



RESEARCH PAPER

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Serve, understand, respect waste education management (SURWEM): An extension project to strengthen solid waste management in a service Barangay (Arosip) in northern Philippines

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Abstract

Due to the rapid population and economic growth, the environment suffers due to the unprecedented increase in solid waste generation. Based on this global crisis, compliance theory states that organizations must realize the power they must use to direct the behaviour of the stakeholders. In the Philippine context, the government must properly impose the "No Segregation, No Collection" or the NSNC policy to ensure that solid waste issues are properly dealt with. The extension project was based on a completed study that investigated the effectiveness of the implementation of the NSNC policy. It was found that was a low level of awareness by stakeholders in the collection of solid wastes. Overall, there was also a very low level on the level of awareness of the NSNC policy. To address this, the extension project was conducted to train the stakeholders in a service barangay in Northern Philippines. The service barangay was Arosip in the Municipality of Bacnotan, Province of La Union. The stakeholders were trained in the (1) solid waste management and its importance; (2) techniques in reducing waste (segregation, and 3 R's); and (3) proper waste disposal. The strategy imposed in the extension activity to engage the stakeholders in the service barangay Arosip is the "search for the most eco-friendly zone / purok" contest. After the extension activity, barangay folks realized the importance of solid waste management through their utmost participation in all the activities. Moreover, barangay folks implemented different techniques in reducing waste in line with segregation and the 3 R's through varied activities conducted. Because of the extension strategy imposed, the "gulayan sa barangay" was intensified. Finally, barangay puroks actively participated in the various activities in the extension project. Based on these extension project outcomes, it is recommended that the service barangay would consider the establishment of an eco-tourism project.

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Introduction

Parallel to the rapid population and economic growth, urbanization, industrialization, and changing socioeconomic conditions is the unprecedented increase in solid waste generation. Solid waste management (SWM) is a serious global issue as there is environmental public health, as well as aesthetic concerns associated with its safe disposal. Important concerns associated with solid wastes management includes the emission of large amount of greenhouse gases that have a significant influence on global warming, contamination of water and soil, production of unpleasant odor, and spread of diseases (Ishigaki *et al.*, 2011).

Achieving significant reduction of solid waste necessitates waste diversion which in turn entails waste segregation at source. The latter is key to maximizing gains from waste diversion. Active participation of waste generators in waste diversion depends on proper waste segregation at source during which on-site re-use, recycling and composting are promoted. Waste segregation and collection are to be conducted at the barangay level specifically for biodegradable and recyclable wastes and eventually be recycled and others will be done at home through using compost, if possible, while disposal and collection of nonrecyclable/residual and special wastes are the responsibility of the city or municipality.

It was found out in the study “Effectiveness of the Implementation of the “No Segregation, No Collection Policy: The Case of DMMMSU Service Barangays” that in general, the policy is effective in terms of household awareness, reduction of collected household wastes; compliance of households in the community but three barangays (Casiaman, Arosip and Sapilang) failed to reduce household waste from May 2018 to June 2021. Thus, series of seminar-workshop/trainings/orientations was planned to conducted to the three service barangays of DMMMSU – NLUC to address the said findings in the study “Effectiveness of the Implementation of the “No Segregation, No Collection Policy: The Case of

DMMMSU Service Barangays” and to overall decrease generation of household solid wastes and increase awareness on solid waste management.

Based on the above-mentioned situation the compliance theory will support this extension program. Compliance theory states that organizations can be classified by the type of power they use to direct behaviour of their members and the type of involvement of the participants. In conducting the SURWEM program, it is important to determine the proper means of communications to the household participants and protocol to be followed in its conceptualization. Hence, the extension workers are continuously conducting, implementing and monitoring the progress of the activities so as not to compromise to the objective of the study. Meetings, orientation, training and seminar-workshop activities and other strategies were prepared to help the barangay officials of the service barangays to strictly implement waste management to the barangay folks.

This project helped the barangay officials of the DMMMSU service barangays in strengthening their implementation of waste management. This project assisted them address the identified problems as a result of the research conducted. In addition, barangay folks learned the different skills and strategies of turning waste into worthy things by attending the seminar-workshop which were organized by the extension workers.

Moreover, partnership with these service barangays was done utilizing the existing MOA between Arosip and DMMMSU College of Forestry. DMMMSU-NLUC extension unit monitored these projects until identified problems had given proper remedy and practical solution. The extension workers (Science teachers, College of Education) started to implement the project by sharing their knowledge about waste management since they are teaching Environmental Science, Earth Science, Ecology and other waste management related courses in the College of Education.

This project intends to improve the awareness level of the residents of Barangay Arosip on solid waste management and in turn, apply the skills learned in reducing waste generated in their respective jurisdictions. Beneficiaries will be able to:

1. acknowledge the importance of solid waste management through a series of meetings/seminars/orientations/training/workshops;
2. learn the different techniques in reducing waste in line with segregation and the 3 Rs through meetings/seminars/orientations/training/workshops;
3. adopt the best practices of solid waste management;
4. establish the SURWEM Agbuo, SURWEM Aglako, SURWEM AgpaAdu; and
5. inspire and implement the policies on waste management through the activity search for the eco-friendliest purok and other related activities.

Scientific basis and theoretical framework

The waste management extension project made use of the "Search for Eco-friendliest Purok" as part of a mass mobilization strategy. A technique known as mass mobilization is engaging and motivating a variety of partners and allies at the national and local levels in order to boost demand for and awareness of a particular development goal. There is an on-site evaluation of the indicators listed in the rubric to choose winner, the extension workers came up with this technique to motivate barangay residents to participate. Aside from the result of the study conducted initial survey was made prior to the launching of the search. The results of the evaluation were used to determine the winner and were utilized to analyse the outcome of the project.

In the implementation phase: A simple opening program was conducted then a brief communication of results of the study "Effectiveness of the Implementation of the "No Segregation, No Collection Policy: The Case of DMMMSU Service Barangays" was discussed. A Memorandum of Agreement or Memorandum of understanding was prepared. Followed by the needs assessment survey

for the priority areas to be addressed. Meeting with the Barangay officials was called to discuss the result of the needs assessment. Planning with the stakeholders followed.

The beneficiaries/clienteles were encouraged to share best practices in their barangays in terms of solid waste management thru an open forum. Orientation was conducted by the extension workers. Monitoring and Evaluation of the participating Purok were done to measure the effectiveness of the service rendered to the beneficiaries/ clientele.

Waste segregation policies in a global scale

Licy *et al.* (2013) said that environmental problem is a global concern and it has no boundary. Worldwide, environmentalists are putting much effort to inform people about the importance of protecting the environment. One of the reasons why our environment deteriorates is because of the common practice of improper management of solid wastes. Therefore, pollution and outbreak of diseases become one of the major issues that people from around the world are facing.

Since there is no long-lasting solution to those problems, the only thing to do is to reduce and control waste generation through awareness and proper practice of waste management. According to United Nations Environment Programme (2012), "every year, an estimated 11.2 billion tons of solid waste is collected worldwide and decay of the organic proportion of solid waste is contributing about five (5) percent of global greenhouse gas emissions" which speeds up climate change and worsen its effects like global warming and flash floods.

With this, things may get worse especially with the fast growth of population and urbanization around the world. The World Bank (2018) stated that in 2025 wastes are expected to rise by 2.2 billion tons. Furthermore, poor management and ineffective disposal of wastes cause soil, water, and air pollution. Soil and water pollution contribute to the contamination of the ground water that we use in

watering our plants, cooking and for our own consumption which may cause various diseases and infections to animals and especially to humans.

These huge problems are making the world deteriorate and humans suffer. The purpose of waste management is to reduce the negative effect of increasing generation of waste to human health and to the environment. Moreover, Choi (2016) said that one of the goals of waste management is to reduce the harm to the environment through treating the waste in a safe and appropriate way. For an instance, in reported news from Vanguard News written by Obinna (2015), due to improper disposed refuse, it causes direct and indirect health effects.

Direct health effects include leptospirosis, diarrhea, and malaria from rats, flies and mosquitos, respectively. Also, it may contaminate and poison bore holes which are deep narrow vertical holes that were dug to obtain water from beneath. Furthermore, aside from those aforesaid diseases, improper managed wastes may cause injuries and incisions from broken glasses and rusting metals. Hence, developed countries like Japan and developing countries such as the Philippines have made policies and established efficient ways of managing waste to minimize expected negative effects of poor wastes disposal to the environment and to health.

Japan, one of the highly developed countries and have market-oriented economy, is effectively implementing solid waste management and developing technologies that can be used for turning wastes into resources and appropriate way of disposing wastes. Japan's main purpose of doing these is to make their society a sustainable one. Japan is strict when it comes to Management of wastes that is why they were able to maintain an incredibly clean and eco-friendly environment (Lane, 2014).

Since wastes cannot be prevented, Japan made a simple way of addressing the whole problem of the country through putting several public trash cans wherein there is a specific waste to be thrown in the

trash can. If someone fails to do it, Lane (2014) narrated that the trash he/she has thrown will be returned to him/her by the authorities.

In addition to that, according to Japan Environmental Sanitation Center (2012), the country passed the law for the Promotion of Sorted Collection and Recycling Containers and Packaging. The Japan Containers and Packaging Recycling Association turnover sorted plastic wastes, glass, and paper containers collected from homes to reproduction companies to recycle them into new products, such as carpets, area rugs, and recycled uniforms. Also, Japan Environmental Sanitation Center (2012) wrote that Japan also has concrete measures for food wastes. They passed a law called The Food Recycling Law.

To achieve a recycling society, the law calls for the creation of a recycle loop for feed and fertilizers and reduction of food wastes. In collaboration with the said law, Japan built composting, methane fermentation, and power generation facilities to address the problem. Moreover, according to the booklet of Japan Environmental Sanitation Center (2012), Solid Waste Management and Recycling Technology of Japan-Toward a Sustainable Society, in order to reduce carbon dioxide (CO₂) emissions, they recycle sewage sludge to usable fuel instead. Japan uses these two methods, sewage gas generation, and carbonization, to recycle sewage sludge to usable fuel.

Waste segregation policies in a national scale in the Philippines

The government also crafted a law as a response to the growing rate of garbage disposal problems in the country. The Philippine Congress passed RA 9003 or the Ecological Solid Waste Management on December 20, 2000 and was later on approved by the Office of the President on January 26, 2001. The aforementioned law sets guidelines and stresses ways of adopting systematic, comprehensive and ecological solid waste management program to ensure protection of the health of the public and the environment through adopting different best environmental practices on proper waste management.

This includes collection, transportation, and disposal. Despite of the presence and implementation of the said law, looming garbage and waste management are still dilemma in the country (Republic Act 9003: Ecological Solid Waste Management Act of 2000, 2001). Various published waste management studies in the country show how serious the problem is. Bernardo (2008) investigated the solid-waste management practices of households in Manila as Castillo and Otoma (2013) suggest that solid waste management (SWM) is truly an issue that needs critical attention.

In the study of Acosta *et al.* (2012), they scrutinized the development of the Philippines national solid waste management strategies from 2012-2016. They have found its successes but there are remaining gaps to be resolved. Magalang (2014) further mentioned that since Philippines is one of the developing countries in Asia and the Pacific Region, it is more pronounced to waste management challenges in urban metropolitan centers.

This scenario is also true in Dasmariñas, Cavite, Philippines as Macawile and SiaSu (2009) brought implications that inefficient waste management in the Philippines can surely affect environment and public health. To address this, Ancog *et al.* (2012) proposed institutional arrangements for solid waste management in Cebu City, Philippines. This strategy was set to directly target identified waste problems so that limited resources may be fully maximized.

According to Ranada (2015), the Philippines ranked 3rd as the biggest source of plastic leaking into the ocean. 2.7 million metric tons is the estimated amount of plastic garbage per year and twenty percent (20%) of it ends up in the ocean. On Ranada's article (2015) posted by Rappler, government officials said that the problem is caused by illegal dumping by garbage-hauling companies and open dump sites near waterways.

To minimize fuel consumption and save their time and money, "trash haulers" the reporter added,

"dump wastes at the roadside, at informal deposit sites or directly into waterways". Though open dump sites are considered to be illegal under Ecological Solid Waste Management Act of 2000, in the article, Ranada (2015) reported that there are still 600 open dumpsites around the country. From these two aforementioned scenarios, waste management is really a serious problem.

In addition, in a news written by Alave (2011) of Inquirer, the Department of Environment and Natural Resources (DENR) told that one-fourth (1/4) of the Philippine's daily solid wastes are to be blamed to the residents. Emy Aguinaldo, executive director of the National Solid Waste, said in the same news report that each person produces 0.7 kilograms of waste a day which is 130% higher than the global average of 0.3 kg per person each day (Alave, 2011).

Moreover, some local governments lack political will and though the Philippine government wanted to construct facilities and buy equipment that can address these problems, they do not have enough budget to do it (Ranada, 2015.) These can either be resolved or will remain as problems to the country in the next few months or years. Surely, if those said activities and problems will continue, everybody will suffer. Like what happened to the most popular island destination here in the Philippines, Boracay, which is set to close for 60 days this year, 2018, due to environmental violations.

In a news report, Duterte told in an interview, after his visit, that the island is a "cesspool" (Calder, 2018). In the same news report by Calder (2018), the travel guide "Lonely Planet" said that "environmental regulations are poorly implemented and waste management is a huge problem" (p.1). Because of that, a study by Coastal Ecosystem Conservation and Adaptive Management, excessive algal bloom is being observed, which kills and declines the growth of corals (Calder, 2018).

According to an interview by Virata (2018) to Centre Europeen de Calcul Atomique et Moleculaire

(CECAM) scientist Miguel Fortes of the University of the Philippines, water in Boracay is already unsafe for swimming, snorkelling and other activities because of the presence of untreated sewage water. The pristine beach turned into a dangerous one.

In a news by Virata (2018), expressed that as a result of the raw sewage being dumped on the water, diseases like *Cryptosporidium*, *Giardia*, *Campylobacteriosis*, *Escherichia coli*, diarrhea, encephalitis, gastroenteritis, and typhoid fever can be acquired when a person is excessively exposed to the current state of the water. The same thing also happened in Siargao Island of Surigao. The Department of Environment and Natural Resources (DENR) confirmed that an “operation” is on its way in addressing Siargao’s garbage situation (Villaruel, 2019).

DepEd issued DO 5, s. 2014, an implementing guideline on the integration of Gulayan sa Paaralan, Solid Waste Management and Tree Planting under the National Greening Program (NGP). This order was released on February 7, 2014 nationwide for efficient and effective implementation of the NGP. Other beaches in the Philippines may soon face the same fate if we do not wake up to our senses.

In two to three years, the Surfing Capital of the North—San Juan, La Union—can be the next Boracay, for all the wrong reasons, such as scattered cigarette butts and wastes from the locals and tourists. Urbiztondo Beach, the popular surf spot of San Juan, La Union is the nesting place of the local pawikan because of its wide beach and sand dunes (De La Cruz, 2016.) Moreover, De La Cruz (2016) reported that the project Coastal Underwater Resource Management Actions (CURMA), however, found out that climate change has caused confusion in the natural birthing cycle of the reptiles. The flock of tourists has also disturbed their nesting place which resulted to less hatchling. The sea turtles control the infestation by consuming jellyfish and sea grass. Less pawikan heads to more jellyfish that could lead to zero swimmable water. Most of the time, development is not the answer to the world’s problems.

Waste segregation policies in the local and institutional scale

In Don Mariano Marcos Memorial State University, North La Union Campus, Comprehensive Waste Management Program is purposely implemented to guide the enforcement of solid waste management in the campus. Despite the implementation of CWMP, proper management of solid wastes in some institution and departments is challenging (Damasco, 2016).

Because of these programs the campus was awarded as the “Most Sustainable and Eco-friendly Schools in 2017. These strategies can be a model to the nearby barangays/schools of the campus. Despite the DO 5 s.2014 of the Department of Education the different elementary and secondary schools in La Union is amenable that it is challenging for the different schools to strengthen their solid waste management.

Another crucial phase of waste management in some schools include activities such as placing waste collection bins, collecting waste from those bins and accumulating trash in the location where the collection phase involves transportation. Based on the findings of research, service barangays need assistance on waste management. These are the reasons why the extension professionals were very much interested to conduct an extension program for the service barangays.

The conceptual paradigm of the project explains the intertwining and critical relationship between research and extension towards sustainable development (Fig. 1)). Before academic institutions can extend their output and breakthroughs to the community, they need to ensure that their products have underwent the critical and rigorous methods of research. This is called evidence-based extension (Dunifon *et al.*, 2004). After which, the breakthroughs are extended to the community. The research investigation is the backbone that ensures that the community is geared toward sustainable development.

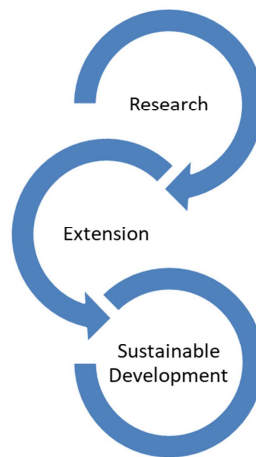


Fig. 1. A conceptual paradigm showing the process conducted from research to extension up to sustainable development of barangay Arosip

Materials and methods

Research design

This extension project made use of a participatory method of investigation. According to Bergold and Thomas (2012), participatory research has a practical consideration regarding the roles and tasks of various participants. This approach also has specific methodological approach and a quality criterion is understood here in the sense of arguments justifying a participatory approach.

In this present study, the participatory method for the extension project was utilized since barangay folks were gathered together to participate in the various activities in the study. Moreover, it was used to capacitate Barangay folks to address the priority needs for Barangay Arosip, Bacnotan, and La Union.

Sources of data and sampling procedure

The participants of this project were the residents of Barangay Arosip, Bacnotan, La Union, Philippines. From the entire population of Barangay Arosip, Bacnotan, La Union, Philippines, the extension professionals attempted complete enumeration. A barangay official from Arosip disseminated the extension activity to all their constituents and reported the progress of their participation to the extension professionals. According to PhilAtlas (2020), the population of barangay Arosip, Bacnotan, La Union Philippines as of 2020 is $N = 629$.

Stages in the conduct of the extension work

Orientation activity

The preliminary activity in the conduct of the extension work is the orientation stage. In this stage, the different extension professionals introduced the project entitled: Serve, Understand, and Respond to Waste Education Management with an acronym "SURWEM." The word "surwem" is an Ilocano dialect from the Philippines that means "to learn".

This means that the stakeholders and the local citizens from Arosip, Bacnotan, La Union, Philippines ought to learn waste management in its fullest sense. The extension professionals presented the research where the extension activity was based. The title of the completed research was Effectiveness of the Implementation of the "No Segregation, No Collection Policy": The Case of DMMMSU Service Barangays. The salient result from the research study was that there was low level of awareness in the collection of solid wastes. Moreover, that was also a very low level on overall households' level of awareness on "No Segregation, No Collection" policy.

Based on these results, it was explained in the orientation stage the trainings to be conducted including: (1) solid waste management and its importance; (2) techniques in reducing waste (segregation, and 3 R's; and (3) proper waste disposal. It was also highlighted that the strategy to

be imposed in the extension activity is the "search for the most eco-friendly zone / purok" contest.

Conduct of training

After the orientation activity, the extension professionals conducted the trainings: (1) solid waste management and its importance; (2) techniques in reducing waste (segregation, and 3 R's; and (3) proper waste disposal. The strategy imposed in the extension activity was the "search for the most eco-friendly zone / purok" contest. There were also hands on waste management activities imposed during the trainings conducted. Furthermore, the extension professionals also provided video presentations to expound on the management of recyclable materials. Lastly, a

seminar regarding composting was also discussed. After the trainings and seminars conducted, hands on workshop was performed and executed so that the stakeholders would completely understand the execution of waste management in the real-world scenario.

Monitoring and evaluation

The extension professionals regularly visited Barangay Arosip to monitor the progress of the SURWEM extension project. It was ensured that the service barangay was able to increase their knowledge and skills in waste management. The extension professionals also searched, evaluated and determined the eco-friendliest purok and provided waste management awards for barangay Arosip (Fig. 2).



Barangay: Arosip
Municipality: Bacnotan
Province: La Union

Nearby cities:

Coordinates: 16°44'49"N 120°25'12"E

Fig. 2. Visual map showing Barangays in Bacnotan, including Arosip

Arosip is a barangay in the municipality of Bacnotan, in the province of La Union. Its population as determined by the 2020 Census was 629. This represented 1.42% of the total population of Bacnotan (PhilAtlas, 2020). Barangay Arosip has the following coordinates: 16°44'49"N 120°25'12"E.

Results and discussion

This extension project was originally an initiative project from the College of Education in 2020. The project was put on hold after the government of the Philippines imposed a state of lockdown in March 2020. The clients/beneficiaries were unable to attend

because of the epidemic and all were required to stay at home. Fortunately, in 2021 limited face-to-face was allowed.

The extension office permitted the extension workers to perform the extension project in Barangay Arosip, a neighboring barangay of DMMMSU NLUC. The approved annual and quarterly plans were implemented. The project was launched in the 1st quarter of 2021, and the procedures, such as health protocols, getting permits, meetings, launching, orientation, and evaluation were realized. Due to the pandemic, only the Barangay officials and purok

representatives were able to attend the upper-mentioned activities, and these activities were cascaded by the attendees to the participating purok. Based on the evaluation conducted in 2021, Barangay folks are requesting some face-to-face training on the technique of converting waste into usable things. The team implemented more activities through face-to-face training/activities conducted.

Annual and quarterly activities that were planned from 2021-2023 were completed. The trainings were implemented for the barangay together with two neighboring barangays. Lectures on solid waste management and its significance, methods for reducing waste by segregation and the three Rs, and proper waste disposal are all included in the training/seminar/workshop conducted last November 2022. Through an open forum, the participants were urged to discuss best practices for managing solid waste in their barangays.

The workshops were applied in their *Gulayan sa Barangay*. A series of monitoring and evaluations was implemented through face-to-face and online platforms. Table 1 shows the training evaluations conducted for Barangay Arosip. Table denotes that participants appreciated the training conducted this could be justified by the computed mean of 4.47 and 4.60 for the waste management seminar and composting respectively.

Table 1. Training evaluations conducted

Training	Mean	Remarks
Waste management seminar	4.47	Excellent
Composting	4.60	Excellent

The presence of “*Gulayan sa Barangay*” can tangibly support this claim. This implies that the activities conducted for three years had an impact on the identified problems for Barangay Arosip. Appendices on page serve as evidence of different activities conducted during the implementation. According to Mariano (2020), one of the several interrelated factors that contributed to the success of Barangay Potrero’s SWM was proper coordination; the process of managing the barangay’s solid waste became more efficient.

This is very true in Barangay Arosip the varied activities, monitoring, and evaluation conducted were all supported by the Barangay folks in coordination with the industrious barangay officials. Their participation in the Parol Making Contest last December 2022 utilizing indigenous and recyclable materials made them receive the 1st Runner Up award.

In summary, this extension project intended to improve the awareness level of the residents of Barangays Casiaman, Arosip, and Sapilang on solid waste management and in turn apply the skills learned in reducing waste generated and utilizing biodegradable and non-biodegradable waste in their respective jurisdictions.

The purpose of this extension project is for the beneficiaries to (1) acknowledge the importance of solid waste management through a series of meetings/seminars/ orientations/ training/ workshops; (2) learn the different techniques for reducing waste in line with segregation and the 3 Rs through meeting/seminar/orientation/training/workshop; (3) adopt the best practices of solid waste management; (4) establish the SURWEM Agbuo, SURWEM Aglako, SURWEM AgpaAdu through *Gulayan sa Barangay*; and (5) inspire and implement the policies on waste management by participating in the search for the eco-friendliest purok, parol making and other related activities.

The project utilized the participatory method. The necessary data were obtained through client feedback forms, pictures, videos, and actual accomplishments for Barangay Arosip. Mean and ranking were used to determine the usefulness of activities. The results of the training evaluation were 4.47 and 4.60 which means the training conducted was excellent. Engr. Raffy Espiritu taught the conversion of waste to fertilizer using a biodigester barangay folks were very satisfied with the said training. Barangay Arosip was able to establish *Gulayan sa Barangay* through the different activities conducted. Furthermore, barangay puroks participated in the town activities; they won

the contest “Parol Making” using Indigenous and recyclable materials last December 2022. Purok (Center) was adjudged the winner for the eco-friendliest purok.

Conclusion

From the foregoing results, the following conclusions were derived: (1) barangay folks realized the importance of solid waste management through their utmost participation in all the activities; (2) barangay folks implemented different techniques in reducing waste in line with segregation and the 3 Rs through varied activities conducted; (3) Barangay Arosip had *gulayan sa barangay*; and (4) Barangay puroks actively participated in the various activities of this extension project.

Recommendation

Based on the conclusions, the following recommendations were designed: (1) Extension project for Barangay Arosip be continued for the next phase; (2) Consider the establishment of an Eco-tourism project in this Barangay; and (3) This study can be a basis for conducting another extension project.

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