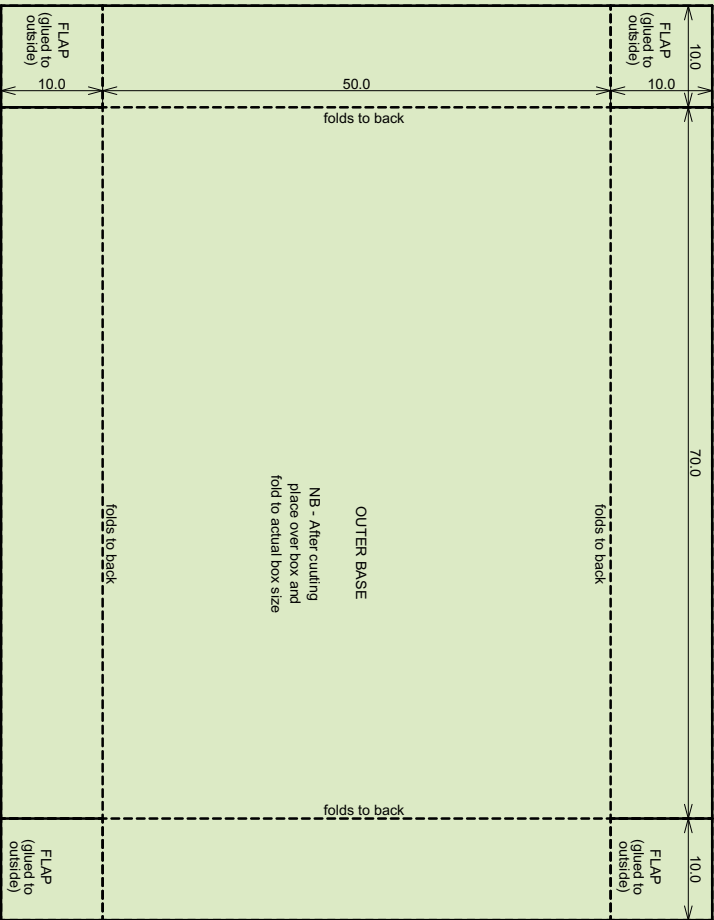


**Enjoy! Solar cooked food is also much healthier – make sure you get in enough veggies and you will save money and be healthier at the same time!**



DWG No.: P.01 DWG Name: Main body  
**SOLAR BOX OVEN PATTERN**  
 date: 2020/08/11 revision: 01 version: Solar Oven Mark III

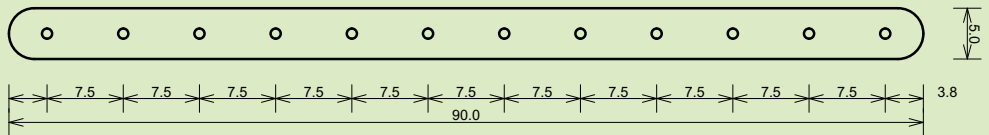
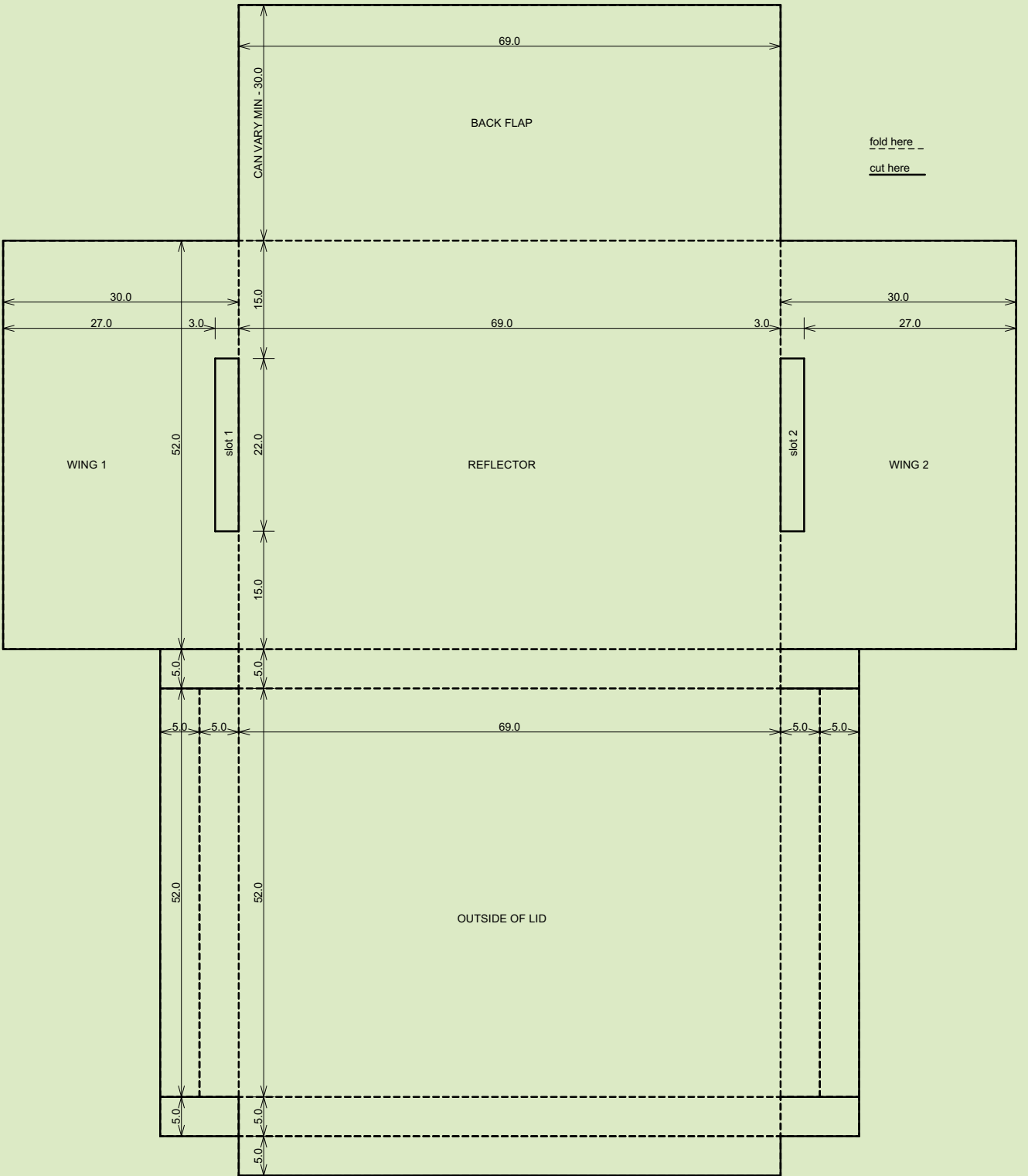
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DWG No.: P.02 DWG Name: Base  
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PROP  
glue together  
glue together  
layers of  
cardboard

DWG No.: P.03 DWG Name: Lid and Prop  
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