BUSINESS MODEL 1

Briquettes from agro-waste

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A. Key characteristics

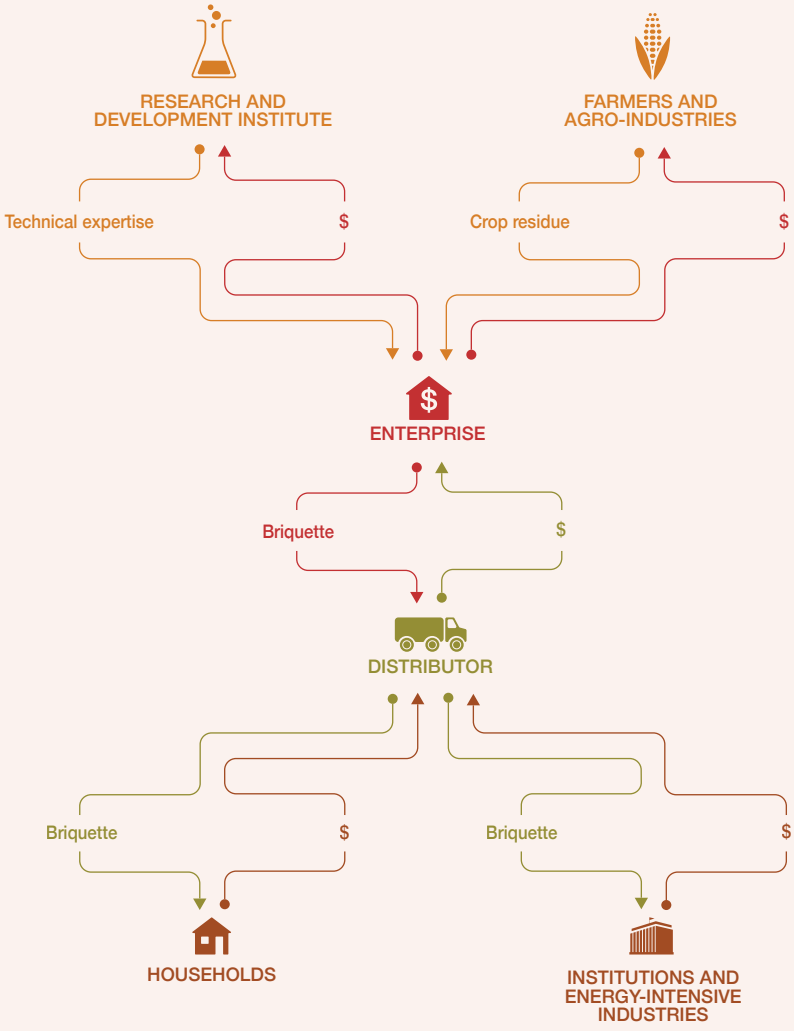
Model name	Briquettes from agro-waste
Waste stream	Agricultural farm waste/residues (saw dust, millet husks, ground nut shells, wheat bran, maize combs, coffee husks, etc.)
Value-added waste product	Briquettes (clean cooking fuel)
Geography	Region with ease of availability of crop residue and lack of ease in availability of fuel wood
Scale of production	Medium scale; 1,000–2,000 tons per year of briquettes
Supporting cases in this book	Kampala, Uganda
Objective of entity	Cost-recovery [ ]; for profit [X]; social enterprise [ ]
Investment cost range	Approx. USD 200,000 to 450,000
Organization type	Private
Socio-economic impact	Reduction in deforestation and environmental pollution, reduced indoor air pollution resulting in improved health for household and employment generation
Gender equity	Beneficial to women and children using fuel with less indoor air pollution than firewood; time savings in fuel collection for women 

B. Business value chain

The business model is initiated by either a standalone private enterprise or agro-industries such as coffee processing units or rice mills that generate large quantities of crop residues as waste. The business processes crop residues such as wheat stalk, rice husk, maize stalk, groundnut shells, coffee husks, saw dust etc. and converts them into non-carbonized briquettes as fuel. Non-carbonized briquettes serve as a replacement to natural firewood and raw biomass fuel. They can also be offered as a replacement fuel among rural populations where firewood is still dominant. Further commercial processes such as drying of crop, drying of tea, curing of tobacco and firing of ceramics/brick can also make use of briquettes. The key actors in the business value chain are the suppliers of crop residue such as farmers and agro-industries, product distributors and end users of the product: households and energy intensive industries (Figure 12).

The characteristics of the agricultural waste including burning characteristics, ash content and the caloric value are first ascertained before making briquettes. The process of briquetting involves sieving of agricultural waste to remove large content such as glasses and stones, pulverizing, drying, mixing of different materials with the required proportions, briquetting using high pressure compression such

FIGURE 12. VALUE CHAIN OF BRIQUETTES FROM AGRO-WASTE



as by piston stroke and using binding agent. The high pressure and resulting high temperature causes the lignin (the natural woody material in plants) to flow and bind the material together. The action of the piston pushes the material through a dye, to make a continuous rod about 50 mm in diameter. The rod cools in the air and breaks into 'sticks' or briquettes about 400 mm long. As multiple crop residues with differing calorific value are the raw material input, it is ideal for the enterprise to collaborate with a research institution to find a suitable combination of crop residue to produce briquettes with higher calorific value and consistent quality.

There are two technologies for making briquettes, reciprocating ram/piston press and screw press technology. The screw pressed briquettes are generally found to be superior to the ram pressed solid briquettes in terms of their storability and combustibility. While the briquettes produced by a piston press are completely solid, screw press briquettes on the other hand have a concentric hole which

gives better combustion characteristics due to a larger specific area. The screw press briquettes are also homogeneous and do not disintegrate easily.

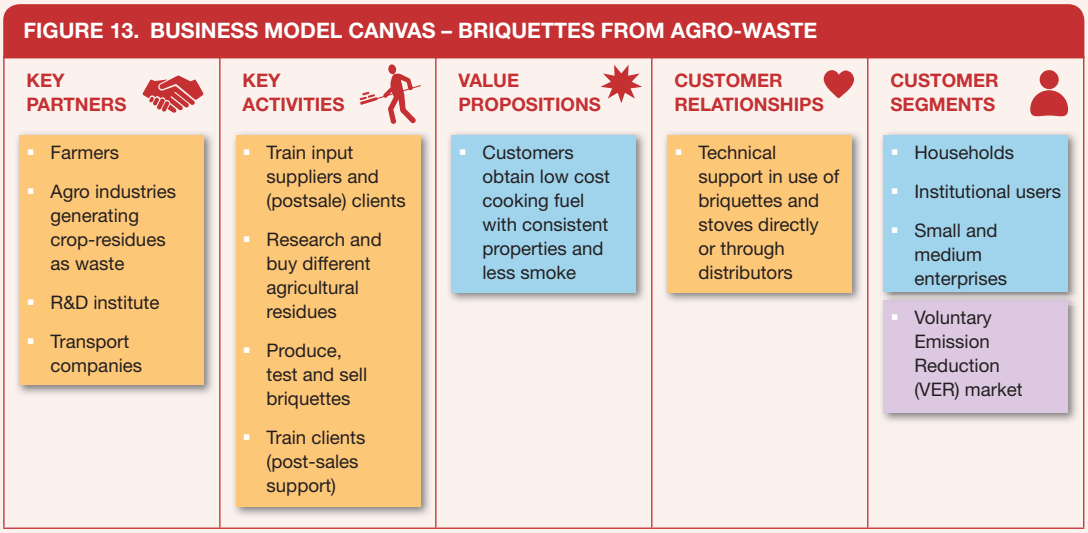
Another option is to produce carbonized briquettes or charcoal from crop residues by burning them in low-oxygen atmosphere. The resulting charred material is compressed into carbonized briquettes. Carbonized briquettes can act as a replacement for charcoal for domestic and institutional cooking and heating, where they are favoured for their near-smokeless use. Moreover, briquettes can be used as fuel for gasifiers and generators to generate electricity or powering boilers to generate steam. The business model described in this section is focused on using briquettes as fuel for thermal applications only.

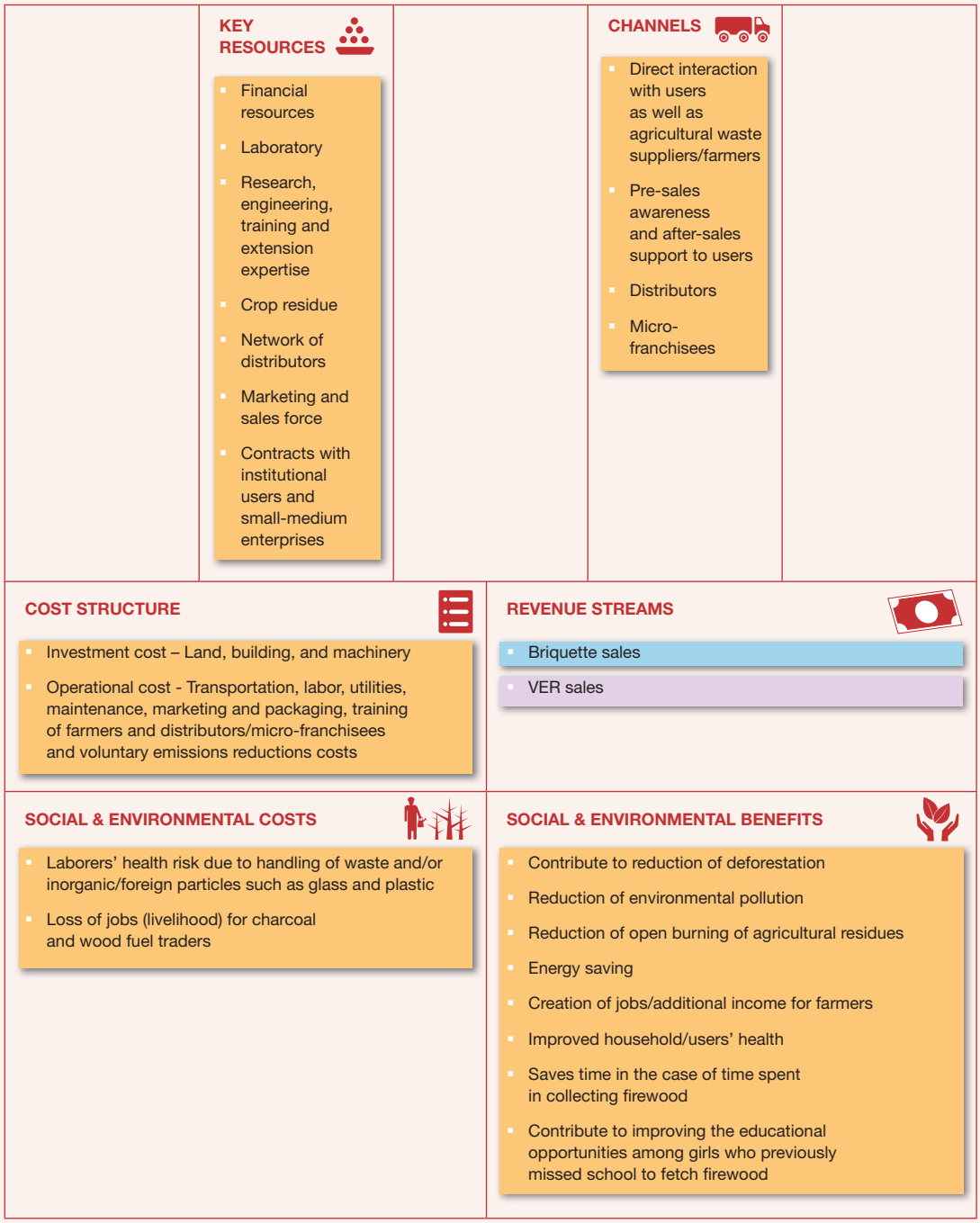
C. Business model

The primary value proposition of the business model depends on the entity initiating the business model. For an agro-industry generating large quantities of crop residue, the value proposition is to dispose the crop residue to mitigate risks from negative externalities of social and environmental impact and, in the process, incur savings from reduced energy costs. However, for a standalone private enterprise the value proposition is to use crop residue to provide briquettes to households, institutions, such as schools and prisons, and small and medium enterprises that need fuel for heating (Figure 13). The business model described in this chapter presumes the operation for a standalone private enterprise.

The briquettes are delivered to the customers either through direct sales, network of distributors or micro-franchising[1]. The direct sales requires large human resource of sales and marketing team and thus has related challenges associated with managing large staff base. The business requires developing strategic partnerships with farmers and agro industries to ensure reliable supply of crop residues at an agreed price. The key activities of the business model are procurement and processing of crop residue, briquette production and sales. To improve the production efficiency and product quality, training of farmers can be a useful activity so that farmers provide crop residue with lower moisture content and store crop residue in an appropriate manner to reduce moisture content. Research and development (R&D) would be a useful activity to streamline a process that delivers higher calorific value product. However, the cost-benefit of R&D should be assessed and ideally partnership with a research institution would mitigate the risk of need for high-skilled labor.

FIGURE 13. BUSINESS MODEL CANVAS – BRIQUETTES FROM AGRO-WASTE





The business enterprise's key capital costs are building and machinery and primary operational costs are transportation, labor, utilities and marketing. Briquette sales is the only revenue source unless the enterprise is able to tap into the carbon market. A briquette enterprise is potentially eligible for carbon offset depending on the type of fuel replaced and the baseline used to calculate benefits from reduced greenhouse gas emission. In comparison to fossil fuels, briquettes produce net lower greenhouse gas

as the raw material inputs are already part of the carbon cycle. Even for regions with high deforestation where wood is used as fuel, briquettes from crop residue will make a strong case for carbon benefits. However, briquette enterprises are unlikely to be individually able to apply for Clean Development Mechanism (CDM) projects due to associated transaction costs, and therefore the preferred route would be to apply via producer associations or for carbon offset on Voluntary Emission Reductions (VERs).

D. Alternative Scenarios

The business model can incorporate two additional value propositions in addition to briquette production from crop residues: a) produce low cost compost, a by-product from briquette production and b) vertical integration of business by manufacturing and selling improved cook stoves and ovens (Figure 14).

Scenario I: Compost production

Production of briquettes results in generation of crop residual waste, which can be used to produce compost. The compost can be either sold or given away to the farmers on good will basis and strengthen their relationship with farmers for reliable supply of crop residue. The additional key activity required for this value proposition is production of compost and related costs incurred. The sales and distribution process will be similar to sales of briquettes.

Scenario II: Manufacturing of improved cook stoves

The business model offers scope for vertical integration as the briquette enterprise could potentially manufacture improved cook stoves and ovens that use the briquettes produced by the enterprise. The improved cook stoves have high social benefits for households especially for women and children through reduced indoor air pollution. In addition, with improved cooking efficiency and reduced fuel consumption, household would earn savings. The business model does not require significant alteration to its distribution process. The additional key activity required is for the manufacturing of improved cook stoves, which has related capital and operational costs. Similar to briquette production, R&D is a required activity to design the cook stoves and oven that meet the customer's requirements. The product also requires specific marketing and awareness campaign.

E. Potential risks and mitigation

Market risks: Briquettes are targeted for households that do not have access to fossil fuels and that are dependent on firewood for cooking. This customer segment has low market risks in the urban areas due to scarcity of firewood. However, in the rural areas in developing countries the market risks for households as customers is high due to free availability of firewood if picked up from forest/plantation on community land. The business should target diverse customer base to mitigate these risks. It is preferred for the business to have both household and institutional customers. The business could also get into bulk contractual arrangement with institutional customers and have assured sales.

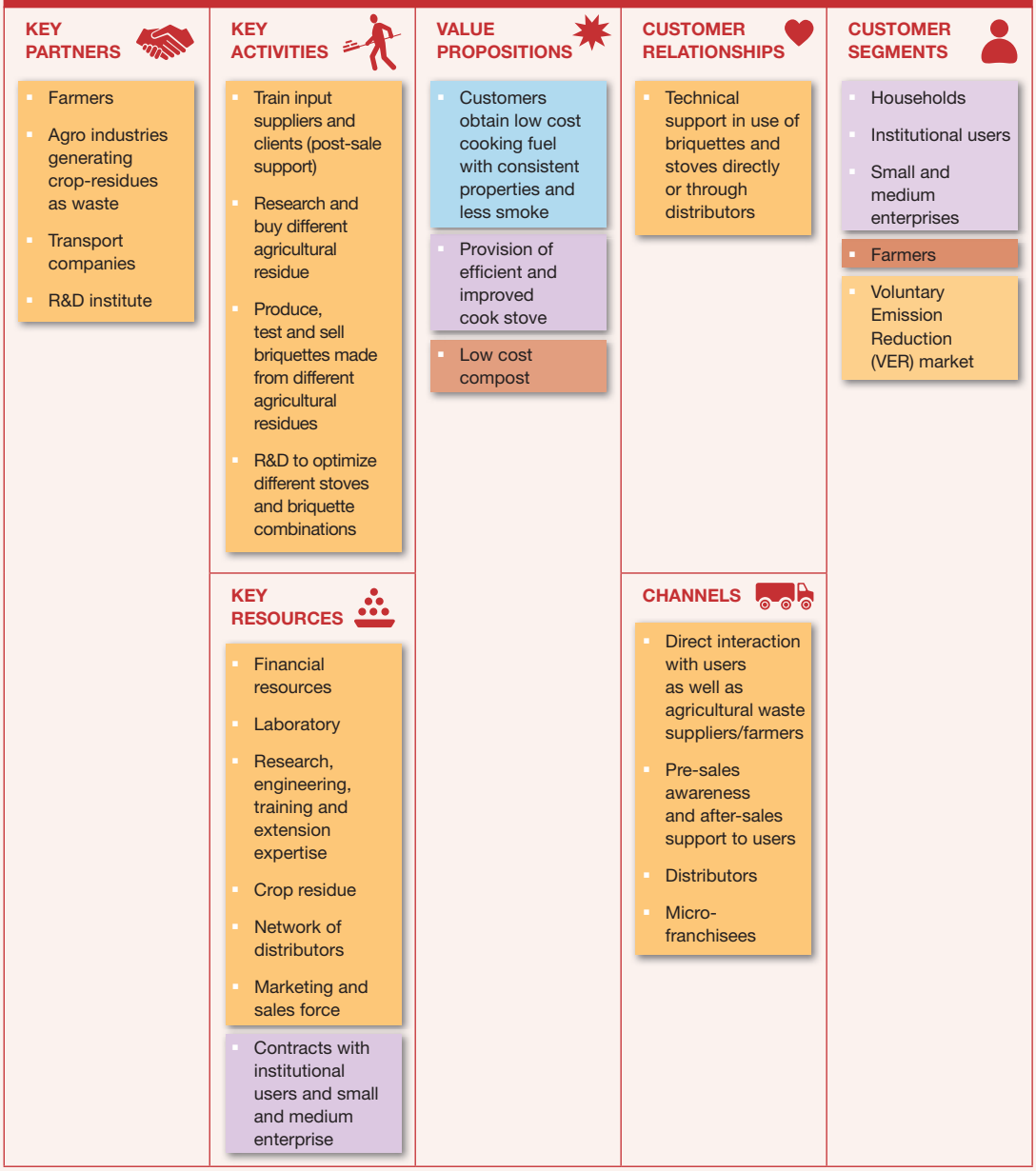
Competition risks: Briquettes have strong competition risks from competing alternative products such as charcoal, wood, kerosene and liquefied petroleum gas (LPG). Fuel choice typically depends on availability, consumer preference, price, convenience and at times social status associated in using certain types of fuels like LPG. Ideally briquette should be targeted to customer segment that uses firewood and charcoal because briquettes can be more competitive, convenient and efficient.

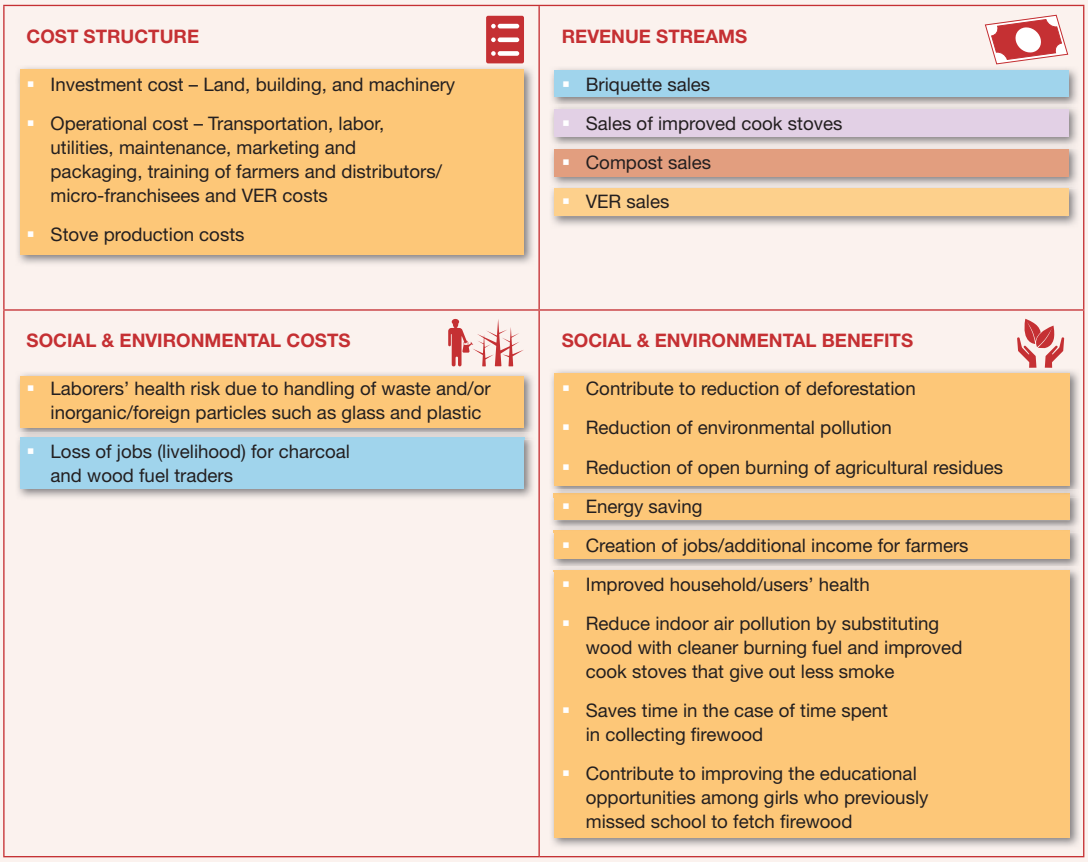
Risks associated with stoves are similar to briquette and there are multiple suppliers of different types of stoves in the market. In the case of compost as mentioned above the enterprise could give it away for free as goodwill measure to the farmers in exchange for assured reliable supply of crop residues which can be procured either directly from the farm gate or have the farmers deliver the agro-waste for a fee. A key risk in procuring crop residue from farmers is that with time they are likely to demand

higher price. To mitigate this risk in addition to giving low cost compost for free, the enterprise should target different types of farmers cultivating different crops so as to negate the rising input cost or have a longer-term agreement with the farmers.

Technology performance risks: The technology used is mechanical compressing with a binding agent or pyrolysis. The technology has been widely used commercially and is proven. It doesn't require high skills for operating it and doesn't have complications towards repair and maintenance.

FIGURE 14. BUSINESS MODEL CANVAS – BRIQUETTES FROM AGRO-WASTE ALTERNATIVE SCENARIO





Political and regulatory risks: In most developing countries, cooking is a social issue and governments in developing countries provide subsidy for fuels such as kerosene and LPG. These competing products are priced lower than briquettes and hence can pose significant risks to the business. Diversifying customer base and including energy intensive small and medium enterprise as primary customers can considerably negate this risk. Increasing government support through financial incentives and policies that promote renewable energy reduce this risk considerably in the long term.

Social-equity-related risks: The model is considered to have more advantages to women as culturally in developing countries women collect fuel wood and do the cooking at household. The model provides employment opportunities and additional revenue for farmers to sell their crop residues. The users of briquettes are low-income households who are using other unhealthy and inefficient fuels, or more costly ones.

Safety, environmental and health risks: Organic waste when left in open begins to decay and releases methane, which is more damaging to the environment than carbon dioxide. The waste-processing technologies are not without problems and pose a number of environmental and health risks if appropriate measures are not taken. The safety and health risks to workers are present and thus standard protection measures should be put in place (Table 8). There is a potential risk for those households where less harmful cooking fuels such as LPG, kerosene or electricity are replaced by biomass briquettes especially without introduction of safer cooking stoves.[2]

TABLE 8. POTENTIAL HEALTH AND ENVIRONMENTAL RISK AND SUGGESTED MITIGATION MEASURES FOR BUSINESS MODEL 1

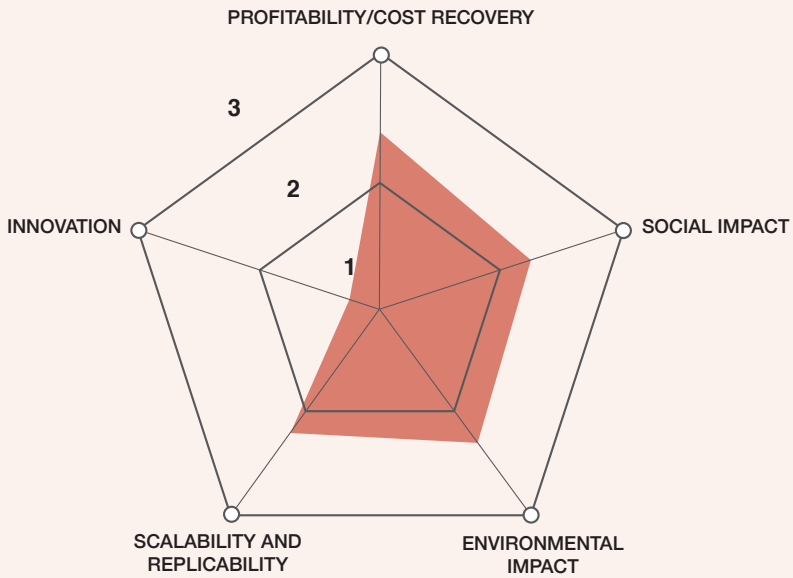
RISK GROUP	EXPOSURE ROUTE					REMARKS
	DIRECT CONTACT	AIR	INSECTS	WATER/ SOIL	FOOD	
Worker						Health risk for households might increase or decrease depending on the quality of the used fuel. Possible exposure to air and noise pollution
Farmer/User						
Community						
Consumer						
Mitigation measures						

Key: NOT APPLICABLE; LOW RISK; MEDIUM RISK; HIGH RISK

F. Business Performance

This business model is rated high on profitability followed by environmental impact (Figure 15). The business model has a strong revenue source and diverse customer base. It has potential for additional revenue source from sale of stoves and VERs. The environmental impact is specifically high for regions with deforestation.

FIGURE 15. RANKING RESULTS FOR BRIQUETTES FROM AGRO-WASTE BUSINESS MODEL



The business model has high potential for replication in developing countries as there are no limiting factors such as new technology, special policies and regulations, institutional capacity, waste availability that can limit replication of the business model. It can be scaled horizontally and has potential for vertical scaling by expanding into the business of selling pressing machines for briquettes through a franchising model and getting into manufacturing of improved stoves. It also has a potential to be implemented in agriculture intensive regions and which have high usage of firewood and charcoal for cooking. The model is straightforward with no sophisticated or innovative financing and technology requirements and hence scores low on innovation.

Notes

1 Micro-franchising borrows the traditional franchising concept with scaled-down business concepts found in successful franchise organizations. It operates as a micro-enterprise following proven marketing and operational concepts with systematic replication. The concept is predominant in delivering services to the poor along the lines of microfinance and microcredit. Micro-franchise entrepreneur has similarities to an agriculture extension worker and typically such an entrepreneur sells multiple product like seeds, fertilizers, water filters, Fast Moving Consumer Goods (FMCG) etc.

2 Winkler, M.S., Fuhrimann, S., Pham-Duc, P., Cissé, G., Utzinger, J., Nguyen-Viet H., 2017. Assessing potential health impacts of waste recovery and reuse business models in Hanoi, Vietnam. Int J Public Health 62 (Suppl 1): 7–16.