

# Utilization and Maintenance Practices of Postharvest Facility: A Case in Davao del Norte

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## Abstract

The study was descriptive qualitative (case study) in design, and data was gathered using Key Informant Interviews (KII) and Focus Group Discussions (FGD). It was conducted in the Province of Davao del Norte with seven KII participants and three participants subjected to FGD using the researcher-made instrument validated by experts. This study was conducted to determine the practices in utilizing and maintaining postharvest facilities (PHFs) in the Province of Davao del Norte. Also, this study wanted to resolve the challenges in the utilization and maintenance of PHFs in Davao del Norte. Consequently, this study determined the coping mechanisms to address the identified challenges and difficulties. The findings of the study revealed five (5) practices in the utilization and maintenance of PHFs. PHF Knowledge and Experience, Formulation of Organization's Policies, Systems, and Procedures (PSPs), Proper Implementation of Organization's PSPs, Appropriate PHF Utilization and Maintenance, and Regular Monitoring Activities. The study's findings also revealed that the three unavoidable challenges documented in the utilization and maintenance of PHFs are the PHFs Related Predicaments, Organization & Membership Challenges, and PHF's Actual Operations. Finally, to address the mentioned challenges and difficulties, coping strategies were also made known in this study. This includes but is not limited to organizational coping strategies and operators and PHF operation coping mechanisms. Future research is recommended to validate its results further.

**Keywords:** Postharvest facilities; Utilization; Maintenance; Practices; Challenges; Coping Strategies; Davao del Norte; Philippines

## 1. Introduction

The invention of the postharvest facility paved the way to address one of the global concerns: postharvest losses. In early times, bare hands and crude tools were used to harvest food plants and to kill food animals. As years passed, humans changed their lifestyle practices of cultivating crops and herding animals, resulting in the need to store produce for food and as planting material for the next cropping cycle. More complex tools were devised, such as plowing, planting, cultivating, and harvesting machines. Such changes in production practices have been reflected in postharvest practices (Joyce and Clarke, nd).

Over the past four decades, the priorities on postharvest have evolved across the globe from being solely technical in their viewpoint to being more receptive to the demands of consumers (FAO 2014). In the Philippines, while there are continuous government efforts to reduce postharvest losses, anecdotal evidence indicates that government postharvest facilities (PHF) investments may have been misallocated. This was shown in the study of Manalili et al. (2016), who evaluated the effectiveness of PHFs in upgrading value chains and improving economic outcomes for smallholder farmers.

With this, the researchers conducted this study to describe the practices, difficulties, and overcoming strategies adopted by the recipients in the utilization and maintenance of the postharvest facility in Davao del Norte. The findings generated a plus factor towards smooth and proper implementation of Department of

Agriculture postharvest facility projects by adopting strategies and schemes to improve the program. Further, the best practices of the beneficiaries shall inspire and motivate others in the local setting.

## 2. Research Problems

The purpose of this case study is to gather reliable information from the beneficiaries of the postharvest facilities from the Department of Agriculture regarding its practices, problems encountered, and overcoming strategies through its utilization and maintenance.

Specifically, the attainment of the purpose of this study was answered by investigating three (3) specific research questions. First, what are the practices in utilizing and maintaining the Postharvest facility in Davao del Norte? Second, what are the predicaments encountered in doing such? Third, how do they overcome difficulties in utilizing and maintaining the postharvest facility?

## 3. Theoretical Framework

There were four theories that this study was anchored, which provided distinct but complementary perspectives on how postharvest facilities can be utilized, maintained, and improved for long-term success. This study is first anchored on the diffusion of innovations theory (Rogers, 2003), which is considered one relevant theory for understanding the utilization and maintenance of postharvest facilities. This theory, proposed by Everett Rogers, examines how new ideas, practices, or technologies spread within a society or group. In the context of postharvest facilities, the theory highlights the adoption process of advanced technologies, equipment, and storage methods that improve postharvest practices (Rogers, 2003).

Another relevant theory for understanding the utilization and maintenance of postharvest facilities is the Technology Acceptance Model (TAM). Developed by Fred Davis, TAM explains the factors influencing users' acceptance of technology. In postharvest facilities, TAM suggests that perceived ease of use and perceived usefulness are key determinants of whether stakeholders (farmers, workers, or facility managers) will adopt and continue using a particular technology (Davis, 1989). The Resource-Based View (RBV) theory is another valuable framework for understanding the utilization and maintenance of postharvest facilities. According to this theory, organizations can achieve sustained competitive advantages by acquiring and effectively utilizing valuable, rare, inimitable, and non-substitutable resources. In the context of postharvest facilities, the theory emphasizes that the physical assets (e.g., storage structures, machinery) and human capital (e.g., trained staff) are vital resources that contribute to the efficient and long-term operation of these facilities (Barney, 1991). Finally, the Sustainable Development Theory, as introduced by the Brundtland Commission in 1987, can be applied to the management of postharvest facilities. This theory emphasizes meeting the needs of the present without compromising the ability of future generations to meet their own needs. In the context of postharvest facilities, this means adopting practices that are both efficient in the short term and environmentally and economically sustainable in the long term (Brundtland, 1987).

## 4. Research Methodology

The study employed qualitative design, specifically a case study. A qualitative case study approach was applied with the use of an interview guide with open-ended questions because this method involves talking to the recipients of the postharvest facilities of every organization in Davao del Norte engaged in the four banner programs of the Department of Agriculture to find out their practices in the utilization and maintenance of postharvest facilities.

The study was conducted in the selected cities and municipalities of the Province of Davao del Norte. Purposive sampling was used in this study through open-ended interview guide questions. The researcher used this study's qualitative data collection method by conducting a Key Informant Interview (KII)

with the seven selected informants and a Focused Group Discussion (FGD) with three research participants using the validated and tried-out research-made interview guide. Data analysis was done using thematic analysis and data triangulation.

## 5. Results

### 5.1. Practices in the Utilization and Maintenance of Postharvest Facilities

Five themes were generated in terms of the practices for the utilization and maintenance of Post Harvest Facilities (PHF). These are as follows: PHF Knowledge and Experience, Formulation of the Organization's Policies, Systems, and Procedures (PSPs), Proper Implementation of the Organization's PSPs, Appropriate PHF Utilization and Maintenance, and Regular Monitoring Activities.

#### 5.1.1. PHF Knowledge and Experience

Based on the KII and FGD results, PHFs' knowledge and experience were among the practices in utilizing and maintaining postharvest facilities. These include equipment maintenance knowledge and experience, equipment operation training and other enhancements, and technical assistance.

**Equipment Maintenance Knowledge and Experience.** KII research participants agreed that one of their practices in using and maintaining their PHFs is using their prior and existing knowledge and experience in maintaining and managing the said equipment. KII 1 emphasized the importance of having this knowledge and previous experience, even minor ones. The same response was also recorded for KII 7. FGD participants also agree that knowledge and prior experience are among the practices in utilizing and maintaining their PHFs, which they considered to be one of the factors for their successful utilization. FGD 1 recalled that they were initially excited to request the PHFs from the Department of Agriculture.

**Equipment Operation Training and Other Skills Enhancement.** KII participants also state that their practice in the utilization and maintenance of PHF involved training for operating the equipment and enhancing other skills related to PHF utilization and maintenance. KII 1 said they have the training, including NC 2 from TESDA for Small Engines. KII 2 added explicitly that there was training for the operators on operating and troubleshooting the equipment, which PHILMECH facilitated. KII 3, for his part, received financial management training as part of the training to RCEF beneficiaries by PHILMECH. FGD 3 and FGD 1 also mentioned that they, along with their operators, attended various skills enhancement training from TESDA and DA-PhilMech, such as small engine service, farm machinery operations and maintenance training, leadership and financial management training, and record-keeping-related training, which immensely helped them in the utilization and maintenance of their PHF equipment and machines.

**Technical Assistance.** Another essential practice is receiving technical assistance from various agencies, such as the Provincial Government, the Department of Agriculture, and its attached agencies. KII 2 said they availed themselves of technical assistance utilizing and maintaining their PHF. KII 7 added that the Provincial Agriculture Office staff provided this technical assistance during frequent and regular visits, even during actual operations. FGD 3 added that they opened their organization and provided technical assistance from the DA-PhilMech and the Provincial Government.

#### 5.1.2. PHF Utilization and Maintenance

Another practice in the utilization and maintenance of the PHF is the appropriate PHF utilization and maintenance, as revealed in the responses of KII and FGD participants, which includes preventive maintenance activities, PHF care before, during, and after operations, and infrastructure establishment.

**Preventive Maintenance Activities.** KII participants agree that preventive maintenance activities form part of their practices. For instance, KII 3 mentioned that they practice preventive maintenance and routine checks, and he said that after 2 years of operation, the unit would ask for maintenance. He further added that preventive maintenance is a requirement and that to minimize damage, only the designated operator must be the one to operate the equipment. In the case of KII 1, maintenance is the most important, as he observed that there was damage to their tractor that had to be fixed first. Then, the engine needs regular oil check-ups. The unit must be checked first before going to the field for actual operation. FGD 1 mentioned that after the harvest season, their units were cleaned, greased, and checked for possible damage before being put in the shed.

**PHF Care Before, During and After Operations.** Another practice of the KII and FGD participant in their utilization and maintenance of PHF is the care of the units before, during, and after every operation. KII 5 mentioned that the machinery's basic needs are before and after operation care. He elaborated that the machinery must be thoroughly checked before actual operations, including possible oil, fuel, and water leaks. This must be done before the unit is dispatched to the field to ensure 100% operation and will not break down during the actual operations. FGD participants also agree that one of the practices in the utilization of maintenance of the PHF is the care of the units before, during, and after the actual operations. FGD 1 mentioned that they took good care of their PHF to ensure it would be helpful beyond its estimated lifespan by thoroughly checking the units for possible damage before deploying it to the field and after the operation.

**Infrastructure Establishment.** Establishing an appropriate infrastructure or machinery shed was also considered by the KII and FGD participants when utilizing and maintaining their PHF. KII 3 mentioned that they established two machinery sheds and even boasted that it has a Closed-Circuit Television Camera (CCTV) installed for safety and security purposes. FGD participants also mentioned using the farm machinery shed to utilize and maintain PHF. FGD 3 recalled that before receiving the units from DA-PhilMech, they were required to establish a machinery shed as their counterpart.

#### *5.1.3. Formulation of Organization's Policies, Systems, and Procedures (PSPs)*

KII participants and FGD also agree that one of their practices is formulating the organization's Policies, Systems, and Procedures (PSPs) in utilizing and maintaining Postharvest Facilities. This includes but is not limited to drafting the Policies, Systems, and Procedures (PSPs) and approval and dissemination of the Policies, Systems, and Procedures (PSPs).

**Drafting of Policies, Systems, and Procedures (PSPs).** The importance of policies, systems, and procedures (PSPs) in the utilization and maintenance of PHF is one of the pieces of information shared by both KII and FGD research participants. KII 1 said that associations must have policies that will serve as guides. KII 2 added that the organization must set up procedures in case the unit is damaged so they have the resources to repair it. FGD 1 also mentioned that all their farmer associations with PHFs had drafted policies that aided the proper implementation and utilization of PHFs.

**Approval & Dissemination of Policies, Systems, and Procedures (PSPs).** Aside from having the policies, it is also essential that they should be approved and disseminated to the general membership. This could be why KII and FGD participants agree that their practice includes approval and dissemination of PSPs. KII 3 mentioned that all their association members were informed of the policies, which were also approved during the general assembly. FGD 2 recalled that he was so happy that the general membership approved the policies he had proposed to the board, and it is now instrumental in the associations.

#### 5.1.4. Proper Implementation of the Organization's Policies, Systems, and Procedures (PSPs)

Another practice in the utilization and maintenance of postharvest facilities is the proper implementation of the organization's policies, systems, and procedures (PSPs) which covers prioritization of beneficiaries, penalties and sanctions, service fees and income sharing, provisions of additional benefits to associations and farmer members, budget allocation for repair and maintenance, and human resource and manpower. Both KII and FGD participants confirmed this.

**Prioritization of Beneficiaries.** It is also the practice of the KII participants to prioritize their beneficiaries as stipulated in their approved policies, which is now used as their guide in implementing their post-harvest services. KII 4 mentioned that their priority is their members, while the next is the non-members, of which they are hopeful that they will join their association in the future because of the services. This is also true for KII 1, who mentioned that their utmost priority in serving their PHF is their members. To have a smooth implementation of the prioritization of beneficiaries, KII participants also agree to use "first come, first served" policies, which means that those who requested first must also be served first. FGD Participants also confirmed this information. FGD 1 mentioned that their associations implemented a "*First Come, First Served*" policy to manage PHF operations properly.

**Penalties & Sanctions.** KII participants agree that implementing their approved policies as part of their practice in utilizing and maintaining PHF is the imposition of penalties and sanctions. This is the case for KII 3, as he mentioned that in the full implementation of their policy, there are corresponding penalties, including suspension if they break the rules. KII 1 added that it is their standard practice to include penalties so that the members are constantly engaged in organization-related activities and services. FGD participants also confirmed penalties and sanctions incorporated in their approved policies. FGD 2 observed that these penalties and sanctions helped the organization manage and maintain its PHFs. It served as internal control of the Associations.

**Service Fees and Income Sharing.** KII participants agree that implementing service charges and sharing income is part of their practice in utilizing and maintaining their PHF. For example, KII 4 mentioned rental and service fees for using the services. In the case of their thresher, they followed 12-1 sharing, or for every 12 bags harvested, 1 for the thresher (organization) and 11 for the farmer. FGD participants shared the same information, though they could not specify the exact amount and value in percentages. However, it is very clear without a doubt that part of the practice of utilization and maintenance is the implementation of an income-sharing scheme. For instance, FGD 1 recalled that their associations could repair their PHF because they allocated a certain percentage of the income for the services for repair and maintenance.

**Provision of Additional Benefits to Association and Farmer-Members.** KII participants also agreed that though it has disadvantages, one of the practices in the utilization and maintenance of Post Harvest Facilities is the provision of additional benefits to Farmer-Members. For example, KII 3 observed that the Farmers Association generated colossal income. KII 2 added that one of the benefits of having postharvest facilities is that it makes rice production activities easier, has lesser expenses for rice production, and has good quality output against manual operation. KII. FGD participants corroborated the statements and observations of the KII participants that the acquisition and presence of the PHF in the Association was able to provide additional benefits to the Association and farmer members. For instance, FGD 1 mentioned that he was shocked that under their jurisdiction, the Farmers Association could establish an additional shed and buy additional farm machinery from the income of their PHF services given to their farmer members.

**Budget Allocation for Repair and Maintenance.** KII participants agree that budget allocation for repair and maintenance is part of their practice in the utilization and maintenance of PHF. For instance, KII 2 mentioned that they allocated a budget annually for the repair and maintenance of the units. Also, as previously stated by KII 4, they ensure that the formed part of the income sharing of the PHF is for the repair and maintenance budget. FGD participants also confirmed that one of their practices in the utilization and maintenance of the PHF is ensuring a budget for the repair and maintenance of the units in the policies. FGD

1 mentioned that he observed that the officers were able to draft their policies, and one of the essential statements in their approved policies is the percentage allocation for the repair and maintenance budget.

**Human Resource and Manpower.** KII participants are unanimous in their responses that human resources and manpower are requirements and good practices in utilizing and maintaining PHFs. KII 3 mentioned that this policy of having the right manpower for the operation of the PHFs is present, especially on the bagger and operator of their rice combine harvester. KII 2, for his part, shared that currently, their practice is to designate operators for their units. In terms of maintenance, they also hired a mechanic to repair and maintain their PHF. FGD participants confirmed the statements of the KII participants that one of the associations' practices in the utilization and maintenance of the PHFs involved human resources and manpower. FGD 1 observed that most of the associations that have successfully operated and maintained the PHF involved regular manpower, such as operators and baggers.

#### *5.1.5. Regular Monitoring Activities*

KII participants agree that one of the practices in the utilization and maintenance of PHF is conducting regular monitoring activities. FGD participants also confirmed this.

**Monitoring from Government Agencies.** KII participants have common responses that the practice in the utilization and maintenance of PHF includes monitoring from various national and local government agencies. For instance, KII 1 mentioned the Provincial Agriculture Office (PAGRO), the Municipal Agriculture Office (MAGRO), and the Department of Agriculture Regional Field Office XI. For the part of KII 2, he mentioned that the Department of Agriculture Regional Field Office, Planning, and Monitoring Division, the Regional Agricultural Engineering Division (RAED), and PhilMech also conducted monitoring and inventory of the units. They performed this to determine if the units were functional. He further added that this monitoring was regularly conducted annually. FGD participants also agree that the local and national line agencies conducted regular monitoring visits to ensure the equipment was utilized and managed correctly. FGD 1 said that one of his tasks is to monitor this equipment and submit a monitoring report to the concerned agencies.

**Organization Led Monitoring.** KII participants also highlighted the importance of monitoring activities by government agencies and within their organization. They also considered this in their practice in utilizing and maintaining their PHFs. FGD participants also conformed to the statements of KII participants that one of the practices they observed in the utilization and maintenance of the PHF is the conduct of monitoring not just by the source of funds or the government agencies but also their internal monitoring. For example, FGD 1 mentioned that their associations have a monitoring committee composed of one BOD member and their manager. Their monitoring reports were considered valuable information that aided the organization in their decision on the utilization and maintenance of the PHF.

#### *5.2. Challenges in the Utilization and Maintenance of Postharvest Facilities*

At least 3 (three) clustered themes were identified as challenges or the predicaments of the research participants in the practices involved in the utilization and maintenance of the postharvest facilities. These are Organization and membership-related challenges, PHF-related predicaments, and PHF's actual operations.



### 5.2.1. Organization & Membership-Related Challenges

One of the challenges encountered by the research participants is organization- and membership-related challenges, which include no clear policies, member participation and mindset, lack of information and dissemination, and lack of funds availability.

**There are no clear policies.** The research participants identified no guidelines for utilizing and maintaining the postharvest facilities. According to KII 2, they have no basis or clear policies to implement the utilization and maintenance of post-harvest facilities. FGD 2 also observed that some of the associations in their area of observation have no clear guidelines regarding the utilization and maintenance of the PHF, which makes this a challenge in the implementation.

**Member Participation and Mindset.** Another problem experienced by the research participants is the members' participation and mindset. KII 5 said that some members did not even understand their protocol and policies regarding equipment utilization. Their organization is implementing a *first come, first served* policy. FGD participants also agreed that the mindset of the members should be changed, particularly regarding the use of the equipment. FGD 1 observed that some members are complaining because of the charges implemented by the Association regarding equipment utilization, as this was not the case in past government interventions.

**Lack of Information Dissemination.** Another predicament of the research participants is related to the organization's ineffective information dissemination, particularly on the policies for implementing their farm mechanization services. KII 5 strongly mentioned that information dissemination among the members is lacking. He further elaborated that the management should adequately explain to the members the drafted policies because, as he observed, most members always think that once it comes from the government, it should be free. However, this was not the case for farm mechanization services, where the equipment needs spare parts for repair and maintenance. One of the observed predicaments of FGD participants was the lack of information dissemination. FGD 2 agreed that the Association lacked the information to disseminate to the farmer members. At the same time, FGD 3 mentioned some info-dissemination-related activities that the Associations should do to inform their members properly.

**Funds Availability.** Another problem identified by the research participants is the availability of funds for repair and maintenance. KII 1 observed this predicament. He said that one of the most challenging problems is the funds to maintain the equipment. He further mentioned that urgent repair must be done to avoid further damage to the equipment. This can be done if a budget is available for the immediate repair. KII 2 observed the same predicament. He mentioned that one of the difficulties encountered in utilizing and maintaining their postharvest facilities is the availability of funds, as without funds, the repair of the units is complicated. FGD participants also agree that the availability of funds for the repair and maintenance of the postharvest facility is one of the challenges encountered in the utilization and maintenance of PHF. For instance, FGD 3 observed that a few of the Associations he monitored shared the same sentiments that one of their problems is the fund's availability. He observed that one of the many reasons the farmer's associations are unsuccessful in managing their PHF is that they do not consider the cost of repair and maintenance and where to get funds when major repairs happen.

### 5.2.2. PHFs Related Predicaments

Another challenge is PHFs' related predicaments, such as the availability and high cost of spare parts and shortage of equipment,

**Availability and High Cost of Spare Parts.** Concerns about the availability and high cost of spare parts were also identified as one of the challenges encountered by the respondents. KII 3 shared his experience that their problem in the maintenance of the unit is the availability of spare parts. He mentioned that it takes 2 weeks for them to wait for the parts they ordered, especially when they come from Manila,

which causes delays in the repair of the machinery. The FGD participants shared the same observations. FGD 2 mentioned that the Associations under his area of responsibility have difficulties maintaining their Rice Combine harvesters because, aside from the high cost of the spare parts, another problem is the unavailability of replacement parts in the locality.

**Shortage of Equipment.** Another challenge encountered by the respondents was the shortage of available equipment, which affected their schedules. KII 3 shared this when he said that their problem was the available equipment, which could not serve all that was scheduled. As our FGD participants observed, the problem of equipment shortage was also a challenge. FGD 1 mentioned that the Association's available corn sheller cannot cope with the harvest; an additional unit must be procured.

### 5.2.3. PHF Actual Operation

The PHF's actual operation is also considered one of the challenges in the utilization and maintenance of the postharvest facility, including site condition and operator-related problems.

**Site Condition Problems.** One of the challenges encountered and identified by the respondents is site-related problems like bad weather conditions, unavailability of farmer-owners, unclear farm areas, and the like. KII 5 narrated his experience, mainly when there was terrible weather. Due to bad weather, the scheduled operations were affected and halted. This creates a domino effect as the other schedules will also be affected, and the operations will be delayed. The FGD participants also mentioned the problems related to the actual condition of the farms as one of the challenges they encountered. For instance, FGD 1 noted that one of the challenges faced during actual operation is the problems related to the exact condition of the area.

**Operators-Related Problems.** Other challenges and predicaments the research participants encounter are related to the operators. KII 3 observed that their operators, including baggers, needed to be committed enough to utilize their existing farm machinery and equipment. For FGD 1, some farmers did not consider the presence of equipped and skilled operators in requesting the said intervention for as long as they had one.

### 5.3. Coping Mechanisms and Strategies of the Challenges in the Utilization and Maintenance of Postharvest Facilities

Based on the responses of the research participants when asked how they overcame difficulties in managing the utilization and maintenance of the postharvest facility, at least two emerging themes were identified. These are organizational coping strategies and operators and PHFs operation coping mechanisms.

#### 5.3.1. Organizational Coping Strategies

Organizational coping strategies are one of the strategies identified to address the challenges in the utilization and maintenance of postharvest facilities. This includes constant and effective monitoring activities, the role of leaders and members of the organization, the presence of updated and strong organization policies, and procured/outsourced additional equipment.

**Constant and Effective Monitoring Activities.** The role and importance of monitoring were highlighted as one of the coping strategies in managing the difficulties and challenges in the utilization and maintenance of the postharvest facility. For instance, KII 1 said that monitoring must always be conducted, as he emphasized the importance of monitoring. These responses were also recorded in the focus group discussions of respondents, which highlighted the importance of conducting regular and effective monitoring activities. For FGD 2, constant monitoring is one of the reasons the utilization and maintenance of the PHF are successful. According to him, if problems in the operations are known earlier through monitoring, this will be addressed immediately and will not result in a much bigger problem.



**The Role of the Leaders and Members of the Organization.** Another coping mechanism and strategy that was highlighted in the responses of the key informant interviews is the role of leaders and members in the organization. KII 2 mentioned some of the officers' and operators' attitudes and characteristics, as well as the farm machinery mechanic. He said that dedication and commitment are both required in the leaders as well as the members to address issues and concerns: The role of the officers and members in coping with problems and issues in the organizations was also recorded as one of the responses during the conduct of Focus Group Discussions. FGD 2 mentioned that the leaders should be able to take immediate and urgent actions regarding the management of their PHF. Leaders can also collaborate and partner with government agencies, fellow farmers' groups, spare parts suppliers, and other stakeholders.

**Presence of Updated and Strong Organization Policies.** Another coping mechanism and strategy identified and recorded is the presence of updated and strong policies in the organization. KII 2 mentioned that there must be a functional policy related to using and maintaining the postharvest. The policy should include allocating funds for repair and maintenance activities and the operator's qualifications (skills). The FGD respondents also emphasized the presence of updated and strong organizational policies as part of the organization's coping mechanisms. For example, FGD 1 mentioned that they addressed the problems and difficulties the farmers' group encountered with their approved policies as one of the bases.

**Procured/Outsourced Additional Equipment.** Procuring additional farm equipment was one of the suggested and identified coping strategies for the challenges encountered by the group. KII 2 said additional tractors should be procured so the unit would not be overutilized. KII 5 also indicated a village-type rice mill for their association. All of the FGD participants agree that, based on their observations, the current and existing units of the associations must be increased in number as farmers now have problems with the limited and shortage of manpower for their farming activities.

### 5.3.2. Operators and PHFs Operation Coping Mechanisms

Another coping mechanism in the challenges encountered by the research participants in the utilization and maintenance of postharvest facilities is operators and PHFs operation coping mechanisms, which include funds availability for repair and maintenance, proper maintenance-related activities, and training & capability enhancement.

**Funds Availability for Repair and Maintenance.** Another coping mechanism for the organization identified and explicitly mentioned by the respondents is the availability of funds. For example, KII 2 suggested that apart from the policies, a considerable amount must be allocated for repair and maintenance. The conduct of FGD also confirmed the importance of having a sufficient budget for the repair and maintenance of the equipment. FGD 2 said that the budget for repair and maintenance plays a significant role in the successful utilization and maintenance of the PHF.

**Proper Maintenance-Related Activities.** Another coping strategy that came out during the conduct of the Key Informant Interviews is proper maintenance-related activities. This was emphasized particularly by KII 2 when he said that the number of machinery sheds must be increased. He also mentioned the importance of having a machinery shed. FGD 1 and FGD 3 also agree on adequately caring for the equipment by observing proper, regular, and periodic maintenance activities.

**Training & Capability Enhancement.** KII participants agree that training and capability enhancement are among the associations' coping strategies and activities to address their challenges when using farm machinery. For example, KII 2 elaborated on several operator training and capability enhancements, such as training for proper machine operation, troubleshooting, and 5S. Meanwhile, KII 3 suggested that operators receive National Certification II from the Technical Education and Skills Authority (TESDA) and training on handling emotional concerns. FGD participants also emphasized training and capability enhancement. FGD 2 and FGD 3 both mentioned maximizing the training provided by government agencies such as ATI, TESDA, and PhilMech, as it is beneficial that the operators and those directly involved

in the utilization and maintenance of the units are well-equipped with the needed knowledge and skills for the successful operation of the said units.

## 6. Discussion

### 6.1. Practices in the Utilization and Maintenance of Postharvest Facilities

**PHF Knowledge and Experience.** Improving knowledge and experience in utilizing and maintaining PHFs ensures the effective implementation of government mechanization programs. It increases the adoption of PHF technologies locally, as many Filipino farmers still rely on traditional farming practices, such as manual labor, making their productivity vulnerable to inefficiencies. Given that training and other-related initiatives are one of the practices in the utilization and maintenance of PHF, Sarker et al. (2022) confirmed that those farmers, including operators and officers who have more excellent knowledge to understand the importance of improving their self, can adopt the use of farm machinery which includes PHFs as they have broader exposure to various sources of information.

**Appropriate PHF Utilization and Maintenance.** Researchers have shown that the suitability of the application and performance of farm machinery, including PHFs, relies on the dependability of the machinery used, the operating environment, and the efficiency of the maintenance plan (Najapi et al., 2015; Ahiakwo, 2023). According to Oduma et al. (2014), to avoid needless wear and failures, PHFs must be appropriately maintained. It is clear from the fact that timely inspections, cleaning, and frequent lubrication are all part of reasonable care.

**Formulation of Organization's Policies, Systems, and Procedures (PSPs).** Strong, farmer-focused policies and good leadership techniques are essential for efficiently utilizing agricultural equipment, especially PHFs (Liao et al., 2022). Furthermore, creating organizational PSPs is crucial in guaranteeing the appropriate use and upkeep of PHFs. Because they minimize losses and maintain crop quality, these facilities are essential to the agricultural value chain. However, for them to work well, their operation, upkeep, and general performance must be governed by precise and well-defined policies, methods, and processes.

**Proper Implementation of Organization's PSPs.** Ensuring the appropriate storage, processing, and preservation of agricultural products depends on effectively applying an organization's PSPs for the use and upkeep of postharvest facilities. Strong policies, such as frequent maintenance plans and employee training, are essential for increasing the shelf life of products and improving overall postharvest quality, according to research by Kumar and Gupta (2020). Systems and procedures are crucial operational tools that guarantee the efficient implementation of policies in postharvest facilities, according to Ravindra et al. (2019).

To guarantee that all policies and procedures are understood and appropriately followed, management and frontline employees must have open lines of communication. The success of postharvest facilities depends on the human resources that oversee, run, and maintain these systems and have the proper physical infrastructure, as Singh and Sharma (2021) stress. For postharvest facilities to be used and maintained effectively, PSPs about staffing and human resources must be appropriately implemented.

In addition, implementing organizational PSPs regarding income sharing and service fees in utilizing and maintaining postharvest facilities is essential for ensuring financial sustainability and fairness. Clear policies should define how income generated from these facilities is distributed among stakeholders, including operators, investors, and service providers, to incentivize proper use and maintenance. These procedures help prevent financial mismanagement and encourage responsible resource use. According to Ahmed et al. (2020), effective income-sharing frameworks and a structured fee system ensure that post-harvest facilities remain financially viable while maintaining high service and infrastructure quality standards.

Furthermore, organizational PSPs about income sharing and service fees must be implemented to guarantee postharvest facility operations, financial viability, and equity. According to Ahmed et al. (2020), postharvest facilities maintain high service and infrastructure quality standards while maintaining financial

stability through efficient income-sharing mechanisms and a well-organized pricing structure. Regular audits and reviews of income distribution and fee structures can also optimize operations and ensure fair benefits for all stakeholders involved in the post-harvest process. Similarly, PSPs about penalties and sanctions must be implemented appropriately to guarantee discipline and accountability in the usage and upkeep of post-harvest facilities. According to Sharma et al. (2021), effective punishment regimes enhance the facility's long-term viability by encouraging personnel and users to behave responsibly while safeguarding the integrity of post-harvest operations.

Therefore, to guarantee equitable access to resources and maximize facility efficiency, PSPs must be appropriately implemented to prioritize members in the usage and upkeep of postharvest facilities. To ensure that members with the most urgent demands are given priority, policies should specify precisely how members will be prioritized depending on variables such as the volume of produce, processing urgency, and membership status. A well-structured priority approach guarantees optimal facility utilization, particularly during peak harvest seasons, and promotes long-term sustainability by efficiently allocating maintenance and operational resources, according to Singh and Patel (2020). Furthermore, the successful deployment of PSPs that provide members with additional advantages in the usage and upkeep of PHFs can increase member satisfaction and the facility's long-term viability. To encourage responsible use and investment in the maintenance of the facility, policies should be set up to offer incentives like lowered service costs, priority access during busy hours, or training opportunities. According to Chandra and Singh (2019), these extra advantages improve facility use and foster a sense of accountability and ownership among participants, resulting in improved equipment maintenance and more effective operations.

Lastly, to guarantee these facilities' long-term effectiveness and usefulness, PSPs for budget allocation for PHF repairs and maintenance must be implemented appropriately. Policies should establish a methodical and transparent procedure for allocating money, especially for preventive care, equipment maintenance, and routine repairs. According to Patel and Kumar (2020), a properly run budget allocation system ensures that the post-harvest facility remains in good shape and can satisfy user requests by balancing financial resources with actual repair and maintenance needs.

**Regular Monitoring Activities.** Maintaining constant quality and operating efficiency requires routine postharvest facility use and monitoring of upkeep. As part of the monitoring process, routine inspections assist in identifying wear and tear or malfunctions before they cause costly breakdowns or delays. According to Kumar and Reddy (2021), proactive monitoring enables minor concerns to be addressed early on, lowering the likelihood of more prominent, expensive difficulties and guaranteeing that the facility remains in optimal condition for processing and storing agricultural products. The effective use and upkeep of postharvest facilities depend heavily on routine monitoring operations conducted by organizations such as the Department of Agriculture (DA), the Philippine Center for Postharvest Development and Mechanization (PhilMech), and local agriculture offices. According to the DA (2020), these efforts are crucial for boosting the productivity and sustainability of postharvest operations, ensuring that agricultural products are processed and stored effectively, thereby contributing to the country's food security and agricultural development objectives.

The Philippine Center for Postharvest Development and Mechanization (PhilMech), the Department of Agriculture (DA), and local agriculture offices conduct routine monitoring activities about the Rice Competitiveness Enhancement Fund (RCEF) to ensure that postharvest facilities are used and maintained correctly. According to the DA (2021), this monitoring is essential for tracking the progress of RCEF projects, ensuring that the fund is used effectively to enhance the competitiveness of the rice industry while fostering sustainable agricultural practices. According to the DA (2021), this monitoring is essential for tracking the progress of RCEF projects, ensuring that the fund is used effectively to enhance the competitiveness of the rice industry while fostering sustainable agricultural practices. PhilMech and the DA also collaborate closely with local agriculture offices to offer continuous community-level supervision of postharvest facilities funded by RCEF.

Farmer groups are crucial to continuously monitoring the use and upkeep of postharvest infrastructure financed by the Rice Competitiveness Enhancement Fund (RCEF). These organizations actively oversee the postharvest infrastructure's day-to-day operations, ensuring that the facilities are kept up correctly and that the machinery is used effectively. As part of their routine monitoring, they check for equipment failures, provide optimal storage conditions, and plan repairs to prevent downtime. According to the DA (2021), farmer groups play a crucial role in advancing sustainability because of their active participation, which keeps post-harvest facilities in good shape and benefits the larger agricultural community by reducing post-harvest losses and raising the competitiveness of regional rice production.

## 6.2. Challenges in the Utilization and Maintenance of Postharvest Facilities

**Organization & Membership Related Challenges.** In the Philippines, the best use and maintenance of postharvest facilities are significantly hampered by the lack of defined policies at the farmers' association level. According to Bacud et al. (2022), the underutilization and inefficiency of these facilities are caused by the fact that many farmer groups do not have defined management rules for them. Some farmers are ignorant of the facilities' existence or are confused about how to use them efficiently due to unclear operational rules, which make it difficult to access and operate them correctly.

Moreover, the long-term maintenance of these facilities is also impacted by the lack of coherent policy. Essential infrastructure has declined due to unclear criteria for routine maintenance and monitoring, according to the Philippine Institute for Development Studies (PIDS, 2020). Farmers' groups frequently face challenges in maintaining postharvest facilities due to lacking funding and technical expertise. These facilities are vulnerable to deterioration without a well-established maintenance strategy (PIDS, 2020).

The low degree of engagement and involvement among farmers' association members is one of the main barriers to the efficient use and maintenance of postharvest infrastructure in the Philippines. Many farmers cannot take full advantage of the available infrastructure because they do not actively participate in decision-making processes pertaining to the management and usage of these facilities. According to Garcia et al. (2021), many rural farmers are disengaged from association operations, frequently due to their ignorance of the long-term advantages of using postharvest facilities. Farmers are ill-prepared to fully utilize the facilities due to limited access to training and educational programs, further exacerbating this disengagement (Garcia et al., 2021).

Aside from low involvement, farmers' attitudes within organizations may also make it difficult to maintain and utilize postharvest infrastructure efficiently. Many farmers place more importance on short-term, immediate gains than long-term infrastructure expenditures, frequently making them reluctant to participate in cooperative decision-making and maintenance tasks. The Philippine Agricultural Development and Commercial Corporation (PADCC) reports that many farmers view postharvest facilities as an outside resource rather than a communal one requiring financial investment and teamwork. Farmers may disregard maintenance tasks due to this mindset, thinking that the government or other parties should handle it (PADCC, 2022).

The Philippines' poor information flow within farmers' associations is a significant barrier to the efficient use and maintenance of postharvest infrastructure. The postharvest infrastructure that is accessible to them, how to use it, and the advantages it offers are all poorly understood by many farmers. According to Alvior et al. (2021), there are a lot of knowledge gaps in rural areas, and farmers there frequently don't know how postharvest facilities may increase their output and profitability. Poor communication channels are also to blame for this problem; many farmers' associations have not implemented mechanisms that efficiently provide all members with important information.

Also contributing to the poor upkeep of postharvest facilities is the inadequate distribution of information. According to the Philippine Institute for Development Studies (PIDS, 2020), farmers are frequently left to handle these facilities alone without the right direction if there is no continuous and

dependable communication regarding maintenance schedules, best practices, and available assistance. Farmers may find it challenging to maintain facilities without timely upgrades or the requisite technological know-how, which reduces their ability to enhance post-harvest operations. This issue is further compounded by the absence of organized training programs or regular workshops, which could help farmers grasp the importance of maintaining infrastructure and its role in ensuring long-term agricultural productivity (PIDS, 2020).

Another difficulty is the lack of funding for postharvest facility maintenance at the farmer association level. Financial constraints frequently prevent farmer groups, especially those in underserved or rural areas, from setting aside adequate money for regular upkeep, repairs, and improvements of postharvest infrastructure. According to a study by Chua et al. (2020), many farmer cooperatives have trouble managing their finances. Their meager funds are frequently used more for short-term requirements like supplies for the upcoming growing season than long-term infrastructure maintenance. Delays in repairs, worsening facility conditions, and a reduction in the postharvest facility's overall efficacy can all be caused by this financial limitation.

The absence of sufficient funding for appropriate maintenance and repairs is a significant obstacle to the use and upkeep of post-harvest infrastructure. It might be challenging for many farmer cooperatives and local government units (LGUs) to set aside enough money for routine maintenance and equipment repairs. The tight funding for agricultural programs, which frequently prioritizes new investments above the upkeep of current infrastructure, exacerbates this problem even further. The Department of Agriculture (DA, 2021) states that regular oversight and funding for repairs are necessary for facilities supported by initiatives like the Rice Competitiveness Enhancement Fund (RCEF) to continue operating.

**PHF's Related Predicaments.** The effectiveness and sustainability of postharvest facilities in the Philippines are significantly impacted by several issues related to their use and upkeep. A major problem is these facilities' limited ability to handle the growing demands of agricultural productivity, which is made worse by a shortage of equipment. Crop volumes frequently surpass the capacity of current infrastructure during the busiest harvest seasons, leading to delays in storage, drying, and processing. Many facilities are old or poorly constructed, and there aren't many resources available for expansion or improvement, especially in remote areas. Farmers suffer significant economic losses due to this inefficiency, especially in rural areas where post-harvest facilities are essential to their livelihoods. As noted by the FAO (2019), these capacity issues worsen during excess production, further increasing postharvest losses and reducing farmers' profitability.

Another challenge is the insufficient availability or limited operational capacity of post-harvest facilities, particularly during peak harvest seasons. The large influx of crops during harvest often overwhelms these facilities, causing delays in processing and storage. This issue is especially pronounced in rural areas, where postharvest facilities are scarce and usually incapable of handling high production volumes. As noted by the Philippine Center for Postharvest Development and Mechanization (PhilMech, 2020), facilities designed for smaller capacities frequently become congested during peak periods, leading to inefficiencies and an increased risk of crop spoilage. These bottlenecks contribute to higher postharvest losses, undermining the benefits of infrastructure investments and resulting in financial setbacks for farmers.

Another major challenge in maintaining postharvest facilities in the Philippines is the lack of spare parts and the high costs of repairs. Facilities that depend on advanced machinery often struggle to find quality replacement parts or skilled repair technicians. This issue is particularly pronounced in remote areas, where access to parts and services is limited. According to the DA (2021), the absence of a reliable supply chain for post-harvest equipment leads to long downtimes during repair periods, forcing farmers to delay the processing or storage of their crops. The high spare parts costs and hiring skilled technicians can be a heavy burden for small-scale farmers and cooperatives, worsening maintenance challenges. Facilities may sometimes remain out of service for extended periods, leading to product spoilage and financial losses.



Furthermore, farmer associations frequently have restricted access to high-quality spare parts and repair services, especially in isolated rural areas. Postharvest facilities like dryers and milling equipment need routine maintenance and sporadic repairs to function well. However, getting technical assistance and replacement parts can be tricky for farmer groups, particularly those far from cities. Villanueva et al. (2019) claim that the absence of easily accessible supply chains for replacement parts frequently leads to prolonged downtime for equipment that requires maintenance, affecting crops' processing and storage.

One of the Philippines' ongoing problems is the scarcity of post-harvest equipment repair services and spare parts. Long equipment downtimes are frequently caused by the reliance on specialist parts and the challenge of obtaining them, especially in remote locations. The high expense of importing replacement components exacerbates this issue by preventing many farmer groups and cooperatives from accessing them. According to the Department of Agriculture, rural areas frequently lack established supply chains for spare parts, which delays equipment repairs and maintenance (DA, 2021). During times of high harvest, this problem becomes especially urgent because any repair delays could result in significant crop losses. Extended periods of equipment failure increase crop spoiling risks and deterioration, which lower postharvest activities' overall efficiency.

**PHF Actual Operations.** Challenges, difficulties, and predicaments were observed and experienced during the actual operations of these PHFs. Constraints related to the area or site of operations also impede the efficient utilization and maintenance of these PHFs. For example, in the Philippines, many postharvest facilities are in isolated rural locations, making transferring supplies, equipment, and spare parts difficult and expensive. During busy harvest seasons, when a lot of produce needs to be processed quickly to avoid spoiling, this problem becomes very troublesome. According to a study by Villanueva et al. (2019), supplying essential supplies to these distant facilities on time is more challenging when there is insufficient infrastructure, such as bad roads and transportation networks.

Another concern, exacerbated by climate change, is when harvest seasons fall around periods of heavy rain downpours. Typhoons, floods, and droughts are among the extreme weather events that the nation is experiencing more frequently. These occurrences have the potential to harm post-harvest infrastructure or disrupt facility operations. According to a report from the Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA, 2020), the agricultural sector, particularly postharvest activities, is experiencing increased strain due to the increasing frequency and intensity of such weather events. Food security and farmers' lives are at risk due to these disturbances, which can result in significant crop losses, especially for rice and other essential crops. Bautista et al. (2017) concluded that promoting farm mechanization in the Philippines has also been constrained by small, inaccessible rice fields and wildly irregular and nongeometric-shaped farm areas during the rainy season. Mechanizing these lands can be inefficient due to too much maneuvering in operations like land preparation and harvesting.

There are also concerns and challenges related to the operators during the operation of postharvest facilities (PHFs). For example, if operators are not adequately trained, PHFs may not function effectively. The technical know-how required to operate contemporary postharvest equipment is often lacking among farmers and facility managers. The danger of equipment failure increases, and the overall effectiveness of the facilities declines when personnel are not adequately trained to operate and maintain equipment such as rice mills, dryers, and storage systems. According to a study by Villanueva et al. (2019), the improper usage of postharvest facilities is hampered by a lack of training and familiarity with technical improvements. This leads to reduced processing efficiency, higher energy consumption, and increased wear and tear on equipment. This inefficiency is further exacerbated by a lack of knowledge about best practices for crop handling and preservation, which contributes to postharvest losses and diminished facility performance.

Moreover, inadequate training for farmers and facility operators has restricted these postharvest facilities' (PHFs') ability to improve agricultural value chains fully. Despite the availability of numerous postharvest technologies, many users lack the technical know-how necessary for their correct operation and upkeep. According to the Philippine Center for Postharvest Development and Mechanization, a significant



barrier to optimizing the effectiveness of these facilities and subsequently increasing postharvest losses is the lack of a skilled workforce (PhilMech, 2020).

Maintaining the equipment properly is a significant difficulty in running postharvest facilities. Due to a lack of regular maintenance, which results in equipment failures, many facilities in the Philippines have frequent operating disruptions. Regular maintenance is necessary for machinery like grain dryers, milling machines, and sorting equipment to continue operating. However, agricultural cooperatives and local government entities frequently struggle to follow regular maintenance schedules due to insufficient funding and qualified specialists. Villanueva et al. (2019) claim that inadequate maintenance procedures lead to equipment malfunctions that interfere with agricultural processing and storage, increasing losses and decreasing efficiency.

### *6.3. Coping Mechanisms and Strategies for the Challenges in the Utilization and Maintenance of Postharvest Facilities*

**Organizational Coping Strategies.** To cope with these challenges, farmers' associations have adopted various strategies to improve the management and sustainability of post-harvest facilities. One is the constant and effective monitoring activities that have emerged as crucial coping mechanisms for farmers' associations dealing with the challenges of utilizing and maintaining postharvest facilities. Frequent monitoring allows farmers to detect and promptly address problems that could jeopardize the quality of stored goods, such as pest infestations, temperature fluctuations, or equipment failures. Bello and Adeyemo (2022) state that "effective monitoring allows farmers to prevent losses by detecting and correcting issues before they escalate into larger problems." The Food and Agriculture Organization (2022) emphasizes that "ongoing monitoring, especially when supported by agricultural extension services, is essential for enhancing postharvest handling and minimizing spoilage."

The presence of updated and strong organizational policies is another key coping mechanism for farmers' associations facing challenges in the utilization and maintenance of postharvest facilities. These policies establish clear guidelines for the proper operation, maintenance, and troubleshooting of facilities, promoting consistency and minimizing operational risks. Juma and Nzuma (2021) argue that "well-defined policies help to streamline postharvest processes and ensure that members follow standardized procedures for facility maintenance and produce storage." Strong internal policies also encourage accountability, making members more likely to stick to maintenance schedules and promptly report any problems. The Food and Agriculture Organization (2022) notes that "organizations with robust policies are better positioned to secure external funding and technical support," which simplifies access to resources for upgrading facilities and providing training. By keeping policies current, farmers' associations can more effectively manage challenges and ensure the long-term sustainability of their postharvest infrastructure.

The role of both leaders and members of farmers' associations is critical in addressing the challenges encountered in utilizing and maintaining postharvest facilities. Effective leadership is essential for keeping the group focused on regular maintenance, optimal resource utilization, and adherence to best practices. As Khan et al. (2020) note, "Leaders who are proactive in organizing training sessions and facilitating resource allocation significantly enhance the effectiveness of postharvest management within the association." In addition to leadership, the active involvement of members is crucial, as they contribute to facility upkeep, report issues, and follow established protocols. Shittu and Musa (2023) emphasize that "members' active involvement in decision-making and facility maintenance strengthens the association's ability to overcome operational challenges and improve postharvest outcomes." The collaborative efforts of strong leaders and dedicated members create a robust support system that ensures the association's long-term sustainability and the efficiency of post-harvest facilities.

The procurement and outsourcing of additional equipment have proven to be effective coping mechanisms for farmers' associations facing challenges in utilizing and maintaining postharvest facilities. By

acquiring advanced tools or renting specialized equipment, farmers can overcome the limitations posed by outdated or inadequate facility resources. Iwuji et al. (2022) note that outsourcing equipment, such as dryers and cold storage units, allows farmers' associations to meet the increasing demand for efficient postharvest processing without incurring the full cost of permanent infrastructure. Juma and Nzuma (2021) highlight that "procuring additional equipment through partnerships or leasing arrangements enables associations to access state-of-the-art technologies, improving storage conditions and overall productivity.

**Operators and PHF's Operation Coping Mechanisms.** The availability of funds for repair and maintenance is a crucial coping mechanism for farmers' associations in addressing challenges related to the utilization and upkeep of post-harvest facilities. Without adequate financial resources, maintaining and repairing essential equipment becomes difficult, leading to operational disruptions and increased post-harvest losses. As Shittu and Musa (2023) note, the ability to access funds for repairs and maintenance ensures that post-harvest facilities remain in good working condition, preventing costly downtimes and preserving the quality of stored produce. According to Khan et al. (2020), having access to dedicated maintenance funds allows farmers' associations to address repair needs promptly, reducing the risk of equipment failure and ensuring the smooth functioning of postharvest activities.

Proper maintenance-related activities are essential coping mechanisms for farmers' associations to address the challenges they face in the utilization and upkeep of post-harvest facilities. These activities include regular inspection, cleaning, and servicing equipment and infrastructure to prevent breakdowns and ensure facilities remain functional. According to Bello and Adeyemo (2022), routine maintenance practices, such as cleaning, lubricating, and checking equipment functionality, help extend the lifespan of post-harvest facilities and reduce costly repairs. Without consistent maintenance, postharvest equipment can deteriorate rapidly, leading to disruptions in the storage and processing of produce.

In addition to regular maintenance, establishing precise maintenance schedules is another effective coping mechanism. Maintenance schedules ensure that all equipment and facilities are inspected and serviced regularly, which helps identify potential issues before they lead to operational failures. As Juma and Nzuma (2021) explain, well-structured maintenance schedules help ensure that every aspect of the post-harvest facility is checked and maintained, reducing the likelihood of unexpected breakdowns.

Preventive maintenance is another crucial aspect of ensuring the long-term functionality of post-harvest facilities. Rather than waiting for problems to occur, preventive maintenance focuses on addressing potential issues before they arise, such as replacing worn-out parts or upgrading outdated equipment. According to the Food and Agriculture Organization (2022), preventive maintenance helps avoid costly repairs and ensures the continued efficiency of post-harvest facilities. For example, farmers' associations may choose to replace aging cooling systems or install new drying equipment to improve efficiency and avoid costly breakdowns during critical periods.

Moreover, training members of the farmers' association in proper maintenance techniques is vital in enhancing the effectiveness of maintenance activities. Farmers' associations that provide training ensure their members are well-equipped with the knowledge and skills to maintain postharvest facilities properly. Iwuji et al. (2022) highlight that "training in basic maintenance practices, such as proper cleaning techniques, troubleshooting, and minor repairs, helps reduce the reliance on external service providers and keeps post-harvest facilities in optimal condition. Training empowers members to take a hands-on approach in maintaining the facilities, reducing maintenance costs, and fostering a culture of care and responsibility.

## 7. Recommendations

Based on the study's findings, several recommendations can be proposed to enhance the utilization and maintenance of postharvest facilities (PHFs) in Davao del Norte. First, the knowledge and expertise of PHF operators and staff should be improved. This can be accomplished through regular training programs, workshops, and hands-on practice sessions that provide comprehensive instruction on equipment operation,

maintenance procedures, and troubleshooting techniques. The second is establishing and enforcing clear and well-structured policies, systems, and procedures (PSPs) for PHF operations. Farmer groups and associations should prioritize developing formal frameworks that provide detailed equipment usage, maintenance, and safety guidelines. Third, managers and supervisors should actively emphasize the importance of adhering to established PSPs while providing continuous support to operators. A practical approach is implementing a performance monitoring system that tracks compliance with prescribed protocols. This could include regular audits and evaluations of PHF operations to identify areas for improvement and maintain consistent policy enforcement. Fourth, organizations are encouraged to develop contingency plans to manage common issues such as equipment failures, resource shortages, and operational inefficiencies.

## 8. Interventions

Based on the results and findings of this study, innovative and new interventions were outlined to improve the utilization and maintenance of postharvest facilities in the Province of Davao del Norte, which eventually led to a more sustainable, creative, and practical approach. These were grouped into policy making, people's participation, networks and linkage building, capacity building and development, and sustainability schemes.

**Policy Making.** This includes the Creation of the Provincial Agricultural Engineering Office. Institutionalizing Clear Organizational Policies and Systems (PSPs),

**People's Participation.** Community-Based Training Programs and Formation of Local PHF Management Committees

**Networks and Linkage Building.** Collaboration with Government Agencies, Engagement with Agricultural Extension Services, Establishment of Public-Private Partnerships (PPP), Formation of Regional, Provincial, or Local Networks of PHF Operators, Building Connections with Research and Educational Institutions, Linking with Agricultural Cooperatives and Farmer Associations

**Capacity Building and Development.** Technical Training for PHF Operators, Capacity Building in Postharvest Management Practices, Leadership and Management Development, Training on Equipment Calibration and Maintenance, Development of Organizational Systems and Procedures, Establishment of a Maintenance and Repair Support Network, and Community-Based Capacity Building Initiatives.

**Sustainability Schemes.** Establishing a Sustainable Funding Mechanism, Implementing Energy-Efficient Technologies, Incorporating Waste Minimization and Recycling Programs, Developing Local Capacity for Long-Term PHF Management, Building a Resilient Membership and Organizational Structure, and Monitoring and Evaluation for Continuous Improvement.

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