

Corn Tortilla Processing Technology and Corn Chips at Farmer Group/Farming Women in Bekiung Village Kecamatan Kuala, Kabupaten Langkat, North Sumatera

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Abstract—The purpose of PKM activity is to develop the business of corn farmers/women in Bekiung village to be an economically independent business through the processing of tortillas and corn chips, the design of a corn flattening machine, the design of an amphia machine (to make thin), training in the production of tortillas and corn chips, training in business management and packaging. Specific targets to be achieved; build a corn flattening machine in order to increase corn production, construct an amphia machine, produce tortilla's downstream and corn chips, manage marketing and packaging. The method used is education, production training, business management training, design and assistance. The results of the service carried out show that by providing knowledge, appropriate processing technology and business/marketing management, corn farmers/women are expected to be able to exploit the abundant agricultural products with low prices. One of the advantages of making food from corn is that the raw materials are easy to get and an added value farmers.

Index Terms— *TTG, Diversification, Corn, Packaging, Management*

I. INTRODUCTION

In globalization era, the demand for variety and quality of processed food is increasing. Therefore, it is necessary to introduce and innovate agricultural product processing technology at the rural

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area in order to improve product quality and local food diversification [1]. Consumers today demand the quality and guaranteed food safety[2]. However, in general, rural area is the only provider of raw material, while the processing is carried out by the people in urban area. This happens because the technology of processing agricultural products has not developed yet in rural area. In an effort to improve food security and meet nutritional standard for people in Indonesia, food processing innovations have been carried out that utilize corn seeds as the main ingredient.

Processing of agricultural product is important to increase added value, especially when production is abundant and product prices are low, as well as for damaged or low quality product. Corn can be processed into various products, the corn products appreciated by consumers are tortilla and corn chips [3]. The processing this product is quite simple to enable to be adopted by rural communities, especially for farmers / women farmers as a home industry. To develop a variety of food products with guaranteed quality and competitiveness in rural areas, an appropriate processing technology is needed. An existing technology is still possible but a suitable technology for farmers/women in rural areas [4]. Woman farmers are potential labor in farming activity, and functionally cannot be separated in the process of agricultural development. Woman farmer is not only as a housewife, but also plays a role in farming activity and earn additional family income [5].

One of the main commodities planted by the people of Bekiung Village is corn with an area of approximately 45 hectares so that during the harvest season, corn production in Bekiung Village is very abundant. The community can plant corn 3 times a year, the average productivity of corn in Bekiung Village is 6 tons/ha, so that for 1 year corn production can reach 810 tons. The abundance of corn production during the main harvest in Bekiung Village causes the community difficult to handle post-harvest. They have to sell with the wholesale system, both wet shelled and dry shelled corn to middleman. This causes the selling price of corn to be very cheap, ranging from Rp. 1.900/kg for wholesale system, Rp. 2.500 / kg of wet shelled corn and Rp. 4.200 / kg of dry shelled corn. This condition will be economically detrimental to farmers because production costs are not proportional to the selling price. This situation inspired the team to help rural communities, especially female corn farmers in Bekiung village to diversify their corn products by processing them into tortillas and corn chips.

The word "Tortilla" comes from Spanish which means unleavened flatbread made of corn or wheat. Tortilla chip is a favorite snack food in Latin America, made of corn that previously soaked in lime water and boiled, then bake and fry it. Tortilla is one of the most popular corn products

baked by alkaline by adding lime (Nixtamalized product) [6]. Tortilla is a kind of chips made of corn and round shape with different thickness sizes. Corn tortilla is yellow, crunchy, thin and easily crushed. Corn chip is one of the corn products processed by cooking, flattening and drying [7].

Increasing added value for various corn products is very important to stimulate micro-economic of the society, especially for the development of micro, small and medium enterprises (MSMEs). Society empowerment by improving post-harvest knowledge and capability in processing various corn products particularly can be as a basic for society economic development [8]. The contribution of increasing income for families can be by household business unit that be able to produce corn products for selling to the consumers.

II. METHOD

The method used is socialization, education, production training, business management training, and mentoring. Socialization was carried out by a forum group discussion (FGD). The socialization discusses the cooperation between team and partner to succeed the service program. A counseling method for partners is used to introduce a design of tool and how to operate it. In the production training, the team explained and assisted partner for selecting corn as raw material and processing it. The team also provided a training how to make tortilla. Business management training is carried out by providing packaging and labeling technology, creating seller account on startup application, marketing, and financial management.

III. RESULTS AND DISCUSSION

Socialization

The socialization was carried out by using a forum group discussion (FGD) which was held at the partner's house and attended by headman together with his staff of Bekiung Village, chief of PKK and members, and several people representing the Women's Corn Farmers Group, the surrounding society and mass media. The socialization discusses the collaboration between the Team and partner in order to succeed the program effectively and efficiently.

The team leader explained the findings in Bekiung village related to advantages and disadvantages. In particular, the explanation was conveyed about the problems of female corn

farmers based on previous surveys from all aspects, and especially in terms of post-harvest corn management. Alternative problem solving was proposed is to process corn chips and corn Tortilla. These two types of products were chosen as the easiest process and it has a wide market based on geography of Bekiung village which is close to the traditional and modern markets as well as various society, both in terms of race, ethnicity and religion, variations in welfare level, and concentrated society, such as schools ranging from beginner to advanced level. The existence of the society is a potent to create various of corn chips and corn Tortilla products that can be marketed, such as ready-to-eat and ready-to-cook products, various in taste and packaging according to the society. This thing will impact on selling price in accordance with the purchasing power of the society as the consumers.

Another thing that supports, these two products were chosen because easy processing and the products are complementary. In flattening corn chips, various flattens will be created, some h are good, wide, attractive, well thickness that may appetite the consumer. But sometimes the results are of messy, small, and varied thicknesses due to poor engine tuning, improper soaking and heating, and so on. This circumstances may impact on the quality of the next product. By using failed processing as raw material for tortilla, it will improve the quality of corn chips because Tortilla raw material do not require a certain shape and size. This means that the raw material for Tortilla can be taken from crushed materials when the corn is flattened into chips.

Machinery Counseling and Production Training

When counseling partner about machine, it was introduced how to design a machine to make corn flattening to corn chips/tortillas, with capacity 25 Kg/hour. It was also explained how to select a suitable and quality material, as well as the price estimation of raw material in the market. Furthermore, it was also demonstrated how to adjust the machine, periodic maintenance and the possibility of damage as a result of setting errors or due to the age of the machine. The last session of counseling on machines, it was also explained how to repair a breakdown machine to minimize service and machine repair.

In the production training, the team explained and assisted partner how to select raw material and processing them. Starting from an explanation of good corn varieties as raw material for chips and corn tortillas, post-harvest management, soaking and heating efficiently and effectively. Next activity is to train how to operate corn flattening machines for making tortillas and corn chips with assistance. The corn flattener has a capacity up to 25 kg/hour for the best quality *flattening*,

both thickness and shape. This is because the flattening roll used is made of PVC pipe, which makes the corn not sticky when flattened, and production failure can be minimized

Business Management Counseling

Business management training is carried out by providing materials: Marketing, Bookkeeping, production assistance, packaging and labeling technology assistance, creating seller accounts on startup applications and their management.

In the material counseling on marketing, it was explained how important marketing breakthroughs in buying and selling business in order to achieve goals, especially in the financial sector. In this session it was also explained about business development, earning profit and maintaining the survival of the company. The success or failure of a business is highly dependent on management skills and expertise in the marketing. Furthermore, marketing theory is described such as: (1) four steps in marketing planning, namely: determining customer needs, marketing research, choosing specific market, placing marketing strategy, and choosing marketing strategies, and (2) mixed marketing such as product, price, promotion, and place with various aspects in it.

In material counseling on bookkeeping, it was explained about financial management including all activities in an effort to get the funds efficiently. This section explained the important of financial management in competition, namely: (1) determining the source of funds for the company, (2) determining the use of funds for the company, and (3) doing bookkeeping (accounting). The most important thing in this session is to explain how important the role of accounting in a business is and also explaining the weaknesses of MSMEs in aspect of financial accounting.

Furthermore, recording on each transaction is explained. The explanation in this section are: (1) recording, (2) recording process. Types and forms of books and also the aspects that must be recorded for each transaction. The last part of this recording was also described about reporting to determine whether a business is profit or loss. The material on reporting consists of an analysis of efficiency in economical activity.

Production assistance was carried out several times during the service using machines demonstration. Raw materials are provided by partner and the society around. This activity is to obtain SOP for maximum results, such as sequence and step of activity, heating capacity and duration, filtering, cooling, thickness adjustment, engine speed adjustment, refueling, starting the

engine, turning off the engine. This means what to do in pre-production, during production, and post-production.

Packaging and labeling assistance is performed to convey an understanding and skill to partner so that the packaging looks neat, attractive, and safe for consumption. For this program, the team brought several types of packaging and labels of various sizes and shapes based on the target market. Partner is expected to be capable, both in procurement, variety, and volume based on the market in that area.

The last part of business management counseling to partner is about creating seller account on startup applications and managing them. In this session, partner is guided to create digital account on social media online that may be used in order to achieve the success of the Emping Corn and Tortilla. The applications are: e-mail, Facebook, Instagram, WhatsApp, Youtube with advertisements in them.

Social and Economic Impact

After the machines and management counseling, there is a positive impact socially and economically for the society. The social impact may emerge spirit and hope of the partner and society. Society at the Bekiung Village may reorganize their lives especially during the COVID-19 pandemic which destroyed the social lives, such as poverty, relationship. This pandemic has a social impact in over the world, including Bekiung village. Economically, the program has a positive impact since a new economically activity created by using agricultural crops. By implementing a simple technology, partner can produce tortillas and corn chips. Fortunately, raw material for tortillas is from the small crumbs of the corn chip mill. Then the raw material is added with spices and kneaded into a dough that is ready to be ground/thinned, cut into pieces and finally dried in the sun and fried like the treatment for corn chips. By processing tortillas made of small crumbs make the quality of the chips is better because the imperfect grinder has been separated to be used as raw material for tortillas. Thus, it does not need to add capital to produce tortillas.

At the beginning of production, partner has a problem in marketing due to the COVID-19 pandemic, such as many stalls and shops closed, schools closed, society activity limited, etc. Fortunately, partner makes an effort to sell the products with online marketing, such as fb, instagram, whatsapp, and telephone with friends and relatives. At the last visit, partner can sell the products 50 Kg/week although many handicaps.

The estimated economic impact of the partner, as follows:

A. Condition of partner before Corn and Tortilla Chips Machine

1. Farmers harvest 3 times in 1 year
2. Corn income 350 Kg/1 harvest (3 x harvest = 1150 Kg)
3. Selling price Rp. 4.200/Kg = Rp. 4,830,000 (annual income/dry selling)

B. Condition after corn chips Machine from PKM activities

1. Production based on current marketing 50 Kg/week
2. Corn = 1150 Kg can be produced into 23 weeks corn chips
3. If local production is not available, corn can be supplied from other areas with a price Rp. 4.300/Kg (including transportation to Bekiung village)
4. Fuel costs for 50 Kg (gasoline and gas) Rp. 5,000
5. Employee cost Rp. 75,000 (3 workers)/week, 2 days, 1/2 day
6. Electricity cost Rp. 2,000
7. Plastic wrap Rp. 6,000
8. The selling price of dry corn chips is Rp. 25.000/Kg
9. The selling price of dry corn chips is Rp. 25.000/Kg

C. If the harvest is processed to be corn chips (1,150 Kg), a shrinkage of 2 Kg in 20 Kg. This means that 20 kg of dry corn will produce 18 kg of dry corn chips

1. 1,150 Kg dry corn produces 1,035 Kg of corn chips
2. Fuel cost : Rp. 115,000
3. Electricity cost : Rp. 46,000
4. Plastic wrap : Rp. 138.000
5. Employee cost : Rp. 1,725,000
6. Total production cost : Rp. 1,909.115
7. Selling price: $1,035 \times \text{Rp. } 25,000 = \text{Rp. } 25,875,000$
8. Profit $(\text{Rp. } 25,875,000 - \text{Rp. } 4,830,000) - \text{Rp. } 1,909,115 = \text{Rp. } 19,136,885.- /\text{per year}/3 \times \text{harvest year}/3 \times \text{harvest}$

D. If the production time raw materials are empty for the local area, production of corn chips is still running by bringing dry corn from other areas. Other alternative, partner may buy raw material from other farmers. For example, for 50 weeks/year, there are still $50-23 = 27$ weeks = 1,350 Kg with corn chips production 1,215 Kg

1. The price of corn is $1,350 \times 4,300 = \text{Rp. } 5,805,000$
2. Fuel cost : Rp. 135,000
3. Electricity fee : Rp. 54,000
4. Plastic wrap : Rp. 162,000
5. Employee costs: Rp. 2,025,000
6. Total Production Cost = raw material capital : Rp. 8,181,000,-
7. Selling price of $1,215 \times \text{Rp. } 25,000 : \text{Rp. } 30,375,000$
8. Profit : Rp. Selling – Corn capital – production cost = Rp. $30,375,000 - \text{Rp. } 5,805,000 - \text{Rp. } 8,181,000 = \text{Rp. } 16,389,000$

E. Profit for 1 year based on owned harvest plus from other farmers, and also from other regions to supply raw materials to produce corn chips and tortillas is $\text{Rp. } 19,136,885.- + \text{Rp. } 16,389,000 = \text{Rp. } 35,525,885.-$

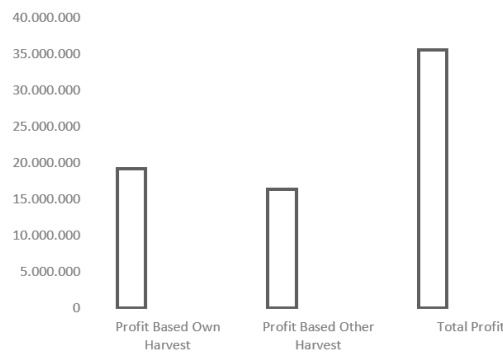


Figure 1. Partner benefits if production and marketing running well every year

Figure 2 shows the service activities that have been carried out. The team came directly to the village of Bekiung and carried out several activities with the residents including:

Opening Activities in Bekiung Village and Speech by the Head of PKM Unimed, Village Head Bekiun and Partners Village. Submission of Machinery and other Equipment by Ketau PKM and Members are accompanied by LPPM Unimed staff to partners and witnessed by the village head Bekiung Village, PKK Group and the surrounding Community. Making, drying and frying Corn Tortillas and chips and product packaging.



Figure 2. Corn Tortilla Processing Technology and Corn Chips at Farmer Group/Farming Women in Bekiung Village Kecamatan Kuala, Kabupaten Langkat, North Sumatera

IV. Conclusions And Recommendations

Conclusions

- a. PKM activities in Bekiung Village have been performed willingly by designing and constructing corn chips and tortilla machines, corn chips drying racks and corn chips sieves, as well as supporting equipment for corn tortilla production. The results of the corn chips product and organoleptic tests shows a positive responses from partner, headman, PKK women and other community groups.
 - b. The results of this Community Partnership Program (PKM) shows quite good results and an open opportunity for other farmers to develop their business especially at the post-harvest because corn tortilla and corn chips are highly valued. Corn tortilla and chips are food diversification products may support to develop rural agro-industry in increasing farmers income.
 - c. Cost analysis by using the simple technology is very beneficial for partners.
 - d. District Food Security Service of Kuala Langkat Regency appreciates the PKM activities to support the women farmer group
- The SI unit for magnetic field strength H is A/m. However, if you wish to use units of T, either refer to magnetic flux density B or magnetic field strength symbolized as $\mu_0 H$. Use the center dot to separate compound units, e.g., “A·m².”

Recomendations

It is necessary to proceed the partnership continuously both other teams and local government by assistance in:

1. Marketing for corn tortillas and corn chips
2. Diversification and nice-looking packaging based on market
3. Processing tortilla and corn chips with various flavors.
4. Production permits, product quality from the Health Office, business license, Food Health and Industry and Trade Office should be completed.

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