Eco-Friendly and Pollution-Free Farming for Rural Environmental Sustainability

A community service project
Submitted in partial fulfillment of the requirements for
The award of the degree of

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE AND ENGINEERING (Internet of Things)

by

Gandikota Manjusri

(22BQ1A4916)

Under the esteemed guidance of

Dr. S. Krishna Prasad

Professor

[Program: Computer Science and Engineering (Internet of Things) – CSO]

VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY

(Autonomous)

Approved by AICTE, Permanently Affiliated to JNTUK, NAAC Accredited with 'A' Grade, ISO 9001:2015 Certified

Nambur (V), Pedakakani (M), Guntur (Dt.), Andhra Pradesh – 522 508

2025

PROGRAM BOOK FOR COMMUNITY SERVICE PROJECT

Name of the student: Gandikota Manjusri

Name of the college: Vasireddy Venkatadri Institute of Technology

Registration Number: 22BQ1A4916

Period of CSP: 6 weeks From: 05-05-2025 To 17-05-2025 & 02-06-2025 To 28-06-2025

Name and Address of the Community/Habitation:

Kaza and Venkatareddypalem, Guntur, Andhra Pradesh.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

DEPARTMENT OF COMPUTER SCIENCE AND TECHNOLOGY

[Program: Computer Science and Engineering (Internet of Things) – CSO]

VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY

Community Service Project Report

Submitted in accordance with the requirement for the degree of B.Tech.

Name of the College: Vasireddy Venkatadri Institute of Technology

Department: Computer Science and Engineering (Internet of Things)

Name of the Faculty Guide: Dr. S. Krishna Prasad

Duration of the CSP: 6 weeks From 05-05-2025 To 17-05-2025 & 02-06-2025 To 28-06-2025

Name of the Student: Gandikota Manjusri

Programme of study: B.Tech

Year of Study: 2025-2026

Register Number: 22BQ1A4916

Date of Submission:

Student's Declaration

I, **Gandikota Manjusri**, a student of the **B.Tech** Program,Reg.No**. 22BQ1A4916** in the Department of **Computer Science and Engineering (Internet of Things)**, **Vasireddy Venkatadri Institute of Technology** College do hereby declare that I have completed the mandatory community service from 05-05-2025 To 17-05-2025 & 02-06-2025 To 28-06-2025 in **Kaza,Venkatareddypalem** under the Faculty Guideship of **Dr. S. Krishna Prasad, Professor of Computer Science and Engineering (Internet of Things)** in Vasireddy Venkatadri Institute of Technology.

(Signature and Date)

Endorsements

Faculty

Guide

Head of the Department

Principal

Certificate from
Official of the Community

This is to certify that_____*(Name of the Community Service Volunteer)* Reg. No_____of_____(Name of the College) underwent community service in _____*(Name of the Community)* from_____to _____ The overall performance of the Community Service Volunteer during his/her community service is found to be_____*(Satisfactory/Good).*

Authorized Signatory with Date and Seal

Acknowledgements

The completion of any project depends upon cooperation, coordination and combined efforts of several sources of knowledge. This report acknowledges a lot of guidance, supervision, stimulation and a lot of inspiration from numerous people. First of all, we thank the almighty for the blessings that have been showered upon us to complete this project work successfully. Our grateful regards to our beloved Principal, Dr. Y. Mallikarjuna Reddy for his constant support and motivation.

We are thankful to Dr. Ch. V. Suresh, Head of the Department, Computer Science and Engineering (Internet of Things) for his extended and continuous support, valuable guidance and timely advice in the completion of this project thesis.

We are also thankful to the Department Community Service Project coordinator Mr. O. Srinivas for his able support and guidance.

It is our privilege to express our sincerest regards to our project guide, Dr. S. Krishna Prasad for his valuable input, guidance, encouragement, whole-hearted cooperation and constructive support throughout the duration of our project.

We take the opportunity to thank all our teaching and non-teaching faculty who have either directly or indirectly helped in our project. We pay our respects and love to our parents and all other family members and friends for their love and encouragement throughout our careers. Last but not least we express our thanks to our friends for their cooperation and support.

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CHAPTER 1: EXECUTIVE SUMMARY

During our community service project in the villages of Kaza and Venkatreddy Palem, our team engaged with local farmers and residents to address challenges related to stubble burning, improper crop residue management, declining soil health, and lack of awareness about sustainable farming techniques in rural areas. We conducted surveys, organized awareness programs, and proposed both short-term and long-term action plans. The project primarily focused on improving agricultural productivity, conserving natural resources, and fostering long-term sustainability in farming.

The activities included comprehensive efforts in the following areas:

- Promoting the mulching technique using crop residues like straw and cow dung to avoid stubble burning and improve soil health.
- Developing and demonstrating an IoT-based smart system to monitor soil moisture and pH levels for efficient and eco-friendly farming.
- Spreading awareness among farmers about the harmful effects of stubble burning and encouraging sustainable agricultural practices.

Through these efforts, we aimed to empower local farmers with the knowledge and resources to enhance their agricultural practices, improve crop yields, and conserve resources. The project sought to promote environmental sustainability and build resilience in the face of climate variability.

We developed an IoT-based smart farming system using Arduino Uno, soil moisture sensor, pH sensor, and a relay module to monitor soil conditions and support eco-friendly practices like mulching instead of stubble burning.

Learning Objectives and Outcomes:

- Increased awareness
- Enhanced collaboration
- Improved communication
- Effective planning and execution

CHAPTER 2: OVERVIEW OF THE COMMUNITY

The community involved in this project is a rural, agrarian society that depends heavily on agriculture as its main source of income and sustenance. These farmers, though resilient and hardworking, are often limited by access to advanced technology, knowledge, and resources, which impedes their ability to adapt to modern agricultural methods. The region may experience varied climatic conditions, including unpredictable rainfall, water scarcity, and soil degradation, all of which pose significant threats to their agricultural productivity and food security.

The community largely practices traditional farming techniques that have been passed down through generations. While these methods may have been sufficient in the past, they are now struggling to keep pace with the growing challenges of climate change, population growth, and dwindling natural resources. The community's farming practices often involve burning crop residue**,** which leads to air pollution, loss of soil nutrients, and long-term soil degradation. There is also limited awareness about soil conservation techniques such as mulching, which can help maintain moisture and improve fertility. In addition, rain-dependent agriculture and the lack of real-time soil monitoring tools make it difficult for farmers to take timely action, resulting in reduced crop yields and greater vulnerability to environmental changes like droughts and soil erosion.

Water and soil management are key concerns in the rural farming areas targeted by our project. Farmers often face extreme conditions-periods of heavy rain followed by drought-yet lack access to efficient irrigation systems or rainwater harvesting methods. As a result, water is either wasted or not used properly, especially during crucial crop stages. Many farmers are unaware of simple water-saving techniques like mulching, which helps retain soil moisture and reduce evaporation.

At the same time, soil health is declining due to the burning of crop residues, lack of soil conservation efforts, and overuse of chemical fertilizers. This leads to soil erosion, nutrient loss, and poor crop productivity. Many farmers do not practice methods like crop rotation or organic enrichment, which are essential for maintaining long-term soil fertility.

The goal of this community service project is to address these pressing challenges by promoting sustainable agricultural practices and improving water management strategies. The project aims to introduce modern, eco-friendly farming techniques that not only boost crop yields but also help

conserve natural resources. This includes educating farmers about the importance of soil health, introducing crop diversification, and promoting the use of organic fertilizers and pest management methods. By adopting these techniques, the community can work towards long-term sustainability, ensuring that the land remains fertile and productive for future generations.

Water and soil conservation are central to our project approach. We focus on promoting simple yet effective water-saving techniques such as mulching**,** which helps retain soil moisture, reduces the need for frequent irrigation, and improves soil structure. By encouraging farmers to reuse crop residue like straw or dry cow dung instead of burning it, we promote both resource conservation and pollution-free practices. In the long term, this helps in maintaining soil moisture during dry spells and supports better crop growth.

Our project also aims to build strong community involvement by organizing awareness sessions**,** practical demonstrations, and training workshops on sustainable farming. Through these activities, farmers learn how to monitor soil health using IoT-based tools like the soil moisture sensor**,** pH sensor, and relay-based automation system. By equipping farmers with the right knowledge and tools, we aim to help them adopt eco-friendly, cost-effective, and climate-resilient practices that ensure better yields and protect the environment for future generations.

In conclusion, the farming community is currently struggling with issues like stubble burning, loss of soil fertility, and poor water usage methods. However, with the right guidance and low-cost solutions, these challenges can be turned into opportunities for improvement. Our project focused on encouraging eco-friendly practices like mulching, which helps preserve soil moisture and avoids harmful burning of crop waste. By educating farmers and giving them hands-on tools and knowledge, the project aims to build a future where farming is sustainable, pollution-free, and climate-resilient**,** ensuring long-term benefits for the community and future generations.

CHAPTER 3: COMMUNITY SERVICE PART

During the community service project, we undertook several initiatives aimed at enhancing agricultural practices and improving waste management in the communities of Kaza and Venkatreddy Palem. The project focused on addressing the challenges faced by rural farming communities, such as stubble burning, soil degradation, and inefficient water use, by promoting sustainable farming practices like mulching and encouraging the use of a Smart Soil Health Monitoring System to improve long-term productivity and resource conservation.

To begin with, we interacted closely with farmers and local villagers to understand the real problems they face in farming. These discussions helped us learn about issues such as the burning of crop residue**,** lack of knowledge about sustainable practices like mulching**,** and poor water management**.** Many farmers still depend on traditional methods and are unaware of low-cost solutions that can protect the soil and save water. They also shared concerns about declining soil fertility, changing weather conditions, and not having proper tools to monitor soil health. These challenges directly affect their crop production and income.

In addition, we collaborated with local farmers to explore the benefits of crop rotation and organic farming methods. This initiative aimed to improve soil health and boost crop yields while reducing dependence on chemical fertilizers. We also conducted training workshops, where farmers learned about the importance of soil conservation and sustainable practices, including the use of cover crops and natural fertilizers to enhance soil fertility.

As part of our project, we also looked at how the local farming community manages water. We visited farms, irrigation points, and nearby water sources to understand their current practices and the problems they face. Many farmers shared that water is either wasted or not available when needed, especially during dry seasons. To help with this, we introduced the idea of using mulching as a natural method to retain soil moisture, and we suggested simple techniques like rainwater harvesting to store water during rainy times.

This community service project in Kaza and Venkatreddy Palem empowered local farmers with the knowledge and tools needed to adopt sustainable agricultural practices and reuse crop residue.

CHAPTER 4: COMMUNITY SERVICE PROGRAM LOG BOOKS

ACTIVITY LOG FOR THE FIRST WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day-1 05-05-2025	Initial meeting with the farmers of Kaza and VenkatreddyPalem to understand their challenges and gather information about their farming methods.	Gained insight into the community's current agricultural practices.	
Day-2 06-05-2025	Conducted a field survey in Kaza, documenting on crop cultivation and waste management.	Learned about the diversity of crops and the limitations of traditional waste management methods.	
Day-3 07-05-2025	Held a workshop on sustainable farming techniques for using of waste ecofriendly.	Educated the farmers on sustainable practices that can enhance soil health and improve crop yields.	
Day-4 08-05-2025	Surveyed the waste management techniques in Venkatreddy Palem, assessing current waste management techniques and identifying potential technique for usage of waste.	Understood the local water challenges and identified solutions for efficient water use, including rainwater harvesting techniques.	
Day-5 09-05-2025	Organized a group discussion with farmers to gather feedback on the proposed waste management.	Gained a clearer understanding of the community's openness to change and their concerns about implementing new techniques.	
Day-6 10-05-2025	Provided hands-on training for Working on waste management technique.	Farmers learned practical, waste management techniques	

WEEKLY REPORT

WEEK – 1 (From 05-05-2025 To 10-05-2025)

Objective of the Activity Done:

The primary objective of this week's activities was to assess the current agricultural practices and waste management systems in the communities of Kaza and Venkatreddy Palem. Through direct engagement with local farmers, the goal was to identify challenges in crop production, soil health, and fertility. Additionally, the objective was to introduce sustainable farming techniques, educate the farmers on efficient waste usage, and provide practical solutions for improving soil fertility.

Detailed Report

We began the week by holding an introductory meeting with the farmers from Kaza and Venkatreddy Palem. The purpose of this meeting was to establish communication with the community, understand their existing farming practices, and identify specific challenges they face.

On the second day, we conducted an in-depth field survey in Kaza. We observed the types of crops are grown Farmers in this area rely on traditional methods to reduce the pollution obtained from crop residue.

Midweek, we organized a workshop focused on introducing sustainable agricultural practices. We discussed the benefits of mulching for burning of crop. On the next following days, we shifted our focus to implementing of this technique in Venkatreddy Palem

On Saturday, we conducted a practical training session in both communities, demonstrating the use of waste management. We also taught farmers about mulching, a simple technique that helps environment friendly.

This first week of the community service project was highly productive. We established strong communication with the local farmers, identified key challenges, and began to introduce sustainable practices that can improve both agricultural productivity and waste management.

ACTIVITY LOG FOR THE SECOND WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day-1 12-05-2025	Conducted a follow-up meeting with farmers to gather feedback on the previous week's activities and discuss ongoing challenges.	Farmers provided insights into the initial outcomes of adopting the new farming and waste management techniques introduced in the first week.	
Day-2 13-05-2025	Organized a workshop on mulching and organic waste management to improve soil fertility.	Farmers learned how to create organic compost from local resources, reducing their reliance on chemical fertilizers.	
Day-3 14-05-2025	Continued training on waste usage, focusing on the design and construction of simple waste management systems to reduce pollution.	Participants gained practical knowledge on waste techniques, understanding the benefits of pollution reduction.	
Day-4 15-05-2025	Field demonstration on soil testing methods to assess soil health and nutrient deficiencies.	Farmers learned how to test soil quality and received guidance on how to amend their soil based on the test results.	
Day-5 16-05-2025	Conducted a hands-on session on installing advanced waste management system in the fields.	Farmers gained experience in installing and maintaining efficient waste management systems, which can reduce waste.	
Day-6 17-05-2025	Community engagement session with local leaders to promote widespread adoption of sustainable agricultural practices.	Discussed the long-term benefits of sustainability and began planning how to scale these practices across the community.	

WEEKLY REPORT

WEEK – 2 (From 12-05-2025 To 17-05-2025)

Objective of the Activities Done

The primary objective of the second week was to continue building on the sustainable farming and waste management techniques introduced in the first week. The aim was to reinforce the new methods, ensure proper implementation, and introduce further knowledge on organic waste management for soil fertility and increase productivity. Another key focus was assessing the waste that obtained from crop after cultivation and reduce the pollution occurred from burning.

Detailed Report

We started the second week by meeting with the farmers to collect feedback on their experiences after the first week of training and implementation. The farmers shared initial results and voiced their concerns regarding the practical application of new technique such as mulching.

On Tuesday, we conducted a workshop focused on the use of organic waste to create mulch compost. We demonstrated how to convert agricultural waste and dry leaves and straw into mulching compost. This composting process will help improve soil health and reduce dependence on chemical fertilizers.

We introduced soil testing methods to help farmers assess the quality of their soil. Using basic tools, we showed how to measure pH levels, nutrient content, and other soil health indicators. Based on these tests, we recommended ways to utilize the crop waste and use in soil fertilization.

On the final day of the week, we held an evaluation session to assess the effectiveness of the week's activities. We reviewed the progress made in waste harvesting, soil conservation. Farmers reported increased understanding of these techniques, and we collectively identified areas for further improvement.

Week 2 of the community service project was a continuation of the initial efforts to implement sustainable agricultural practices and improve waste management and drip irrigation.

ACTIVITY LOG FOR THE THIRD WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day-1 02-06-2025	Continued evaluation of mulching and its effectiveness in soil fertility.	Farmers reported improved soil health and expressed interest in expanding the technique further.	
Day-2 03-06-2025	Workshop on implementing technique efficiently to improve crop diversity and soil health.	Farmers gained deeper insights into maximizing crop yields through mulching.	
Day-3 04-06-2025	Practical training on collecting the crop waste, straw for mulching process without burning.	Farmers learned how to turn crop waste into nutrient-rich fertilizer, reducing the need of burning.	
Day-4 05-06-2025	Field demonstration on layering the soil with crop wastes, straw and watering it for maintaining moisture level, ph level in it.	Farmers practiced how to preparing the mulching compost and monitoring the moisture level, ph level.	
Day-5 06-06-2025	Follow-up on soil health and crop yield improvements after the application of organic mulching.	Farmers observed better soil structure and increased yields in fields where mulching inputs were applied.	
Day-6 07-06-2025	Workshop on importance of maintaining moisture level and ph level.	Farmers learned the importance of utilizing crop waste and maintaining moisture level and ph level.	

WEEKLY REPORT

WEEK – 3 (From 02-06-2025 To 07-06-2025)

Objective of the Activities Done

The primary focus for this week was to continue reinforcing sustainable farming and waste management techniques with an emphasis on evaluating soil health, enhancing crop diversity, and introducing pollution free environment. The week also aimed to build community knowledge on moisture level and ph level.

Detailed Report

The primary objective was to monitor and analyze changes in soil moisture levels and pH levels before and after the application of mulch. Mulching, the practice of covering soil with organic materials such as dry leaves, coconut husks, and straw, helps in conserving moisture, suppressing weeds, and enhancing soil fertility.

Before applying any mulch, baseline readings of soil moisture and pH levels were recorded using a soil moisture sensor and a digital pH meter. The initial moisture levels were observed to be relatively low due to dry weather conditions, and the pH levels varied slightly across the plots, ranging from slightly acidic to neutral.

Following this, a uniform layer of organic mulch approximately 3 to 4 inches thick was applied to the topsoil of each plot. The monitoring process involved recording soil moisture and pH levels at regular intervals on day 0 (before mulching), and then on days 3, 7, 14, and 21. Over time, a gradual increase in soil moisture was observed under the mulched plots, indicating that the mulch significantly reduced evaporation and improved water retention. Additionally, the pH levels in the mulched areas remained more stable compared to the non-mulched control areas, which experienced slight fluctuations due to exposure to rain and sun.

The results of this study clearly demonstrated the benefits of mulching in regulating soil moisture and maintaining pH balance.

ACTIVITY LOG FOR THE FOURTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day-1 09-06-2025	Conducted system calibration for pH and soil moisture sensors on different soil types.	Team members learned how different soil compositions affect sensor readings and fine-tuned the code logic.	
Day-2 10-06-2025	Integrated the relay and motor with the Arduino Uno and tested automated activation based on sensor thresholds.	Students learned how to interface actuators with sensors and control hardware based on real-time data.	
Day-3 11-06-2025	Conducted live demo for farmers on how automatic mulching works using agricultural waste for soil moisture retention.	Farmers understood how smart mulching can help conserve water, improve soil health, and reduce labor.	
Day-4 12-06-2025	Community meeting to spread awareness on smart waste reuse techniques using sensors and microcontrollers.	Community members recognized the value of technology in sustainable agriculture and expressed interest.	
Day-5 13-06-2025	Troubleshooting session to resolve unstable pH readings caused by dry soil or sensor corrosion.	The team learned about real-world issues with sensor data and implemented error handling and calibration.	
Day-6 14-06-2025	Reviewed project progress and documented feedback from users and farmers for improvement in system performance.	Valuable feedback was gathered to enhance sensor accuracy and improve relay control timing for better results.	

WEEKLY REPORT

WEEK – 4 (From 09-06-2025 To 14-06-2025)

Objective of the Activities Done

The fourth week focused on testing and validating the automatic mulching system, raising community awareness about smart agriculture technologies, and evaluating the impact of sensor-based monitoring on soil health and moisture conservation.

Detailed Report

We began the week by integrating the pH sensor and soil moisture sensor with the Arduino Uno. Code calibration was completed, and sensor readings were displayed via serial output. Practical tests were conducted to trigger the relay and motor automatically based on sensor thresholds. The relay successfully activated the mulch-dispensing motor when the soil moisture was low and pH was within the optimal range (6.0–7.5).

A Community Awareness Program was organized to educate local farmers on the benefits of sensor-based mulching systems for organic waste management. Farmers were shown live demonstrations of the prototype and its application in conserving moisture and improving plant health.

Farmers reported interest in using such systems to replace manual mulch spreading and reduce water evaporation from their fields. The feedback helped refine the relay timing and soil moisture thresholds in the code. We emphasized the connection between agricultural waste reuse (mulching) and better soil quality and pest suppression, aligning with sustainable farming goals.

Midweek, a session was held discussing how to scale the system using locally available materials and how cooperative societies or rural innovation funds could help subsidize the cost of sensors and components.

The week ended with impact evaluation and planning for sensor durability testing, outdoor prototype trials, and system extension using solar power.

ACTIVITY LOG FOR THE FIFTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day-1 16-06-2025	Evaluated the performance of the prototype in low-moisture soil conditions. Sensor accuracy and motor activation were tested.	Participants learned how the system responds to real-time changes in soil moisture levels.	
Day-2 17-06-2025	Conducted a workshop on using organic mulch from crop waste and demonstrated its effect on soil temperature and moisture.	Participants learned how the system responds to real-time changes in soil moisture levels.	
Day-3 18-06-2025	Demonstrated integration of composting and organic waste recycling with the automated system for sustainable fertilizer application.	Farmers learned how compost mulch can replace chemical fertilizers and support better soil quality.	
Day-4 19-06-2025	Organized a group discussion with farmers to gather user feedback and suggestions for prototype improvements.	Farmers provided insights on system use, and the team identified areas for further sensor calibration.	
Day-5 20-06-2025	Tested the system in different environmental conditions (humid/dry) to compare sensor stability and motor response.	Participants observed how environmental factors affect soil sensor readings and system reliability.	
Day-6 21-06-2025	Conducted a review meeting to discuss expansion plans and train selected farmers to operate the system independently.	Farmers were empowered to maintain and operate the system, promoting self-reliance and scalability.	

WEEKLY REPORT

WEEK – 5 (From 16-06-2025 To 21-06-2025)

Objective of the Activities Done

Week 5 is to improve field-level performance of the automatic mulching system and promote the residue of agricultural waste as a productive alternate for chemical fertilizers. This week also focused on explaining long term benefits of soil irrigation and soil monitoring while supporting community-level participation in expanding eco-friendly farming technology.

Detailed Report

This week is about field testing, mainly about how the system performs in dry soil conditions during high temperatures. The soil moisture sensor correctly detects dry soil and pH sensor detects acidity before the motor through relay system.

A practical workshop was conducted to show farmers how mulch made from crop waste could help reduce evaporation, control weeds, and improve soil fertility. By using the automatic system, the mulching process could be carried out efficiently and with minimal labor.

Farmers also learned materials like neem oil sprays and planting particular crops together can keep pests away without using harmful chemicals. In which this also helps in preventing pests and helps in improving crop health which works along with the mulching system, giving crops better protection and help them grow healthier and stronger.

At the end of the week, a feedback and planning session was conducted with the farmers. They shared their thoughts and expressed their idea in using the mulching system on other nearby farms too. Many of them asked for more training about how to use basic electronic parts, like circuit connections used in the system, and how to use the sensors and make them work properly. This explains that the farmers are not only interested in using the technology, but also they are ready to learn more so that they can take care of the system in the future..

ACTIVITY LOG FOR THE SIXTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day-1 23-06-2025	Final review on working of mulching system in farms and discussion on pH and soil moisture data improved fertility.	Farmers reported improvement of soil health and moisture level due to mulching as regular technique for monitoring.	
Day-2 24-06-2025	Workshop on how to use sensors and components on compost generation from mulch residue.	Focuses on compost generation from mulch residue and reuse sensor modules for the next crop cycle.	
Day-3 25-06-2025	Community meeting to form support groups for knowledge on mulching farming systems.	Farmers formed support groups to improve technique efficiently.	
Day-4 26-06-2025	Field demo on large irrigation and mulching units for field usage by using multiple relays and sensors.	Farmers learned about how to support larger crop fields by using multiple installations.	
Day-5 27-06-2025	Awareness council on improvements like soil irrigation, and climate conditions.	Farmers gained knowledge on improvements for future conditions.	

Day-6 28-06-2025	Project completion and feedback of the project. Farmers shared their experiences, and with this project team finalized overall impact and goals.	Farmers expressed their confidence in operating the system and planned to expand it future works.	

WEEKLY REPORT

WEEK – 6 (From 23-06-2025 To 28-06-2025)

Objective of the Activities Done

We finished the project by making sure that mulching works well and that farmers feel comfortable using it on their own. And we also focused on how to support and help people keep using the system and share their knowledge with others. Our project completed with a small celebration for success of our project and thanking everyone who took part.

Detailed Report

In this final week, we checked how mulching system was working the Arduino based system was tested many times in different soil and weather conditions to make sure it is working properly or not, based on the soil's moisture and pH levels.We held a training session to teach farmers how to use and implement whenever it is needed. On that includes how to clean the sensors, and use the relay safely.

An awareness session was also held to tell how the system helps with climate friendly farming by saving water and taking action when needed without any manual work.

During a feedback session, farmers and local leaders shared their thoughts. Most of them felt more confident about using the system .The project ended with farmers ready to use the system on their own and continue the farming methods we introduced. A support network was set up to keep things going in the long term. The final ceremony celebrated the success of the project and its benefits to the farming groups. In the future, teamwork and support will be important to spread this system to more areas.

CHAPTER 5: OUTCOMES DESCRIPTION

Details of the Socio-Economic Survey of the Habitation attached the questionnaire prepared for the survey.

COMMUNITY SERVICE PROJECT SURVEY FORM

Village Name: _____

Date: _____

Student Name: _____

Contact Number: _____

Name of the Respondent: _____

Age of the Respondent: _____

Occupation of the Respondent: _____

Contact Information: _____

1. Basic Information 1.1. How many people live in your household?

- ☐ 1-3
- ☐ 4-6
- ☐ 7-9
- ☐ 10 or more

1.2. What is your primary occupation?

- ☐ Agriculture
- ☐ Laborer
- ☐ Small business
- ☐ Government service
- ☐ Other: _____

2. Education

2.1. How many children in your household attend school?

- ☐ None

- ☐ 1-2
- ☐ 3-4
- ☐ 5 or more

2.2. What is the highest level of education attained by any member of your household?

- ☐ Primary School
- ☐ Secondary School
- ☐ Higher Secondary
- ☐ College/University
- ☐ None

3. Health

3.1. Do you have access to a healthcare facility within your village?

- ☐ Yes
- ☐ No

3.2. How far is the nearest healthcare facility from your home?

- ☐ Less than 1 km
- ☐ 1-3 km
- ☐ 3-5 km
- ☐ More than 5 km

3.3. What are the common health issues in your village? (Select all that apply)

- ☐ Fever
- ☐ Cold/Cough
- ☐ Malaria/Dengue
- ☐ Diarrhea
- ☐ Others: _____

4. Infrastructure

4.1. What type of road connects your village to the nearest town?

- ☐ Paved Road

- ☐ Dirt Road
- ☐ No Road

4.2. Does your village have a reliable source of electricity?

- ☐ Yes
- ☐ No

4.3. Does your village have access to clean drinking water?

- ☐ Yes
- ☐ No

4.4. What is the main source of drinking water in your village?

- ☐ Well
- ☐ Bore well
- ☐ River/Pond
- ☐ Other: _____

5. Sanitation

5.1. Does your village have proper sanitation facilities?

- ☐ Yes
- ☐ No

5.2. Do most households in your village have toilets?

- ☐ Yes
- ☐ No

6. Agriculture and Livelihood

6.1. What crops are commonly grown in your village?

- ☐ Rice
- ☐ Wheat
- ☐ Vegetables
- ☐ Fruits
- ☐ Others: _____

6.2. What are the major challenges faced by farmers in your village?

- ☐ Lack of water/irrigation

- ☐ Pest problems
- ☐ Lack of modern equipment
- ☐ Market access
- ☐ Others: _____

7. Social and Community Issues

7.1. What are the major social issues in your village? (Select all that apply)

- ☐ Alcoholism
- ☐ Domestic Violence
- ☐ Child Labor
- ☐ Gender Discrimination
- ☐ Others: _____

7.2. Are there any community organizations or groups active in your village?

- ☐ Yes
- ☐ No

8. Additional Comments

Please provide any additional comments or information about the problems faced by your village:

Thank you for your cooperation!

Description of the Problems we have identified in our community

Problem-1: Crop Residues are burnt in the field (Open burning)

Description:

Farmers burn remaining crop residues such as paddy and wheat straw in the open fields post harvest to rapidly prepare the land for the next crop. It is an attractive method due to cheapness and rapidity.

Impacts:

-Air Pollution: Produces toxic gases such as CO_2, particulate matter, contributing to smoke and respiratory illnesses.

-Public Health Problems: Triggers asthma, lung diseases and eye irritations among the local communities, in particular in rural areas.

-Loss of Soil Fertility: Burning at high heat kills beneficial microbes and decreases organic matter in the soil.

-Climate Change: Adds gases to the atmosphere, making global warming worse.

Problem-2: Absence of Awareness Concerning the Sustainable Practices

Description:

There are still a good proportion of farmers who are unaware of environmentally-friendly alternatives including composting, mulching or bio- pest control and decomposition of crop residues.

Impacts:

-Persistent environmental damage: For lack of understanding, damaging practices such as burning persist.

-Addiction to chemicals: Farmers are addicted to chemical use, they have no idea about the alternative natural methods.

Problem 3: Soil Imbalance and Soil Erosion

Description:

Such practices as the incorrect treatment of crop residues, and frequent burning and the use of chemicals, damage the structure, pH balance and moisture holding capacity of the soil.

Impacts:

-Decreased Crop Yield: The soil is hard and dry, where it takes more time until the soil becomes fertile.

-Nutrient Loss: Phosphorus and nitrogen in the soil, two important nutrients, are lost from the topsoil.

-Costly Fertilizer and High Soil Conditioner: Farmers use a lot of expensive fertilizer and soil conditioner to keep yield.

Problem-4: Water Mismanagement

Description:

Without soil moisture sensors, farmers are watering using guesswork, not based on when water is actually needed.

Impact:

− Health risks: Animal and human health problems arise from food contaminated with chemicals.

-Water Pollution: Pesticides and herbicides from fields seep into local water sources.

Short-term and Long-term Action Plans for Addressing the Identified Problems

- In our society, traditional agricultural practices including open burning of crop residues, over exploitation of chemical fertilizer and improper water management, resulting in severe environmental and health concerns.
- Short-term and long-term plans need to be formulated to rectify these adopted for long-term crop residues utilization and sustainable and green farming practices. In the immediate, we recommend an in-depth review of existing agricultural methods to find inefficiencies in areas like water utilization, soil fertility and pest control.
- Economically feasible aids for the statement (like PH -sensor, Soil-moisture) for the garden should be installed and pilot-composting projects could be initiated to test the efficacy of converting crop residues in into organic fertilizer.
- In the long run, the emphasis should be on integrating smart technologies and development sustainable farming systems. Farmers need to be stimulated by providing them with access to Arduino-based sensing systems, on Arduino-uno to measure crop parameters irrigation, and relay based compost mixers as they have to automated and optimized farming processes.
- Research agencies to provide organic fertilizers, bio-pesticides, and training on sustainable practices such as crop rotation, integrated the integrated pest management (IPM) and the organic production. Policy-level support is likewise essential — there need to be laws that ban crop burning and incentives for eco-friendly farming practices. Establishing knowledge-sharing networks where farmers share best practices, technologies, and resources can form a stronger, better-educated and empowered community.
- By adopting this all of the above approach, the merging of short term measures with long term consideration, we have the potential to shift away from a farming model that continues to foster an unsustainable, vulnerable, and profoundly unjust system which is failing farmers and harming the environment.

Community Awareness Programs Conducted to Address the Identified Problems:

1. Campaign to Sensitize Farmers on Dangers of Crop Burning

Description: Trained them on the ill-effects of burning the crop residues on the air quality, soil health and public health through posters..

Outcomes:

-Greater awareness of pollution from burning.

-Some farmers ceased burning of their own accord, and instead adopted other practices such as composting.

-The decrease in respiratory disease and local air pollution during the harvest seasons.

2. Compost and Organic Farming Workshops

Description:

Practical training on composting of crop residues using pit and heap method, encouraging participants to utilize gerneiert compost unit as a natural fertilizer.

Outcomes:

-Farmers began constructing compost pits on their fields.

-Decreased use of chemical fertilizers.

-Enhanced texture and nutrient quality of pilot plot soils.

3. Soil Health and Testing Have a long drive to go.

Description:

Free testing for soil pH and moisture was performed with the help of experts to ensure the correct. Free soil testing for PH and moisture conducted with expert guidance to support appropriate fertilizer and water use.

Outcomes:

-Farmers started plugging soil data, rather than guesswork, into their input decisions.

-Prevented over-fertilization, preserving cash and soil.

-Rising demand for sustainable agricultural inputs.

4. Farmer Knowledge-Sharing Meets

Description:

Monthly occasions, during which experienced farmers exchanged practical experiences with their colleagues on composting, crop rotation and water.

Outcomes:

-Increased confidence of farmers to experiment with new approaches.

-Accelerated acceptance of peer-validated techniques.

-Growth of our community sense of partnership.

5. Using Crop Waste as Mulch

Description:

Carried out field demonstrations about the virtues of using dried crop waste as mulch deprecated for moisture as mulch crop waste can be used to water conservation moisture and also help to discourage weeds and enrich your soil.

Outcomes:

-Less evaporation and soil moisture is preserved better.

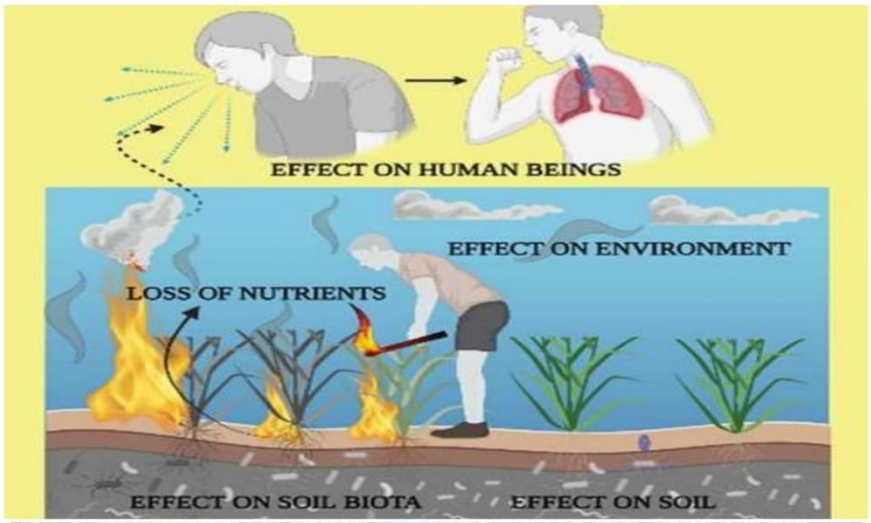
-Improved weed control without chemicals.

-Increased awareness of zero-waste agriculture.

REPORT OF THE CSP PROJECT WORK

Introduction

In several farming localities the mismanagement of crop residues, Open producing emissions of CO2 and other greenhouse gases, is a significant issue. Conventional clearing of crop residues is an environmental hazard and also results in substantial nutrient depletion from the soil. This issue is dealt with in this work through the implementation of a smart, sensor-based. Although we live in an arid area with sporadic rain, we have found our experience has not only been more pleasant, but also more profitable than colleagues in the region, mainly through introduction of a waste-management. Utilizing a pair of soil moisture and pH sensors with Arduino-uno controlled motor and relay set up, the system allows automation in composting and irrigation, achieving the best soil conditions by recycling crop waste in a useful manner.



Project Background:

The project originated out of the idea that crop waste can be used in a sustainable manner and that sensor technology as a tool can be used to manage ESL effectively improve soil health. It utilize a soil moisture and pH sensor to measure live soil conditions. We use an Arduino microcontroller to process the data and drive a motor via a relay to close the loop and automate this watering or compost mixing. This goes a long way to mitigate the damaging activity of burning crop residue from 80 per cent of Punjab' fields converting it into compost. The system keeps soil consistently moist and in optimum soil pH condition for 90 days better crop growth. It can facilitate intelligent agriculture, decrease the consumption of manual work and the waste of resource. In general the project makes for environmentally sound and low cost agriculture.

Objectives:

- Saleable ecofriendly solution for the disposal of crop waste.
- In an effort to check the damaging practice of burning crop residues.
- To enable integration of compost and inbuilt moisture control with the benefit of low cost sensors.
- Sustainably increase soil fertility and crop productivity.
- To advocate for tech in agriculture to rural farmers.

Scope:

This technology can be applied in rural farming societies to minimize the burning of crop waste and promote composting. It is suitable for small and medium size farms and is low cost and simple. The scope of the system can be further extended to integrate even more types of sensors for full soil diagnostics. It supports water Smart watering Indexing from Soil Moisture to achieve conservation. The model can be used in schools of agriculture for the purpose of education. All in all, the initiative may increase crop productivity, soil health, and environmental quality.

Significance:

This initiative advocates for sustainable agriculture initiative by transforming harmful crop residue into beneficial compost. It reduces air pollution from crop burning. Monitoring of is achieved with the aid of sensors soil quality, resulting in better crop production. It saves water by automatic irrigation on Soil moisture levels. The system is affordable and can be adopted by small farmers. It reduces dependency on chemical fertilizers by enriching the soil naturally. Overall, it encourages environmentally friendly and smart agricultural practices.

PROJECT OVERVIEW

Description of the Agricultural Practices and Waste Management:

The project focuses on introducing sustainable agricultural practices and efficient waste management techniques to improve soil fertility and to reduce the pollution which caused after burning of waste after yielding of crop for this concept we uses the mulching Technique by using this increase the fertility of soil. This project addresses by promoting waste disposal systems, such as on-site disposal, off-site disposal systems along with organic farming practices like crop rotation, composting, and integrated pest management .These techniques aim to improve soil fertility, reduce dependency on chemicals and ensure crop yields for protecting the waste.

Target Audience:

The primary target audience of this project is the local farming communities in Kaza and Venkatreddy Palem. These communities can primarily depend on agriculture for their lively hoods, to reduce the pollution and faces significant challenges in managing waste resources and maintaining soil health. this project also assures to engage agricultural contributors such as local government schemas, agricultural cooperatives, and non-profit organizations that support sustainable farming practices and rural environment development they can develop new and improved sustainable farming technologies and practices NGO plays a vital role promoting sustainable agriculture through advocacy.

Key Features:

- **Moisture Conservation**: Mulching reduces water evaporation from the soil, that leads to better moisture retention and potentially reducing irrigation needs.
- **Weed Control**: By preventing sunlight, mulching inhibits weed germination and growth, minimizing the competition for resources.
- **Temperature Regulation**: Mulching acts as an insulator, moderating soil temperature and fluctuations. It keeps the soil cooler in summer and warmer in winter, protecting plant roots.

- **Soil Health Improvement**: Organic mulch decompose over time, adding organic matter to the soil and developing it with nutrients.
- **Erosion Control**: Mulching can help preventing soil erosion by reducing the impact of rainfall and runoff.
- **Reduced Pest and Disease Incidence**: Some mulches, particularly plastic mulches, can create a barrier against pests and diseases.
- **Improved Soil Structure**: Mulch can develop soil structure by promoting earthworm activity and increasing soil porosity.
- **Aesthetic Value**: Mulch can improve the appearance of landscapes in cultivated areas.
- **Nutrient Cycling**: Organic mulches decompose and release nutrients, contribute to a more sustainable nutrient cycle.
- **Reduced Fertilizer Leaching**: Mulch can help preventing the loss of fertilizers through leaching and keeping nutrients available for plant uptake.

PROJECT IMPLEMENTATION

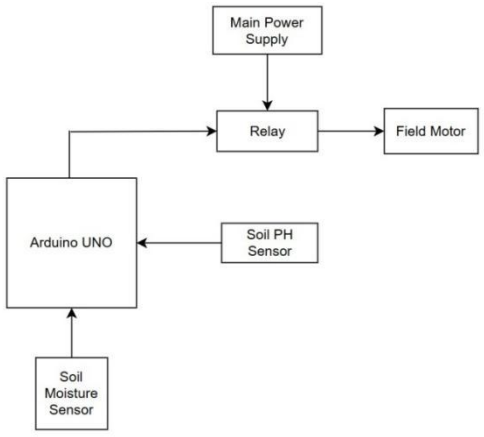
1. Objective of Implementation

The main objective of this implementation is to develop an eco-friendly and pollution-free hardware system that monitors soil conditions (moisture and pH) in real time. When the soil is dry and the pH is within a healthy range, the system automatically activates a water motor through a relay to irrigate the crops. This helps reduce manual effort, avoids water wastage, and promotes the sustainable reuse of crop residue using the mulching technique.

2. Components Used

Component	Purpose
Arduino Uno	Acts as the main microcontroller.
Soil Moisture Sensor	Measures the moisture level of the soil.
pH Sensor	Measures the acidity/alkalinity of the soil.
Relay Module	Controls the ON/OFF state of the water motor.
Motor	Delivers water to the soil when relay is ON.
Bread Board	For mounting and wiring components.
Jumper wires	To connect all components.
Power Supply (USB)	To power the Arduino board.

3. Block Diagram



4. Connection Details

Component	Arduino Pin
Soil Moisture A0	A0
Soil Moisture VCC	5V
Soil Moisture GND	GND
pH Sensor A0	A1
pH Sensor VCC	5V
pH Sensor GND	GND
Relay IN	D7
Relay VCC	5V
Relay GND	GND
Motor Power	External PSU
Motor GND	External PSU

5. Code Explanation

```
const int soilMoisturePin = A0;
const int phSensorPin = A1;
const int relayPin = 7;
const int soilDryThreshold = 150;
const float minPH = 6.0;
const float maxPH = 7.5;
void setup() {
  Serial.begin(9600);
  pinMode(relayPin, OUTPUT);
  digitalWrite(relayPin, LOW);
```

```
  Serial.println("Crop Waste Management System Started");
}
void loop() {
  int soilValue = analogRead(soilMoisturePin);
  Serial.print("Soil Moisture (0=wet to 200=dry): ");
  Serial.println(soilValue);
  int phRaw = analogRead(phSensorPin);
  float voltage = phRaw * (5.0 / 1023.0);
  float pHValue = 14.0 - (voltage * 14.0 / 5.0); // Map voltage to 0–14 scale
  Serial.print("pH Sensor Voltage: ");
  Serial.print(voltage, 2);
  Serial.print(" V  -->  pH Value: ");
  Serial.println(pHValue, 2);
  if (soilValue > soilDryThreshold && pHValue >= minPH && pHValue <= maxPH) {
    Serial.println("Conditions met: Activating mulch motor.");
    digitalWrite(relayPin, HIGH);
    delay(5000);
    digitalWrite(relayPin, LOW);
    Serial.println("Mulch application complete. Motor OFF.");
  } else {
    Serial.println("Conditions not met. Motor remains OFF.");
    digitalWrite(relayPin, LOW);
  }
  Serial.println("-----------------------------------");
  delay(3000);
}
```

6. Working Procedure

1. The soil moisture sensor continuously reads the moisture percentage.
2. The pH sensor checks the pH level of the soil.
3. If the soil is dry (moisture < 40%) and pH is in the ideal range (6.0 to 7.5), the relay turns **ON** the motor to water the plants.
4. If not, the relay remains OFF, and no water is supplied.
5. This process repeats every 3 seconds.

7. Output Screenshots

Figure 1: Hardware Connections of the project

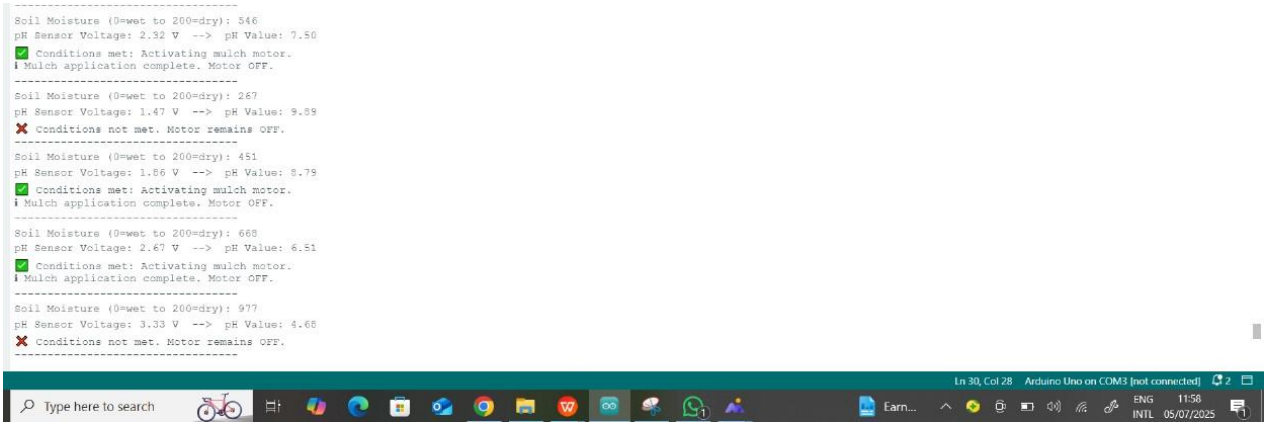


Figure 2: Serial monitor output

8. Result

Our project successfully observed soil moisture level and ph level by using sensors. when soil was dry and ph was in the normal range the relay turns on the motor automatically. If the conditions were not appropriate, the motor remains off to prevent unnecessary watering. The output will be displayed on the serial monitor for observation and testing. The system supports the mulching method by providing water only when required. Overall, the prototype worked accurately and promotes smart, eco-friendly farming.

CHAPTER 6: RECOMMENDATIONS AND CONCLUSIONS OF THE CSP PROJECT

Recommendations:

For the future of our "Eco-Friendly and Pollution-Free Farming for Rural Environmental Sustainability" project, a key recommendation is to develop an informative and interactive website specifically focused on mulching techniques as a waste management solution. This website would offers a valuable resource for rural farmers in Kaza and Venkatreddy Palem, providing easy information on different types of mulches (like straw, wood chips, and compost from farm waste), how to apply them as correctly, and many benefits they offer. It should explain how mulching helps and save water by reducing evaporation, stops weeds from growing without Rough chemicals, improves soil health by adding nutrients as the mulching breaks down, and protects the soil from degrade accurately. The website could include simple diagrams, short videos, and frequently asked questions to make the information clear and practical for farmers. By making this knowledge easily available, we can encourage more farmers to adopt mulching, turning farm waste into a valuable resource and moving towards more sustainable and pollution-free farming practices.

Conclusions:

The mini project successfully addressed critical challenges faced by farmers in the rural areas of Kaza and Venkatreddy Palem. In simple terms, our project is all about helping farmers to grow food in a way that's good for the environment and free from pollution. We saw that these farmers struggled with not enough water and unhealthy soil. Our plan focused on teaching them better ways to farm, like using mulching to save water and make the soil richer. By working with the farmers, local groups, and charities, we're not just helping them grow more food, we're also making their villages healthier and more sustainable for the future. The goal is a cleaner, greener way of farming that benefits everyone.

Student Self-Evaluation for the Community Service Project

Student Name:

Registration No:

Period of CSP: From: To:

Date of Evaluation:

Please rate your performance in the following areas:

Rating Scale: **Letter grade of CGPA calculation to be provided**

1	Oral communication	1	2	3	4	5
2	Written communication	1	2	3	4	5
3	Proactiveness	1	2	3	4	5
4	Interaction ability with community	1	2	3	4	5
5	Positive Attitude	1	2	3	4	5
6	Self-confidence	1	2	3	4	5
7	Ability to learn	1	2	3	4	5
8	Work Plan and organization	1	2	3	4	5
9	Professionalism	1	2	3	4	5
10	Creativity	1	2	3	4	5
11	Quality of work done	1	2	3	4	5
12	Time Management	1	2	3	4	5
13	Understanding the Community	1	2	3	4	5
14	Achievement of Desired Outcomes	1	2	3	4	5
15	**OVERALL PERFORMANCE**	**1**	**2**	**3**	**4**	**5**

Date: **Signature of the Student**

Evaluation by the Person in-charge in the Community / Habitation

Student Name:

Registration No:

Period of CSP: From: To:

Date of Evaluation:

Name of the Person in-charge:
Address with mobile number:

Please rate the student's performance in the following areas:

Please note that your evaluation shall be done independent of the Student's self-evaluation

Rating Scale: 1 is lowest and 5 is highest rank

1	Oral communication	1	2	3	4	5
2	Written communication	1	2	3	4	5
3	Proactiveness	1	2	3	4	5
4	Interaction ability with community	1	2	3	4	5
5	Positive Attitude	1	2	3	4	5
6	Self-confidence	1	2	3	4	5
7	Ability to learn	1	2	3	4	5
8	Work Plan and organization	1	2	3	4	5
9	Professionalism	1	2	3	4	5
10	Creativity	1	2	3	4	5
11	Quality of work done	1	2	3	4	5
12	Time Management	1	2	3	4	5
13	Understanding the Community	1	2	3	4	5
14	Achievement of Desired Outcomes	1	2	3	4	5
15	**OVERALL PERFORMANCE**	**1**	**2**	**3**	**4**	**5**

Date: **Signature of the Supervisor**


GPS Map Camera
Kaza, Andhra Pradesh, India
9grq+3m6, Kaza, Andhra Pradesh 522508, India
Lat 16.390127° Long 80.539287°
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Google


GPS Map Camera
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EVALUATION

Internal Evaluation for the Community Service Project

Objectives:

- To facilitate an understanding of the issues that confront the vulnerable / marginalized sections of society.
- To initiate team processes with the student groups for societal change.
- To provide students an opportunity to familiarize themselves with the urban / rural community they live in.
- To enable students to engage in the development of the community.
- To plan activities based on the focused groups.
- To know the ways of transforming society through systematic programme implementation.

Assessment Model:

- There shall only be internal evaluation.
- The Faculty Guide assigned is in-charge of the learning activities of the students and for the comprehensive and continuous assessment of the students.
- The assessment is to be conducted for 100 marks.
- The number of credits assigned is 4. Later the marks shall be converted into grades and grade points to include finally in the SGPA and CGPA.
- The weightings shall be:
    - o Activity Log 20 marks
    - o Community Service Project Implementation 30 marks
    - o Mini Project Work 25 marks
    - o Oral Presentation 25 marks
- Activity Log is the record of the day-to-day activities. The Activity Log is assessed on an individual basis, thus allowing for individual members within groups to be assessed this way. The assessment will take into consideration the individual student's involvement in the assigned work.

- While evaluating the student's Activity Log, the following shall be considered -

  a. The individual student's effort and commitment.

  b. The originality and quality of the work produced by the individual student.

  c. The student's integration and co-operation with the work assigned.

  d. The completeness of the Activity Log.

Outcomes Description

a. Details of the Socio-Economic Survey of the village/habitation.

b. Problems identified.

c. Community Awareness Programs organized.

d. Suggested Short-Term and Long-Term Action Plan.

MARKS STATEMENT

(To be used by the Examiners)

INTERNAL ASSESSMENT STATEMENT

Name of the Student:

Programme of Study:

Year of Study:

Group:

Register No/H.T. No:

Name of the College:

University:

SI.No	*Evaluation Criterion*	*Maximum Marks*	*Marks Awarded*
1.	Activity Log	20	
2.	Community Service Project Implementation	30	
3.	Mini Project Work	25	
4.	Oral Presentation	25	
	GRAND TOTAL	100	

Date : **Signature of the Faculty Guide**

Date: **Certified by**

Seal:

Signature of the Head of the Department/Principal