

# Islamic Social Finance and Sustainable Finance to Minimize Post Harvesting Food Losses in Indonesia

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## Abstract

The whole world is passing through an unparalleled timing and struggling to survive in this era of digitalization and declining globalization caused by a tiny virus COVID 19. Indonesia is no exception. To handle the pandemic, ensuring good health through enhancing food security is vital. The post harvesting food losses because of lack of storage capacity is an issue for the country. Essentially, renewable energy-based mini cold storage can solve the issue. Sustainable financing, along with Islamic Social Financing, can play a vital role to facilitate the cold storage opportunities to the rural fishermen and farmers. This paper, following a qualitative research approach, is trying to offer two financing models to facilitate the cold chain in existing post harvesting food supply chain to minimize the losses. The implementation of the models can help the rural mass to get rid of the poverty, hunger, malnutrition problems. In this effort not only good health and well-being will be guaranteed, but also partnership business practices will be boosted while assuring affordable clean energy uses. Moreover, rural people will get strength to overcome the current crisis moment and reduce uncertainty while attaining several sustainable development goals.

**Keywords:** Islamic Social Finance, Sustainable Finance, Post Harvesting Food Losses, Food Security, Digitalization.

## 1. Introduction

Indonesia is the fourth most populated country in the world. Food safety is one of the national development urgencies. Over the past four decades, the country has upgraded its food security, and agronomic production has significantly enhanced. Nevertheless, increasing population, other demographic changing aspects, and environment change pose challenges to future food security (FAO, 2017). The current unprecedented event of pandemic increases burden on the country to maintain the food security. In the Global Food Security Index in 2018, out of 113 countries Indonesia ranked 65th. In terms of natural resources and resilience, the country ranked 111th, t it is an indication that sustainability must be one of the prioritized programs in food and agriculture planning of the country. The Ministry of National Development Planning (BAPPENAS) is formulating a detailed roadmap to meet SDG targets to achieve the country's vision to be one of the Top economies by 2045. Among other aspects, the country

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need to focus more to reduce postharvest losses to ensure food security and to achieve its vision 2045 (ADB, 2019).

The Indonesian use traditional methods to handle fresh vegetables without hardly any sorting or grading prior to marketing. Therefore, at the farm level the post-harvest loss begins, measures need to take to reduce the losses of vegetables at the farm level. A considerable proportion of the harvested produce never reaches the consumers mainly because of postharvest losses. The estimated postharvest losses of fruits and vegetables lie in the range of 20-40% throughout the world (Wills et al., 2004). The amount of food losses and waste in Indonesia is relatively high. , On the contrary, the availability of data and information about food losses and waste are very limited (Adiandri, 2017). Moreover, in the entire marketing channel, there is very low facility for short and long-term storage of perishables. Ideally, storage facilities should be located at each of the loading and unloading points, and in the wholesale markets. This is a critical problem in the present marketing system, especially for the perishables like fishes, meat, fruits and vegetables.

Although quality of fresh produce cannot be improved by post-harvest handling, however it is necessary for extending shelf-life. Fresh fruits and vegetables continue to function metabolically after harvest and therefore they are subjected to physiological and pathological deterioration. Post-harvest handling has a decisive effect on the extent of post-harvest losses, the final quality, and the market value of the crops (Kim, 2006). Post-harvest handling covers the time span from product harvesting in the farm field until it reaches the urban consumer through the market (Tjahjadi, 2006).

The loss of post harvesting fruits, vegetables, meat and fishes is an important issue to ensure food security, specially, in this pandemic scenario when ensuring food security is an essential: this article would try to find out an appropriate solution of the problem. Consequently, the first objective of the article is to identify whether there is a way to solve the problem. After extensive literature review it is detected that proper cooling technology, specifically, the cold storage within the supply chain can reduce the losses remarkably. Cabbage, broccoli, fishes all the items need different temperature and relative humidity to keep them fresh (Pracaya, 2003; REEEP, 2012; Rukmana, 1994). The cooling process during the postharvest handling helps to reduce deterioration of food items from high tropical temperature (Zainalabidin et al., 2019). Moreover, cold storage facilities prolongs fruits and vegetables usefulness and in some cases improves their quality, it also checks market overabundance, provides wide varieties of fruits and vegetables throughout the year, helps in orderly marketing, increases financial gain to the producers and preserves the quality of the living product (Bafdal et al., 2019; Moody et al., 2007).

Therefore, introduction of solar based mini cold storage can solve the problem significantly. Cold chain need to set up across the supply chain (Verma et al., 2019). This strategy is also in line with government desire to upgrade many fishing ports in off-grid and under-serviced areas to 'eco-fishing-port' status, with both financial and energy self-sufficiency (REEEP, 2012). Ministry of Agriculture, The Republic Indonesia, is currently implementing a national program, called UPSUS standing for Upaya Khsusus (special effort), aimed at increasing productivity and production while at the same time reducing yield losses. The cool chin at the grip of farmers could reduce the losses in a significant proportion, and thereby, millions of

rupiahs would be saved annually. The constant supply of electricity is necessary for cold storage and the inconsistency of the electricity supply at rural level is major hindrance for introducing the cold storage. Considering all these factors, if it is possible to introduce mini solar based cold storage in Indonesia, it will be a revolution in agriculture sector.

The solar mini cold storage will not only save huge number of produced foods and money but also will create different kinds of employment related to managing these cold storage systems. Moreover, servicing activities of this equipment will create new employment opportunities in the local region. Broadly, it will help the country to achieve many of the SDGs. The solar mini cold storage is expensive and beyond the capacity of individual farmer to afford it. Therefore, the second objective of the article is to find out whether there is financing mechanism to solve the cost problem. Considering the socio-economic background of the country this article is going to offer two different financing models including sustainable finance with social Islamic finance and by involving banks or non-bank financial institutions under one umbrella. To facilitate the finding the paper is divided in various sections and the sections are as follows literature review, methodologies, results analysis and discussion followed by conclusion and recommendations.

## 2. Literature review

This section is going to investigate literatures related to Islamic social finance, green finance, post harvesting food losses in Indonesia, existing solutions that is practiced solving the problem and sustainable development goals (SDGs).

### a) Islamic Social Finance

Social finance is a multibillion-dollar approach to manage investments that generate financial returns while having assessable positive social and environmental impact. Though the area is rapidly advancing but remains an under-institutionalized field. Social finance or social investment does not mean a grant or donation, it is still an investment which is repayable and often comes with profit. Islamic social finance is social finance or social investment which follows *Shariah* rules and principles (Razinah & Engku Ali, 2017). Islamic social finance occupies a central position in the Islamic social safety nets and poverty eradication programs. ISF is also used as a form of empowerment of the less privileged members of the society (SFC, 2017).

According to current practices Islamic social finance can be divided into three main groups which consist of: (a) Islamic traditional instruments based on philanthropy. Examples: *zakat*, *sadaqat* and *waqf* (Abduh, 2019; Jouti, 2019; Razinah & Ali, 2017; Marwan & Ali, 2019). (b) cooperative-based foundations. Examples: *qard al hasana* and *kafala* (Islamic Social Finance Report, 2015). (c) Other modern forms of Islamic financial services. Examples: Islamic microfinance, *sukuk* and *takaful* (Jouti, 2019), socially-impactful Islamic crowdfunding (Syed Marwan & Engku Ali, 2019).

In case of Islamic social crowdfunding initiatives, to help the under privileged people, Indonesia is in an advantageous position the country has already used the Ethis Islamic Crowdfunding platform for social housing (Ethis Crowd, 2018). Moreover, to boost the operation of Micro, Small and Medium Enterprises (MSMEs) investment -based

crowdfunding is proposed by Abdullah and Susanto, (2019) and to increase the contribution of East Java's agricultural sector to GDP of the country an Integrated Agricultural Land Crowdfunding Model (IALCM) using Islamic financing instruments through a crowdfunding platform also proposed by Thaker et al. (2020). Subsequently, there is a potential to use the same platform to lessen the post harvesting food losses in Indonesia.

From the Islamic finance viewpoints many scholars have discussed the Sustainable Development Goals (SDGs) (Gundogdu, 2018). According to few Islamic finance scholars the SDGs are aligned with the philosophy of Islamic finance and therefore, Islamic finance is the novel finance substitute to achieve SDGs in 2030 (Zarrouk, 2015). Three Islamic social finance instruments namely *infaq*, *waqf* and *zakat* are excellent alternative philanthropies fund to cover global SDG's investment gap; SDG no. two that is "end hunger, achieve food security and improved nutrition and promote sustainable agriculture" is possible to achieve through Islamic social finance (Abduh, 2019). Islamic finance could promote agricultures sustainability and a more efficient process with FinTech enabled platform (Ningrat & Nurzaman, 2019). Recently the authors have offered three different types of financing mechanism to solve post harvesting fruits and vegetable losses in Bangladesh context and they have given emphasize on the Islamic social financing crowdfunding investment platform and recommended to implement the mechanism (Julia, Noor, & Kassim, 2020).

#### **b) Sustainable Finance**

In Indonesia the Financial Services Authority (Otoritas Jasa Keuangan, OJK) is committed to establish an effective regulatory environment to encourage the development of sustainable financing for the achievement of the SDGs. In 2014, the OJK with the support of some prominent contributors issued the first phase sustainable finance roadmap for the years 2015-2019 (Maghribi, 2019), later in 2017 incorporated green bond guidelines to raise capital for green projects and SDGs initiatives under sustainable finance umbrella regulation. At the same year the OJK imposed binding regulation on banks, capital market and nonbank financial institutions to prepare standardized sustainability reporting (Imansyah, 2020). Although studies indicate that it is technically feasible for Indonesia to undertake an affordable green transformation without jeopardizing economic growth and poverty reduction, there exists a large gap in financing. Increased investment from both private and public sectors is needed, as public funds alone are insufficient (Liebman et al., 2019).

"Green finance comprised financing of (including preparatory cost and capital cost) green investments, financing of public green policies and green financial system" (Nannette Linderberg, 2014). According to the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), "Green Finance is a strategic approach to incorporate the financial sector in the transformation process towards low-carbon and resource-efficient economies, and in the context of adaptation to climate change" (GIZ, 2011). Green businesses adopt principles, policies and practices that improve the quality of life for the customers, employees, communities, and the planet. Green businesses are socially and environmentally responsible and challenge themselves to bring the goals of social and economic justice, environmental

sustainability, as well as community health and development. Green businesses improve communities.

Although in Bangladesh the sustainable financing or green financing started its journey since 2011 after the inauguration of green banking policy and guidelines by Bangladesh central bank (Circular 2, 2011), however Indonesia is a pioneering country with the sustainable finance strategy for the entire financial system (IFC, 2018). Like Bangladesh Islamic banks in Indonesia are in ahead position in green financing compare to conventional counterpart (Julia & Kassim, 2019, 2020). In Indonesia Islamic banks are doing 2.5% green financing of total financing, while the portion of green financing in conventional banks is 1.1% (Siregar, 2014). Therefore, Islamic social finance platform along with sustainable finance have huge potential to help unbanked rural people to get financing to afford solar mini cold storage to reduce post harvesting losses.

### c) Sustainable Development Goals (SDGs)

UN Sustainable Development Summit was held in New York from 25-27 September 2015 for the adoption of an ambitious, bold and universal sustainable development agenda that will end poverty and promote prosperity by 2030, while addressing the environment. The summit outcome document, entitled “Transforming our World: The 2030 Agenda for Sustainable Development,” was agreed on by the 193 Member States of the United Nations, and includes 17 Sustainable Development Goals and 169 targets (GRI & UNGC, 2016). The seventeen goals are- no. 1 no poverty, no. 2 zero hunger, no. 3 good health and well-being, no. 4 quality education, no. 5 gender equality, no. 6 clean water and sanitation, no. 7 affordable and clean energy, no. 8 decent work and economic growth, no. 9 industry innovation and infrastructure, no. 10 reduced inequality, no. 11 sustainable cities and communities, no. 12 responsible consumption and production, no. 13 climate action, no. 14 life below water, no. 15 life on land, no. 16 peace, justice and strong institutions and no. 17 partnerships for the goals. .

To appreciate the SDGS understanding five P’s are vital. They are People, Planet, Prosperity, Peace and Partnership. These five P’s are considered as elements of SDGs and three of them are the pillars of SD: People, Planet and Prosperity. The 2030 Agenda is indivisible. Therefore, countries should avoid cherry picking goals and carefully assess the trade-offs across goals or targets (Mohin, 2016). SDGs are very comprehensive and designed to achieve universal goals which are agreed by world community in general and has no direct conflicts with Islamic percepts. The sustainable development discourse has, however, acknowledged that the three pillars of sustainable development need to be completed by an ethical dimension at the level of popular values. The World Summit on Sustainable Development in Johannesburg (2002) added a short paragraph 6 to its Programme of Action: “We acknowledge the importance of ethics for sustainable development and, therefore, emphasize the need to consider ethics in the implementation of Agenda 21” (WSSD, 2002).

### d) Post Harvesting Losses & Food Security

Indonesia is experiencing an agri-food transformation with rapidly growing demand for high value agricultural products including horticultural products such as fruits and vegetables. Therefore, policy makers and government should support farmers to expand the adaptation of

horticultural crops besides adequate production of vital staple food crops such as rice, maize and soybean, to achieve national food self-sufficiency (Suprehatin, 2016) .

The quality of the product cannot be improved by post-harvest handling but is necessary for extending shelf-life is affected by natural properties of fresh produce as well as various external factors (Bafdal et al., 2019). Appropriate post-harvest technology can minimize moisture loss. The losses basically have two-fold social impacts. Firstly, the country is facing enormous annual monetary loss. Secondly, the consumers are deprived from the consumption of the highly nutritious fruits and vegetables (Hassan, 2010). Post-harvest handling of food which greatly influence the level of postharvest losses and the quality of produce include harvesting, sorting, cleaning, pre-cooling, grading, packing, storage, transportation and postharvest treatments.

Good temperature management is the most effective way to reduce post-harvest losses and preserve the quality of fruits and vegetables. Post harvesting losses of food is related to the early stages of the food supply chain and refers to a system which needs investment in infrastructure. Food waste is applied to later stages of the food supply chain and generally, relates to the attitude of food suppliers and consumers. Like it or not, food losses and wastes will influence global food security. To ensure global food security besides increasing agricultural productivity, initiatives to reduce post harvesting losses of food is critical. However, the later aspect is overlooked by all (Tengku, 2017).

Broccoli is a highly economic crop in Indonesia, it is rich in vitamin and mineral and is a good source of vitamin A; Potassium; Folic acid; Iron and Fiber. The problem of broccoli is post-harvest handling without appropriate technology and handling is still carried out by traditional method without hardly any sorting or grading prior. To maintain the product quality and to extend shelf-life temperature plays a vital role. Different temperature is needed to keep the freshness of fruits and vegetables such as cabbage and broccoli. Cabbage should be stored at 0°C, RH 90%. In such condition cabbage can be stored for 8 months (Pracaya, 2003). On the other hand, broccoli's storage conditions should be dark, 4.4 °C, RH 85 – 90%. In such conditions broccoli can be stored for 14 – 28 days (Rukmana, 1994). There are 800 small fishing ports in Indonesia, many of them without proper cold storage and ice-making facilities. This leads to considerable spoilage. The Government of Indonesia has the aim to upgrade many fishing ports in off-grid and under-serviced areas to 'eco-fishing-port' status, with both financial and energy self-sufficiency. It is also committed to mobilizing renewable energy to further expand the cold chain in the regions (REEEP, 2012).

#### e) **Existing Solutions to Reduce PHL**

In 2013, Indonesia formulated its first long-term agricultural development plan, the Grand Strategy of Agricultural Development 2013–2045. Its primary objective was promoting sustainable agroindustry. The Ministry of Agriculture had set the strategic plan for medium term to achieve food sovereignty and enhance the welfare of farmers by 2015-2019. In 2011, the Indonesian Government launched its third National Plan of Action on Food and Nutrition, and the phase sustain from 2011 to 2015, recognizing stunting as a significant nutrition problem for the first time. The country joined the Scaling Up Nutrition (SUN) Movement and developed the SUN Framework in 2012, together with a new food law to strengthen food

sovereignty and self-reliance. The fourth National Plan of Action on Food and Nutrition, for the years 2015-2019, includes the Sustainable Development Goals and the outcomes of the second International Conference on Nutrition. In addition, the Strategic Policy and Action Plan on Food and Nutrition has been finalized as of December 2016 and a Presidential Decree for it has been proposed. Food security improved between 2007 and 2016 in Indonesia, as a result of improvements in a number of food and nutrition security related factors and policy decisions (FAO, 2017).

Controlling PHL can reduce the hunger problem of developing countries. Both developed and developing countries are applying three strategies to resolve the PHL problem. Firstly, application of current knowledge to improve the handling systems. Secondly, overcoming the socioeconomic constraints, such as inadequacies of infrastructure, poor marketing systems, and weak R&D capacity; and thirdly, encouraging consolidation and vertical integration among producers and marketers of horticultural crops (Kumar, Shankar, & Kumar, 2015).

In India, to solve the PHL problem as well as to save the environment from the harm of diesel made cold storage three alumni of IIT Kharagpur has provided an impactful solution to the agri-community. The solution is known as Ecozen Solutions. The best way towards developing a clean, non-exhaustible and optimized technology was by harnessing solar energy. Ecozen's solar-powered cold room, called Ecofrost, is designed to help farmers store fresh produce till it reaches end consumers. Expanded shelf life of crops enables the farmers to earn more and reduce post-harvest losses. The startup targets agri-traders, wholesalers, retailers and farmers (SW, 2018).

#### **f) Literature Gaps**

To prevent the PHL of fruits and vegetables among many recommendations by Hassan, Chowdhury, and Akhter 2010, one is mentionable here that is the public private partnership. The researchers had emphasized on introducing new and modern postharvest technologies like low temperature storage, refrigerated transport vehicle, ethylene induced ripening technology and plastic packaging and the dissemination of low-cost storage technology at farmers doorsteps. Generally, the losses were greater at the hands of the intermediaries, especially in the hand of wholesalers due to improper supply chain. The growers generally sell their produce either to the party in their own field or to the wholesaler in the nearby rural markets. Subsequently, they never get their expected price from the market. This scenario could be change if the cool chain can be introduced at the reach of the farmers. it is recognized that the intermediaries are also vital components of the today's business. Therefore, they could not be excluded from the supply chain. Nevertheless, if cold storage is possible to introduce at the reach of the farmers the bargaining power of the poor farmers will be increased and monitoring will be strengthened in order to reduce the negative influence of the intermediaries in meats, fishes, fruits and vegetables supply chain. This would ensure two-fold benefits, firstly, the growers would receive reasonable price of their produce, and secondly, the consumers would purchase produce at reasonably lower prices. However, until to date no initiatives has been taken in Indonesia to set up cold chain in extensive manner. Therefore, there is a gap that needs to fill up.

### 3. Methodology

In line with the title of the article the researchers tried to investigate literatures. Literature was searched based on the title ‘post harvesting losses’, ‘Islamic Finance’, ‘green finance’, ‘sustainable development’, ‘existing solution of the post harvesting losses of fruits and vegetables in Indonesia’. The combined effort of Islamic social finance instruments and sustainable finance supported by banks or nonbank financial institute can facilitate poor people to own solar mini cold storage in group or collective manner so that all the year-round fishes, meats, fruits and vegetables can be stored and kept fresh to get appropriate price.

Based on literature review this article at first tries to find answer of the first objective of the article that is “whether there is a way to solve the problem” and attempts to find the possible solution to lessen the post harvesting loses of fruits and vegetables in Indonesia. It has been identified that solar based mini cold storage facilities can solve the problem significantly. A model is also acknowledged. The model used by Eco Frost seems appropriate to handle unique natured vegetables and fruits which required different level of temperature to preserve the freshness as well as nutrients values (Hassan, Chowdhury, and Akhter 2010; Smart World 2018). However, the solar mini cold storage is expensive, approximately 345.6 million to 259.2 million Rupiah per cold storage and financing is an issue. Therefore, extensive literature has been reviewed to get the answer of second objective of the article which is “to find out whether there is financing mechanism to solve the cost problem”. Keeping in mind that solar based mini cold storage facility is expensive this article is going to offer a unique funding way including green financing and Islamic social financing as mechanism based on authors analytical abilities and literature reviewed. Considering country’s law situation and socio-economic background appropriateness of the offered solution is justified. The articles and research papers used as a source of data are published in internationally recognize journals, therefore, data used are reliable and useful.

### 4. Results and Discussion

The solar mini cold storage solution, invented by Ecozen, or similar type of product seems appropriate to resolve PHL condition in Indonesia as well. However, the financing mechanism will be different. Although the projects are subsidy driven, the product cost varies depending on different customer requirements, markets and regions. Solar power helps users to save major running costs on electricity or fuel. In most of the case, the company followed lease-based business model and the model received positive responses from buyers. The system has especially helped horticulture farmers, who have specific season-based production in the year, by allowing to lease the system whenever required.

The system comes with a five years maintenance contract. Return on investment (ROI) period solely depends on the mode of usage and the commodity stored inside the system. The crops which are highly perishable, highly valued, ensure good returns. The payback period is two to three years of use; however, regular crop production may take slightly longer payback time. The web and mobile applications bring the sellers (farmers and perishable crop growers or vendors) and buyers (organized retailers, fresh e-commerce players, wholesalers or traders) in one platform to trade. Therefore, it enables both parties to pre-cool and transport the



commodities in a refrigerated truck from source to destination that allows maintaining the quality of produce.

The advantages of the solar micro cold storage are enormous. It uses renewable energy that is solar power, the storage capacity is five metric tons, hybrid in nature, therefore, can use both grid electricity and solar power. During cloudy weather, the system automatically switches to the available alternative power supply, notifying the operator. The temperature varies 2-10 to 10-12 degrees Celsius, relative humidity is 80-95 percent. It also has pre-cooling capacity; it requires less battery and portable. It is controlled by report & prognosis which not only helps run the system but also charges the thermal plates installed inside, that can provide backup up to 30 hours. These thermal batteries have at least twice the life compared to conventional solar batteries and lower replacement costs that reducing running costs significantly.



Figure 1: Solar Mini cold storage  
Sources: (SW, 2018).

#### **g) Financing Model One**

The solar mini cold storage is expensive about 345.6 million to 259.2 million Rupiah and beyond the capacity of individual farmer. However, farmers can collectively afford it and own it, for this one party is required that will combine them, train them and help them to manage the whole process including getting financing. The party can be a green company or cooperative society. One cold storage can be used by many to preserve different variety of fruits and vegetables one by one throughout various seasons. On other way, farmers can use the cold storage upon need, rental basis and green companies can provide the services to farmers as well as all other parties in the supply chain. In this case green company will own the cold storage. This article is going to offer two financing models to own the solar cold storage in Indonesia context.

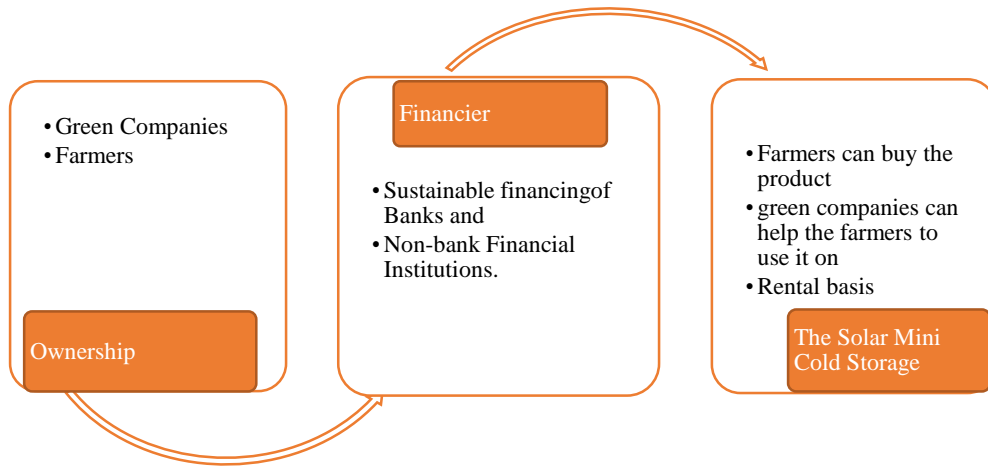


Figure 2: Solar Cold Storage Financing Model One  
Source: Authors Illustration

### Steps to Accumulate Financing

In this scenario farmers or green companies, anyone party can own the cold storage and financing provider will be banks, non-banks financial institutions or international donors. The financing type will be green or sustainable financing.

**Step 1-** Green companies can approach for financing facilities to any bank or non-bank financial institutions to provide them financing from their sustainable financing scheme to buy the product.

**Step 2-** Green Company then will provide the storage facilities to rural people and farmers according to their needs on rental basis. If farmers are the owner, then they can use and manage the whole system by themselves and take help from the seller companies for the servicing job.

**Step 3-** If green companies are the owners in this case farmers will be hassle free as they need not to think about the servicing or maintenance things and

**Step 4-** Green companies will be liable to pay bank installments

### h) Financing Model Two

In this scenario farmers or green companies, anyone party can own the cold storage and financing provider will be Islamic social financing Crowdfunding investment platform. The financing type will be green crowdfunding or sustainable crowdfunding.

### Steps to Accumulate Financing

**Step 1-** Crowdfunding platform is not new in Indonesia, already there are few platforms that are operational such Ethis Islamic Crowdfunding for social housing (Ethis Crowd, 2018).

Moreover, two different platforms have been proposed to promote Micro, Small and Medium Enterprises (MSMEs) business (Abdullah & Susanto, 2019) and to increase the contribution of East Java’s agricultural sector (Thaker et al., 2020). Therefore, another Islamic social crowdfunding platform is possible to initiate to finance the solar mini cold storage.

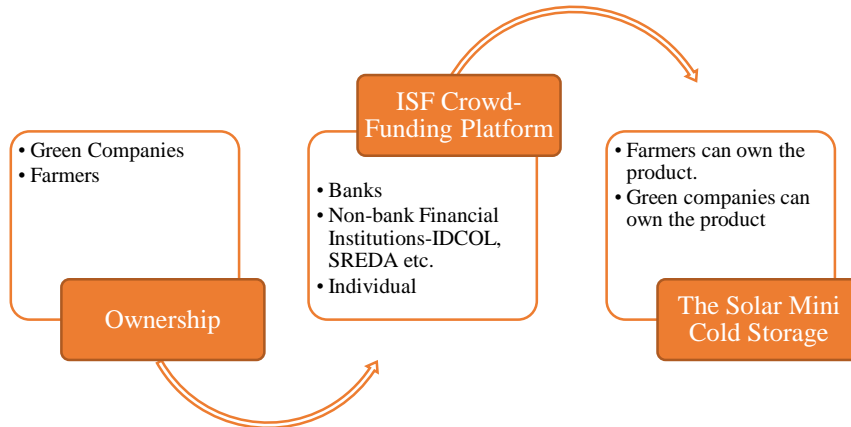


Figure 3: Solar Clod Storage Financing Model Two  
Sources: Authors Illustration

**Step 2-** Banks from green financing scheme, non-bank financial institutions all other parties could join in this platform as investors along with individual. Consequently, the large amount of investment could help farmers or green companies to buy huge number of storage facilities to lessen the PHL of highly valuable fishes, meats, fruits and vegetables.

**Step 3-** Green companies will provide servicing services as well as helps banks to get repayment of loan installments on time.

**Step 4-** Green companies as seller of product will manage the product and the farmers as owner will use the product throughout the year according to their need and harvesting type.

**i) Implications of the Financing Models**

If proposed financing mechanism is possible to implement successfully a revolutionary movement will occur in Indonesian agricultural sector. The strategies that will reduce PHL, will simultaneously help to achieve few SDGs directly such as SDG no. one- no poverty, SDG no. two- zero hunger, SDG no. three- good health and wellbeing, SDG no. seven- affordable and clean energy, SDG no. eight- decent work and economic growth and SDG no. seventeen- partnership for the goals. Few SDDs will be achieved indirectly too those are SDG no. nine- industry, innovation and infrastructure, SDG no eleven- sustainable cities and communities and SDG no. twelve responsible consumption and production.

**5. Conclusion and recommendation**

Post harvesting losses of food items such as meat, fishes, fruits and vegetables are an important hindrance to grow any country’s economy, Indonesia is no exception. Instead of

Indonesian government's various initiatives to ensure food security, post harvesting crop losses remain an issue. The current pandemic and lock down have worsened the scenario. On the contrary, food with nutrient values and proper quantity is essential for all to boost the immune system and handle the pandemic boldly. Therefore, government and regulators should focus immediately on reducing fruits and vegetable losses and ensuring the quality of those. Moreover, solving the issues can resolve many problems such as hunger, malnutrition, overweight, health hazard, over pricing of commodities, farmer's economic losses. This initiative also can help to achieve many of the SDGs such as good health and wellbeing, increase employments etc.

Indonesia's economy has enormous promise. Already the country has achieved the status of 16<sup>th</sup> largest economy in the world, this dynamic archipelago has the potential to be the seventh biggest by 2030 (Oberman et al., 2012). The Ministry of Agriculture has taken measures to respond to COVID 19 such as conducting careful and detailed analyses to the food security situation and interventions to guarantee the supply of staple food for the community (WFP, 2020), besides, those initiatives arrangement of solar mini cold storage can solve the post harvesting losses, food security issue and lessen uncertainties.

Recently, the farmers are feeling the extreme need of storing ability facing with the recent unprecedented event of pandemic and country wide lock down that basically deteriorate the scenario of post harvesting losses (Parvez, 2020). Therefore, in this article the authors are trying to offer a solution of existing post harvesting losses problem through desk research. Secondary data sources have been used to discover the appropriate solution. The solar mini cold storage with average 5-10 tons capacity can be the best alternative sources of dependable, sustainable, cost effective and environment friendly solution of post-harvesting storage problem. Considering the environmental factors and agricultural scenario of Indonesia, solar mini cold storage market opportunity is huge. However, cold storages are expensive and beyond the capacity of individual farmers, therefore looking for financing option seems another challenge which the authors have solved. A blended financing mechanism is proposed including Islamic social finance with green finance. Authors research experience, academic excellence and market trends played a very important role to design the financing models.

Additionally, the proposed financing models are supportive to the Ministry afford to enhance food security. The COVID 19 has shifted the business world towards digitalization. Therefore, authors are strongly recommending the second model that is the digital financing solution. This proposed fintech based solution of Islamic social finance crowdfunding investment platform includes green financing of bank and nonbank financial institutions. Therefore, the mechanism could raise huge amount of capital or funding to afford mini cold storage. In this platform individuals, banks and nonbank financial institutions from green financing scheme can invest, hence, the accumulated funding will be huge that would help to buy a bulk amount of solar mini cold storage. The massive installation of mini cold storage could drastically reduce the post harvesting losses of meats, fishes, fruits and vegetables and could help the country to attain many of the sustainable development agenda.

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