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# Database Management System (IT615)

## Noun Analysis and ERD for Sustainable Agriculture Resource Management

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## Final Problem description

- Farmers need increased awareness and training on sustainable practices and new agricultural technologies.
- Farmers seek better access to tools like weather forecasting, soil health monitoring, and disease management systems.
- Programs to encourage youth to continue farming and adopt sustainable methods.
- There is a need for improved water conservation techniques and irrigation systems.
- Education on crop rotation and diversified farming for better productivity and sustainability.
- Cost-effective technological solutions for small-scale farmers to integrate into their practices.
- Researchers stress the need for more clarity and education on sustainable farming, focusing on long-term resource conservation and ecosystem health.
- Both farmers and researchers agree on the need for new technologies like precision farming and smart irrigation systems to enhance sustainability and productivity.
- While crops can boost yields, careful management is required to avoid environmental risks.
- Improved techniques for soil and water conservation are needed for more efficient farming.

- Increased awareness and education on sustainable practices.
- Enhanced access to modern agricultural technologies.
- Support for technology adoption and addressing the high cost of technology:
- Training programs and support for young farmers:
- Encouragement of crop rotation and modern water management practices

While young farmers are knowledgeable about sustainable agriculture, they encounter significant barriers related to technology access, financial constraints, and a lack of training opportunities. To empower this demographic, it is essential to enhance access to affordable sustainable technologies, increase funding for training programs and low-interest loans, and foster mentorship connections with experienced farmers.

Queries could identify geographic areas with high young farmer populations but low access to funding and training programs. Relationships between young farmers and their mentors could be tracked to measure the impact of mentorship on adoption of sustainable practices. By using data to understand the barriers and target support, we can create more opportunities for young farmers to thrive in sustainable agriculture

- The shift away from traditional methods has led to unsustainable farming practices, impacting long-term productivity.
- Farmers lack tools to efficiently track and manage critical resources such as soil health, water usage, and weather patterns.
- While technology has increased yields, it has also intensified the challenge of balancing high productivity with sustainability.

- Farmers often do not have access to crucial real-time information, such as weather forecasts or crop growth metrics, which could help optimize their decisions.
- Many farmers have limited access to training and information about modern sustainable practices, resulting in a reliance on outdated methods.
- Unpredictable weather patterns, such as droughts or floods, severely disrupt farming cycles and strain water resources.
- Farmers face difficulties in adapting their practices without real time data or technologies to manage the effects
- The mismanagement of irrigation systems, compounded by water scarcity, leads to inefficient water use and stress on water resources, particularly in drought-prone areas.
- Traditional irrigation practices are often not optimized for modern water conservation needs.
- The lack of precision farming tools, such as sensors for soil monitoring or automated irrigation systems, makes it difficult for farmers to adopt efficient resource management strategies.
- Farmers relying on a single crop year after year are depleting the soil and reducing biodiversity, leading to long-term negative impacts on ecosystem health.
- Many farmers lack access to subsidies or financial aid for implementing sustainable practices, creating a barrier to adopting new technologies.
- The high upfront cost of tools such as soil sensors, automated irrigation, and precision farming equipment discourages many small-scale farmers.

- Farmers often lack access to research findings or innovative agricultural techniques developed by academic institutions and agricultural organizations.
- There is a slow uptake of research-based farming practices due to the difficulty of communicating these findings effectively to farmers.
- Farmers are not fully equipped with strategies to deal with climate-related challenges such as droughts, floods, and erratic rainfall patterns.
- Local farmers' networks could be stronger, allowing more peer-to-peer learning and dissemination of sustainable practices.
- Policy support for sustainable agriculture, such as incentives for organic farming or penalties for unsustainable practices, is often weak or insufficient.
- Farmers' reliance on chemical fertilizers and pesticides is leading to long-term soil degradation and water contamination.
- Unstable market prices prevent farmers from making long-term investments in sustainable practices.
- Farmers find it difficult to access premium markets for sustainably grown crops due to a lack of certification or infrastructure.
- Many farmers lack exposure to international examples of successful sustainable agriculture, making it hard for them to implement globally tested solutions.

## 1. Noun & Verb Analysis

Nouns	Verbs
Student	Needs
Farmer	Boost
Young Farmers	Provides
Researcher	Tracks
Educational resources	Monitors
Technology	Conserves
Crops	Stress
Crop diseases	Encourage
Weather Forecasting	Support
Soil	Adopt
Policy	Provide
Training programs	Encourages
Machinery	Affects
Fertilizer	Seeks
Crop rotation	Improve
Irrigation	Tracks
Water manages	Monitors
Disease Manages	Health
Subsidies	Optimizes
Sustainable Practices	Detects
Farming Tools	Study
Markets	Adopt
Climate	Provide
Financial	Encourage
Farmers	Detect
Awareness	Address
Training	Access
Technologies	Challenges
Tools	Supports
Weather	Adopts
Forecasting	Rotate

Ecosystem	Informs
Health	Depletes
Monitoring	Manages
Disease	Analysis
Management	Learn
Programs	Educate
Youth	Implement
Practices	Optimize
Water	Review
Conservation	Manage
Techniques	Assists
Irrigation	Grows
Education	Diversify
Crop	Enhances
Rotation	Affects
Sustainability	Improves
Solutions	Mismanages
Research	Monitor
Resource	Participate
Productivity	Enhance
Equipment	Certify
Sensors	Impacts
Data	Addresses
Challenges	Grow
Funding	Provides
Support	Face
Networks	Fund
Policies	Conserve
Chemicals	Track
Fertilizers	Disrupts
Pests	Conserves
Certification	Yield
Investment	Helps
Biodiversity	Implements

Information	Support
Patterns	Help
Aid	Educates
Drought	Impact
Flood	Reduce
	Degrades
	Seek
	Assist
	Affect
	Lacks
	Search
	Prepare
	Train
	Faces
	Deplete
	Accesses
	Recommend
	Analysis
	Relies
	Reviews
	Uses

## 2.1. Candidate Entity set and Candidate Attribute set

<b>Candidate Entity</b>	<b>Candidate Attributes</b>
Student	Student ID, Name, Major, Year of Study, Contact Info
Farmer	Farmer ID, Name, Farm Size, Crop Types, Contact Info
Researcher	Researcher ID, Name, Area of Research, Publications, Contact Info
Educational Resource	Resource ID, Title, Type (e.g., article, video), Subject, URL
Technology	Technology ID, Name, Type, Purpose, Manufacturer



Crop	Crop ID, Name, Type, Growth Period, Yield
Crop Disease	Disease ID, Name, Affected Crops, Symptoms, Treatment
Weather	Weather ID, Date, Temperature, Precipitation, Conditions
Soil	Soil ID, Type, Nutrient Content, pH Level, Moisture Level
Policy	Policy ID, Name, Type, Scope, Implementation Date
Fertilizer	Fertilizer ID, Name, Type, Nutrient Content, Application Method
Irrigation	Irrigation ID, Type, Coverage Area, Efficiency, Installation Date
Crop Rotation	Rotation ID, Crop Sequence, Duration, Benefits
Farming Tool	Tool ID, Name, Type, Usage, Manufacturer
Training Program	Program ID, Title, Duration, Target Audience, Content
Sustainable Practice	Practice ID, Name, Description, Benefits, Implementation Level
Investment	Investment ID, Amount, Purpose, Beneficiary, Date
Aid	Aid ID, Type, Amount, Beneficiary, Date
Drought	Drought ID, Region, Duration, Severity, Impact
Flood	Flood ID, Region, Duration, Severity, Impact

## 2.2. Candidate Relationship set

Relationship	Entities Involved	Description
Enrols	Student, Training Program	A student enrols in a training program.
Owns	Farmer, Crop	A farmer grows a specific crop.

Conducts	Researcher, Crop Disease	A researcher studies crop disease.
Uses	Farmer, Technology	A farmer utilizes technology for farming.
Affects	Weather, Crop	Weather conditions impact crop growth.
Composed Of	Crop Rotation, Crop	A crop rotation consists of multiple crops.
Implements	Farmer, Sustainable Practice	A farmer implements sustainable practices in farming.
Requires	Crop, Fertilizer	A specific crop requires certain fertilizers.
Affects	Crop Disease, Crop	A crop disease affects specific crops.
Involves	Policy, Irrigation	A policy may regulate irrigation practices.
Uses	Farmer, Farming Tool	A farmer uses various farming tools.
Provides	Investment, Farmer	An investment provides funds to a farmer.
Allocates	Aid, Farmer	Aid is allocated to farmers in need.
Occurs In	Drought, Region	A drought occurs in a specific region.
Occurs In	Flood, Region	A flood occurs in a specific region.
Monitors	Researcher, Weather	A researcher monitors weather patterns.

## Rejected Noun & Verbs list

Noun	Reason for Rejection
Young Farmers	Too specific; lacks broader context or categories.
Technology	Overly broad; needs specificity related to agriculture.
Machinery	Generic; needs context on types or relevance to farming.
Water manages	Vague; unclear what specific aspect of water management refers to.
Disease Manages	Lacks clarity; needs to specify what aspect of disease management is being discussed.
Subsidies	Broad term; needs context related to agriculture.
Sustainable Practices	Too vague; needs specifics on which practices are sustainable.
Markets	Generic; lacks context on which markets are relevant.
Climate	Too broad; lacks specific relevance to farming practices.
Financial	Generic; needs to specify what financial aspects are relevant.
Farmers	Overly broad; can refer to various types without specificity.
Awareness	Vague; lacks context on what awareness is being referenced.
Training Access	Needs specificity on what type of training is being accessed.
Technologies Challenges	Too vague; needs clarification on which challenges are relevant.
Tools Supports	Generic; lacks specificity on which tools or supports are being referenced.
Weather Adopts	Unclear; needs context on how weather is being adopted or its implications.
Forecasting Rotate	Lacks clarity; needs to specify what is being forecasted or rotated.

Ecosystem Informs	Vague; lacks specificity on how ecosystems inform farming.
Monitoring Manages	Unclear; needs context on what is being monitored and managed.
Disease Analysis	Needs specificity on which diseases or methods of analysis are being referenced.
Management Learn	Vague; lacks clarity on what is being learned in management.
Programs Educate	Generic; needs detail on which programs are being referred to.
Youth Implement	Lacks specificity on what youth are implementing.
Practices Optimize	Too vague; needs context on which practices are being optimized.
Water Review	Generic; lacks context on what is being reviewed regarding water.
Conservation Manage	Vague; unclear what aspect of conservation management is being referred to.
Techniques Assists	Needs specificity on which techniques are being referenced.
Irrigation Grows	Lacks clarity; needs context on how irrigation is growing or its implications.
Education Diversify	Vague; needs specifics on how education is diversifying.
Crop Enhances	Needs context on what crop is being enhanced or how.
Rotation Affects	Unclear; needs detail on what is being rotated and its effects.
Sustainability Improves	Vague; lacks specifics on what sustainability is improving.
Solutions Mismanages	Unclear; needs context on what solutions are mismanaged.
Research Monitor	Lacks specificity; needs context on what is being monitored in research.
Resource Participate	Vague; lacks clarity on what resources are participating in.

Productivity Enhance	Needs context on what productivity is being enhanced and how.
Equipment Certify	Unclear; needs detail on which equipment is being certified.
Sensors Impacts	Vague; lacks specifics on what sensors are being discussed.
Data Addresses	Needs context on what data is being addressed and how.
Challenges Grow	Generic; lacks specificity on which challenges are being referred to.
Provides	Too vague; lacks context on what is being provided.
Support Face	Unclear; needs context on what support is facing which challenges.
Networks Fund	Vague; lacks clarity on what networks and what they are funding.
Policies Conserve	Needs specificity on which policies are being referenced.
Chemicals Track	Unclear; needs detail on what chemicals are being tracked and why.
Fertilizers Disrupts	Vague; lacks clarity on how fertilizers disrupt practices.
Certification Yield	Needs context on what is being certified and how it relates to yield.
Implements	Too vague; lacks clarity on what is being implemented.
Information Support	Generic; lacks specifics on what information is being supported.
Patterns Help	Unclear; needs detail on which patterns are helping and how.
Educates	Vague; lacks specificity on who or what is being educated.
Drought	Needs context on its specific impact on farming practices.
Flood	Lacks specifics on how flooding affects agriculture.

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## CONCEPTUAL SCHEMA

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EducationalResource(ResourceID, Title, Type, Subject, URL)  
Technology(TechnologyID, Name, Type, Purpose, Manufacturer)  
Crop(CropID, Name, Type, GrowthPeriod, Yield)  
CropDisease(DiseaseID, Name, AffectedCrops, Symptoms, Treatment)  
Weather(WeatherID, Date, Temperature, Precipitation, Conditions)  
Soil(SoilID, Type, NutrientContent, pHLevel, MoistureLevel)  
Policy(PolicyID, Name, Type, Scope, ImplementationDate)  
Fertilizer(FertilizerID, Name, Type, NutrientContent, ApplicationMethod)  
Irrigation(IrrigationID, Type, CoverageArea, Efficiency, InstallationDate)  
CropRotation(RotationID, CropSequence, Duration, Benefits)  
FarmingTool(ToolID, Name, Type, Usage, Manufacturer)  
TrainingProgram(ProgramID, Title, Duration, TargetAudience, Content)  
SustainablePractice(PracticeID, Name, Description, Benefits, ImplementationLevel)  
Investment(InvestmentID, Amount, Purpose, Beneficiary, Date)  
Aid(AidID, Type, Amount, Beneficiary, Date)  
Drought(DroughtID, Region, Duration, Severity, Impact)  
Flood(FloodID, Region, Duration, Severity, Impact)

## ER DIAGRAM:



