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CIRCULAR ECONOMY BUSINESS CASE STUDIES IN SOUTHEAST ASIA

Husk Ventures Cambodia

Phnom Penh, Cambodia

Agriculture/Rice/Carbon based fertilizers

www.huskventures.com

Analysis period: 2019-2024

Biochar Innovation in Agriculture

Business Spotlight

Husk Ventures in Cambodia converts rice husk into biochar through pyrolysis, which addresses environmental and agricultural challenges. This circular solution rejuvenates the traditional use of biochar, tailored to modern agricultural demands. The process captures carbon in the biochar, locking it in for at least a hundred years. This solution recovers value from previously wasted rice husk, reduces the use of chemical fertilisers, and enhances soil health because biochar contributes benefits such as retaining water and nutrients and filtering out toxic substances. Biochar helps restore degraded soils while regenerating ecosystems. Husk's solutions clearly demonstrate significant resource circularity and resource efficiency.

With respect to its business, Husk has seen remarkable growth, with revenues from both carbon removal credits and biochar sales, and the company has received significant support from various organisations and is already starting to export to several countries. Future plans include expanding domestically and into international markets, aiming to broaden the company's impact in sustainable agriculture while promoting the circular economy.

Keywords

Biochar, Rice husk, Waste management, Sustainable agriculture

Innovation

Product/service design, Manufacturing, Use, End-of-life management, Resource circularity, Resource efficiency, Resource substitution

Analysis of Husk Ventures Cambodia

Context and baseline

The dual challenges of climate change and poverty exert a profound effect on smallholder farmers in Cambodia. The rice milling industry annually generates approximately 2 million metric tonnes of rice husk, its main by-product. The traditional practices of uncontrolled burning and landfilling pose serious environmental and health issues. Historically, rice husk biochar was used as a natural soil improver in Southeast Asia, but the shift to widely available chemical fertilisers and their mismanagement has replaced biochar, contributing to soil degradation.

Husk's innovative solution consists of transforming rice husk into biochar products through a customised industrial pyrolysis system. Applying biochar in agriculture sequesters carbon, and the increased soil carbon levels improve water and nutrient retention, which in turn revitalise soil health and improve agricultural yield. Some of the biochar is mixed with vermicompost and nutrients to produce customised products like seedling substrate. The water released during pyrolysis has a strong smoky odour and is recovered and marketed separately as a natural insect repellent.

Husk Ventures, along with local rice mills and research institutions and by adhering to European Biochar Certification standards, has established a circular economy model that integrates waste management, provides agricultural inputs, and utilises carbon removal credits. The revenue provided by these credits makes biochar and the range of biochar-based products affordable for smallholders while promoting sustainable agriculture in emerging economies.

Innovation

The innovation of Husk Ventures lies in customising and optimising the known pyrolysis technology for the specific characteristics of rice husk as raw material, thereby maximising the char output while ensuring that no tar is produced, which is essential for the efficiency of the pyrolysis. This approach significantly enhances the production of biochar in accordance with the European Biochar Standard. The pyrolysis process is initiated by burning some fuel for two hours, after which the process runs continuously for 28 days. During this period, it generates enough heat to keep the pyrolysis process going; excess heat is generated which is used for drying the organic fertilizer granules produced by Husk Ventures. A high energy efficiency is achieved by harnessing the syngas produced as the by-product of the biochar production, illustrating a self-sustaining operation that further demonstrates the integrated sustainability benefits of the production process.

Pyrolisis technology has been essential in developing Husk Ventures' products, which include biochar-based soil and fertiliser products, and biochar-derived natural insect repellant. In this way, Husk Ventures has revitalised an old and largely discontinued artisanal practice of enriching soil with biochar, adapting it to today's agricultural needs and scaling it to an industrial scale.

As a further busines-model innovation, Husk Ventures succeeded in obtaining carbon removal credits, providing enough additional revenue flow to ensure that making biochar from rice husk would be a feasible business venture.

The company's innovation addresses several stages in the lifecycle of agricultural inputs: design/product development, manufacturing, and use. In terms of product development, Husk Ventures has developed a range of agricultural products suited for different applications in agriculture based on the biochar and its associated by-products it manufactures. In manufacturing, significant efforts were been made to select the most appropriate pyrolysis technology and optimise it for the use of rice husk biochar output. To determine how best to use their biochar products, Husk Ventures worked with farmers and agronomists on the best schedules for their applications to support soil recovery, nutrient retention, productivity, and pest control.

Husk Ventures achieved international recognition for its innovation and growth potential as reflected by its inclusion in the Cleantech Group's 2023 list of 'Global 50 to watch' among clean-tech start-ups.

Circular Economy impact

The innovations introduced by Husk Ventures are consistent with key circular economy strategies that aim to use all materials and resources efficiently and circularly and to switch to renewable inputs.

Specifically, using previously wasted rice husks to provide raw material for biochar contributes to resource circularity. The condensed water released during the pyrolysis process as a natural insect repellent adds to the recovery of valuable products from previously wasted rice husk.

The application of biochar products by farmers achieves resource efficiency. The biochar sequesters carbon, and the resulting increased carbon content in the soil improves its quality, in particular its ability to retain moisture and nutrients, which enables the more efficient use of irrigation and fertilisers. Moreover, applying biochar helps to maintain soil moisture during the dry season and prevents the soil from becoming waterlogged during the wet season. Impact studies conducted by Husk Ventures in Cambodia show a yield increase of between 10% and 70% depending on the crop, which means higher revenues for farmers while at the same time reducing costs incurred from using chemical fertilisers by 60% along with irrigation costs. This has already improved the livelihoods of 3712 smallholder farmers and the soil health of 4103 hectares of land between 2020 and 2023, demonstrating the tangible benefits of the circular economy model in both environmental and social terms.

In addition, in the case of the natural insect repellent produced as byproduct from biochar production, resource substitution is achieved, as this natural product is replacing synthetic repellents and/or insecticides.

Business and market impact

The successful business model of Husk Ventures relies on two revenue streams. The first one results from the sale of their products. Husk has diversified its offerings from basic biochar to soil enhancers and their popular carbon-based granulated fertilisers, which are user-friendly and nutrient-rich. This has boosted income, as evidenced by the tripling of sales from 350 metric tonnes to 1000 metric tonnes between 2022 and 2023. Carbon removal credits have provided the second income source, which also makes the biochar-based fertilisers more affordable for farmers.

On average, farmers using Husk products experience a 10%–20% reduction in input costs, and a 20%–40% yield increase depending on crops, soil and previous practices. Husk Ventures has experienced rapid growth and is now targeting a 5% share of the fertiliser market in Cambodia. Its expansion plans include collaborations with larger farms as well as extending its market beyond organic farms to encourage a reduction in synthetic chemical fertiliser use on a broader scale.

Internationally, Husk Ventures is making strides by exporting to Taiwan and the Philippines, and also by exploring partnerships in Vietnam and Thailand. In May 2024 Husk Ventures secured a USD 5 million investment. This positions Husk Ventures for significant future growth and development, further cementing its role in advancing the circular economy in Cambodia.

Stakeholders

Husk Ventures has garnered significant support from major organisations, which has been pivotal for its current success. Notable grants and technical support have come from these organisations: SNV Netherlands Development Agency, United Sates Agency for International Development (USAID), Cambodia Agricultural Value Chain Program (CAVAC), United Nations Industrial Development Organization (UNIDO), Climate Knowledge and Innovation Community (Climate-KIC), and the Open Value Foundation. A significant grant from Innovations against Poverty was instrumental in acquiring the first pyrolysis machine, which made it possible to begin commercial biochar production.

The commercial success of Husk Ventures is further bolstered by a robust network that aids in the distribution and promotion of its biochar products. This is comprised of distributors, agricultural cooperatives and a unique ‘super farmer network’. This latter group consists of around 100 women farmers who not only use Husk Ventures products but also advocate for them, receiving commissions in return. This approach also empowers women in agriculture, supporting broader social impact goals.

With around 2500 customers, of whom 70%–89% are women famers and most of these smallholders, Husk Ventures demonstrates commitment to and significant beneficial impact on the most vulnerable segments of the agricultural sector in Cambodia.

Implementation

Husk Ventures have succeeded in commercialising biochar and overcoming their challenges through their extensive partnerships and support network. Specifically:

- A significant challenge was the cost of the pyrolysis machine and setting up a fertiliser plant, which required over USD 1 million in investment. The carbon credits system and the support of international donors played a significant role in securing the investment.
- A recurring issue faced is the farmers' trust in chemical fertilisers as the foundation for their crops and indeed livelihoods, resulting in a reluctance to try alternatives that may potentially adversely impact yields and hence their livelihoods. The initial cost of converting a customer to biochar use is therefore high for Husk Ventures, requiring substantial time and investment to convincingly showcase the benefits of biochar over the sole reliance on chemical alternatives.
- Another recent challenge is the rising cost of raw materials, as the increasing use of rice husk for biofuel production in Cambodia has driven up the price of this key input. However, for the moment, the risk is not considered problematic. To deal with it the company is exploring alternatives, leveraging the flexibility of the pyrolysis process to use other types of agricultural waste.
- Finally, a significant issue is high taxation. For export purposes, biochar is currently equally taxed as charcoal, at 15%. This classification overlooks the non-polluting, environmentally beneficial nature of biochar. Consequently, Husk Ventures is actively advocating for a revision of the tax policy. However, the opportunities to scale up further and increase exports are numerous.

Takeaways

An important lesson from the experience of Husk Ventures in Cambodia is the importance of perseverance for success, especially when aiming to instigate behavioural change. Transitioning to circularity requires time, patience and maintaining a strong business focus and design for economic viability from the start. For positive results, it is essential to acknowledge the challenges and risks that come with change, particularly in agriculture.

The shift from chemical-based to regenerative agriculture can involve significant risks for farmers, including potential initial decreases in yield. Understanding and accommodating these realities is key to Husk Ventures' strategy, which aims to facilitate a transition to regenerative agriculture rather than insisting exclusively on organic practices. Husk Ventures assists farmers in reducing their use of fertilisers by 60%, and the company is confident that with a mixed approach and patience, significant progress can be achieved.

By acknowledging the complexities and risks involved in changing traditional farming practices, Husk Ventures is able to work more effectively with farmers, ensuring a larger circular economic impact.

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