



Renewable Housing Solutions South Africa

Proposal for Bamboo Treatment Facility and Workshop at
Nelson Mandela Community Youth Centre, Chatsworth

15 February 2019

ATT: Nelson Mandela Community Youth Centre

PROJECT PROPOSAL: Bamboo Treatment Facility and Workshop at Nelson Mandela Community Youth Centre, Chatsworth

Contents

Introduction	3
Youth Centre and Rhssa	4
Bamboo Skills Development Program	5
Harvesting	5
Treatment / Curing	6
Building Workshop	7
Craft Workshop	8
Propagation	9
Bamboo Treatment Facility and Workshop – Components	11
Bamboo Treatment Tank	12
Bamboo Treatment Chemical	12
Sun Drying Rack + Horizontal Storage	13
Workshop Upgrades with Tools acquirement	13
End note	14
Appendix: List of Clumping (Sympodial) Bamboo Species to introduce at NMCYC	15



Renewable Housing Solutions South Africa (Pty) Ltd

Unit 18 - 53 JB Marks Rd, Glenwood, Durban 4001

Dimitar V Dobrev - 0715812568

Kanji Yoshimura - 0761004764

info.rhssa@gmail.com

www.renewablehouses.wixsite.com/rhssa

Introduction

Rhssa is a research and development based organization with focus on creating alternative housing solutions and job opportunities for South Africa. Once our production processes are established, we would like to initially certify a standardized bamboo construction system through Agreement, as well as assist in rural development programs providing plants and building necessary structures out of bamboo, earth and modern technology.

Our perceived markets are chiefly Education and Housing, although any project which provides employment and skills development opportunities is eligible. We want to develop a working model for a “new” industry (utilising our existing natural resources) with the intended outcomes being accessible housing solutions.

We have been involved with various projects using bamboo at the NMCYC since August 2018 and we would like to officially ask for permission to continue our operation there.

This proposal seeks acknowledgement of our involvement and permission to be able to use the youth centre building together with available open space / land on the property. We would like to develop a bamboo treatment facility (on a suitable piece of land) and secure an area for a workshop which will assist in the skills development programs.

Youth Centre and Rhssa

Rhssa would like to develop a bamboo treatment facility and workshop at the youth centre to perform skills development programs for the locals. Once this is established, Rhssa would like to proceed with the testing of bamboo construction systems, alongside the skills development programme.

Our objective is to also develop bamboo products and systems that are easy to fabricate and replicate with basic training. We are developing operation manuals for various stages of the production line, which will ensure consistency of products and safety during production.

We see the treatment facility / workshop as an asset to the youth centre and Chatsworth. The treatment facility can either be a temporary or permanent structure (refer to page 12).

We would also like to ask for permission to plant different size clumping (non-invasive) bamboo species at the centre. Some would act as security barriers along the perimeter. For instance, the top side of the Memorial Garden boundary fence has been vandalized. A thin bamboo hedge (5m tall species) could prevent access by informal settlers while at the same time, the hedge could produce raw material (eg. Bamboo straws).

In summary, we kindly request permission to

- use the youth centre as RHSSA operational base
- use existing infrastructure/site and improve them to suit production needs
- plant specified bamboo species at mutually agreed locations on site
- be dispersed for some costs necessary for improvements and general maintenance of NMCYC
- be part of the integrated planning and future developments of the centre

Bamboo Skills Development Program

Bamboo is a raw material which requires treatment in order to make it suitable for use. The proposed program would allow local youth to acquire skills to be able to identify, propagate, harvest, treat, cure and create bamboo products.

Bamboo has a life pattern synchronized with the annual seasons and their rainfalls, therefore, we perform different tasks appropriate to the time of the year.

During the **dry season** (May to August), bamboo is harvested, treated and cured.

During the **rainy season** (October to March) bamboo is planted, and bamboo saplings are propagated.

The main objective is to transmit knowledge of how to work with bamboo to the local skill force.

Listed sub headings below are the main stages of the **Bamboo Skills Development Program**; they are quite extensive, so we will provide a short summary.

Harvesting

Bamboo grows naturally across KZN. In order to keep costs at a minimum, we are currently identifying and locating mature bamboo clumps in and around Chatsworth. Once we have found resources available in close proximity to the youth centre, we will perform excursions with trainees to introduce them to sustainable harvesting methods of bamboo.

So far, we have identified potential sources of bamboo in the following locations

- Silverglen nature reserve

There is also an opportunity to consult the Parks Department and create an agreement whereby bamboo cuttings (eg from maintenance of municipal land) would be delivered to the youth centre, instead of being discarded at local dump sites. We strongly advocate for the responsible usage of resources and believe that there is potential to turn “waste” into “opportunity” with benefit to the community.

Treatment / Curing

Harvested bamboo must be treated in order to preserve it against insects and mould. We use a combination of Boric Acid and Borax to treat the bamboo. This is a non-fixing type of treatment which is cost effective and environmentally friendly. The chemicals themselves are naturally occurring and harmless to plants and animals (and humans). The chemicals are boiled with water (to a specific ratio) to create a solution called Octabor and the bamboo is allowed to soak in this solution.

In order for the chemicals to be absorbed effectively by the bamboo, the nodes of the bamboo must be punctured in order to allow the solution to enter the culm and be absorbed from the inside (as the outer layer is water resistant).

Between August 2018 and January 2019, we had a temporary treatment tank at the youth centre, which was made from builder's plastic (image 3). This had a limited life span as the material was not UV resistant was too weak to withstand the stresses of working with bamboo (sharp corners can puncture the material).

Treatment process

1. Harvest bamboo and transport to treatment facility
2. Puncture nodes using modified steel rod
3. Submerge culms in chemical solution for 2 weeks
4. Remove culms from solution and sun dry for 1 month
5. Store culms under cover for 2 months (vertical), thereafter horizontal storage is possible (spatial constraints)



Building Workshop

The path towards the standardization of bamboo for construction will require local bamboo to be tested under controlled laboratory conditions. Specifically, segments of bamboo will be tested under different stresses and loads. In addition, simple bamboo structures and tectonic connections will be tested in a similar way. These tests can only be carried out by certified labs or Universities, and as such, we cannot perform the tests ourselves at the youth centre.

However, we will need space to produce the different components and elements required for testing. As such, we will require a small workshop space at the youth centre (approximately 45m² indoor area and 90m² outdoor area).

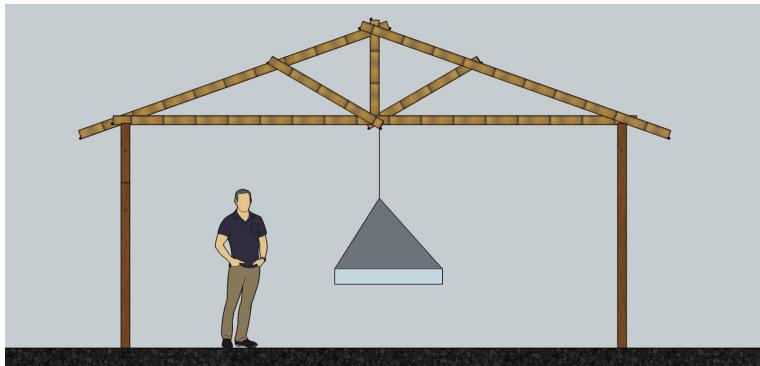
Bamboo is vulnerable to weather and soil contact, therefore every aspect / detail of a bamboo structure needs to be designed and developed with the preservation of bamboo in mind. Treated bamboo may last up to 30 years under cover compared to 2 to 3 years untreated and exposed to the elements.

Below are few examples of our current processes and observations:

1. Concrete cast foundation using split bamboo. Steel rebar is cast in the centre and acts as a connection for the bamboo post above.
2. Threaded bar, washer and bolt is one of the methods to connect bamboo together. This allows the connections to be tightened if they become loose or replaced entirely. For larger structural applications the bolted connection would be located in the middle of bamboo internode filled with concrete.
3. Example of bamboo application for a street edge in Kyoto, Japan. This is the quality of craftsmanship we would strive to achieve through our venture and possibly pass onto as many able hands in South Africa using locally available bamboo species.



Below is an image depicting a 6m span bamboo roof truss system which we would like to develop at the youth centre. If we are successful, we will venture to secure our own premises for further operations. In the meanwhile, we request permission to work at the youth centre as mentioned.



Load testing of pre assembled bamboo roofing system

Craft Workshop

Product manufacturing is limited to the availability of certain species of bamboo and possessions of tools required to create them. The planting of the selected species of bamboo at the youth centre assures constant supply of resources to create and develop products.

Through our involvement, we would develop a workshop acquiring necessary machines and tools in order to create a safe working environment for the operators (trainees/youth) at the youth centre.

We expect to increase the complexity and range of bamboo products as our labour force become more skilled and confident.

Our current products:

1. Bamboo straws
2. Biodegradable planter pots (collaboration with urban garden project)
3. Screens, fence



Products we would like to make:

1. Woven Products
2. Furniture



These are basic examples and there are challenges regarding availability of bamboo species. Also, as we learn more about the behaviour of local bamboo in our local context (ie. Humidity, insects, culture), we will be able to develop innovative products suited to local people and their customs. We are currently working on products that can be made with basic training and using locally available species.

Propagation

We would like to establish a bamboo propagation nursery at the youth centre, in order to provide bamboo saplings for locals interested in planting bamboo, but also for our own purposes. Currently, there are not enough varieties of bamboo species available commercially to create different products. Essentially, we want to create a resource bank for various species of bamboo.

At this stage, we do not know our precise spatial requirements, but we anticipate that our minimum requirement would be:

- Space for 6 clumping species (approximately 100m² outdoor space, refer Appendix for details) – these plants can be located amongst existing vegetation at NMCYC site, coexistence is possible with appropriate placement.
- Space for sapling storage – since these can be in portable bags, it is possible to have them scattered around the site, and placed in otherwise unused space on site. We approximate around 100m² of outdoor space.

Below is a case study of bamboo nursery in Tanzania for Fumba Town. They have a vision to assist housing needs for East Africa using laminated bamboo lumber.

1. Vegetative propagation method of burying bamboo cuttings. This happens in nature when bamboo poles are broken / washed downstream and when any nodes(branches) have soil contact they are able to root and grow, this is how a grove is formed.
2. Node of bamboo has the ability to grow individual root structures. As one bamboo pole may consist few dozen nodes, it is possible to mass produce bamboo as long as there is

a mother plant with in the area. Methods needs to be revised as there may be more space efficient ways to propagate bamboo.

3. Saplings are taken through stages of shade cover with less water along the way in order to prepare them for the planting out on the fields.



The provision of bamboo plants is fundamental to our movement. Non indigenous plants are considered invasive and dangerous to our ecology, however they are still found in South Africa, with their origins largely unknown. Our aim is to provide the appropriate species for the appropriate application. We are strictly against the propagation of non-indigenous running bamboo species as these constitutes the biggest threat to our indigenous ecosystem.

We will only work with clumping (sympodial) bamboo species, as found in Appendix of this document.

Bamboo Treatment Facility and Workshop – Components

This section will cover the necessary infrastructures, items and tools in order to process raw bamboo into various products.

The treated bamboo is currently being used for projects in and around the centre. We hope that once we have smooth production, we can begin bigger projects in the precinct, and be able to employ more locals.

1. Builders plastic are unreliable for a heavy duty usage, observation of a leaking tank
2. Last batch of treated bamboo from the temporary treatment tank used for the urban garden greenhouse structures



The bamboo treatment facility would be required to maintain the urban garden project that has been initiated at the youth centre if the future selection of material is going to be bamboo. We hope to collaborate with Nandigram Eco Village to operate projects in the future.

We would need the following items / infrastructures:

- Treatment Tank
- Bamboo Treatment Chemical
- Sun Drying Rack
- Horizontal Storage
- Tools

Bamboo Treatment Tank

There is an option regarding the bamboo treatment tank, temporary or permanent. We would also need to create a tap connection for water and heating mechanism (fire+oil barrel) in order to create a solution which the bamboo will soak in. This would narrow the selection of sites which we would like to discuss when we get to meet with the directors at the youth centre.

Size of proposed treatment tank 7m x 2m=14m²

Temporary Tank (Image 1)		Permanent Tank (Image 2)	
Total depth of 1m trench would be dug out with soil mounted around the edge, dam lining is layed on top for waterproofing.		Concrete slab would be casted with 1m high double masonry wall, dam lining is fitted with in the confined box.	
Pro	Con	Pro	Con
Able to restore site to previous state	Possible contamination from excess surface water overflow (flood)	Durable and assurance of quality product	Fixed infrastructure impossible to relocate once built
Repurposable to become water pond for garden			
Estimated cost R4000		Estimated cost R15000	



Bamboo Treatment Chemical

We require storage for 1 ton of Boric Acid and 1 ton of Borax, 2 pallets consisting of 40 x 25kg bags each. Single batch of proposed tank will use 75kg of Boric Acid and 112.5kg of Borax, which will treat harvested bamboo culms for the season (solution is reusable for multiple usage).

Sun Drying Rack + Horizontal Storage

We would perform a non permanent method for the installation of bamboo drying and storage racks. Gum poles would be erected into a hole compacted with soil (no cement), horizontal bamboo members bolted onto the vertical gum poles. This would allow for progressive expansion for storage spaces with relocation or removal possibilities. As for cover, we would like to investigate using split bamboo so the entire structure is biodegradable.

1. Sun drying rack $6m \times 4m = 24m^2$
2. Example of horizontal storage rack $6m \times 2m = 12m^2$
3. Half split bamboo roofing



Workshop Upgrades with Tools acquirement

The NMCYC already has some room designated for the urban garden and bamboo workshop. However, there is a shortage of tools. RHSSA has been lending its tools in order for the program to kickstart, however we petition the NMCYC to invest in its own tools, which can be shared with other programs. Bamboo is a material which is processable with basic tools and machinery that the initial investment could be minimal.



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End note

First of all we would like to thank Nelson Mandela Community Youth Centre and their active members for their support and opportunity that has so far been given in order for us to engage in our mission and it would be a honor if we could develop our very first bamboo operational base in Chatsworth. We believe in good social change through utilization of bamboo and at the same time remediating the effects from the environmental crisis that could potentially threaten our future generations. We believe it is our mission to pass on the knowledge of how to use this plant to as many communities as we could possibly reach.

Bamboo has not been fully utilized in Durban, South Africa. Lack of knowledge of this plant and its potential has led to many removal of these unwanted (ancient) giant grass/weed by the general public. Also with overharvesting of the bamboo for prayer poles have caused drastic decrease of this resource over the years. There is a need to conserve this heritage plant that was brought over nearly 400 years ago to suit our modern needs.

Bamboo is a workable material and people are familiar with their products, they require simple machinery, tools and guidance to start a localized renewable economy using this plant.

We are on a path to develop affordable housing solutions and this facility at the youth centre would become a critical case study for South Africa. Many communities could turn this raw resource into usable construction and craft material in the future through this research and development.

We would officially like to ask for a meeting with the Board of the Nelson Mandela Community Youth Centre to discuss our possibilities at the centre.

Yours truly

Yoshimura, K.

Dobrev, D

Appendix: List of Clumping (Sympodial) Bamboo Species to introduce at NMCYC

Bamboo Botanical Name	Description	Picture
Bambusa Balcooa	<p>20-25m ht, 70-150mm dia culm</p> <p>Naturalized species in South Africa, originally from India. Bambusa Balcooa is a drought-resistance species which can survive in widespread areas of KZN and neighbouring provinces. Shoots are edible and mature culms are usable for construction / craft.</p> <p>Floor coverage 20sqm</p>	
Beema Bamboo (Bambusa Balcooa Roxb)	<p>12-20m ht, 50-120mm dia culm</p> <p>Selectively propagated Bambusa Balcooa species developed by Dr. N. Barathi from Growmore Biotech. Beema bamboo culms grow almost solid and is often cultivated for bio energy projects.</p> <p>Floor coverage 16sqm</p>	
Bambusa Tuldoides	<p>7-15m ht, 50mm dia culm</p> <p>Commonly known as "Punting Pole Bamboo", native to southern China and Vietnam. As the name suggests the bamboo is small enough to be handled pushing a boat, this is the size we want to use as purlins for buildings. Edible shoots and culm cortex shavings are used in Chinese medicine for febrile diseases, haematuria, epistaxis and infantile epilepsy.</p> <p>Floor coverage 12sqm</p>	

Bambusa Multiplex	<p>3 to 5m ht, 2 to 2-20mm dia culm</p> <p>Smaller scale bamboo commonly used as an evergreen hedge. This particular bamboo produces culms that are the size of a straw and is able to produce many shoots every year. The bigger diameter culms may be used for craft (weaving).</p> <p>Floor coverage 4sqm</p>	
Dendrocalamus Asper	<p>15-30m ht, 80-200mm dia culm</p> <p>This is a giant bamboo species from northern Malaysia. The bamboo tends to grow straight and is usable for heavy duty construction. The culm have thick walls which could be turned into many products. Shoots from this bamboo is sweet and consumed widely in region of origin. With diverse usage this specie is very popular to be grown by commercial bamboo farmers across the world.</p> <p>Floor coverage 25sqm</p>	
Guadua Angustifolia	<p>15-30m ht, 90-130mm dia culm</p> <p>Giant open clumping bamboo from Columbia. World renowned construction bamboo species, this bamboo has officially been used by architects to create private / public buildings all over the world.</p> <p>Floor coverage 25sqm</p>	
<p>It is in our interest to try cultivate the above mentioned species in South Africa and put them through controlled laboratory testing to select most appropriate species suited for this context.</p>		