Sustainable Community Empowerment Through the Program of Self-Sufficient Village of Non-Rice Food in Raanan Baru

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Abstract. Raanan Baru Village has potential in the field of agricultural food crops such as lowland rice, field rice, corn, peanuts, cassava, sweet potatoes, and taro. This potential is less manageable to the maximum because of various problems, such as: cropping systems are still traditional and hereditary, food production is still low, farmers are lack in innovation and limited in creation of agricultural products, non-rice food plants grow wild and not cultivated commercially, farmers' knowledge related to market access and opportunities is limited, and many other problems. To address these problems, a community service, Program Pemberdayaan Desa Mitra (PPDM) scheme has been carried out for three years (2017-2019) with a focus on developing Raanan Baru Village as a non-rice food independent village. Methods of implementation include: socialization, technical guidance, training, pilot projects, and workshops. The applications of science and technology includes: techniques for cultivating non-rice food crops, improving the quality and diversification of non-rice food crop products, and introducing the basics of entrepreneurship for farmer group partners. Implementation of the activity showed an increase in the competitiveness of non-rice farming products (cassava), an improvement in the existence of natural resources, and an increase in community welfare.

1. Introduction

Raanan Baru Village is one of the villages located in West Motoling Subdistrict, South Minahasa Regency, North Sulawesi Province (figure 1). Based on 2018 data, the population of this village is 1,201 people (consisting of 619 men and 582 women), with a population density of 179.25 people per km². Main agricultural product commodities in West Motoling Subdistrict are peanuts, corn, lowland rice, field rice, soybeans, cassava, and sweet potatoes; while plantation commodities are cloves, coconut, sugar palm, nutmeg, coffee, and vanilla [1].

With a large agricultural area (figure 2) and the profession of the majority of the community (around 40%) as farmers, this village actually has potential that has not yet been fully explored, especially in the food crop agriculture sector. The agricultural system that is still practiced traditionally and is hereditary has an impact on low productivity. With its potential, supported by fertile soil conditions and a climate suitable for food crops, the village can be developed into an agricultural production center for alternative food crops, based on non-rice products.

Non-rice carbohydrate food in Raanan Baru Village is generally sourced from agricultural products that are intentionally planted, except for taro (known as *bete* (*Colocasia esculenta* (L.) Schot) which is often found growing wild. Non-rice food products such as *bete* have not yet become fully commercial businesses. If anything, *bete* crops are sold in small quantities because they are not part of the main
agricultural business. *Bete* commercialization has not been seriously done even though its prospects in the market are not bad. In addition, non-rice foods such as *bete* have a low sugar content, so that if consumed can reduce the risk of *diabetes mellitus* [2]. *Bete* is quite popular to be used as a raw material for traditional Minahasa food, namely *tinutuan*. *Tinutuan* is porridge which most of the raw materials are non-rice food plants, such as cassava, sweet potato, taro, pumpkin, corn, bamboo shoots, water spinach, *gedi* (edible hibiscus), red spinach, basil, and lemongrass [3,4].

**Figure 1.** A series of google satellite scene maps (A to D) and BPS map [1], illustrating the location of Raanan Baru Village in the spatial hierarchical order of: A) Republic of Indonesia; B) Sulawesi Utara Province; C) Minahasa Selatan Regency; D) Motoling Barat Subdistrict; and E) BPS map of Motoling Barat Subdistrict (Raanan Baru is marked with a black square).

**Figure 2.** A series of google satellite scene maps of: A) Raanan Baru Village, the yellow box shows the location of the residential area, which covers an area of 1: 40 with an area of agriculture and plantation area in a red perimeter; and B) the landscape of Raanan Baru Village shows the topography in the form of hills and mountains.
In addition to the problems mentioned above, most of the farming community is less able to innovate and is limited in creating farming products, also not yet aware of the potential of non-rice food crops and the importance of diversifying food consumption. Called to overcome these problems, a community service program, Program Pemberdayaan Desa Mitra (PPDM) scheme has been carried out. This activity has been going on for three years, since 2017, and what is reported in this article is the implementation of activities in the last year of funding, 2019. Activities in the first year (2017) are more focused on increasing the competitiveness of bete products [5] and improving the existence of natural resources [6]. For the second year (2018), activities are more focused on improving community values, both in the social, educational and health fields [7]. In the third year (2019), the activities will be focused on increasing the application of science and technology in the cultivation and diversification of non-rice food crop agricultural products.

The application of science and technology as a form of solution to the problems faced by people of Raanan Baru Village includes the application of modern agricultural technology, the development of diversified agricultural products of non-rice food crops, and the introduction of entrepreneurial principles for non-rice food farmers. The application of modern agricultural technology is done by facilitating land management using agricultural machinery for efficiency such as hand tractors [8,9] and the use of solid organic fertilizer based on Effective Microorganisms 4 (EM4) [10]. For the development of diversification, postharvest products of non-rice foods are processed into traditional snacks that are full of creativity and innovation as well as quality. The application of science and technology of non-rice food cultivation and diversification is carried out using a mentoring approach that is charged with the introduction of entrepreneurial principles [11,12].

2. Methods of implementation

2.1. Application of science and technology of non-rice food crops cultivation
The series of processes in the application of non-rice food cultivation technology includes: land management, seed preparation and planting, fertilizing, maintaining, controlling plant-disturbing organisms, harvesting, and post-harvesting [13]. Land management is carried out to prepare the land until it is ready to be planted, by using agricultural mechanization tools [14,15]. Seed preparation and planting of non-rice food crops are carried out according to the type [16-18]. Furthermore, fertilization is carried out in accordance with the type of plant in order to provide adequate nutrition for plant growth and development [19-21]. The maintenance actions that need to be taken include replacing, watering and soiling. To control plant-disturbing organisms it must be adjusted to the level of attack and as much as possible is done manually without the use of pesticides.

2.2. Application of science and technology of non-rice food products diversification
Non-rice food commodities such as bete, sweet potato, cassava and corn are very potential to be developed, because the land in partner villages is still quite extensive. In general, non-rice food is only used as a staple food substitute for rice by partner village communities. This custom can be changed by educating the public on the importance of diversifying non-rice food products [22]. To further increase the sale value, the quality of non-rice food processing must be improved as well. Quality improvement can be done on two characteristics, namely: 1) physical characteristics, which include appearance (color, size, shape, presence or absence of physical defects), texture, taste; and 2) hidden characteristics, which include nutritional value and food safety.

2.3. Introduction of the basic principles of entrepreneurship
It is necessary to optimize the processing of non-rice food products by partner village communities. In addition to the introduction of cultivation and diversification technology, the community also needs to be given a briefing related to the principles of entrepreneurship [11,12]. Through the provision of entrepreneurship, it is hoped that partner village communities will be able to create and innovate so as to increase the added value of non-rice food production. In this activity, the partner village community will get material supplies in the form of: introduction of the character of successful entrepreneurs,
creative and innovative business ideas, market research, risk management, planning and management of production, finance and marketing.

3. Results of the implementation of activities

3.1. The results of the application of science and technology
The implementation of PPDM activities in Raanan Baru Village is a series of activities for three years. The first year emphasized the efforts to increase the production of sweet potatoes, taro, cassava, corn, several types of bananas, etc. (figure 3. A-B). Likewise in the second year, the activity remained on strengthening the production of agricultural products coupled with basic training in the diversification of non-rice food crop products (figure 3. C-F). Diversification of post-harvest production is directed at making chips with cassava raw materials.

Figure 3. A series of documentation of PPDM activities: A) land preparation for planting; B) cultivation of taro plants; C) business training for PKK women; D) governance training for partner group members; E & F) strengthening community values involves community leaders and teachers of SMA Negeri 1 Motoling Barat.
The third year, in addition to strengthening the production of agricultural products as a continuation of the first and second years, also increased production as a continuation of the second year, then carried out production activities coupled with the basic marketing techniques of the members. Making sweet potato chips is done by using modern tools (cutting machines, fryer, spinner, and packaging equipment) with techniques in accordance with existing guidelines. Stages of training in making chips are carried out with several activities, namely preparation of materials to be used, operationalization of the equipment used, training and testing of equipment and the process of packaging the results. The entire series of activities involved partner members both farmer groups and PKK (Pemberdayaan Kesejahteraan Keluarga, or family welfare program) women’s group partners. The results obtained from this activity are all participants understand the techniques and treatment of raw materials that will be used for production. This is important so that the raw materials to be used are treated equally so that the end result can be guaranteed uniformity in both shape, taste, and color. In addition, in terms of operating the equipment used, all participants understood even though in practice each stage was managed by certain people such as the cutting, frying and packaging stages.

Figure 4. Training on diversification of processed agricultural products of non-rice food crops in a series of PPDM activities.

The results of the activities of the PKK women’s group are directed at efforts to produce quality products to be able to compete in the local market. Therefore, at the end of this activity, a package of processed products which are ready to be marketed is available starting from around the village to the local level. After this activity took place, production centers were started by establishing pilot gardens in the hope that production centers will be formed, especially bete, which are characteristic of the people of Raanan Baru Village.

The final stage in a series of activities is the marketing of post-harvest processed products. This marketing activity is carried out with the aim of developing a marketing network for products that have been produced and developing an entrepreneurial spirit for partner members so that they have the ability to market all products derived from raw agricultural products of Raanan Baru Village. This stage of the activity was begun by holding a Focus Group Discussion (FGD) involving marketing practitioners. In this FGD activity, there was an exchange of information about marketing experiences, including considering market tastes and consumer character. Based on FGD input, a marketing team
was formed to market the production results. Marketing starts from the surrounding environment such as in kiosks, schools, and BUMDes (Badan Usaha Milik Desa, or Villages-Owned Enterprises) which all work together with the PKK of Raanan Baru village. In an effort to improve the quality of production and marketing, evaluations are conducted every month, and the results are used as input for improving the implementation of activities.

3.2. Lesson learned
Farming activities are carried out by most of the people of Raanan Baru Village for generations in the traditional way without considering the results obtained at harvest time. As a result, farm yields cannot be expected to improve the standard of living of farmers due to a mismatch between the production costs and the results obtained. The implementation of PPDM activities has helped many farmers to open their minds because they can see firsthand how to grow crops properly with an appropriate technology approach. The application of science and technology in non-rice food crop cultivation can change farming behavior patterns from traditional to more modern. The application of science and technology of non-rice food products diversification can also change the mindset of PKK women to use the market to increase family income. This change in mindset and behavior has a positive impact on improving people's values in the social field, especially the tendency to form associations in the form of productive farmer groups which automatically impacts on the serenity and security of the community. In addition, at every opportunity, the PPDM implementation team always motivates the community for the importance of non-rice food production results directed at efforts to improve children's education.

4. Conclusions
In general, PPDM activities for third year funding (2019) carried out in Raanan Baru Village, West Motoling Subdistrict, South Minahasa Regency, went well. During the implementation of this third year, PPDM activities can significantly improve the application of science and technology of cultivation and diversification of non-rice food crops. The success achieved in the third year complements the success achieved in previous years. PPDM activities in previous years can significantly improve the competitiveness of non-rice food products sought by partners, can improve the quality of governance of rural community development, can improve the existence of natural resources in the location of activities, and can improve community values. The continuity of this activity will certainly have the potential accumulative impact in empowering partner village communities. The socialization of the movement to grow non-rice food needs to be echoed by the government in order to succeed the national program in the field of food security.

Acknowledgments
The author would like to thank Direktorat Riset dan Pengabdian Masyarakat (DRPM), Direktorat Jenderal Penguatan Riset dan Pengembangan (Dirjen Rishbang), Kementerian Riset, Teknologi, dan Pendidikan Tinggi, which has fully funded the implementation of PPDM activities.

References
[1] Badan Pusat Statistik Kabupaten Minahasa Utara 2019 Kecamatan Motoling Barat dalam Angka 2019 (Amurang Barat: Badan Pusat Statistik (BPS))
[2] Yalindua A 2013 Potensi Genetik Klon Tanaman Uwi (Dioscorea alata L.) Asal Banggai Kepulauan Sebagai Sumber Pangan dalam Menunjang Ketahanan Pangan Nasional (Bogor: Institut Pertanian Bogor)
[3] Kandou G D 2009 Kebiasaan makanan etnik Minahasa di Propinsi Sulawesi Utara Jurnal Kesehatan Masyarakat 3 53-7
[4] Kurnala K, Kindangen P and Pondaag J J 2018 Analisis pengendalian persediaan bahan baku bubur Manado (tinutuan) guna meminimalisir biaya persediaan pada RM Minahasa Baru
Manado Jurnal EMBA 6 2728-37

[5] Palapa T M, Yalindua A and Maramis A A 2017 Peningkatan daya saing produk ubi bete melalui kegiatan Ipteks bagi Desa Mitra (IbDM) desa mandiri pangan non beras di Raanan Baru, Kec. Motoling Barat, Kab. Minahasa Selatan Prosiding Seminar Nasional Biologi XXIV PBI Manado 24 – 26 August Manado pp 321-7

[6] Palapa T M, Yalindua A and Maramis A A 2018 Perbaikan keberadaan sumber daya alam melalui kegiatan Ipteks bagi Desa Mitra (IbDM) desa mandiri pangan non-beras di Raanan Baru, Kec. Motoling Barat, Kab. Minahasa Selatan Prosiding Seminar Nasional Pendidikan Biologi Universitas Mataram 30 Maret 2017 Mataram pp 556-61

[7] Palapa T M, Yalindua A and Maramis A A 2018 Improvement of community well-being through programs of non-rice food self-sufficiency in Raanan Baru Proc. 2nd Int. Sem. on Natural Resources Biotechnology: From Local to Global Universitas Atma Jaya 13 – 14 July 2018 Yogyakarta pp 72-9

[8] Suyatno A, Imelda and Komariyati 2018 Pengaruh penggunaan traktor terhadap pendapatan dan penggunaan tenaga kerja pada usaha tani padi di Kabupaten Sambas AGRARIS: Journal of Agribusiness and Rural Development Research 4 91-100

[9] Umar S 2013 Pengelolaan dan pengembangan alsintan untuk mendukung usaha tani padi di lahan pasang surut Jurnal Teknologi Pertanian 8 37-48

[10] Ansari M I, Jaya J D and Alamsyah P 2017 Pengaruh penambahan EM4 dalam pembuatan pupuk organik berbahan kotoran ayam terhadap pertumbuhan tanaman seledri Polhasains: Jurnal Sains dan Terapan Politeknik Hasnur 5 1-7

[11] Dumasari 2014 Kewirausahaan petani dalam pengelolaan bisnis mikro di pedesaan Jurnal Inovasi dan Kewirausahaan 3 196-202

[12] Wahyudin U 2012 Pelatihan kewirausahaan berlatar ekokultural untuk pemberdayaan masyarakat miskin pedesaan MIMBAR XXVIII 55-64

[13] Makruf E and Iswadi H 2015 Kumpulan Informasi Teknologi (KIT) Budidaya Tanaman Umbi-umbian (Bengkulu: Balai Pengkajian Teknologi Pertanian)

[14] Ampratwum D B, Dorvlo A S S and Opara L U 2004 Usage of tractors and field machinery in agriculture in Oman Agriculture Engineering International: the CIGR Journal of Scientific Research and Development VI 1-9

[15] McCauley J F 2003 Plowing ahead: the effects of agricultural mechanization on land tenure in Burkina Faso Journal of Public and International Affairs 14 1-27

[16] El-Sayed S F, Gharib A A, El-Sawy A M and Darwish O S 2016 Micropropagation protocol of Egyptian native cultivar of taro, Colocasia esculenta var. esculenta Int. J. Adv. Res. Biol. Sci. 3 17-26

[17] Amadi C O, Onyeka J, Chukwu G O and Okoye B C 2015 Hybridization and seed germination of taro (Colocasia esculenta) in Nigeria Journal of Crop Improvement 29 106-116

[18] Rashmi D R, Raghu N, Gopenath T S, Palanisamy P, Bakthavatchalam P, Karthikeyan M, Gnanasekaran A, Ranjith M S, Chandrashekrappa G K, and Basalingappa K M 2018 Taro (Colocasia esculenta): an overview Journal of Medicinal Plants Studies 6 156-61

[19] Tewodros M, Neim S, Mesfin S, Getachew W and Ashenafi A 2017 Effect of mineral N and P fertilizers on storage tuber yield and yield components of Taro [Colocasia esculenta (L.) Schott) in Southwest Ethiopia J. Biol. Chem. Research 34 688-95

[20] Buke G and Gidago G 2016 The effects of Np fertilizer rates on the yield and yield components of taro (Colocasia esculenta (L.) Schott.) in Boloso-Sore Woreda Wolaita Zone, Snpr, Ethiopia International Journal of Agriculture Innovation and Research 5 329-340

[21] Das L K, Dwivedi A K and Singh S K 2018 Interactive effects of cultivars and NPK fertilizer on the growth and yield of taro [Colocasia esculenta (L.) Schott] under agro-climatic condition of zone IV prevailing in Palamu District of Jharkhand, India Int. J. Curr. Microbiol. App. Sci. 7 600-6

[22] Simanjuntak D 2006 Pemanfaatan komoditas non beras dalam diversifikasi pangan sumber
kalori Jurnal Penelitian Bidang Ilmu Pertanian 4 45-54