AGRITECTURE

vietnam bamboo

dr helen norrie

UNIVERSITY OF TASMANIA

collaborative design research

bamboo hothouse june/july 2015 cave urban + UTAS

bamboo hothouse june/july 2015 cave urban + UTAS

bamboo hothouse june/july 2015 cave urban + UTAS

NH Village Architects
possible visit

Kimono Restaurant

Hoang Thuc Hao

Soui Re Village Community House
- Hoa Binh

Hoang Thuc Hao

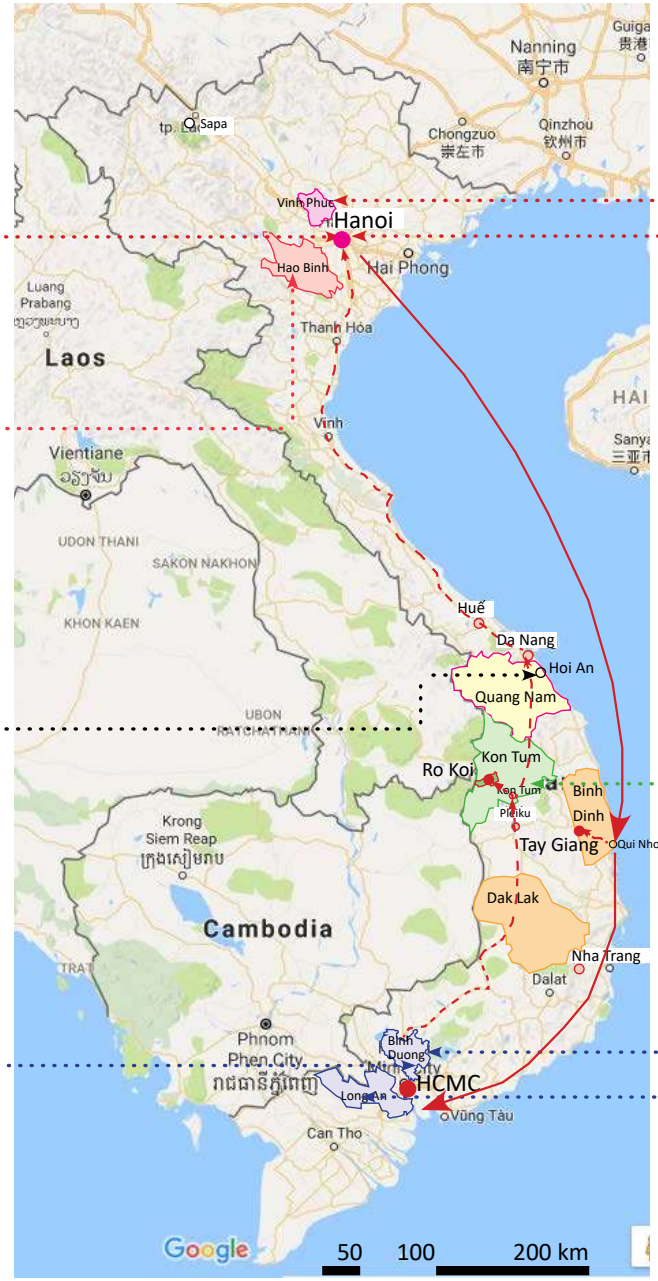
Cam Thanh Community House

Vo Trong Nghia
possible visit

Naman Conference Hall Beach Bar, Hay Hay Restaurant & Bar
- Danang

Phu An Bamboo Village

- Binh Duong Province



Vo Trong Nghia
possible visit

Bamboo Wing
- Vinh Phuc

Vo Trong Nghia

Roc Von Restaurant
- Hao Binh

Vo Trong Nghia

Kontum Indochine Restaurant
- Kon Tum City

Vo Trong Nghia

Wind + Water Bar

Sen Village Community Centre
- Long An

vietnam bamboo

bamboo architecture vietnam phu an bamboo village binh duong

bamboo architecture vietnam phu an bamboo village binh duong

bamboo architecture vietnam wind and water café vo trong nghia architects

bamboo architecture vietnam sen village community house vo trong nghia architects

bamboo architecture vietnam sen village community house vo trong nghia architects

bamboo architecture vietnam

serena resort

various architects

bamboo architecture vietnam suoi re community house 1+1>2 architects

bamboo architecture vietnam suoi re community house 1+1>2 architects

bamboo architecture vietnam suoi re community house 1+1>2 architects

bamboo architecture vietnam suoi re community house 1+1>2 architects

bamboo architecture vietnam cam thanh community hse 1+1>2 architects

bamboo architecture vietnam cam thanh community hse 1+1>2 architects

bamboo architecture vietnam cam thanh community hse 1+1>2 architects

bamboo agriculture

dr diep thi my hanh demonstrating bamboo planting in ro koi | kon tum

AGRITECTURE

explores the merging of agriculture and architecture,
investigating the relationship between buildings and places
through cross-disciplinary, collaborative research projects.

bamboo AGRITECTURE collaborative design research

AGRITECTURE

explores the potential of bamboo

to postively contribute to the economic and environmental ecology

of regional communities.

bamboo AGRITECTURE collaborative design research

AGRITECTURE | VIETNAM BAMBOO is a collaboration between

University of Tasmania (UTAS) Architecture & Design +

Cave Urban | architects and bamboo specialists

working directly with project collaborators in Vietnam.

Workshops in Vietnam are funded through the Australian Government New Colombo Plan.

bamboo AGRITECTURE collaborative design research

exploring the potential of bamboo in buildings

exploring the potential of bamboo in buildings

exploring the potential of bamboo in buildings

exploring the potential of bamboo in buildings

developing bamboo construction skills

developing bamboo construction skills

developing bamboo construction skills

developing bamboo construction skills

taboo workshop | hoi an

developing bamboo construction skills

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developing bamboo construction skills

taboo workshop | hoi an

prototyping bamboo building ideas

workshop UTAS | NUCE | HAU

prototyping bamboo building ideas

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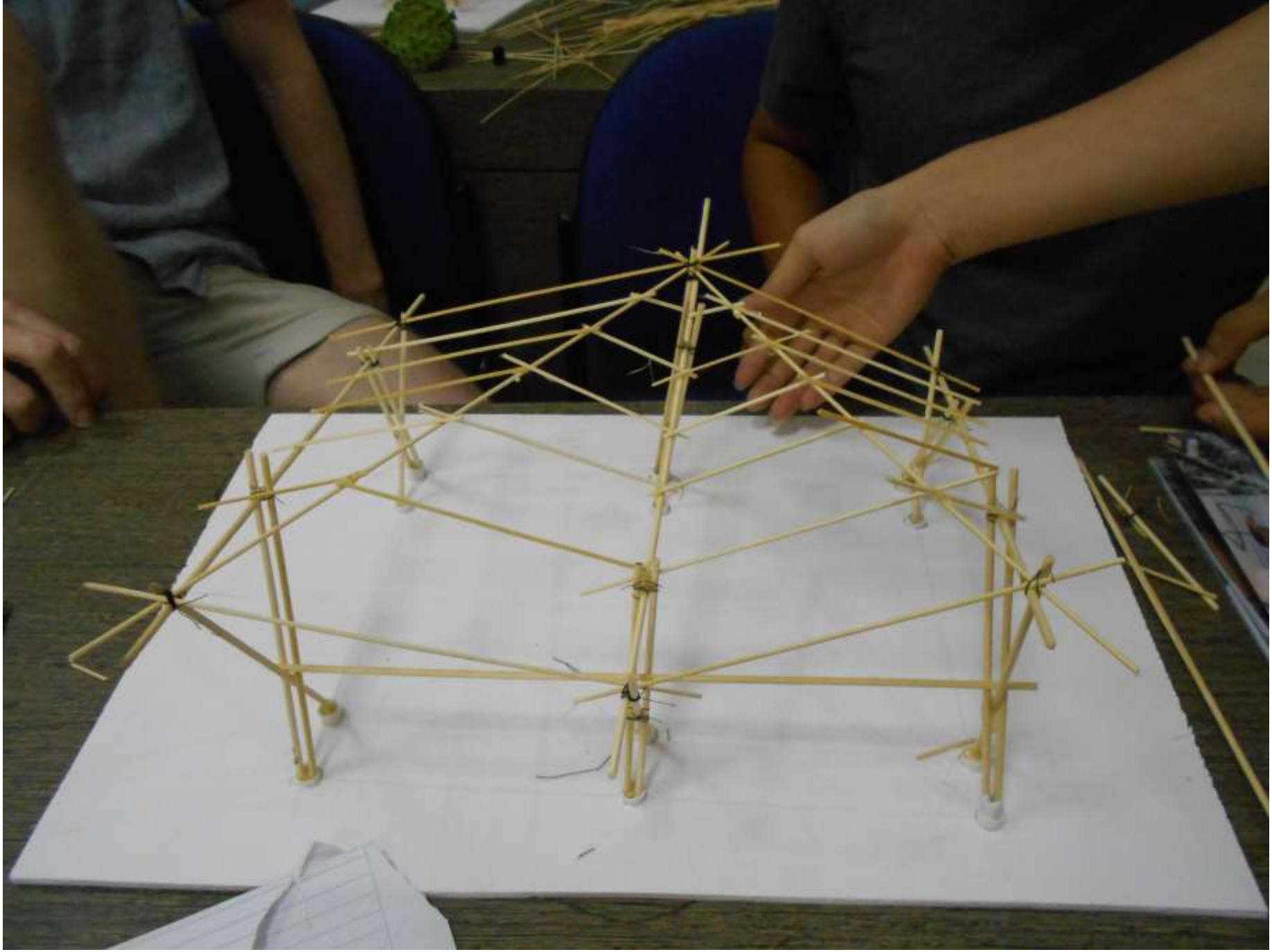

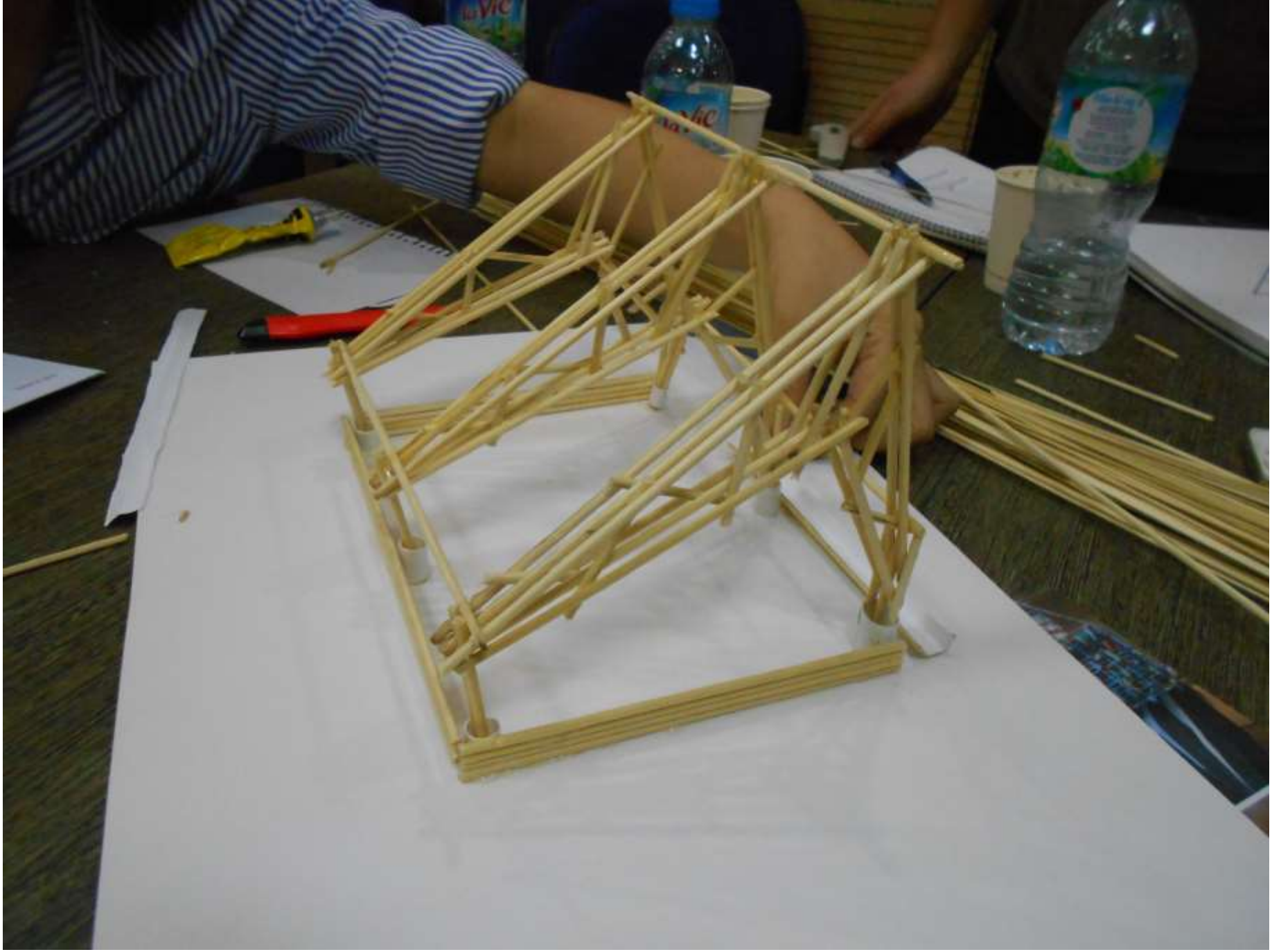

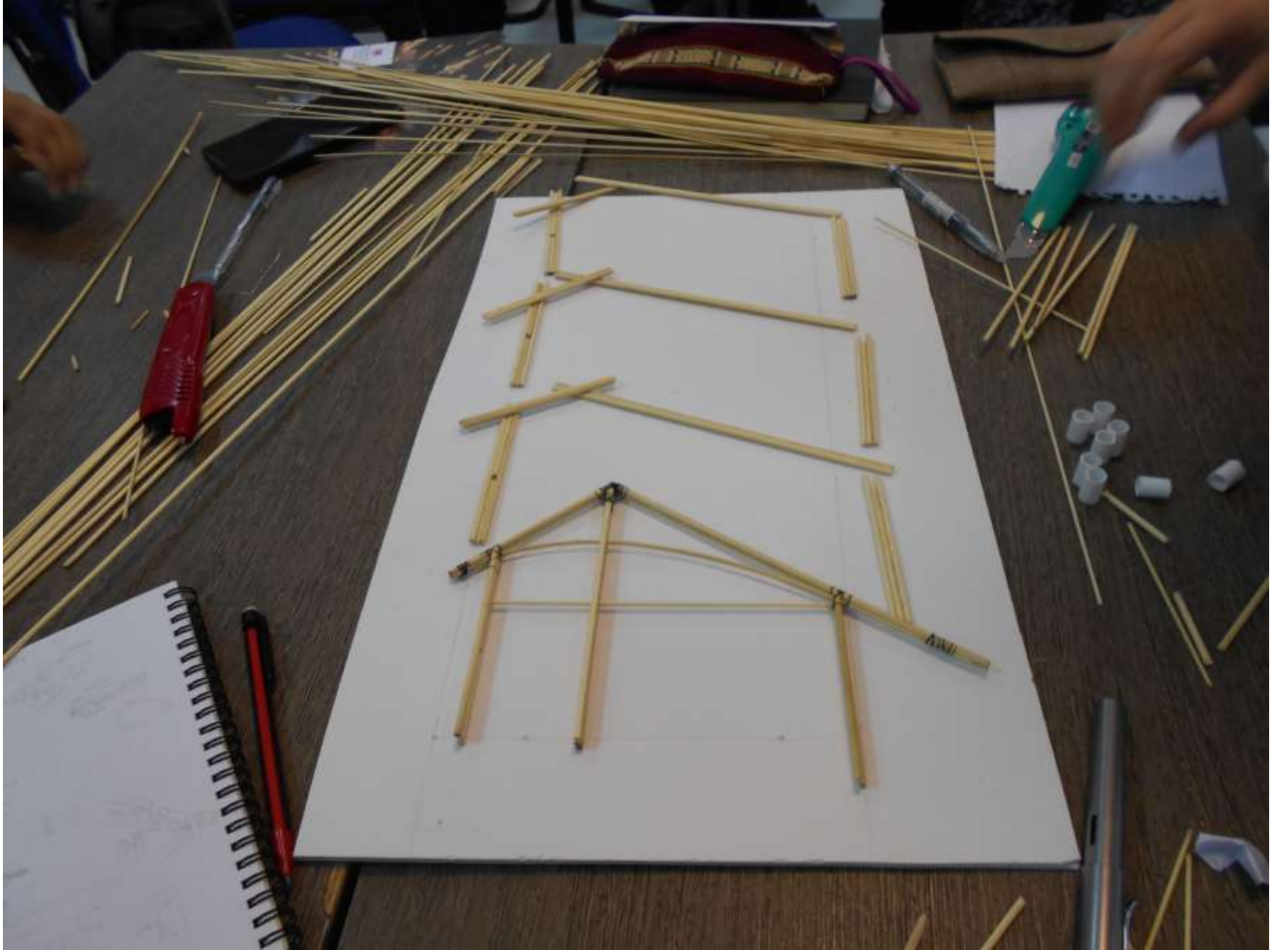

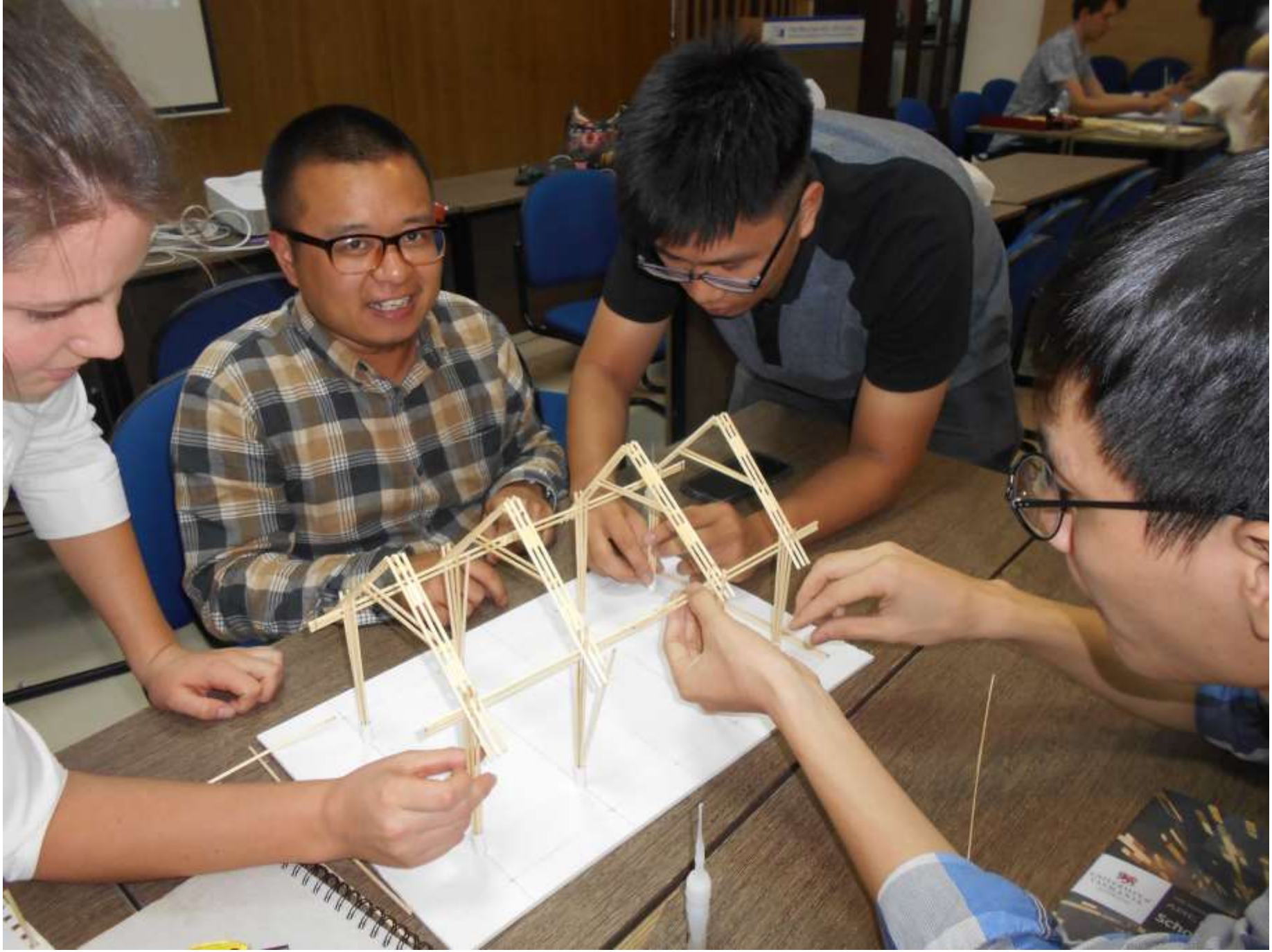

bamboo agriculture vietnam cattle shelter v 1.0 UTAS | cave urban | TIA | HUAF

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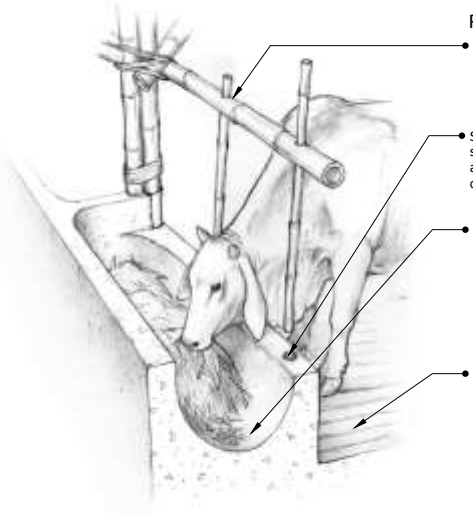
bamboo agriculture vietnam cattle shelter v 1.0 UTAS | cave urban | TIA | HUAF

bamboo agriculture vietnam cattle shelter v 1.0 UTAS | cave urban | TIA | HUAF

CONSTRUCTION DETAILS

Not to scale



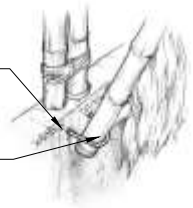
FEEDER ARRANGEMENT

- Holes bored through bamboo beam support spacer bars. Spacers are not fixed in place so they can be replaced easily and quickly should they be broken or decayed
- Small post-holes in lip of feeder receive spacer bars. Spacing of holes in feeder and beam set at 30cm but can be cast differently depending on needs
- Rounded form or trough keeps all feed in centre of trough and easy for cattle to access and thus no fodder is wasted or at risk of rotting. Bottom of trough set 15cm higher than enclosure floor to reduce strain on cattle when feeding
- Raked channels in floor increase grip and assist in carrying away waste for a cleaner and safer living environment

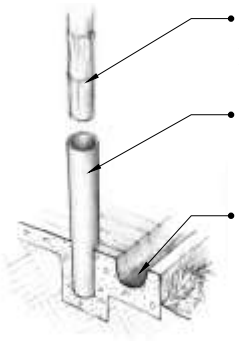
END WALL ASSEMBLY

The end wall is intended to be versatile depending on material availability and cost. In the example, a simple bamboo frame is assembled to the shape of the wall to be sealed and thatch is lashed to it to create a closed surface. Palm-thatch, split bamboo weave, bamboo shingles or sheet metal can all be fixed to the same frame

- A small loop of steel rod is cast into the concrete as an anchor point
- Frame is lifted into position and slotted into place on the anchors. Upper part of frame is then lashed to the main building structure



TRUSS FOOTINGS AND DRAIN



- Bamboo poles are carefully selected and cleaned to fit tightly within footings. Should truss be damaged or deteriorate over time the old truss can be lifted out and a new one inserted
- 120mm PVC pipe used as footings. Pipe keeps water or waste from reaching the bamboo and preventing rot. Pipe is set into concrete slab for a secure anchor-point
- 200mm wide drain collects waste runoff. Drain uses 5% slope for drainage and built in rounded profile to assist with cleaning using a shovel. Drain runs to a collection point where waste can be dried and used as fertiliser

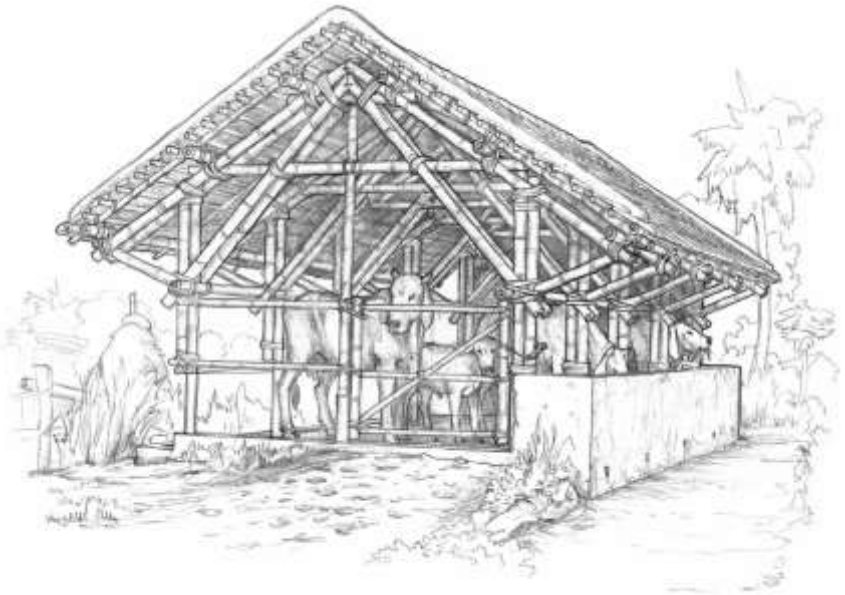
BAMBOO JUNCTIONS

Most junctions used on truss require a hole drilled through the members and a bamboo pin hammered in. Lashing is then used to bind the joint but also to prevent splitting

BAMBOO COW SHED

BASIC DESIGN AND NOTES ON CONSTRUCTION

University of Tasmania Vietnam Study Tour 2017

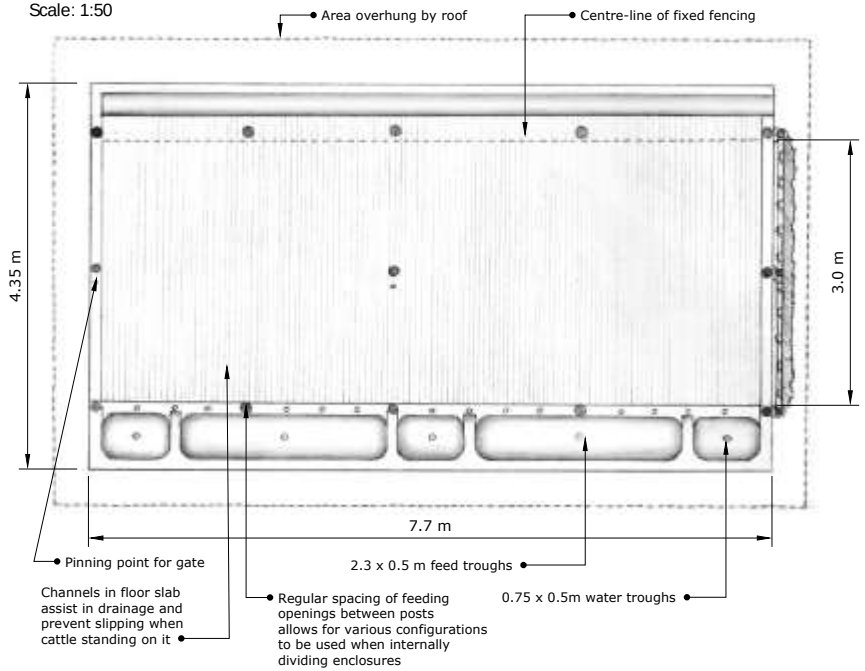


DESIGN AND ILLUSTRATIONS BY:
Robin Verhoeff

DESIGN CONSULTATION BY:
Nguyen Xuan Ba
Rowan Smith

PLAN

Scale: 1:50



SECTION

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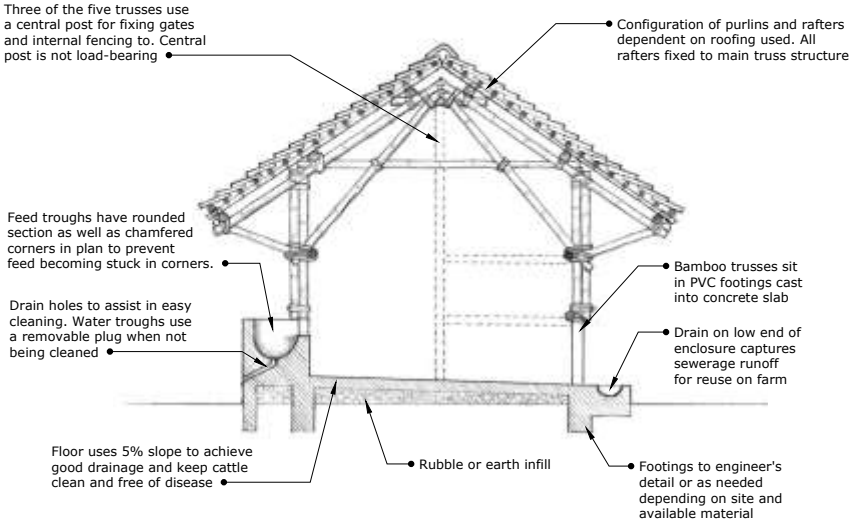

ELEVATION - LONG SIDE

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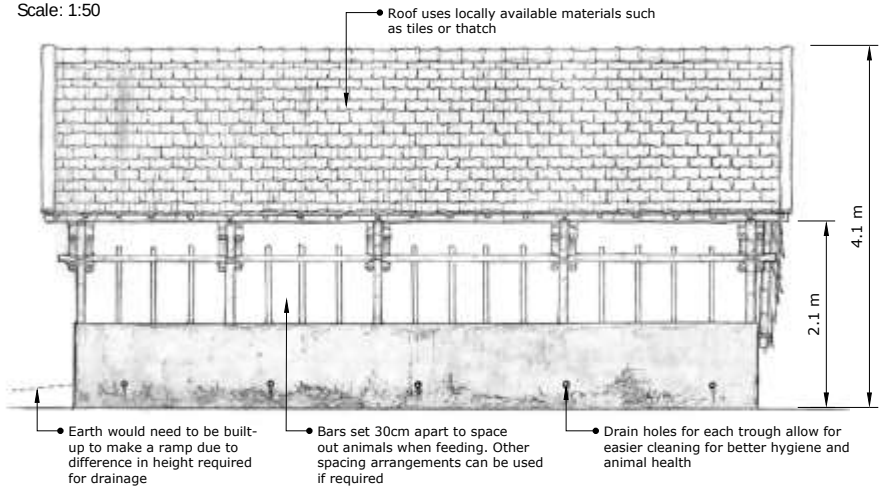
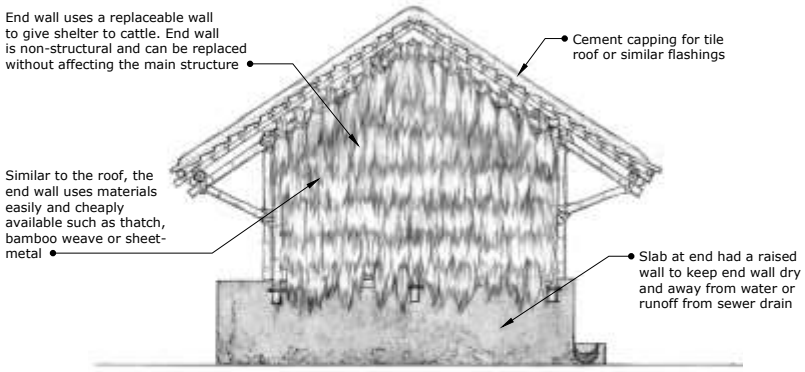


ELEVATION - SHORT SIDE

Scale: 1:50



AGRITECTURE | VIETNAM BAMBOO

University of Tasmania | Architecture + Design

TIA | Tasmanian Institute of Agriculture

Cave Urban

NIAS | National University of Animal Science (Vietnam)

UAH| Hanoi Architectural University

NUCE | National University of Civil Engineering

VNUF | Vietnamese National University of Forestry

TUAF | Thai Nguyen University of Agriculture + Forestry

TBU | Tay Bac University

bamboo AGRITECTURE collaborative design research

It focusses on the potential of bamboo as an increasingly important aspect of the economic and environmental ecology of regional and remote communities, investigating bamboo forestry management and prototypes for bamboo buildings.

bamboo agritecture collaboration june/july 2018 UTAS | NIAS | HAU | NUCE | TBU

A series of buildings form a compound, with the main house and a number of animal shelters.

The cattle shelter on the right protects cattle on the lower floor, with a raised roof allowing access to a platform to store food.

Some new, larger scale cattle shelters have been erected, using minimal materials and creating minimal enclosure

It is constructed very simply, using bamboo, compressed brick and fibre cement corrugated roof sheeting.

The bamboo structure is very crudely held together with wire ties. This structure cost USD700.

Our farmer, Mr Hoc has a small existing cattle shelter, which provides minimal enclosure and is constructed from timber and fibre cement sheets.

The site adjacent to the existing cattle shelter was available for a new shelter.

The initial designs developed in a workshop with HAU/NUCE were reviewed to determine the most appropriate ideas to be further developed.

The ideas in this scheme were simplified to produce a less complex roof system.

Arriving on site, the first task was to discuss the ideas with Mr Hoc, and to work out the best siting, with Ms Thuy translating.

Dr Rowan Smith, an expert in cattle production from the Tasmanian Institute of Agriculture assisted with the design of the site arrangement.

A strategy was developed to drain the urine and manure to the rear of the site and then collected into a pit that would it to be dried out and then reused.

The only drawing that was prepared was the frame set out, with dimension to locate the structure.
All other details were constructed directly from the model, which showed the form and the structural system.

Production of bamboo pins to be used for joining bamboo structure.

Bamboo dowels were used to set up a jig so that all four frames to be constructed to the same profile.

Each piece was cut to size in situ.

The frame was triangulated with a horizonal member, which would allow a loft to be build that could be used for storage.

The first of many holes were drilled and pinned with bamboo dowels, and he building process commenced.

The pins are longer than the joint so they can be wedged firmly into place in the next step of construction.

Some junctions were made by a joining piece that connected two structural members.

Once completed, it lifted was moved to the side to allow for the next frame to be constructed in the jig.

Next the process of splitting and wedging the dowels in to place began.

Dowels are split so that the expand to fill the hole, always working along the length of the bamboo do reduce splitting.

A team of people can work together on this task, speeding up the construction process.

Each joint was then lashed together, with variations of square lashing adapted depending on the joint configuration.

Meanwhile, the second portal can be laid out. The allows a streamline process, with many teams working in parallel.

The nodes of the bamboo at the base of the columns were removed to allow steel reinforcing to be inserted into the bamboo.

The water bottles from the water that were consumed each day were used as permanent formwork for the footings.

Larger bottles were used for the single poles of the structure.

The reinforcing connected the bamboo to the concrete footings

The assembly was fixed in place to allow to cure...

…providing a similar size footing to the dual pole structure.

A structural grid was laid out over the site to locate the position of the portals.

The site needed to be leveled, and so the digging began…

Each portal was e manoeuvred into the correct alignment, and the footing holes were adjusted as necessary.

A string line was set up to establish the alignment between the trusses and to establish the horizontal level…

Each frame was located in place…

…and raised into a vertical position.

Once the alignment was established, the footings were concreted into place and back filled...

…and temporary bracing was used to hold the structure in place.

Once the end portals were positioned, the central portals were located into place.

…and the alignment of the structure was able to be controlled through adjusting each portal, as necessary.

…ready for the secondary structure to connect the portals together.

The portals were lashed together with bamboo poles…

…increasingly stablising the structure.

Wire was used to join the battens to the frame…

…using a twisting technique, as demonstrated by Jed…

…this provides a quick and stable jointing method…

…and knits the structure together into a stable matrix.

Bamboo splits were used to form battens, which span across the purlins, to support the roof tarp.

The battens were fixed to purlins with zip ties to speed up the process of construction.

This transformed the structure into a scaffold.

The local kids came to check out the progress and perform the first structural test.

Throughout the building process, a constant split factory continued along the road.
Lengths of bamboo were cut to site and split down their length.

1.5 metre long splits were made to form the roof panels…

…and 4 metre long splits were made to hold down the roof sheeting…

Mr Hoc gave a masterclass in bamboo splitting...

…and the local children also came to lend a hand…

Roof panels were prefabricated…

Bamboo set out to in place to form the weft…

…and the warp splits were fed into place.

…and the warp splits were fed into place.

The panels were sacked ready for use…

The panels were sacked ready for use…

…and Mr Hoc and his mates came to check on progress – sharing their thoughts and demonstrate his bamboo skills.

…and the neighbours were also interested in the process…

...as the portal frame system presented a very different construction process to the post and beam structures traditionally used.

Tarpaulins, which are employed for a range of different uses, were used as the lining for the roof

Bamboo splits were folded and rolled into the tarps for ease of handling.

This allowed the tarps to be easily manoeuvred in to place…

…and unrolled in stages...

Battens were fixed with wire to hold the tarp down, with a rubber gasket under the split covering the hole that had pierced the tarp.

Teams worked above and below the structure, feeding the wires through the tarp and then fixing underneath.

Teams worked above and below the structure, feeding the wires through the tarp and then fixing underneath.

The scaffolded structure allowed for the team to work together.

…and the ridge was easily put in place.

The second tarp was tucked under the ridge tarp, but kept rolled up while the roof panels to the ridge were fitted.

The 1.5m x 1.5m roof panels were passed up on to the roof…

The 1.5m x 1.5m roof panels were passed up on to the roof and fixed to the battens…

…and the second panel lapped horizontally over the first.

…and the third panel lapped horizontally over the second.

Once the first line of panels was put in place, the second layer of tarp lining was unrolled and fixed into place below.

The second layer of panels was tucked under the first layer, so that rainwater will run down the roof.

As the second layer was put in place, the tarp could be rolled down in preparation for the third layer.

A similar process was mirrored on the rear roof.

A similar process was mirrored on the rear roof.

Longer panels were made for the rear roof, so that if could be covered in two layers, increasing the ease of construction.

A single bamboo pole was spit in half and fixed to either side of the roof to cover the uneven splits.

New and old shelters…

Water and feed troughs will be fitted to the western edge, which is sheltered from the afternoon sun by the hill and trees beyond.

The eastern wall is low to protect from the summer sun and the winter winds.

The northern end is left open in summer to promote cross ventilation, to keep the cattle cool.

In winter a tarp can be rolled down to block out the cold winds.

Horizontal rails were fitted to contain the cattle.

The cattle shelter will be complete when a concrete slab is layed.

The cows came to check out their new home…

The high roof allows for the hot air to rise, and the wide eaves provide plenty of shade.

The team from UTAS, NIAS, HAU and the village.