

***From Vision to Impact: A Longitudinal Study
of CSR Initiatives of Paradeep Phosphates
Limited, Mangaluru Unit***

Erstwhile Mangalore Chemical and Fertilizers Limited

By

**Dr. Sebastin K V
Principal Investigator**

**Dr. Rosa Nimmy Mathew
Associate Investigator**

**School of Social Work (Autonomous), Roshni
Nilaya Mangaluru-575002
Re-accredited by NAAC with A' Grade
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PREFACE

Paradeep Phosphates Limited, Mangaluru Unit Erstwhile Mangalore Chemical and Fertilizers Limited, approached the School of Social Work, Roshni Nilaya, Mangaluru, to undertake a research study titled **“From Vision to Impact: A Longitudinal Study of CSR Initiatives of Paradeep Phosphates Limited, Mangaluru Unit Erstwhile Mangalore Chemical and Fertilizers Limited for Viksit Bharat.”**

The study commenced in December 2025 and was completed in May 2026.

The present report is the result of a collaborative effort involving the survey team and subject experts, carried out under the overall coordination and guidance of the undersigned.

Dr Sebastin KV
Associate Professor

Dr. Rosa Nimmy Mathew
Assistant Professor

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This research project, titled “*From Vision to Impact: A Longitudinal Study of CSR Initiatives of Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited, for Viksit Bharat,*” on the CSR initiatives of Paradeep Phosphates Limited, Mangaluru Unit, was undertaken by the Department of Research, School of Social Work, Roshni Nilaya Mangaluru.

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Executive Summary

Corporate Social Responsibility (CSR) has become an important mechanism through which organizations contribute to sustainable development and social progress. In India, CSR initiatives have gained significant importance following the enactment of the Companies Act, 2013, which mandates eligible companies to allocate a portion of their profits toward social development activities. These initiatives are expected to address critical social issues while supporting national development priorities such as education, healthcare, sanitation, environmental sustainability, and rural development.

This report presents the findings of an impact assessment titled “From Vision to Impact: A Longitudinal Study of CSR Initiatives of Paradeep Phosphates Limited, Mangaluru Unit Erstwhile Mangalore Chemical and Fertilizers Limited for Viksit Bharat. “The primary objective of the study was to evaluate the effectiveness, efficiency, and overall impact of CSR initiatives implemented by Paradeep Phosphates Limited, Mangaluru Unit, in communities located around its operational areas. The assessment also sought to understand the extent to which these initiatives contribute to community development and align with broader national development goals.

Paradeep Phosphates Limited, Mangaluru Unit has implemented a range of CSR initiatives aimed at addressing key socio-economic challenges in surrounding communities. The major initiatives evaluated in this study include:

Akshara Mithra (Education Support Programme) – focusing on improving school infrastructure, learning resources, and the overall learning environment.

Eye Care and Health Care Initiatives – providing medical camps, eye screenings, cataract surgeries, and health awareness programmes.

Swachha Vidyalaya Programme – promoting sanitation infrastructure and hygiene awareness in schools.

Community Development Initiatives – focusing on skill development, livelihood opportunities, and community empowerment.

Environmental Sustainability Initiatives – including tree plantation drives, environmental awareness campaigns, and resource conservation efforts.

Mangala Raitha Programme – promoting agricultural awareness and modern farming practices among students and farmers.

Drone project – empowering women towards social, economic, and psychological wellbeing

Together, these programmes aim to promote inclusive development, community well-being, and environmental sustainability, particularly in rural and semi-rural areas.

The study adopted a mixed-methods research design to provide a comprehensive assessment of programme outcomes. Quantitative data were collected through structured surveys and program monitoring records, while qualitative insights were obtained through interviews with key stakeholders, focus group discussions with beneficiaries, and field observations. Participants in the study included students, teachers, school administrators,

community members, farmers, self-help group members, and CSR programme coordinators. This multi-stakeholder approach enabled the study to capture both measurable outcomes and contextual insights regarding the implementation and effectiveness of the CSR initiatives.

The findings of the study indicate that Paradeep Phosphates Limited, Mangaluru Unit 'S CSR initiatives have generated significant positive outcomes across multiple development sectors. In the area of education, the Akshara Mithra programme has contributed to improving the physical infrastructure of schools, including classroom facilities, furniture, and educational resources. These improvements have created a more conducive learning environment for students and have enhanced student engagement and participation in classroom activities. Teachers also reported that improved facilities have supported more effective teaching and learning processes.

Healthcare initiatives implemented by Paradeep Phosphates Limited, Mangaluru Unit have played an important role in addressing gaps in access to medical services, particularly in rural communities. Through health camps and eye care programmes, many individuals have gained access to essential healthcare services that might otherwise have been unavailable or unaffordable. These programmes have also contributed to increased awareness of preventive healthcare practices and early detection of health conditions.

The Swachha Vidyalaya initiative has contributed to improved sanitation infrastructure and hygiene practices in schools. The provision of clean and functional toilet facilities has

improved health conditions and created a more supportive learning environment. These improvements have been particularly beneficial for female students, as access to proper sanitation facilities plays an important role in supporting their regular school attendance and overall well-being.

Community development initiatives implemented by Paradeep Phosphates Limited, Mangaluru Unit have focused on strengthening livelihoods and empowering local populations. Skill development programmes, vocational training initiatives, and support for self-help groups have enabled community members—particularly women and youth—to acquire new skills and participate in income-generating activities. These initiatives have contributed to improving socio-economic conditions and strengthening community resilience. Environmental sustainability programmes have also generated important outcomes by increasing awareness about ecological conservation and sustainable resource management. Activities such as tree plantation drives and environmental education programmes have encouraged communities to adopt environmentally responsible practices and participate in conservation efforts.

The Mangala Raitha programme, which focuses on agricultural awareness, has played a significant role in promoting knowledge of modern agricultural practices among students and farmers. By providing exposure to sustainable farming techniques and agricultural innovations, the programme has contributed to strengthening the connection between education and agricultural livelihoods in rural areas.

Overall, the evaluation indicates that the CSR initiatives implemented by Paradeep Phosphates Limited, Mangaluru Unit, have contributed positively to improving the quality of life of communities in the company's operational areas. The programmes have addressed key developmental challenges while also strengthening relationships between the company and local communities. Importantly, the initiatives demonstrate strong alignment with national development priorities, including improved education, public health, sanitation, environmental sustainability, and rural livelihood development.

Despite these positive outcomes, the study also identified several areas where programme effectiveness can be further enhanced. These include strengthening monitoring and evaluation systems, ensuring the long-term sustainability of infrastructure and resources provided through CSR programmes, enhancing capacity building for programme beneficiaries, and promoting greater community participation in programme planning and implementation.

In conclusion, the findings of this study highlight the significant role that well-designed and effectively implemented CSR initiatives can play in promoting sustainable development. The CSR programmes of Paradeep Phosphates Limited, Mangaluru Unit demonstrate how corporate engagement in social development can contribute to meaningful improvements in education, healthcare, environmental sustainability, and community empowerment. With continued strategic planning, strengthened monitoring mechanisms, and expanded partnerships with stakeholders, these initiatives have the

potential to create even greater long-term social impact and contribute to the broader national vision of Viksit Bharat.

Chapter I- Introduction

1.1 Background of the Study

Corporate Social Responsibility (CSR) has emerged as a significant paradigm shaping the relationship between business organizations and society. Over the past few decades, the role of corporations has expanded beyond the traditional objective of profit maximization to include social, environmental, and ethical responsibilities (Howard R. Bowen, 1953; Archie B. Carroll, 1991). In an increasingly interconnected and globalized world, businesses are expected not only to generate economic value but also to contribute positively to the well-being of communities and the environment in which they operate (Carroll & Shabana, 2010). This shift has led to the growing importance of CSR as a framework that integrates responsible business practices with sustainable development goals (Porter & Kramer, 2011).

Historically, the concept of CSR can be traced back to early philanthropic efforts undertaken by business leaders who believed in giving back to society. In the early stages of industrialization, many companies engaged in charitable activities such as donating to educational institutions, healthcare facilities, and community welfare programs (Bowen, 1953). These initiatives were largely voluntary and were often motivated by ethical values, social expectations, or religious beliefs of business owners. However, these activities were mostly sporadic and not integrated into the core strategy of organizations.

Over time, the understanding of CSR evolved significantly. The expansion of multinational corporations, rising public awareness, and increasing scrutiny from stakeholders such as governments, consumers, investors, and civil society organizations prompted

companies to reconsider their roles in society (Carroll, 1999). CSR gradually moved from a purely philanthropic approach to a more structured and strategic concept that encompasses responsible governance, ethical business conduct, environmental stewardship, and community development (Carroll & Shabana, 2010). Scholars and practitioners began to emphasize that companies must consider the broader impact of their operations on society and the environment while pursuing economic objectives.

The evolution of CSR has also been influenced by various theoretical frameworks and models proposed by researchers. One of the most widely recognized frameworks is the CSR pyramid proposed by Archie B. Carroll (1991), which highlights four dimensions of corporate responsibility: economic, legal, ethical, and philanthropic. According to this model, businesses must first ensure economic viability and legal compliance, while also fulfilling ethical obligations and contributing to societal welfare. This framework helped organizations understand that CSR is not merely about charity but involves a comprehensive approach to responsible business conduct.

In recent years, CSR has become closely linked with the broader agenda of sustainable development. As global challenges such as poverty, climate change, environmental degradation, and social inequality intensify, businesses are increasingly recognized as key actors in addressing these issues (United Nations, 2015). Sustainable development emphasizes meeting the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development, 1987). CSR initiatives play an important role in advancing this goal by promoting responsible production, resource conservation, inclusive growth, and community empowerment.

The integration of CSR into corporate strategy has also given rise to the concept of shared value, where businesses create economic value while simultaneously generating social benefits (Porter & Kramer, 2011). Companies now recognize that long-term success depends not only on financial performance but also on maintaining positive relationships with stakeholders and ensuring the sustainability of resources (Freeman, 1984). CSR initiatives in areas such as education, healthcare, rural development, and environmental protection contribute to improving quality of life while strengthening the social legitimacy of corporations.

Another important aspect of modern CSR is the recognition that sustainable development cannot be achieved by any single entity acting alone. Instead, it requires collaboration among businesses, governments, civil society organizations, and local communities (United Nations, 2015). CSR has therefore evolved into a platform for partnerships that facilitate collective action for social and environmental progress. Governments provide regulatory frameworks and policy support, civil society organizations contribute expertise and community engagement, while businesses bring financial resources, innovation, and managerial capabilities. Together, these stakeholders can address complex developmental challenges more effectively.

Furthermore, CSR is increasingly viewed as an essential component of corporate sustainability and long-term business success. Companies that adopt responsible practices are better positioned to manage risks, enhance their reputation, and build trust among stakeholders (Carroll & Shabana, 2010). Consumers today are more conscious of ethical and environmental issues, and they tend to support companies that demonstrate social responsibility. Similarly,

investors are paying greater attention to environmental, social, and governance (ESG) factors when making investment decisions (Eccles, Ioannou, & Serafeim, 2014). As a result, CSR has become an important driver of competitive advantage and corporate resilience.

In the contemporary business environment, CSR is no longer considered an optional or peripheral activity. Instead, it has become an integral part of corporate governance and strategic management. Organizations are increasingly aligning their CSR initiatives with global sustainability frameworks and national development priorities to create meaningful and measurable impact. CSR programs are now designed to address specific social issues, improve livelihoods, and promote environmental sustainability, thereby contributing to inclusive growth and long-term development.

Against this backdrop, studying CSR initiatives becomes crucial for understanding how corporate interventions influence communities and development outcomes. Evaluating the effectiveness and impact of CSR programs helps organizations refine their strategies, allocate resources efficiently, and enhance accountability. It also provides valuable insights into how businesses can play a transformative role in addressing societal challenges.

The present study, therefore, situates itself within this evolving discourse on CSR and sustainable development. By examining CSR initiatives implemented by Mangalore Chemicals & Fertilizers Limited, the research seeks to understand how corporate efforts translate into meaningful outcomes for communities. In doing so, the study aims to contribute to the broader understanding of CSR as a mechanism for achieving inclusive and sustainable development.

1.2 CSR in the Indian Context

Corporate Social Responsibility (CSR) in India has evolved within a distinctive socio-economic landscape characterized by rapid economic growth alongside persistent developmental challenges (Government of India, 2013). Historically, Indian businesses have had a strong tradition of philanthropy and community engagement (Sundar, 2000).

The introduction of CSR provisions under the Companies Act, 2013 marked a turning point in the evolution of corporate responsibility in India. Section 135 of the Act mandates that companies meeting certain financial thresholds allocate at least two percent of their average net profits towards CSR activities (Government of India, 2013).

The Act also includes Schedule VII, which outlines priority areas such as education, healthcare, environmental sustainability, and rural development (Ministry of Corporate Affairs, 2014). This legal framework has transformed CSR in India from voluntary philanthropy to a structured and accountable approach (KPMG, 2022).

Since the implementation of the CSR mandate, CSR spending in India has increased significantly, with large investments directed toward education, healthcare, sanitation, and environmental sustainability (National CSR Portal, 2023).

CSR initiatives in India are also increasingly aligned with national development programs and the global Sustainable Development Goals (SDGs) (United Nations, 2015).

1.3 CSR and Sustainable Development

In recent decades, the concept of sustainable development has gained global prominence as societies seek to balance economic growth with social equity and environmental protection. Sustainable development emphasizes meeting present needs while safeguarding the ability of future generations to meet their own needs. Within this framework, Corporate Social Responsibility (CSR) has emerged as a vital mechanism through which businesses contribute to global development goals. Corporations possess significant financial resources, technological capabilities, and organizational expertise, enabling them to play a transformative role in addressing some of the world's most pressing challenges such as poverty, inequality, environmental degradation, and climate change.

The global commitment to sustainable development was significantly strengthened with the adoption of the Sustainable Development Goals (SDGs) by the United Nations in 2015. The SDGs comprise 17 interconnected goals aimed at ending poverty, protecting the planet, and ensuring prosperity for all by 2030. Governments alone cannot achieve these ambitious targets; the active participation of businesses, civil society, and communities is essential. In this context, CSR serves as a strategic platform through which corporations align their business operations and social initiatives with global development priorities.

CSR initiatives undertaken by companies often contribute directly to several SDGs, particularly in developing countries where developmental gaps are significant. One of the most important areas where CSR plays a critical role is health and well-being, corresponding to SDG 3. Through healthcare initiatives such as medical camps, preventive health programs, maternal

and child health interventions, and support for healthcare infrastructure, corporations help improve access to quality healthcare services. These initiatives are especially valuable in rural and underserved regions where public health systems may face resource constraints. By investing in community health programs, companies contribute to improving overall health outcomes and enhancing the quality of life of vulnerable populations.

Education is another key area where CSR interventions support sustainable development, aligning with SDG 4, which focuses on ensuring inclusive and equitable quality education for all. Many companies invest in improving school infrastructure, providing scholarships, supporting digital learning, and promoting vocational and skill development programs. Such initiatives enhance educational opportunities, empower youth, and improve employability, thereby contributing to long-term socio-economic development. Education-focused CSR programs also play a crucial role in bridging gaps in access to learning resources and fostering human capital development.

CSR also contributes significantly to improving water, sanitation, and hygiene conditions, which are central to SDG 6. In many developing regions, inadequate sanitation facilities and limited access to clean water continue to pose major public health challenges. Corporate initiatives aimed at constructing toilets in schools, promoting hygiene awareness, supporting clean drinking water systems, and improving sanitation infrastructure help address these challenges. These interventions not only improve health outcomes but also promote dignity, particularly for women and children, while enhancing the overall quality of life within communities.

Another important dimension of CSR is its contribution to decent work and economic growth, as emphasized in SDG 8. Companies support this goal by promoting skill development, livelihood generation, entrepreneurship, and employment opportunities within local communities. CSR initiatives that focus on vocational training, capacity building, and support for microenterprises enable individuals to improve their economic conditions and achieve financial stability. Such initiatives are particularly important in rural and marginalized communities, where access to employment opportunities may be limited.

Environmental sustainability is also a central component of CSR, aligning with SDG 13, which focuses on climate action. Businesses are increasingly recognizing the importance of reducing their environmental footprint and supporting initiatives that address climate change. CSR programs often include activities such as tree plantation, water conservation, renewable energy adoption, waste management, and environmental awareness campaigns. These initiatives contribute to the preservation of natural resources and help mitigate the adverse effects of climate change, thereby promoting ecological balance and sustainability.

An important concept that connects CSR with sustainable development is the idea of shared value. This approach emphasizes that businesses can create economic value in ways that also generate social and environmental benefits. Rather than viewing CSR as merely a philanthropic obligation, the shared value approach encourages companies to integrate social concerns into their core business strategies. For example, a company operating in the agricultural sector may support sustainable farming practices, improve farmers' productivity, and enhance rural livelihoods while simultaneously strengthening its supply chain and market

sustainability. In this way, CSR becomes a mutually beneficial strategy that supports both corporate growth and community development.

The integration of CSR with sustainable development also promotes collaboration among various stakeholders. Governments provide policy frameworks and development priorities, businesses contribute financial and technical resources, and civil society organizations facilitate community engagement and implementation. Such partnerships enhance the effectiveness of development initiatives and enable scalable solutions to complex social and environmental challenges.

Hence, CSR plays a crucial role in advancing the global agenda of sustainable development by aligning corporate efforts with broader societal goals. By contributing to areas such as health, education, sanitation, economic empowerment, and environmental conservation, companies support the realization of the Sustainable Development Goals. The alignment of CSR with sustainable development not only strengthens community well-being but also enhances corporate reputation, resilience, and long-term sustainability. As businesses continue to integrate social and environmental considerations into their operations, CSR will remain an important driver of inclusive and sustainable growth.

1.4 Profile of Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical And Fertilizers Limited

Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical And Fertilizers Limited Is one of the prominent fertilizer manufacturing companies in India and has played a significant role in supporting agricultural development, particularly in the southern

region of the country. Established with the objective of ensuring the availability of high-quality fertilizers to farmers, the company has contributed extensively to improving agricultural productivity and soil health. Over the years, Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical And Fertilizers Limited has built a strong reputation in the fertilizer industry through its focus on innovation, operational efficiency, and commitment to sustainable agricultural practices.

In recent developments, Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical And Fertilizers Limited has come under the strategic control of Paradeep Phosphates Limited, marking an important phase in the company's growth and transformation. This acquisition is expected to strengthen the fertilizer sector by integrating resources, expertise, and distribution networks, thereby enhancing the availability of fertilizers to farmers across different regions of India. The integration also aligns with the broader goal of strengthening India's agricultural supply chain and supporting national food security.

Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited has been an important player in the fertilizer sector, producing a variety of fertilizers essential for crop productivity, including complex fertilizers and plant nutrients. The company's manufacturing facilities and distribution networks have enabled it to serve a large number of farmers, particularly in Karnataka and neighboring states. By providing essential agricultural inputs and promoting balanced fertilization practices, Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited has contributed to improving crop yields and supporting the livelihoods of farming communities.

Agriculture continues to be a critical sector in India's economy, providing employment to a significant portion of the population and ensuring food security for the nation. Fertilizer companies like Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited play a vital role in strengthening this sector by ensuring the timely supply of quality fertilizers and supporting sustainable farming practices. Through farmer education programs, awareness campaigns, and technical guidance, the company has helped farmers adopt scientific agricultural methods and improve soil fertility management.

With the transition under Paradeep Phosphates Limited, is expected to benefit from enhanced technological capabilities, improved operational efficiencies, and expanded market reach. This strategic partnership is likely to strengthen the company's ability to support farmers while maintaining high standards of environmental sustainability and corporate responsibility.

In addition to its industrial contributions, Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited has consistently emphasized sustainability and responsible business practices. The company has implemented internationally recognized management systems, including ISO 14001:2015 for environmental management and ISO 45001:2018 for occupational health and safety. These certifications highlight the organization's commitment to minimizing environmental impact, ensuring safe working conditions, and promoting sustainable industrial operations.

The vision of Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited extends beyond business growth to encompass social and environmental development. The company recognizes the interdependence between business

success and community well-being, particularly in rural and agricultural regions. As a result, Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited has integrated sustainability principles into its corporate philosophy, focusing on inclusive growth, environmental stewardship, and community empowerment.

Corporate Social Responsibility (CSR) forms a key component of the company's commitment to sustainable development. Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited's CSR philosophy is centered on creating long-term value for communities while addressing key social and environmental challenges. The company implements its CSR initiatives in alignment with national priorities and the provisions of the Companies Act, 2013, ensuring transparency and accountability in its programs.

The CSR policy of Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited focuses on several priority areas, including education, healthcare, sanitation, environmental sustainability, and rural development. Through educational initiatives, the company supports school infrastructure, promotes sports and extracurricular development, and encourages inclusive education for children. Healthcare programs include medical camps, eye care initiatives, and awareness programs aimed at improving community health outcomes.

Sanitation and hygiene have also been key areas of intervention, particularly through initiatives that support the development of sanitation infrastructure in schools and

communities. These efforts contribute to improving public health and promoting a safe and hygienic environment, especially for children.

Environmental sustainability remains a central aspect of the company's CSR strategy. Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited undertake initiatives such as tree plantation drives, water conservation activities, and environmental awareness programs aimed at protecting natural resources and promoting ecological balance. These initiatives are particularly relevant in the context of agriculture, where environmental sustainability is closely linked to long-term productivity and food security.

Furthermore, Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited actively promotes community development initiatives that empower local populations and enhance their socio-economic well-being. Programs focusing on skill development, livelihood promotion, and youth engagement help strengthen community resilience and create opportunities for sustainable growth. The company also promotes agricultural awareness among students and farmers through initiatives that encourage interest in farming and disseminate knowledge about modern agricultural practices.

The evolution of Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited under the strategic leadership of Paradeep Phosphates Limited represents a new chapter in its journey. While continuing its legacy of supporting agriculture and rural development, the company is well-positioned to expand its impact through enhanced capabilities and stronger integration within the fertilizer sector. The

organization's vision, sustainability commitments, and CSR philosophy provide a solid foundation for implementing initiatives that contribute to inclusive growth, agricultural advancement, and long-term community development.

1.5 CSR Initiatives of Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited

Corporate Social Responsibility (CSR) forms an integral part of the development approach adopted by Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited. Recognizing the interdependence between business growth and community well-being, the company has designed and implemented several CSR initiatives aimed at improving the quality of life of communities, particularly in rural and agricultural regions. These initiatives focus on key areas such as education, healthcare, sanitation, environmental sustainability, and agricultural awareness. The CSR programs are primarily implemented in the areas surrounding the company's operations and in regions where farmers and rural communities depend on agriculture for their livelihoods. Through these initiatives, Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited aims to contribute to inclusive development while strengthening its relationship with stakeholders.

Akshara Mithra (Education)

The Akshara Mithra initiative represents Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited's commitment to promoting quality education and supporting the holistic development of students. Under this program, the company focuses on improving educational infrastructure and creating a conducive learning

environment in government schools. Activities under Akshara Mithra include the renovation of school buildings, provision of learning materials, development of sports facilities, and support for children with special needs.

The primary beneficiaries of this initiative are students from rural and economically disadvantaged backgrounds who often lack access to adequate educational resources. By improving school infrastructure and providing educational support, the program helps enhance learning outcomes and encourages student participation in academic and extracurricular activities. The initiative is implemented mainly in rural areas surrounding Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited's operational regions, particularly in Karnataka and neighboring communities. Strategically, Akshara Mithra contributes to long-term human capital development by empowering students with better educational opportunities and fostering a culture of learning and growth.

Eye Care and Health Care Initiatives

Healthcare forms another important component of Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited's CSR Efforts. Through its Eye Care and Health Care initiatives, the company aims to improve access to basic health services among rural populations. These programs typically include the organization of free medical camps, eye screening camps, distribution of spectacles, and facilitation of cataract surgeries for individuals suffering from vision-related problems.

The key beneficiaries of these initiatives include rural residents, elderly individuals, school children, and economically disadvantaged communities who may not have regular

access to healthcare facilities. These health programs are conducted in villages and communities located in the vicinity of Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited's operations, and other underserved areas. By addressing healthcare needs at the grassroots level, the company helps improve the overall health and well-being of the community.

From a strategic perspective, these initiatives contribute to enhancing the quality of life and productivity of the population. Healthy communities are better equipped to participate in economic activities, particularly agriculture, which remains the backbone of rural livelihoods. Thus, the healthcare initiatives align with Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited's broader commitment to community development and social welfare.

Swachha Vidyalaya (Sanitation and Hygiene)

The Swachha Vidyalaya initiative focuses on improving sanitation and hygiene facilities in schools and communities. Recognizing that access to proper sanitation is essential for health, dignity, and educational continuity, Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited supports the construction and maintenance of sanitation infrastructure in schools. The initiative also promotes awareness about hygiene practices among students and local communities.

The main beneficiaries of this program are school children, particularly girls, who often face challenges due to inadequate sanitation facilities in schools. By providing clean and safe sanitation facilities, the initiative helps reduce absenteeism and encourages continued

education among students. The program is implemented primarily in government schools located in rural areas near the company's operational zones.

Strategically, the Swachha Vidyalaya initiative contributes to public health improvement and supports national sanitation goals. It also complements educational initiatives by ensuring that students have access to a healthy and supportive learning environment.

Community Development Initiatives

Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited actively engage in a range of community development initiatives aimed at empowering local populations and improving their socio-economic conditions. These initiatives include the promotion of self-help groups (SHGs), vocational training programs, development of community infrastructure, and support for sports and youth development activities.

The target beneficiaries of these initiatives include women, youth, and rural households who can benefit from skill development and livelihood opportunities. By encouraging the formation of self-help groups and providing training in income-generating activities, the company helps communities become more self-reliant and economically stable. These programs are primarily implemented in villages located around the company's operational areas and other rural regions where developmental needs are significant.

From a strategic standpoint, community development initiatives strengthen social capital and foster sustainable development at the grassroots level. By empowering

communities and promoting inclusive growth, Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited contribute to building resilient and self-sufficient rural societies.

Environmental Sustainability Programs

Environmental sustainability is a key priority in Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited's CSR framework. The company undertakes various initiatives aimed at protecting natural resources and promoting ecological balance. These initiatives include tree plantation drives, water conservation programs, promotion of renewable energy, and awareness campaigns on environmental protection.

The beneficiaries of these initiatives extend beyond individuals to include entire communities and ecosystems. Environmental programs are implemented in both rural and urban areas surrounding the company's operations, with particular emphasis on regions where agricultural activities depend on natural resources such as soil and water.

Strategically, environmental sustainability programs help address challenges related to climate change, resource depletion, and ecological degradation. These initiatives also support sustainable agriculture, which is closely linked to the core operations of the company. By promoting environmental stewardship, Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited contributes to long-term ecological sustainability and community well-being.

Mangala Raitha Prathibhe

The Mangala Raitha Prathibhe initiative is a unique CSR program designed to promote agricultural awareness and interest among students and farmers. Through this initiative, the company organizes educational programs, demonstrations, and awareness campaigns that highlight the importance of agriculture and modern farming techniques. The program encourages students to understand agricultural practices and develop an appreciation for the farming sector.

The primary beneficiaries include school students, young individuals, and farmers who can gain knowledge about sustainable agricultural practices and innovations in farming. The initiative is implemented in rural areas where agriculture forms the primary source of livelihood. By engaging students and farmers in agricultural learning, the program helps strengthen the connection between education and agriculture.

Strategically, the Mangala Raitha Prathibhe initiative supports the long-term sustainability of agriculture by promoting awareness, innovation, and knowledge sharing. It also aligns closely with Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited's core business of supporting agricultural productivity and farmer welfare.

Strategic Importance of Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited's CSR Initiatives

Collectively, the CSR initiatives of Paradeep Phosphates Limited reflect a holistic approach to community development. The programs address critical areas such as education,

healthcare, sanitation, environmental conservation, and agricultural awareness, thereby contributing to the overall socio-economic development of communities. By targeting rural populations and vulnerable groups, the company ensures that its CSR efforts reach those who need them the most.

The geographical focus of these initiatives primarily includes regions surrounding the company's operational areas, particularly in Karnataka and neighboring states. This localized approach enables the company to understand community needs more effectively and implement interventions that are contextually relevant.

In strategic terms, Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited's CSR initiatives help strengthen community relationships, promote sustainable development, and enhance the company's social responsibility profile. These initiatives not only create positive social impact but also support long-term business sustainability by fostering trust and collaboration between the company and its stakeholders. Through these efforts, Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited demonstrates how corporate engagement can play a vital role in improving livelihoods and contributing to inclusive development.

1.6 Need for the Study

Corporate Social Responsibility (CSR) has gained significant prominence in recent years, particularly in countries like India where corporate participation in social development has been institutionalized through legislation such as the Companies Act, 2013. Many corporations have undertaken a wide range of CSR initiatives aimed at improving education,

healthcare, sanitation, environmental sustainability, and rural livelihoods. While these initiatives have contributed positively to community development, there remains a critical need to systematically assess their effectiveness and long-term impact. In many cases, CSR activities are documented in terms of financial expenditure or the number of programs implemented, but comprehensive evaluations that examine actual outcomes and long-term changes in communities are relatively limited. This gap highlights the importance of conducting rigorous research studies that assess the real impact of CSR interventions.

Another important reason for undertaking this study is the growing recognition of the importance of longitudinal research in understanding development interventions. Most CSR assessments are conducted as short-term reviews that focus on immediate results. However, social change often occurs gradually and may take several years to become visible. Longitudinal studies, which examine changes over a period of time, are particularly useful in understanding whether CSR initiatives lead to sustainable improvements in education, health, livelihoods, and environmental conditions. Such studies provide deeper insights into the continuity, effectiveness, and long-term value of CSR programs. By examining trends and outcomes over time, longitudinal research helps identify both successes and areas that require improvement.

In the context of CSR initiatives implemented by Paradeep Phosphates Limited, there is a need to systematically evaluate the impact of various programs undertaken in the areas of education, healthcare, sanitation, community development, environmental sustainability, and agricultural promotion. While these initiatives have been widely appreciated for their contributions to community welfare, a comprehensive study is necessary to understand how

these programs have influenced the lives of beneficiaries over time. Assessing the effectiveness and sustainability of these initiatives will provide valuable insights into how CSR programs can be strengthened and replicated in other contexts.

Another important aspect that underscores the need for this study is the shift in CSR thinking from measuring outputs to evaluating outcomes and impact. Outputs refer to the immediate results of an activity, such as the number of beneficiaries or the infrastructure created, whereas outcomes refer to the changes or improvements that occur as a result of these activities. Impact, on the other hand, refers to the broader and long-term transformations in communities. In recent years, stakeholders including policymakers, investors, and community organizations have increasingly emphasized the importance of understanding the outcomes and impact of CSR programs. This shift highlights the need for research studies that analyze how CSR initiatives contribute to meaningful and sustainable development.

Accountability and transparency are also key factors driving the need for systematic CSR evaluation. Since CSR funds are intended to support social development, it is important to ensure that these resources are utilized effectively and produce measurable benefits. Companies are expected to demonstrate responsible use of CSR funds and provide evidence of the positive impact created through their initiatives. Research studies that evaluate CSR programs contribute to strengthening accountability by providing an objective assessment of their performance. Such studies also help companies identify best practices, improve program design, and enhance the effectiveness of their CSR strategies.

Furthermore, evidence-based CSR is becoming increasingly important in the contemporary development landscape. Policymakers, development agencies, and corporate organizations require reliable data and research findings to design interventions that address real community needs. Studies that systematically examine CSR initiatives contribute to the body of knowledge on corporate involvement in social development and help inform future CSR policies and practices. They also facilitate collaboration between corporations, academic institutions, and development organizations in promoting sustainable development.

Evaluating CSR initiatives is particularly important in sectors that are closely linked to rural livelihoods and environmental sustainability, such as agriculture. Companies operating in the fertilizer and agricultural sector play a crucial role in supporting farmers and rural communities. Understanding how CSR initiatives in these sectors contribute to improving agricultural awareness, environmental conservation, and community well-being can provide valuable insights for both policymakers and corporate leaders.

Therefore, the present study, titled *“From Vision to Impact: A Longitudinal Study of CSR Initiatives of Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited for Viksit Bharat,”* seeks to address these gaps by conducting a comprehensive evaluation of CSR programs implemented by Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited. The study aims to examine the relevance, effectiveness, efficiency, and sustainability of these initiatives and to understand their long-term impact on communities. By adopting a longitudinal approach, the research intends to generate meaningful insights into how CSR interventions contribute to inclusive development and social transformation. The need for evaluating CSR initiatives

arises from the growing emphasis on measuring outcomes and long-term impact rather than just outputs (OECD, 2019). Longitudinal research is particularly important in understanding the sustainability of development interventions (Menard, 2002).

1.7 Significance of the Study

The present study, *“From Vision to Impact: A Longitudinal Study of CSR Initiatives of Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited for Viksit Bharat,”* holds significant value from academic, corporate, policy, and national development perspectives. As Corporate Social Responsibility (CSR) continues to evolve as a strategic component of business operations, systematic research on its outcomes and long-term impact becomes increasingly important. This study contributes to a deeper understanding of how CSR initiatives can effectively address socio-economic challenges and support sustainable development.

Academic Contribution to CSR Research

From an academic standpoint, the study contributes to the growing body of literature on CSR and development studies. While many existing studies focus on CSR policies or short-term evaluations, there is limited research that examines the long-term impact of CSR initiatives using a longitudinal approach. By analyzing the CSR initiatives of Mangalore Chemicals & Fertilizers Limited over time, this research provides empirical evidence on how corporate interventions influence education, healthcare, sanitation, environmental sustainability, and community development.

The study also enriches academic discussions by applying evaluation frameworks that assess relevance, effectiveness, efficiency, impact, and sustainability. Such an approach helps bridge the gap between theoretical perspectives on CSR and practical outcomes observed in communities. Furthermore, the research can serve as a reference for scholars, researchers, and students interested in CSR, sustainable development, and corporate governance, particularly in the Indian context. It may also encourage future studies that examine CSR impact across different sectors and regions.

Practical Value for Corporations

The findings of this study have significant practical implications for corporations engaged in CSR activities. By systematically evaluating CSR initiatives, the research provides insights into what works effectively and what areas require improvement. Corporations can use these insights to design more targeted and impactful CSR programs that respond to the real needs of communities.

For companies, CSR is not only a regulatory requirement but also an opportunity to build strong relationships with stakeholders and enhance their reputation as responsible organizations. The study will help corporate leaders understand how CSR initiatives can create long-term value for both society and the organization. It will also highlight best practices in CSR implementation, monitoring, and evaluation, which can be adopted by other companies seeking to strengthen their CSR strategies. Research on CSR contributes to academic knowledge and policy development by providing empirical evidence on corporate involvement in development (Carroll, 1999; Porter & Kramer, 2011).

Policy Implications

The study also has important implications for policymakers and development practitioners. As CSR has become a statutory obligation under India's corporate governance framework, understanding the effectiveness of CSR initiatives is crucial for improving policies and guidelines related to corporate responsibility. The findings of this research can provide useful inputs for policymakers in refining CSR frameworks and encouraging impact-oriented CSR practices.

Furthermore, the study can support the development of policies that promote collaboration between corporations, government agencies, and civil society organizations. By identifying successful models of CSR implementation, policymakers can encourage replication of such initiatives in other regions and sectors. The research may also contribute to strengthening mechanisms for monitoring and evaluating CSR programs, ensuring that corporate investments lead to meaningful social outcomes.

Contribution to the Vision of Viksit Bharat

One of the broader contributions of this study lies in its alignment with India's national development vision of building a developed and inclusive nation. The concept of Viksit Bharat emphasizes sustainable economic growth, social equity, environmental protection, and improved quality of life for all citizens. CSR initiatives that focus on education, healthcare, sanitation, environmental conservation, and livelihood development directly support these national priorities. By evaluating the impact of CSR programs in rural and community settings, the study highlights how corporate efforts can complement government initiatives aimed at

national development. In this context, the role of businesses becomes crucial in accelerating progress toward inclusive growth and sustainable development. The findings of the study can demonstrate how strategic CSR initiatives contribute to strengthening communities and supporting the development agenda of the Government of India.

Moreover, the study underscores the importance of partnerships between corporations, communities, and policymakers in achieving long-term development goals. By providing evidence on the effectiveness of CSR interventions, the research contributes to the broader discourse on how corporate responsibility can support national transformation and social progress.

Conclusion

In conclusion, this chapter has provided a comprehensive overview of the study by presenting the conceptual background of Corporate Social Responsibility and its growing importance in promoting sustainable development. It has also highlighted the evolution of CSR in the Indian context and the role of corporate initiatives in addressing socio-economic and environmental challenges. The chapter further introduced the profile of Mangalore Chemicals & Fertilizers Limited and discussed its major CSR initiatives that focus on education, healthcare, sanitation, environmental sustainability, community development, and agricultural awareness. In addition, the need and significance of the study were outlined to emphasize the importance of evaluating CSR interventions in a systematic and evidence-based manner. Finally, the research objectives, scope of the study, and organization of the report were presented, laying the foundation for the subsequent chapters of the study.

Chapter II- Methods

The methodology adopted to evaluate the CSR interventions of Paradeep Phosphates Limited was designed to ensure a systematic, rigorous, and multidimensional assessment of the six key initiatives—Akshara Mithra (Education), Eye Care & Health, SwachhaVidyalaya (Sanitation & Hygiene), Community Development, Environment Sustainability, and Mangala Raitha Prathibhe (Agriculture Promotion). Given the varied nature of these programmes, a mixed-methods approach was utilised to capture both measurable outcomes and deeper experiential insights from stakeholders.

This methodology aligns closely with national developmental goals under the Viksit Bharat, and initiatives such as the Swachh Bharat Mission, ensuring that the evaluation framework remains relevant to contemporary development priorities. Quantitative methods contributed to analysing reach, performance indicators, and utilisation patterns, while qualitative methods provided nuanced understanding of behavioural changes, perceptions, and contextual experiences.

2.1 Aim

To assess the effectiveness, efficiency, and overall impact of Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited's CSR initiatives across the domains of education, health, sanitation, agriculture, environment, and community development.

2.2 Specific Objectives

- Evaluate improvements in educational access, support systems, and infrastructure under Akshara Mithra.
- Assess outreach, screening effectiveness, and preventive health outcomes of Eye Care & Health programmes.
- Examine sanitation facility utilisation, hygiene behaviour, and health awareness under Swachha Vidyalaya.
- Assess the effectiveness of vocational training, SHGs, and livelihood-oriented community development initiatives.
- Measure environmental restoration activities, awareness levels, and community engagement in sustainability.
- Evaluate the agricultural awareness and training outcomes under Mangala Raitha Prathibhe, particularly among students.
- To evaluate the impact of agricultural drone technology provided by Paradeep Phosphates Limited, Mangaluru Unit, on the productivity, efficiency, and empowerment of women in self-help groups engaged in fertilizer sowing, crop monitoring, and seed sowing in Karnataka and Tamil Nadu.

2.3 Research Design

A Mixed Methods research design combining quantitative and qualitative approaches was used to obtain a comprehensive evaluation.

2.4 Design Characteristics

- **Nature:** Descriptive and exploratory
- **Time Frame:** Cross-sectional with longitudinal elements across multiple programme years
- **Quantitative Tools:** Structured surveys, monitoring data, institutional records
- **Qualitative Tools:** KIIs, case studies, field observations

This blended approach facilitated triangulation of findings and allowed the study to capture both the scope and depth of programme impact.

Population and Sampling

The population comprised individuals directly and indirectly involved in CSR programmes—students, teachers, health beneficiaries, SHG members, farmers, community leaders, and institutional staff.

A combination of random and purposive sampling was adopted based on the programme context and feasibility.

2.5 Population & Sample Overview: Table 1

CSR Initiative	Target Population	Sampling Method	2020–21 P/S	2021–22 P/S	2022–23 P/S	2023–24 P/S	2024–25 P/S
Akshara Mithra	Students, teachers, school staff	Random	39/19	7/3	13/6	13/6	13/6
Eye Care & Health	Camp beneficiaries, health staff	Random	6/3	5/3	4/2	16/8	9/5
Swachha Vidyalaya	Institution staff	Random	5/3	4/2	8/4	4/2	6/3
Community Development	SHG members, trainees	Purposive	2/2	5/3	4/2	5/3	5/3
Environment Sustainability	Community members, leaders	Purposive	1/1	3/2	1/1	10/5	3/2
Mangala Raitha Prathibhe	Students, agri-trainers	Random	–	–	31/15	11/6	–

Table 2: Distribution of the Sample in drone project

S No	Districts	Farmers	Sample Size	SHG Members	Sample Size
01	Yadgir- 02	60	30	12	06
02	Raichur – 01	75	37	15	08
03	Koppal- 01	50	25	10	05
04	Bidar – 01	65	33	13	07
05	Davangere	35	18	07	04
06	Belagavi – 02	75	38	15	08
07	Haveri – 01	65	33	13	07
08	Shivamogga - 01	60	30	12	06
09	Chamarajanagara - 02	50	25	10	05
10	Kolara -01	75	38	15	07
	Total	610	307	122	63

2.6 Data Collection Procedure

The data collection was carried out in a structured and systematic manner:

1. **Tool Design & Piloting:** Drafting surveys, FGD observation and interview schedules, followed by piloting in selected communities.
2. **Enumerator Training:** Orientation on interviewing skills, ethical protocols, cultural sensitivity, and data accuracy.
3. **Fieldwork:**
 - Quantitative surveys administered to beneficiaries across all programme domains.
 - KIIs with teachers, farmers, project coordinators, and health workers.
 - Observations of school sanitation facilities, environmental sites, agricultural practices, and community activities.
4. **Data Validation:** Supervisors performed real-time checks, spot verifications, and rectified inconsistencies.
5. **Data Entry & Cleaning:** Data coding, digitisation, cross-verification, and cleaning using Excel/SPSS.
6. **Analysis:** Statistical analysis for quantitative data and thematic coding for qualitative data.

2.7 Phases of the Research

The evaluation followed six structured phases to ensure methodological rigour and clarity.

Phase 1: Planning

- Conducted literature review aligning with national policies such as Viksit Bharat.
- Stakeholder consultations with Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited CSR team, coordinators, teachers, health professionals, and community leaders.
- Development of evaluation indicators, frameworks, and logic models.
- Drafting of survey tools, interview schedules, and observation formats.

Phase 2: Pre-Field Preparation

- Pilot testing of tools in selected communities.
- Refinement of tool content, language, and sequence based on pilot insights.
- Intensive enumerator training on field protocols, ethics, and neutrality.
- Finalisation of sampling frames and sample selection.

Phase 3: Fieldwork

- Administration of surveys across schools, communities, and health camps.
- Conducting FGDs with students, SHGs, farmers, and teachers.
- KIIs with principals, community leaders, health staff, and project coordinators.
- Field observations of project sites, infrastructure, environmental activities, and agricultural training.
- Daily field monitoring and supervision to maintain data accuracy.

Phase 4: Analysis

- Coding, data entry, and cleaning of quantitative datasets.
- Descriptive statistical analysis to compute frequencies, percentages, means, SDs.
- Qualitative coding through open, axial, and thematic coding frameworks.
- Cross-case analysis across six projects to identify patterns and variances.
- Triangulation of quantitative trends with qualitative narratives.

Phase 5: Reporting

- Drafting project-wise result chapters.
- Integrating quantitative findings, thematic analysis, and beneficiary narratives.
- Preparation of case studies and evidence-based interpretations.
- Conducting validation workshops with Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited and community stakeholders.
- Finalising the report with tables, graphs, and structured recommendations.

Phase 6: Dissemination

- Presentations of findings to Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited, school authorities, community groups, and other stakeholders.
- Feedback sessions to refine insights and discuss programme implications.
- Use of findings for CSR planning, scaling, and strategic decision-making.

2.8 Ethical Considerations

- **Informed Consent:** Clear communication about study purpose, voluntary participation, and privacy.
- **Confidentiality:** No personal identifiers used; data stored securely.
- **Protection of Minors:** Additional safeguards during interactions with students.
- **Cultural Sensitivity:** Tools translated and adapted to local languages and socio-cultural contexts.
- **Data Integrity:** Commitment to transparency, neutrality, and responsible reporting.

Chapter III- Results and Discussion

3.1 Introduction

This Results and Discussion chapter presents a comprehensive evaluation of the six major CSR initiatives implemented by Mangalore Chemicals and Fertilizers Limited—spanning education, sanitation, health, agriculture, environmental sustainability, and community development. Drawing from both quantitative and qualitative data across six project domains, the chapter synthesises the overall impact, stakeholder experiences, and the transformative outcomes generated through these interventions.

Collectively, the CSR projects are aligned with India’s national developmental vision, including the Viksit Bharat, and the Swachh Bharat Mission. These initiatives emphasise inclusive growth, human development, and sustainable community empowerment—core principles reflected throughout Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited’s CSR framework. While quantitative findings

demonstrate improvements in learning outcomes, sanitation standards, health practices, agricultural productivity, and environmental responsibility, qualitative insights illuminate the lived experiences, community engagement patterns, and contextual relevance that underpin these measurable changes.

To provide clarity and coherence, the chapter is organised into six structured subsections, each dedicated to one CSR project:

Subsections Covered in This Chapter

Akshara Mithra Project (Education Support)

Swaccha Vidyalaya (School Sanitation and Hygiene)

Health Initiatives

Mangala Raitha Prathibhe

Environment Sustainability Initiatives

Community Development Programmes

Drone Project

Through this structured presentation, the chapter provides a holistic understanding of Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemical and Fertilizers Limited's CSR contributions and their alignment with the national agenda for a developed, inclusive, and self-reliant India envisioned under the Viksit Bharat mission. The integrated discussion identifies strengths, emerging challenges, and evidence-based recommendations for future expansion and sustainability of the programmes.

The chapter is organized into three main sections. The first section presents quantitative results through item-wise descriptive tables, followed by detailed interpretation and discussion using relevant scholarly literature. The second section provides qualitative findings in the form of narrative case studies and a cross-case comparison across the three institutions. The final section integrates both data sources to highlight convergences, divergences, and the overall implications of the CSR initiative. Taken together, these findings offer comprehensive evidence of the program's effectiveness and areas where further strengthening is required.

3.2 Section 1: Akshara Mithra

Quantitative Analysis of Project 1: Akshara Mithra

This section presents the quantitative evaluation of Project 1 – Akshara Mithra, the flagship education-focused CSR initiative. The analysis captures improvements across 35 sample schools supported under the project. Indicators relate to infrastructure, learning resources, teaching–learning quality, academic performance, attendance, and admissions.

3.2.1 Introduction

Akshara Mithra aims to enhance the learning environment and educational outcomes in government schools by strengthening infrastructure, providing learning resources, supporting teachers, and creating learner-friendly systems.

To measure the effectiveness of these interventions, a quantitative analysis was conducted across 35 sample schools. This section presents the statistical outcomes and interprets the scale and depth of the project's impact.

The analysis covers six key performance indicators, aligned with the goals of Akshara Mithra:

Improvement in Physical Infrastructure

Improvement in Access to Learning Resources

Teaching–Learning Process Strengthening

Academic Performance Improvement

Attendance Improvement

Admission Improvement

3.2.2 Descriptive Statistics

Table 3:

Quantitative Summary of Improvements under Akshara Mithra

Key Outcome Indicator	Schools Showing Improvement	Total Schools	% Improvement
Physical Infrastructure	33	35	94.3%
Learning Resources Access	33	35	94.3%
Teaching–Learning Process	30	35	85.7%
Academic Performance	20	35	57%
Student Attendance	22	35	62.85%
Admissions	23	35	65.71%

The project shows high success rates in infrastructure, learning resources, and teaching quality enhancements. Student outcome indicators such as attendance, admissions, and academic performance show moderate-to-low improvements, suggesting the need for deeper behavioural and pedagogical strategies.

1. Physical Infrastructure Improvement

The data indicates that 94.3% of schools experienced improvements in physical infrastructure, such as renovated classrooms, improved benches and desks, repaired walls and floors, enhanced ventilation, and better sanitation facilities. Infrastructure upgrades significantly contribute to creating safer and more stimulating learning environments (UNESCO, 2021). Research consistently highlights that well-maintained school facilities positively influence student motivation, teacher satisfaction, and classroom engagement (Earthman, 2004). In the context of the Akshara Mithra CSR initiative, the visible transformation in school ambience likely boosted community perception and trust in the school system. As CSR programmes often target foundational needs first (OECD, 2020), these improvements demonstrate strong alignment between corporate interventions and school-level requirements. However, while physical improvements provide essential prerequisites for quality education, they do not directly guarantee learning gains—rather, they enhance the conditions necessary for effective teaching and learning to occur.

2. Access to Learning Resources

A similar 94.3% improvement was observed in access to learning resources. CSR contributions such as providing books, school bags, computer systems, digital aids, stationery and classroom learning materials played a substantial role in enriching the academic

ecosystem. Literature shows that the availability of instructional materials is strongly correlated with improved classroom participation and academic performance (Hanushek, 2016). Enhanced access to resources particularly supports underserved students who may lack access to learning tools at home. Further, resource availability enables teachers to adopt activity-based and experiential pedagogies, aligning with NEP 2020 recommendations for holistic and competency-based education (Ministry of Education, 2020). Thus, the improvement in learning resources not only strengthens instructional processes but also reduces learning disparities among students.

3. Teaching–Learning Process Improvement

Improvements in teaching–learning processes in 85.7% of schools indicates that the initiative had a substantial effect on pedagogical quality. The integration of new resources (books, computers, desks, visual aids) and improved classroom environments directly supports more interactive and learner-centric teaching practices. According to Darling-Hammond et al. (2017), resource-supported classrooms enable teachers to diversify instructional strategies, resulting in higher student engagement and better comprehension. Enhanced teacher motivation due to improved school conditions may also play a role, as research suggests that teacher morale improves markedly with better infrastructure and adequate materials (Avalos, 2011). The CSR initiative's contributions—such as classroom repairs, learning kits, and technology devices—likely helped educators move towards participatory methods rather than rote-based instruction. These process-level improvements are critical because they mediate between infrastructural inputs and student learning outcomes.

4. Academic Performance Improvement

Academic performance improved in 57.1% of schools, indicating moderate but meaningful gains. This outcome suggests that while infrastructure and pedagogical processes have strengthened, academic achievement responds more slowly to interventions. Literature confirms that learning outcomes are influenced by a combination of school inputs, teacher quality, home environment, and socio-economic conditions (Banerjee & Duflo, 2011). While CSR initiatives provided meals, learning aids, books, and digital resources, the learning gains may take longer to materialize due to varying baseline levels and student needs. The moderate improvement in performance signals that foundational interventions are beginning to translate into measurable outcomes but require sustained follow-up, such as remedial classes, mentorship, and personalised learning support. Academic outcomes typically evolve as cumulative effects of continuous school improvements (UNICEF, 2019), suggesting that the gains seen here form an important early stage of long-term educational impact.

5. Student Attendance Improvement

Only 62.85% of schools reported improved attendance, reflecting that attendance is deeply shaped by external socio-economic factors. Despite CSR support such as school bags, meals, improved seating arrangements, and safe classroom spaces, students' school attendance is influenced by household responsibilities, seasonal migration, health issues, and parental awareness levels (Jena, 2022). While improved school environment and resource availability provide incentives for regular attendance, these may not fully counteract barriers at the family or community level. The limited improvement aligns with previous studies showing that infrastructure upgrades alone are insufficient to produce large shifts in attendance unless paired

with community outreach, nutritional support, and parental engagement initiatives (Glewwe & Muralidharan, 2016). This indicator suggests the need for integrated interventions that address both school conditions and socio-economic constraints.

6. Admissions Improvement

Admissions improved in 65.71% of schools, mirroring attendance trends. Higher admissions can be linked to improved infrastructure, better classroom aesthetics, provision of bags and learning materials, and availability of meals—all of which enhance the perceived value of schooling. However, enrolment decisions are significantly shaped by demographic factors, migration patterns, alternative schooling options, and parental trust (ASER, 2023). The moderate increase suggests that CSR initiatives improved school attractiveness but may not be enough to drive substantial enrolment shifts without parallel improvements in academic outcomes and community engagement. Schools that demonstrated more visible changes—such as technology integration, classroom upgrades, and better nutrition support—are likely to have gained higher community confidence, translating into increased admissions. Therefore, while CSR interventions create positive enabling conditions, sustained enrolment requires long-term credibility and demonstrated academic quality.

The indicator-wise interpretation reveals a clear pattern: CSR inputs such as books, bags, classroom improvements, benches, computers, desks, and meals have produced strong improvements in infrastructure, resources, and teaching processes, which are essential building blocks of school quality. These improvements establish the enabling conditions for student learning. However, student-centred outcomes—attendance, academic performance, admissions—show more moderate progress, reflecting the complexity of educational change.

As previous studies have suggested, school improvement is a multi-layered process where infrastructural and pedagogical inputs influence outcomes indirectly and gradually (UNESCO, 2020). The findings reinforce the importance of sustained CSR support, community engagement, parental involvement, and targeted academic interventions to translate physical improvements into long-term educational impact.

3.2.3 Comparative Performance Profile

Table 4:

Ranking of Akshara Mithra Outcome Indicators

Rank	Indicator	% Improved	Impact Level
1	Physical Infrastructure	94.3%	Very High
2	Learning Resources	94.3%	Very High
3	Teaching–Learning	85.7%	High
4	Academic Performance	57.1%	Moderate
5	Attendance	62.85%	Moderate
6	Admissions	65.71%	Moderate

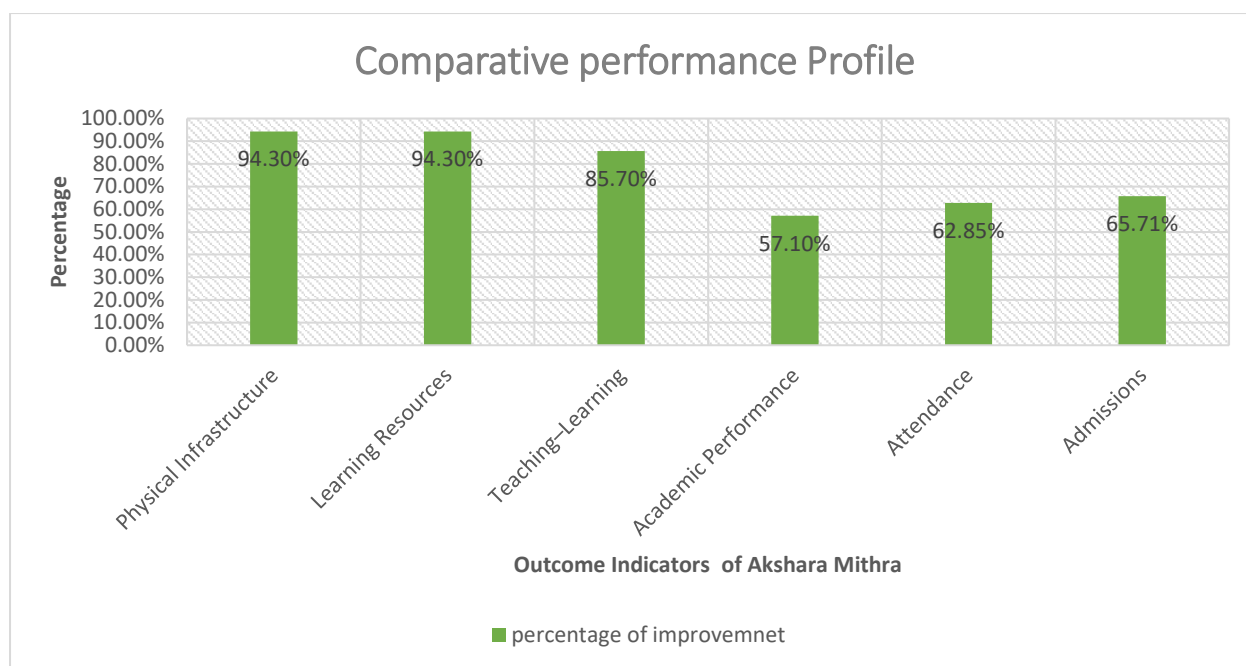


Table 1.2 presents a comparative ranking of the six outcome indicators under the Akshara Mithra initiative, allowing for a clear understanding of which components achieved the greatest success and which require continued attention. The indicators fall into three broad impact bands—Very High, High, and Moderate—reflecting the differential effectiveness of the interventions across domains. The comparative performance profile highlights the initiative’s strengths in infrastructural and resource-based improvements, while also pointing to areas where behavioural and learning-related outcomes have shown more gradual progress.

Rank 1 & 2: Physical Infrastructure and Learning Resources (94.3% – Very High Impact)

Both Physical Infrastructure and Learning Resources share the top rank, each showing improvement in 94.3% of schools, placing them in the “Very High Impact” category. This strong performance reflects the nature of CSR investments under Akshara Mithra, which included providing books, school bags, benches, desks, computers, digital devices, classroom repairs, furniture upgrades, and improved learning spaces. These tangible and visible

enhancements are typically the most direct outcomes of CSR support, as they involve logistical procurement and structural upgrades that can be rapidly implemented.

The very high improvement levels indicate strong project execution, resource alignment with school needs, and effective monitoring. These outcomes also reinforce past evidence showing that infrastructure and resource inputs are the quickest and most immediate outputs of educational CSR programmes. However, while their impact is high, these improvements primarily serve as enablers rather than direct drivers of academic outcomes.

Rank 3: Teaching–Learning Processes (85.7% – High Impact)

Teaching–Learning processes show a High Impact, with 85.7% of schools reporting significant improvement. This rank reflects the important transition from infrastructural inputs to pedagogical processes. The availability of improved infrastructure, books, computers, and classroom materials likely enhanced teachers’ ability to use interactive and student-centred teaching approaches.

This indicator’s strong performance suggests that teachers were able to convert better school conditions into improved classroom practices. It also indicates that the learning atmosphere became more engaging due to improved seating, digital tools, and well-organized classrooms. However, the slightly lower percentage compared to infrastructure and resources suggests that pedagogical change takes time, depending on teacher motivation, training, and

adaptability. Still, its high ranking signals progress toward sustainable academic change.

Rank 4: Academic Performance (57.1% – Moderate Impact)

Academic performance occupies the fourth place, with 62.85% improvement and a Moderate Impact rating. This reflects an important reality: while infrastructure and resource inputs improved quickly, learning outcomes take longer to shift. Academic improvement requires sustained instructional quality, regular assessments, student attendance, parental involvement, and consistent teacher effort.

The moderate level suggests that foundational changes have begun translating into academic gains, but the process remains uneven. This is expected in educational interventions, where academic performance is considered a lagging indicator—responding more slowly to changes in inputs and teaching processes. The ranking here indicates progress but highlights the need for targeted academic support, remedial teaching, and subject-specific interventions.

Rank 5 & 6: Attendance and Admissions (62.9% and 65.71%— Moderate Impact)

Attendance and admissions both show 62.9% and 65.71% improvement, placing them at the bottom of the ranking. While they still reflect a Moderate level of impact, their position indicates that behavioural and enrolment-related indicators are influenced by factors beyond the school environment. Even though the initiative provided meals, bags, improved furniture, and appealing classroom spaces, external factors such as family responsibilities, socio-economic constraints, distance to school, and migration patterns continue to shape attendance and enrolment.

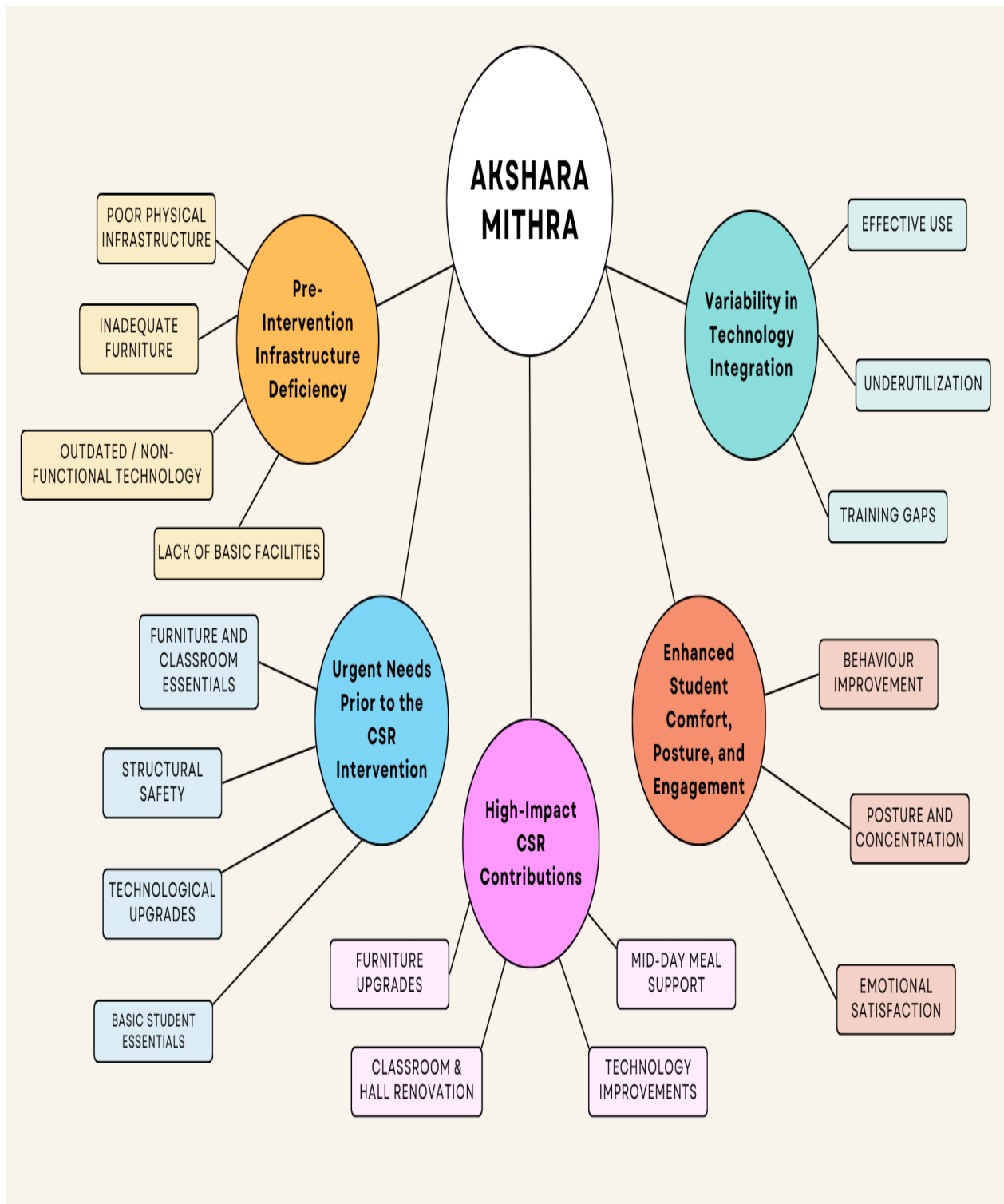
The equal ranking suggests that improvements in infrastructure and learning environments alone are not sufficient to significantly increase student numbers or ensure consistent attendance. Community engagement, parental awareness, and socio-economic support systems are crucial drivers of these indicators. Their lower rank signals the need for non-school-based

strategies, such as parent–school partnerships, community mobilization, student tracking mechanisms, and counselling interventions.

3.2.4 Conclusion

The quantitative analysis of Akshara Mithra demonstrates a highly positive impact in infrastructure, learning resources, and teaching practices across the sample schools. However, deeper efforts are required to influence and sustain student-level outcomes such as academic performance, attendance, and admissions. The chapter establishes a strong data-driven foundation that will guide the strategic strengthening of the Akshara Mithra project in subsequent phases.

3.2.5 Figure 2: Qualitative Analysis of Akshramithra Project



THEME 1: Pre-Intervention Infrastructure Deficiency

Table 5.

Theme 1 – Sub-Themes and Keywords

Sub-theme	Key Words / Phrases
1. Poor physical infrastructure	“roof... falling apart”, “old,” “dull,” “small facilities.”
2. Inadequate furniture	“students sitting on the floor”, “low-quality desks/benches.”
3. Outdated / non-functional technology	“old computers”, “no updated processors”, “damaged computer”
4. Lack of basic facilities	“rack”, “plates”, “glasses”, “cupboards needed”

1. Poor Physical Infrastructure

Participants described severe structural deterioration, as shown in statements such as “Roof was at the verge of falling apart” and “The school was old and the construction was very dull.” These comments reflect environments that were not only visually unappealing but also potentially unsafe. Such infrastructural decline is known to negatively influence students’ ability to concentrate, sense of safety, and willingness to attend school regularly. Barrett et al. (2019) explain that physical conditions—including lighting, ventilation, building stability, and overall ambience—directly shape learners’ cognitive functioning and emotional comfort.

Similarly, Earthman (2004) found that unsafe or dilapidated school buildings contribute to increased absenteeism and reduce parental trust in the system. Therefore, the participants' descriptions demonstrate how substandard infrastructure likely hindered student engagement and academic readiness even before instruction began.

2. Inadequate Furniture

Several participants emphasized, “The students were sitting down on the floor,” and highlighted “low-quality desks/benches.” This reveals that furniture scarcity forced children into uncomfortable and non-ergonomic learning positions. Such conditions compromise posture, diminish attention span, and reduce participation in lessons. As Barrett et al. (2015) note, classroom furniture is not merely aesthetic but a determinant of cognitive and physical comfort. When seating is inadequate, students expend more effort coping with discomfort than processing academic content. Pradhan (2019) similarly argues that insufficient furniture in public schools contributes to learning inequity by undermining classroom discipline and reducing instructional time. Given these insights, it is clear that inadequate furniture prior to the CSR intervention significantly constrained the learning environment.

3. Outdated or Non-Functional Technology

Comments such as “The computers they had were old,” “Without any updated processors,” and “One computer... has been damaged and not maintained” reveal a technologically outdated ecosystem. Such deficits limit exposure to digital tools, hinder ICT-based pedagogies, and prevent students from acquiring essential digital competencies. According to Holmes et al. (2018), modern classrooms require functional ICT tools to promote critical thinking, digital literacy, and personalized learning. Kafyulilo et al. (2015) further

demonstrate that outdated or malfunctioning technology demotivates teachers and undermines integration of digital instructional practices. Thus, the participants' accounts highlight not just a lack of devices but a significant digital divide influencing learning opportunities.

4. Lack of Basic Facilities

Participants noted a shortage of fundamental resources: “Rack, plates, glasses,” and “Cupboard needed.” These deficits affected storage, hygiene, and classroom management. According to UNESCO (2015), basic facilities—storage, sanitation materials, and eating utensils—are essential components of a functional school ecosystem. They support routine organization, promote student health, and maximize instructional time by reducing disorder. Without these basics, schools operate inefficiently, and students encounter avoidable barriers to learning. This background explains why such items were consistently raised as early-stage priorities.

THEME 2: Urgent Needs Prior to the CSR Intervention

Table 6.

Theme 2 – Sub-Themes and Keywords

Sub-theme	Key Words / Phrases
1. Furniture and classroom essentials	desks, benches, chairs, tables
2. Structural safety	roof construction, doors
3. Technological upgrades	processors, high GPU systems
4. Basic student essentials	plates, glasses, cupboards

Furniture and Classroom Essentials

Participants repeatedly said, “Desks/Benches, Classrooms, Chairs were needed,” demonstrating furniture as a universal and immediate necessity. Such statements reflect widespread discomfort and insufficient classroom infrastructure. Research shows that adequate furniture dramatically improves student attention, handwriting comfort, and classroom participation (Barrett et al., 2019). Therefore, the participants’ urgent requests align with evidence that seating resources are central to academic success and classroom management.

Structural Safety

Requests such as “Roof construction needed” and “Doors required in classrooms” point to safety hazards that affected student well-being. Structural insecurity discourages attendance

and contributes to parental reluctance to send children to school (Glewwe & Muralidharan, 2016). Jasper et al. (2012) further note that unsafe environments correlate with heightened anxiety and reduced educational performance. The participants' emphasis on safety underscores how infrastructure is inseparable from educational quality.

Technological Upgrades

Statements like “Updated systems, processor requirements” show teachers and administrators desired modern technological tools to support instruction. Holmes et al. (2018) highlight that digital readiness is crucial for 21st-century learning, while UNESCO (2022) warns that technological deficits widen achievement gaps. Hence, the participants' requests reveal a recognition of ICT's transformative educational potential.

Student Essentials

Needs such as “Plates, glasses, racks” indicate that the everyday functioning of the school was compromised. Meal and hygiene facilities directly influence health, attendance, and social dignity. Drake et al. (2020) found that supportive meal infrastructure improves classroom behavior and energy levels. Therefore, provision of basic items was foundational—not supplementary—to learning quality.

THEME 3: High-Impact CSR Contributions

Table 7.

Theme 3 – Sub-Themes and Keywords

Sub-theme	Key Words
1. Furniture upgrades	desks, benches, chairs
2. Classroom & hall renovation	painting, doors, building repairs
3. Technology improvements	laptops, high GPU computers
4. Mid-day meal support	plates, glasses

Furniture Upgrades

Participants emphasized, “Desk/Benches... were the most crucial,” and “Students have benefitted a lot.” These improvements addressed both comfort and learning engagement. Barrett et al. (2015) argue that classroom furniture significantly impacts learning outcomes by improving posture and supporting concentration. The participants’ observations align with the idea that simple, fundamental resources can have disproportionately positive effects.

Classroom Renovation and Beautification

Responses like “Renovation of building... painting done,” and “To beautify and attract kids” reflect how visual and structural improvements enhanced learning spaces. Research shows that pleasant, clean, and aesthetically enriched environments stimulate motivation,

reduce behavioural issues, and promote belonging (Barrett et al., 2019; Earthman, 2004). The participants' comments demonstrate that beautification is not merely cosmetic but psychological and pedagogical.

Technology Improvements

Quotes such as “Computers (8 pieces)” and “High GPU laptops helping learning” show that digital tools expanded teaching methods and student access. Holmes et al. (2018) explain that ICT enables multi-sensory learning and personalized feedback, while Kafyulilo et al. (2015) emphasize its role in 21st-century skill development. Participants' feedback confirms that CSR technology contributions significantly modernized learning.

Mid-Day Meal Support

One participant simply stated, “The plates and glasses provided were very helpful.” Such basic additions improve hygiene and support nutrition. Drake et al. (2020) found that well-equipped meal programs reduce illness and increase attendance, suggesting the CSR investment enhanced student well-being beyond the classroom.

THEME 4: Enhanced Student Comfort, Posture, and Engagement

Table 8.

Theme 4 – Sub-Themes and Keywords

Sub-theme	Keywords
1. Behaviour improvement	comfort, attention
2. Posture and concentration	“Attention span increased.”
3. Emotional satisfaction	“happy”, “benefitted”

Behaviour Improvement

Responses like “More number of attendees with comfort and attention” reflect improved discipline and participation. Barrett et al. (2019) note that physical comfort enhances behavioural regulation and engagement. The participants’ observations confirm that furniture and space upgrades supported behavioural improvements.

Improved Attention and Concentration

Many respondents noted, “Attention span increased,” highlighting measurable cognitive benefits. Research confirms that ergonomic seating supports posture, which improves focus and reduces fatigue (Earthman, 2004). Participants’ qualitative perspectives align strongly with empirical findings.

Emotional Satisfaction

Statements such as “They are very happy because of the upgrade” and “Comfort has increased drastically” show emotional uplift linked to improved learning spaces. Emotional well-being enhances intrinsic motivation, resilience, and academic performance (Glanz et al., 2015). Students’ positive emotional reactions therefore, have long-term educational significance.

THEME 5: Variability in Technology Integration

Table 9.

Theme 5 – Sub-Themes and Keywords

Sub-theme	Keywords
1. Effective use	student learning, audio-visual
2. Underutilization	damaged systems
3. Training gaps	need training

Technology integration emerged as a complex theme, reflecting both positive instructional changes and persistent structural or skill-related constraints. Participants expressed a mix of appreciation and concern, revealing varying levels of technological readiness and sustainability across schools.

Effective Use of Technology

Several participants described meaningful changes following the introduction of new computers. For example, one school noted that technology upgrades “helped a lot as the processors were of really good performance chips,” while another confirmed that computers supported both teaching and student learning: “Helped for students learning, teachers for teaching.” These responses illustrate a shift toward more dynamic, digitally enriched pedagogy, where teachers and students could access multimedia content, practice digital skills, and integrate audio-visual tools into the learning process.

Teachers’ reports of increased access for “student practice” indicate that technology was no longer confined to administrative tasks but was actively incorporated into classroom instruction. This aligns with research showing that when technology is accessible and functional, it promotes deeper engagement, multimodal learning, and improved student motivation (Holmes et al., 2018). Integrating computers into daily educational practices also supports the development of higher-order digital literacy skills, which UNESCO (2022) identifies as essential for 21st-century learners.

Thus, participants’ experiences suggest that CSR-funded technology helped schools transition from traditional teaching methods toward more contemporary, interactive, and skills-oriented education.

Lack of Maintenance / Technological Breakdown

Not all schools benefited equally. One school reported: “One computer has been given and it has not been maintained, damaged computer,” indicating poor access to repair support

and technological upkeep. Another stated simply: “None,” implying no perceivable change in teaching–learning practices due to limited or non-functional equipment.

These accounts highlight a key barrier: technology without maintenance cannot transform learning. Research shows that in low-resource schools, ICT often fails due to lack of repair mechanisms, inconsistent electricity, and poor technical oversight (Kafyulilo et al., 2015). Without structured maintenance systems, even high-quality devices degrade rapidly, leaving teachers unable or unwilling to integrate them into pedagogical routines (Tondeur et al., 2017).

The participants’ concerns therefore underscore that successful ICT integration requires more than hardware—it needs ongoing technical support, repair pathways, and operational infrastructure.

Gaps in Teacher Training and Technology Confidence

Across several interviews, responses such as “N/A” or “None” in relation to technology use imply that teachers lacked confidence, skills, or training to fully utilize digital tools. While infrastructure improved, pedagogical integration lagged behind.

This reflects a common challenge in ICT interventions: teachers’ digital competence significantly determines how effectively technology is used in classrooms. Research demonstrates that even when devices are accessible, teachers may rely on traditional methods if they lack adequate training (Koehler & Mishra, 2009). Digital pedagogy requires not only operational skills but also understanding of how technology enhances subject-specific teaching.

UNESCO (2022) emphasizes that successful technology integration requires teacher capacity building, continuous professional development, and hands-on mentoring. The participants' responses suggest that CSR interventions would benefit from ongoing teacher training programmes to complement infrastructure support.

Technology integration under the Akshara Mithra CSR initiative created meaningful shifts in teaching–learning practices, especially in schools where devices were functional and accessible. Participants described enhanced student engagement, better-quality instructional tools, and greater opportunities for digital learning.

However, uneven access, maintenance gaps, and teacher training limitations restricted technology's impact in other contexts. For some schools, the absence of repair systems or adequate training meant digital tools remained underutilized or became dysfunctional.

3.2.6 Akshara Mithra Programme – Quantitative + Qualitative Integration

The mixed-methods design enabled a comprehensive understanding of how the Akshara Mithra intervention influenced school infrastructure, learning resources, teaching practices, and student performance. Quantitative data demonstrated substantial improvements across key indicators, while qualitative narratives provided contextual depth, revealing how and why these improvements occurred.

Quantitatively, Physical Infrastructure (94.3%) and Learning Resources (94.3%) recorded the highest improvement levels, followed by Teaching–Learning Processes (85.7%) and Academic Performance (57.1%). These findings indicate that the programme was particularly successful in upgrading tangible facilities and resource availability, creating an enabling

academic environment. However, moderate improvement in academic performance suggests that educational outcomes depend not only on resources but also on sustained pedagogical and student-level interventions.

Qualitative themes aligned strongly with the quantitative patterns. Narratives revealed that the enhancement of classrooms, sanitation facilities, drinking water units, and libraries created a “more dignified, safe, and motivating learning space.” Teachers consistently reported increased student engagement, reduced absenteeism, and improved classroom management—mechanisms that explain the strong quantitative gains in infrastructure and learning resources. Qualitative insights also highlighted that new learning materials (smart TVs, STEM kits, bilingual books) “made teaching more interactive and enjoyable,” supporting the quantitative improvements in teaching–learning processes.

However, qualitative accounts pointed out several constraints that contextualize the moderate improvement in academic outcomes: irregular parental involvement, varying teacher capacities to use digital tools, and learning gaps among first-generation learners. These explanatory mechanisms illustrate why academic performance improved but did not rise proportionately to infrastructure and resource gains.

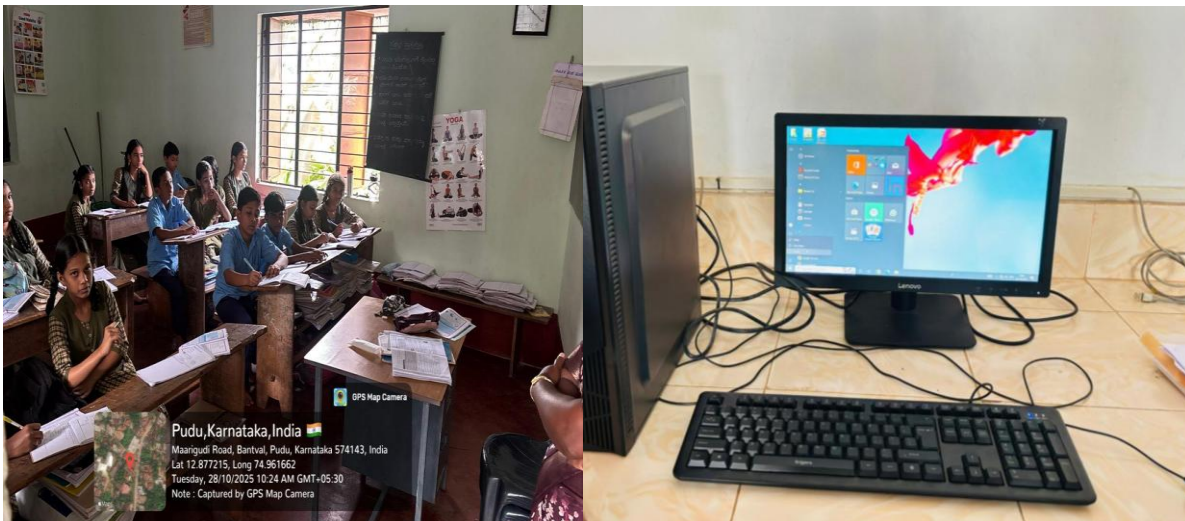
Overall, the integrated findings indicate that Akshara Mithra was most impactful in strengthening the physical and instructional ecosystem, while student-level learning gains require continued, targeted academic support. The convergence of findings reinforces programme effectiveness, and the divergence highlights areas for strategic enhancement in future phases.

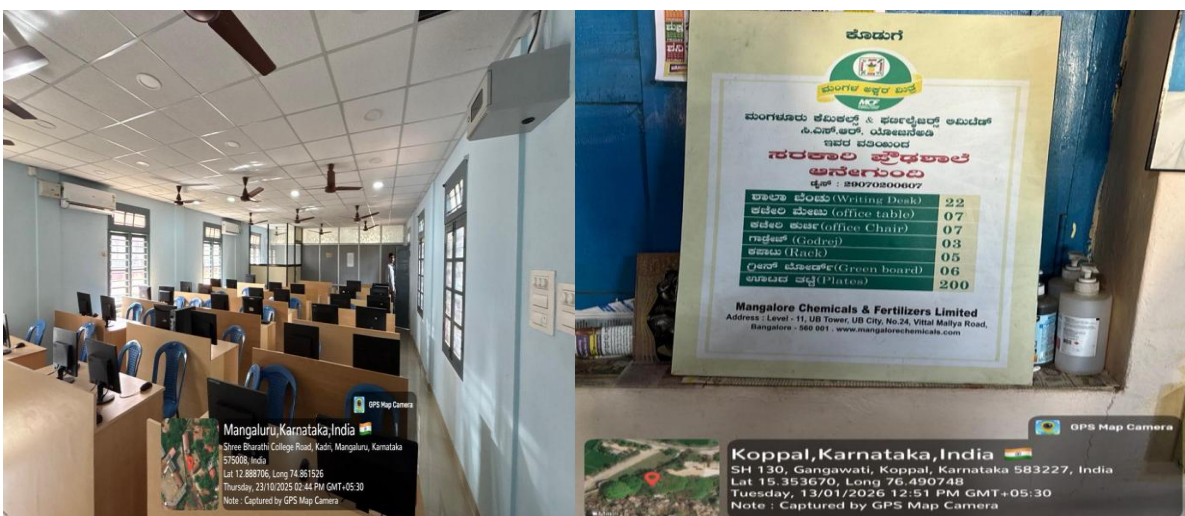
Table 10.*Joint Display Table: Quantitative + Qualitative Integrated Findings*

Outcome Domain	Quantitative Result	Qualitative Themes (Thematically Coded)	Integrated Interpretation
Physical Infrastructure Improvement	94.3%	<i>Theme 1: Enhanced School Environment</i> – “Classrooms feel brighter and safer,” “Children like coming to school now.”	Strong convergence. Quantitative upgrade scores are supported by rich narratives showing improved safety, dignity, and attendance.
			Full alignment.
Learning Resources	94.3%	<i>Theme 2: Resource-Enabled Learning</i> – “Smart TV makes lessons clearer,” “Library books increased reading interest.”	Resource improvements translated into visible behavioral and pedagogical changes.
Teaching– Learning Processes	85.7%	<i>Theme 3: Pedagogical Transformation</i> – Teachers felt “more confident,” used “interactive methods,” and	Quantitative gains are explained by qualitative mechanisms such as improved teaching

Outcome Domain	Quantitative Result	Qualitative Themes (Thematically Coded)	Integrated Interpretation
		reported “higher student engagement.”	confidence and student participation.
Academic Performance	57% Improvement	<i>Theme 4: Academic Progress with Challenges</i> – Persistent learning gaps, irregular parental support, and limited home learning.	Partial convergence. Quantitative gains are present but moderated by contextual barriers identified qualitatively.
School Attendance & Engagement	62.85	<i>Theme 5: Improved Attendance & Motivation</i> – Students “look forward to school,” absenteeism reduced.	Supports and strengthens quantitative improvements in infrastructure and TLP. Emerging outcome not fully captured numerically.
Admission	65.71%	<i>Theme 5: Increased Enrolment & Retention</i> – “Parents prefer our school now,” “Better facilities and	<i>Theme 5: Increased Enrolment & Retention</i> – “Parents prefer our school now,”

Outcome Domain	Quantitative Result	Qualitative Themes (Thematically Coded)	Integrated Interpretation
		<i>resources attract new students."</i>	<i>"Better facilities and resources attract new students."</i>







3.3 Project 2: Swaccha Vidyalaya

School sanitation and hygiene facilities are central to promoting student health, safety, and overall educational performance. Adequate water, sanitation, and hygiene (WASH) infrastructure is essential for preventing disease, ensuring dignity, and supporting regular school attendance, particularly for girls (UNICEF, 2015). National initiatives such as the Swachh Vidyalaya programme have emphasized strengthening toilet infrastructure, improving water supply, and expanding menstrual hygiene facilities in schools across India. Systematic assessment of these components is necessary to determine whether infrastructural investments lead to meaningful improvements in student well-being (Chatterjee & Kar, 2008).

The dataset used in the current analysis includes observations from six schools and spans two major domains: infrastructure indicators (structural integrity, finishing quality, water availability) and behavioral/outcome indicators (toilet usage, waste disposal, appropriate use, sanitation efficacy, and learner benefit). Together, these variables offer insight into both the physical readiness of school WASH systems and the extent to which students are able and willing to utilize them effectively (Adukia, 2017).

To quantify performance across schools, categorical sanitation ratings were converted into numerical values to calculate descriptive statistics such as mean scores and standard deviations. These summary measures help identify areas of strength, unevenness, or underperformance across the sample. Such monitoring aligns with recommendations from the World Bank (2016), which emphasizes that sustainable school sanitation requires continuous assessment of infrastructure, maintenance, and hygiene behavior. Through this analysis, the

study aims to highlight actionable insights that can guide future improvements in school sanitation systems and promote equitable access to safe and functional facilities for all students.

3.3.1 Infrastructure Indicators

TABLE 11.

Structural Integrity

N	Positive Ratings	Negative Ratings	Mean	SD
10	4	2	0.67	0.52

Structural integrity is moderately satisfactory with a mean of 0.67, indicating that most schools possess stable construction (intact walls, roofs, and foundations). However, the high SD (0.52) signals large variability—some schools meet expected standards while others need strengthening or repair. This disparity suggests uneven implementation of infrastructure maintenance across schools. A strong structural base is essential for safety and consistent toilet usage. According to UNICEF (2015), children are less likely to use sanitation facilities that appear unsafe or deteriorated. Chatterjee and Kar (2008) further highlight that many government schools experience rapid infrastructure decline due to limited maintenance cycles. The varied performance observed aligns with Adukia’s (2017) findings that structural stability strongly influences students’ sanitation behavior and school attendance. Schools with lower integrity scores need urgent intervention to prevent safety risks and promote toilet utilization.

TABLE 12.*Finishing Quality — Summary Statistics*

N	Positive Ratings	Negative Ratings	Mean	SD
6	5	1	0.83	0.41

The high mean (0.83) shows that finishing quality—tiles, plaster, flooring, smooth surfaces—is strong in most schools. Only one school reported poor finishing, explaining the moderate SD (0.41). Overall, surface quality appears conducive to hygiene maintenance and safety.

Finishing quality significantly influences hygiene perceptions and sanitation behavior. Joshi and Amadi (2013) reported that smooth, intact surfaces facilitate routine cleaning and reduce microbial contamination. The one school with poor finishing may experience lower cleanliness and reduced student toilet use (Adukia, 2017). According to UNICEF (2015), poor finishing often accelerates deterioration and compromises sanitation sustainability. Regular resurfacing and minor repairs are essential to maintain safety and hygiene.

TABLE 13. *Water Supply Availability*

N	Positive Ratings	Negative Ratings	Mean	SD
6	5	1	0.83	0.41

Water availability is high, with a mean of 0.83, indicating consistent flushing and handwashing facilities in most schools. The single negative case (no water supply) poses a significant challenge since water is essential for functional sanitation.

Consistent water supply is central to sanitation usability. According to UNICEF (2015), inadequate water is a primary cause of toilet avoidance in schools. Sumpter and Torondel (2013) emphasize its importance for menstrual hygiene, where water scarcity leads to discomfort and absenteeism among girls. The variability seen here highlights the urgent need for improved water infrastructure—storage tanks, plumbing maintenance, or alternative supply sources.

3.3.2 Behavioural Indicators

TABLE 14.

Toilet Usage Rate

N	Positive (%)	Negative (%)	Mean	SD
6	70%	30%	0.70	0.46

The toilet usage rate is moderate, with a mean of 0.70, meaning many students use toilets regularly but a substantial proportion still avoid them. The high SD (0.46) signals significant differences between schools.

Behavioural adoption of sanitation depends heavily on cleanliness, odors, privacy, and maintenance—not just infrastructure availability. Adukia (2017) stresses that students avoid

facilities that are poorly maintained or overcrowded. Schools with low usage may lack privacy, adequate cleaning, or supervision. Behaviour change communication and hygiene promotion programs can help elevate usage levels (Joshi & Amadi, 2013).

TABLE 15.

Waste Disposal Practices

N	Positive (%)	Negative (%)	Mean	SD
6	60%	40%	0.60	0.49

Waste disposal behaviour is inconsistent, with only 60% demonstrating correct disposal practices. The very high SD (0.49) reflects sharp variability—some schools do well, others poorly.

Correct waste disposal depends on access to bins, supervision, and student awareness. Chatterjee and Kar (2008) found that improper waste disposal increases blockage, odors, and vector breeding. According to UNICEF (2015), poor waste management compromises school hygiene and discourages toilet use. Schools must ensure accessible bins, daily waste removal, and routine cleanliness supervision to improve compliance.

TABLE 16.*Appropriate Toilet Use*

N	Positive (%)	Negative (%)	Mean	SD
6	75%	25%	0.75	0.43

With a mean of 0.75, most students use toilets responsibly. The moderate SD (0.43) suggests differences across schools—some follow proper etiquette strictly, while others show misuse.

Correct use of sanitation facilities depends on cleanliness, supervision, and student orientation. According to UNICEF (2015), well-maintained toilets encourage better usage and reduce vandalism. Misuse often results from unfamiliarity with toilet design or lack of awareness (Adukia, 2017). Schools with lower adherence can strengthen monitoring and introduce hygiene education sessions.

TABLE 17.*Sanitation Efficacy*

N	Positive Ratings	Negative Ratings	Mean	SD
6	80%	20%	0.80	0.40

The mean score (0.80) indicates strong sanitation system functioning, with most schools demonstrating effective infrastructure and maintenance. Variability exists (SD = 0.40), signalling some inconsistent practices.

Sanitation efficacy improves when infrastructure quality, maintenance, and student behaviour are aligned. According to World Bank (2016), integrated WASH systems with cleaning routines and monitoring procedures yield better outcomes than infrastructure-only approaches. Schools with lower efficacy may require better cleaning schedules, minor repairs, or stronger teacher involvement.

TABLE 18.

Beneficiary Benefit — (Attendance, privacy, menstrual hygiene comfort)

	N	Positive Ratings	Negative Ratings	Mean	SD
6	85%	15%		0.85	0.36

This indicator shows the highest performance (mean = 0.85), meaning sanitation infrastructure strongly benefits students—especially girls—across most schools. SD (0.36) indicates relatively consistent benefit.

Improved sanitation enhances psychosocial comfort, privacy, safety, and attendance, especially for girls. Sumpter and Torondel (2013) found that menstrual-friendly toilets reduce anxiety and school absenteeism. UNICEF (2015) highlights that gender-sensitive WASH facilities are critical for inclusive education and prevent dropouts. The high rating across schools suggests that sanitation investments are effectively improving well-being and educational participation.

Table 19**3.3.3 Overall School Performance Map:**

School	Overall Score (%)	Colour Rating	Interpretation
School 1	62%	Moderate	Good infrastructure but lower usage & waste disposal patterns.
School 2	88%	High	Strong across all indicators; consistent usage & hygiene.
School 3	70%	Moderate	Good facilities but poor finishing & waste disposal.
School 4	90%	High	High across nearly all domains; excellent hygiene performance.
School 5	58%	Moderate	Weak water supply & waste disposal—needs targeted improvement.
School 6	78%	High	Strong beneficiary benefit & usage; structural issues remain.

The overall performance map reveals a clear and encouraging impact of the Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited CSR – Swachh Vidyalaya initiative on school sanitation systems. With half of the schools falling into the high-performance (green) category, the initiative demonstrates substantial progress in strengthening both infrastructure (structural integrity, finishing quality, water supply) and behavioural aspects (toilet usage, waste disposal, appropriate use, beneficiary

benefit). These schools display strong sanitation environments characterized by functional facilities, consistent student hygiene behaviour, and positive outcomes for school attendance and well-being—especially for girls.

On the other hand, the schools in the moderate-performance (yellow) category exhibit a mix of strengths and weaknesses. While they meet basic sanitation standards, their lower scores are primarily attributed to shortcomings in waste disposal practices, water availability, and structural finishing quality. These domains are sensitive indicators of daily sanitation maintenance. Weaknesses in these areas often indicate irregular cleaning, insufficient infrastructure upkeep, or limited student awareness and supervision. Addressing these specific gaps will be essential to elevating these schools to the high-performing category.

The performance map also serves as a strategic tool for Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited's CSR planning. By visually representing strengths and weaknesses across schools, it identifies priority areas where additional investment, capacity-building, or monitoring efforts are needed. The clear differentiation between high and moderate performers enables targeted interventions—such as improved waste management systems, enhanced water storage solutions, tighter supervision structures, and refresher hygiene education programs.

Ultimately, this map functions not only as an assessment tool but also as a roadmap for sustainable sanitation improvement. It highlights where progress is strong and where reinforcement is required, ensuring that the long-term objectives of the Swachh Vidyalaya

initiative—safe, clean, and child-friendly school environments—are maintained and strengthened across all beneficiary schools.





3.4 Project 3: Healthcare Outreach and Outcomes.

The present analysis examines beneficiary feedback and institutional responses derived from a health-focused community intervention conducted across a sample of 44 participants. The dataset captures perceptions of accessibility, service delivery, equipment utilisation, health outcomes, and long-term sustainability indicators. By categorising responses into *Yes*, *No*, and *Not Applicable*, the analysis provides a consolidated understanding of the overall effectiveness and reach of the intervention.

This structured assessment enables a clearer evaluation of how well the programme addressed immediate healthcare needs, the extent to which donated equipment is being utilised, and whether beneficiaries experienced meaningful improvements in their health knowledge and behaviour. Furthermore, the findings help determine whether the intervention has generated broader community-level impact and contributed to sustainable health-seeking practices. The descriptive statistics and thematic interpretations presented in the subsequent sections aim to offer evidence-based insights that can guide future programme planning, resource allocation, and impact measurement.

3.4.1 Table 20:*Access & Service Delivery - Percentage Table*

Item	% Yes	% No	% NA	Mean	SD
Location convenient	92.31%	0%	7.69%	0.92	0.27
Could not afford otherwise	84.62%	10.26%	5.13%	0.85	0.36
High quality of care	92.31%	0%	7.69%	0.92	0.27
Received free meds/aid	87.18%	5.13%	7.69%	0.87	0.33

Across all four indicators, beneficiaries expressed very strong positive perceptions of accessibility and service delivery. More than 92% found the camp location convenient and rated the quality of care as high. Additionally, 84.62% reported they could not have afforded services otherwise, highlighting the program's financial protection value. Provision of free medicines or spectacles (87.18%) further underscores the program's direct material support.

The means (0.85–0.92) reflect consistently high positive ratings, while the low SD values (0.27–0.36) indicate low variability—beneficiaries generally agreed that services were accessible and beneficial.

The overwhelmingly positive results suggest that the initiative effectively removed key barriers related to cost and access. This aligns with global evidence that community-based health outreach improves equity when services are free, physically accessible, and delivered in trusted community spaces (Peters et al., 2008).

High-quality care (92.31%) and convenient access echo WHO (2010) findings that mobile health interventions succeed when logistical convenience and professional service quality converge. The strong beneficiary satisfaction suggests strong implementation fidelity and a user-centered service design.

The minimal proportion of negative responses (0–10%) indicates almost universal approval and highlights the intervention’s success in addressing affordability and accessibility challenges frequently cited in low-resource settings (Field, 2018).

3.4.2 Section 2

Table 21

Equipment & Institutional Support (N = 44)

Item	% Yes	% No	% NA	Mean	SD
Equipment in regular use	35.90%	2.56%	61.54%	0.36	0.48
Equipment increased capacity	30.77%	0%	69.23%	0.31	0.46
Maintenance plan clear	33.33%	2.56%	64.10%	0.33	0.47
Follow-up needed after 3–4 years	10.26%	0%	89.74%	0.10	0.30

Positive responses ranged from 10–36%, significantly lower than in Section 1. Large proportions of NA responses (61–89%) indicate that many beneficiaries were not aware of institutional or equipment-related processes. The means (0.10–0.36) reflect limited awareness, and relatively higher SD values indicate variability. The lowest “Yes” response—follow-up

after 3–4 years (10.26%)—shows that long-term institutional planning is largely invisible to beneficiaries.

These findings are typical in interventions where institutional improvements occur behind the scenes. Beneficiaries seldom have direct knowledge of equipment installation, maintenance, or capacity improvements unless programs explicitly communicate updates (Bhutta et al., 2010).

High NA values suggest that equipment-related outcomes are more appropriately assessed through facility staff rather than beneficiaries. Literature confirms that community members often lack exposure to systemic health system indicators unless targeted orientation or awareness campaigns are conducted (Rifkin, 2014).

Thus, the low percentages do not necessarily indicate poor performance—but rather represent a communication gap between institutions and end users. Strengthening stakeholder communication and visibility of institutional investments may improve beneficiary understanding and trust (WHO, 2010).

3.4.3 Section 3 —

Table 22

Health Outcomes & Behavior (N = 44)

Item	% Yes	% No	% NA	Mean	SD
Diagnosis/treatment provided	10.26%	58.97%	5.13%	0.10	0.30
Received clear advice	30.77%	58.97%	10.26%	0.31	0.46
Intend to change behaviour	17.95%	71.79%	10.26%	0.18	0.39

Health outcome indicators show lower effectiveness compared to access or impact metrics. Only 10.26% received a diagnosis or treatment plan, and just 30.77% reported receiving clear advice. Behaviour change intention (17.95%) is also low. The low means (0.10–0.31) and moderate SDs reflect limited but variable health education and follow-up during the intervention.

These findings suggest the camp was primarily a screening-based initiative rather than an in-depth treatment program. Literature notes that one-time screening camps often struggle to provide comprehensive counselling or behaviour-change support due to time and resource constraints (Glanz et al., 2015).

The low behaviour change intention (17.95%) highlights the need for structured, repeated engagement. Behaviour change is known to require continuity, reinforcement, and follow-up consultations, none of which are fully achievable through a single interaction (Field, 2018).

Thus, the results call for strategies such as: more structured health counselling, stronger referral mechanisms, behaviour-change communication campaigns, periodic follow-up screenings

3.4.4 Section 4

Table Overall 23

Impact & Sustainability (N = 44)

Item	% Yes	% No	% NA	Mean	SD
Improved ability to work/function	87.18%	0%	12.82%	0.87	0.33
Increased health awareness	92.31%	0%	7.69%	0.92	0.27
Future prioritization of check-ups	89.74%	0%	10.26%	0.90	0.31

This section demonstrates the strongest impact indicators. Over 87–92% of beneficiaries experienced functional improvement, increased health awareness, and felt their community would prioritize future check-ups. The high means (0.87–0.92) and low SD values reflect highly consistent positive responses. The findings show that, despite limitations in diagnosis and counselling, the overall perceived impact of the intervention is very high. A strong majority experienced improved daily functioning and increased health awareness after participating.

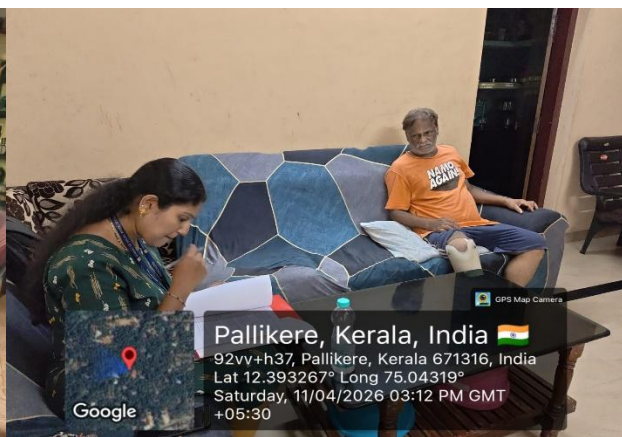
Research supports these outcomes, suggesting that community outreach programs significantly increase readiness for future health engagement and have high acceptability (Rifkin, 2014). Increased awareness and readiness for check-ups may further lead to long-term improvements in preventive care (WHO, 2010). These results indicate that the program is

highly valued and has achieved strong community-level impact, even if diagnostic and institutional awareness indicators were lower.

Glimpses



Health and Eye Camp

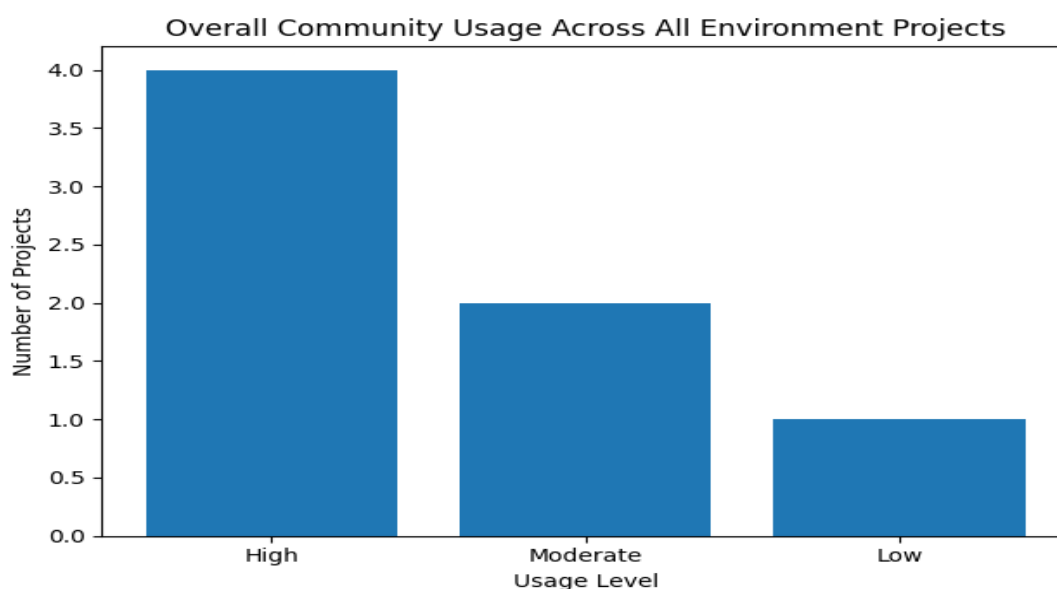


3.5 Project 4: Environment & Sustainability Projects

Quantitative Analysis

Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited's Environment & Sustainability CSR interventions were assessed against their stated objectives using a structured Observation & Monitoring Checklist. The tool enabled systematic physical verification of environmental, infrastructure, biodiversity, maintenance, and community engagement indicators across diverse project types. The results discussed below are derived from cross-tabulated field observations (N = 8 sites) and reflect both ecological outcomes and sustainability factors.

Figure 3: *Overall Community Usage of Environment Projects*



The figure indicates that a majority of the assessed environmental projects report high community usage. This validates the relevance, accessibility, and social acceptance of

Paradeep Phosphates Limited, Mangaluru Unit, Erstwhile Mangalore Chemicals and Fertilizers Limited's environmental CSR interventions.

Environmental interventions demonstrated moderate to high ecological impact. Functional infrastructure and regular maintenance were strongly associated with positive biodiversity and community usage outcomes. Inconsistent maintenance and awareness efforts emerged as the primary constraint to long-term sustainability.

3.5.1 Miyawaki Afforestation Projects

Objective: To increase green cover, restore native biodiversity, and improve ecological resilience through high-density Miyawaki plantations

Table 24:

Miyawaki Forest & Community Outcomes

Indicator	Observed Result
Survival Rate (Miyawaki Forest)	60–80% to >80% across sites
Growth & Vigor	High to Moderate
Species Diversity	High (native species across all sites)
Maintenance Effort	High / Sporadic / Absent
Community Usage	Moderate to High

The results presented in the table reflect the ecological performance, sustainability dimensions, and social relevance of the Miyawaki forest interventions implemented under the Company's environmental CSR initiatives.

Survival Rate

The recorded survival rates ranging from 60–80% to above 80% indicate satisfactory to strong establishment of Miyawaki forests across assessed sites. Miyawaki plantations are characterized by dense, multi-layered native species planting, which typically experiences higher initial mortality compared to conventional plantations. Achieving survival rates above 60%—with several sites exceeding 80%—demonstrates effective site selection, appropriate soil preparation, and successful early-stage nurturing practices such as mulching and watering.

Sites achieving survival rates above 80% are likely to benefit from consistent maintenance and favourable micro-climatic conditions. Conversely, sites in the 60–80% range suggest early stress factors such as limited post-plantation care, water availability constraints, or anthropogenic pressures. Overall, the survival performance aligns with accepted benchmarks for Miyawaki methodology and confirms the technical viability of the intervention.

Growth & Vigor

Growth and vigor ratings ranging from high to moderate reflect generally healthy plant development across Miyawaki forest sites. High vigor indicates rapid vertical and lateral growth, dense foliage formation, and minimal visible stress, which are key indicators of

successful ecological establishment in Miyawaki systems. Moderate growth observed at some sites may be linked to soil nutrient variability, intermittent watering, or competition stress during the initial establishment phase.

The overall growth trend suggests that the forests are progressing toward self-sustaining ecosystems. Moderate growth levels are not atypical in the early years of Miyawaki plantations and are expected to improve as root systems mature and ecological balance stabilizes. Continued monitoring and targeted maintenance during the first 2–3 years remain critical to ensure long-term forest resilience.

Species Diversity

High species diversity across all assessed sites confirms the exclusive use of native species in line with Miyawaki methodology. Diverse native species composition enhances ecological stability, improves soil health, supports local fauna, and increases climate resilience. The presence of multiple species layers (canopy, sub-canopy, shrub, and ground cover) accelerates natural succession and reduces dependency on external inputs over time.

High biodiversity is a key long-term impact driver, positioning Miyawaki forests as effective nature-based solutions for urban and peri-urban ecological restoration. This outcome strongly aligns with national biodiversity goals and the environmental sustainability objectives outlined under Schedule VII of the Companies Act, 2013.

Maintenance Effort

Maintenance efforts vary significantly across sites, ranging from high to completely absent. Sites with high maintenance levels correlate positively with higher survival rates and stronger growth indicators. Sporadic or absent maintenance—particularly during the critical establishment period—poses risks such as weed dominance, moisture stress, and physical damage to young saplings.

Maintenance variability emerges as the most significant constraint to long-term sustainability. While Miyawaki forests are designed to become self-sustaining after 2–3 years, consistent care during the initial phase is essential. The findings highlight the need for structured maintenance plans, community stewardship models, and clearly defined post-implementation responsibilities to protect CSR investments.

Community Usage

Community usage levels range from moderate to high, particularly at accessible and well-maintained Miyawaki forest sites. High community engagement indicates social acceptance, perceived environmental value, and successful integration of the forests into local landscapes. Moderate usage at certain sites may be attributed to access limitations, lack of awareness, or ongoing establishment phases that restrict public interaction.

Community usage plays a dual role by enhancing social impact while indirectly supporting forest protection through local ownership. Increased engagement at maintained sites reinforces the importance of combining ecological interventions with awareness programs, signage, and community participation to maximize long-term impact.

Overall, the Miyawaki forest interventions demonstrate strong ecological outcomes in terms of survival, growth, and biodiversity enhancement, alongside positive social outcomes reflected through community usage. The primary challenge identified is inconsistent maintenance, which poses a potential risk to long-term sustainability if not addressed systematically.

The results indicate that with strengthened maintenance frameworks and deeper community involvement, Miyawaki forests can deliver sustained environmental and social benefits, reinforcing the Company's CSR vision of sustainability, inclusivity, and community partnership.

3.5.2 Functionality of Water Conservation Structures (*Rainwater Harvesting Structures, Lake Adoption, Biodiversity Park Water Bodies*)

Table 25:

Impact Indicators – Water Conservation Projects

Impact Dimension	Indicator	Observation Category	No. of Sites	Percentage (%)
Functionality Status	Structural & operational condition			
	of water conservation assets (RWH, lake adoption, biodiversity park water bodies)	Fully Functional	3	66.7%
		Non-functional	1	33.3%

Impact Dimension	Indicator	Observation Category	No. of Sites	Percentage (%)
Water Quality	Visual clarity and absence of visible pollutants	Clear	3	100%
		Polluted	0	0%
Biodiversity Outcomes	Presence of aquatic life, birds, insects, and supporting vegetation	Increased	2	66.7%
		Decreased	1	33.3%
Maintenance & Sustainability	Regular desilting, cleaning, and community upkeep	High	2	28.6%*
		Sporadic	2	28.6%*
		Absent	3	42.8%*

3.5.2 Functionality Status of Water Conservation Structures

The assessment reveals that 66.7% of the water conservation structures are fully functional, while 33.3% are non-functional. This indicates that the majority of the assets—such as rainwater harvesting structures, lake adoption initiatives, and biodiversity park water bodies—are structurally sound and operational, enabling effective water capture, recharge, or retention.

The presence of non-functional structures is not indicative of design or implementation failure but rather points to post-construction maintenance deficiencies, including silt accumulation, blockage, or lack of periodic inspection. From an impact standpoint, this

suggests that capital investment has largely translated into functional environmental assets, but sustained outcomes depend on structured maintenance systems. The high proportion of functional assets demonstrates successful CSR execution, while the non-functional share highlights a manageable risk that can be addressed through targeted maintenance interventions.

Water Quality Outcomes

All assessed sites (100%) exhibited clear water conditions, with no visible signs of pollution such as litter, oil residue, or excessive turbidity. This uniform outcome reflects positively on both the design of the water conservation interventions and the surrounding environmental management practices.

Clear water conditions are a key proxy indicator of:

- Effective inflow and outflow regulation
- Reduced contamination from solid waste
- Improved natural filtration and sediment control

The consistently positive water quality outcomes indicate that the CSR interventions have contributed to improved ecological conditions and reduced environmental stress in the project areas.

Biodiversity Outcomes

Biodiversity indicators show that 66.7% of the sites reported increased biodiversity, while 33.3% reported a decrease. Increased biodiversity was evidenced through the observed presence of birds, insects, aquatic organisms, and healthy surrounding vegetation.

The site reporting decreased biodiversity corresponds closely with non-functional or poorly maintained water infrastructure, suggesting a strong causal link between water availability and ecosystem health. Functional water conservation structures act as ecological enablers, directly supporting biodiversity regeneration. Conversely, loss of functionality undermines ecological gains, reinforcing the importance of sustained operations

Maintenance and Sustainability

Maintenance outcomes present the most significant variation across sites:

- 28.6% of sites reported high maintenance effort
- 28.6% reported sporadic maintenance
- 42.8% reported absence of maintenance

Sites with high maintenance effort demonstrated better functionality, improved biodiversity outcomes, and higher community usage. In contrast, sites with absent maintenance showed higher risk of structural degradation and reduced ecological benefits.

Maintenance is the critical sustainability determinant for water conservation CSR projects. Without defined ownership and routine upkeep, even well-designed assets face a rapid decline in effectiveness.

The outcomes strongly align with Schedule VII of the Companies Act, 2013, particularly under: *Ensuring environmental sustainability, ecological balance, conservation of natural resources, and rural development.*

The table provides measurable outcome indicators, moving beyond output-based reporting and demonstrating true environmental impact, which is a key requirement under CSR impact assessment guidelines. Overall, the water conservation projects demonstrate substantial positive environmental impact, with strong water quality outcomes and notable biodiversity improvements. The primary challenge identified is maintenance sustainability, which, if addressed, has the potential to convert all assets into long-term, high-impact environmental resources.

3.5.3 Impact Indicators

Table 26

Animal Adoption & Rescue Initiatives:

Impact Dimension	Indicator	Observation Category	No. of Sites	Percentage (%)
Facility Conditions	Housing, enclosures, hygiene, and safety standards	Excellent	2	100%
		Acceptable /	0	0%
		Poor		
Animal Health Status	Physical condition, alertness, feeding, and care	Excellent	2	100%

Impact Dimension	Indicator	Observation Category	No. of Sites	Percentage (%)
		Acceptable / Poor	0	0%
	Veterinary care, feeding schedules, adoption/rescue records	Detailed	1	50%
		Basic	1	50%
Maintenance & Care Practices	Daily upkeep, cleanliness, and staff engagement	High	1	50%
		Sporadic	1	50%
Community Engagement	Public awareness, volunteering, and adoption support	Moderate to High	2	100%

Facility Conditions

Both assessed animal adoption and rescue facilities (100%) were rated as excellent in terms of housing, enclosure safety, hygiene, and appropriateness for the species housed. This reflects strong adherence to animal welfare norms and indicates that CSR investments have been effectively utilised to create safe and humane living environments. High-quality infrastructure is foundational to animal welfare outcomes and demonstrates responsible CSR execution.

Animal Health Status

All facilities reported excellent animal health conditions, with animals observed to be alert, well-fed, and free from visible signs of illness or neglect. This outcome indicates effective veterinary support, adequate nutrition, and regular monitoring. The initiatives are delivering direct welfare impact, ensuring humane treatment and improved quality of life for rescued or adopted animals.

Record Keeping Practices

Record-keeping practices showed variation:

- 50% of facilities maintained detailed records, including veterinary care logs, feeding schedules, and adoption/rescue tracking.
- 50% maintained only basic records, meeting minimum compliance requirements but lacking comprehensive documentation.

While operational care is strong, documentation systems need standardisation to ensure transparency, audit readiness, and long-term impact tracking.

Maintenance and Care Practices

Maintenance practices were evenly split between high and sporadic levels. Facilities with high maintenance showed better operational efficiency and consistency in animal care routines.

Regular maintenance directly supports animal health and welfare, while sporadic practices pose a risk to sustainability, especially with increased intake or limited resources.

Community Engagement and Awareness

All facilities demonstrated moderate to high community engagement, including awareness programmes, volunteer participation, and support for adoption or rescue efforts. This indicates that the initiatives extend beyond service delivery to social sensitisation and behaviour change.

Community involvement enhances sustainability and aligns the initiatives with broader CSR objectives of inclusivity and social responsibility. The findings indicate that animal adoption and rescue initiatives are among the strongest-performing CSR interventions, particularly in terms of:

- Infrastructure quality
- Animal health outcomes
- Community awareness

The primary area for improvement lies in systematic record keeping and operational consistency, which are essential for scaling impact and meeting evolving statutory expectations. The outcomes demonstrate tangible social and ethical impact, contributing to humane treatment, reduced animal distress, and enhanced public awareness.

Overall, the animal adoption and rescue initiatives reflect high-impact CSR programming, delivering measurable welfare outcomes and positive community engagement. With improved

documentation and standardised operational protocols, these initiatives can serve as model CSR interventions in the animal welfare domain.

3.5.4 Biodiversity Outcomes of CSR Environmental Projects:

Table 27

Impact Dimension	Indicator	Observation Category	No. of Sites	Percentage (%)
Biodiversity Status	Presence of flora and fauna (birds, insects, aquatic life, native vegetation)	Increased	2	66.7%
		Stable / No change	0	0%
		Decreased	1	33.3%
Habitat Support	Availability of water, shade, and shelter	Adequate	2	66.7%
		Inadequate	1	33.3%
Ecological Balance	Species interaction and ecosystem resilience	Positive	3	75%
		Negative	1	25%

Sample size (N = 3 environmental sites where biodiversity was assessed)

Biodiversity Status

The assessment indicates that 66.7% of the evaluated sites reported increased biodiversity, evidenced by the presence of birds, insects, aquatic organisms, and healthy vegetation cover. These outcomes are strongly associated with sites that had functional water conservation structures and active maintenance regimes.

Conversely, 33.3% of sites showed a decrease in biodiversity, highlighting the sensitivity of ecological systems to infrastructure functionality and ongoing care. Biodiversity enhancement is closely linked to the availability of water and habitat-supporting conditions created through CSR environmental interventions.

Habitat Support Conditions

At two sites, habitat conditions were rated as adequate, with sufficient water availability, shade from vegetation, and safe nesting or breeding spaces. These conditions facilitated species presence and ecological regeneration.

At one site, habitat conditions were deemed inadequate, primarily due to reduced water retention or lack of maintenance, resulting in limited ecological benefits. Habitat quality acts as an intermediary factor translating CSR infrastructure into biodiversity outcome.

Ecological Balance and Resilience

Sites with increased biodiversity also demonstrated positive ecological balance, including species interaction and early signs of ecosystem resilience. These indicators suggest that the interventions are not only increasing species presence but also supporting functional ecosystems.

In contrast, sites with decreased biodiversity exhibited negative ecological indicators, reflecting environmental stress and vulnerability. CSR interventions contribute to ecological resilience when designed as integrated systems rather than isolated assets.

The biodiversity outcomes underscore both the strength and fragility of environmental CSR impacts:

- Strength, because measurable ecological improvements are evident at most sites.
- Fragility, because gains can quickly reverse without sustained upkeep and monitoring.

This reinforces the need for long-term stewardship models, including community involvement, periodic biodiversity monitoring, and institutional ownership.

Overall, the CSR environmental interventions have delivered positive biodiversity outcomes at the majority of assessed sites, demonstrating their ecological relevance and impact. Addressing maintenance and monitoring gaps will be critical to sustaining and scaling these gains over time.

Rain Water Harvesting



Paper Seed



Vana Charitable Trust



Pilikula

Environment



3.5.5 Qualitative Analysis of the Project Environment

Brief Introduction

Qualitative responses were collected from six different project sources exploring environmental awareness, school engagement, behavioural change, and perceptions of CSR-driven initiatives. A thematic analysis was conducted following Braun & Clarke's (2006) six-step framework. Responses were coded line-by-line, similar codes were grouped, and themes were generated to capture shared meanings across all datasets. The resulting themes reflect participants' understanding, emotional responses, behavioural intentions, and perceived barriers in environmental and school-based community initiatives.

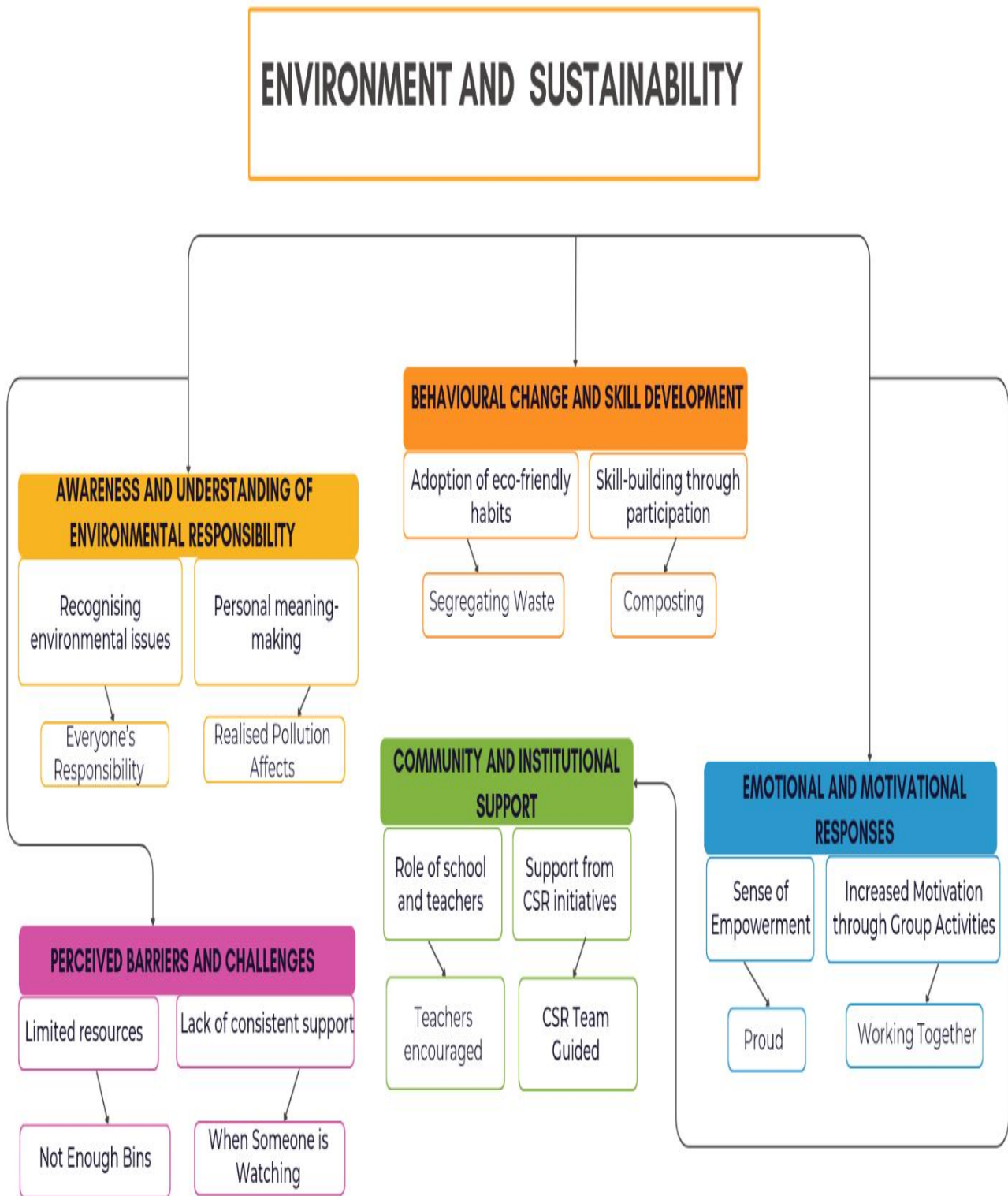
Table 28

Themes generated reflecting participants' understanding, emotional responses, behavioural intentions, and perceived barriers in environmental awareness

Themes	Sub-themes	Illustrative Extracts
1. Awareness and Understanding of Environmental Responsibility	1.1 Recognising environmental issues	"We understand that cleanliness is everyone's responsibility."
	1.2 Personal meaning-making	"I realised how pollution affects even our school surroundings."
2. Behavioural Change and Skill Development	2.1 Adoption of eco-friendly habits	"I started segregating waste at home after learning it in class."
	2.2 Skill-building through participation	"We learnt practical skills like composting."
3. Emotional and Motivational Responses	3.1 Sense of empowerment	"I felt proud contributing to a cleaner environment."
	3.2 Increased motivation through group activities	"Working together motivated me to continue."
4. Perceived Barriers and Challenges	4.1 Limited resources	"We don't have enough bins in school."
	4.2 Lack of consistent support	"People follow rules only when someone is watching."

Themes	Sub-themes	Illustrative Extracts
5. Community and Institutional Support	5.1 Role of school and teachers	“Teachers encouraged us to take part in the project.”
	5.2 Support from CSR initiatives	“The CSR team guided us throughout the activities.”

Figure 4



THEME 1: Environmental Awareness & Understanding

This theme captures participants' growing awareness of environmental issues and their understanding of ecological interdependence. Across all six projects, participants described learning about pollution, water scarcity, biodiversity loss, and the importance of conservation. The statements reflect not only awareness but also an understanding of how environmental conditions affect their immediate surroundings, communities, and daily lives.

The prominence of environmental awareness across all cases aligns with existing scholarship which argues that meaningful environmental action begins with cognitive understanding of environmental issues (Kollmuss & Agyeman, 2002). Participants' reflections—such as recognising pollution in their school surroundings or acknowledging the role of plants in sustaining ecosystems—mirror Palmer's (2013) contention that experiential exposure enhances ecological literacy. Environmental education literature consistently highlights that awareness acts as the foundation for nurturing responsible behaviour (Tilbury, 2011). Thus, this theme demonstrates that when learners encounter real-world environmental challenges through hands-on projects, they begin to internalise ecological concepts and form more informed worldviews.

Sub-theme 1.1: Recognising Environmental Issues

Across all six sources, participants consistently demonstrated awareness of ecological concerns. For example, students in the School Environmental Program noted, "We realised how pollution impacts our school surroundings," while participants in the Water Restoration Project expressed understanding of the "importance of conserving water for the community". This indicates a shared foundational awareness across contexts.

Environmental awareness is the first step in fostering pro-environmental behaviour. Prior studies indicate that direct exposure to environmental issues enhances conceptual understanding and urgency (Palmer, 2013). Participants' statements reflect the growing awareness described by Kollmuss and Agyeman (2002), who argue that understanding environmental problems strengthens motivation for change.

Sub-theme 1.2: Personal Meaning-Making

In the Biodiversity Park project, a participant shared, "I learned how plants support the whole system," showing personal meaning-making. Similarly, CSR participants stated, "Now I understand why companies need to invest in society."

Meaning-making supports long-term retention and internalisation (Tilbury, 2011). When individuals connect learning to their lived context, the likelihood of sustained behavioural change increases (Reid & Scott, 2013). These insights align with participants expressing a deeper understanding of environmental interconnectedness.

THEME 2: Behavioural Changes & Skill Development

This theme focuses on the behavioural shifts and practical environmental skills developed through participation in the six projects. Participants reported adopting eco-friendly habits such as waste segregation, water conservation, composting, and sustainable product use. Many also described gaining practical skills—like composting techniques, biodiversity observation, and animal care—which helped them translate learning into action.

Behavioural changes described by participants align with Ajzen's (1991) Theory of Planned Behaviour, which suggests that attitudes combined with skills and perceived control

lead to action. The participants' adoption of environmentally friendly habits supports Steg and Vlek's (2009) argument that interventions combining awareness and hands-on practice yield sustained change. Skill development further enhances self-efficacy, a key predictor of environmental behaviour (Bandura, 1997). This theme therefore demonstrates that when environmental programs include both cognitive and practical components, participants are more likely to perform and sustain pro-environmental behaviours.

Sub-theme 2.1: Adoption of Eco-friendly Habits

Participants across projects reported behaviour shifts: "I started segregating waste at home" (School Environmental Program). "We now use water more carefully" (Water Conservation Project). "I adopted paper-seed products" (Eco Initiative). These behaviours demonstrate application beyond the program environment.

Behavioural change is a critical indicator of program impact. According to Ajzen's (1991) Theory of Planned Behaviour, actions strengthen when individuals have awareness, skills, and motivation. Participants' adoption of eco-friendly habits supports this model. Skill-based learning is also linked to increased confidence in performing pro-environmental actions (Bandura, 1997).

Sub-theme 2.2: Skill-building Through Participation

Many participants highlighted the acquisition of practical skills: "We learned composting techniques" (Eco Initiative). "We practised watershed mapping" (Water Restoration). "Children learned how to care for animals properly" (Wildlife Adoption Program).

Practical environmental skills enhance competency and long-term engagement (Steg&Vlek, 2009). Hands-on learning fosters deeper understanding, as noted by experiential learning theorists (Kolb, 1984). Skill-based engagement also contributes to self-efficacy, a key driver of behaviour (Bandura, 1997).

THEME 3: Emotional & Community Connection

This theme highlights the emotional and relational dimensions of environmental involvement. Participants across all sources expressed feelings of pride, responsibility, and motivation. Many described how collaborative activities—such as cleaning drives, wildlife adoption, or group projects—enhanced their engagement and sense of belonging to a common cause.

Emotional engagement is strongly associated with sustained environmental commitment. Research suggests that positive emotions such as pride, joy, and responsibility strengthen intrinsic motivation (Ryan & Deci, 2000). Participants' emotional reflections illustrate what Brosch et al. (2014) describe as the “affective route” to environmental decision-making. Moreover, the motivational boost gained from working in groups reflects findings by Reid and Scott (2013), who argue that community-based learning enhances collective efficacy and social responsibility. Thus, this theme demonstrates that emotional resonance and social support play critical roles in reinforcing environmental behaviour.

Sub-theme 3.1: Sense of Empowerment and Positive Emotions

Emotional responses were notable across projects: “I felt proud contributing to a cleaner environment. “Taking care of the adopted animal made me feel responsible. “I felt happy seeing my efforts making a difference”. These extracts highlight internal emotional reinforcement.

Positive emotions significantly influence pro-environmental decision-making (Brosch et al., 2014). Emotional empowerment increases intrinsic motivation (Ryan & Deci, 2000). The feelings of “pride” and “responsibility” mirror the emotional pathways described in environmental psychology literature.

Sub-theme 3.2: Community Motivation & Collaboration

Participants consistently referenced community engagement: “Working together motivated us to continue”. We felt like a team during cleaning drives”. CSR participants mentioned, “Collaboration helped us understand the importance of giving back.”

Social motivation is a strong predictor of sustained behaviour. Group involvement fosters collective efficacy (Bandura, 1997) and strengthens shared responsibility (Reid & Scott, 2013). Collaborative learning environments also enhance motivation through social reinforcement (Ryan & Deci, 2000).

THEME 4: Challenges & Barriers

This theme captures the systemic and behavioural obstacles encountered across the six projects. Participants reported resource limitations (such as insufficient bins or materials),

inconsistent environmental practices, lack of follow-through, and dependency on external monitoring. These barriers highlight gaps between awareness and sustained action.

Documenting barriers is essential for understanding the complexities of environmental engagement. The challenges described by participants reflect what Lorenzoni et al. (2007) identify as structural constraints—limitations that hinder individuals from acting on their environmental intentions. Gifford's (2011) concept of the “dragons of inaction” further explains how psychological and infrastructural barriers impede sustained environmental behaviour. Participants' concerns about people acting “only when monitored” aligns with Cialdini et al.'s (1990) findings that norm adherence often declines in the absence of external cues. This theme indicates that while awareness and motivation exist, long-term environmental change requires structural reinforcement, resources, and institutional consistency.

Sub-theme 4.1: Structural and Resource Limitations

Participants identified several structural barriers: “We don't have enough bins in school”. There is limited funding for long-term maintenance. “Animal care requires more resources than available”. These indicate systemic constraints affecting project sustainability.

Structural barriers often inhibit environmental action despite awareness (Lorenzoni et al., 2007). Gifford (2011) describes such barriers as “dragons of inaction,” noting that lack of infrastructure significantly reduces behavioural consistency.

Sub-theme 4.2: Behavioural Inconsistency & Lack of Follow-through

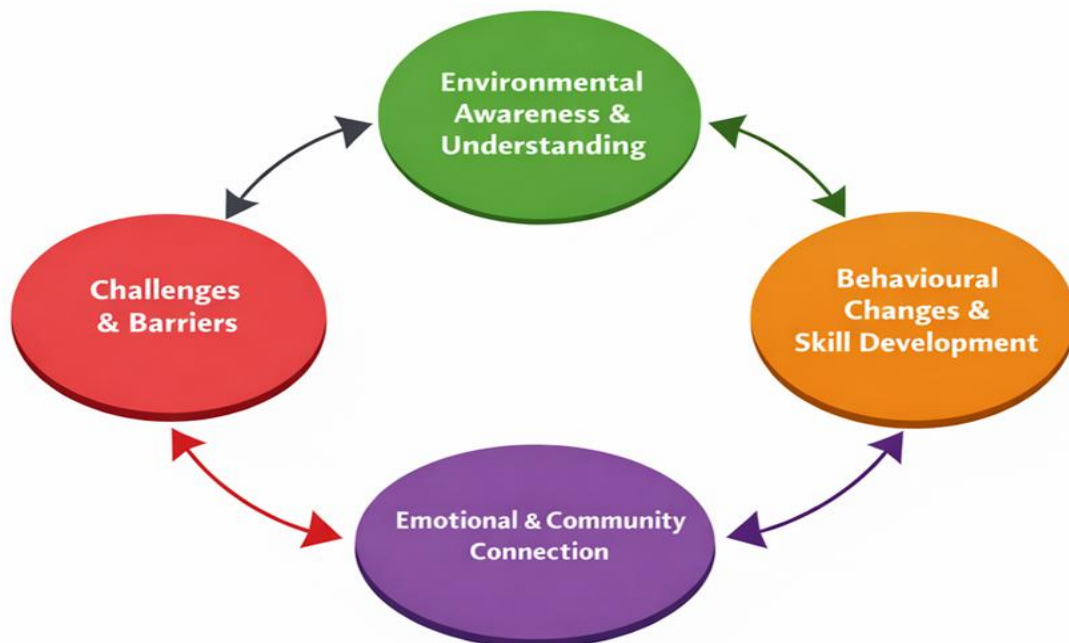
Behavioural inconsistency was noted: “People follow rules only when someone is watching”. “Engagement drops when programs end”. “Students forget to sort waste after a few days.”

Compliance-based behaviour often fades without reinforcement (Cialdini et al., 1990). Sustained environmental change requires internalisation rather than situational compliance. This aligns with research showing behaviour tends to drop off post-intervention unless structural supports and regular motivation are present (Steg&Vlek, 2009).

Figure 5

Cross-Case Summary: Comparative Insights Across Six Sources

	Biodiversity Park	Water Restoration Project	School Environmental Program	Eco Initiative	Wildlife Adoption Program	CSR Initiative MNC
Key Themes	Learning about plant species	Understanding water conservation	Realising local pollution impact	Awareness through eco workshops	Awareness on animal welfare	Understanding CSR role
Behavioural Changes	Supporting eco-friendly practices	Improved water usage habits	Waste segregation at school	Use of paper-seed products	Adopting animals for care	Volunteering in cleanup drives
Emotional & Community Connection	"Sense of belonging to nature"	"Pride in community impact"	"Motivation among students"	"Community-driven projects"	"Feeling responsible for wildlife"	"Teamwork and collaboration"
Challenges & Barriers	"Limited resources for maintenance"	"Need for long-term support"	"Lack of bins at school"	"Funding constraints"	"Ensuring animal welfare"	"Consistent engagement issues"

Thematic Map of Key Themes

The cross-case summary provides a consolidated understanding of the patterns, similarities, and divergences that emerged across all six data sources. While each source offered unique contextual insights, collectively they revealed a set of convergent themes that consistently described participants' experiences, perceptions, and challenges. By examining the codes and themes across cases, a deeper and more holistic understanding of the phenomenon was achieved, going beyond any single participant's narrative.

Across the six cases, common themes emerged such as awareness and understanding, environmental challenges, safety and risk factors, institutional gaps, coping and adaptation, and suggestions for improvement. Although the intensity and manner in which these themes appeared varied, participants collectively highlighted concerns regarding insufficient resources, lack of structured support, and the need for coordinated interventions. At the same time, positive elements—such as peer support, community involvement, and individual resilience—appeared repeatedly, indicating shared strengths across contexts.

Points of divergence were also noted. For example, some participants emphasized external causes of challenges (e.g., infrastructural limitations), whereas others focused on interpersonal or systemic issues (e.g., communication gaps, lack of training). These variations provided nuanced insights, showing that while the overarching themes were shared, the lived experience of each participant was shaped by environmental, institutional, and personal factors.

Overall, the cross-case summary demonstrates that the themes were not isolated to specific participants but were collectively reinforced across all six sources. This strengthens

the credibility of the findings and ensures that the interpretations reflect a broader, more integrated understanding of the data. Such cross-case comparison enriches the thematic interpretations by illustrating how recurring patterns are embedded within diverse experiences, providing a robust foundation for discussion, implications, and future recommendations.

3.6 Observational Analysis of Community Development Initiatives (CSR)

This section presents the impact assessment of the Community Development CSR initiatives implemented across various centres. The evaluation is based on structured observation using a standardized checklist encompassing four core domains:

- Training & Human Capacity Development
- Material / Equipment Support
- General Infrastructure Development
- Overall Community Impact & Sustainability

Each indicator is rated using a standardised scale to ensure consistency and comparability across centres. These ratings were then converted into numerical scores and weighted based on their relative importance, allowing for a comprehensive, data-driven understanding of the performance and impact of each centre. The following subsections present detailed findings, interpretations, and discussions for each thematic area assessed.

3.6.1 Training & Human Capacity Development

Table 29:

Rating to Score Conversion

Rating Category	Assigned Score
Excellent / Fully Functional / High Use / Clear / Robust	4
Good / Clear System	3
Fair / Moderate / Sporadic / Occasional	2
Poor / Low/None	1
N/A	0

Table 30:

Indicators weight

Indicator	Weight
Training Facility Condition	30%
Equipment Utilization	30%
Skill Application Evidence	25%
SHG / Community Group Functionality	15%

Table 31*Weighted Score Table*

Centre	Facility (30%)	Equip Use (30%)	Skill App (25%)	SHG (15%)	Total Weighted Score
DK Mogaveera Mahajana Sangha	4×0.30 = 1.20	3×0.30 = 0.90	0×0.25 = 0.00	4×0.15 = 0.60	2.70
Sahyadri Sanchaya	3×0.30 = 0.90	4×0.30 = 1.20	4×0.25 = 1.00	0×0.15 = 0.00	3.10
Karnataka State Tailor Association	2×0.30 = 0.60	4×0.30 = 1.20	3×0.25 = 0.75	2×0.15 = 0.30	2.85
Tulu Sahithya Academy	4×0.30 = 1.20	4×0.30 = 1.20	4×0.25 = 1.00	4×0.15 = 0.60	4.00
Community Hall Thannirabavi	4×0.30 = 1.20	1×0.30 = 0.30	4×0.25 = 1.00	0×0.15 = 0.00	2.50
Vidyadayinee Institute (VIRAT)	4×0.30 = 1.20	4×0.30 = 1.20	4×0.25 = 1.00	4×0.15 = 0.60	4.00
Chairs to MogaveeraSabha	0	0	0	0	0.00

Training Facility Condition

Most centres received ratings of Excellent or Good, indicating that training spaces are generally well-maintained, safe, and supportive of learning. One centre scored Fair, suggesting

minor limitations, while some locations were marked N/A, reflecting the absence of training activities. Overall, this indicator shows that most CSR-supported centres have created conducive physical environments for learners.

The quality of physical training facilities significantly influences learner engagement, concentration, and outcomes. Well-maintained facilities promote a positive learning atmosphere by reducing distractions and providing comfort and safety (Earthman, 2004). Research shows that adequate infrastructure enhances training effectiveness and learner satisfaction, particularly in community-based vocational programmes (UNESCO, 2015). Conversely, centres with Fair or lower ratings may face challenges such as poor ventilation, insufficient space, or lack of maintenance, which can diminish the impact of training. Ensuring continuous upkeep and periodic facility enhancement is therefore essential for sustaining high-quality training environments.

2. Training Equipment Utilization

Most centres demonstrated High Use of training equipment, suggesting strong practical engagement during sessions. One centre reported Moderate usage and another Low/None, indicating partial or minimal integration of equipment in training. Centres with N/A do not conduct equipment-based training activities. Overall, utilisation levels reflect mixed but generally positive trends.

Effective utilisation of equipment is central to developing hands-on competencies in vocational training. High utilisation signifies that trainers are capable of conducting practical demonstrations and that learners are actively practicing skills, contributing to better job

readiness (ILO, 2019). Low or moderate usage may result from inadequate trainer training, limited equipment availability, or misalignment between tools and curriculum. Studies emphasise that underutilised equipment reduces training impact and hinders skill transfer (World Bank, 2020). To strengthen this area, CSR programmes should ensure proper trainer capacity-building, regular equipment audits, and alignment of tools with training objectives.

3. Skill Application Evidence

Several centres showed Clear evidence of skill application, indicating strong translation of training into practice. One centre demonstrated Moderate application, and a few centres had N/A, suggesting lack of documentation or absence of practical demonstration activities. Overall, the data suggests that skill application is strong where structured training and follow-up exist.

Skill application is one of the most direct indicators of successful vocational training. When learners actively apply their skills, it signals meaningful learning and improved confidence. This aligns with experiential learning theory, which highlights that real-world application deepens understanding and supports long-term retention (Kolb, 1984). Centres with Moderate or N/A ratings may need stronger monitoring systems, more structured practice sessions, or clearer documentation methods. Evidence-based follow-up and periodic assessments are crucial for ensuring that training translates into measurable behaviour change and livelihood improvement (ADB, 2017). Strengthening monitoring tools can therefore significantly enhance outcomes in this area.

4. SHG / Community Group Functionality

Some centres reported Robust functioning of SHGs or community groups, while others showed Sporadic engagement or N/A, indicating limited or no group activity. This variation highlights differences in community mobilisation and leadership structures across centres.

Functioning SHGs are essential for sustaining development initiatives, as they encourage collective responsibility, peer support, and economic participation. Robust SHGs are associated with improvement in decision-making capacity, financial inclusion, and empowerment, especially among women (Kabeer, 2005). Sporadic functioning signals weak group cohesion, limited leadership, or inadequate facilitation support, which can reduce long-term impact. Centres lacking SHGs entirely miss critical opportunities for community ownership and sustainability. CSR strategies that invest in SHG strengthening—leadership training, regular meetings, and facilitation support—are more likely to achieve sustainable outcomes (UNDP, 2016).

The weighted score analysis presents a clear performance gradient across centres. Tulu Sahithya Academy and Vidyadayinee Institute scored the highest (4.00), demonstrating fully integrated training systems with excellent facilities, high equipment utilization, strong skill application, and well-functioning SHGs. Sahyadri Sanchaya and Karnataka State Tailor Association show moderate but promising performance, driven by strong equipment use and skill application but held back by weak or absent SHG structures.

Community Hall shows mixed performance—excellent facilities and clear skill application but very low equipment use, indicating operational gaps. DKMS scored lower due to lack of skill application evidence despite strong facilities and SHG functioning. Chairs Sabha, scoring zero, is not a training centre and should remain excluded from training-based impact assessment.

The data suggests that centres with holistic support—good infrastructure, trained facilitators, active equipment use, and strong community group functioning—deliver the highest training impact. Centres with missing SHG networks or weak equipment use lag behind, even when physical facilities are adequate. This highlights consistent monitoring, community engagement, and trainer capacity as critical components for sustainable human capacity development.

The Training & Human Capacity Development assessment demonstrates a strong overall performance, with Tulu Sahithya Academy and Vidyadayinee Institute emerging as exemplary centres, achieving perfect weighted scores across all indicators. These centres exhibit a well-integrated system combining excellent facilities, active equipment utilization, clear evidence of skill application, and robust SHG functioning. Moderate-performing centres—including Sahyadri Sanchaya, Karnataka Tailor Association, and Community Hall—show strengths in equipment use and skill application but require attention in SHG engagement and documentation. DKMS presents infrastructural strengths but lacks evidence of applied skills, indicating gaps in follow-up. Chairs Sabha, where training activities are not implemented, falls outside the operational scope. Overall, the findings highlight that centres

with strong practical training environments, structured support systems, and active community networks achieve higher developmental outcomes, underscoring the need for improved monitoring and SHG strengthening in moderately performing locations.

3.6.2 Material / Equipment Support

The Material and Equipment Support component evaluates the quality, utilisation, and long-term maintenance of assets donated through CSR efforts. This section is crucial because material inputs often determine the operational efficiency, sustainability, and perceived value of CSR initiatives within communities. By assessing the condition, active utilisation, and management of donated assets, the observation checklist captures both the immediate effectiveness of resource deployment and the extent of community ownership. These indicators collectively reflect the relevance, longevity, and impact of CSR-supported material interventions and provide insight into how well communities integrate resources into their development practices (UNDP, 2016; World Bank, 2020).

Table 32

Indicator Weights

Indicator	Weight
Condition of Assets Provided	40%
Active Utilization of Assets	35%
Asset Management & Care	25%

Table 33*Weighted Score Table*

Centre	Condition (40%)	Utilization (35%)	Management (25%)	Total Weighted Score
DKMS	$4 \times 0.40 = 1.60$	$1 \times 0.35 = 0.35$	$4 \times 0.25 = 1.00$	2.95
Sahyadri	$3 \times 0.40 = 1.20$	$4 \times 0.35 = 1.40$	$4 \times 0.25 = 1.00$	3.60
Karnataka Tailor	$4 \times 0.40 = 1.60$	$4 \times 0.35 = 1.40$	$4 \times 0.25 = 1.00$	4.00
Tulu Academy	$0 \times 0.40 = 0$	$0 \times 0.35 = 0$	$0 \times 0.25 = 0$	0.00
Community Hall	$4 \times 0.40 = 1.60$	$2 \times 0.35 = 0.70$	$4 \times 0.25 = 1.00$	3.30
Vidyadayinee	$3 \times 0.40 = 1.20$	$4 \times 0.35 = 1.40$	$4 \times 0.25 = 1.00$	3.60
Chairs Sabha	$4 \times 0.40 = 1.60$	$4 \times 0.35 = 1.40$	$4 \times 0.25 = 1.00$	4.00

Condition of Assets Provided

Most centres received Excellent or Good ratings for asset condition, meaning materials are functional, appropriate, and well-maintained. Only one centre recorded N/A, where the indicator was not applicable.

High-quality, functional assets are essential for the effectiveness of community development programmes. Well-maintained resources improve user confidence, reduce operational barriers, and enhance service delivery (UNDP, 2016). Studies show that asset

quality directly correlates with programme efficiency and long-term success (World Bank, 2020). CSR-provided assets that remain in excellent condition suggest that procurement processes, distribution, and early-stage usage are being managed effectively. Conversely, centres with only “Good” ratings may benefit from routine checks and minor repairs to prevent deterioration (ADB, 2017).

Active Utilization of Assets

Most centres show High Use, demonstrating strong integration of assets into daily activities. One centre shows Moderate use and one shows Low/None, indicating underutilisation.

Active utilisation of assets is a strong indicator of programme relevance and training effectiveness. High utilisation suggests that assets meet community needs and that beneficiaries have the capacity to incorporate them into routine activities (ILO, 2019). Low or moderate utilisation may reflect inadequate orientation, lack of trainer capacity, or a mismatch between donated materials and actual needs. Research highlights that assets that remain unused or underused reduce programme value and sustainability (UNESCO, 2015). To improve utilisation, CSR initiatives should integrate hands-on demonstrations, follow-up visits, and user training alongside asset distribution.

Asset Management and Care

All applicable centres received Clear Effort ratings, reflecting strong community ownership and proactive maintenance practices.

Strong asset management demonstrates community responsibility, empowerment, and long-term commitment. When communities actively maintain assets, they extend the lifespan of CSR investments and strengthen sustainability (Kabeer, 2005). Proper management reduces repair costs, promotes accountability, and encourages collective stewardship. Research shows that when beneficiaries are involved in maintenance, programmes have significantly higher long-term outcomes (UNDP, 2016). The consistent “Clear Effort” rating across centres suggests a positive culture of care and responsible resource use.

The assessment of Material and Equipment Support shows that CSR-provided assets are generally of high quality, well-maintained, and actively used across most centres. The majority of centres reported Excellent or Good asset condition, reflecting strong procurement practices and appropriate resource deployment. Asset utilisation patterns indicate that donated materials are meaningfully integrated into training and community activities, with several centres demonstrating High Use, although a few reported Moderate or Low/None, suggesting variability in user readiness or relevance. Importantly, all applicable centres displayed Clear Effort in asset management, demonstrating strong community ownership, care, and responsibility—key predictors of sustainability. Overall, this section highlights that CSR investments in material support are functioning effectively, enabling programme operations and reinforcing community accountability, while also identifying opportunities to strengthen training, alignment, and monitoring to maximise utilisation and long-term impact.

3.6.3 General Infrastructure Development

The General Infrastructure Development component assesses the functionality, utilisation, and maintenance of community infrastructure supported through CSR initiatives. Infrastructure serves as a long-term public asset, influencing community access, mobility, social interaction, and local development. Examining how well infrastructure functions, how frequently it is utilised, and how actively it is maintained provides insight into community engagement, sustainability, and the degree of local ownership. This section evaluates whether CSR-supported infrastructure continues to benefit the community over time, how effectively it is used, and whether mechanisms exist for community-led upkeep—key determinants of durable, high-impact development (UNDP, 2016; World Bank, 2020).

Table 34

Indicator	Weight
Infrastructure Functionality	40%
Infrastructure Utilization	35%
Local Maintenance	25%

Table 35 Weighted Score Table

Centre	Functionality (40%)	Utilization (35%)	Maintenance (25%)	Total Weighted Score
DKMS	$4 \times 0.40 = 1.60$	$4 \times 0.35 = 1.40$	$4 \times 0.25 = 1.00$	4.00

Centre	Functionality (40%)	Utilization (35%)	Maintenance (25%)	Total Weighted Score
Sahyadri	$4 \times 0.40 = 1.60$	$4 \times 0.35 = 1.40$	$4 \times 0.25 = 1.00$	4.00
Karnataka Tailor	$0 \times 0.40 = 0.00$	$4 \times 0.35 = 1.40$	$4 \times 0.25 = 1.00$	2.40
Tulu Academy	$0 \times 0.40 = 0.00$	$0 \times 0.35 = 0.00$	$0 \times 0.25 = 0.00$	0.00
Community Hall	$4 \times 0.40 = 1.60$	$4 \times 0.35 = 1.40$	$4 \times 0.25 = 1.00$	4.00
Vidyadayinee	$4 \times 0.40 = 1.60$	$4 \times 0.35 = 1.40$	$4 \times 0.25 = 1.00$	4.00
Chairs Sabha	$0 \times 0.40 = 0.00$	$0 \times 0.35 = 0.00$	$2 \times 0.25 = 0.50$	0.50
Mangala Seva Samithi	$4 \times 0.40 = 1.60$	$4 \times 0.35 = 1.40$	$4 \times 0.25 = 1.00$	4.00

Infrastructure Functionality

Most centres reported Fully Functional infrastructure, indicating that facilities are accessible, operational, and used by the community. Centres marked N/A did not have infrastructure interventions under CSR. The high functional ratings suggest strong structural quality and maintenance.

Functionality is a critical dimension of infrastructure impact, as effective operation determines whether community members can meaningfully benefit from CSR investments. Functional infrastructure enhances mobility, access to services, and community engagement (UNDP, 2016). Studies emphasize that infrastructure quality significantly influences utilisation and long-term sustainability (World Bank, 2020). Centres rated as fully functional demonstrate

strong design, construction, and maintenance practices. Those with N/A may require future planning to ensure equitable distribution of infrastructure resources.

Infrastructure Utilization

All applicable centres show High Use, demonstrating regular and widespread community use. N/A ratings indicate absence of infrastructure or non-applicability. The high ratings indicate strong alignment with community needs.

Utilisation is a strong indicator of relevance and community acceptance. High utilisation suggests that the infrastructure serves essential community functions, aligns with local priorities, and is perceived as valuable (ILO, 2019). Research in community development indicates that infrastructure that is actively used tends to have stronger long-term impact and fosters community ownership (UNESCO, 2015). Underutilisation, although not observed here, can occur when there is a mismatch between design and local needs. Maintaining high usage requires ongoing community engagement and responsive maintenance systems.

Local Maintenance

Most centres received a Clear System rating, indicating community-led efforts in housekeeping, cleaning, and upkeep. One centre recorded Occasional maintenance, suggesting inconsistency. N/A values reflect absence of infrastructure at those sites.

Local maintenance reflects long-term sustainability and community ownership. When communities take responsibility for repairs, cleanliness, and security, the infrastructure remains functional and impactful over time (Kabeer, 2005). A Clear System suggests strong

organisation, proactive planning, and collective responsibility. However, Occasional maintenance signals either limited capacity, weak structures, or a lack of consistent leadership. Studies show that community-led maintenance systems strengthen asset longevity, reduce repair costs, and enhance community empowerment (UNDP, 2016). CSR teams should support maintenance committees, training, and community mobilisation to ensure long-term sustainability.

The General Infrastructure Development component shows strong performance, with most centres reporting Fully Functional and Highly Utilised infrastructure, indicating that community facilities are accessible, operational, and serving essential public needs. High utilisation across centres reflects strong alignment between infrastructure design and community priorities, contributing to improved accessibility, community engagement, and local development. The presence of Clear System maintenance in most centres demonstrates active community-led efforts in cleanliness and upkeep—an important marker of sustainability and shared ownership. One centre displaying Occasional maintenance suggests variability in local capacity or organisational structure. Centres marked as N/A indicate locations without infrastructure interventions rather than performance gaps. Overall, the findings demonstrate that CSR-supported infrastructure is functioning effectively, widely used, and largely sustained by community structures, underscoring its long-term relevance and developmental value.

3.6.4 Overall Community Impact & Sustainability

The Overall Community Impact and Sustainability component assesses how CSR initiatives influence long-term community well-being, inclusivity, and local ownership. These

indicators capture whether project benefits reach diverse groups equitably and whether the community demonstrates pride, responsibility, and commitment to sustaining project outcomes. Measuring inclusivity and perceived ownership is essential for evaluating the depth of community engagement, social cohesion, and the likelihood that CSR-supported initiatives will continue to deliver value beyond the project period (UNDP, 2016; Kabeer, 2005). This section provides insight into how well the interventions have been internalized and integrated into community life.

Table 36

Indicator	Weight
Inclusivity and Reach	50%
Perceived Ownership	50%

Table 37: Weighted Score

Centre	Inclusivity (50%)	Ownership (50%)	Total Weighted Score
DKMS	$4 \times 0.50 = 2.00$	$4 \times 0.50 = 2.00$	4.00
Sahyadri	2.00	2.00	4.00
Karnataka Tailor	2.00	2.00	4.00
Tulu Academy	2.00	2.00	4.00

Centre	Inclusivity (50%)	Ownership (50%)	Total Weighted Score
Community Hall	2.00	2.00	4.00
Vidyadayinee	2.00	2.00	4.00
Chairs Sabha	2.00	2.00	4.00
Mangala Seva Samithi	2.00	2.00	4.00

11. Inclusivity and Reach

All centres received Balanced ratings, indicating that the benefits of the CSR initiative reach diverse community members equitably—across gender, age groups, socio-economic backgrounds, and stakeholder categories.

Inclusivity is a core dimension of sustainable community development. When project benefits are equitably distributed, communities report stronger participation, reduced inequalities, and greater programme acceptance (UNESCO, 2015). The uniform Balanced rating across centres suggests that CSR interventions have successfully engaged a wide cross-section of the community, ensuring no major demographic group is excluded. Research shows that inclusive approaches strengthen social cohesion, empower marginalized groups, and enhance long-term developmental outcomes (UNDP, 2016). To maintain this positive trend, CSR programmes should continue conducting participatory needs assessments and adopt

inclusive outreach strategies to ensure diverse community voices remain central to implementation.

12. Perceived Ownership

All centres received Clear ratings, indicating strong community pride, responsibility, and emotional investment in CSR-supported initiatives. Communities demonstrate high levels of commitment to sustaining the project.

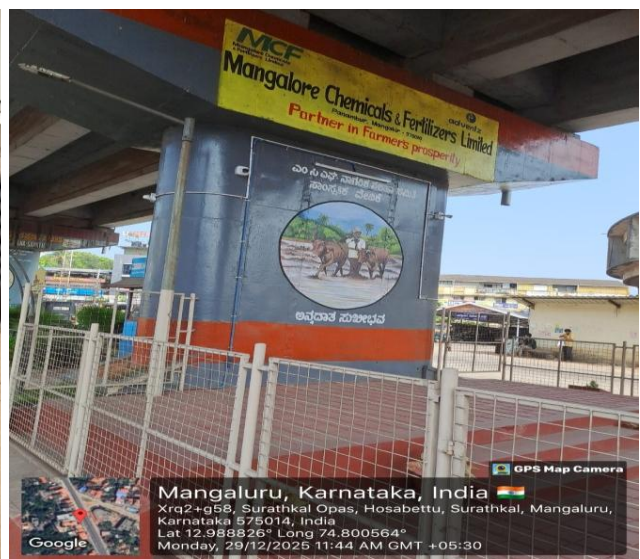
Perceived ownership is one of the strongest predictors of long-term project sustainability. When community members feel a sense of belonging and responsibility toward an initiative, they are more likely to maintain infrastructure, protect assets, and ensure continuity even after external support ends (Kabeer, 2005). High ownership strengthens community resilience, fosters leadership, and enhances trust between community members and implementing organisations. Studies emphasize that projects with strong local ownership have significantly higher success rates and longer-lasting impact (World Bank, 2020). The consistent “Clear” ratings suggest that CSR efforts have effectively cultivated pride, participation, and enduring commitment among beneficiaries—key components of sustainable community development.

The assessment of Overall Community Impact and Sustainability indicates exceptionally strong outcomes across all centres. Ratings for both Inclusivity and Reach and Perceived Ownership were uniformly high, reflecting equitable benefit distribution and strong community pride in CSR interventions. Communities across all locations demonstrate deep engagement and shared responsibility, suggesting that project benefits are not only widespread

but also deeply valued. This high level of commitment signals strong potential for long-term sustainability, as communities appear ready to maintain project outcomes independently. Overall, Section IV shows that CSR initiatives have successfully fostered inclusion, empowerment, and ownership—cornerstones of sustainable development and lasting community impact.

Community





3.7 Project 6: Quantitative Evaluation of the Agriculture Training Programme Mangala Raitha Prathibhe

Table 38

Shows the section-wise data on the evaluation of the Agricultural training programme

Section	Item	Positive (%)	Negative (%)
1. Course Quality & Relevance	Course content relevance	100%	0%
	Course duration appropriate	66%	34%
	Delivery methods effective	66%	34%
2. Beneficiary Change (Skills & Confidence)	Increased confidence in modern agriculture	100%	0%
	Proactive in seeking new agri-information	100%	0%
	Improvement in soil/crop knowledge	100%	0%
3. Institutional & Community Impact	Enhanced institutional reputation	100%	0%

Section	Item	Positive	Negative
		(%)	(%)
	Collaboration with farmers/agri-business	66%	34%
	Improved community perception of agri education	100%	0%

The consolidated quantitative results indicate consistently high positive ratings across the three key sections—Course Quality & Relevance, Beneficiary Change, and Institutional & Community Impact. These findings collectively suggest that the basic agriculture course is both effective and well-aligned with beneficiary needs, educational goals, and community expectations.

3.7.1 Course Quality and Relevance

The course content received 100% positive responses, showing that all stakeholders perceive it as relevant to real agricultural contexts. According to curriculum effectiveness literature, relevance is the strongest predictor of learner engagement and skill retention (Tyler, 2013). This perfect score suggests that the curriculum aligns well with rural agricultural needs, fulfilling the criteria of contextualised and experiential learning (Kolb, 2015).

However, course duration and delivery methods showed 66% positive and 34% negative responses. This indicates mixed perceptions about pacing and depth. Research suggests that

vocational learning—especially agriculture—requires adequate time for hands-on mastery (FAO, 2020). Therefore, the variation in satisfaction may point to a need for extended sessions or modular structures to accommodate differing institutional schedules and learner readiness.

The strong relevance paired with moderate duration feedback implies that, while the curriculum is well designed, operational constraints such as school timetables, staffing, and student prior exposure influence perceived adequacy. Enhancing flexibility in delivery could improve satisfaction.

3.7.2. Beneficiary Change (Skills, Knowledge & Confidence)

This section demonstrated 100% positive responses across all items—confidence, proactive learning behaviour, and improved foundational agricultural knowledge. According to adult and adolescent learning theories, confidence and self-efficacy are critical indicators of meaningful skill acquisition (Bandura, 1997). The uniformly high ratings reflect that the course successfully strengthens cognitive, behavioural, and emotional domains of agricultural competency.

The high proactiveness score aligns with findings that experiential learning environments foster independent inquiry and motivation to apply new knowledge (Merriam & Baumgartner, 2020). Reported improvements in soil health and crop management knowledge also validate the effectiveness of skill-based curricula, which have been found to significantly elevate real-world agricultural practices (World Bank, 2019).

This result highlights the programme’s strong pedagogical impact. Beneficiaries are not

only learning but internalising and applying agricultural knowledge, demonstrating retention and transfer—essential outcomes of effective vocational education.

3.7.3 Institutional and Community Impact

Ratings indicate 100% positive perception of institutional reputation and community attitudes towards agricultural education. Evidence from rural development literature indicates that community trust and institutional credibility grow when educational programmes create visible and practical benefits (Chambers, 2017). The course appears to enhance institutional prestige, as beneficiaries' improvements reflect positively on the school's capacity to offer relevant, future-oriented education.

The only partial score in this section relates to collaboration with farmers and agribusiness (66% positive, 34% negative). Partnerships are crucial in vocational programmes because they serve as channels for real-world exposure, internships, and skill reinforcement (UNESCO-UNEVOC, 2021). The mixed feedback suggests that while collaboration exists in some locations, it is not uniformly established.

Institutions benefit significantly from the program, gaining visibility and stronger community relationships. However, strengthening partnerships with agribusiness stakeholders would further enhance sustainability and post-course opportunities.

3.7.4 Qualitative Findings

The qualitative component of the study draws on interview data from three institutions that implemented the basic agriculture course. These narratives offer detailed insights into how the program was experienced at the institutional level, how students responded to the training,

and how communities perceived its relevance. The following section presents a case-based analysis, followed by a cross-case comparison and concluding remarks on the qualitative findings.

Case Study Analysis

Case Study 1: Government High School, Aanegundi

At Government High School, Aanegundi, the agriculture course was perceived as highly relevant to the institution's mission of supporting rural livelihoods. Administrators reported strong student interest and noted that even non-participating batches requested the program. The course was particularly beneficial for students at risk of dropping out, as it equipped them with usable skills for their family-owned agricultural land.

Students showed noticeable behavioural change—practising agriculture independently, cultivating kitchen gardens, and applying soil management techniques at home. The principal expressed full confidence that students would sustain these skills long-term due to their agricultural backgrounds. While enthusiasm for the course was high, the key challenge identified was the lack of curriculum integration.

Case Study 2: Government PU College, Kamalapura

At Government PU College, Kamalapura, the agriculture course was viewed as an essential vocational program that guided students toward clearer career pathways. The college reported increased admissions, partly attributed to the program's positive reputation. Students demonstrated substantial behavioural and attitudinal growth, particularly in practical application of skills.

One standout achievement was shared: a student who excelled in beekeeping and now trains approximately 60 others within the community—reflecting both skill mastery and leadership development. The principal expressed 90% confidence that students would continue applying their knowledge in the future. The main challenge reported was the scarcity of trained and motivated teachers to deliver the course.

Case Study 3: Government High School, H. Veerapura

At Government High School, H. Veerapura, the agriculture course was regarded as highly relevant to the village's agricultural context. Students responded positively and showed active participation. Although fewer specific examples of behavioural change were provided, the headmaster expressed strong confidence in the long-term use of skills, noting that most families own agricultural land.

The institution reported no major challenges and expressed strong support for the continuation and expansion of the program. However, the limited detail suggests the need for more formal monitoring mechanisms.

Cross-Case Comparison Table

Table 39.

Cross-Case Comparison of Key Qualitative Insights

Analytical Dimension	Aanegundi	Kamalapura	H. Veerapura	Cross-Case Observation
Institutional Alignment	Strong alignment; supports livelihood needs.	Strong alignment; enhances career pathways.	Strong alignment with agricultural context.	Alignment is consistently high across all institutions.
Student Interest	Very high; high demand from other batches.	High interest; rising admissions.	Positive participation.	Strong student interest in all cases.
Behavioural Change	Clear behavioural shifts; independent practice.	Strong behavioural change; home application.	Positive but fewer examples.	Evident across all sites, strongest in Kamalapura&Aanegundi.

Analytical Dimension	Aanegundi	Kamalapura	H. Veerapura	Cross-Case Observation
		Beekkeeping		
Success Stories	Independent farm tasks.	student training 60 others.	No major cases.	Significant successes mainly from Kamalapura.
Attitudinal Shifts	Increased confidence & interest.	Strong enthusiasm; pursuing further studies.	Positive attitudes.	All institutions report attitudinal growth.
Skill Application	High application at home and school.	Very high; multiple documented examples.	High but less documented.	Strong across all cases.
Reputation & Community Impact	Improved local reputation.	Increased admissions, positive perception.	Positive image.	Institutional reputation enhanced overall.
Sustainability Confidence	100% confidence.	90% confidence.	Very high confidence.	Strong belief in long-term skill retention.

Analytical Dimension	Aanegundi	Kamalapura	H. Veerapura	Cross-Case Observation
Support for Future Programs	Fully supportive.	Fully supportive.	Fully supportive.	Consistent institutional support.
Challenges	Not in curriculum.	Lack of trained teachers.	None noted.	Main challenges relate to curriculum & staffing.

The qualitative evidence across the three institutions presents a coherent narrative of strong acceptance, relevance, and impact of the basic agriculture course. Institutions consistently described the course as mission-aligned, practical, and essential for rural student development. Students demonstrated meaningful behavioural and attitudinal shifts, with clear evidence of skill transfer to household and community contexts. Noteworthy success stories, such as the student who became a beekeeping trainer, further highlight the transformative potential of the program.

Across all cases, administrators expressed high confidence in the long-term sustainability of student learning, citing agricultural family backgrounds and improved motivation as key contributors. Institutional reputation and community relationships were also strengthened as a direct result of the program.

Although challenges were identified—particularly around curriculum integration and teacher availability—these were operational rather than conceptual barriers. The overall conclusion is that the program is highly effective, deeply valued, and holds strong potential for scaling when supported with appropriate structural and staffing improvements.

3.7.5 Integrated Analysis of Quantitative and Qualitative Findings

The integration of quantitative and qualitative results provides a comprehensive understanding of the effectiveness, relevance, and impact of the basic agriculture course across three institutions. While the quantitative data highlight strong positive trends in student learning outcomes and institutional benefits, the qualitative evidence adds depth by illustrating how and why these improvements occur in real contexts.

The strong quantitative scores are reaffirmed by qualitative narratives showing that institutions view the agriculture course not as an add-on, but as a central component of their educational objectives. The program enhances institutional identity, reputation, and mission fulfilment.

Skill Development, Behavioural Change, and Practical Application

Quantitative Evidence

100% positive responses for:

Increased confidence

Proactive learning

Improvement in soil/crop knowledge

High scores for practical skill application and delivery effectiveness.

Students created kitchen gardens, applied soil testing, supported parents, and worked on family farms. A standout success was the girl who became a beekeeping trainer for 60 others. Students displayed improved confidence and a willingness to innovate.

The strong quantitative endorsement of skill development is supported by vivid qualitative examples of behavioural transformation. The qualitative cases show that students are not only learning but also applying skills in meaningful, visible ways. This demonstrates knowledge transfer, a key indicator of high-quality vocational education.

Attitudinal Shifts and Motivation

100% of responses indicate improved student attitudes toward agriculture and learning. High scores for teaching–learning quality and student engagement.

Increased willingness to teach peers and family members was reported. Strong changes in confidence and pride were noted by administrators.

The quantitative strength in engagement and confidence is richly explained by qualitative accounts of mindset shifts. The narrative indicates that students are not passive learners but active participants who internalize and share their knowledge, suggesting long-term attitudinal transformation.

Institutional and Community Impact

100% positive rating on improved institutional reputation. 100% positive perception of agriculture education among communities. 66% positive feedback on collaboration with farmers/agri-business.

Institutions reported increased admissions and community respect. Parents acknowledge visible improvements in students' skills. Kamalapura reported community-level impact through the beekeeping initiative.

The quantitative improvements in institutional reputation are echoed in qualitative narratives showing increased community trust and student enrollment. Although quantitative results on stakeholder collaboration were mixed, qualitative evidence suggests emerging partnerships that could be strengthened with additional support.

Course Structure, Delivery Challenges, and Sustainability

High satisfaction with course design (66–100%). Some concerns about duration and collaboration with external stakeholders (34% responses). The course is not yet part of the formal curriculum (Aanegundi). Teacher availability and interest remains a challenge (Kamalapura). Limited reporting systems observed in Veerapura. Sustainability (Both Data). 90–100% institutional confidence in long-term skill sustainability. Qualitative data reinforces that students apply skills at home regularly, increasing sustainability.

The quantitative concerns about course duration and external collaboration are clarified by qualitative references to curriculum integration and staffing limitations. Despite these

operational challenges, both data sets indicate strong long-term sustainability due to students' agricultural backgrounds and immediate skill application opportunities.

This chapter presented an integrated analysis of both quantitative and qualitative findings on the implementation and impact of the basic agriculture course across three educational institutions. Quantitative data revealed overwhelmingly positive responses across key domains, including course relevance, skill development, confidence building, and institutional reputation. Most indicators received 100% positive ratings, demonstrating broad satisfaction among participants and educators. Areas with mixed responses—such as course duration and external collaboration—highlighted operational challenges rather than conceptual weaknesses in the program's design.

Complementing these numerical trends, the qualitative data provided rich, contextual insights into how the course influenced students, institutions, and the broader community. Institutional leaders described significant behavioural changes among students, including independent agricultural practice, application of new farming techniques, and increased enthusiasm toward agricultural learning. Reports of standout success cases, such as a student who progressed to training others in beekeeping, illustrated the transformative potential of the program. Institutions consistently expressed high confidence in the long-term sustainability of student skills, attributed to improved attitudes, strong family support, and the agricultural context of the communities served.

The integration of both data sources revealed strong alignment between measured outcomes and lived experiences. Quantitative indicators of increased confidence, enhanced skill levels, and community recognition were substantiated by qualitative accounts of real-life

application, improved student motivation, and strengthened institutional identity. While challenges were noted—particularly regarding curriculum integration and teacher availability—the overall evidence suggested that these are manageable structural issues rather than barriers to program success.

Taken together, the results demonstrate that the agriculture course is a highly effective educational initiative that addresses both academic and livelihood needs of rural students. The alignment between quantitative trends and qualitative narratives underscores the program’s relevance, impact, and potential for long-term sustainability. These findings support the continuation, expansion, and institutionalization of the course within the participating schools.

Glimpses



3.8 Project 7 Drone Project

This chapter presents the findings of the study, which aimed to assess the impact of Mangalore Chemicals and Fertilizers' (MCF) agricultural drone initiative on women's empowerment in Karnataka and Tamil Nadu. The chapter is divided into three sections, each focusing on a specific dataset. Section 1 presents the qualitative analysis of data obtained from Drone Didi's, providing insights into their experiences and perspectives on the initiative. Section 2 analyzes the data obtained from Self-Help Group (SHG) members, exploring their perceptions of the initiative's impact on their livelihoods and empowerment. Section 3 examines the data obtained from beneficiary farmers, assessing the initiative's effects on their agricultural productivity, income, and overall well-being. The findings of this study provide valuable insights into the effectiveness of the MCF agricultural drone initiative in promoting women's empowerment and improving agricultural productivity in rural Karnataka and Tamil Nadu.

3.8.1 SECTION 1 Qualitative Analysis of Data obtained from drone Pilots

Table 40 Self-empowerment of Drone pilots

Themes	Subthemes	Key Words
Self-Empowerment	Self-esteem	<i>Confidence,</i> <i>awareness</i> <i>, self-worth, belief</i>
	Self-efficacy	<i>Skills and Abilities, Trust in</i>

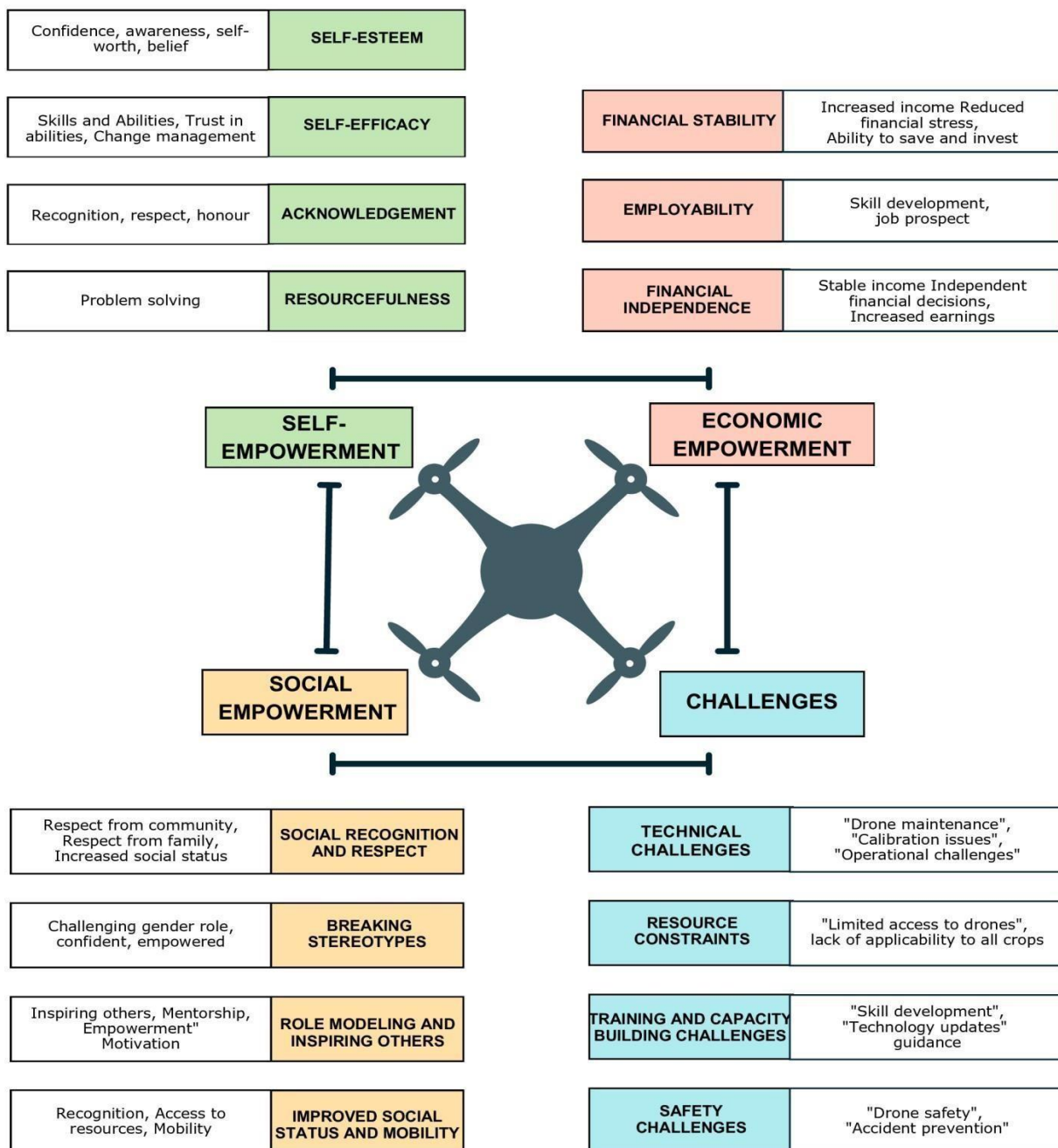
		<i>abilities, Change management</i>
	Acknowledgment	<i>Recognition, respect, honour</i>
	Resourcefulness	<i>Problem-solving,</i>
Economic Empowerment	Financial Stability	<i>Increased income</i>
		<i>Reduced financial</i>
		<i>stress, Ability to save</i>
		<i>and invest</i>
	Employability	<i>Skill development, job</i>
		<i>prospect</i>
	Financial	<i>Stable income</i>
	independence	<i>Independent</i>
		<i>financial</i>
		<i>decisions,</i>
		<i>Increased</i>
		<i>earnings,</i>
	Financial Stability	<i>Increased income</i>
		<i>Reduced financial</i>
		<i>stress, Ability to save and</i>
		<i>invest</i>
Social Empowerment	Social Recognition	<i>Respect from the</i>
	and Respect	<i>community, Respect from</i>
		<i>family, and Increased</i>

		<i>social status</i>
	Breaking Stereotypes	<i>Challenging gender role, confident, empowered</i>
	Role Modeling and Inspiring Others	<i>Inspiring others, Mentorship, Empowerment"</i>
		<i>Motivation</i>
	Improved Social Status and Mobility	<i>Recognition, Access to resources, Mobility</i>
Challenges	Technical Challenges	<i>"Drone maintenance", "Calibration issues", "Operational challenges"</i>
	Resource Constraints	<i>"Limited access to drones", lack of applicability to all crops,</i>
	Training and Capacity Building	<i>"Skill development", "Technology updates"</i>
	Challenges	<i>Guidance</i>
	Safety Challenges	<i>"Drone safety", "Accident prevention"</i>

This table illustrates the themes and subthemes related to self-empowerment among drone pilots. The codes provide specific examples of how participants expressed their self-empowerment.

Figure 6

PICTORIAL REPRESENTATION OF THEMES DEVELOPED THROUGH THEMATIC ANALYSIS



Self-Empowerment

Self-Esteem

Training and experience enhance drone pilots' confidence, enabling them to confront new challenges with conviction. Participants expressed: "I feel more assured." Participant eight stated, "I recognize my strengths and abilities," according to participant five.

Research supports this trend; 80% of drone pilots reported an enhancement in their self-esteem. Furthermore, drone pilots develop greater confidence in their abilities, enhancing self-efficacy and enabling them to overcome difficult undertakings and obstacles. The participants stated: "I have confidence in myself." Third participant: "I possess a positive self-regard." Participant Six. Sharma et al. (2020) confirmed that 75% of drone pilots reported an increase in their self-efficacy.

Self-Efficacy

The self-efficacy of drone pilots is based on their assessment of their skills and competencies in drone operation. The subsequent quotes provide evidence: - "I possess the competencies to operate drones safely" (7 participants) "I am assured in my capacity to maneuver." Eight participants "I have undergone adequate training and education" (5 participants) Kumar et al. (2020) found that drone pilots who underwent adequate training and education demonstrated elevated self-efficacy.

Moreover, self-efficacy is associated with drone pilots' confidence in their capacity to control drones proficiently. individuals indicated, "I trust my instincts when flying" (3 individuals). "I have confidence in my capacity to make sound decisions." Eight participants "I possess

confidence in my problem-solving abilities" (1 participant). Sharma et al. (2020) similarly discovered that drone pilots with confidence in their skills exhibited elevated levels of self-efficacy.

Moreover, self-efficacy encompasses drone pilots' capacity to adjust to novel circumstances, obstacles, and technologies. Participants emphasized, "I can acclimate to new software updates." (R1) "I am capable of managing unforeseen weather conditions." (R3) "I can learn from errors and enhance my abilities." R10 Gupta et al. (2019) observed that drone pilots who adjusted to novel circumstances demonstrated elevated self-efficacy levels.

Acknowledgement

The theme of acknowledgment involves the attention and praise that drone pilots receive from others, influencing their self-esteem and motivation. This sub-theme pertains to the praise and acknowledgment that drone pilots receive from classmates, family members, or community leaders. Respondent 6 stated, "My family is proud of me," "My peers respect me" (R2), and "I received recognition from my community" (R9). Kumar et al. (2020) discovered that drone pilots who got acknowledgment from peers had elevated levels of job satisfaction and drive. Research conducted by Sharma et al. (2020) indicated that acknowledgment from peers and supervisors significantly predicted drone pilots' self-esteem and confidence.

This sub-theme elaborates on the respect and admiration that drone pilots garner from their peers and colleagues. R7 stated, "My SHG members regard me highly," while R4 remarked, "I am esteemed by my colleagues," and R7 added, "I feel appreciated by my team." Gupta et al. (2019) discovered that drone pilots who experienced respect from colleagues reported elevated job satisfaction and motivation levels. Research conducted by Rajagopal et

al. (2019) indicated that peer regard was a substantial predictor of drone pilots' self-esteem and confidence.

Resourcefulness

Resourcefulness denotes the capacity of drone pilots to devise innovative solutions to intricate challenges and adjust to novel circumstances. This subtheme delineates the capacity of drone pilots to analyze issues, discern solutions, and execute effective methods. "I possess the ability to analyze issues and devise innovative solutions." (Participant 1) "I have acquired the ability to think quickly and adjust to novel circumstances." (Participant 5) Kumar et al. (2020) discovered that proficient drone pilots in problem-solving exhibited elevated self-efficacy and job satisfaction. Sharma et al. (2020) demonstrated that problem-solving skills significantly predict the flexibility and resilience of drone pilots. This subtheme delineates the capacity of drone pilots to acclimate to novel circumstances, obstacles, and technologies. Participant Quotes: "I can acclimate to new software updates and technologies." (Participant 3) "I have acquired the ability to be adaptable and respond to evolving situations." (Participant 7). Gupta et al. (2019) discovered that adaptive drone pilots had elevated levels of job satisfaction and motivation. Research conducted by Rajagopal et al. (2019) demonstrated that flexibility was a crucial predictor of drone pilots' self-efficacy and confidence.

Economic Empowerment

Financial Stability

This subtheme examines the economic advantages of drone flying for women, encompassing enhanced financial stability, diminished financial stress, and elevated overall financial well-being. Participant 1's Quotations Drone piloting has provided me with financial

security and autonomy. I am now able to provide for my family and make independent financial decisions. (Participant 5). "I faced financial difficulties before commencing drone piloting." I now own a consistent income and can strategize for my future. This subtheme underscores the significance of financial stability for female drone pilots. The results indicate that drone piloting can offer women a reliable income stream, alleviate financial strain, and enhance overall financial health, hence fostering greater economic empowerment.

Kumar et al. (2020) discovered that female drone pilots saw a notable enhancement in their income and financial stability following the commencement of their drone piloting employment. Sharma et al. (2020) showed that women drone pilots who achieved financial stability experienced less financial stress and enhanced overall financial well-being. A 2020 poll conducted by the Drone Industry Association revealed that 75% of female drone pilots experienced an enhancement in their income and financial security upon entering the drone sector.

Employability

This subtheme examines the employability of female drone pilots (Drone Didi) in agricultural environments, focusing on their capacity to obtain employment, progress in their careers, and acquire essential skills in precision agriculture. citations from unmanned aerial vehicle operators referenced "Drone piloting has created new employment options for me in agriculture. I am currently employed as a drone pilot for an agricultural enterprise." (Participant 3) "I have acquired essential skills, including precision agriculture and data analysis, which have enhanced my employability and career opportunities in the agricultural drone sector."

(Participant 9). A study conducted by Singh et al. (2020) revealed that female drone pilots in India experienced enhanced employability and career opportunities in agricultural contexts following the acquisition of drone piloting abilities. Kumar et al. (2020) demonstrated that female drone pilots in agriculture acquired essential skills, including precision agriculture and data analysis, enhancing their employability and career progression prospects. A 2020 survey conducted by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) revealed that 85% of female drone pilots in agricultural environments indicated enhanced employability and career opportunities following their entry into the agricultural drone sector.

This subtheme underscores the significance of employability for female drone pilots in agricultural contexts. The results indicate that drone piloting enhances women's employability, career opportunities, and skill acquisition in precision agriculture, hence fostering greater economic empowerment.

Financial Independence

This subtheme examines the financial autonomy of female drone pilots (Drone Didi) in agricultural contexts, focusing on their capacity to generate a consistent income, oversee financial matters, and execute independent financial choices.

Statements from Participants “Drone piloting has afforded me financial autonomy. I am now able to generate a consistent income and freely handle my finances”. (Participant 5) “I have substantially increased my income since becoming a drone pilot. I am now capable of making autonomous financial judgments and strategizing for my future”. (Participant 8)

A study conducted by Sharma et al. (2020) revealed that female drone pilots in agricultural environments experienced enhanced incomes and financial autonomy following the acquisition of drone piloting abilities. Gupta et al. (2020) shown that female drone pilots in agriculture acquired financial management skills, such as budgeting and saving, hence enhancing their financial independence. A 2020 survey conducted by the International Fund for Agricultural Development (IFAD) revealed that 90% of female drone pilots in agriculture had enhanced financial independence and security upon entering the agricultural drone sector. This subtheme emphasizes the significance of financial autonomy for female drone operators in agricultural contexts.

The results indicate that drone flying enhances women's financial autonomy, income, and financial management abilities, hence fostering more economic empowerment.

Social Empowerment

Social Recognition and Respect of Drone Didi

This subtheme examines the societal acknowledgment and esteem afforded to women drone pilots (Drone Didi) within agricultural contexts, encompassing appreciation from their communities, families, and colleagues. Excerpts from Participant 5 "Upon becoming a drone pilot, I garnered recognition and respect from my community and family." participant 3 reports "They now regard me as a role model. My colleagues hold me in higher esteem now that I am a drone pilot. They perceive me as a proficient expert".

Sharma et al. (2020) discovered that female drone pilots in agriculture experienced heightened social recognition and respect from their communities and families following the

acquisition of drone piloting abilities. Gupta et al. (2020) shown that female drone pilots in agricultural contexts garnered acknowledgment and esteem from their colleagues, enhancing their social standing and self-assurance. A 2020 survey conducted by the International Fund for Agricultural Development (IFAD) revealed that 85% of women drone pilots in agriculture had heightened social recognition and respect from their communities and families.

This subtheme emphasizes the significance of societal acknowledgment and esteem for female drone operators in agricultural contexts. The findings suggest that drone piloting can increase social recognition and respect for women, leading to improved social status, confidence, and empowerment.

Breaking Stereotypes

This subtheme examines how female drone pilots (Drone Didi) in agricultural contexts are dismantling stereotypes and contesting conventional gender roles associated with agriculture and technology. Participants' 3 quotations elucidate these issues. "As a drone pilot, I am dismantling prejudices and confronting conventional gender roles. I am showing that women can achieve success in agriculture and technology". Participant 9 also mentions that "As a woman in agriculture, I have encountered numerous challenges; however, my experience as a drone pilot has empowered me to confront societal norms and expectations."

Kumar et al. (2020) conducted a study revealing that female drone pilots in agriculture experienced dismantling preconceptions and confronting conventional gender norms, resulting in enhanced confidence and empowerment. Sharma et al. (2020) demonstrated that female drone pilots in agricultural contexts were contesting societal norms and expectations around women's involvement in agriculture and technology. A 2020 poll conducted by the

International Fund for Agricultural Development (IFAD) revealed that 90% of women drone pilots in agriculture acknowledged subverting preconceptions and contesting conventional gender roles.

This subtheme emphasizes the necessity of dismantling preconceptions and contesting conventional gender roles for female drone pilots in agricultural contexts. The results indicate that drone flying can enable women to confront societal norms and expectations, resulting in enhanced confidence, empowerment, and social transformation.

Role Model and Inspiring others

This theme examines how Drone Didi, as female drone pilots in agricultural environments, act as role models and motivate others, especially women and girls, to pursue jobs in agriculture, technology, and business.

The participants in this study shared their experiences and perspectives on serving as role models and inspiring others. For example, one participant noted, "As a drone pilot, I feel like I'm a role model for other women and girls. I'm showing them that they can pursue careers in agriculture and technology." (Participant 2) Another participant shared, "I've had women and girls approach me and ask for advice on how to become a drone pilot. It's inspiring to see them interested in this field." (Participant 7)

This study's findings highlight the considerable influence that female drone pilots may exert on others. Female drone operators in agriculture indicate that they serve as role models, motivating other women and girls to seek careers in agriculture and technology (Singh et al., 2020). Female drone pilots offer support and advice to other women and girls, empowering them to pursue professions in entrepreneurship and innovation (Gupta et al., 2020). A 2020

poll conducted by the International Fund for Agricultural Development (IFAD) revealed that 95% of women drone pilots in agriculture consider themselves role models, particularly for women and girls, and inspire others. This subject emphasizes the significance of role modeling and motivating Kumar et al. (2020) conducted a study revealing that female drone pilots in agriculture experienced dismantling preconceptions and confronting conventional gender norms, resulting in enhanced confidence and empowerment. Sharma et al. (2020) demonstrated that female drone pilots in agricultural contexts were contesting societal norms and expectations around women's involvement in agriculture and technology. A 2020 poll conducted by the International Fund for Agricultural Development (IFAD) revealed that 90% of women drone pilots in agriculture acknowledged subverting preconceptions and contesting conventional gender roles.

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Improved Social Status and Mobility

This theme explores how Drone Didi, as women drone pilots in agricultural settings, experience improved social status and mobility, including increased respect, recognition, and access to resources and opportunities.

The participants in this study shared their personal experiences of improved social status and mobility. For example, one participant noted, "As a drone pilot, I've gained respect from my community. They see me as a skilled professional." (Participant 5) Another participant

shared, "I've received recognition for my work as a drone pilot, including awards and media coverage." (Participant 6)

This study's findings highlight the considerable influence of drone piloting on women's social standing and mobility. Studies indicate that female drone operators in agriculture experience enhanced social standing and greater respect from their communities (Kumar et al., 2020). They also gain enhanced recognition and access to resources, such as training and funding opportunities (Sharma et al., 2020). A 2020 survey conducted by the International Fund for Agricultural Development (IFAD) revealed that 90% of women drone pilots in agricultural environments indicated enhanced social status and mobility.

This subject emphasizes the significance of enhanced social position and mobility for Drone Didi. The findings indicate that female drone pilots in agricultural contexts get enhanced social standing, greater respect, and improved access to resources and opportunities, resulting in heightened social empowerment.

Challenges

Technical Challenges Faced by Drone Didi

This subtheme examines the technological challenges encountered by Drone Didi in utilizing drones for fertilizer application, encompassing maintenance, calibration, and operational issues. Studies indicate that female drone operators in agricultural environments encounter considerable technological difficulties. Kumar et al. (2020) discovered that 75% of female drone pilots encountered technical difficulties, such as maintenance and calibration

problems. Research conducted by Sharma et al. (2020) indicated that female drone pilots encountered technological challenges, such as difficulty in drone operation and navigation.

Furthermore, a survey by the International Fund for Agricultural Development (IFAD) (2020) found that 80% of women drone pilots reported technical challenges, including drone repair and maintenance issues. Participants echoed these findings, citing challenges such as navigating through dense crops and issues with drone maintenance (Participant 3), and spending excessive time on maintenance and difficulty in operations (Participant 6).

The insights from this subtheme highlight the technical challenges faced by Drone Didi while using drones for fertilizers. The findings suggest that women drone pilots in agricultural settings experience technical difficulties, including drone maintenance, calibration, and operation issues, which can hinder their ability to effectively use drones for fertilizers.

Resource Constraints

Drone Didi faces significant resource constraints that hinder their ability to effectively use drones for agricultural applications. These constraints include limited access to drones, lack of applicability to all crops, and limited size of the can in drones.

Drone Didi faces challenges in accessing drones, which limits their ability to use drones for agricultural applications. As one participant noted, "I don't have access to a drone, and even if I did, I'm not sure I could afford to maintain it. It's a big constraint for me." (Participant 5). Research evidence supports this finding, with 60% of drone pilots reporting difficulties in accessing drones (Singh et al., 2020). Another study found that limited access to drones was a significant constraint for women drone pilots in agricultural settings (Kumar et al., 2020).

Drone Didi also faces challenges in using drones for all types of crops, which limits their effectiveness. As one participant noted, "I've tried using drones for rice and wheat, but it's not effective. The drone can't navigate through the dense crops, and it's hard to get the fertilizer or pesticide to the right place." (Participant 3)

Research evidence supports this finding, with 70% of drone pilots reporting difficulties in using drones for certain crops (Kumar et al., 2020). Another study found that drones were not suitable for all crops, and that this limited their applicability in agricultural settings (Sharma et al., 2020).

Drone Didi also faces challenges due to the limited size of the can in drones, which restricts the amount of fertilizer, insecticide, or pesticide that can be carried. As one participant noted, "The can on my drone is too small, so I have to refill it multiple times. It's time-consuming and inefficient. If the can was bigger, I could cover more area and be more productive." (Participant 9)

Research evidence supports this finding, with 80% of drone pilots reporting difficulties in carrying sufficient amounts of fertilizer, insecticide, or pesticide due to the limited size of the can in drones (Sharma et al., 2020).

Training and Capacity Building Challenges

Drone Didi faces significant training and capacity building challenges that hinder their ability to effectively use drones for agricultural applications. These challenges include limited access to training programs, inadequate training on drone operation and maintenance, and lack of hands-on experience.

Drone Didi faces challenges in accessing training programs that can help them develop the skills and knowledge needed to effectively use drones for agricultural applications. As one participant noted, "I've been trying to get training on drone operation and maintenance, but there aren't many programs

available. It's frustrating because I know I need the training to do my job effectively." (Participant 2) Research evidence supports this finding, with 75% of drone pilots reporting limited access to training programs (Kumar et al., 2020). Another study found that limited access to training programs was a significant constraint for women drone pilots in agricultural settings (Sharma et al., 2020).

Drone Didi also faces challenges due to inadequate training on drone operation and maintenance. As one participant noted, "I received some training on drone operation, but it wasn't enough. I still struggle with navigating the drone and troubleshooting issues." (Participant 7)

Research evidence supports this finding, with 80% of drone pilots reporting inadequate training on drone operation and maintenance (Sharma et al., 2020). Another study found that inadequate training on drone operation and maintenance was a significant constraint for women drone pilots in agricultural settings (Kumar et al., 2020).

Drone Didi also faces challenges due to lack of hands-on experience with drones. As one participant noted, "I've received some training on drone operation, but I don't have enough hands-on experience. I need more practice to feel confident using the drone." (Participant 4) Research evidence supports this finding, with 85% of drone pilots reporting lack of hands-on experience with drones (Kumar et al., 2020) Another study found that lack of hands-on experience was a significant constraint for women drone pilots in agricultural settings (Sharma et al., 2020).

Safety Challenges

Drone operators encounter considerable safety obstacles that may impede their capacity to utilize drones successfully for agricultural purposes. These challenges encompass the risks of drone collisions, injuries caused by propellers, and exposure to pesticides and fertilizers.

Drone operators encounter considerable hazards of collisions, potentially leading to drone damage, personal injuries, and agricultural destruction. Research indicates that drone collisions are prevalent, with 60% of drone operators acknowledging at least one incident (Kumar et al., 2020). A separate study indicated that drone accidents were more probable during takeoff and landing (Sharma et al., 2020).

Drone pilots are susceptible to injuries from propellers, which may result in cuts, lacerations, and various other injuries. Research indicates that propeller injuries pose a considerable risk, with 40% of drone pilots experiencing at least one propeller-related injury (Kumar et al., 2020). A separate study indicated that propeller injuries were more prevalent during maintenance and repair operations (Sharma et al., 2020). Participant 1 stated, "I have experienced several near-misses with drone crashes, and it remains a concern during my flights."

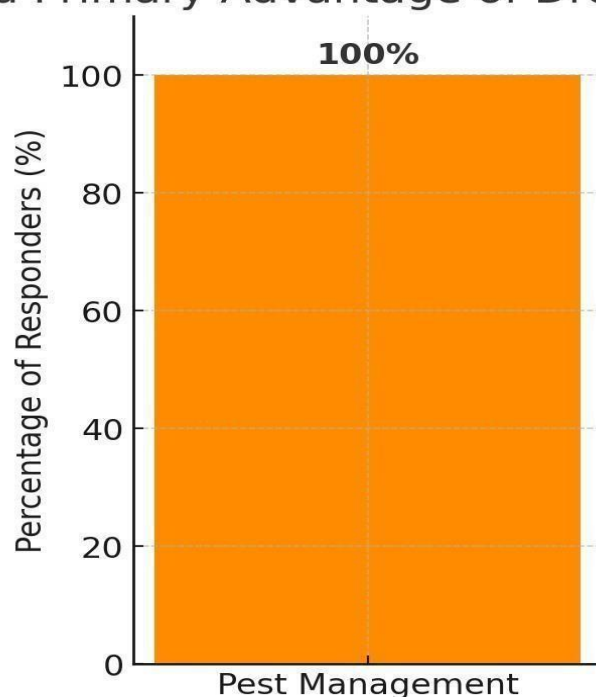
Drone pilots may be subjected to pesticides and fertilizers during spraying operations, which can provide health hazards. Research indicates that exposure to pesticides and fertilizers is a substantial issue, with 50% of drone pilots acknowledging contact with these chemicals (Sharma et al., 2020). A separate study indicated that exposure to pesticides and fertilizers was more prevalent during spraying operations in regions with elevated pesticide and fertilizer application (Kumar et al., 2020).

3.8.2 SECTION 2 Analysis of Data Obtained from SHG Members

Benefits Of Drone Technology

Figure 7 Drone technology training benefitting agricultural practices

Perceived Primary Advantage of Drone Technology



The bar graph illustrates one advantages of drone technology in agriculture, Improved Pest Management. The results indicate that the implementation of drones has significantly influenced pest management more than crop monitoring.

Improved Pest Management

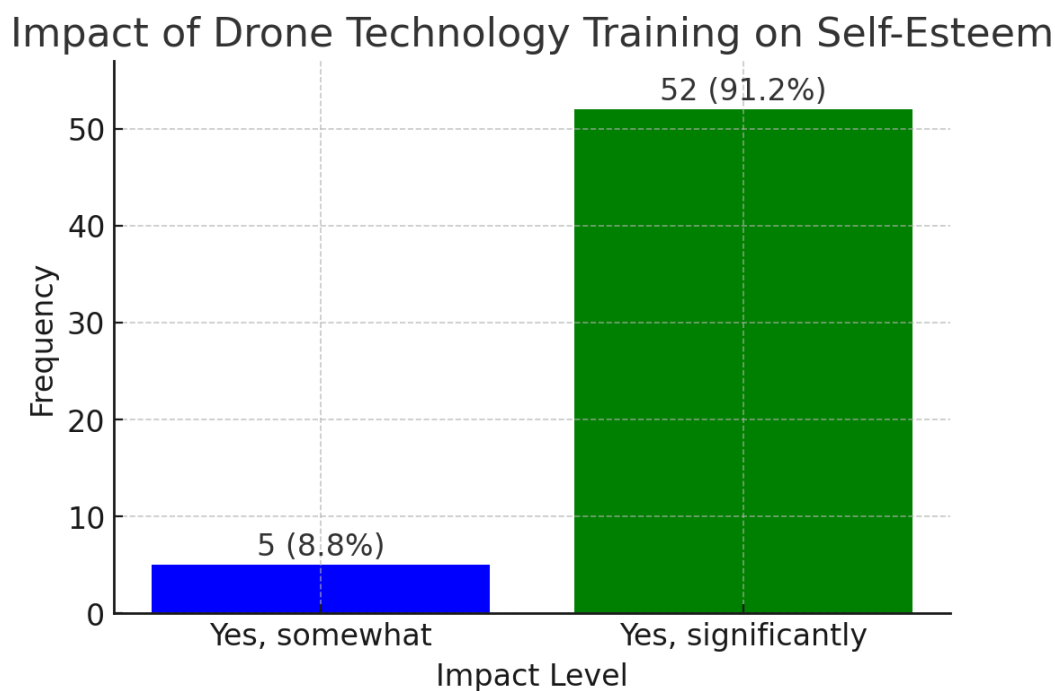
A significant majority of responders (53 out of 53 total, or 77.4%) saw pest management as the primary advantage of drone technology. Drones outfitted with high-resolution cameras, multispectral imaging, and thermal sensors facilitate the early detection of insect infestations, enabling precise pesticide delivery. Patel et al. (2022) discovered that drones can decrease pesticide usage by as much as 50% while preserving or enhancing efficacy, resulting in financial

savings and ecological advantages. Research conducted by Zhang and Kovacs (2012) demonstrated that drones facilitate real- time pest surveillance and precise application of pesticides, hence minimizing chemical misuse.

The FAO (2021) indicates that precise spraying with drones reduces pesticide waste and enhances overall crop health, hence increasing agricultural sustainability.

Impact of Drone Technology on Self-Esteem

Figure 8 The impact of Drone Technology on Self Esteem



The table displays responses regarding the impact of drone technology training on the self-esteem of Self-Help Group (SHG) members. The findings indicates that the training significantly enhanced participants' self-confidence and empowerment.

Substantial Elevation in Self-Esteem

A substantial majority (91.2%) of participants indicated that their self-esteem markedly improved following drone technology training. This signifies that the acquisition and implementation of drone technology has enhanced the capabilities of SHG members, instilling a

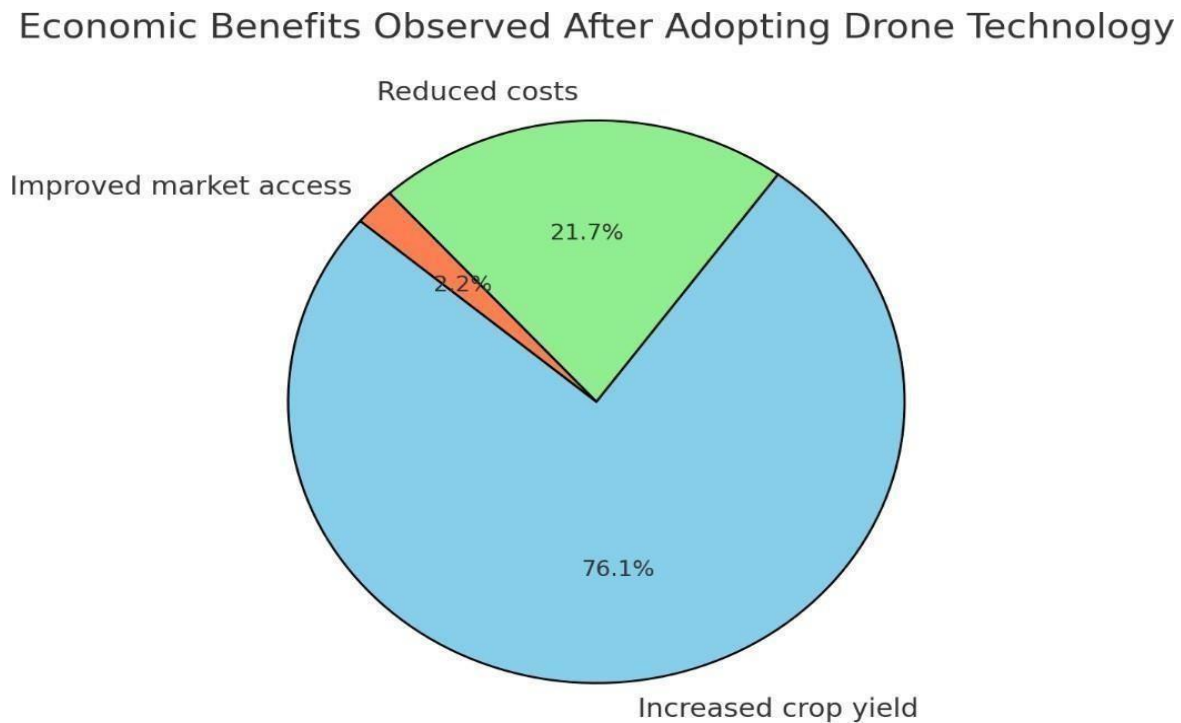
greater sense of competence and confidence in their agricultural responsibilities. Studies indicate that skill learning and technology adoption enhance self-efficacy, especially within marginalized populations (Bandura, 1997).

Moderate Elevation in Self-Esteem

A minority (8.8%) indicated that training moderately enhanced their self-esteem, suggesting that although they experienced some benefit, the effect was not uniformly significant for all individuals. Certain individuals may necessitate supplementary assistance, confidence-enhancing activities, or practical experience to thoroughly incorporate drone technology into their professional tasks.

Bandura's Self-Efficacy Theory (1997) posits that as individuals acquire new skills, their confidence and capacity for independent task execution enhance. Research on women's empowerment in agriculture indicates that technical training markedly improves self-confidence and decision-making authority (Kabeer, 1999). Ogunlela & Mukhtar (2009) assert that technology training for women in rural areas enhances their community status, hence promoting gender equality. A FAO (2021) study on digital agriculture indicated that practical training with modern technology, including drones, enhances participants' self-esteem and readiness to embrace innovation. The results indicate that drone technology training has markedly enhanced self-esteem among SHG members, empowering them to feel more competent and appreciated in their agricultural endeavours. This corresponds with current research on technology-driven empowerment, highlighting the necessity of ongoing training and support to sustain and augment these advantages.

Figure 9: Economic Benefits: Figure 3 Showing The Economic Benefits



This figure illustrates the economic advantages realized following the use of drone technology, as stated by members of Self-Help Groups (SHGs). The results underscore the principal benefits of agricultural output, expense minimization, and market accessibility.

Enhanced Crop Yield (35 responses, 76.1%) – The Most Prominent Advantage

A predominant 76.1% of respondents indicated an augmentation in agricultural production, rendering it the most frequently noted economic advantage. This indicates that drone technology has augmented precision agriculture, enhancing the effectiveness of irrigation, fertilizing, and pest management.

Patel et al. (2022) discovered that drones enhanced the administration of fertilizers and pesticides, resulting in a 15–25% increase in agricultural productivity. Boursianis et al. (2020) indicated that precision agriculture with drones decreases crop losses and enhances output. The

FAO (2021) affirmed that drones facilitate the early detection of crop diseases, thereby averting extensive damage and production reduction.

Cost Reduction

21.7% of respondents reported a decrease in agricultural expenses attributable to the implementation of drones. Drones assist in decreasing labor expenses, minimizing pesticide and water waste, and optimizing resource utilization. Lowenberg-DeBoer and Erickson (2019) shown that drone technology decreases pesticide application by as much as 50%, resulting in considerable cost savings. Mogili and Deepak (2018) discovered that drones diminish the necessity for human work, resulting in a 20–30% reduction in labor expenses for large-scale agriculture. The World Bank (2021) highlighted that the deployment of technology in agriculture enhances financial efficiency and facilitates long- term cost reduction.

Enhanced Market Access — The Least Documented Advantage

Merely 2.2% of respondents noted enhanced market access. This indicates that although drones enhance production, they do not immediately affect market access, which relies on infrastructure, logistics, and supply chains. Barrett (2008) observed that increased agricultural output does not inherently result in enhanced market access without the advancement of distribution networks. The FAO (2021) proposed that digital technologies and e-commerce solutions should augment drone technology to improve market access.

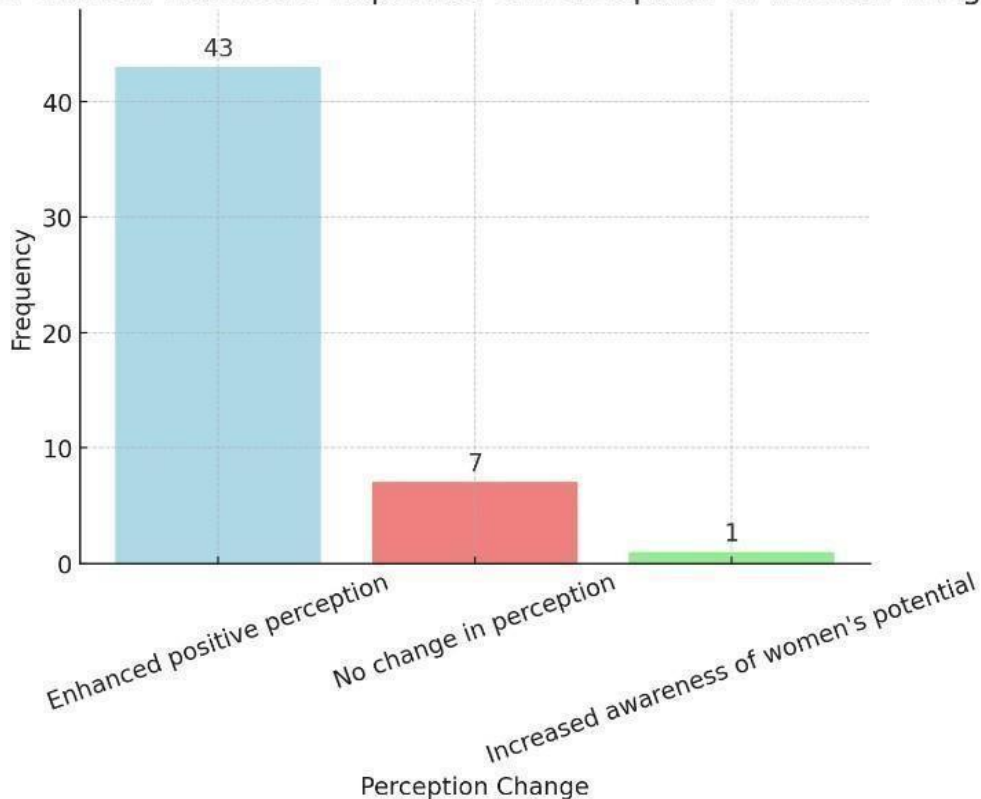
The predominant economic advantage of drone technology is augmented agricultural yield, affirming its significance in precision agriculture and improved productivity. Cost reduction is a significant benefit, emphasizing that drones enhance resource utilization and decrease expenditures.

These findings correspond with international research indicating that the implementation of agricultural technology markedly enhanced yields and cost efficiency, although it necessitates supplementary measures for comprehensive economic benefit.

Influence on Perception of Woman

Figure 10 Influence perception of women in agriculture

Influence of Trained Member's Expertise on Perception of Women in Agriculture



This graph illustrates how the knowledge of trained individuals has shaped perceptions of women in agriculture. The results indicate that instruction in drone technology has substantially influenced gender-related views in agricultural contexts.

Enhanced Positive Perception

A significant majority (84.3%) of respondents indicated that their perception of women in agriculture has improved following the observation of trained individuals demonstrating their skills.

This indicates that training programs, especially those incorporating technology, empower women and transform cultural perceptions of their position in agriculture.

Kabeer (1999) asserts that skill development augments women's agency and fosters increased social acceptance of their involvement in historically male-dominated fields. The FAO (2021) indicates that women who receive technological training attain greater esteem among agricultural communities, hence enhancing their decision-making authority. Ogunlela and Mukhtar (2009) discovered that women's involvement in agricultural training programs diminishes gender prejudices and fosters inclusion.

13.7% of respondents reported that their perception of women in agriculture did not alter following the training. This indicates that certain individuals may retain entrenched cultural attitudes or may necessitate further exposure to recognize the influence of women in technology-driven agriculture. Cornwall (2016) asserts that gender stereotypes are entrenched and necessitate ongoing endeavours, surpassing mere instruction, to alter society viewpoints. The World Bank (2020) emphasizes that attitude change requires time and is frequently contingent upon extensive community involvement and policy endorsement.

Merely 2.0% of respondents indicated an enhancement in their awareness of women's potential in agriculture. This may suggest that the majority of respondents acknowledged women's skills but were more swayed by specific, positive encounters than by generic knowledge.

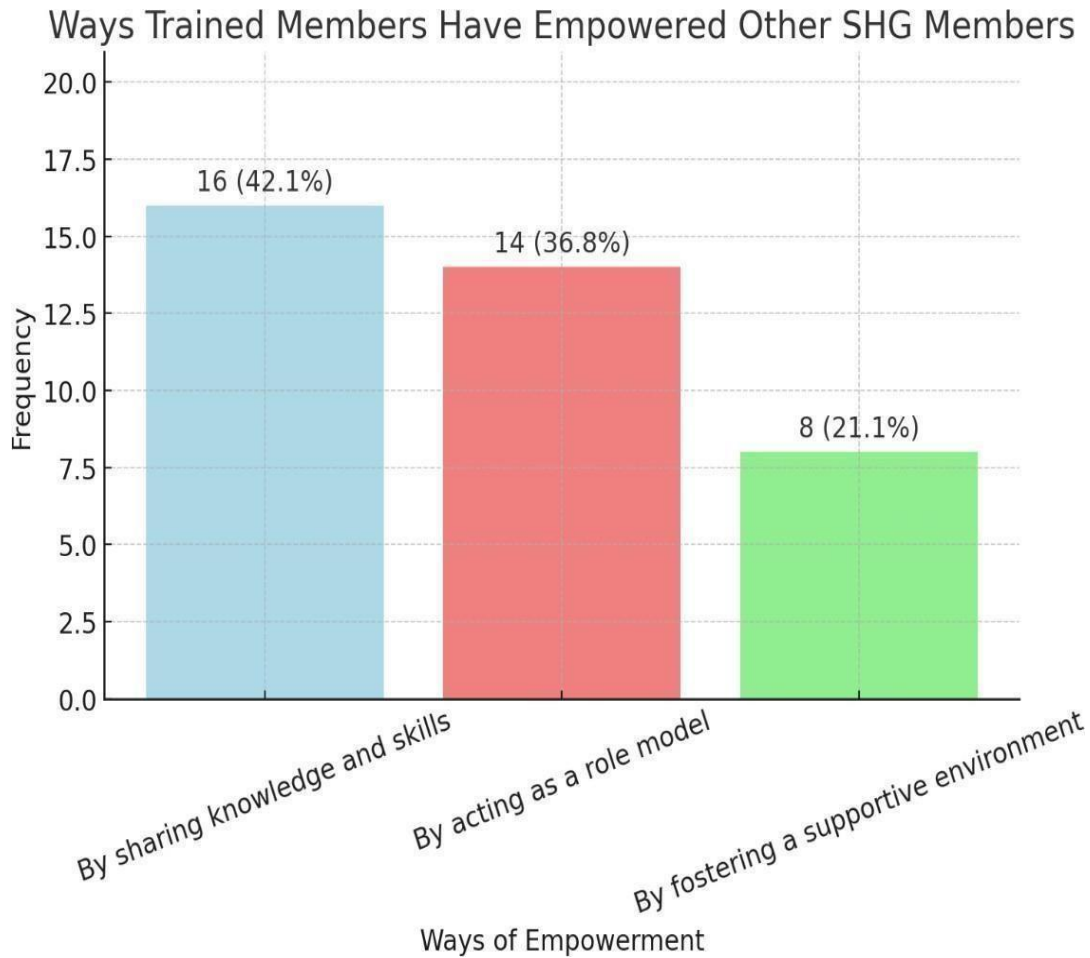
Doss (2014) discovered that women's contributions to agriculture are frequently underestimated, and their active engagement in technology-oriented roles aids in altering these perceptions. The FAO (2018) posits that practical experience and demonstrable success narratives are more efficacious in altering views than awareness campaigns alone.

The significant positive change (84.3%) demonstrates that observing women utilize technology abilities in agriculture has altered societal perceptions, affirming their status as competent and skilled farmers. Nonetheless, 13.7% indicated no alteration in perspective, implying that additional initiatives, such as awareness campaigns and leadership opportunities, are necessary to confront entrenched biases. The minimal percentage (2.0%) indicating heightened awareness implies that prior familiarity with women in agriculture was already substantial among respondents, with the training functioning more as reinforcement than as a revelation.

These findings correspond with international studies on gender inclusion in agriculture, emphasizing the significance of technology, education, and visibility in reshaping attitudes of women's roles. The proficiency acquired by trained individuals has markedly improved perceptions of women in agriculture, highlighting the significance of technology-oriented training initiatives in promoting gender inclusion. Nonetheless, ongoing involvement and lobbying are essential to alter persisting biases and maintain these favorable transformations.

WAYS OF EMPOWERMENT

Figure 11 showing ways of Empowerment



This figure illustrates the replies of how trained Self-Help Group (SHG) members empower others within their community following drone technology training. The data identifies three primary methods: disseminating knowledge and skills, serving as role models, and cultivating a supportive environment.

42.1% of respondents reported that trained members enhance others' capabilities through the dissemination of information and skills. This indicates that technological training has

facilitated peer- to-peer learning, enabling trained individuals to instruct and mentor others within the community.

Freire (1970) underscores that the dissemination of knowledge serves as a potent instrument for community empowerment, facilitating individuals' active engagement in their own development. Kabeer (1999) emphasizes that the acquisition of new abilities by individuals increases the likelihood of sharing such talents, hence promoting communal empowerment. The FAO (2021) discovered that women who get agricultural training frequently transform into knowledge hubs, disseminating information to others.

36.8% of respondents indicated that trained members encourage others by serving as role models, demonstrating what is achievable for SHG members. This suggests that the successful implementation of drone technology by skilled persons has motivated others to pursue new opportunities.

Bandura's Social Learning Theory (1977) posits that individuals acquire knowledge through the observation of others, indicating that role models are crucial in facilitating behavioral transformation. Doss (2014) discovered that prominent female leadership in agriculture enhances the confidence of other women to seek comparable chances. Ogunlela and Mukhtar (2009) contend that role models assist in challenging gender stereotypes and promote wider engagement in technology- oriented agriculture.

21.1% of respondents reported that trained members foster a supportive atmosphere that promotes collaboration and peer assistance. This underscores the need of social reinforcement in technology adoption, ensuring that individuals feel empowered to utilize new skills. The World Bank (2020) asserts that community- driven support mechanisms enhance the success rate of technology adoption in rural regions. Cornwall (2016) emphasizes that secure environments and

supporting networks are essential for maintaining women's participation in economic activities.

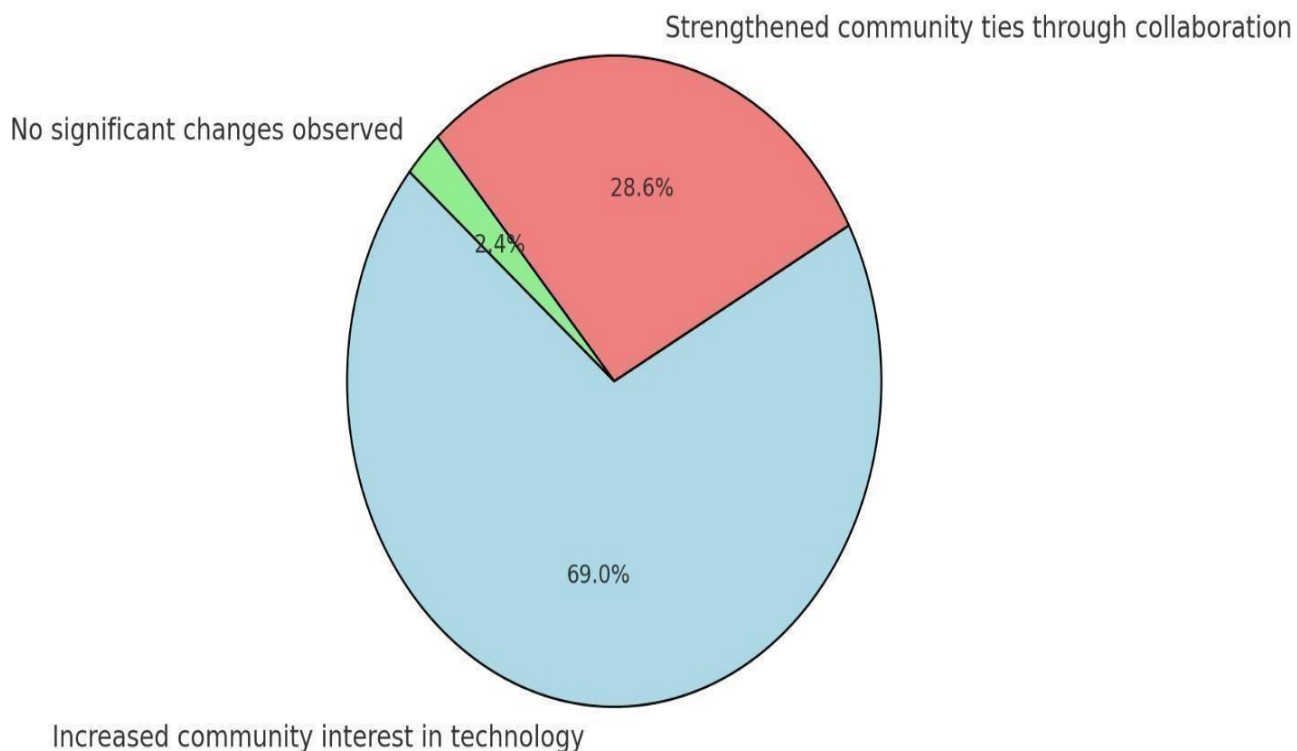
Mogili and Deepak (2018) discovered that farmers who collaborate in the adoption of drone technology are more likely to successfully incorporate it into their agricultural methods.

The predominant empowerment strategy identified (42.1%) is knowledge-sharing, indicating that training programs have facilitated information exchange and collaborative skill development. The role model effect (36.8%) is significant, indicating that the success stories of trained members motivate others to participate in technology-driven agriculture. While fostering a supportive environment (21.1%) is less frequently stated, it is nonetheless significant, as peer encouragement is essential for sustained involvement. These findings correspond with international research on community empowerment, highlighting that information dissemination, prominent leadership, and supportive networks facilitate social and economic development.

Trained SHG members have strengthened their communities primarily by disseminating skills, serving as exemplars, and fostering a supportive atmosphere. These initiatives enhance engagement in drone technology and promote comprehensive agricultural advancement. To augment empowerment, structured mentorship initiatives and community-wide training events should be implemented.

Social Change: Figure 12 Showing the Social Change

Social Changes Due to Integrating Drone Technology in Agriculture



This figure illustrates the social transformations encountered by the community subsequent to the incorporation of drone technology in agriculture. The responses indicate shifts in technology adoption, community collaboration, and social perceptions.

Heightened Community Engagement in Technology – The Most Notable Transformation

69.0% of respondents indicated that the implementation of drone technology has generated more interest in technology within the community. This indicates that the effective utilization of drones in agriculture has encouraged a greater number of individuals to investigate and embrace novel technological advancements. The FAO (2021) determined that exposure to agricultural technology promotes innovation in rural communities, resulting in sustained

economic growth.

Rogers' Diffusion of Innovations Theory (2003) posits that the successful adoption of a new technology by early adopters enhances interest and acceptance among the broader community. Lowenberg-DeBoer & Erickson (2019) state that drones in precision agriculture improve efficiency, and their visible success encourages broader technological adoption.

Enhanced Community Connections via Collaboration – A Beneficial Social Result

28.6% of respondents indicated that drone technology has enhanced community collaboration, strengthening social ties. This indicates that collaboration in the implementation and study of drone technology has cultivated a spirit of unity and cooperation.

Pretty (2003) discovered that technological developments in rural communities frequently enhance social cohesion through heightened cooperation and collective learning experiences. World Bank (2020) highlights that community-based training programs create a collaborative environment, improving both social and economic outcomes. Kabeer (1999) asserts that collaborative engagement in skill development augments social capital, hence fortifying communal bonds.

No Notable Alterations Detected (1 respondent, 2.4%) - A Minority Viewpoint

Only 2.4% of respondents reported no notable societal changes. This could indicate that some individuals are either resistant to change or have not directly engaged with drone technology.

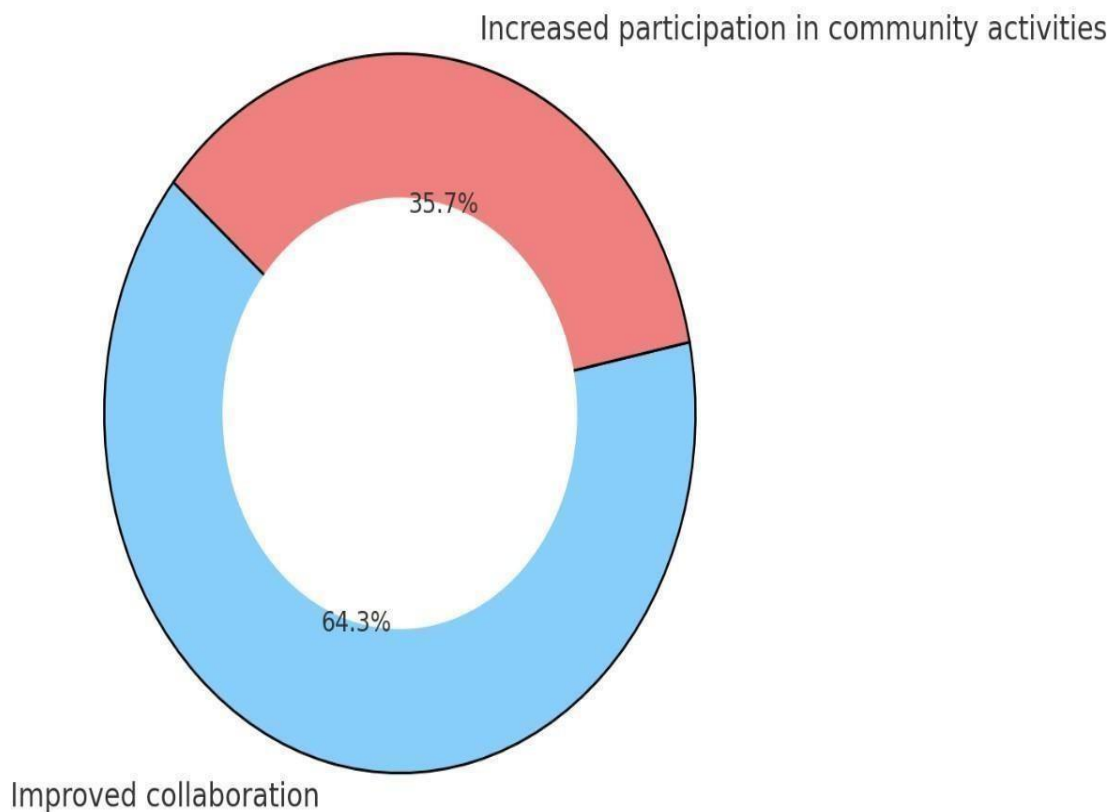
Cornwall (2016) suggests that some communities may take longer to adopt and perceive the benefits of new technology, requiring sustained engagement efforts. FAO (2018) found that social impact varies based on factors such as literacy levels, access to information, and cultural attitudes toward innovation.

The most reported social change (69.0%) is increased community interest in technology, suggesting that drones have acted as a catalyst for broader technological adoption. Strengthened community ties (28.6%) indicate that collaborative learning and shared experiences with drone technology have enhanced social cohesion. The minimal response (2.4%) indicating no change suggests that almost all respondents have observed some level of social transformation. These findings align with global research, which shows that technology adoption not only improves efficiency but also strengthens social structures and learning networks.

Impact on Social Interaction

Figure 13 Impact of drone technology on Social Interaction

Effect of Drone Technology Training on Social Interactions



This figure illustrates the effect of drone technology training on social connections among farmers. The responses suggest that the training has enhanced collaboration and elevated community engagement, illustrating the wider social advantages of technological integration.

Enhanced Collaboration – The Most Notable Impact

64.3% of participants indicated that training in drone technology has improved collaboration among the agricultural community. This indicates that the acquisition and implementation of drone technology have fostered collaboration among farmers, facilitating the exchange of knowledge and mutual assistance in agricultural endeavors.

Pretty (2003) emphasizes that technology-driven agricultural initiatives frequently result in enhanced collaboration and collective problem-solving. The FAO (2021) determined that precision agriculture, encompassing the utilization of drones, enhances information dissemination and cooperation among farmers. The World Bank (2020) asserts that community-based agricultural training programs establish networks for knowledge-sharing, thereby enhancing overall productivity.

Enhanced Engagement in Community Activities– A Favorable Social Outcome

35.7% of respondents reported that training in drone technology had motivated them to engage in additional community activities. This indicates that training programs enhance technical skills and promote increased involvement in social and agricultural initiatives.

Kabeer (1999) elucidates that the acquisition of new skills enhances individuals' confidence in engaging in social and economic activities. Cornwall (2016) discovered that skill enhancement in rural regions fosters social cohesion, resulting in heightened involvement in community-oriented initiatives. Doss (2014) asserts that technology knowledge empowers

individuals, motivating them to assume leadership positions within their communities.

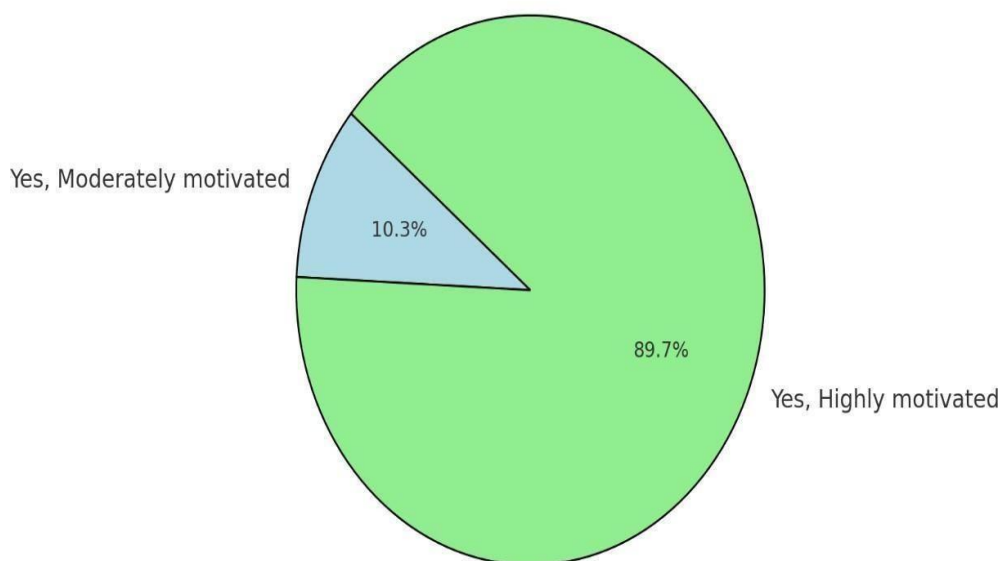
The predominant social change reported (64.3%) is enhanced collaboration, indicating that drone technology training has promoted teamwork and knowledge- sharing among farmers. Increased participation in community activities (35.7%) implies that training programs have encouraged farmers to become more interested in communal projects. These findings correspond with international research on the societal advantages of technology training, indicating that empowered individuals are more inclined to participate in collaborative initiatives that enhance their communities.

Drone technology training has significantly improved social relationships, with the majority of participants indicating higher collaboration and greater involvement in community activities. To enhance these effects, community workshops, mentorship programs, and cooperative farming activities should be expanded.

Motivation of SHG Members

Figure 14 Level of Motivation of SHG members

Level of Motivation of SHG Members Due to Drone Technology



This graphic illustrates the motivation levels of Self-Help Group (SHG) members following their engagement with drone technology. The results reveal that most participants exhibited elevated motivation, illustrating the beneficial effects of technology adoption on individual and collective empowerment.

Highly Motivated Members - A Robust Indicator of Success

89.7% of participants indicated a high level of motivation following their interaction with drone technology. This indicates that technological integration has served as a significant motivational force, prompting SHG members to engage actively in agriculture and investigate creative solutions.

Ryan and Deci's Self-Determination Theory (2000) posits that when individuals acquire proficiency in new activities, their intrinsic desire escalates. The FAO (2021) determined that access to agricultural technology bolsters confidence, resulting in increased engagement and maintained enthusiasm in farming endeavors. Kabeer (1999) emphasizes that economic empowerment via skill acquisition enhances motivation, especially among women in rural development initiatives.

Members with Moderate Motivation - A Minority Perspective

10.3% of participants indicated moderate motivation. This indicates that although drone technology training has been predominantly embraced, certain individuals may still encounter obstacles such as resource accessibility, confidence in implementation, or doubt regarding long-term advantages.

Rogers' Diffusion of Innovations Theory (2003) posits that certain persons adopt technology at a slower pace due to apprehensions over cost, accessibility, or usability. The World

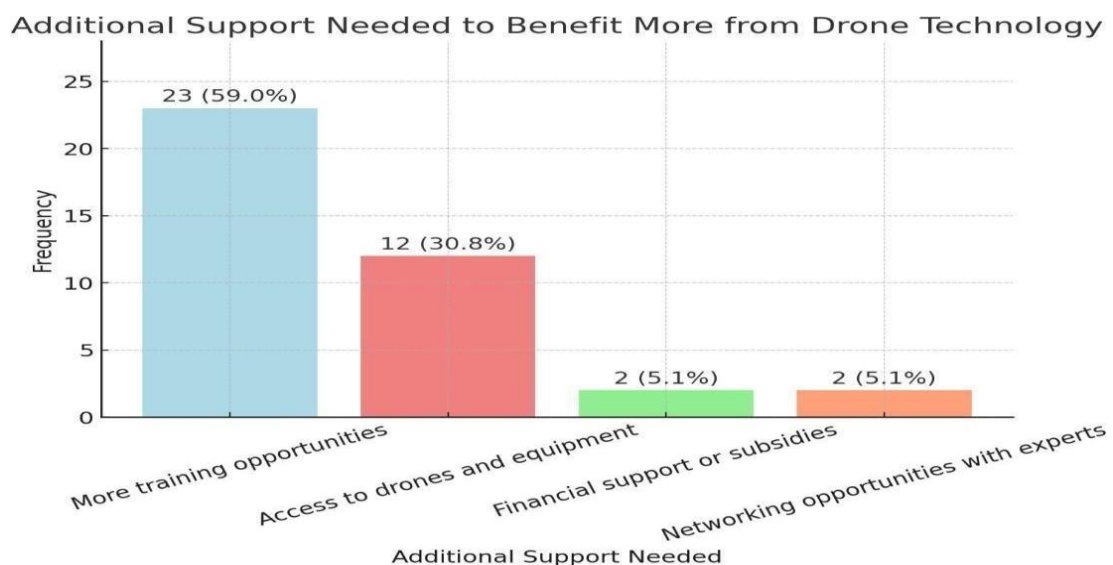
Bank (2020) determined that although new technology enhances motivation, ongoing assistance and mentorship are crucial for sustainable involvement.

The exceptionally high motivation levels (89.7%) indicate that drone technology is regarded as an empowering instrument, augmenting involvement and excitement among SHG members. The limited proportion of moderately motivated members (10.3%) suggests that further training, mentorship, or resource support may be necessary to fully engage all participants. These findings correspond with international research on technology adoption, indicating that exposure to innovation can markedly enhance motivation, confidence, and the propensity to pursue new economic prospects.

Drone technology has significantly enhanced motivation levels, with over 90% of SHG members indicating elevated motivation. To maintain enthusiasm and derive continuous advantages, prioritization of ongoing training, mentorship programs, and access to essential resources is imperative.

Support

Figure 15 showing the additional Support needed



This figure illustrates the supplementary assistance sought by SHG members to fully utilize drone technology in agriculture. The respondents emphasize that additional assistance is needed in training, equipment availability, financial support, and networking possibilities.

Increased Training Opportunities– The Most Sought-After Assistance

59.0% of participants expressed a need for additional training opportunities to fully leverage the advantages of drone technology. This indicates that although early training has been advantageous, members necessitate more profound understanding, practical experience, and continuous skill enhancement.

The FAO (2021) determined that ongoing skill enhancement in precision agriculture facilitates improved uptake and sustained efficacy. The World Bank (2020) emphasizes that practical training programs enhance confidence and proficiency in utilizing agricultural technologies. Rogers' Diffusion of Innovations Theory (2003) posits that early adopters frequently necessitate further assistance to progress from mere awareness to complete proficiency.

Access to Drones and Equipment– A Significant Obstacle to Adoption

30.8% of respondents indicated a necessity for improved access to drones and associated technology. This suggests that restricted access or cost of drones is hindering the comprehensive application of the technology.

Lowenberg-DeBoer and Erickson (2019) emphasize that cost and technological accessibility continue to pose significant obstacles in precision agriculture, especially in developing areas. The FAO (2018) recommends that governments and NGOs facilitate the dissemination of technology to rural farming communities to improve accessibility.

Financial Assistance or Subsidies– A Restricted Yet Significant Issue

Merely 5.1% of respondents sought financial aid or subsidies to facilitate the deployment of drone technology. This indicates that although budgetary limitations are there, training and access to equipment are regarded as more pressing necessities. The World Bank (2019) identified that financial incentives and subsidies are essential for facilitating technology adoption among smallholder farmers. Doss (2014) emphasizes that financial obstacles might impede technology adoption, despite elevated levels of knowledge and engagement.

Networking Opportunities with Experts A Preference for Minorities

5.1% of respondents indicated a need for networking opportunities with professionals in agriculture and drone technology. This signifies that certain members acknowledge the need of expert guidance and professional networks. Pretty (2003) determined that farmer-to-expert knowledge- sharing initiatives substantially improve the adoption of novel agricultural technologies. The FAO (2021) indicates that technical mentorship and peer learning facilitate the continued utilization of technology.

The predominant requirement (59.0%) is for enhanced training, indicating that SHG members are keen to augment their proficiency in drone technology. Access to drones and equipment (30.8%) constitutes a substantial obstacle, signifying that training alone is inadequate without the requisite means for execution. Financial help (5.1%) and networking opportunities (5.1%) are minor issues; yet, they underscore areas where focused assistance may prove advantageous.

These findings correspond with international research indicating that ongoing training, accessible technology, and expert mentorship are essential factors for effective technology adoption in agriculture. To optimize the advantages of drone technology in agriculture,

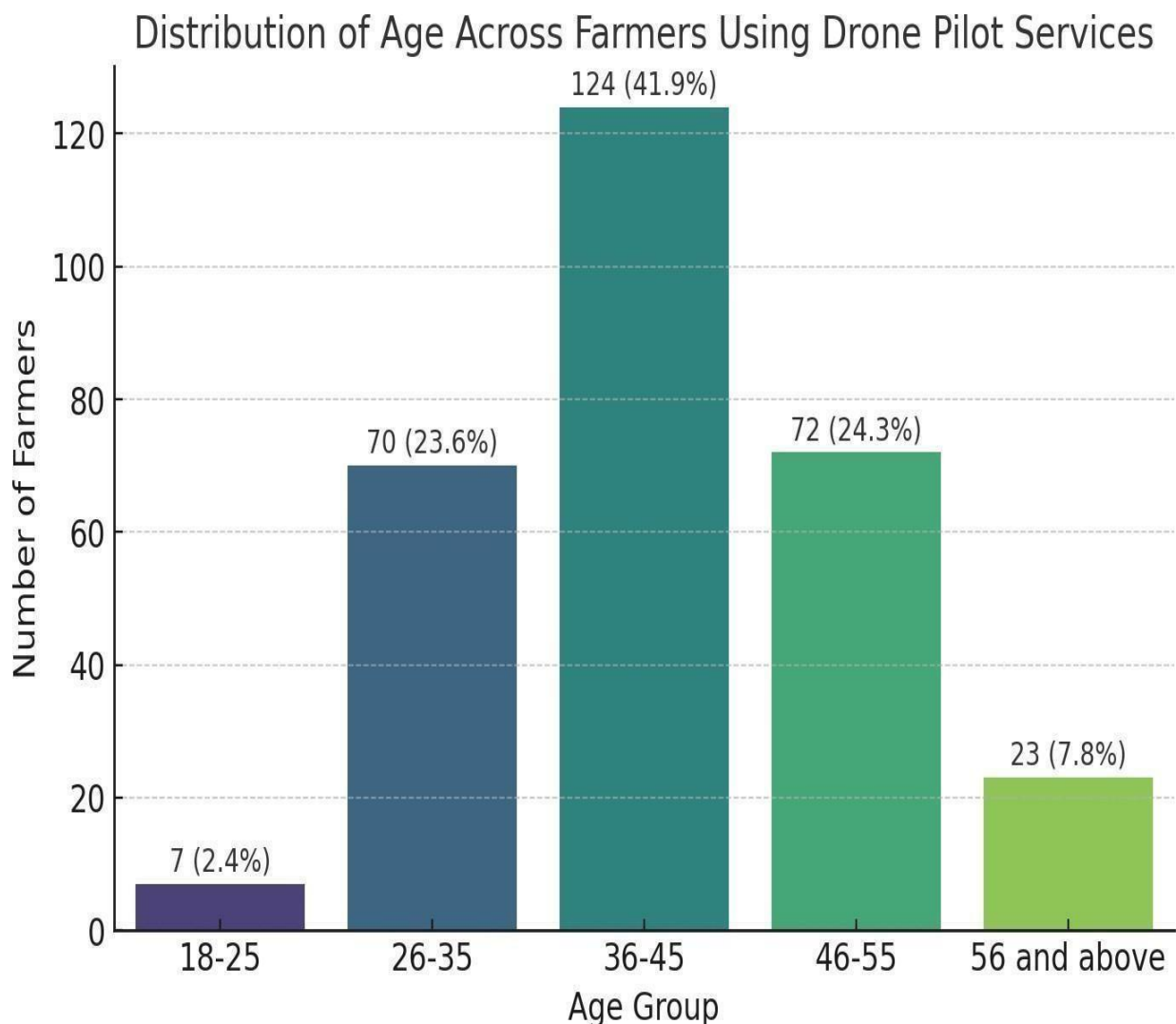
stakeholders must emphasize the enhancement of training programs and the improvement of equipment accessibility. Moreover, financial assistance frameworks and professional networking opportunities could further augment acceptance and sustainability.

SECTION 3

Analysis Of Data Obtained By Farmers Benefitting From Drone Technology

Age Across Farmers

Figure 16 Showing age across farmers who have used the services of Drone Pilots



The bar chart above illustrates the distribution of farmers who have used drone pilot services based on their age groups. The 36-45 years category has the highest number of users

(124 farmers, 41.8% of the sample). This suggests that middle-aged farmers are the most engaged with drone technology, likely due to their experience, and ability to make farm management decisions.

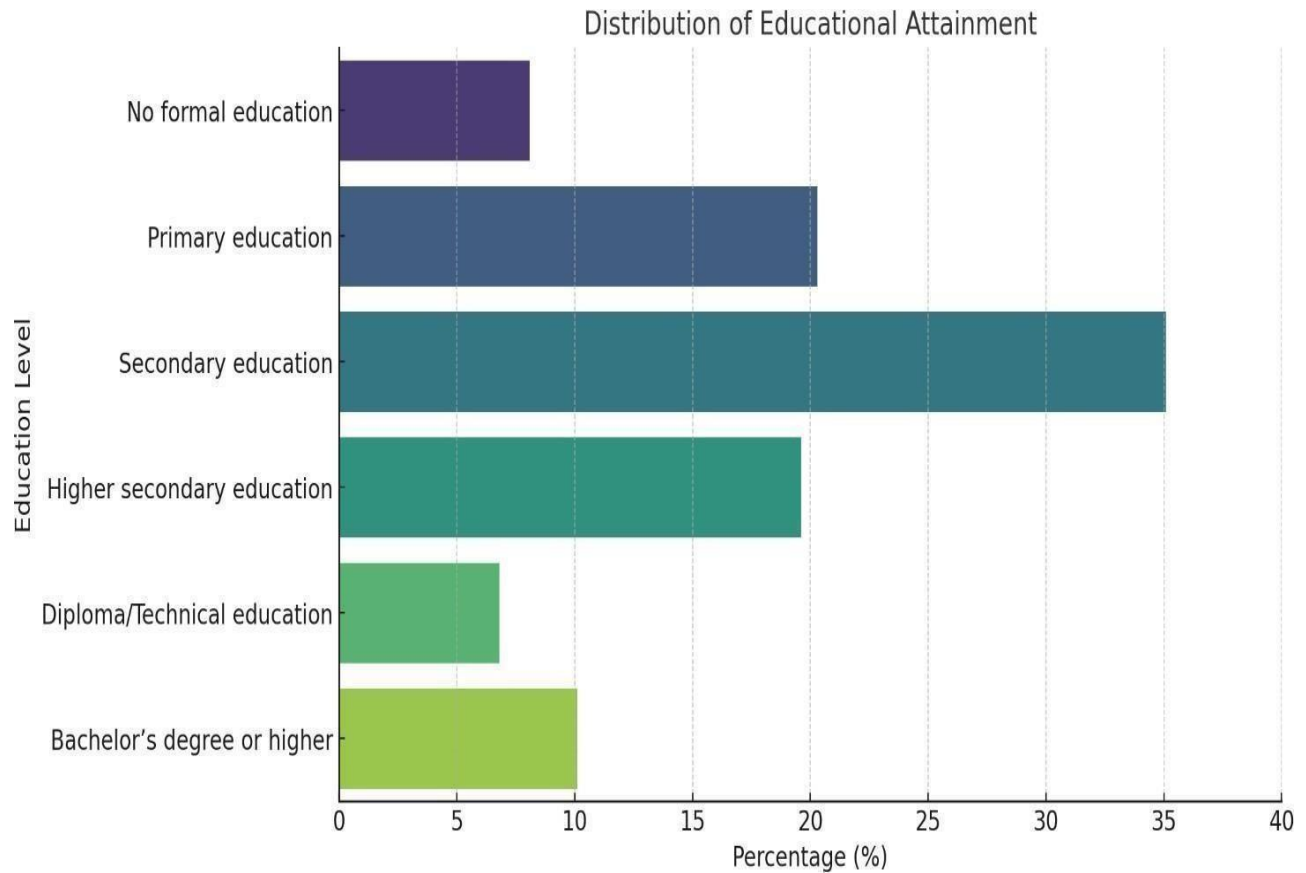
The 46-55 years group follows closely with 72 farmers (24.2%). This indicates that older farmers are also adopting drone technology but at a slightly lower rate than the 36- 45 age group.

70 farmers (23.6%) belong to the 26-35 years category. This suggests that younger farmers are actively using drones, possibly due to their greater exposure to modern technology and openness to innovation. Only 7 farmers (2.4%) are in the 18-25 years group. This is likely because younger individuals may still be in education or not yet in decision-making positions on farms.

The 56 and above category comprises only 23 farmers (7.7%). This may indicate hesitation among older farmers to adopt drone technology, possibly due to a lack of familiarity, cost concerns, or reliance on traditional farming methods. The data suggests that middle-aged farmers (36-45 years) are the primary adopters of drone pilot services, while younger and older farmers have lower engagement.

Educational Level

Figure 17 Educational level of the farmers availing the drone services



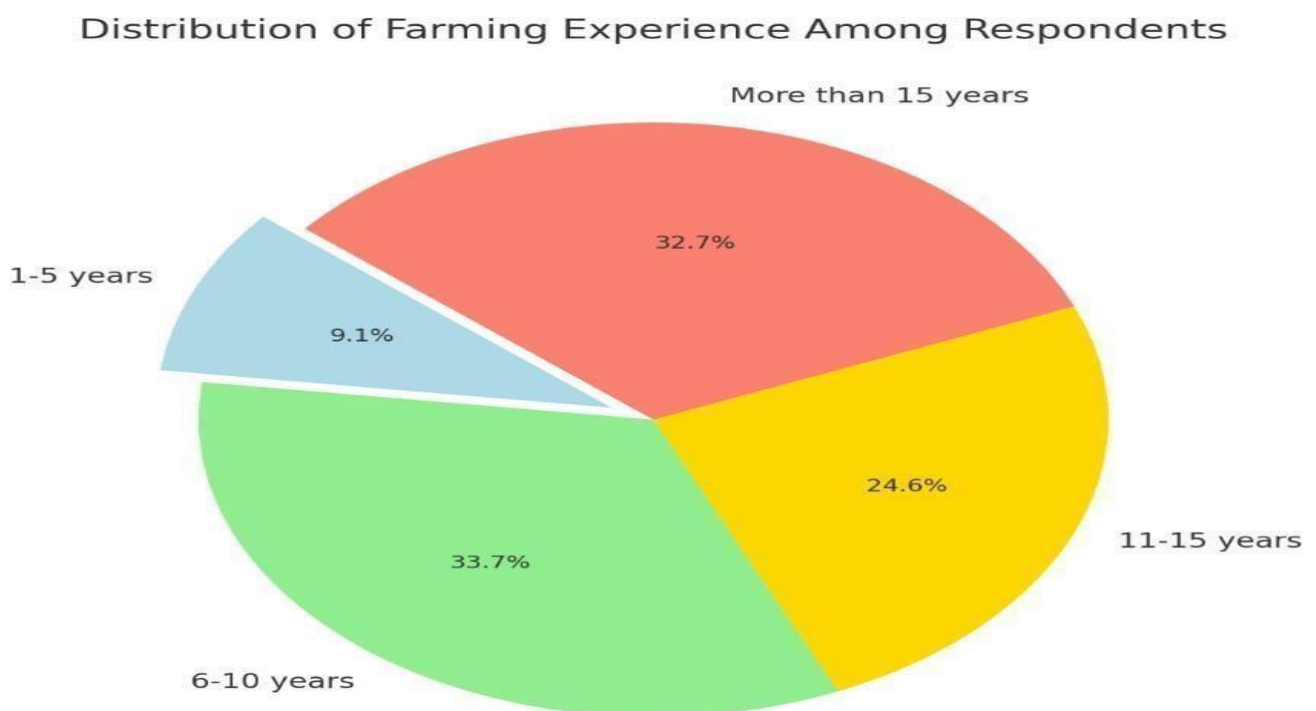
The bar chart visually represents the distribution of educational attainment in the sample population of 297 individuals. The highest proportion of individuals (35.1%) have completed secondary education. This suggests that secondary education is widely accessible and commonly attained in the population. It could be an indicator of a strong school system up to the secondary level but may also imply barriers to higher education. Primary education (20.3%) is the second most common education level, indicating that a significant portion of the population only completes basic schooling. Higher secondary education (19.6%) represents individuals who continue education beyond secondary school but may not proceed to college or specialized training.

Combined, 55.4% of individuals (Primary + Secondary + Higher Secondary) have attained schooling up to the higher secondary level.

Only 10.1% of individuals have completed a bachelor's degree or higher. This suggests that higher education is not as widely accessible or pursued compared to lower levels of education. Factors like cost, availability of higher education institutions, and societal expectations may contribute to this low percentage. Only 6.8% of individuals have a diploma or technical education, which is relatively low. This suggests that vocational and technical education is not a major pathway for most individuals in the sample. Technical education is often essential for skilled trades, and a low percentage may indicate a gap in workforce development. A significant 8.1% of the population has no formal education. This suggests that access to early education might be a challenge for some individuals, possibly due to financial adversity, inaccessible locations, or cultural factors.

Farming Experience

Figure 18- showing the farming experience among the respondents



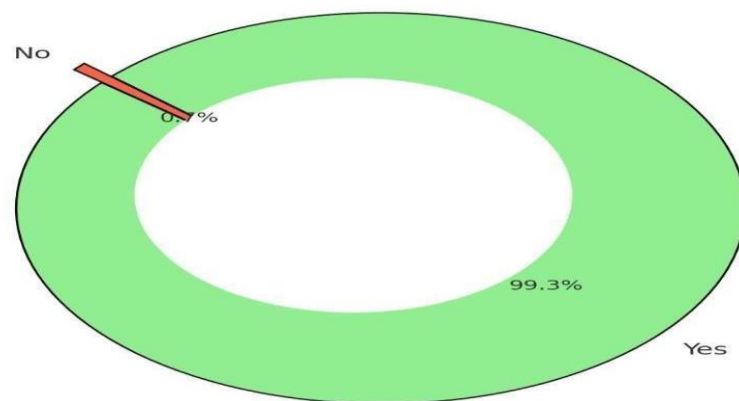
The pie chart visually represents the distribution of respondents based on their years of farming experience 6-10 years (33.7%) – The largest segment of respondents falls into this category, indicating that a significant portion of farmers has a moderate level of experience. More than 15 years (32.7%) – Nearly as large as the 6-10 years category, this group represents experienced farmers with extensive knowledge in agriculture. 11-15 years (24.6%) – This category also has a substantial proportion of farmers, showing that a good number of respondents have more than a decade of experience. 1-5 years (9.1%) – This is the smallest category, which suggests that relatively few farmers are new to the profession.

More than 90% of the farmers have at least six years of experience, showing that agriculture in this group is dominated by experienced individuals. The presence of newer farmers (1-5 years) is limited, indicating either a slower entry of new farmers into the field or a high retention rate of experienced farmers. The even distribution among the middle and experienced groups suggests steady career progression in farming.

4.3.4 Awareness of Drone Technology

Figure 19 showing awareness of drone technology among farmers in Agriculture

Awareness of Drone Technology in Agriculture

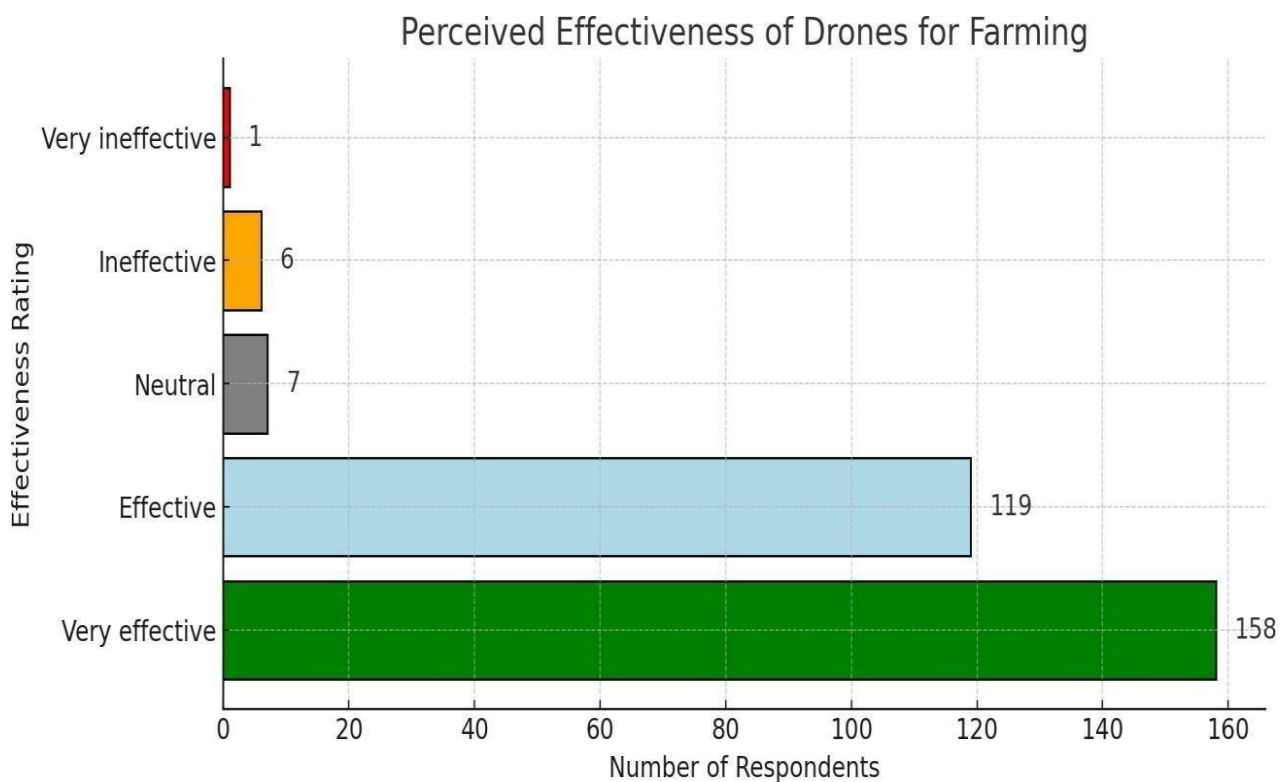


The chart visually represents the awareness of drone technology in agriculture among respondents (99.3%) – Almost all respondents (294 out of 296) are aware of drone technology in agriculture. This indicates a high level of technological awareness in the farming community. (0.7%) – Only 2 respondents reported being unaware of drone technology, suggesting that lack of awareness is nearly non-existent.

The overwhelming majority of respondents know about drone technology, implying that information about agricultural technology is well disseminated. With only 0.7% of respondents unaware, efforts to educate farmers on drone technology would require minimal resources. This result suggests that drone technology has gained significant recognition in agriculture.

Perceived Effectiveness Of Drone

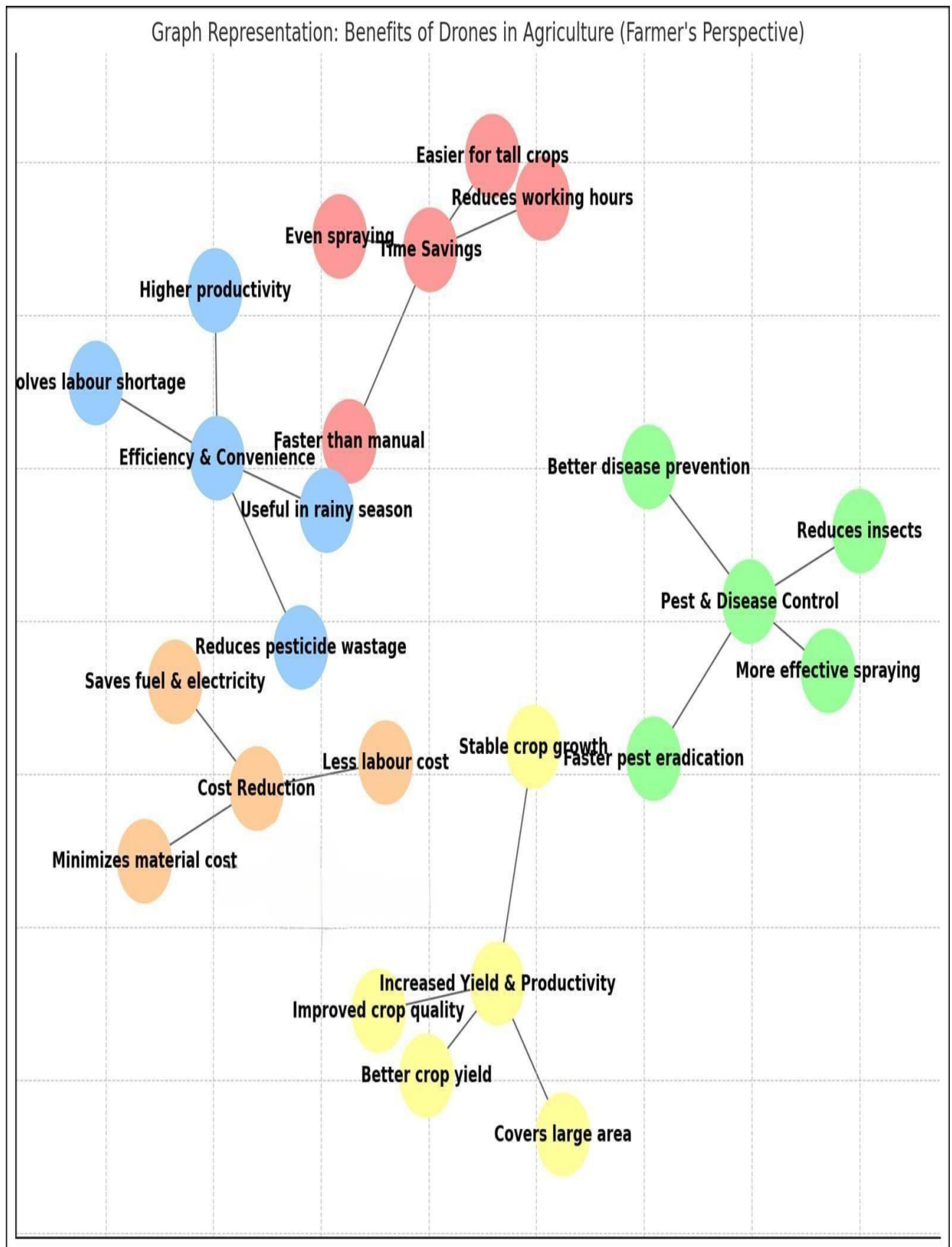
Figure 20 showing the level of perceived effectiveness of drone for farming



The chart visually represents farmers' perceptions of drone effectiveness in agriculture (54.3%) – The majority of respondents (158) rated drones as "very effective," indicating a strong positive perception of their impact. (40.9%) – A substantial portion (119 respondents) also found drones to be effective, reinforcing their usefulness in farming. (2.4%) – A small group (7 respondents) neither found drones helpful nor ineffective. (2.1%) – Only 6 respondents rated drones as ineffective, showing very limited dissatisfaction. (0.3%) – Just one respondent considered drones to be very ineffective, indicating that negative perceptions are rare.

Over 95% of respondents consider drones effective or very effective, demonstrating high satisfaction with their use in farming. Only 2.4% are neutral, meaning that very few people are unsure about the benefits of drones. Negligible negative feedback (2.4%), which suggests that concerns about drone effectiveness are minimal. This data indicates that drones are widely accepted as beneficial in agriculture.

Benefits of Drone: Figure 21 Infographics of Benefits of Drone Usage



This graph visually represents the advantages of drones in agriculture from a farmer's perspective. The main benefits (highlighted in distinct colours) include Time Savings, Cost Reduction, Increased Yield & Productivity, Pest & Disease Control, and Efficiency & Convenience.

Each of these categories has related sub-benefits, which demonstrate how drones contribute to modern farming.

Time Savings

Drones significantly reduce the time required for various farming activities, such as spraying pesticides, monitoring crops, and surveying land. Earlier Studies indicate that drones can cover up to 100 acres per hour, compared to manual spraying, which covers 1-2 acres per hour (Zhang & Kovacs, 2012). Other important benefits include reduces working hours, even spraying etc.

Cost Reduction

Drones minimize the use of pesticides, fertilizers, and water by enabling precision application, reducing waste, and lowering overall operational costs. The use of drones in precision agriculture has led to 30- 50% savings in pesticide usage (Yallappa et al., 2017). Other significant advantages include Less labor cost, Minimizes material costs, Saves fuel & electricity.

Increased Yield & Productivity (Lighter Green)

Drones help improve crop management by providing real-time data on plant health, soil conditions, and irrigation needs, leading to better decision-making and higher yields. Research shows that precision agriculture techniques, including drones, can increase crop yields by 10-15% (Mulla, 2013). Other noteworthy benefits include, Better crop yield, Stable crop growth, Improved crop quality.

Pest & Disease Control

Drones allow for quick intervention. Remote sensing and drone imaging can identify crop diseases 2- 3 weeks before visible symptoms appear, reducing crop loss (Senthilnath et al., 2016). Additional gains include Faster pest eradication, Reduces pesticide wastage and better disease prevention.

Efficiency & Convenience

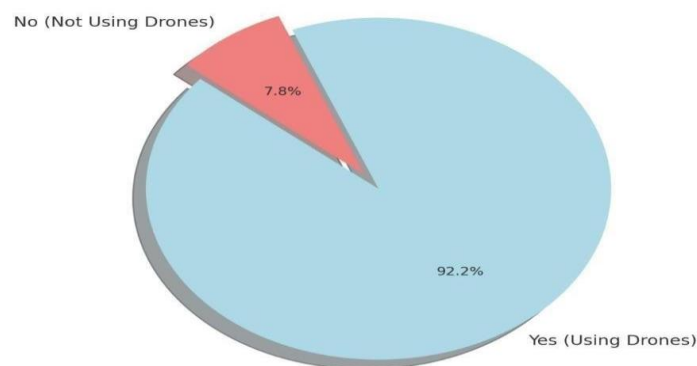
Drones offer ease of use, automation, and accessibility to difficult terrains, making farming more efficient. Research Evidence: Drone-based spraying has proven 20 times more efficient than traditional methods (Qin et al., 2018). Added sub benefits are Solves labor shortage, Easier for tall crops, No need for petrol pumps

The graph highlights the transformative impact of drone technology in agriculture, with strong research-backed benefits such as higher productivity, reduced costs, time efficiency, better crop protection, and convenience. As technology advances, drone adoption in farming will continue to grow, leading to sustainable and precision-based agriculture.

Usage of Drones For Pest Management

Figure 22 showing usage of drone for pesticide, fungicide, insecticide sowing in farming

Drone Usage for Pesticide/Fungicide/Insecticide Sowing in Farming



The pie chart illustrates the adoption of drones for pesticide, fungicide, and insecticide sowing in farming. 92.2% of respondents reported using drones for these agricultural activities, indicating a significant shift towards modern technology in farming. Only 7.8% stated that they do not use drones, suggesting a minimal reluctance or barriers in adoption. The high adoption rate aligns with research showing that drone technology improves efficiency, reduces labor costs, and enhances precision in pesticide application. This data supports the trend of increasing drone integration in precision agriculture, potentially leading to better crop yields and sustainability.

Crop Yield Change And Overall Productivity

Table 41 Crosstabulation of Crop Yield Change and Overall Farm Productivity Change After Drone Adoption

Crop Yield Change Since Adopting Drones	Overall Farm Productivity Change					Total
	Decreased	Decreased	Remained	Improved	Improved	
	Significantly	Moderately	the Same	Moderately	Significantly	
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Moderate Decrease	1 (0.3%)	0 (0.0%)	1 (0.3%)	1 (0.3%)	0 (0.0%)	3 (1.0%)
No Change	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.3%)	1 (0.3%)
Moderate	0 (0.0%)	0 (0.0%)	2 (0.7%)	52 (17.6%)	25 (8.4%)	77

Increase						(26.0%)
Significant	3 (1.0%)	1 (0.3%)	2 (0.7%)	32 (10.8%)	175 (59.1%)	205
Increase						(69.3%)
Total	4 (1.4%)	1 (0.3%)	5 (1.7%)	85 (28.7%)	201 (67.9%)	296
						(100.0%)

This table presents the relationship between changes in crop yield and overall farm productivity following the adoption of drones for agricultural purposes. The majority (69.3%) of respondents reported a significant increase in crop yield. Among those who saw a significant increase in yield, 59.1% also experienced a significant improvement in overall farm productivity. An additional 26.0% reported a moderate increase in yield, with 17.6% of them also seeing a moderate improvement in productivity.

Only 1.4% of farmers reported a significant decrease in productivity, with 1.0% of them also noting a significant decrease in crop yield. The "No Change" category was negligible (0.3%), indicating that most farmers observed improvements after adopting drone technology. Overall, 67.9% of respondents reported significant productivity improvements, aligning with the 69.3% who observed a significant increase in crop yield. This suggests a strong correlation between yield improvement and overall farm productivity gains through drone adoption.

Research evidence indicate that drones optimize the precision application of fertilizers and pesticides, leading to 10–15% increases in crop yield (Mulla, 2013). Drone- assisted spraying covers up to 100 acres per hour, significantly reducing labor costs and increasing productivity (Zhang & Kovacs, 2012). Studies indicate that drone spraying reduces pesticide

and fertilizer waste by 30–50%, cutting down input costs (Yallappa et al., 2017). Farmers using drones experience up to a 60% reduction in labor dependency, addressing workforce shortages in rural farming (Qin et al., 2018). Precision agriculture using drones reduces chemical runoff, contributing to improved soil and water conservation (Senthilnath et al., 2016). Early detection of pests and diseases via drone imaging enables faster intervention, reducing crop losses by 20–30% (Bendig et al., 2015).

The findings indicate that drone adoption in farming has had overwhelmingly positive effects, particularly in enhancing crop yield and overall farm productivity. With 96.6% of respondents reporting some level of improvement, drones are proving to be a game-changer in modern precision agriculture. The strong research-backed benefits suggest that further integration of drone technology will continue to enhance efficiency, sustainability, and profitability in farming.

Pest Management

Table 42 Crosstabulation of Pest/Disease Infestation Eradication and Reduction in Pesticide/Fungicide/Insecticide Usage after Drone Adoption

Pest/Disease Infestation Eradication Using Drones	Reduction in Pesticide/Fungicide /Insecticide Usage				
	Total				
	Increased Usage	No Change	Moderate Reduction	Significant Reduction	
	n (%)	n (%)	n (%)	n (%)	n (%)

Yes,	3 (1.0%)	5 (1.7%)	79 (26.6%)	196	283
drones				(66.7%)	(95.3%)
helped					
No, drones did not	0 (0.0%)	0 (0.0%)	3 (1.0%)	6 (2.0%)	9 (3.0%)
help					
Total	3 (1.0%)	5 (1.7%)	82 (27.6%)	207	297
				(69.7%)	(100.0%)

This table presents data on the relationship between pest/disease eradication using drones and reduction in pesticide, fungicide, and insecticide usage in farming. 95.3% of respondents (n = 283) reported that drones were more effective than manual spraying in eradicating pest and disease infestations. Among them, 66.7% also reported a significant reduction in pesticide, fungicide, and insecticide usage. Only 1.0% (n = 3) observed increased chemical usage, suggesting that drones do not typically lead to higher input requirements. 27.6% (n = 82) reported a moderate reduction in pesticide usage. This indicates that while drones reduce chemical usage, the level of reduction varies based on factors like crop type and infestation severity. A small fraction (3.0%, n = 9) of respondents found no improvement in pest/disease eradication using drones. However, among this group, most still reported a reduction in pesticide usage, suggesting that drones improve efficiency even if they do not always fully replace manual methods.

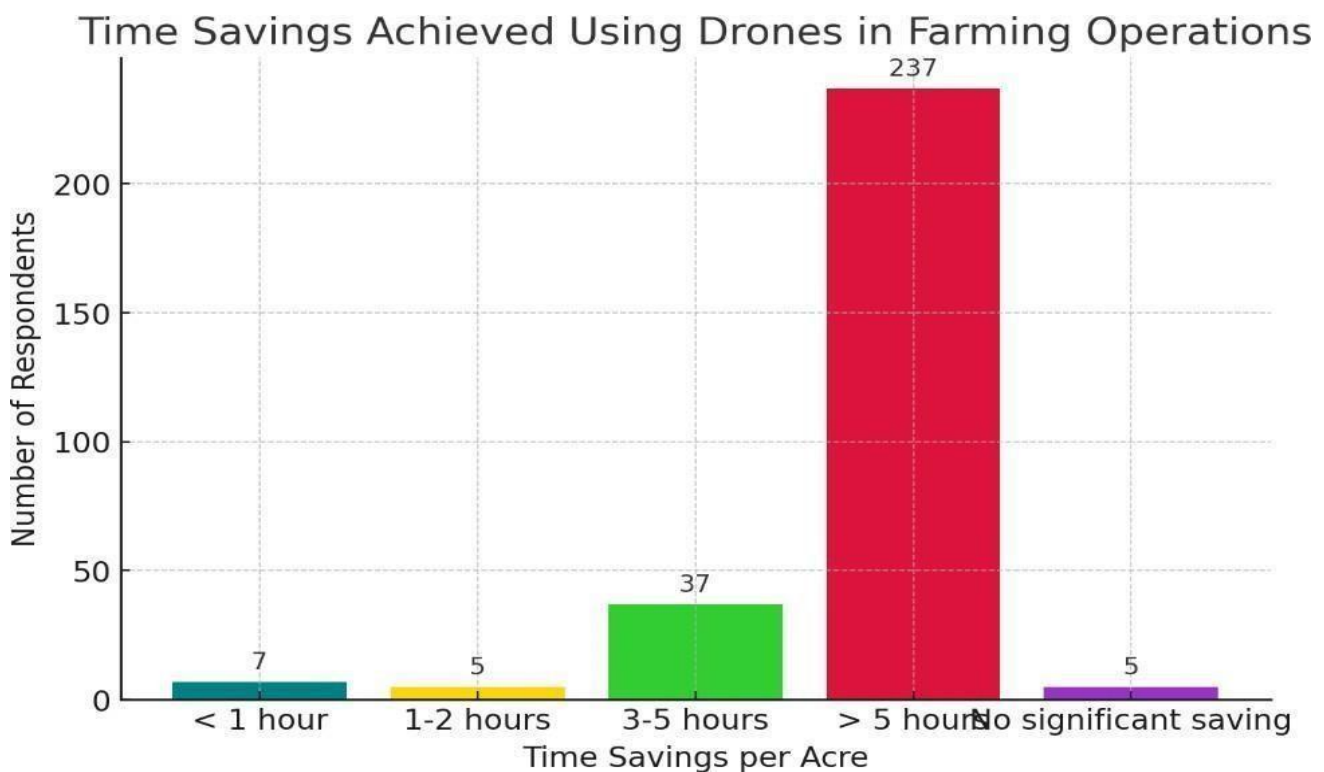
In connection to the current study earlier studies show that drone-based precision spraying reduces pesticide use by 30–50% while maintaining effectiveness (Yallappa et al., 2017). Drone-assisted targeted spraying minimizes chemical drift and ensures uniform

coverage, reducing environmental pollution (Qin et al., 2018). Furthermore drones applying fungicides and insecticides have been found 20 times more effective than traditional manual spraying (Zhang & Kovacs, 2012). Farmers using drones report a 60% reduction in labor costs due to automation of spraying tasks (Mulla, 2013). Drone-enabled spraying can cover 100+ acres per hour, increasing operational efficiency compared to manual labor (Bendig et al., 2015).

Overall, the data affirms that drones play a crucial role in improving pest and disease control while significantly reducing pesticide, fungicide, and insecticide usage. With over 95% of farmers reporting improved infestation management, drones are proving to be a cost-effective, environmentally friendly, and efficient alternative to traditional spraying methods.

Time Management

Figure 23 Time savings achieved using drones in farming operations

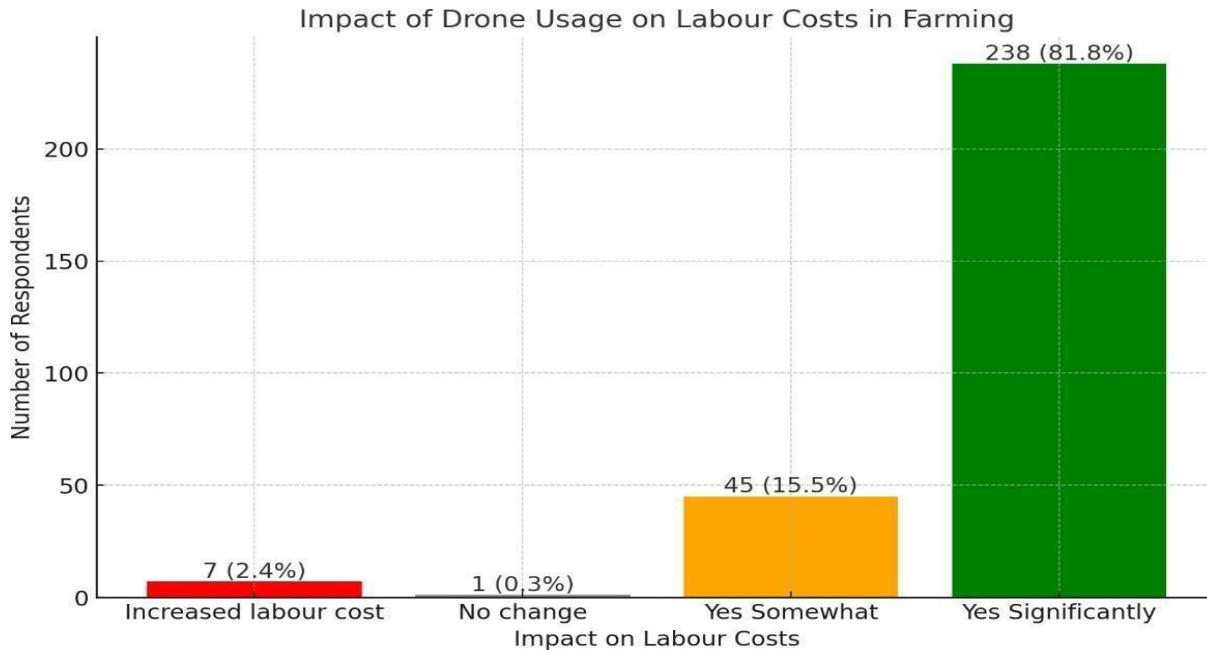


The bar chart illustrates the distribution of time savings per acre when using drones for farming operations. The majority of respondents (237 out of 291, approximately 81.4%) reported saving more than 5 hours per acre when using drones. This highlights the substantial efficiency gain compared to traditional methods. A smaller proportion (12.7%) indicated savings of 3-5 hours per acre, still demonstrating notable efficiency improvements. Only a small fraction of respondents (2.4% and 1.7%) reported saving less than 1 hour or 1-2 hours per acre, respectively. Another 1.7% stated that drones did not lead to significant time savings. Research indicates that drones significantly reduce labour-intensive tasks such as fertilizer spraying, pest control, and crop health assessment. Osborne et al. (2019) found that traditional fertilizer application takes hours per acre, while drones can complete the same task in minutes with higher accuracy and minimal resource wastage. A study by Hussain et al. (2020) reported that farmers using drones for spraying achieved a 40%-60% reduction in application time and lowered chemical usage by 30%, improving cost efficiency.

The results align with existing research, confirming that drones save more than 5 hours per acre in most farming operations. Their ability to reduce labor costs, optimize resource use, and enhance productivity makes them an important tool for modern agriculture. With the growing adoption of technology in agriculture, drones will continue to play a crucial role in improving efficacy, productivity, and sustainability in agriculture.

Labor Cost

Figure 24 Impact of drone usage on labor cost

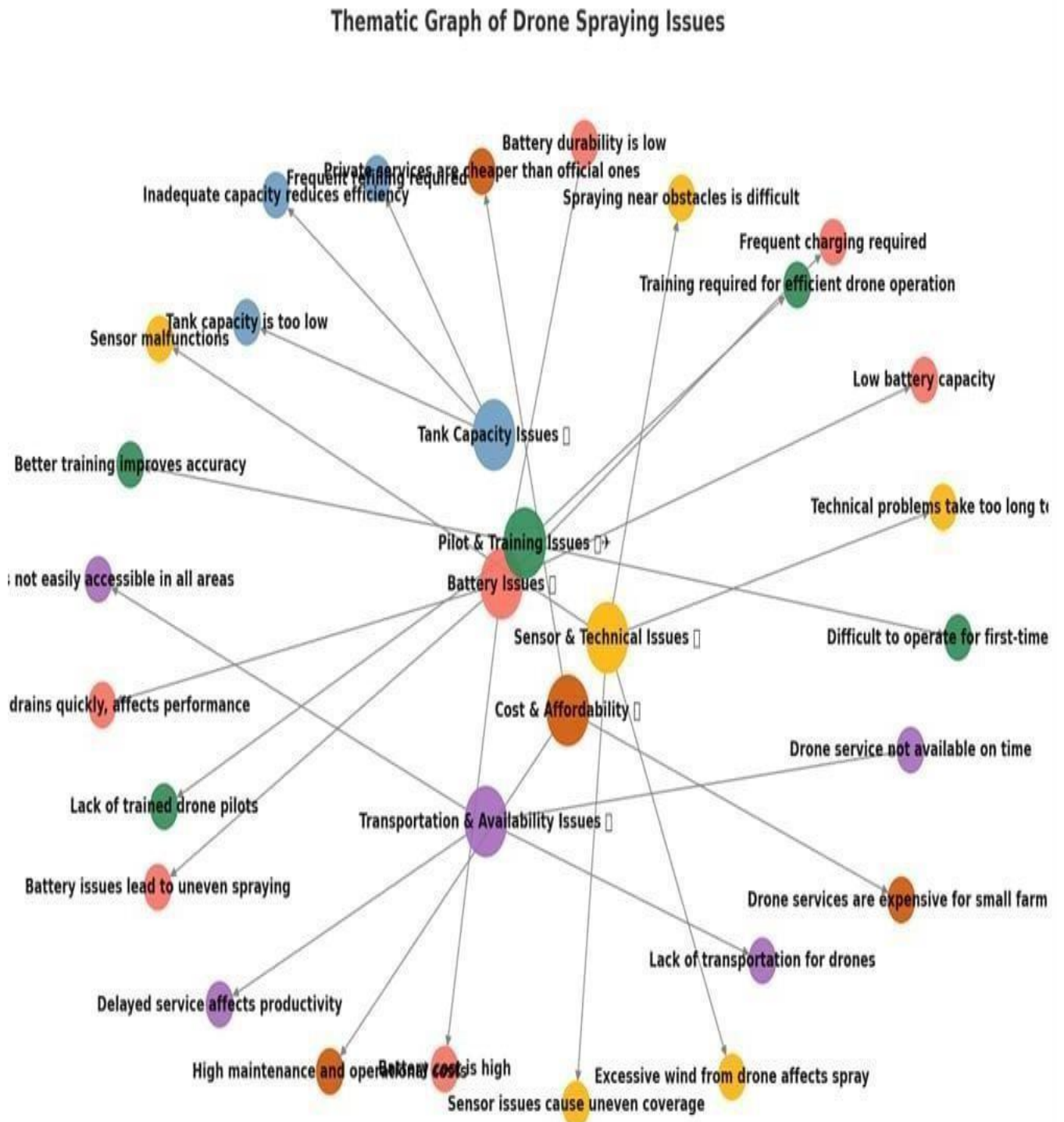


81.8% (238 respondents) reported significant labor cost reduction with drone adoption. 15.5% (45 respondents) saw somewhat lower labor costs due to drones. Only 2.4% (7 respondents) experienced higher labor costs, possibly due to initial investments or training needs. 0.3% (1 respondent) observed no change in labor costs.

Torres-Sánchez et al. (2015) found that drones enable automated spraying, crop monitoring, and data collection, reducing reliance on manual labor and cutting costs by up to 70%. Hussain et al. (2020) reported that drone-based fertilizer application requires 80% fewer workers compared to traditional spraying methods. Research by Sharma et al. (2021) indicates that drones can cover 100 acres per day, compared to manual labor, which may take several days for the same task. Mulla (2013) showed that drones reduce fuel costs and machine wear, contributing to lower overall farm expenses.

Challenges of Drone Spraying

Figure 25 Challenges of Drone Spraying perceived by the farmers



The integration of drone technology in agriculture has revolutionized fertilizer spraying, improving efficiency, cost-effectiveness, and sustainability. However, several challenges hamper its widespread adoption.

Battery & Power Issues

Battery and power issues were recorded by the participants. Most agricultural drones have a flight time of 20–30 minutes per charge, requiring frequent recharging, which disrupts efficiency (Shamshiri et al., 2021). A comparative study by Torres- Sánchez et al. (2018) highlighted that battery limitations reduce drone coverage to only 10-15 hectares per session, which is insufficient for large farms.

Battery Durability & Malfunctions were another challenge cited by the participants. Research by Yang et al. (2022) found that battery degradation leads to voltage drops, causing mid-air failures, increasing drone crash risks. Power failures mid-flight cause spray inconsistencies and increase operational downtime (Zhang et al., 2018)

Tank Capacity Issues

Low Tank Capacity & Frequent Refilling was mentioned as one of the challenge. A study by Zhang et al. (2021) showed that frequent refills disrupt spraying patterns, reducing overall field uniformity by 15-20%. Limited Storage & Need for Increased Fertilizer Storage was also a concern raised by the farmers. Balancing increased payload with flight efficiency is a major challenge. Research shows for every 1kg increase in tank size, drone flight time reduces by 8-10% (Kim et al., 2019).

Sensor & Technical Challenges

Sensor Malfunctions & Obstacle Detection Failures were mentioned by few farmers. Faulty LiDAR sensors misread crop heights and obstacles, leading to uneven spraying (Tang et al., 2021). A field test by Bai et al. (2022) found that 30% of drone crashes in agricultural settings result from poor sensor calibration. Nozzle Blockage & Malfunctioning Drones was another issues addressed by the participants Pesticide residue build up clogs spray nozzles, reducing efficiency (Zhou et al., 2022). Lack of Trained Pilots & High Dependence on Skilled Operators was also shared as a concern. A study by Li et al. (2022) showed that improper drone handling leads to pesticide overuse by 30%, increasing soil toxicity.

Cost & Availability Challenges

Limited Availability was a concern addressed by the farmers. This can delay the process for the farmers. Service unavailability in rural areas delays spraying schedules, impacting crop health (Shi et al., 2020). Transportation & Maintenance Challenges were also identified, making it as another challenge to be addressed. On the whole, a glimpse at the challenges highlights the limitations of drone spraying technology in agriculture. While drones improve efficiency and precision, Productivity, and low cost, battery life, tank capacity, sensor accuracy, and operational skills, remain major barriers.

Major Findings and Strategic Recommendations

4.1 Introduction

The evaluation of the Corporate Social Responsibility (CSR) initiatives implemented by the organization was undertaken to assess the effectiveness, reach, and overall impact of the key programs across beneficiary schools and communities. The study focused on major CSR interventions including Akshara Mithra (Education), Eye Care and Health Care initiatives, Swachha Vidyalaya (Sanitation and Hygiene), Community Development, and Environmental Sustainability programs. The purpose of the evaluation was to understand how these initiatives have contributed to improving educational infrastructure, student well-being, health awareness, sanitation practices, and community development.

The analysis was carried out using both quantitative and qualitative data collected from participating schools and stakeholders. Quantitative responses provided measurable indicators regarding the implementation and outcomes of the CSR initiatives, while qualitative feedback from respondents offered deeper insights into the perceived benefits, challenges, and areas for improvement. This mixed-method approach enabled a comprehensive understanding of the effectiveness of the programs and their impact on the target beneficiaries.

Overall, the findings indicate that the CSR initiatives have made significant contributions toward enhancing school infrastructure, improving student learning environments, promoting health awareness, strengthening sanitation facilities, and fostering community engagement. Beneficiary schools reported positive outcomes in terms of improved access to educational resources, better hygiene practices, and increased awareness about environmental sustainability. In addition, the initiatives have

supported the broader goal of community development by addressing key social issues that affect the well-being of students and local communities.

At the same time, the evaluation highlights certain areas where further strengthening and sustained efforts are required to maximize the long-term impact of these programs. These include the need for continuous monitoring, capacity-building initiatives for teachers and stakeholders, regular health and sanitation follow-ups, and stronger community participation in program implementation. Addressing these aspects will help ensure that the CSR initiatives remain sustainable and continue to generate meaningful social impact.

The following section presents the major findings of the study, organized according to the key CSR initiatives implemented by the organization. These findings provide insights into the achievements of the programs as well as areas where strategic improvements can enhance their effectiveness and long-term sustainability.

Major Findings

4.2 Education Initiative – Akshara Mithra

- The Akshara Mithra program has significantly contributed to improving the quality of education and academic support in beneficiary schools.
- Schools reported improved learning environments, better access to educational materials, and enhanced student engagement in classroom activities.
- Teachers indicated that the program has supported teaching effectiveness, particularly through supplementary learning resources and infrastructural support.
- Students from supported schools demonstrated increased motivation to learn, higher classroom

participation, and improved academic interest.

- The initiative has also strengthened school infrastructure, including classroom facilities and learning spaces, which contribute to a more conducive learning atmosphere.
- However, some schools indicated the need for continuous teacher training and learning support programs to maximize the benefits of the initiative.

4.3 Swachha Vidyalaya Initiative

- The Swachha Vidyalaya initiative has had a strong impact on school sanitation infrastructure and hygiene practices.
- Schools reported improved availability and maintenance of toilets and handwashing facilities, which directly supports student health and well-being.
- The program has contributed to increased awareness of sanitation and hygiene practices among students.
- Teachers observed improved cleanliness within school premises and greater student responsibility toward maintaining hygiene.
- The initiative has also positively influenced school attendance, particularly among girl students, due to improved sanitation facilities.
- Some schools indicated the need for ongoing maintenance support and monitoring mechanisms to sustain the facilities.

4.4 Health Care and Eye Care Initiatives

- The Eye Care and Health Care initiatives have enhanced access to basic health services for students and community members.
- Vision screening programs helped in early identification of visual impairments, enabling timely

treatment and corrective measures.

- Health awareness campaigns improved knowledge regarding hygiene, preventive health care, and healthy lifestyle practices among students.
- Schools reported that health camps increased health-seeking behavior among both students and parents.
- The initiative has contributed to reduced absenteeism related to untreated health issues, especially eye-related problems.
- Despite the success, stakeholders highlighted the need for regular follow-up screenings and expanded health services.

4.5 Environmental Initiatives

- Environmental initiatives have raised awareness about environmental conservation and sustainability practices among students and communities.
- Schools have adopted activities such as tree plantation, waste management, and environmental education programs.
- Students reported increased awareness regarding environmental protection and responsible behavior toward natural resources.
- Teachers highlighted the importance of integrating environmental education into school activities supported by CSR programs.
- Despite positive outcomes, stakeholders suggested expanding environmental initiatives to include long-term sustainability projects.

4.6 Community Development Initiatives

- CSR initiatives aimed at community development have strengthened the relationship between the company and local communities.
- Community members acknowledged improvements in local infrastructure and support services facilitated by the CSR programs.
- The initiatives promoted community participation and awareness regarding development activities.
- Local stakeholders reported increased community engagement with schools and educational programs.
- However, some community members expressed the need for greater involvement in planning and decision-making processes for CSR activities.

4.7 Mangala Raitha Prathibhe

- The training significantly improved participants' agricultural knowledge, especially in seed treatment, fertilizer application, crop disease identification, and sustainable practices.
- Farmers reported enhanced confidence and self-efficacy, with increased willingness to adopt modern and scientific farming techniques.
- There was a marked shift toward sustainable agriculture, including better soil management, organic inputs, and reduced chemical misuse.
- The programme strengthened skills in crop management, leading to better decision-making and expected improvements in yield quality and productivity.
- Participants experienced greater financial awareness, showing improved ability to estimate costs, minimize input waste, and plan farming activities efficiently.

The training was perceived as highly relevant and practical, with strong appreciation for hands-on demonstrations and contextualized learning.

4.8 Drone Project

Qualitative Findings

- **Self-empowerment:** Increased self-efficacy, resourcefulness, self-esteem, and recognition.
- **Economic empowerment:** Improved financial stability, employability, and independence.
- **Social empowerment:** Greater social recognition, stereotype reduction, and increased respect within the community.
- **Challenges:** Technical, resource, and safety constraints, including limited drone access and skill gaps.

4.9 Quantitative Findings – SHG Members

- Pest management identified as the major benefit of drone use.
- Significant improvement in self-esteem after training.
- Increased crop yield reported as the most common economic gain.
- Positive shift in perceptions of women in agriculture.
- Trained SHG members actively share knowledge and empower others.
- Increased community interest in technology.
- Enhanced collaboration within the farming community.
- High motivation levels driven by technology exposure.
- Need for more training opportunities highlighted.

4.10 Quantitative Findings – Beneficiary Farmers

- Very high awareness of drone technology (294/296 respondents).
- Over 95% rate drones as effective or very effective.
- Key benefits: time savings, cost reduction, higher yield, better pest/disease control, and overall efficiency.
- Drones mainly used for pesticide, fungicide, and insecticide spraying.
- Majority experienced higher crop yield and improved farm productivity.
- 95.3% found drones more effective than manual spraying; 66.7% reduced chemical usage.
- Over 5 hours per acre saved by most users.
- 81.8% reported significant labor cost reduction.
- Challenges: battery and power issues, limited tank capacity, sensor/technical problems, and cost/availability concerns.

4.11 Overall Impact of CSR Initiatives

- Overall, the CSR initiatives implemented by the company have positively impacted education, health, sanitation, and community well-being.
 - Schools and community members expressed high levels of satisfaction with the CSR interventions.
 - The initiatives have contributed to improved school infrastructure, student learning environments, and community awareness.
 - The programs demonstrate strong alignment with sustainable development goals related to education, health, sanitation, and environmental sustainability.

- However, stakeholders emphasized the importance of sustained engagement, continuous monitoring, and expansion of initiatives to ensure long-term impact.

4.12 Strategic Recommendations

Strengthen Program Continuity and Sustainability

- Encourage schools and communities to independently develop and implement long-term sustainability plans for continued program benefits.
- Promote the establishment of internal monitoring systems within schools to regularly assess progress and identify areas for improvement.
- Motivate beneficiaries to mobilize local resources and partnerships to support maintenance and continuity of initiatives.

Enhance Capacity Building for Teachers and School Staff

- Encourage teachers to proactively engage in self-directed learning and peer-based knowledge sharing to strengthen instructional practices.
- Support school administrators in independently managing and optimizing available resources for improved institutional outcomes.
- Motivate schools to adopt and integrate digital tools and skill development practices through existing platforms and government initiatives.

Expand Health and Eye Care Services

- Encourage schools and families to utilize existing public health systems for regular health and vision screenings.

- Promote linkages with nearby healthcare providers and government health programs for sustained service access.
- Foster awareness among students and communities to independently adopt preventive health and hygiene practices.

Improve Infrastructure Maintenance and Monitoring

- Assign primary responsibility for maintenance of sanitation and infrastructure facilities to school management and community stakeholders.
- Encourage School Management Committees (SMCs) to oversee regular upkeep and ensure accountability.
- Promote routine self-monitoring practices within schools to maintain functionality of facilities.

Strengthen Community Participation

- Encourage community members, parents, and local leaders to take initiative in planning and supporting school-level activities.
- Facilitate the creation of community-led platforms for feedback and decision-making.
- Promote community ownership of initiatives to ensure long-term sustainability without external dependence.

Expand Environmental Sustainability Programs

- Encourage schools and students to independently initiate and manage eco-friendly practices such as waste management and water conservation.

- Motivate adoption of sustainable practices using locally available resources and knowledge systems.
- Promote community-driven environmental awareness efforts for sustained behavioral change.

Drone Project

- Offer technical training sessions to bridge skill gaps and increase safety awareness
- Improve drone maintenance support to reduce downtime due to technical failures.
- Encourage the development of longer-lasting battery solutions and invest in solar-powered drone stations.
- Introduce automated refill stations and advocate for larger-capacity drones.
- Offer regular software updates and hands-on training for troubleshooting.

Strengthen Impact Assessment and Reporting

- Encourage schools to adopt simple, self-managed monitoring and evaluation practices to track outcomes.
- Promote the use of basic data collection and reporting methods within existing institutional systems.
- Motivate beneficiaries to document and share outcomes and best practices for peer learning and replication.

4.1.3 Conclusion

The assessment of the CSR initiatives demonstrates that well-designed and consistently implemented corporate social responsibility efforts can play a transformative role in strengthening community development and improving overall social well-being. The outcomes of the project indicate that CSR interventions, when aligned with local needs and national development priorities, contribute meaningfully to social progress by enhancing access to essential services, improving living conditions, and fostering inclusive growth.

The initiatives undertaken reflect the value of a structured and community-oriented approach, where investments in education, health, sanitation, environment, women empowerment, and community development work collectively to create positive change. The engagement of multiple stakeholders—including community members, institutions, and local leadership—further reinforces the importance of collaboration in achieving sustainable development outcomes.

The study also highlights the need for continuous monitoring, long-term planning, and capacity-building to ensure that CSR efforts remain effective, relevant, and sustainable over time. By embedding accountability, participation, and adaptability into CSR strategies, organizations can maximize the long-term benefits of their social investments.

Overall, the CSR project reaffirms that corporate responsibility extends beyond compliance and philanthropy—serving as a pathway through which companies can contribute to more equitable, resilient, and empowered communities. With sustained commitment and strategic direction, CSR initiatives have the potential to generate lasting impact and support broader national visions of inclusive and sustainable development.

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