Concept Note Template

Find on the following pages the questions your idea should address. There is no strict protocol here, the goal should be to convince our judges that your idea has what it takes for further development.

We value all types of different ideas; from bold, large scale ideas to tweaks on existing financial instruments. However, it is crucial that your idea is replicable and not geared towards a specific one-off transaction. All in all, we want to encourage every single one of you to not hold back and come forward with what you think is a great idea.

Team	
Team Members, e-mails, Universities, Programmes	• _____ • _____ • _____

Concept Note (Proposed Idea)

Describe your idea and the problem / issue(s) it addresses	Agriculture is one of the main sectors that contribute to Indonesia's massive CO_2 emission. The emission level coming from agriculture sector has not been treated aggressively since the Government of Indonesia is more focused on other areas such as energy and transportation, thus keeping the emission level from agriculture sector stagnant at 8 MT of CO_2. However, it is expected to grow significantly in the future years since the Government of Indonesia is planning to increase the production level of agriculture product, especially rice, to cope with its increasing demand. Indonesia used to be self-sufficient of rice in the 1980s. Nowadays, Indonesia must fulfil its demand by using imported rice from neighbouring countries. Imported rice is introduced to the market as a balancing mechanism for both rice supply and price. As bizarre as its sound, the price of imported rice is lower compared to the local rice. Analyzing from the perspective of food security, being dependent on neighbouring countries for the supply of main agriculture product exposes Indonesia to a high risk of rice deficit. It is also contributing a significant amount of CO_2 emission in Indonesia's agriculture sector. The Government of Indonesia has been planning to reduce the volume of imported rice by increasing its production capacity to mitigate the risks from imported rice. It is achieved by opening new lands for rice paddy fields. Data from the Ministry of Agriculture in 2019 shows that the area for rice paddy field has grown from 7.1 million hectares in 2018 to 7.46 million hectares in just one year. The land-use change from forestry to rice paddy fields is the root cause for the growth of CO_2 emission from the agriculture sector in the future. As postgraduate students that focused on the energy sector, we believed that this issue is an untapped climate opportunity that desperately needs to be solved sustainably. To help the Government of Indonesia solving this issue, we propose our innovative technology called e-rice. It is an automated water and fertilizer control based on the System of Rice Intensification (SRI) method that has been developed in Institut Teknologi Bandung by Prof. Dr Ir. Mubiar Purwasasmita. The SRI method uses less water and prefers compost fertilizer to double the rice paddy productivity. It is powered by a solar photovoltaic to increase its deployment agility. The e-rice is proposed to be sold to the farmers by using energy performance contracting (EPC) scheme that utilizes the rice sales improvement as our revenue stream to put less burden towards the farmer or landowners.

In making e-rice investment, the availability of capital cost was considered as the top barrier by most stakeholders. During early years of innovation, there is no warranty that the tool can be implemented and suitable for particular paddy field. There are several options for a financial scheme. It could be a grant funding to support equipment purchases or profit-sharing contract between the technology developer and landowner or farmer.

According to the Indonesia Statistic Agency (BPS), the production cost of a one-hectare paddy field is Rp 13,559,300 (~£ 760) with paddy fertilizer accounted for 9.43%. 36% out of total production cost, Rp 4,955,540 (~£ 277) per hectare, would be the farmer's revenue. While the application of the e-rice can reduce the fertilizer cost, and the production rate is expected to increase by 60%. The increased profit of Rp 2,973,324 (~£ 166) per hectare-season is estimated. Summary of fundamental cash flow analysis is shown in Table 1 below. On condition when grant funding is not accessible, contract farming agreement could work well between technology developers and farmers as well as landowners to cover the capital cost.

Table 1. Summary of cash flow analysis for each e-rice device.

CAPEX (£)	OPEX (£)	Discount Rate	NPV (£)	IRR (%)	PBP (years)
562	6	8%	810	23%	7

Describe the key stakeholders involved, which stakeholder provides which services to another, and the flow of funds (e.g., investment amounts, project revenues, customer savings, etc.)

If easier, use a flow diagram to explain.

There are three typical schemes of paddy field management in Indonesia. Firstly, the farmers pay land use rent periodically to the landowner, the farmers get a monthly salary from the landowners, and lastly, a profit-sharing contract between the farmers and landowners. For the first and third scheme, the involvement of the farmers needs to be acquired while the landowner needs to get approached in the case of the second scheme. These are the social risks that must be mitigated by utilizing the support from local government and NGOs. Other estimated significant risks are the weather that can affect the rice paddy field productivity and rice price fluctuation. Analyzing the weather pattern throughout the year deemed to be enough to mitigate the weather risk. However, support from the Government of Indonesia is required to minimise the rice price fluctuation risk. The rice price must behold at a stable level to reduce the impact of this risk.

In the initial development stage, a grant from angel investors is expected to fund the project (see Figure 1). After the project is deemed to be ready to be deployed commercially, funding from investment banks and subsidy from the Government of Indonesia are expected to fund the project. Both funding is needed to accelerate the deployment rate, thus cutting the learning curve of the technology applied.

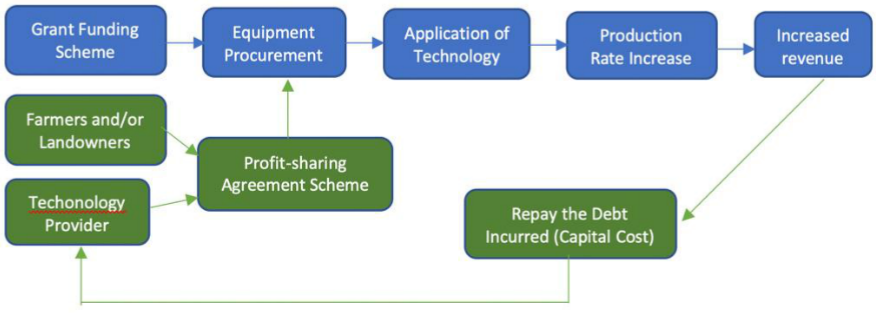

Figure 1. Investment scheme.

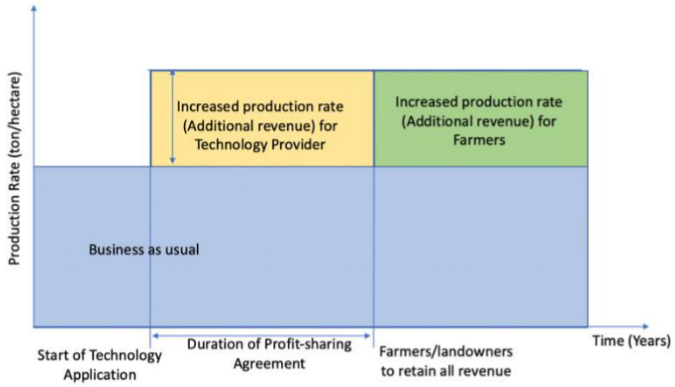

Figure 2. Financing scheme.

The approach for financing scheme is a form of productivity performance contract which allows funding tool to upgrade from increased products. Under the arrangement, the technology developer implements a project to control the use of fertilizer and water irrigation and uses the stream of revenue from increased production to repay the costs of the project, including the cost of investment (see Figure 2). This financing scheme offers several benefits such as financing total project without pursuing capital funding, reduced production cost, increased productivity, consistent production, and reduce the impact on the environment.

Another scheme is that each party provides different capital inputs, sharing the cost for an innovative tool. All the revenue due to the innovative tool will recompense the cost for the innovative tool for several years until all the debt incurred is paid. All the revenue after that period will become the revenue for farmers or landowners, under each land contract agreement.

If possible and appropriate, describe or use a simple illustrative calculation to demonstrate the feasibility/attractiveness of the idea.

- Area of productive paddy farm in the year 2019 in Indonesia:

  10,677,887.15 hectare = **106,778.87 km2**

- Total rice production 2019:

  Area (km^2) x production rate (ton/ km^2) = 106,778.87 x 511.37 = **54,603,510.75 tons**

- Improvement by System of Rice Intensification (SRI):

  Up to 100%, assuming a **60% increase in production**.

- The target of SRI implementation:

  25% of the current productive paddy farm area.

- Assumed yearly increase of production with SRI:

  Total area with SI implementation (%) x production increase (%) = 25% x 60% = **15%**

- Total increase of production by SRI:

  Yearly production (ton) x yearly production increase (%) = 54,603,510.75 x 15% = **8,190,526.61 tons**

- Total NPV for a national scale deployment:

  One e-rice device can cover up to 200 m^2 area.
  Number of e-rice device = 66,735,000 devices

  NPV = £ 54 billion

- Required land use change from forestry to paddy field to achieve the same increase of production:

  Production increase (ton) / current production rate (ton/km^2) = 8,190,526.61 / 511.37 = **16,016.83 km^2**

- CO_2 emission avoided from opening a new rice paddy farm:

  Required land use change area (km^2) x deforestation emission factor (tons CO_2 equivalent/ km^2) = 16,016.83 x 29410 = **471,054,970.3 tons CO_2 equivalent avoided**

What is the climate impact of your solution? Who does it target?	More rice production is essential to ensure future food security. E-rice that utilize the SRI method may double rice production without opening lands for new rice farms. According to *Statistics Indonesia*, the area of productive paddy farm in 2019 is 106,778.87 km^2. Assuming this new technology is successfully applied in a quarter of farms in the nation, the nation's total rice production may optimistically be increased by 15%. To produce the same amount of rice with conventional rice-growing methods, required land area for new paddy field may reach 16,016.83 km^2, contributing to the overall rain forest deforestation rate. Furthermore, considering that deforestation emission factors of secondary dryland forest in Java island are 294.1 tons CO_2 equivalent per hectare, opening 16,016.83 km2 of forest area will cause up to 471 million tons of CO_2 equivalent of emission. New paddy growing method also use up to 30% less water compared to conventional farming method. In conclusion, this new method of paddy growing will help produce more rice to help achieve Indonesia food security while avoiding the adverse effect of deforestation.
How is it scalable/replicable?	The target market for e-rice is 25% of rice paddy farm in Indonesia. However, the rational target would be 100 devices on the first deployment for initial improvement stage. Rapid deployment is expected throughout the following years after the desired learning rate is achieved. The e-rice device is designed to be replicable and deployed in any rice paddy farm in Indonesia. The solar photovoltaic is chosen to make the device agile and not grid-dependent. E-rice device is not policy-dependent, and it should be ready to be applied by anyone, anywhere. As the device helps increase productivity while also helps to avoid CO_2 emission, it should be able to be certified for Green Bonds.

References

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