

PLANTATION INDUSTRY WASTE BACK TO SUSTAINABLE AGRICULTURE

Agus Sutanto*, Hening Widowati, Nani Septiana, Handoko Santoso, Achyani,
Rasuane Noor, Nedi Hendri, Fenny Thresia
Muhammadiyah University of Metro
[*E-mail: sutanto11@gmail.com](mailto:sutanto11@gmail.com)

Introduction.

The potential of the plantation industry in Lampung continues to grow, in 2019 the production of palm oil was 189. 840,000 tons and pineapple in 2021. 7,058,999 quintals [1]. This production potential produced abundant liquid, solid waste of palm oil and pineapple. There are 15 indigenous bacteria in pineapple waste that have the ability to degrade waste organic matter. The results showed that the 15 isolate consortia fermenter treatment (P5) produced the best liquid fertilizer and compost. Application of P5 to the best vegetable, ornamental, fruit, rice, corn, gaharu plants. The mass production of liquid fertilizer and compost with the trademark Pumakkal is produced by PT. Pumahitari is one of the business units of the Muhammadiyah University of Metro. Application of Pumakkal through community service at the Hijau Daun Farmers Group Karangrejo North Metro, Pumakkal fertilizer is proven to produce vegetables equivalent to chemical fertilizers. Assistance from land cultivation, nurseries, planting, care, fertilization, pest and disease control, harvesting, packaging, labeling, material diversification and diversification of processed and marketing variations have increased the knowledge, income and awareness of farmers for environmentally friendly farming. The above description is presented in the following discussion.

Discussion.

On average, PT Kalirejo Lestari can process around 800 tons of Fresh Fruit Bunches (TBS) per day, with an average annual processing capacity of 288,000 tons of TBS [2]. From the processing, crude palm oil (CPO) is produced and solid waste is produced 150 tons of empty bunches and 4,440 liters of liquid waste per day, from observations there was a buildup of palm oil waste at the wastewater treatment plant, while solid waste in the form of empty coconut bunches was burned and the ashes were taken for plantation fertilizer. oil palm and some were used by mushroom farmers as a medium for growing oil palm mushrooms. Burning empty palm oil bunches was considered inefficient because it can pollute the air. PT Kalirejo Lestari has utilized the waste but it has not been maximized. Palm oil waste contains useful organic substances, including cellulose, hemicellulose, lignin, N, P, K, Ca, Mg which are good for plant growth.

PT. GGF Terbanggi Besar, Central Lampung Regency is the third largest pineapple producer in the world, pineapple peels, stems and leaves are often found in the form of waste from processing sites. The volume of liquid waste per harvest reaches 5,000 m³, while for solid waste it reaches 45 tons [3] Compost from pineapple peel, stem and leaf waste contains macro nutrients

(nitrogen, phosphorus and potassium) which are essential for plant growth and development. Pineapple peels contain 81.72% water; 20.87% crude fiber; 17.53% carbohydrates; 4.41% protein and 13.65% reducing sugar. Given the high carbohydrate, sugar, and protein content, pineapple peel can be used as raw material for making fertilizer through a fermentation process [4].

Isolation of pineapple liquid waste obtained 15 isolates potential to degrade organic matter and acidic pH [5].

Consortia	Total	Bacteria isolates	Hydrolysis ability
Bacteria	Isolates		
P1	3	Isolates 2, 3, 5	fat degradation
P2	6	Isolates 4, 5, 6, 7, 12, 14	amylum degradation
P3	9	Isolates 1, 2, 3, 8, 10, 11, 12, 14, 15	protein degradation
P4	12	Isolates 1, 2, 3, 7, 8, 9, 10, 11, 12, 13, 14, 15	protein dan amyllum degradation
P5	15	Isolates 1 s.d. 15	protein, amyllum dan fat degradation

Five kinds of Consortia have been tested for various agricultural, plantation, fishery, household and market wastes and applied to various vegetable, fruit, agricultural, plantation and ornamental plants through 125 Undergraduate theses and theses from 2012 to 2022. The ability of bacterial consortia in degrading materials organic matter has been patented: Composition of bacteria indigen degrading Pollutant Organic pineapple liquid waste Patent Certificate No. IDP000043727 [6] Composition Bioremediator neutralizing pH of pineapple liquid waste pollutants. Patent certificate No.: IDP000044452 [7].

Higher Education Human Resources (SDM) are required to overcome the turmoil of changes that occur due to the transformation that continues to develop. SDM prepares themselves with qualifications and competencies that can compete and survive in the industrial era 4.0. Muhamadiyah University of Metro with Catur dharma carried out has an enlightening direction of education and teaching in the 4.0 industrial era, research oriented to invention and innovation, future service that brings prosperity to each other in the frame of Al Islam and Kemuhammadiyah [8]. The ability of the consortia was tested for the manufacture of liquid waste fertilizer for pineapple and oil palm [3], the Pumakkal fermenter had an effect on the levels of nitrogen, phosphorus, potassium in the compost mixture of peels, stem, and leaves of pineapple. The best fermenter to be found in treatment 5 (P5) with the number of bacterial isolates (15 isolates). The use of the P5 formula is a recommended formula in the manufacture of compost for oil palm empty fruit bunches and palm oil waste, [2] showing the best effect on the growth of gaharu (*Aquilaria malaccensis*).

Based on the research that has been done, it shows that the variation of organic fertilizer compost of pineapple waste and liquid fertilizer of pineapple

waste on isolate P5 gave the best effect on the growth of chili pepper plants. Application of pineapple liquid waste on lettuce (*Lactuca sativa* L) In accordance with the results of experimental research that has been carried out, the dosage variation of pineapple liquid waste organic fertilizer (LCN) 15% on the growth of Lettuce (*Lactuca sativa* L) is the best [9].

Production of fertilizer with a patented bacterial bioremediator using the trademark Pumakkal (Lampung:biang, starter) Brand Certificate Number: IDM000848139 [10]. Liquid fertilizer and Pumakkal compost are produced by PT. Pumahitari (PT owned by UM Metro campus) with a Risk-Based Business Licensing Business Registration Number (NIB) : 0268010161316 [11].

Downstreaming (*Hilirisasi*) fertilizer products for community service have partnered with Hijau Daun farmer groups in the form of community service with the concept of sustainable agriculture from tillage, seeding, planting, care, control of weeds, pests and diseases, harvesting, post-harvest, various packaging, processing and selling products on and off others and build organic communities. [12] [13], the results achieved in the implementation of community service for vegetable farmers in Karangrejo, North Metro District, Metro City can be concluded as follows: 1) Understanding of pollution increased by 108.01%; 2) The public recognizes the contamination of chemical fertilizers and pesticides that can be distributed to agricultural products; 3) Recognizing the types of heavy metals in chemical fertilizers and active residues of synthetic pesticides; 4) Recognizing the characteristics of environmental profiles and polluted vegetables, with their skills an increase of 29.17%; 5) Identifying solutions to minimize contamination by controlling organic fertilizers and pesticides; 6) Organic farming, including by utilizing microbial fermented fertilizers and bioinsecticides; 7) Awareness of environmentally friendly farming increased by 41.67%, but awareness to practice it consistently was still insufficient. Among other things, because of economic demands and wanting to quickly and instantly improve agricultural products, without taking into account the long term and sustainability and sustainable environment.

Organic cultivation with Pumakkal reduces chemical residues in soil, water and vegetables and increases soil fertility. Farmers have knowledge and skills about sustainable organic farming. Efforts to sustain organic vegetable cultivation by building marketing networks both conventional and online. Organic agriculture is characterized by being free from chemical substances that can damage the environment and damage the health of all ecosystem components [14]. The adverse effects of the use of chemicals/synthetics in the agricultural system have begun to occur, among others: (1) Indonesian farmers are very dependent on the use of superior seeds, fertilizers, and pesticides that are not energy efficient; (2) applied agricultural technology destroys nature and the environment, it can be seen from the emergence of resistance and urgency in cropping [15]; [16] and the presence of residues in soil, water, air, and agricultural products.

The officially used definition of organic farming is that adopted by the IFOAM General Assembly in September 2005 in Adelaide, Australia. Organic

agriculture is a production system that supports the health of soil, ecosystems and people. Organic agriculture relies on ecological processes, biodiversity and cycles adapted to local conditions, without the use of inputs with adverse effects. Organic agriculture applies the amalgamation of tradition, innovation, and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved [17]. The four principles are the principles of health, ecology, justice, and protection [18]. The Hijau Daun farmer group has been implementing agriculture using chemicals, so with mutual awareness it has begun to reduce dependence on chemicals and switch to existing organic materials. The area of organic farming in Indonesia is still very limited, of the total agricultural land (rice fields and gardens) in Indonesia, only 0.14% are applying organic cultivation [19]. The categories of commodities that deserve to be developed with an organic farming system [20] include: 1) rice food crops, 2) vegetable horticulture: broccoli, red cabbage, Chinese cabbage, caisin, white cho, sprouted cabbage, leaf spinach, squash, luffa, and wax gourd. Fruits: jackfruit, durian, salak, mango, orange, and mangosteen; 3) plantations: coconut, nutmeg, cashew, clove, pepper, vanilla and coffee; 4) spices and medicines: ginger, turmeric, Javanese ginger, and other types of rhizome of ginger; and 5) dairy, egg and meat farming. A review of various aspects of organic agriculture has the potential to be developed [21], namely: (1) to increase soil fertility, biodiversity, and sustainability of agricultural production; (2) to conserve natural resources; (3) to improve agronomic and economic performance, to produce more and relatively, especially in risk-prone tropical ecosystems, to achieve better, quality food and ensure food security; (4) to provide access to attractive markets through certified products; (5) to create new partnerships throughout the value chain and also to strengthen the confidence and autonomy of farmers. Currently, Hijau Daun farmers are developing vegetable commodities that have been certified prima 3, including: green beans, eggplant, mustard green, lettuce, pak choy, cucumber, lemon basil, water spinach, long beans, spinach [23].

The results of the study [22] show that the determinants of organic farming adoption consist of various aspects, namely (1) availability of information and knowledge, (2) economic and financial motives, (3) technical and management skills, (4) social considerations, (5) environmental concern, (6) institutional environment, and (7) socio-economic and demographic background of farmers. To encourage the adoption of organic farming needs to be considered in the formulation of policies and programs. The government's role is very important, especially to convince farmers about the benefits of organic farming education, providing information, as well as technical assistance for farmers.

[24] suggested that macro constraints in the development of organic agriculture are the market and climatic conditions. In terms of marketing, the consumer segment is still limited to the upper middle class, despite global market demand such as America, Japan, and countries in Europe. The biggest obstacles faced by farmers in pursuing organic farming according to [25] are lack of knowledge, access to markets, need for certification, agricultural inputs, and lack of organization. Meanwhile, the results of a study [26] in South Bandung, showed that the obstacles for farmers in implementing organic

farming as a whole include 1) the lack of facilitators or driving forces who are able to motivate farmers to apply organic farming more; 2) low or insufficient carrying capacity, one of which does not have a green house; 3) lack of support for infrastructure from the government to support organic farming; and 4) farmers feel that organic farming is complicated to run, while they are comfortable with the conventional cultivation conditions that they have been running. The results of a study in Taiwan [27] show that in the development of an organic system that needs to be considered is the supply, marketing, and distribution of these organic products, which requires the trust of producers, retailers, and consumers who all benefit and have an ethical vision and responsible socially. The results of the inventory of the problems of the Hijau Daun group obtained the constraints in organic farming:

1. Land: organic is smaller than non-organic (0.2% Indonesia, 0.3% China, India 0.7%, European countries more than 5%, Germany is 6.5%), limited safe water sources , long distance transportation access.
2. Production Facilities: limited production and distribution of organic fertilizers, limited organic pesticides.
3. Processing: Equipment has not been separated between organic and non-organic, organic processed food is less than fresh food, Information on organic processed is limited.
4. Marketing: minimal technical knowledge and marketing channels controlled by organic entrepreneurs, limited marketing channels and still mixed with organics, expensive transportation costs (location and means of transportation).
5. Human Resources: Limited number of competent SDM, coaches, researchers, organic agriculture inspectors, business actors/small farmers.

Then it is necessary to do:

1. Formulation, regulation, standards and guidelines on organic agriculture based on producer and consumer justice
2. Improving the ability and knowledge of SDM
3. Socialization, technical coaching and marketing development
4. Development of a system of recognition and supervision of organic agricultural products. Based on the explanation above, the assistance of the Hijau Daun farmer group is carried out regularly and continuously, involving components in the village of 23 Karang Rejo.

Conclusion.

Downstreaming processes and research products of lecturers, one of which is the plantation industry, is waste that is treated with indigenous bacteria capable of producing liquid fertilizer and Pumakkal compost products by involving student research umbrellas. The mass production of Pumakkal fertilizer is managed by PT. Pumahitari is one of the companies under the campus of Muhammadiyah University of Metro and is applied through service to the Hijau Daun farmer group, Karang Rejo, North Metro. Continuous assistance to farmer groups provides awareness of the importance of healthy agriculture for long-term sustainability of life.

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