Database Management System (IT615)

Noun Analysis and ERD

for

Sustainable Agriculture Resource Management

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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

Candidate Entity	Candidate Attributes
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.

3. 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.

4.1. Candidate Entity set and Candidate Attribute set

Candidate	Candidate

Entity	Attributes
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
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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

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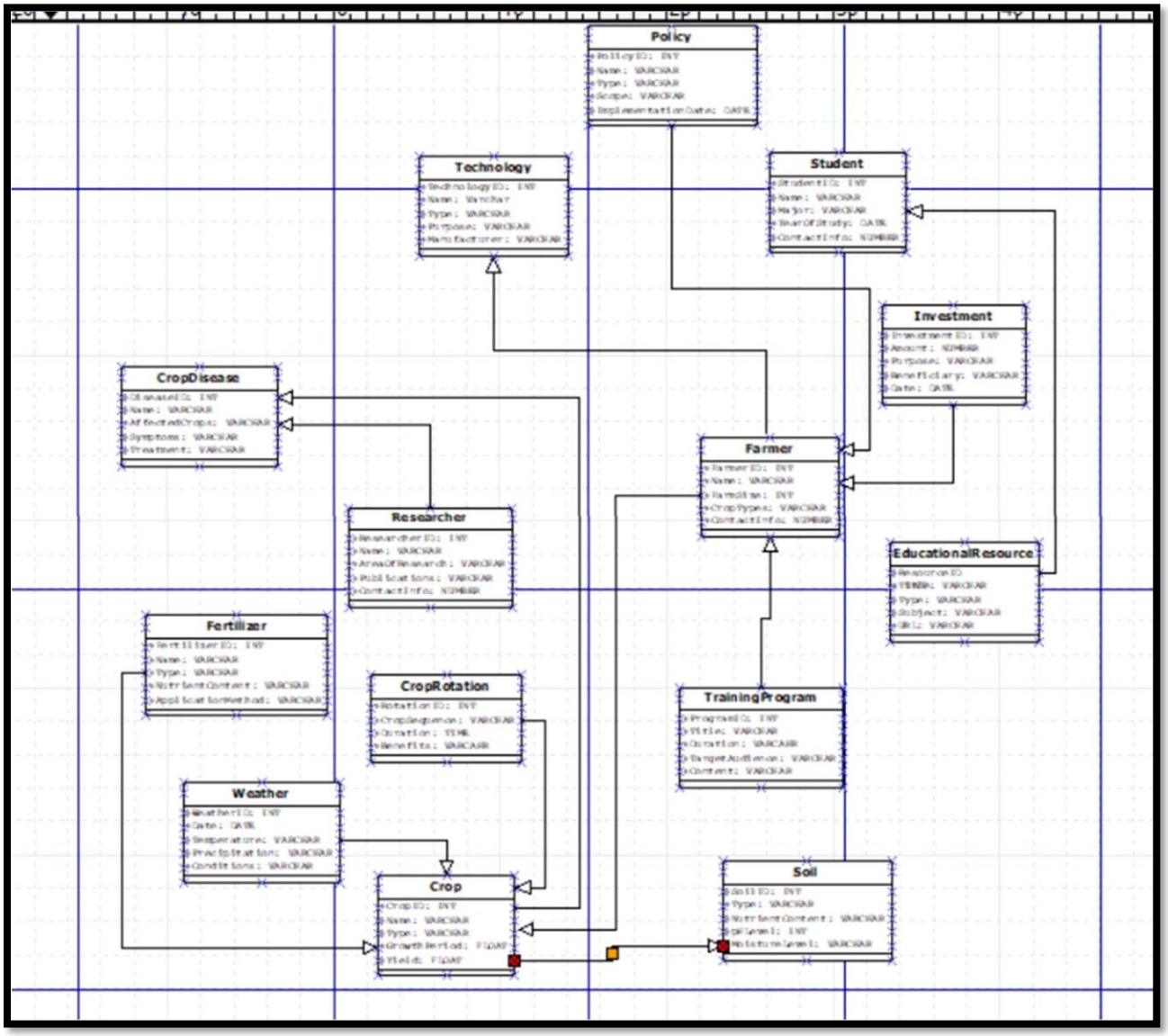
Allocates	Aid, Farmer	Aid is allocated to farmers in need.

Monitors	Researcher, Weather	A researcher monitors weather patterns.

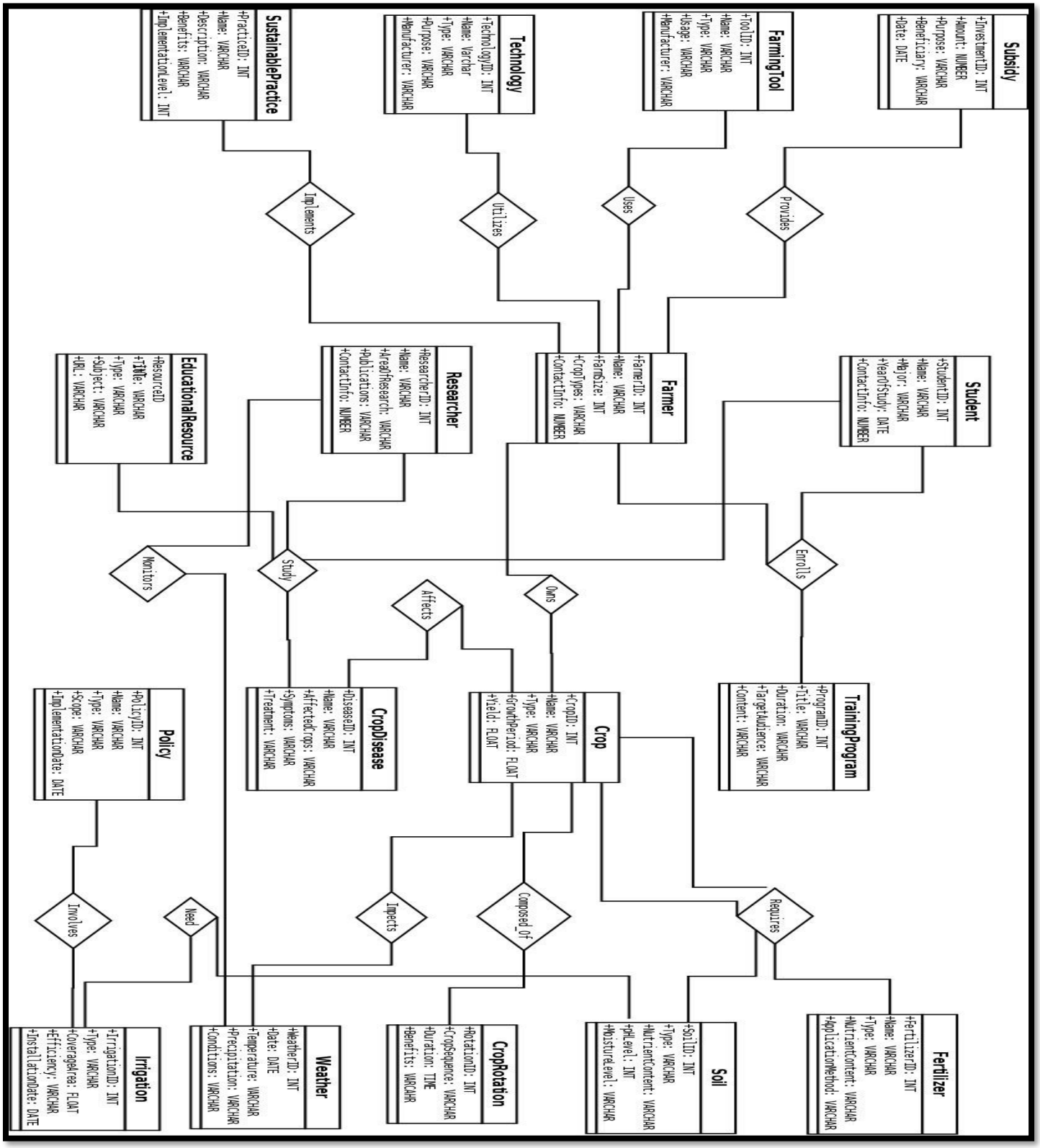
CONCEPTUAL SCHEMA

1. Student(StudentID, Name, Major, YearOfStudy, ContactInfo)
2. Farmer(FarmerID, Name, FarmSize, CropTypes, ContactInfo)
3. Researcher(ResearcherID, Name, AreaOfResearch, Publications,ContactInfo)
4. EducationalResource(ResourceID, Title, Type, Subject,URL)
5. Technology(TechnologyID, Name, Type, Purpose,Manufacturer)
6. Crop(CropID, Name, Type, GrowthPeriod, Yield)
7. CropDisease(Name, CropID, Symptoms, Treatment)
8. Weather(WeatherID, Date, Temperature,Precipitation, Conditions)
9. Soil(SoilID, Type, NutrientContent,pHLevel, MoistureLevel)
10. Policy(PolicyID, Name, Type, Scope,ImplementationDate)
11. Fertilizer(FertilizerID, Name, Type,NutrientContent, ApplicationMethod)
12. Irrigation(IrrigationID,Type, CoverageArea, Efficiency, InstallationDate)
13. CropRotation(RotationID, CropSequence, Duration, Benefits)
14. FarmingTool(ToolID, Name, Type, Usage, Manufacturer)
15. TrainingProgram(ProgramID, Title, Duration, TargetAudience,Content)
16. SustainablePractice(PracticeID, Name, Description,Benefits, ImplementationLevel)
17. Investment(InvestmentID, Amount, Purpose, Beneficiary, Date)
18. Aid(AidID, Type, Amount, Beneficiary, Date)

ER DIAGRAM (Version: 1):



ER DIAGRAM (Version: 2.1):



Identify Entity types

A. Weak entity set/s

- Aid
- Investment
- Crop Disease

B. Type of relationships using natural associations appearing in problem description (Hierarchy, Aggregation, Recursive, Simple Association Link)

1. Farmer – Crop (Many-to-Many)
- Relationship: Grow
- Type: Simple Association

2. Farmer – Technology (Many-to-Many)
- Relationship: Adopt
- Type: Simple Association

3. Farmer – FarmingTool (One-to-Many)
- Relationship: Uses
- Type: Simple Association

4. Farmer – Irrigation (One-to-Many)
- Relationship: Installs
- Type: Simple Association

5. Farmer – Soil (Many-to-Many)
- Relationship: Manages
- Type: Simple Association

6. Farmer – Fertilizer (Many-to-Many)

- Relationship: Applies
- Type: Simple Association

7. Farmer – TrainingProgram (Many-to-Many)
- Relationship: Attends
- Type: Simple Association

8. Researcher – Crop (Many-to-Many)
- Relationship: Studies
- Type: Simple Association

9. Researcher – Policy (Many-to-Many)
- Relationship: Influences
- Type: Simple Association

10. Farmer – CropDisease (Many-to-Many)
- Relationship: Manages
- Type: Simple Association

11. Crop – Fertilizer (Many-to-Many)
- Relationship: Needs
- Type: Simple Association

12. Crop – CropDisease (Many-to-Many)
- Relationship: Affects
- Type: Simple Association

13. Farmer – Aid (Many-to-Many)
- Relationship: Receives
- Type: Simple Association

14. Farmer – Investment (Many-to-Many)
- Relationship: Secures

- Type: Simple Association

15. Policy – Farmer (Many-to-Many)
- Relationship: Affects
- Type: Simple Association

16. Irrigation – Soil (Many-to-Many)
- Relationship: Waters
- Type: Aggregation

17. Crop – Soil (Many-to-Many)
- Relationship: GrowsIn
- Type: Aggregation

18. Weather – Crop (Many-to-Many)
- Relationship: Affects
- Type: Aggregation

19. Drought/Flood – Farmer (Many-to-Many)
- Relationship: Impacts
- Type: Aggregation

20. Researcher – SustainablePractice (Many-to-Many)
- Relationship: Researches
- Type: Aggregation

21. Farmer – SustainablePractice (Many-to-Many)
- Relationship: Implements
- Type: Aggregation

Identify Relationship types

A.1. Entity vs. Attribute vs. Relationships

- CropTypes: If a farmer can cultivate multiple types of crops, this attribute should be a multivalued attribute. Instead of having a single field, we want to create a separate table or an associative entity to manage this relationship.
- Create a new entity to represent this relationship:
  FarmerCrop(FarmerID, CropID)

- **Therefore New Schema can be**
- Farmer(FarmerID, Name, FarmSize, ContactInfo)
- Crop(CropID, Name, Type, GrowthPeriod, Yield)
- FarmerCrop(FarmerID, CropID)

A.2. Binary vs. Ternary Relationships

1. Farmer and Crop
- Type: Binary
- Description: A farmer can grow multiple crops, and a crop can be grown by multiple farmers.

2. Farmer and FarmingTool
- Type: Binary
- Description: A farmer uses various farming tools, and a tool can be used by multiple farmers.

3. Researcher and EducationalResource
- Type: Binary
- Description: Researchers may create multiple educational resources, and each resource may have multiple researchers.

4. Crop and CropDisease

- Type: Binary
- Description: A crop can be affected by multiple diseases, and a disease can affect multiple crops.

5. Policy and TrainingProgram
- Type: Binary
- Description: Policies may be linked to multiple training programs aimed at implementing them.

6. Weather and Soil
- Type: Binary
- Description: Different weather conditions affect soil types, but this might not need a direct relationship in the schema unless you want to analyze effects on crop growth.

7. Irrigation and Crop
- Type: Binary
- Description: Different irrigation systems may be used for different crops.

8. Investment and Farmer/Researcher
- Type: Binary
- Description: Investments can be made towards specific farmers or researchers.

9. SustainablePractice and Farmer
   Type: Binary
- Description: Farmers may adopt multiple sustainable practices, while a practice can be adopted by multiple farmers.

10. Drought and Crop
- Type: Binary
- Description: Drought affects multiple crops, and crops can be impacted by different drought events.

11. Flood and Crop

- Type: Binary
- Description: Flood impacts various crops, and crops can be affected by multiple flood events.

12. Crop, Fertilizer, and Irrigation

- Type: Ternary
- Description: A specific fertilizer is applied to a specific crop using a specific irrigation method.

A.3. Aggregation vs. Ternary Relationship

- TrainingProgram for Farmers using Technology:
- Assume there's a training program that trains Farmers on using specific Technology. We model this using a ternary relationship between TrainingProgram, Farmer, and Technology.

B. total participation

Entity	Related Entity	Relationship	Total Participation
Researcher	EducationalResource	Studies	Yes
Crop	CropDisease	Affected	Yes
Crop	CropRotation	Affected	Yes
Crop	Soil	Grown In	Yes
Farmer	Crop	Grow	Yes
Farmer	Soil	Manages	Yes

ER DIAGRAM (Version: 2.2):