**Title of the Technology:**

**AGRO-X:** An Intelligent Agricultural System for Non-Lethal Animal Deterrence, Pest Control, and Precision Farming

**Background of the Project**

Agriculture in rural areas faces multiple challenges, from wild animal invasions to inefficient farming practices. Wild animals, such as elephants and boars, often destroy crops, leading to significant losses for farmers. Insects and pests exacerbate the issue by damaging crops and reducing yields. Additionally, many farmers in India do not have access to effective soil monitoring tools, resulting in poor crop health and inefficient resource use. AGRO-X addresses these challenges by offering a comprehensive, non-lethal solution that integrates wildlife deterrence, pest control, and precision soil monitoring to optimize agricultural productivity.

**Objective/s of the Project**

1. Wildlife Intrusion Deterrence
2. Pest Control
3. Precision Soil Monitoring
4. Cloud-Based Data Processing
5. Real-Time Weather Integration
6. Ground-Level Crop Health Imaging
7. Accessible Data for Farmers
8. Long-Term Crop Productivity Improvement

### Beneficiaries of AGRO-X

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | | Beneficiary |  |  | | --- | |  | | Description | Impact | | Number of Beneficiaries | | --- |  |  | | --- | |  | |
| |  | | --- | | Farmers |  |  | | --- | |  | | Primary users of the AGRO-X system. | Gain real-time insights into soil quality, pest control, and crop health, improving yields. | |  | | --- | | 2-3 million |  |  | | --- | |  | |
| |  | | --- | | Agricultural Workers |  |  | | --- | |  | | Those assisting farmers in daily operations. | |  | | --- | | Increased productivity and efficient use of resources, enabling better crop management. |  |  | | --- | |  | | |  | | --- | | 2-5 million |  |  | | --- | |  | |
| Technicians | Individuals are responsible for maintaining the AGRO-X system. | |  | | --- | | Gain skills in IoT, robotics, and data analysis, contributing to local employment. |  |  | | --- | |  | | |  | | --- | | 5,000–10,000 |  |  | | --- | |  | |
| Local NGOs/Organizations | Groups collaborating with farmers for agricultural and environmental initiatives. | |  | | --- | | Increased collaboration opportunities for promoting sustainable agriculture and eco-friendly practices. |  |  | | --- | |  | | 300–500 |

**Methodology to be Adopted**

1. Wildlife Detection and Deterrence
2. Pest Control System
3. IoT-Based Soil Monitoring Robot
4. Cloud-Based Data Processing
5. User-Friendly Data Interface
6. Real-Time Weather Integration

### How to Maintain Future Sustainability of Installed Technology in the Village

1. **Local Ownership and Training**: Train farmers and local technicians to use and maintain the AGRO-X system, ensuring local ownership.
2. **Affordable Maintenance**: Ensure spare parts are available locally at affordable rates for easy maintenance.
3. **Solar Power Reliance**: The system runs on solar energy, minimizing operational costs and ensuring long-term sustainability in off-grid areas.
4. **Community Engagement**: Collaborate with local agricultural organizations to support ongoing education and technological adaptation.

### Process of Execution of the Project:

The execution of the project aimed at developing the AGRO-X system for farmers involves a systematic approach, encompassing various stages to ensure effective agricultural outcomes.

1. **Project Planning and Design**
2. **Component Development**
3. **Technical Integration**
4. **Field Testing and Calibration**
5. **Stakeholder Engagement and Training**
6. **Implementation and Deployment**
7. **Monitoring and Evaluation**
8. **Sustainability and Future Development**

### Impact on Farmers and Society

1. **Increased Agricultural Productivity**:  
   Enhanced crop yields through real-time data on soil and pest conditions.
2. **Efficient Resource Management**:  
   Optimized use of water and fertilizers, reducing waste and costs.
3. **Empowerment and Education**:  
   Farmers gain knowledge and skills, fostering innovation in practices.
4. **Reduced Human-Wildlife Conflicts**:  
   Non-lethal deterrents minimize conflicts with wild animals.
5. **Community Engagement**:  
   Encourages collaboration among farmers, NGOs, and local organizations.
6. **Economic Stability**:  
   Improved crop health leads to enhanced livelihoods and economic resilience.
7. **Environmental Benefits**:  
   Promotes sustainable practices that improve soil health and biodiversity.
8. **Long-Term Social Impact**:  
   Contributes to food security and well-being for future generations.

### Hardware and Software Used

* GPS mapping
* Cloud platform
* Data processing algorithms
* User interface
* IoT protocols
* Analytics tools
* Thermal sensors
* High-beam flickering floodlights
* Variable acoustic frequency generators
* Microcontrollers
* NPK soil quality sensor
* Autonomous robot with rocker bogie mechanism
* Charging stations
* Doppler motion sensors
* Solar panels

**Flow chart:**

