Situational analysis and prospect of interest-free financing in tapioca agro-industry

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Abstract. Tapioca agro-industry is one sector that needs to be developed into a competitive industry as currently there are many users of its derivative products. However, its development deals with limited access to finance. The purpose of this study is to describe condition of tapioca agro-industry and its prospect of interest-free financing. This research is a review of previous studies discussing about the relevant topic. Review was undertaken through descriptive analysis on a number of related literature and was in accordance with availability of secondary data. Results of the study have provided information on condition of tapioca agro-industry and prospect of reinstating the interest-free financing through development of a partnership-financing model of tapioca agro-industry. This partnership model has some other advantages in addition to interest-free, such as collateral-free and profit-and-loss agreements that are mutually agreed among involved parties to minimize the gap between capital owners and business owners.

1. Introduction
Situational analysis is a mapping of actual conditions of an object being studied. Based on previous study, methods used to perform situational analysis include TOWS Matrix [1], McKinsey Matrix, PLC Concept, SWOT [2], Multi-methodology [3], Quantitative Method [4], and Soft System Methodology [5]. Situational analysis can be used by individuals, groups and organizations as informative tools for designing a system, model and strategy in a complex environment.

Tapioca agro-industry has an opportunity to develop into a competitive industry for sustainable economic growth. This is based on various application of tapioca flour in food industry, including thickening agent, filler, and binder [6]. Furthermore tapioca can be processed into several derivative products including glucose syrup [7], lactic acid [8], [9], acetone, butanol, ethanol [10], bioethanol [11], bio-nano composite [12], bioplastic [13], fructose [14], edible film [15], intelligent packaging film [16], and dextrin [17]. These derivative products have supported pharmaceutical industry, confectionery industry, fermentation industry, textile industry, and food and beverage industry.

On the other side, development of agricultural industries such as tapioca agro-industry is constrained by limited access to finance. This limitation is due to the fact that agriculture-based industries cope with different risks such as production risks (weather, pests and diseases), price and market risks (price fluctuations and market shocks), institutional risks (regulations, laws, policies and taxes), human resources risks (physical and mental health), and environmental risks [18–23].
Therefore, requirements to obtain an access to finance are not easy to meet, especially for small scale industries. A limited access to finance may lower tapioca agro-industry’s space to develop. Funding is essential as capital for business development and increased production current. Financing programs in an interest-bearing system showed unsatisfactory results and even caused new problems such as inflicting farmer’s debt and bad credit [24]. Thus, it is necessary to find and develop a financing system that is simple, easy and burden-free.

The purpose of this study is to describe the condition of tapioca agro-industry and the prospect of interest-free financing application in tapioca agro-industry.

2. Methods
This study is a review of previous studies discussing about development and prospects of interest-free financing. Through a descriptive analysis of some related literature and referring to secondary data available, a description of tapioca agro-industry’s conditions and prospects of interest-free financing in tapioca agro-industry were carried out. Some secondary data sources were used as references in this study, such as FAOSTAT (Food and Agriculture Organization Statistics) data, OEC (Observatory of Economic Complexity) data, ACIAR (Australian Centre for International Agricultural Research) data, Center for data and information of the Ministry of Agriculture of the Republic of Indonesia and data from the Directory of the Ministry of Industry of the Republic of Indonesia, as well as results from other research studies published in relevant journals.

Aspects examined include potential of cassava as tapioca raw material, amount of tapioca imports and exports, production process, number and type of tapioca agro-industry, structure of a tapioca value-chain network, financing policies for agro-industry, barriers and challenges in agro-industry financing, and prospects for financing models partnership in tapioca agro-industry. This study includes discussion of the condition of tapioca agro-industry, tapioca agro-industry supply chain financing, and the prospect of non-interest financing of tapioca agro-industry. Systematic details of the study framework can be seen in figure 1.

![Research framework](image)

**Figure 1.** Research framework.

3. Result and discussion

3.1. Tapioca agro-industry’s conditions
Tapioca agro-industry is an industry that processes cassava (*Manihot Esculaenta* Crantz) in such a way so that the starch from cassava is able to be extracted. In terms of production, the largest cassava production in the world comes from Africa with 55.2% of world production, followed by Asia at 30.2%, America at 14.5%, and Oceania at 0.1% [25]. In 2017, Indonesia ranked fourth among world’s cassava-
producing countries with 19 million tons of cassava production, above Brazil, Ghana, and Angola. Details of the largest cassava producing countries can be seen in figure 2.

![Cassava producing countries in the world](image)

**Figure 2.** The biggest cassava-producing country in the world.

There are many varieties of cassava grown in Indonesia. Different cassava varieties will affect yield, color, and taste of flour produced (table 1). Cassava with high HCN elements content and high flour yield is suitable for industrial needs. In the process of making tapioca, cells are dissolved which allows kinase enzyme present in cassava to break down cyanogenetic glucosides and HCN will be released [26].

**Table 1.** Cassava varieties and characteristics [27].

| Varieties          | Released (Year) | Harvest period (Month) | Productivity (Tonnes/Ha) | HCN Content (mg/Kg) | Starch Content (%db) | Yield flour (%) |
|--------------------|----------------|------------------------|--------------------------|---------------------|----------------------|-----------------|
| Adira-1            | 1978           | 7-10                   | 22                       | 27.5                | -                    | 45              |
| Malang-1           | 1992           | 9-10                   | 36                       | <40                 | -                    | 32-36           |
| Malang-2           | 1992           | 8-10                   | 31                       | <40                 | -                    | 32-36           |
| Darul Hidayah      | 1998           | 8-12                   | 100                      | <40                 | 25-31.5              | 35-45           |

| Varieties          | Released (Year) | Harvest period (Month) | Productivity (Tonnes/Ha) | HCN Content (mg/Kg) | Starch Content (%db) | Yield flour (%) |
|--------------------|----------------|------------------------|--------------------------|---------------------|----------------------|-----------------|
| Adira-2            | 1978           | 8-12                   | 22                       | 124                 | -                    | 41              |
| Adira-4            | 1978           | 10                     | 35                       | 68                  | 18-22                | 39              |
| Malang-4           | 2001           | 9                      | 40                       | 100                 | 25-32                | 43              |
| Malang-6           | 2001           | 9                      | 36                       | 100                 | 25-32                | 43              |
| UJ-3               | 2000           | 8-10                   | 27                       | >100                | 20-27                | 41              |
| UJ-5               | 2000           | 9-10                   | 31                       | >100                | 19-30                | 46              |
| Litbang UK-2       | 2012           | 9-10                   | 42                       | 31                  | 18-31                | 43              |

In Indonesia, cassava serves as food source at 58%, industrial raw materials at 28% and the rest as feed and export [27]. In addition to direct consumption, cassava is processed into flour for industrial needs. The main exporters of cassava flour are Thailand ($ 873 million), Vietnam ($ 266 million), Cambodia ($ 25.2 million), Paraguay ($ 15.3 million) and the Netherlands ($ 9.1 million). The main importers of cassava flour are China ($ 714 million), Indonesia ($ 126 million), Malaysia ($ 95.8 million), the United States ($ 56.1 million) and Japan ($ 45.5 million) [28]. In 2019, Indonesia is at second position among importers of cassava flour.
The number of tapioca imports to Indonesia has been fluctuating. However, tapioca imports to Indonesia have continued to increase since 2013 (figure 3). The number of tapioca imports in 2016 was 630,127 tons, while the number of tapioca exports in the same year was 9,064 tons. In general, cassava prices and tapioca prices fluctuated from 2009, which experienced a drastic decline in 2016 and then came back to rise in 2017 [29] (figure 4).

![Number of Indonesian Tapioca Starch Exports and Imports](image1)

**Figure 3.** Indonesian tapioca starch import and export trends.

![Growth of Indonesian tapioca flour prices](image2)

**Figure 4.** Growth of Indonesian tapioca flour prices.

Central productions of Tapioca production are spread on a small, medium and large scale throughout Indonesia. There are 5 regions with the largest number of Tapioca SMEs, including Lampung, Central Java, West Java, East Java, and North Sumatra. Details on the number of tapioca agro-industries can be seen in table 2.
Table 2. The number of tapioca agro-industry in Indonesia.

| No | Province        | Data source       |
|----|-----------------|-------------------|
| 1  | North Sumatra   | Ministry of Industry [30] |
| 2  | Lampung        | 12                |
| 3  | West Java      | 58                |
| 4  | Central Java   | 17                |
| 5  | East Java      | 35                |
|    | **Total tapioca agro-industry** | **134**            |

Stages in the tapioca production process consist of stripping, washing, grating, extracting, settling, drying and flouring [26, 32, 33]. The production capacity depends on technology used in the tapioca production process. Small scale tapioca industry with manual and labor-intensive technology has an average production capacity of 2-5 tons of cassava per day. Medium scale industries shows a production capacity of up to 20 tons of cassava per day while large scale industries have an ability to produce above 200 tons of cassava per day [26], [33].

Sunlight is still a key factor in the drying process, considering that to provide a drying oven with a large capacity requires considerable investment capital. Therefore, only large-scale tapioca industry can afford to install an oven. Oven dryer technology is employed to support continuity of production without being dependent on sunlight. More detailed technology used in the tapioca production process at different business scales can be seen in table 3.

Table 3. Technology employed in the tapioca production process.

| Process     | Small          | Medium         | Large          |
|-------------|----------------|----------------|----------------|
| Stripping   | Manual         | Semi-Manual    | Machine        |
| Washing     | Semi-Manual    | Machine        | Machine        |
| Grating     | Machine        | Machine        | Machine        |
| Extracting  | Semi-Manual    | Machine        | Machine        |
| Settling    | Manual         | Semi-Manual    | Machine        |
| Drying      | Sunlight       | Sunlight       | Oven           |
| Flouring    | Manual         | Machine        | Machine        |

Production Capacity
- 2-5 Tonne cassava/Day
- 20-100 Tonne cassava/Day
- >100 Tonne cassava/Day

3.2. Supply chain financing of tapioca agro-industry

Supply-chain financing is an optimization of financing between stakeholders and an integration of financing process among customers, suppliers and service providers in order to increase values of all participating stakeholders [34]. The aim is to optimize financial flows through solutions implemented by financial institutions [35]. Tapioca supply-chain financing stakeholders consist of cassava farmers, small traders, farmer groups, collectors, tapioca agro-industry, middle man, intermediate industries (cosmetics, pharmaceuticals, and food), retailers, financial institutions (banks and non-banks) and consumers. Details of a supply-chain financing network structure in tapioca agro-industry are shown in figure 5.
Funding in tapioca supply-chain is available in various types and is classified into 5 types, i.e. agro-input financing, agricultural cultivation financing, agro-industry financing, agro-marketing financing and agro-supporting financing (figure 6).

![Figure 5. Supply chain financing network structure of tapioca agro-industry.](image)

![Figure 6. Classification of supply chain financing of tapioca agro-industry.](image)

The Government of Indonesia has launched several programs to address financing problems. In 2007, the government launched a Kredit Usaha Rakyat (KUR) program. KUR is a credit scheme for working capital and/ or investment financing provided by banks to SMEs, which is feasible but not bankable. In 2017, the Ministry of Finance launched an UMi (Pembiayaan Ultra Mikro) program. UMi is an advanced stage program from a social assistance program to business independence targeting micro-businesses in the lowest strata, which cannot yet be facilitated by banks through the KUR program. Table 4 presents differences between KUR and UMi.
Table 4. Difference between KUR and UMi. [36]

| Criteria                  | KUR (Kredit Usaha Rakyat) Financing | UMi (Ultra Mikro) Financing |
|---------------------------|-------------------------------------|-----------------------------|
| Distributor Institution   | Banking and financial institutions  | Non-Bank Financial Institutions |
|                           | Up to IDR 25 million (Micro) and    |                             |
|                           | IDR 25 million to IDR 500 million   |                             |
|                           | (retail)                             |                             |
| Plafon                    | 10 million max                       |                             |
| Receiver                  | Micro and Small Business             | Ultra micro business actors |
| Loan Tenure               | Long term (> 1 year)                 | Short term (<52 weeks)      |
| Collateral                | Small Businesses need collateral as  | There is no collateral for  |
|                           | stipulated in Banking                | group financing             |
| Assistance and Training   | Not mandatory                        | Must                        |
| Government Support Concepts| Interest subsidies                  | The Government Investment Center |
|                           |                                     | (PIP) provides loans to Non-Bank |
|                           |                                     | Financial Institutions (LKBB) with |
|                           |                                     | an interest of 2% -4%         |
| Loan Procedure            | Banking mechanism                    | Non-Bank Financial Institution |
|                           |                                     | Mechanisms                  |

Problems of financing applications for agriculture-based industries are a complicated procedure and existence of collateral in the forms of land assets [37]. There is an opportunity to form a new financial institution based on Law no. 19 of 2013 concerning the protection and empowerment of farmers. These institutions can be formed through community groups or Farmer-Owned Enterprises (Badan Usaha Milik Petani).

3.3. Prospect of interest-free financing in tapioca agro-industry
As long as the tapioca agro-industry and agriculture in general are concerned about financial feasibility assessment aspects such as Average Rate of Return (ARR), Payback Period (PP), Net Present Value (NPV), and Internal Rate of Return (IRR), they will no longer be relevant for use in business processes and projects carried out, particularly in micro-farming businesses. There is a need for a new instrument that can assess business feasibility more clearly and can describe micro-farming business processes and be able to provide financing recommendations based on results of an appropriate assessment [37].

Interest-based calculations are generally based on the assumption that business must be profitable, even though there is no guarantee that a business always earns a profit [24]. Under these circumstances, it is necessary to study alternative financing models, namely interest-free financing. One of prospective financing models to be considered for this type of venture is a partnership model. This model is an alternative to the current interest-bearing system in which there is no third party involved. The partnership enables direct parties to conduct peer-to-peer financing in a project along tapioca agro-industry supply chain. Details of differences between partnerships and bank loans that apply interest fee are presented in table 5.

Table 5. Difference between the financing-partnership model and bank loans.

| Variable         | Partnership  | Bank Loans      |
|------------------|--------------|-----------------|
| Capital ownership| Money-Owner  | Bank            |
| Asset Ownership  | Money-Owner  | Borrower        |
| Capital return   | No           | Must            |
| Interest payment | No           | Determined by the Bank |
| Profit sharing   | Contract     | No              |
| Loss Sharing     | Mutual       | No              |
Partnership financing focuses on a direct agreement between money-owners and factory owners with a mutually agreed profit and loss-sharing. Therefore, the Financing-Partnership Model is very effective and prospective for tapioca agro-industry financing because there is no gap between money owners and factory owners, and benefits obtained can be utilized for various purposes (figure 7).

![Diagram of Partnership-financing model in tapioca agro-industry](image)

**Figure 7.** Partnership-financing model in tapioca agro-industry.

In In addition, interest-free financing is very prospective and relevant to be applied in highly risky businesses, such as tapioca, in order to improve its competitiveness. In the supply chain, there are financing risks caused by high-interest rates allowing SMEs to have limited capital [38]. Tapioca agro-industry, although it is very prospective, contains risks that can lead to financial difficulties. In general, it is very clear that the financial institution, by applying the element of interest, will not be suitable to be applied in an agro-complex system such as tapioca agro-industry.

### 4. Conclusion

An actual obstacle faced by tapioca agro-industry in Indonesia is difficulty of access to finance. This condition is worsened by an increase in tapioca imports and a decline in tapioca exports. Loan financing from banks has shown weaknesses, such as interest-based loan, use of collateral, and a gap between money-owners and factory-owners. Interest-free financing is very prospective to be developed and implemented in highly risk agriculture-based businesses, such as tapioca agro-industry. The prospective interest-free financing model developed is a partnership-financing model that provides advantages, such as collateral-free, interest-free, profit-sharing and loss-sharing agreed upon, thereby minimizing the gap between money-owners and factory-owners.

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