**DOST TNA Form 01**

APPLICATION FOR TECHNOLOGY NEEDS ASSESSMENT

| | | |
|---|---|---|
| Name of Enterprise: OCCIDENTAL MINDORO STATE COLLEGE – Murtha Campus | | |
| Contact Person:<br>**Dr. GARRY L. CALITANG or**<br>**Mr. Benedicto R. Batiles, Jr.** | Position in the Enterprise:<br>Faculty/Researchers | |
| Office Address:<br>Barangay Murtha, San Jose, Occidental Mindoro | Tel. No.:<br>09772175930 | Fax No.: |
| | E-mail Address: | |
| Factory Address:<br>Barangay Murtha, San Jose, Occidental Mindoro | Tel. No. | Fax No. |
| | E-mail Address: | |
| Website: None | | |

**GENERAL AGREEMENTS**:

1. The applicant shall, at the earliest opportunity, make available to the DOST Regional Office No. IVB-MIMAROPA all information (manuals, procedures, etc.) required to establish the technology status of the selected core business functions and management systems;

2. If DOST IVB-MIMAROPA is not satisfied that all the requirements for business registration are complied with, it shall inform the applicant of the observed deficiencies before starting the assessment;

3. When the required inputs to the assessment are already supplied by the applicant, including Attachment A, the DOST IVB-MIMAROPA will assess the firm through the core business functions and management systems, whichever is applicable to identify technology needs and verify compliance to standards vis-à-vis existing practices;

4. When the DOST IVB-MIMAROPA has completed the technology assessment, a report will be prepared on the results of the assessment with accompanying recommendations and opportunities for improvement. The report prepared will define the scope of activities, functions, management practices and locations assessed. The applicant shall not claim or otherwise imply that the report applies to other locations, product or activities not covered by the report;

5. The applicant agrees that the report will not be used until permission has been granted by the DOST IVB-MIMAROPA;

6. The applicant agrees that the receipt and acceptance or acknowledgment of the report ends the assessment stage; any technical assistance ensuing from the recommendations of the report will be viewed as a separate project.

**UNDERTAKING**

**I agree to undertake and observe the above General Agreements as stipulated by the Department of Science and Technology Regional Office No. IV-B-MIMAROPA.**

**BENEDICTO R. BATILES, Jr**
**Proponent**
**18 October 2021**
Date

Attachment A.

**Enterprise Profile**

Name of Enterprise: Occidental Mindoro State College – Murtha Campus

Production Site/Location: Barangay Murtha, San Jose, Occidental Mindoro

Business Permit No.: Not applicable Year Registered: Not Applicable

Brief Background:

Year enterprise was established: Not applicable

Initial capitalization: Not applicable

Type of Organization:

- ☐ Single Proprietorship
- ☐ Cooperative
- ☐ Partnership
- ☐ Corporation
  - ☐ Profit
  - ☐ Non-Profit
- ☐ LGU - Barangay
- ■ Others (please specify): Academe

Enterprise Registration No.: Not applicable Year Registered: Not applicable

Classification according to capital: Not applicable Present Capitalization: PhP.

- ☐ Micro (less than 1.5 M)
- ☐ Small (1.5 – 15 M)
- ☐ Medium (15- 100 M)

Classification according to employment (number of employees)

Not applicable

- ☐ Micro (1-9)
- ☐ Small (10-99)
- ☐ Medium (100-199)

| Number of Employees: None | **M** | **F** |
|---|---|---|
| Direct Workers | | |
| Production | | |
| Non-production | | |
| Indirect/Contract Workers | | |
| **TOTAL** | | |

Business Activity:

- ☐ Food processing (please specify specific commodity) _____
- ☐ Furniture (please specify specific commodity) _____
- ☐ Gifts, decors, handicrafts (please specify specific commodity) _____
- ☐ Metal and engineering (please specify specific commodity) _____
- ☐ Agriculture/ Marine/ Aquaculture (please specify specific commodity) _____
- ☐ Health products & pharmaceuticals (please specify specific commodity) _____
- ☐ ICT products (please specify specific commodity) _____
- √ Others, please specify **for RESEARCH and DEVELOPMENT**

1. Specific product or service the enterprise offers its customers: NA
   OMSC will offer Liquid Organic Pesticide
2. Reason why assistance is being sought:
   a. For purposes of addressing of Army Worm in Onion infestations
3. Have you consulted any other individual/organization on any assistance?

☐ Yes, from what company/agency? _____

_____

_____

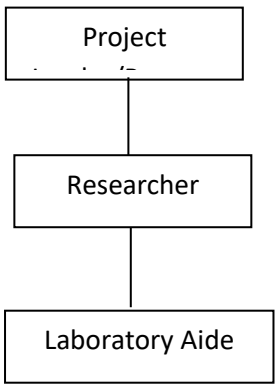
_____

(Please specify the type of assistance sought)

√☐ No, why not?

a. The project proposal is a Research and Development for the production of alternative organic pesticide; DOST-MIMAROPA provides technology assistance

Organizational Structure



Enterprise's plan for the next 5 years

Continuously conduct trials with other crops to improve the product

Next 10 years?

Liquid organic pesticides continuously adopted by farmers to address infestations of Army Worm of Onions

5. Current agreements and alliances undertaken

None

**BENCHMARK INFORMATION**

- **Production and Supply Chain**

  - Raw Materials

| Primary Raw Materials | Volume of Primary Raw Materials Used per Month | | Unit Cost (PhP.) | Value of Primary Raw Materials Used per Month (PhP.) | Annual Cost of Raw Materials (PhP) |
|---|---|---|---|---|---|
| | Quantity | Unit | | | |
| rice | 100 | kg | 50 | 5,000.00 | 60,000.00 |
| molasses | 50 | kg | 25 | 1,250.00 | 15,000.00 |
| **TOTAL** | | | | | **75,000.00** |

  - Production

| Product | Annual Volume of Production | Unit Cost of Production (P) | Annual Cost of Production (P) | Production Capacity | Product Selling Price |
|---|---|---|---|---|---|
| Fermented Metarhizium | 3000 L | 20 | 60,000 | 10,000 L | 100.00 |
| | | | | | |

  - Existing Functional Production Equipment

| Type of Equipment | Specifications | Capacity | No. Of Units | Year Acquired |
|---|---|---|---|---|
| Mechanical Blender | 250 rpm | 1 L/10 s | 2 | 2020 |
| Pressure cooker | | 50L | 1 | 2019 |
| | | | | |

  - Production Problems and Concerns

    Contamination of culture

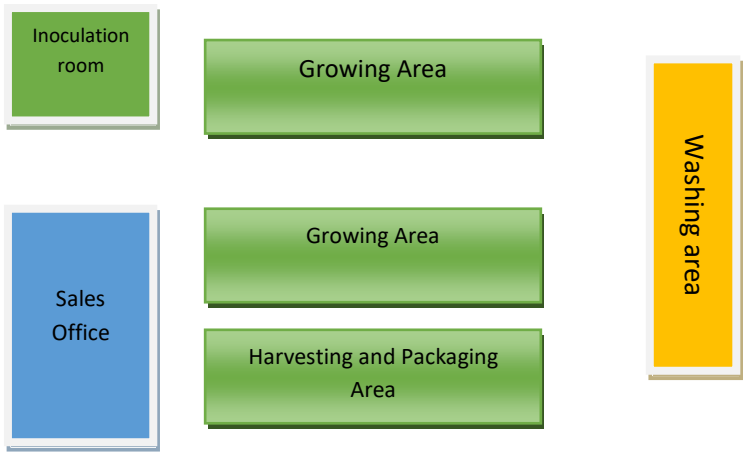
- Production Waste Management System

  The washings from culture containers are drench directly to the plants in the surrounding area of the production site. This served as bio fertilizer that conditions the soil thus benefiting the existing plants in the area.

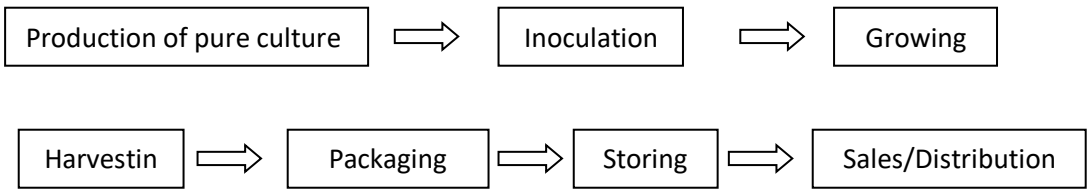
- Production Plan

  Liquid metarhizium will be produced throughout the year.

- Plant Lay-Out




- Process Flow




- Inventory System

  Not applicable

- Maintenance Program

  Staff for the R&D for the liquid pesticide will observe proper maintenance of the equipment to sustain its use.

- cGMP/HACCP Activities

  Not applicable

- Supplies/Purchasing System

  Schedule will be established for the purchase of the supplies and materials for the R&D project. Purchasing shall follow government procedures and process.

- **Marketing**

  - Marketing Plan

    Liquid Metarhizium will be sold to onion producers and can be purchased directly from the chosen Cooperative. Farmer cooperatives are welcome to apply as distributor in order to make the product accessible to most number of farmers in the province.

  - Market Outlets and Number

    Onion is produced in the municipality of Magsaysay and San Jose. One cooperative per municipality will serve as sales outlet of the product.

  - Promotional Strategies

    Advocacy on Organic Farming will be undertaken by the Extension Unit of the College. Through these seminars, the use of Liquid Metarhizium will be introduced to the farmers. The farmers will be informed of the benefits of this product. Advocacy will be done through cooperatives in the province.

  - Market Competitor

    Expensive chemical fungicides are the existing players in the market. These are not only hazardous to the environment but to human as well. Besides the cost is higher by 50 to 100 % than liquid metarhizium.

  - Packaging **Not applicable**
    - Nutrition Evaluation _____
    - Bar Code _____
    - Product Label _____
    - Expiry Date _____

- Finance

  - Cash Flow or other related documents

    Not applicable until the product is ready for commercialization

  - Source(s) of capital/credit

    This proposed R&D project shall be primarily funded by DOST- MIMAROPA with commitment from the Local Government Unit.

  - Accounting System

    Not applicable since this is a Research and Development proposal. Accounting system will be established as soon as the product is ready adoption and for commercialization.

- Human Resources

  In order to effectively implement the project, the OMSC will designate a staff to help supervise and manage the conduct and monitoring of the efficacy trial. All activities shall be properly coordinated with the onion producer - cooperator recommended by LGU San Jose through its Municipal Agricultural Officer. Production of liquid Metarhizium will also be done by OMSC at least eight months (8) months before each cropping season. Project staff from PTSC-Occidental Mindoro will oversee and ensure the successful implementation of the project.

- Hiring and Criteria

  Not applicable

- Incentives to Employees

  Not applicable

- Training and Development

  Not applicable

- Safety Measures Practiced

  Proper orientation on the use of the machines/equipment shall be conducted

- Other Employee Welfare

  Not applicable

- Other Concerns

  None

Prepared by:

**BENEDICTO R. BATILES, Jr.**
**Proponent**

Validated by:

**MARIA ETHELWILDA G. CORONACION**
**Provincial S&T Director**

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## TECHNOLOGY NEEDS ASSESSMENT (TNA) REPORT

| | |
|---|---|
| **COMPANY:** | **Occidental Mindoro State College – Murtha Campus** |
| **ADDRESS:** | **Barangay Murtha, San Jose, Occidental Mindoro** |

### SCOPE OF ASSESSMENT*

The TNA covered the following areas:

1. Strategic Direction
   a. Vision and mission
   b. Plans and Objectives
   c. Strategic alliances and current agreement

2. Management Aspect
   a. Human resource management
   b. Purchasing
   c. Work environment
   d. Corporate social responsibility
   e. Occupational health and safety management

3. Technical Aspect
   a. Operational and outsourcing practices
      -production system
      -production planning and control
      -production lay-out
      -work improvement
      -equipment management and maintenance
      -quality assurance system
      -outsourcing practices
   b. Product and Process Performance and Improvement
      -reengineering and Research and Development
      -Procedures for continuous improvement
      -Product Quality standards
   c. Environmental Management System
      -Waste management

4. Marketing Aspect
   a. Marketing plan
   b. Market outlets and number
   c. Promotional strategies
   d. Market competitors
   e. Packaging

Reported by ANTONIO T. DELOS SANTOS JR. Signature Date 27October 2021
Name of TNA Team Leader

Attested by JERRY B. MERCADO Signature Date 3/NOV/21
Name of ARD

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5. Finance
   a. Cash flow and other related documents
   b. Sources of capital
   c. Accounting system

*** Scope of TNA is based on Technology Assessment Plan (TAP)**

Reported by ANTONIO T. DELOS SANTOS JR. Signature Date 27October 2021
Name of TNA Team Leader

Attested by JERRY B. MERCADO Signature Date 3NOV 21
Name of ARD

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## SUMMARY OF ASSESSMENT

## BACKGROUND

Onion (bulb) is a priority commercial crop that can generate progressive and viable markets not only in Nueva Ecija, Pangasinan and Tarlac but also in the province of Occidental Mindoro. It is commonly planted in the municipalities of Magsaysay, Paluan and San Jose during the second cropping season after rice. Although Occidental Mindoro has the smallest share of production it brought income among onion farmers of the province.

However, maintaining a stable production trend of onion in the country had been a struggle for the past few years. Fluctuations in the supply may be attributed to a number of factors such as occurrence of natural calamities, lack of farming motivation, less systematic commodity flow and production to post-production lapses and incidence of pest and diseases like army worm *(Spodoptera exigua*) locally known as 'Harabas'.

Attempts to control onion pests like army worm currently entail excessive use of pesticides. Intensive pesticides use in onion increases the cost production, making this vegetable expensive for poor consumers. Pesticide misuse and residues post serious risk to the health of growers, consumers, and the environment (Srinivansan, 2009). Since it was proven that chemical pesticide residues are harmful to human health, these practices can be avoided by using biological pesticides which cannot harm human health.

Thus, this study conceptualized that the M*etarhizium anisopliae* could be the source of biological pesticides for controlling army worm infestation in onion. Various amounts and duration of fermentation of liquid *Metarhizium anisopliae* is assumed to have an effect on the mortality of army worm.

This project involves the conduct of efficacy trial of fermented Metarhizium against army worm 'Harabas' infestation in onion, in selected barangays of San Jose, Occidental Mindoro. Onion producers - cooperators will be selected to implement the efficacy trial. This will be done by OMSC Research and Extension Unit in coordination with DOST PSTC Occidental Mindoro and LGU MAO San Jose.

*Metarhizium* will be produced by Occidental Mindoro State College and be used in the efficacy trial. On the other hand, DOST will provide financial assistance for the procurement of equipment that will be used in the production of liquid *Metarhizium,* while LGU San Jose will answer the supplies and materials as well as the labor and honorarium for the researchers and staff. On the other hand, OMSC will do the conduct of the field trial and the technology patent application with IPOPhil.

Reported by **ANTONIO T. DELOS SANTOS JR.** Signature Date 27October 2021
Name of TNA Team Leader

Attested by **JERRY B. MERCADO** Signature Date 3NOV21
Name of ARD

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## METHODOLOGY

This proposal was prepared through the assistance of the project proponent.

## Summary of Findings

### 1. Strategic Direction

#### a. Vision and Mission

Occidental Mindoro State College aims to generate and transfer new knowledge and appropriate technologies through research and extension endeavors to improve the quality of lives of the community;

#### b. Plans and Objectives

Generally, as a Research and Development project is expected to evaluate and determine the efficacy of liquid *Metarhizium anisopliae* as a biological pesticide against army worm in terms of mortality rate.

#### c. Strategic alliances and current agreements

None

### 2. Management Aspect

#### a. Human Resources

In order to effectively implement the project, the OMSC will designate a staff to help supervise and manage the conduct and monitoring of the efficacy trial. All activities shall be properly coordinated with the onion producer - cooperator recommended by LGU San Jose through its Municipal Agricultural Officer. Production of liquid Metarhizium will also be done by OMSC at least eight months (8) months before each cropping season. Project staff from PTSC-Occidental Mindoro will oversee and ensure the successful implementation of the project

#### b. Purchasing

Schedule will be established for the purchase of the supplies and materials for the R&D project.

#### c. Work Environment

For the project, a separate space will be designated as laboratory for the research. Flow of work is illustrated in the production process (see production layout). Work schedule will be complied according to the OMSC's

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regulations. Orderliness of the work environment will be observed. Supplies and materials will be stored properly on shelves.

### d. Business Ethics and Social Responsibility

No harm is expected to humans or the environment when pesticide products containing *Metarhizium anisopliae* are used according to label instructions. No harm is expected to humans from exposure to *Metarhizium anisopliae* by ingesting, inhaling, or touching products containing this active ingredient. No toxicity or adverse effects were seen when the active ingredient was tested in laboratory animals.

### e. Occupational Health and Safety Management

Health and Safety measures will be observed during the production of the liquid organic pesticides. No toxic materials or ingredients are to be used.

## 3. Technical Aspect

### a. Operational and Outsourcing Practices

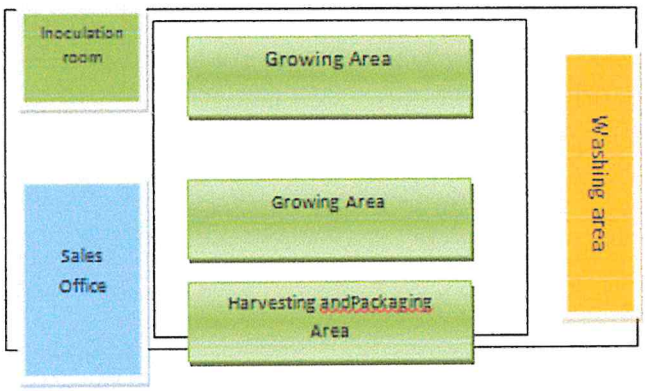
#### Production system

Pure culture of *Metarhizium* will be obtained from BPI Murtha Seed Farm Production Laboratory. It will be mass produced at OMSC Production Laboratory using aseptic procedure. The harvested *Metarhizium* will be processed into liquid form as biological pesticide using OMSC Murtha Campus production technology. Metarhizium will be fermented in the fermentation tanks for at least eight (8) months.

#### Production Planning and Control

After eight (8) months of fermentation, this will be dispensed to 1.5 L capacity plastic bottle and be closed tightly. This is now ready for the efficacy trial.

#### Production Layout




Reported by ANTONIO T. DELOS SANTOS JR. Signature Date 27October 2021
Name of TNA Team Leader

Attested by JERRY B. MERCADO Signature Date 3 NOV 21
Name of ARD

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### Work Study/Improvement

Efficacy of the treatments will be determined in terms of data on percentage mortality and killing duration upon application of the experimental pesticide. Descriptive statistics will be used in presenting the data.

### Equipment Management and Maintenance

Staff for the R&D for the liquid pesticide will observe proper maintenance of the equipment to sustain its use.

### Quality Assurance System

The R&D project is expected to produce an insect and disease-free onion, chemical-free pesticide onion and other crops.

### Outsourcing Practices

Outsourcing is done through contact suppliers and follows outsourcing procedures and process prescribed by the College.

## b. Product and Process Performance and Improvement

### Re-engineering and Research and Development

Application of liquid *Metarhizium anisopliae* will be done on plants with pest infestations. Each plant will receive 20 mL of diluted liquid *Metarhizium anisopliae* of various concentrations. Application will be done once, in all treatments. One teaspoon of detergent powder per liter will be added to various concentrations of liquid *Metarhizium anisopliae* to provide stickiness to larvae cuticle. The following treatments will be as follows:

Treatments
$T_0$ – Control (RR of commercial insecticide)
$T_1$ – 100 mL M. *anisopliae* + 1L water + 1 tsp detergent
$T_2$ – 200 mL M. *anisopliae* + 1L water + 1 tsp detergent
$T_3$ – 300 mL *M. anisopliae* + 1L water + 1 tsp detergent
$T_4$ – 400 mL *M. anisopliae* + 1L water + 1 tsp detergent
$T_5$ – Check control (Chemical pesticide)

### Performance Measures and Results – Process

Data gathered in this study will be analyzed using Analysis of Variance in Randomized Complete Block Design. Difference of treatments will be determine using the least significant difference at 5% level.

Reported by **ANTONIO T. DELOS SANTOS JR.** Signature _____ Date 27October 2021
Name of TNA Team Leader

Attested by **JERRY B. MERCADO** Signature _____ Date 3/10/21
Name of ARD

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### Performance Measures and Results – Product

Pure culture of *Metarhizium* will be obtained from BPI Murtha Seed Farm Production Laboratory. It will be mass produced at OMSC Production Laboratory using aseptic procedure. The harvested *Metarhizium* will be processed into liquid form as biological pesticide using OMSC Murtha Campus production technology. Metarhizium will be fermented in the fermentation tanks for at least eight (8) months. After eight (8) months of fermentation, this will be dispensed to 1.5 L capacity plastic bottle and be closed tightly. This is now ready for the efficacy trial.

### Procedures for Continuous Improvement

The effectiveness of fermented *Metarhizium* as a biological control agent should not be limited in the control of black bug and 12 spotted beetles. It should also be tested to other insects like Army Worm that infest onions.

If this is effective, this can be another technology that would help farmers control insects without the use of chemical pesticides. In this premise, the study on the effectiveness of fermented *Metarhizium anisoplae* shall be conducted.

### Product Quality Standards

The Occidental Mindoro State College claims the right in the ownership of the Intellectual Property of liquid *Metharhizium.* This will be filed with IPOPhil to protect the ownership of the technology. Transfer of technology will be initiated by OMSC, LGU San Jose and OMSC to any individual, Cooperative, and business organization who signify its intention in the production and distribution of the product following the protocols stipulated in the Technology Transfer Act under R.A.10055 and IP Code of the Philippines. The product shall also be registered with Bureau of Agriculture and Fishery Standards following as organic pesticide.

## c. Environmental Management System

### Waste Management

The washings from culture containers are drench directly to the plants in the surrounding area of the production site. This served as bio fertilizer that conditions the soil thus benefiting the existing plants in the area.

## 4. Marketing Aspect

## a. Marketing Plan

Liquid Metarhizium will be sold to onion producers and can be purchased directly from the chosen Cooperative. Farmer cooperatives are welcome to apply as distributor in order to make the product accessible to most number of farmers in the province.

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Name of TNA Team Leader

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Name of ARD

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### b. Market Outlets

Onion is produced in the municipality of Magsaysay and San Jose. One cooperative per municipality will serve as sales outlet of the product.

### c. Promotional Activities

Advocacy on Organic Farming will be undertaken by the Extension Unit of the College. Through these seminars, the use of Liquid Metarhizium will be introduced to the farmers. The farmers will be informed of the benefits of this product. Advocacy will be done through cooperatives in the province.

The licensee together with the licensor shall also conduct seminars on the use and benefits of the product. The product shall also be promoted in social media and in local and national trade fairs and exhibits.

### d. Market Competitors

Expensive chemical fungicides are the existing players in the market. These are not only hazardous to the environment but to human as well. Beside the cost is higher by 50 to 100 % than liquid metarhizium.

## 5. Finance

### a. Cash Flow and other related documents

Not applicable until the product is ready for commercialization

### b. Source of capital/credit

This proposed R&D project shall be primarily funded by DOST- MIMAROPA with commitment from the Local Government Unit.

### c. Accounting System

Not applicable since this is a Research and Development proposal. Accounting system will be established as soon as the product is ready adoption and for commercialization.

Reported by ANTONIO T. DELOS SANTOS JR. Signature Date 27October 2021
Name of TNA Team Leader

Attested by JERRY B. MERCADO Signature Date 3NOV21
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## CONCLUSIONS

Based on the technology needs assessment (TNA) conducted through preliminary discussion with OMSC Researchers and coordination with LGU San Jose, the TNA team concludes the following:

1. The proposed R&D project is a viable project and promises a great help to the farmers once the efficacy and effectiveness of the liquid organic pesticide has undergone thorough trials.

## RECOMMENDATIONS

The following are recommended by the TNA team:

1. The DOST MIMAROPA should extend technology assistance to Occidental Mindoro State College researchers to attain its objective on providing environment-friendly and safe for human and animals organic pesticide.

2. Facilitate Memorandum of Agreement with identified stakeholders for the successful implementation of the project.

3. Constantly monitor the implementation of the project in coordination with the stakeholders based on the set parameters and component indicators

Reported by **ANTONIO T. DELOS SANTOS JR.** Signature _____ Date 27October 2021
Name of TNA Team Leader

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