

SmartAgro Database Documentation

Supporting SDG 2: Zero Hunger

Version 1.0

1. Introduction

The SmartAgro database supports **Sustainable Development Goal 2 (Zero Hunger)** by optimizing agricultural data management to improve food production and distribution. This system enhances smallholder farm productivity, reduces food waste, and strengthens supply chains - all critical components in achieving global food security.

2. Alignment with Zero Hunger Targets

2.1 SDG 2 Relevance

Our solution directly contributes to:

- **Target 2.3:** Doubling agricultural productivity and incomes of small-scale food producers
- **Target 2.4:** Implementing resilient agricultural practices
- **Target 2.C:** Ensuring stable food commodity markets

2.2 Impact Measurement

Key performance indicators aligned with SDG 2:

- % Increase in crop yields per hectare
- Reduction in post-harvest losses
- Improvement in smallholder farmer incomes
- Increase in market access for rural producers

2. Requirements Gathering & Analysis

2.1 Information Collection Methodology

To ensure comprehensive requirements gathering, we employed multiple techniques:

- **Stakeholder Interviews:** Conducted with farmers, agricultural officers, and supply chain managers
- **Field Observations:** Visited farms and markets to understand operational workflows

- **Document Analysis:** Reviewed existing record-keeping systems in use
- **Questionnaires:** Distributed to potential end-users across different regions

2.2 Functional Requirements

Based on our elicitation process, we identified these core requirements:

1. Farmer Management

- Register and maintain farmer profiles
- Track farm locations and sizes
- Record farmer contacts information

2. Crop Management

- Maintain crop catalog with growth characteristics
- Record ideal growing conditions
- Track planting and harvest cycles

3. Market Intelligence

- Capture daily price fluctuations
- Analyze regional price variations
- Generate historical price trends

4. Weather Correlation

- Record meteorological data
- Associate weather patterns with farm locations
- Analyze weather impact on yields

5. Supply Chain Tracking

- Document buyer-seller transactions
- Track quantities and prices
- Generate sales reports

2.3 Development Assumptions

During solution development, we made these key assumptions:

1. Data Availability

- Farmers will maintain accurate records of their operations
- Market price data will be regularly updated
- Weather stations will provide reliable data feeds

2. User Behavior

- End-users will have basic digital literacy
- Field officers will verify farmer-submitted data
- System administrators will maintain data quality

3. Technical Environment

- Stable internet connectivity will be available
- Users will access via standard web browsers
- Mobile access will be primarily for data viewing

4. Operational Factors

- Farmers will grow crops listed in the system
- Measurements will follow standard units (hectares, kg)
- Seasonal variations will be accounted for in analysis

3. Database Schema Overview

The database consists of six core tables that work together to provide comprehensive agricultural management:

1. **Farmers** - Stores details about registered farmers
2. **Crops** - Contains information about different crop types
3. **Farms** - Links farmers to the crops they cultivate
4. **Market_Prices** - Tracks historical pricing data
5. **Weather_Data** - Records environmental conditions
6. **Supply_Chain_Distribution** - Manages sales transactions

4. Data Relationships & Multiplicity

(Supporting SDG Target 2.3: Agricultural Systems Resilience)

4.1 Core Relationships for Food Security

1. Farmers and Farms (1:N)

- **SDG Relevance:** Enables tracking of smallholder productivity (Target 2.3)
- **Cardinality:**
 - One farmer → Many farms
 - Each farm → Exactly one farmer
- **Impact:** Allows analysis of farm diversification and land use efficiency

2. Crops and Farms (1:N)

- **SDG Relevance:** Supports crop rotation planning (Target 2.4)
- **Cardinality:**
 - One crop type → Many farms
 - Each farm → Exactly one primary crop
- **Extension:** Future enhancement will add intercropping support (M:N)

3. Crops and Market Prices (1:N)

- **SDG Relevance:** Stabilizes food commodity markets (Target 2.C)
- **Cardinality:**
 - One crop → Many price records
 - Each price record → One crop
- **Data Capture:** Prices recorded per location/date to identify food price volatility

4. Weather Data and Location (1:N)

- **SDG Relevance:** Climate-resilient agriculture (Target 2.4)
- **Cardinality:**
 - One location → Many weather records
 - Each record → One location
- **SDG Metric:** Enables climate impact analysis on crop yields

5. Farmers and Supply Chain (1:N)

- **SDG Relevance:** Improves smallholder market access (Target 2.3)
- **Cardinality:**
 - One farmer → Many transactions
 - Each transaction → One farmer
- **Impact Measurement:** Tracks income improvements for poverty reduction

6. Crops and Supply Chain (1:N)

- **SDG Relevance:** Reduces food losses (Target 2.1)
- **Cardinality:**
 - One crop → Many transactions
 - Each transaction → One crop
- **Analysis:** Identifies crop-specific post-harvest losses

5. Impact Pathways

5.1 Productivity Enhancement

- Yield prediction algorithms help farmers maximize output
- Crop rotation planning prevents soil depletion
- Weather alerts enable climate adaptation

5.2 Waste Reduction

- Harvest tracking minimizes field losses
- Storage condition monitoring preserves quality
- Demand forecasting improves distribution

5.3 Market Stability

- Price transparency reduces exploitation
 - Buyer networks expand market access
 - Inventory management prevents shortages
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6. Monitoring & Evaluation Framework

6.1 SDG Alignment Metrics

Indicator	Measurement Method	Target
Farmer productivity	Yield per hectare	+40%
Post-harvest losses	Weight comparisons	-30%
Market participation	# of smallholders in system	75% coverage

6.2 Reporting Features

- Automated SDG progress dashboards
- Regional hunger gap analysis
- Intervention effectiveness tracking

7. Conclusion

The SmartAgro database represents a targeted technological intervention to combat hunger through data-driven agriculture. By aligning our system architecture with SDG 2 targets and measuring food security outcomes, we ensure our solution delivers tangible impact toward ending hunger and achieving sustainable agriculture.