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CONSTRAINTS AND CHALLENGES TO FUNCTIONAL ANALOG RICE PRODUCTION: LESSONS LEARNED FROM FOOD DIVERSIFICATION POLICIES IN EAST LOMBOK – INDONESIA[1]

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Sub-Theme: (2) Smallholders in the Global Value Chain

Abstract

Food diversification has been a challenge for Indonesia and also for the West Nusa Tenggara government. Rice self sufficiency has been a major concern, especially in the era of fast land conversion. The government promotes food diversification policies through which other food resources such as cassava, maize, and others are utilised. As part of these policies, in 2012 the National Agency for Food Security in collaboration with the Provincial and East Lombok District Food Security Agencies established an *analog rice* processor plant at Masbagik Village - East Lombok District. This study aims to understand (1) the existing performance of analog rice production, and (2) constraints and challenges for analog rice production. *Modified participatory action research* was applied to the study (July 2016 - June 2019). Focus Group Discussion, in-depth interviews and observation have been used for data collection. The first year study found that analog rice production policies have not been implemented well and analog rice production plant is almost stagnant. Limited production activities took place and the value chain analysis confirmed for several *constraints* to analog rice production such as the machine failures, absence of proper formula and business plan. Absence of a clear vision at the processor/enterprise is identified. The *key challenges* in producing functional analog rice are to get a *proper analog rice production formula*, and to promote an *effective business enterprise*. There is also a need to improve the capacity of human resources involved, and the availability of raw materials for the functional analog rice production.

Key words: Analog, rice, production

1. Introduction

[1] A paper presented at the ICC ISAE Conference, Bali – August 2017

East Lombok is one of 9 districts of the West Nusa Tenggara Province (WNT), covers a land area of 2,679. 88 km2 and sea of 1,074.33 km2. Almost 60% of the total area is highly fertile land for agriculture with mainly rice paddy for 65,231 Ha besides corn (86,860 Ha) and cassava (818 Ha). Potential area of seaweed cultivation in the coastal area of Teluk Ekas up to 2000 Ha although effectively used area is only 520 ha. However the high potency of agricultural land and sea have not been able to make the people move out from the poverty. According to the Department of Social and Menpower, about 21.55% of the East Lombok population is fall under the poverty level.

Previous related activity was a series program conducted by Universitas Mataram (UNRAM) in collaboration with a Food Security Agency (BKP) of WNT focused on the development of local food products. The activity has created groups of farmers as Small-Scale Enterprise (SSEs) that are capable in processing fermented cassava flour (CV. Ijo Mekar), corn and seaweed into analog rice products. However, lack of skills and knowledge to develop the products, poor post-harvest practices, inadequate marketing infrastructure and business development services are limiting the economic development in the area.

The population density of East Lombok is accounted of 720/km2 (1,166,365 people), with 526,179 are man and 604,186 are woman (BPS NTB 2013). By taking considerations that human recourse development plays major role in the community economic growth, strengthening capacities of individual society is important for economic development for East Lombok. Moreover, potential activities of the economic elements found in this area such as micro- scale producers (MSPs) of the three selected crops (Corn, cassava and seaweed), trained farmers (SSEs), a goverment aid machine for processing analog rice, and many other hidden resources are believed will be a positive driven for the economic growth of East Lombok. In addition to the activities, improvement of the previous products that have been developed before to be healthier products is believed to have more benefits.

Increase in number of some degenerative disease recently such as cancer, diabetes has influenced people to change their lifestyle including choosing more healthy food. One of source of healthy food cultivated in East Lombok was Lebui (pigeon pea). This pea is traditionally consumed as vegetable and other kinds of food in Lombok. Bioactive compounds in lebui have been reported to have some bioactivities such as antioxidant, antidiabetic and antihypertensive.

A collaboration action-research project entitled "*Smallholder Livelihood Improvement through Small Scale Functional Analog Rice Food-Base Processing Enterprise: An Action-Research Approach to Smallholder Agribusiness and Food Processing Industrial Development in East Lombok – West Nusa Tenggara Province*" has facilitated experts from University of Gadjah Mada (UGM), University of Mataram and the Government Food Security Agency of West Nusa Tenggara and East Lombok (BKP) to work together in addressing the poverty and healthy issues. This project has been supported by the New Zealand Government through *Community Resilience and Economic Development Programme* (CaRED) managed by UGM. This research based activity (belong to "Sustainable Economic and Livelihoods Opportunities" – SELO theme) has been designed to improve the smallholders' livelihoods during three year program (2016-2019). The results presented and discussed in this paper are the findings from the first year of the project where some constraints and challenges are found.

2. Methodology

An action-reseach method is applied to this three year collaborative research project, started in July 2016 and will be completed by December 2019. The first year project activities was mainly focused on research activities covering two research components, *social/policy/agribusiness* research, and *food science research*. A mix menthod approach has been used in the research activities, combining social research methods and laboratory experiment. Various data collection techniques have been applied to collect social/policy/agribusiness and food science data such as obsevation, survey, in-depth interview, and focus group discussions. Data processing and analysis have also combined both qualitative and quantitative approaches.

Research activities for *the first year* of the project for *social/policy/agribusiness component* are *household survey* to understand the existing smallholders' livelihood assets; *policy analysis and studies* to understand the existing policies affecting agribusiness system and small medium enterprise development, *value chains studies* for cassava, maize, seaweed, and lebui, and *workshop* to share the research findings. Research activities for *food science and processing component* are *social community studies through survey* to understand the existing local traditional food processing technologies, *laboratory research* on optimation research formula low Glicemic Index (GI) and market promotion, *an analysis GI and Nutritional value* (*In vit*ro and *In vivo* test), *workshop* to share the research findings, and in vitro assays on bioactivity of bioactive compounds contained in the products such as antioxidant, antidiabetic, antihypertension.

The second year activities of the project are focusing on action and evaluation to improve stakeholders'capacity (such as framers, farmer groups, food processors, and others) on agribusiness and food processing that may lead to the adoption and difusion of recomended technologies and practices. The second year activities will help the farmers/farmer groups, and the food-base processing enterprises to implement and run their business activities.

The third year activities of the project will be focused on reflection and evaluation of the whole project intervensions in both social/policy/agribusiness components and food processing/technology components. Lessons learned and follow-up activities will be developed in this stage. This three year action research approach is summarised in Figure 1.

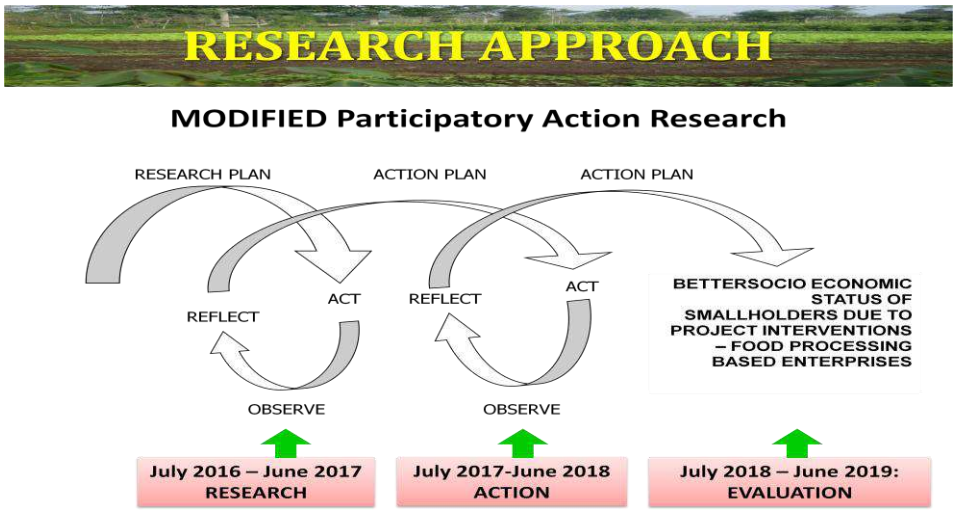

Figure 1. Research Approach Use in the Study

3. Results

Due to the fact that cassava and maize are the most dominant components of the functional analog rice production, the following value chains are focused on these commodities. The value chains of other commodities such as seaweed and labui are not included in these results and discussion due to the small proportion of these commodities used in analog rice production.

3.1. Cassava Value Chain

The value chains of cassava and maize are presented in the following figures. Figure 2 reveals several main and core processes in cassava value chain. Farmers get seedling from farmers' own stock & may buy somewhere elses/Some farmers feeding their cattle with cassava stem skin; or find somewhere else.

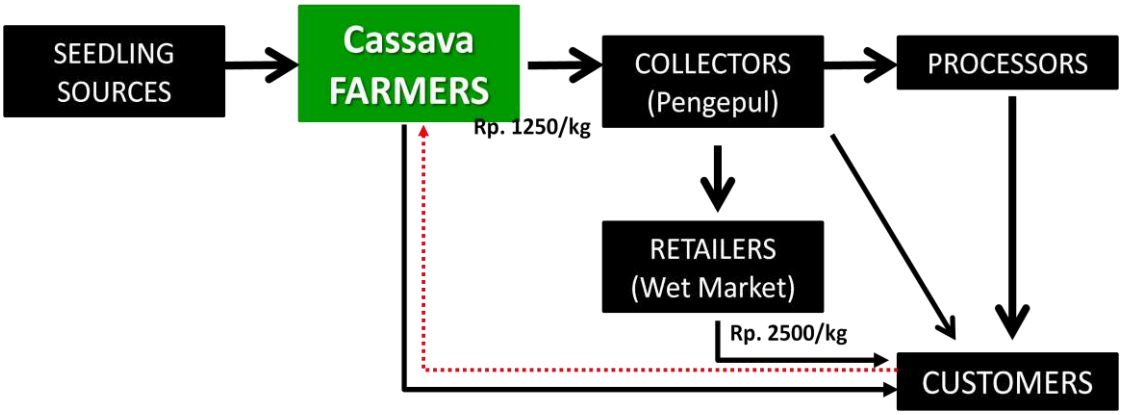

Figure 2. Cassava Value Chain in East Lombok

Farmers grow cassava in intercropping system with other crops such as maize, peanut or long bean; they also do weeding, penggemburan, fertilising (using use, posca & manure); Harvesting range between 8 to 12 months (tape processor like to buy the 8 months or 7 months old. They sell the plant depend on the market/buyers/collectors.

Table 1. Natural Capital Belong to the Cassava, Seaweed, Maize and Lebui Farmers

Commodity	Land size (ha)		Range (ha)		Jumlah						Total	
	Ha	Average	Min	Max	<0,5		0,5-1		>1			
					n	%	n	%	n	%	n	%
Jagung	29,51	1,48	0,25	4	3	15,00	8	40,00	9	45,00	20	100
Singkong	16,55	0,83	0.04	3,5	10	50,00	5	25,00	5	25,00	20	100

Farmers sell their cassava in several go depend on the price, the market needs, and farmers' needs for cash. Once they agreed on the prices, the collectordo the harvest. Foremerly they use "*tebasan*" sistim, but now farmers sell the cassava in bag (100% farmers do this). The collectors harvest the cassava and then they count the total numbers of bags. Farmers may sell the cassava in 1 hectar for several days, depend on the market – due to the perishable nature of the products.

Cassava produced by farmers at Ijobalit village then sell to other cassava processors at nearby villages such as Dasan Gres, Karang Baru, and others. Cassava is proccessed into various products such as cassava crips, chips, fermented cassava or tape, cake (onde2) and others.

3.2. Maize Value Chain

Maize value chain seems to be the more established one among the other three commodities (Figure 3). Maize has been an important product of East Lombok and has been produced for generations by East Lombok Farmers. Maize produced in this area is sold to the village collectors and then to inter island traders and then to the animal feed companies such as Comfed in Surabaya and others in Bali. Farmers may also sell their products to the poutry industries and farms that exist in East Lombok as well as other parts of the island. The pricse of maize at the farmer level may reach Rp. 1,600.00 per kg or Rp. 3,700.00 to Rp. 4,000.00 per kg.

Results of a household survey carried out in East Lombok found that an average farm size for maize production was about 1.48 ha with a range between 0.25 ha to 4.0 ha. Out of 20 farmers interviewed for the study, 85% farmers have farm size above 0.5 ha. Farmers grow maize in mostly monocultural system and harvest maize in 3 times a year. Farmers selling their maize in form of "tongkol" at his farm, transported by the village collectors to the inter-island traders. Farmers do not do anything to get more value added such as "*threshing*" and "*drying*" activities.

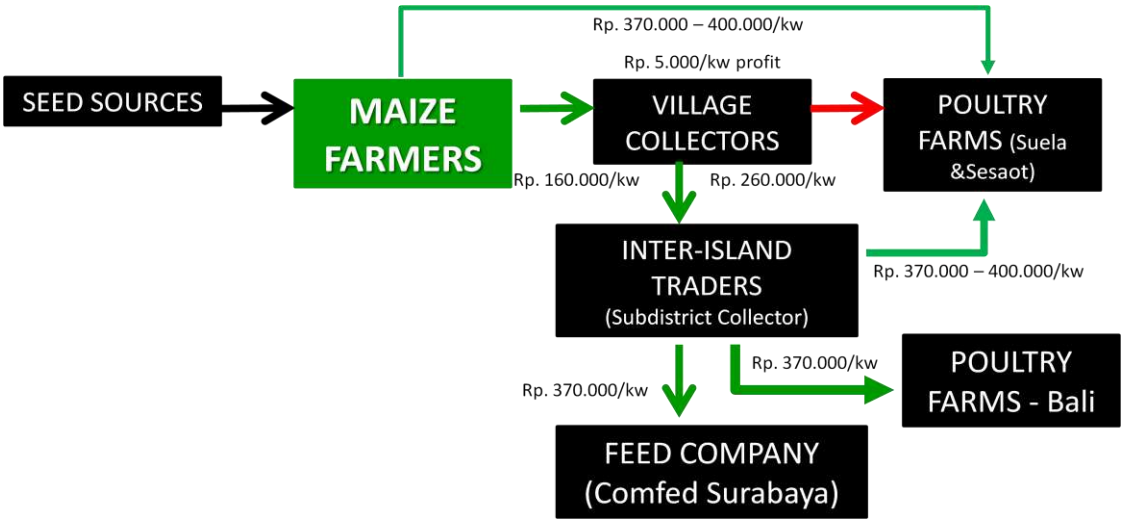

Figure 3. Maize Value Chain in East Lombok

Farmers get maize seeds from local seed shops or even from the local government. Through agricultural development programs, government provides seed for free to the local farmers such as in PIJAR program – a stand for *Sapi Jagung and Rumput Laut Program*. Farmers' activities to produce maize are land preparation, planting, maintenance (pest and disease controll, and fertiliser application), and harvesting.

Collectors usually do not have working capital, and working for the inter-island traders, getting fee for their services. Collectors get Rp. 5,000.00 for every 100 kg of maize they collected. Once they get enough amount of maize, then the collectors ivite the inter-island traders to take the maize to the traders' warehouse.

Inter-island traders then do some activities such as "pemipilan", drying, and packaging. These traders have established a good contact with Bali and Surabaya buyers and they will sell their maize in cash at the traders' gate – to minimise the risk for ceating. Once they get a certaint amount of maize, then they just contact the buyers (feed companies) in Bali and or Surabaya (the traders prefer to contact Bali buyers) to come and get the maize. They prefer Bali buyers due to the fact that Bali buyers do not apply very strict quality standard such as 18% water content, and waste is included is acceptable due to the fact that the maize is used for feeding pigs. Buyers from Bali and Surbaya transport the maize to their places.

Poultry farmers who use maize for their business have their own processing machine for processing maise for their birds. They just buy maize cernel from the surounding farmers and sometimes from the local collectors.

4. Discussion: Constraints and Challenges

To produce functional analog rice from food crops such as cassava and maize, an analog rice processor needs to have adequate amount of raw matterials such as cassava, maize, seaweed and lebui (Figure 4). The first two raw matterials would be the most dominant inputs while the last two raw matterials just needed in a small proportion. The value chain studies found the absence of commodity flow from raw matterial producers to intermediate processors and to the rice analog producer - UD. Kaya Rasa. In other words, the four commodities have not been used to produce functional rice analog. Figure 4 also highlights the issues of analog rice production system, the link among all components in the system such as (1) analog rice producers, (2) intermediate processors, (3) commodity collectors or traders, and (4) raw matterial producers or farmers or smallholders. This study found that the botle neck for the system to stagnant is the issues found at the core component of the system that is **UD. Kaya Rasa**. Observation and interviews with UD. Kaya Rasa manager highlight the following constraints and challenges:

(1) The rice analog production machine was not working or broken. The light would turn off when the swift was turned on.

(2) The technical operator to fix the machine or to maintenance it was not available. As results the broken machine could not be fixed.

(3) Suddent off of the electricity at this rice analog production plant would lead to difficulties in pushing out the "adonan" and its become hardness (mengeras).

(4) The machine did not work to produce rice analog with the capasity 50kg per hour and working for 10 hours per day or equal to 500 kg per day.

(5) This business unit does not have machine spare part (should go to kl protech - west java?)

(6) The last and the most critical factor affecting this food processing performance was the absence of *production formula*. The rice analog manager and the operator do not have good knowledge and skills to run the business. They do not know how to prepare the "adonan" (mixture), the proportion of each rice analog components, and other technical knowledge. The installator of the machine just trained the operator to run the machine, and not the rice processing procedures.

(7) As a business entity, UD. Kaya Rasa does not have a business plan to guide the manager and the operator in runing the production.

(8) The existing production building and the environment have not been supported by adequate faciltiies such as raw matterial and product storages.

(9) Overall, there is no standard operational procedures (SOP) for the rice analog production process.

All these constraints highlight the situation where the rice analog business has not been at the stage of *ready to produce* "analog rice" or even "functional analog rice". Key factors to a successfull business have not been created as they are discussed by Rockart (1979). Rockart (1979) in Klaus G. Grunert and Charlotte Ellegaard (1992) summarised the key factors for a business, and few factors among the others are *management team* (capability and capacity), *production* (schedule, facilities, etc.), *business relation* (with government), *societal images, market understanding,* and *facilities*. Rockart discuss five sources of critical success factors of a business, namely "(1) *The industry* (e.g., demand characteristics, technology employed, product characteristics etc. These can also affect all competitors within an industry, but their influence will vary according to the characteristics and sensitivity of individual industry segments); (2) *Competitive strategy and industry position* of the business in question, which is determined by the history and competitive positioning in the industry; (3) *Environmental factors* are the macroeconomic influences that affect all competitors within an industry, and over which the competitors have little or no influence, e.g., demographics, economic and government legislative policies etc.; (4) *Temporal factors*, which are areas within a business causing a time-limited distress to the implementation of a chosen strategy, e.g., lack of managerial expertise or skilled workers; and (5) *Managerial position*, i.e., the various functional managerial positions in a business have each their generic set of associated critical success factors."

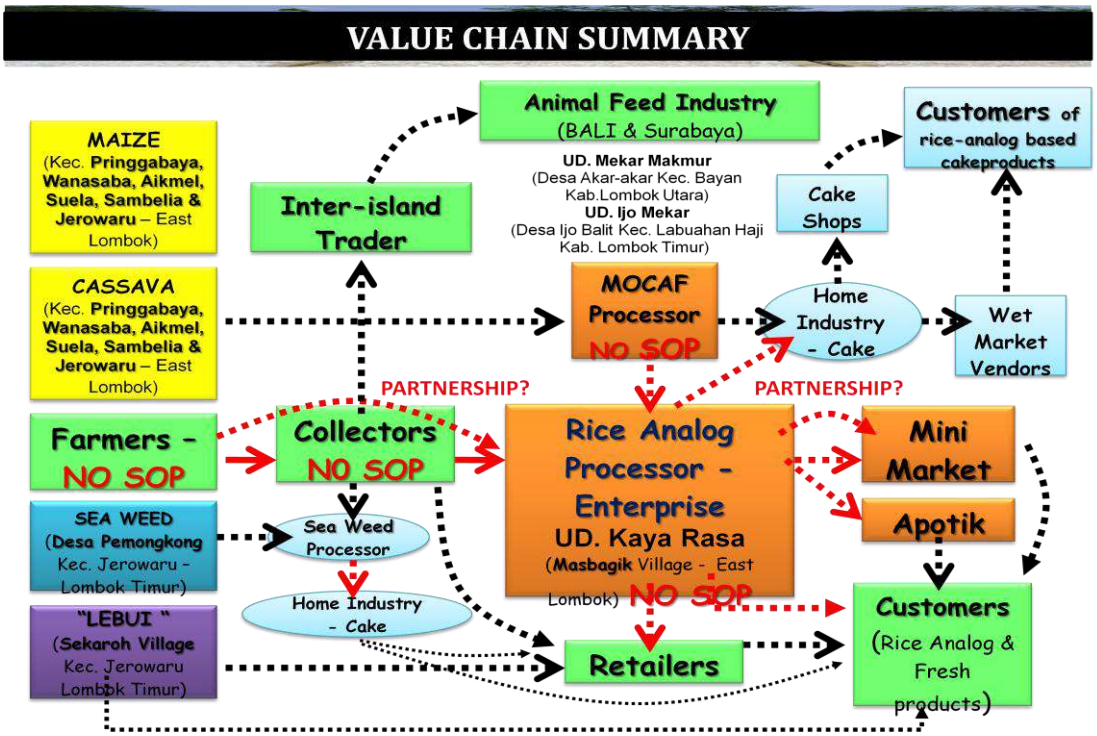

Figure 4. Value Chains of the Four Commodities in East Lombok

The existing value chains are characterised by the following points:

(1) Limited value added activities taking place along the chains except some simple processes and activities taking place at the collectors level for maize. This reflect a very limited job creation from these four commodities.

(2) Provincial and district goverments have actually introduced several programs related to these commodities such as food diversification programs through rice analog production, self sufficiency project for maize but this study found the program have not done enough to promote vaule added to the products. The rice analog production has not been in operation while the sea weed processing is not working.

(3) Lack of inter-actor linkages for all value chains. The analog rice producer and the mocal producer for example have not established a real mutual benefit relationship due to the fact that analog rice producer has not started the production.

(4) Studies of the processors confirmed for several key contraints within these processing actors such as:

   a. Lack of clear vision for rice analog and mocal production

   b. No clear business structure within the enterprises

   c. Lack of technical skills of the processors

   d. Absence of correct production formulas to be used as a production guides. There is no Stadard Operational Procedures establsihed at all value chain actors – see Figure 7

   e. Issues associated with the production machines – inproper instalation, break down, and the power capacity.

(5) Local policies to support small scale food-base processing enterprises have not played their critical roles in helping the systems to work well. The policies seem to be exist only on policy documents, and not at the real activities.

(6) The national government policies on food import provide another form of threat and challenges, not only for food diversification policies and programs, but also mainly for the local analog rice producer and smallholders who producing the raw materials such as cassava and maize. In January – February 2017 the government imported 14,473 tons of rice (from Pakistan, India, China, Thailand, and Vietnam), 68,883 tons maize, 591,413 tons soybean, 1.62 million tons wheat, and 10,009 tons wheat flour (BPS, 2017).

To promote effective functional analog rice production, the following actions should be taken by the key stakeholders:

(1) Get a confirm formula to product a standard and high quality functional rice analog, the rice that has the comparative advantages then the conventional rice.

(2) Get and promotes a clear standar production process or Standard Operational Procedures (SOP) for the high quality and intended functional rice analog – will be used by UD. Kaya Rasa to start the production. This a challenge for the research and development agencies such as the University of Mataram and Universitas Gadjah Mada.

(3) Another challenge to UD Kaya Rasa are the need to establish a standar treatment for the raw materials such as cassava, maize, sea weed, and lebui, and the standar treatment for the outputs (rice analog). There a need to establish a standard raw materilas and product storage. Is it another change to the research and development agencies such as the University of Mataram and UGM.

(4) Standard Operational Procedures (SOP) should be established at the farmers level who produce the raw matterial for rice analog production, at the traders who transporting the raw matterials, and at the intermediate processors such as sea weed and mocaf processing.

(5) Capacity building activities are needed to improve the knowledge, skills, change the attitudes and motivations of all key actors of the value chains to support the improvement of the existing value chain performance.

(6) More research activities are needed to promote an effective and integrated food processing-base small scale enterprises that would help to improve the smallholder farmers' livelihood.

These alternative actions are the challenges for the key stakeholders to finally produce the functional analog rice as part of the food diversification and food security policies.

5. Conclusions and Recomendations

5.1. Conclusions

Supporting policy statements and a single technical innovation (analog rice production machine) are not enough to create substantial changes, include those in the field of food security, food diversification, and food safety. The data collected from this collaborative study highlight that the functional analog rice production or in the ***policy document*** it is stated as "deligent rice" (*beras cerdas)* production have not been materialised as it is expected. Limited production activities were taking place, but fail to go further into commercial stage and even to accelerate food diversification in the social system. The study findings highlight the importance of other supporting components within the functional analog rice production system such as the need for other *technical inventions* (proper and innovative formulas of functional analog rice production; production house construction; approapriate and standardised production and transportation of raw matterials); the *availability of social innovations* (effective management plan; business organisation; social marketing; inter-agency coordination and collaboration; etc.); *supporting human resources* at all components of the system (raw material production and transportation; rice production plant, storage, delivery and marketing); and *supporting social system* (having good knowledge on functional analog rice; willingness to consume functional anlog arice; etc.). These supporting elements should be in place if the government wants to materialise the

functional analog rice production and at the end consume by the communities. Otherwise, the supporting policy statements would only be a normative statement and document.

5.2. Recomendations

The study identify the future challenges in producing analog rice such as the need to develop proper rice production formula, effective marketing of the product, the need to improve the capacity of human resources involved, and the availability of raw matterial for the analog rice production – maize, cassava, and sea weed flours. Above all, the national government's political will to strengthen and implement the national policies on food self sufficiency is critical in facing the existing ***Global food value chain***, otherwise the smallholders are in their steps to the uncertainty.

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