Refugee housing challenge of Uganda:

Utilizing High Prevelance Agricultural By-Products as a Source for Construction Materials

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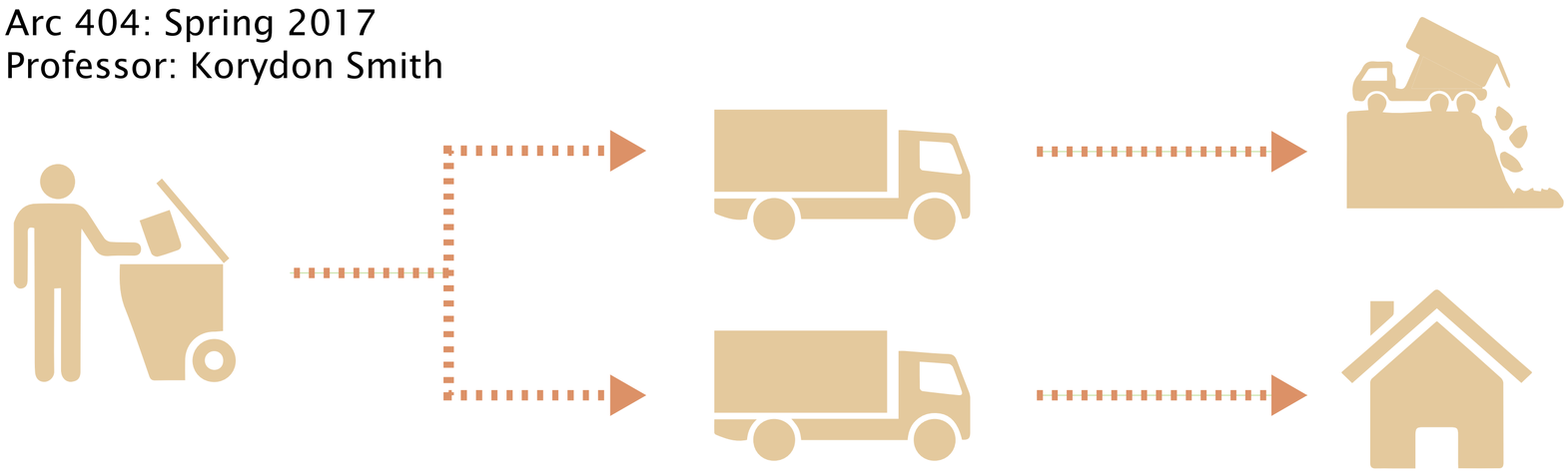


Straw Bales

Cost per bale: 2-5 shillings ($0.02 - $0.05 USD)

Modular Wall System
Functional Elements in Units

Bamboo

Can harvest on owned land or bought from farmers.

Overlapped Halves for Roof Reinforcment for Straw Bales

Various Grasses

Can harvest on owned land or bought from farmers.

Woven Facade
Mats for flat surfaces

Earth/Clay

Must have land available for excavation.

Floor
Exterior Coverage

Interior Rendering - Hallway

Interior Rendering

The Benefits of Straw Bale Construction:

Global Scale

- Lower CO2 Emissions
- Natural and Compostable
- Renewable/ Rapid Regeneration

Regional Scale

- Reduce Load of Agricultral Waste
- Support Regional Farmers
- Reduce Pressure on Depleted Forests
- Reduced Pollution

Inhabitants Scale

- High Insulation Value
- Customizable within dwelling
- Functional Elements Integrated into Design
- Fire Resistant

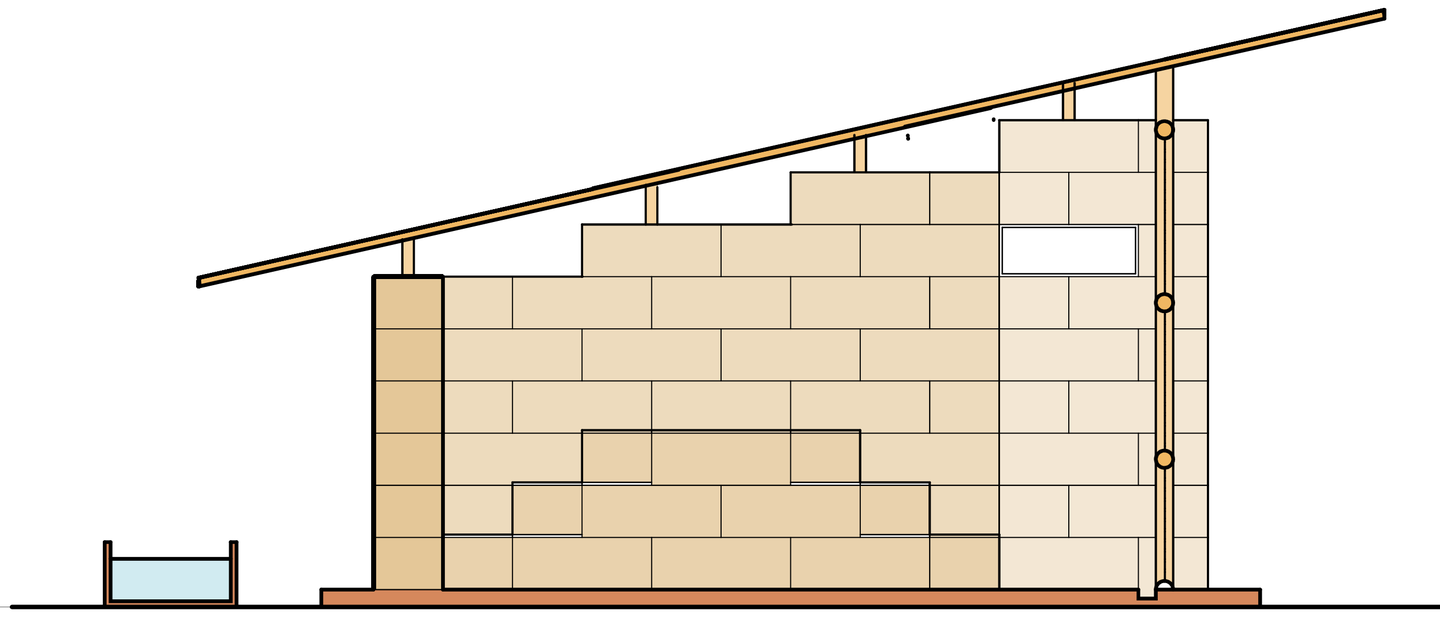
Construction Benefits

- Cheap Materials
- Easily/Comprensive Construction - Modular
- Easily designed to Suit Diverse Family Needs

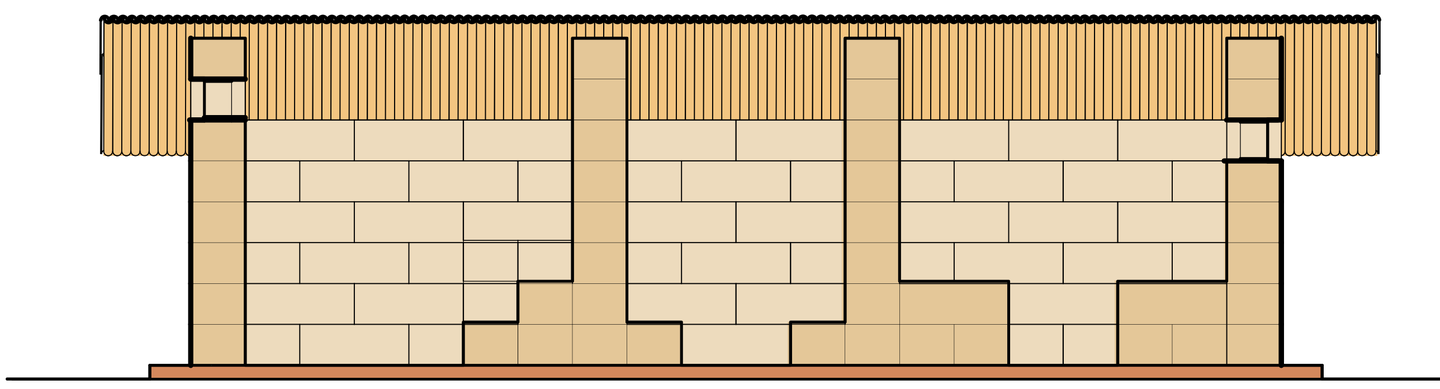
The economy of Uganda is primarily comprised of agriculture. A whopping 82% of the nation's people work in the industry, and it accounts for approximately 90% of the country's GDP. Seemingly paradoxical, there is an overwhelming issue of trash in the nation. The country is currently looking for new landfills, and city trash systems can only handle about 40% of the waste produced. When further investigated, it seems to be that 80% of the waste is organics, 70% of which is vegetable matter. In an effort to divert this waste and support the farming industry, one could imagine using agricultural byproducts as a method of material sourcing. Vegetable matter is a highly researched topic in the engineering material science journals. Used as a reinforcement agent in aggregates, woven to make textiles, or glued together to make oriented strand boards, there are many purposes for plants in construction.

Given the nature of the challenge at hand, the amount of time, money and resources may not be available to construct the more rigorous material innovations. However, one can work with materials that farmers are already accustomed to making. Being that most agricultural byproducts are stems, grasses and leaves, there is a high potential for bales of these byproducts to be a feasible solution for modular construction. One bale of hay runs as cheap as two shillings, or two cents USD. Modular construction is easily comprehensible and modified for family needs. Bales are also large enough to be used as functional elements utilizing the architectural concepts of addition or subtraction.

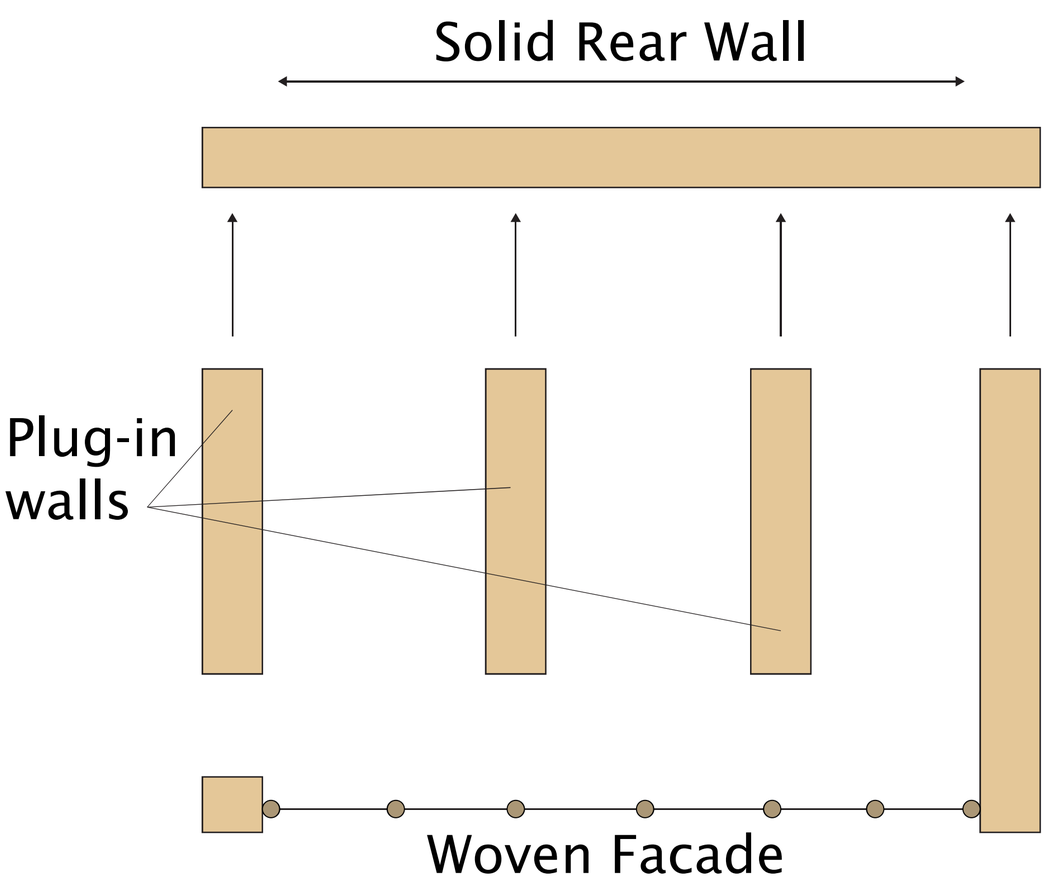
By creating a guide of wall elements, a home could be built as a kit of parts, and spatial needs for each individual family can be met quickly. Other materials needed for this construction would be adobe for floors. Clay and chicken wire can be used to cover the exterior surfaces of the clay. Bamboo can be used as reinforcement for the walls, and also cut in half and overlapped to create a waterproof roof. OSB made of wood or other plant fibers such as corn husks may be used for linters above door and windows, as well as on surfaces meant to be shelves or seats. Finally woven grasses can be used to create a perforated façade bringing in natural light. This woven façade is easily customizable by families and reflects the art of basket weaving so widespread in both Ugandan and South Sudanese cultures.

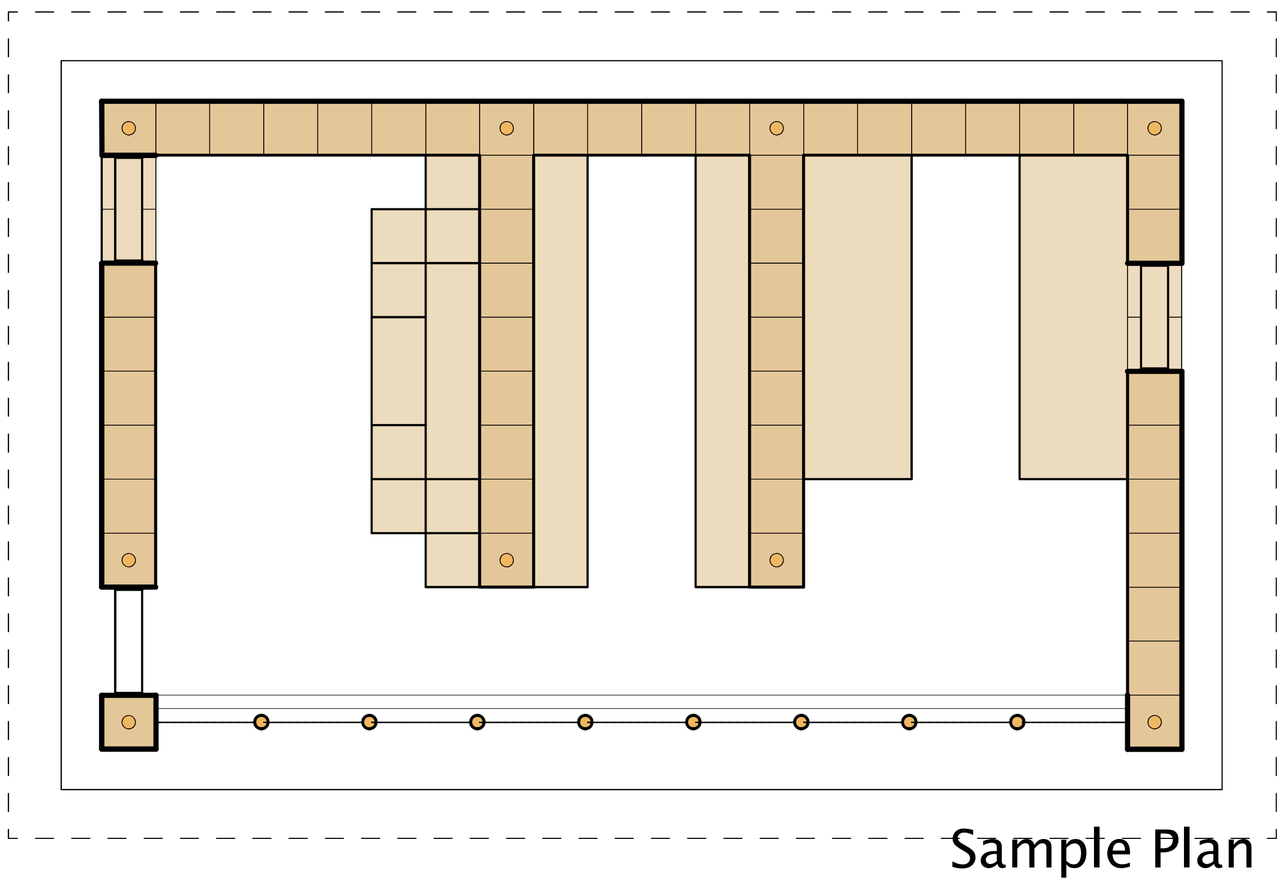


Sample Cross Section

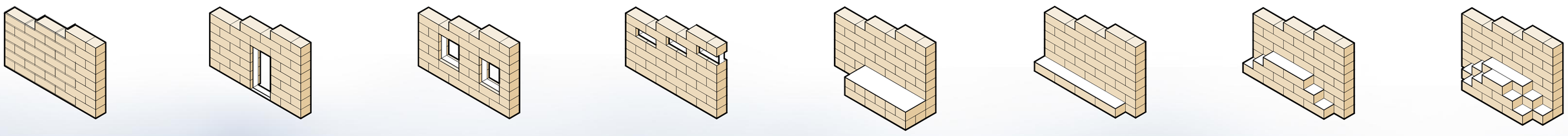


Sample Longitudinal Section





Sample Plan



Wall Systems Catalog

Exterior Render