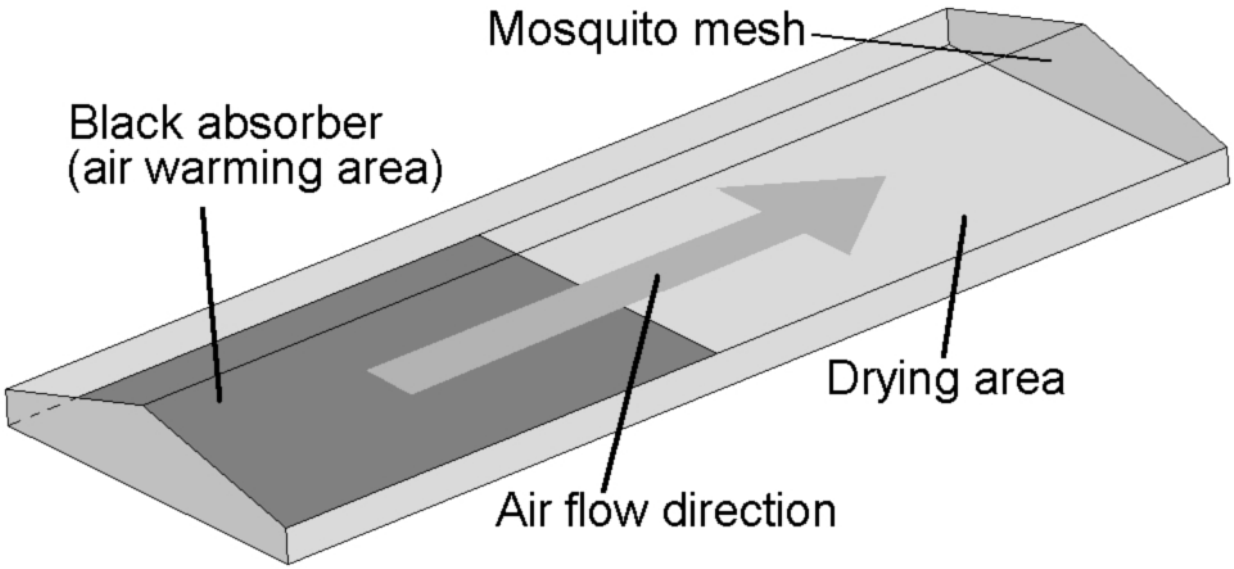
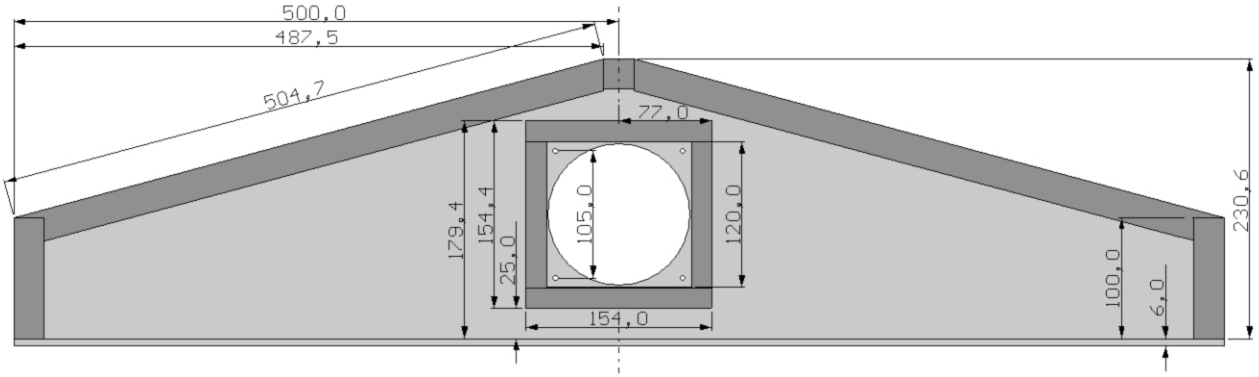
THE SOLAR TUNNEL DRYER TYPE KISUMU



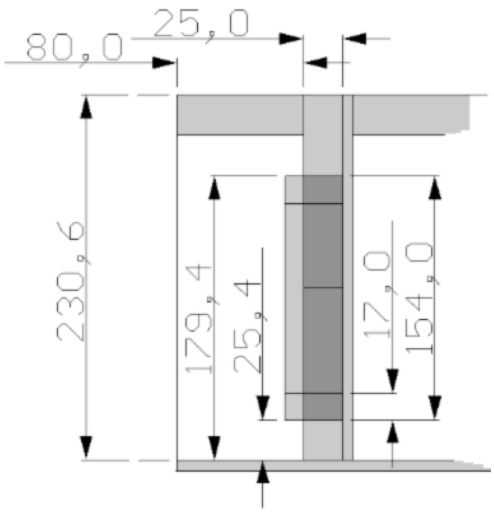
The air inlet

The air inlet wall, also called front wall, shall be constructed according to following drawing, which is designed for a fan with the dimensions 12 by 12 cm. Common fans come also with the dimensions 8 by 8 cm. In this case, just change the air linlet hole. The stabilisation rods are mounted outside.



Drawing 1: All the dimensions of the front (air inlet) wall in mm. The total outer surface is 1.168 m^2. To drive the air with a speed of 1m/sec. through the system, a fan with a capacity of 600m^3/hr. shall be chosen. For food drying purposes, the fan shall move the air with a speed of 20cm/hr. which requires a fan with the capacity of 120m^3/hr.

For the already supplied fan of 0.3 Amps, a solar PV module of 7.2 Watt is sufficient for all sun positions above 20° which covers the time zone from 1 hour after sunrise until 1 hour before sunset. During the 2 remaining hours, the air movement is slower.



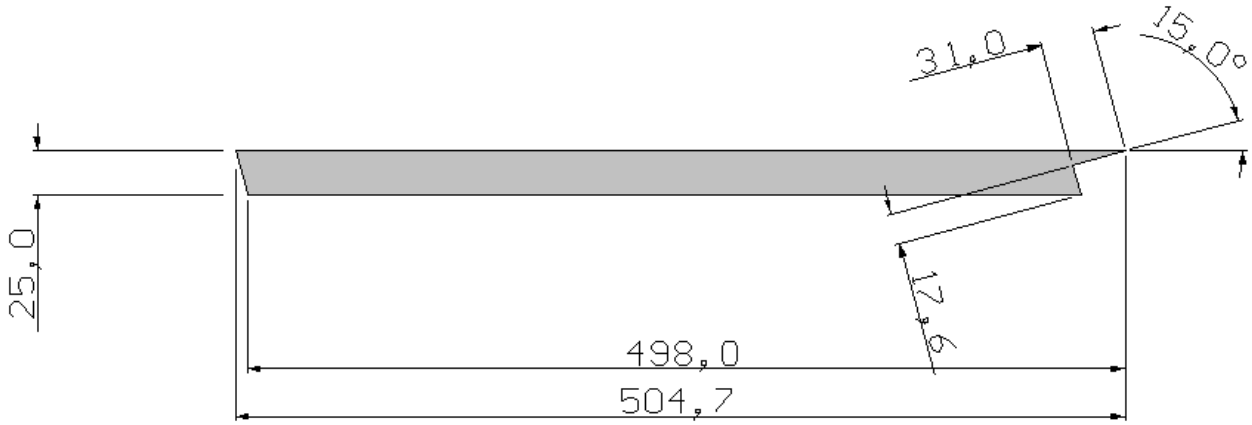
Drawing 2 (left) shows the position of the fan covering and protecting frame, seen from the side. This frame is mounted 25.4 mm (1 inch) above the ground level of the solar food dryer. *If it is mounted higher, the frame won't fit on the upper end. If lower, dirt and insects could agglomerate underneath.*

The gable is extended by 8 cm (80 mm) to attach the solar PV module. The support for the PV module will be constructed on site according to the variable dimensions.

The extended gable can also serve to support other devices, such as a thermo-switch, a five Volts DC plug to charge USB devices or a rain cover. If time allows, the participants at the workshop will be thoroughly educated about various possibilities.

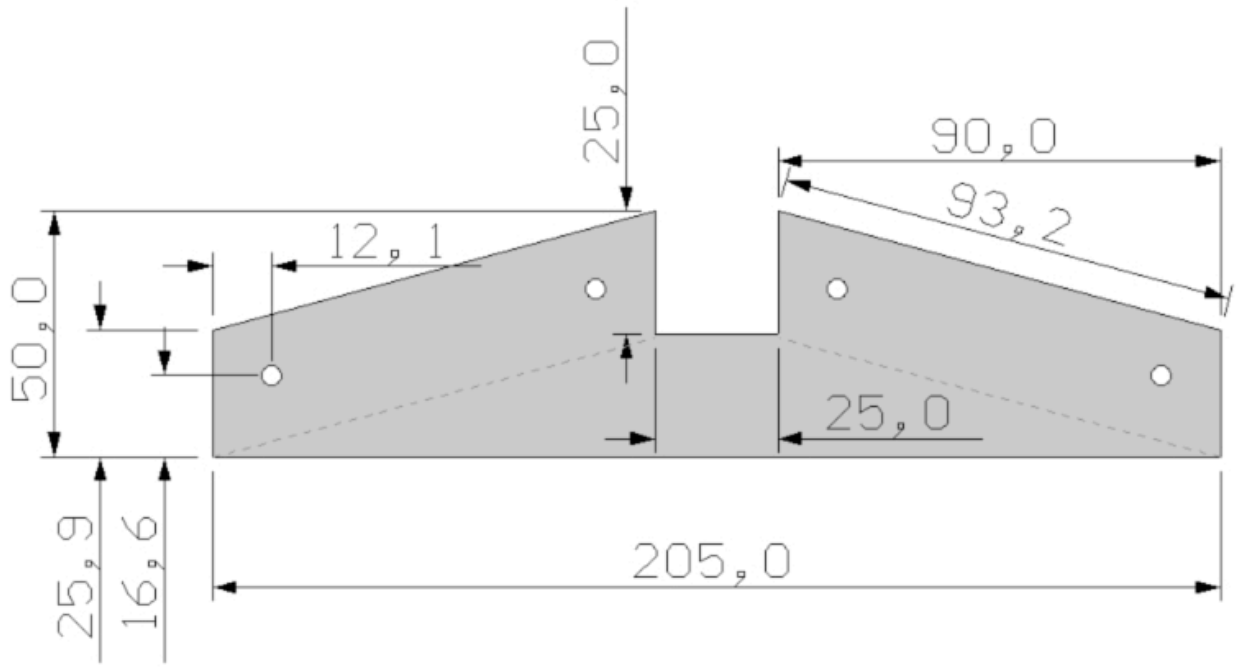
The gable

The function of the gable is to keep the cover in shape and to ensure the slope of about 15°. The roof beams must be cut precisely according to the following drawing.



Drawing 3: Cut the roof beams out of 25 by 25 mm wood strips. For the solar dryer of a length of 5 metres, 12 of them are necessary. Dimensions in mm.

As the middle of the gable is quite instable, a stabilisation plate must be cut out of plywood or metal and mounted on them, where they meet.



Drawing 4 explains how the stabilisation plates – 6 of them – shall be cut. The gable beam from front to rear will then rest in the square shaped cut-out in the middle. Dimensions in mm.

The chassis

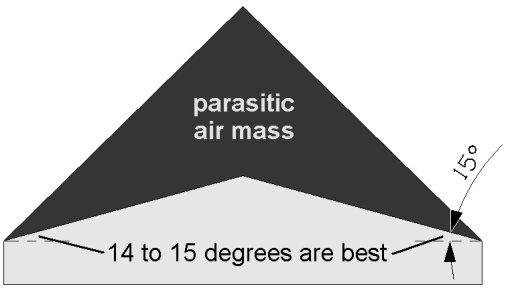
The warming part of the body is about ½ of the length. The drying zone is the other half.

Drawing 5 (left): The chassis for the warming section is 8 cm shorter, to host the fan and possible other devices on the front plate, where the air inlet is intended.

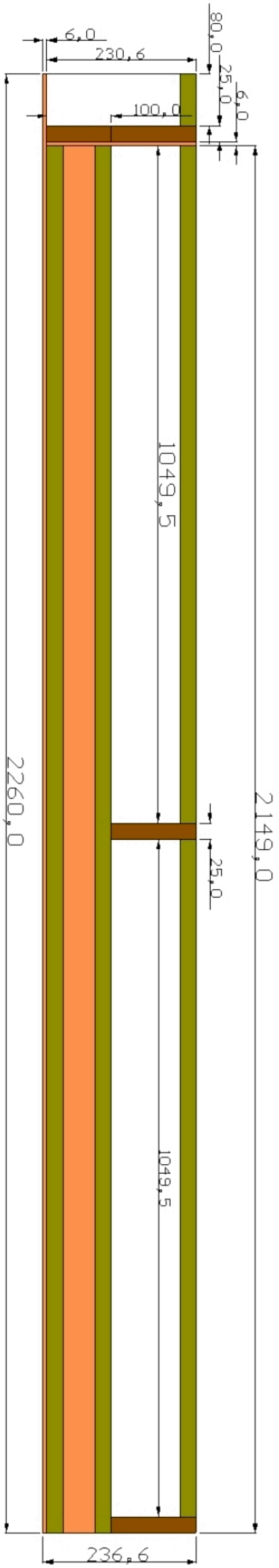
Drawing 6 (right): The chassis for the drying section carries the mosquito mesh only, to reduce the resistance to the air flow. Dimensions in mm.

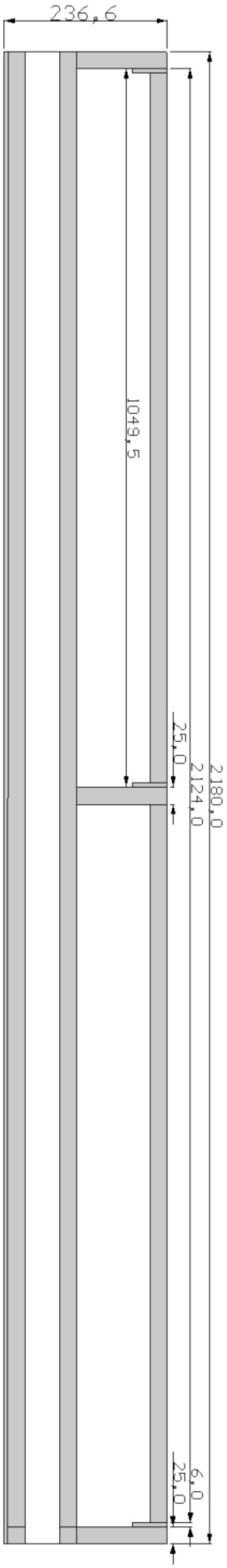
The air warming section and the drying section shall be mounted together, preferrably with screws. This allows to extend the system, once you have to dry more. Explanations how to solve this, the maximum extension, etc. will be given on site.

Please do not change the slope of the covering plastic. If it is less than 14°, condensed water could drop on your goods. If it is more, you'll create space for parasitic air mass. Then you would need a stronger fan and PV module.



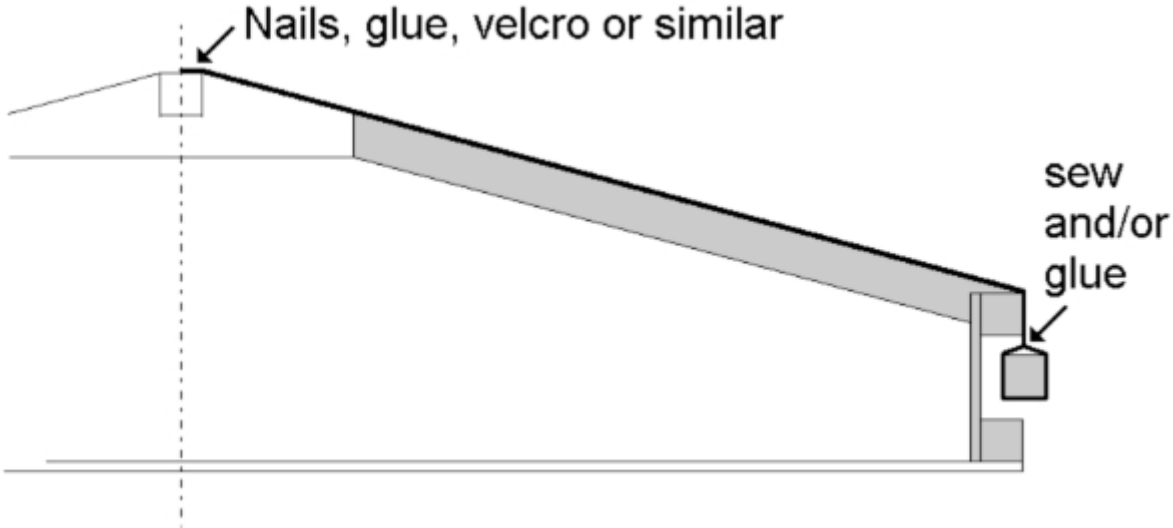
Drawing 7: Never take a steep cover into consideration to avoid the warming of parasitic mass.





The covering foil

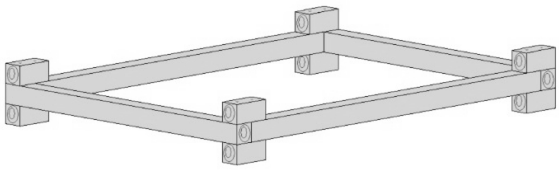
The entire system must be covered with a transparent foil for smooth and successful operation. It must be fitting well in order to prevent warm air to escape. The foil also protects the system of dust, dirt and moisture.



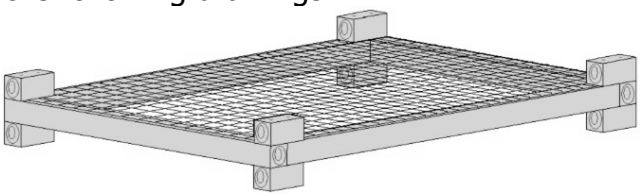
Drawing 8: Fix the foil to the gable rod with nails, double sided tape, glue or similar. In case you use nails only, please take the small upholstery nails. The lower part must be opened to insert and remove the food trays. For this reason, a long wooden strip (or bamboo, etc.) shall serve as weight to keep the foil straight. The foil shall jut out the front and end wall and shall overlap in the middle part(s) of the dryer.

The food trays

The food trays shall preferrably made as per the following drawings:



Drawing 9: the distancers on every corner ensure utmost stability. This way of construction allows stacking as well.

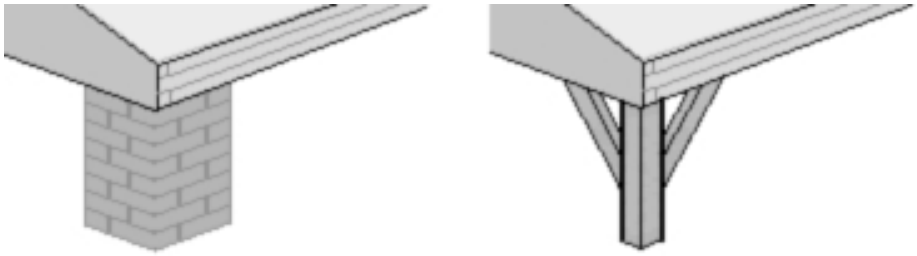


Drawing 10: the ready-made food trays with plastic mosquito mesh. Metallic mesh will corrode due to the fruit acid.

Please try to make the food trays min. 2 cm smaller than the inner compartment area of the solar food dryer to insert and remove them easily.

The support

The solar food dryer shall never rest on the ground but be installed elevated to working height. Usually, this is about 90 cm.
Considering the rim has 10 cm, the support's height shall be 80 cm.



Drawing 11: Support variations.

The orientation

The solar food dryer's front side (air inlet) shall be positioned to the opposite of the sun to gain utmost radiation. Since the drying time shall be extended to the maximum, it must show to the east. Hence, the wall with the air outlet is on the west. This is not valid in case the location where the solar dryer is installed has to withstand strong winds from a certain direction. In this case, the fan wall shall face the wind and gain additional support.

Storing the dried foodstuff

The dried fruits shall be stored in air tight containers of any kind. This can also be stronger plastic bags. Light Polyethylen plastic bags are inapplicably.

Photo 1: appropriate food containers

What is the capacity?

The capacity varies according to the thickness of the fruits. To calculate the total capacity, just weigh a certain reference amount of fruits on a reference area. Then compare the total drying area with the reference area to obtain the total capacity.

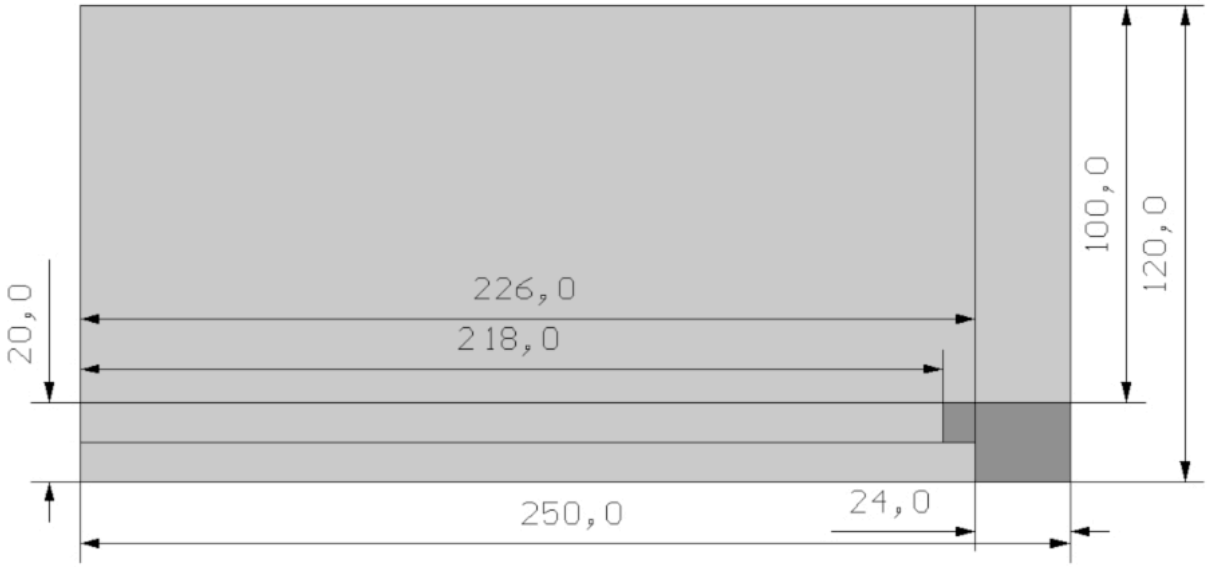
Drying time

The weight of the foodstuff must be reduced by 65% or more on the first day. In case this cannot be achieved, the slices of the fruits or vegetables must be cut thinner.

List of parts and accessories

1. Plywood

Two sheets of 6 mm Plywood, 2.5 by 1.2 metre, each cut according to following drawing:



Drawing 12: Please cut the plywood sheets as shown. Dimensions are in cm.

2. Wood strips 2.5 by 2.5 cm

Purpose	length cm	No. of pcs.	Total cm
Gable strips	50,5	12	606
Air exhaust wall	94	1	94
Side stabilisation, heating section	10	6	60
Side stabilisation, drying section	10	6	60
Gable, heating section	226	1	226
Gable, drying section	218	1	218
Side rails, heating section *)	215	4	860
Side rails, drying section *)	218	4	872
Rails for foil friction *)	215	2	430
Centre stabilisation	94	4	376
Subtotal chassis skeleton:			3802
Drying trays, length strips	90	8	720
Drying trays, counter strips	45	8	360
Drying trays, distancers	6	16	96
Subtotal drying trays:			1176
Vertical posts for support (if applicable)	80	6	480
Diagonal rods for support stabilisation (if applicable) *)	40	14	560
Total wooden support:			1040
Grand total:			6018

List of parts and accessories, continuation

3. Other parts

Wood screws	25 mm	120
Wood screws	35 mm	50
Wood screws	45 mm	8
Transparent greenhouse foil	260 x 70 cm	4
Textile enforced tape	25 mm wide	1
Wide headed upholstery nails	12 mm	50
Wood glue	200 g	1
Blackboard paint	250 g	1
Varnish, water resistant	500 g	1
Mosquito mesh, strong plastic	5 m x 1 m	1
Solar photovoltaic module	12V, 12Wp	1
Axial fan	12V, 0.3 A	1

Plus some other small material which could replace forgotten or missing hardware, such as some nails, tape, glue, cable, etc.

4. Tools

Hammer	1
Pair of pliers	1
Screw clamps or similar	3
Screwdriver for slotted grub screws	1
Screwdriver for recessed head screws	1
Wood saw	1
Brushes for blackboard paint and varnish	2
Bricks for support (if applicable)	x

*) These wood strips can measure 2.5 x 1.25 cm (~ 1 by ½ inch) to save costs.

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