

The collaborative empowerment of rural women in Bandung-Indonesia to contribute for environment conservation: Integrating faculty expertise with transnational insights

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Abstract

Rural women play an important role in managing households and local natural resources, such as water, firewood, and agricultural products. They have the potential to be agents of change for environmental preservation. The primary objective is to evaluate the program of initiatives from academics with the Indonesian diaspora in the United States to encourage rural women in Sindang Sari, Bandung-Indonesia to participate in environmental conservation. The research method is qualitative with interview, participatory workshops, case studies, observation and is equipped with survey conducted in the Sindang Sari Village-Bandung. Based on the results of the analysis, it was found that empowering rural women to conserve the environment can be done by academics supported by diaspora from developed countries who have a habit of maintaining environmental sustainability. Conclusion from this study, the collaboration between academics and the diaspora who have been successful in her country can be a way to empower women in villages to protecting the environment in daily activities through the use of biomass stoves and maintaining vertical gardens.

Keywords

Empowerment, Rural women, Environment, Green technology, Indonesia

Introduction

The In 2022 the population of Paseh District according to the age group structure consists of 37,162 people aged 0-14 years; 96,997 people aged 15-64 years; and 8,675 people aged 65 and above. Sindangsari Village is located in the area of Paseh District, Bandung Regency, West Java Province, Indonesia. It can be seen that the productive age is very dominant, with a sex ratio of 107 which means that the number of male population is 7 percent more than the female population [1]. This data shows that the

Published:
May 30, 2025

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Selection and Peer-
review under the
responsibility of the 6th
BIS-HSS 2024 Committee

number of productive women in the Paseh District has the potential to be educated in green technology as part of environmental conservation.

Environmental problems in Paseh District were identified as related to plastic waste, air pollution and increasingly limited agricultural land. Household waste and household industries such as food processing produce considerable waste. Plastic waste is still found because of the lack of public awareness in waste management [2][3]. Air pollution in this region is also affected by household activities and small industries. Waste incineration, including plastics, is often carried out due to the lack of environmentally friendly waste management infrastructure. This practice produces harmful emissions, worsening local air quality land in Paseh District is under pressure due to population growth and urbanization, which has led to the conversion of agricultural land into settlements or small industries [4][5].

The emergence of stereotyping in Indonesian culture that women are weak, emotional, irrational creatures; making women individuals isolated from the social process [6]. In fact, rural women usually inherit local knowledge about environmentally friendly practices, such as sustainable agriculture [7], forest management, and water conservation [8]. This knowledge can be developed to support environmental solutions coupled with knowledge of green technology [9]. Rural women need to be aware of the threat of environmental damage, such as water and soil pollution, which can damage the health and well-being of their families. By contributing to environmental conservation through green technology, village women can protect their families and communities with long-term risks. The contribution of village women in environmental conservation, such as planting trees, reducing plastic waste, or promoting renewable energy, can help reduce the exploitation of already limited natural resources. Rural women are often connected in social groups such as social gatherings or local organizations [10]. Therefore, their empowerment program is expected to be a way to share information, mobilize communities, and work together in environmental conservation initiatives.

In this program, in addition to involving academics, it also involves a group of Indonesian diaspora women in Florida, United States. A number of migration studies have concluded that international migration that occurred in the era of globalization can not only expand the distribution of the diaspora, but also strengthen their existence in supporting the progress of their countries. Included in the green technology that they get in the country where they live [11].

The existence of the diaspora is related to their role in realizing a symbiosis that is beneficial to the destination and origin countries. Some examples of countries that are considered to have succeeded in reaping benefits from the existence of the diaspora are China, India, and the Philippines [12][13][14][15].

The existence of the Indonesian diaspora in the United States is an important asset to build the Indonesian state and produce a superior generation in the future who do not

forget the roots of the nation. This statement was delivered by the Indonesian Ambassador to the US, Rosan Perkasa Roeslani [16].

This study uses the theory of Participatory Communication Theory. Participatory communication is a dynamic, interactional, and transformative process of dialogue between people, groups, and institutions that allows people, both individually and collectively, to realize their full potential and engage in their own well-being [17]. Participatory communication initiatives create opportunities for people to articulate their views, identify common problems, and seek solutions from within their communities. This program is a community service program that is expected to be a continuous program to change the stereotype that Indonesian women, especially Sindangsari Village Bandung- Indonesia that they are not a helpless group, but they have the potential to contribute to environmental conservation and can be educated using green technology [18]. So that it is in accordance with the participatory communication pattern which provides an opportunity to take the initiative in creating opportunities for a group of people to articulate their views, identify problems, and find solutions from within their community.

Eddyono mention that the approach to women's empowerment has been widely discussed by researchers and social activists with the intention of assessing the situation of women nationally [19]. Kantachote mentioned that since the 1970s, advocates have been lobbying for women's rights related to issues such as feminization, poverty, inequality in politics, education, and wealth to provide explicit support for women's empowerment [20]. The Beijing Declaration in 1995 initiated a move to focus on women's empowerment. A number of governmental and non-governmental agencies, including the United Nations, the World Bank, the U.S. Agency for International Development (USAID), the Pan-American Health Organization, Freedom House, the World Health Organization, and the Canadian Agency for International Development are leading women's empowerment projects. These institutions use indicators to assess the status of women, evaluate interventions, and assess policy options for development [20].

Eddyono stated that women's empowerment is carried out with the aim of assessing the work of organizations that intervene in women's empowerment. However, Eddyono's research does not discuss women's empowerment in a national or organizational perspective but rather seeks to understand the situation of women at the grassroots level, the researcher examines existing empowerment theories to determine which one is most suitable in her observations [19].

Women in Indonesia are traditionally seen as caregivers in the family unit, responsible for household tasks and raising children [21]. Traditional gender roles often describe specific expectations for women and men. Although there has been a shift in urban areas, in the countryside there is still a need to comply with this role. Women are primarily responsible for domestic and parenting duties, while men are expected to be breadwinners [22]. Statistical information from the World Bank shows that the

participation rate of Indonesian women in the labour force is lower than that of men [23] with variations in various sectors and regions. The results of the research's from West Nusa Tenggara Indonesia said that rural communities, especially women, are very motivated and greatly helped by the empowerment program through the PKK (Family Welfare Education Program). The results of cooking skills such as making various snack chips, and so on can meet daily needs and can help ease the family's economic burden [24]. Thus, it can be seen that women have the potential to be empowered in protecting their environment, if they are given education about green technology.

There are three previous studies that discuss rural women and environmental conservation efforts, namely research by Ghasemi et al. which examines women from Iran, then research by Arintyas from Indonesia and Biswas who researches women in Bangladesh in poor rural communities. Their research have similarities for the source of the data, namely rural women. Although the three studies above provide valuable insights into rural women's empowerment and environmental conservation, their research: do not explicitly integrate cross-disciplinary academic expertise with global insights to empower rural women; There is no explicit focus on how rural women can collaborate strategically to become agents of environmental conservation, especially through synergies between local communities, educational institutions and the diaspora with progress in environmental conservation in their advanced residences. This research is interesting because it involves academic expertise in collaboration with parties with international insight to create an empowerment model that is globally relevant but still tailored to local needs. Developing an approach to empowering rural women not only improves their well-being but also integrates them in environmental conservation initiatives collectively and strategically. This research makes a unique contribution by combining local and global approaches to create sustainable empowerment solutions.

Study in Iran explores how empowering rural women acts as a bridge between social influences and environmental conservation. By giving women, the tools and resources to lead, they can positively impact their communities and the environment. The research highlights how ecofeminism and empowerment go hand-in-hand to make these changes sustainable and meaningful [25]. Furthermore, the study in Indonesia focuses on women farmers in rural Indonesian villages. It shows how empowering them with access to health care, financial independence, and sustainable farming education not only improves their quality of life but also ensures the land is cared for. Women are central to driving development and nurturing their families and the earth [26]. Meanwhile, study in Bangladesh offers a practical model to lift rural communities in Bangladesh out of poverty using renewable energy. It emphasizes involving women in decisions about energy use and shows how clean energy solutions can spark economic growth, improve daily life, and help protect the planet [27].

This study is discussing empowering rural women in Bandung, Indonesia focuses on enabling women to take charge of environmental conservation in their communities by

blending academic knowledge and global experiences. Like the studies above, this is approach acknowledges women's central role in sustainable development and environmental care, but it adds a collaborative, international perspective. In essence, rural women are empowered, they uplift not just themselves, but their families, their communities, and the environment around them. By combining local insights with global strategies, this study sets the stage for real and lasting change. This study makes limits on environmental conservation through green technology. Two types of green technology are taught in Sindang Sari Village-Paseh District-Bandung-Indonesia is an eco-friendly stove [28] and vertical garden [29]. Biomass or biogas-fueled stoves use organic residues such as straw, livestock waste, or plant residues. These technologists reduce dependence on firewood, reduce carbon emissions, and improve health by reducing smoke in homes. Rural women can use agricultural or livestock waste to produce biogas and use these stoves in their daily lives. Vertical planting systems with recycling containers such as plastic bottles can save land, utilize plastic waste, and create additional food sources. Rural women can start vertical gardens to grow vegetables or herbs around the house.

The community service activities carried out by the academic team involving the Indonesian diaspora living in the United States are in line with Bilic's opinion that it is necessary to redefine multiculturalism that supports greater dialogue and participation of women from minority cultures. Women's voices are often the least heard in dialogue. Bilic advocates for dialogue among women who are part of her as a multicultural feminist. Multicultural feminism promotes a dialogical approach that recognizes that one of the more comprehensive approaches to women's lives and the issues that affect them is that with dialogue between them, the wider the reach will be (Bilic, 2018).

Recent article on transnationality and the diaspora have provided new tools for thinking about the spread of women to other countries. This poses a new challenge to explore universally in women's experiences and views that are inseparable from feminist theory [31]. The research team invited the Indonesian diaspora from United States with the consideration that this diaspora becomes a role model for the women of Sindangsari Bandung village, Indonesia to contribute to environmental conservation with green technology that they apply in their daily activities.

As mentioned by Eddyono, her research has succeeded in illustrating how Indonesian women can build their social and cultural identities even though they are in slums and fall into the category of poor people in Indonesia. The program created by this team of lecturers is expected to implement environmental conservation as evidence of women's empowerment [19].

This study intends to find a collaborative-based rural women's empowerment model and empower women in environmental issues. The qualitative methods approach equipped with a survey to measure their opinions. This method was chosen because it allows the incorporation of rich empirical data with the direct participation of the village

women studied. This is important to ensure that the resulting solution is tailored to local needs and contexts while remaining informed by global insights.

Method

This research employed qualitative methods with interview, case studies conducted in the Sindang Sari Village-Bandung, Indonesia and do survey to collect the opinion. Primary data sources from the data result of interview and the focus group discussion with twenty mothers from Sindangsari Village Bandung, West Java, Indonesia and field observations, Bandung, West Java, Indonesia.

Qualitative research is one that uses data in the form of narratives, stories, expressions, and construction results from respondents or informants. Data can be obtained from data collection in the form of in-depth interviews and observations [32].

We try to emphasize obtaining a rich and detailed description of the subject or phenomenon under investigation. This qualitative descriptive research tends to employ inductive analysis, allowing categories and patterns to emerge from the data. The research is concerned with understanding the context and nuances surrounding the phenomenon being studied. The collected data obtained is condensed to refine the analysis data to the research needs. For data validity, the researcher invites an informant from Florida, USA, who serves as the founder of the Indonesian women's community in Florida. She is an Indonesian woman residing in the United States since marrying an American citizen. She works at Disney World as a Chef, overseeing a diverse team of employees from various countries.

Data collection

Each participant will fill the questions from survey and have semi-structured interviews from the researcher after the answer in FGD. This format allows for flexibility in exploring topics deeply while ensuring that relevant issues are covered. The study will involve 20 participants. The researcher developed criteria for FGD participants and received recommendations from the local village head. Like they are married, have a husband with below-average economic conditions and have children, both children and adults. The FGD was held in a relaxed atmosphere so that the participants felt free to express their opinions. If there are things that seem very personal and have the potential to cause discomfort to the informant, then the researcher provides a separate paper that has been provided so that they feel comfortable to convey their feelings and experiences which are not followed up with questions individually adjusted to their respective answers in the FGD. These are the profiles for 20 housewives in Sindangsari Village, Bandung West Java, Indonesia as the participant's program are as follows (see Table 1).

Data analysis

The analysis was carried out based on the category of women in awareness about environmental degradation. This approach is used to identify patterns in qualitative

data. This approach provides a comprehensive understanding of the problems that occur in the group being studied and can be used to answer research questions through the dataset obtained. Thematic analysis allows for theoretical freedom, but in this case, the researcher uses the basis of participatory communication. Participatory workshops in FGDs and in-depth interviews are documented by recording, copying, and analysing according to the categories of data obtained. The data that is found and recorded and becomes an idea or pattern that repeats in the subsequent data collection. Data analysis is carried out and checked several times to ensure its validity so that it becomes a comprehensive understanding. This collaborative effort combines academic guidance with the life experiences of the Indonesian diaspora which promises a holistic perspective and has cultural sensitivity in empowering women in rural contexts in Indonesia, especially in environment preservation.

Table 1. Informants' profile

No	Age	Daily Responsibilities	FGD Duration	Individual Interview
1	27	Childcare, occasional participation in community activities	150mins	none
2	50	Household management, no additional income-generating activities	150mins	30mins
3	37	Childcare, part-time involvement in a local business	150mins	none
4	35	Childcare, active involvement in a local community project	150mins	none
5	28	Household management, occasional food sales	150mins	none
6	53	Childcare, involvement in a family-owned business	150mins	none
7	54	Primary caretaker for grandchildren, occasional food vending	150mins	none
8	38	Managing a household, occasional food preparation for sale	150mins	none
9	63	Primary caregiver for grandchildren	150mins	45mins
10	32	Childcare, involvement in a small-scale business	150mins	
11	36	Cooking, cleaning, taking care of two children, managing household finances.	150mins	30mins
12	42	Preparing meals, gardening, assisting children with homework, attending community meetings.	150mins	30mins
13	30	Cooking, cleaning, managing household budget, taking care of two children.	150mins	45mins
14	44	Shopping for groceries, preparing meals, cleaning, caring for grandchildren.	150mins	30mins
15	32	Cooking, laundry, maintaining the house, working part-time from home.	150mins	none
16	40	Preparing meals, cleaning, helping children with schoolwork, organizing community events.	150mins	none
17	47	Cooking, laundry, gardening, volunteering at the community center.	150mins	45mins
18	28	Preparing meals, cleaning, taking care of a newborn, managing household finances.	150mins	30mins
19	43	Cooking, cleaning, managing the garden, participating in local religious activities.	150mins	30mins
20	39	Shopping for groceries, preparing meals, laundry, caring for elderly relatives.	150mins	45mins

Source: Data collected by the author

Results and Discussion

After conducting the FGD, in-depth interviews with certain participants were completed with observations on how the participants answered questions, then data was found that we simultaneously analyzed repeatedly to become discussion material.

Most of the participants showed a good understanding of the negative impacts of pollution, especially plastic waste and waste incineration. However, the lack of access to information is an obstacle to adopting environmentally friendly technology. Participants agreed that this technology can reduce dependence on gas stoves or firewood and also smoke produced from the cooking process can improve family health, this is in accordance with what is suggested by Fatima & Iram [28]. However, some feel that the initial cost of a biomass stove is still a challenge. The cheapest price of biomass compost is IDR 745,000. All participants were enthusiastic about this concept because it utilizes narrow land and produces fresh vegetables as discussed by Fathidarehnijeh [29]. However, the limitations of skills and initial materials are the main obstacles.

An in-depth interview conducted with 20 respondents to dig deeper into their insights resulted in the following results: Older respondents (over 50 years old) emphasized the importance of eco-friendly stoves to reduce the health impact of firewood smoke. They are willing to participate if subsidies or training on their use are available, this is appropriate as discussed by the research of Kamei [17]. Respondents who are active in local communities proposed that vertical gardens could be an economic solution by selling crops. They suggested training in vertical planting techniques.

The discussion of the case study in the implementation of the program produced data that they needed time for the use of biomass stoves that needed to be tested for 2 weeks. The implementation of this shows that the reduction in the use of firewood and gas stoves by up to 60% has improved the comfort of cooking and the living environment. Meanwhile, the implementation of vertical gardens at home shows positive results. In one month, one family can produce vegetables such as kale and spinach for daily needs, reducing household expenses by 10%.

Table 2. The collaborative activity

Stage	Key Activities	Goals	Outcomes
1. Collaboration	Engage academicians, diaspora Assess local needs and challenges Co-design projects with rural women	Establish partnerships Align resources and expertise	Clear roles and responsibilities Feasible and community-driven plans
2. Implementation	Organize training workshops Distribute materials and resources Guide initial project execution	Build technical skills Provide necessary tools Ensure smooth adoption	Women skilled in biomass stove use Vertical gardens established Visible impact in local communities
3. Monitoring & Evaluation	Conduct periodic impact assessments Gather community feedback Share success stories for replication	Measure project effectiveness Foster adaptability Inspire wider adoption	Data-driven improvements Long-term sustainability Broader community empowerment

However, in this implementation, support is needed such as initial subsidies for environmentally friendly technologies such as the provision of biomass stoves for each family. Technical training for vertical gardens and the provision of recycled materials such as plastic bottles and pipes. Early implementation shows that women are able to be the engine of environmental change if they are adequately supported. This narrative reflects the importance of community-based approaches and simple technologies in supporting environmental conservation in rural areas as discussed by Muhaimin [18]. The stages of the program along with the activities, objectives and results obtained in this collaborative activity are described as shown in the Table 2.

In accordance with the theory of participatory communication, the women of Sindangsari Village have the opportunity to dialogue with a team of academics and also the Indonesian diaspora, the nature of communication is transformative that allows the women who are accompanied to be able to realize that maintaining a clean and healthy environment can be done in their daily activities and can be spread to their neighbors as well. They carry out activities without feeling forced. The activity is expected to run in the long term and continue to be sustainable as discussed by Kantachote [20].

Based on the above analysis, the collaborative-based women's empowerment in environment conservation model obtained is presented in Figure 1.

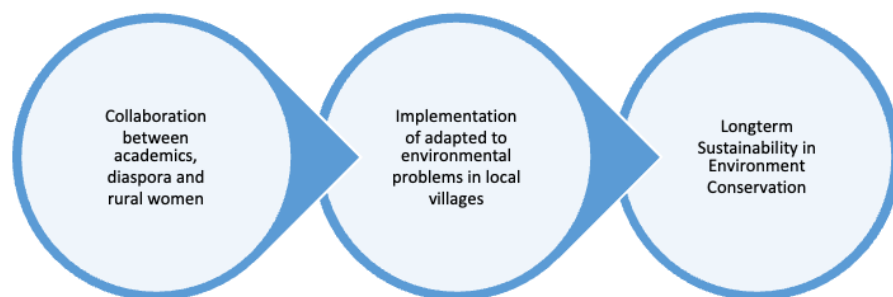


Figure 1. The collaborative-based women's empowerment in environment conservation model

In the village of Sindang Sari, Bandung, the women share stories of resilience and hope. Some of them have started to feel a sense of empowerment, realizing that they can make a positive impact not just in their homes but in their entire community. They've begun to see the connection between their roles as caregivers, workers, and community members, and how they can contribute to protecting the environment while improving their own livelihoods.

Still, there are women who feel stuck, struggling with limited resources and opportunities. But among them are strong, determined women who want to lift up their friends encouraging them to see their potential and to understand how collective action can lead to a better future for everyone. As a whole, the women of Sindang Sari share a common dream: to become agents of change. They want to build a community where sustainability and care for the environment go hand in hand with improving their well-being. They see a future where their voices are heard, their contributions are valued, and their efforts make a lasting difference both for their families and for the world.

around them. This reflects the findings in QU, which highlights the incredible power of rural women to inspire meaningful change when given the right support.

By understanding these daily needs and realities, empowerment programs can tailor their interventions to support women in Sindangsari Village effectively. Integrating local insights with the expertise of academics and international partners can create a holistic approach in the long term as also expressed by Bilic [30]. The theory of participatory communication here plays a role, to position rural women who feel that they have the right to voice their opinions and their desires to conserve the environment where she and her family live. They do not only focus on taking care of the house for the needs of the family as mentioned by Setiyani & Windsor [21], however, it is further and broader for its scope.

One of the implications of this women's empowerment program is growing awareness to protect their environment in two simple green technology efforts such as cooking with a biomass stove and seeing vertical gardens from plastic bottles that have become waste in their environment. Although this program is not necessarily significant in helping to increase income for families in the village as discussed by Mulyati & Suhaety [24]. However, this program is expected to help save their expenses every month.

Woman who are involved in this program collaboration, namely Indonesian women who have lived in the United States for more than 20 years, mentioned that women must be firm with themselves. Even though the environment is different, it should be noted that women can be an example by doing things that seem ordinary, but have an impact on the cleanliness of their environment as discussed by Ghasemi [25] to support each other among women. Such as sorting out which waste can be recycled and which waste is dangerous if not managed, such as plastic bottle waste. In the United States, there is already a program for every home in this waste management. Women must have the courage to express their opinions, such as reprimanding their husbands who litter in their neighborhoods. Women also dare to reprimand if there are other residents who do not pay attention to the environment because women are the center in controlling the family and the earth as mentioned by Arintyas [26].

Women from these villages were identified as having a need for emotional support: as women, they needed to be educated to dare to express their opinions and feelings; Including if family members or the surrounding community throw garbage carelessly and do not take good care of the environment. According to the theory of participatory communication, the program team will make positive encouragement and reinforcement of rural women to pursue their goals and can be compliant with feminist theory from Gorman & Mojab [31]. The program begins with skill development as a training session and finally skills to promote environment conservation for the healthier life. The program activities are participatory in nature where participants gather in groups to share their skills with each other and the academics will add for things that are not mastered by this group of women who are accompanied.

Meanwhile, for effective mentoring and communication, it is necessary for women in Sindangsari Village to be involved in networking that can lead to opportunities for collaboration with other communities so that everyone maintains the cleanliness of the air and the environment in which they live. They need to make cultural and social changes in challenging harmful stereotypes and promoting positive cultural change regarding women's roles and rights as mentioned by Eddyono [19]. This is reinforced by Indonesian women as resource persons from the United States willing to help anyone for the broad good.

From the discussions above, it is proven that collaboration between academics and the Indonesian diaspora can support the women's empowerment program in Sindangsari Village, Bandung-Indonesia in accordance with the theory of participatory communication. Discussion groups can be formed among women in villages with ongoing programs and academic involvement from different disciplines to maximize the skills of rural mothers. This program is also equipped with supporting programs such as the provision of biomass stoves and how to use them as well as training in the creation and maintenance of vertical gardens. The analysis included socio-cultural factors, economic challenges, and individual experiences, with the ultimate goal of formulating a program to increase women's empowerment in managing the environment in which they live and can be maintained to get inspiration on how the Indonesian women's diaspora in the United States share how to protect the environment in their current place of residence with clean air. In the end, this program, if maintained by all parties involved, can protect and protect the earth well as mentioned by Biswas et al [27].

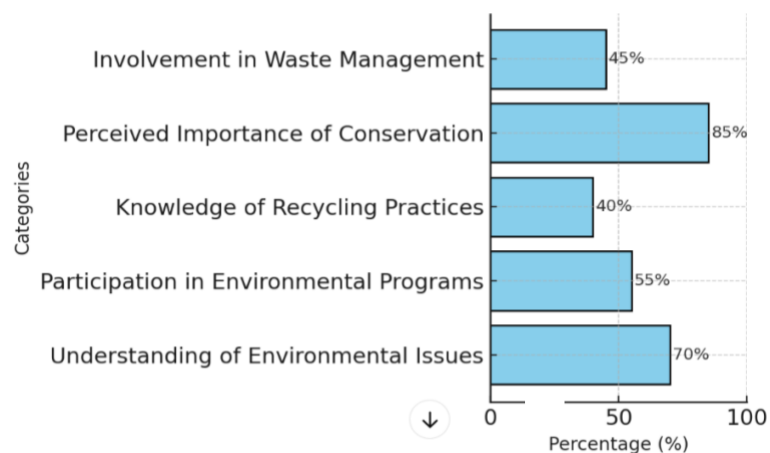


Figure 2. Awareness of green environment of rural women in Sindang Sari village

Figure 2 stated that 85 percent of the 20 village women surveyed were aware of the importance of environmental conservation but they were not involved in waste management and they understood that there were environmental issues that needed attention, but did not apply the practice of recycling plastic bottle waste even though they stated that 55 percent stated that they felt they had participated in environmental sustainability. This implies that rural women usually inherit local knowledge about environment in accordance with the statement from Gustiah & Nawangsari [7] and Susilo & Kodir [8].

Conclusion

Data analysis and discussions revealed that women in Sindangsari Bandung Village, Indonesia, have embraced environmental cleanliness by switching from firewood and gas stoves to biomass stoves, showcasing their commitment to sustainable practices. Their dedication extends to supporting environmental protection through the creation of vertical gardens. This positive shift was significantly influenced by an academic team's workshops and case study discussions, bolstered by the support of peers from the United States, which made the program highly convincing to the village women. It's important to note that these findings are based on a specific selection of women from Sindangsari Bandung Village. Future collaboration with diasporas from other countries, building on the new support from the Florida diaspora, promises to broaden the scope of environmental conservation efforts. This research contributes to the theory of participatory communication, demonstrating its effectiveness in empowering diverse villages to tackle their unique challenges. Practically, this study has boosted women's confidence in contributing to environmental conservation through their daily activities. Future research should explore empowering women with other green technologies applicable to their daily lives. The recommendation stemming from this research is to implement the theory of participatory communication across all village residents to promote environmental cleanliness through easily adoptable green technologies, with continuous monitoring and evaluation to ensure the program's sustainability.

Acknowledgement

The authors would like to thank to all participants of this study and the LSPR Institute who have provided financial assistance for the implementation of this community service. In describing the survey results, the researcher declared that the process uses AI technology.

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