Business Requirements Document (BRD)

Real-World AR ChatGPT for Farmers

Document Control

- **Version:** 1.0
- **Status:** Draft
- **Created:** 2025
- **Project:** NASA Space Apps Challenge - Farm Navigator
- **Document Owner:** Business Analysis Team

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1. Executive Summary

1.1 Business Opportunity

The global agricultural sector faces critical challenges in optimizing crop yields while managing resources sustainably. Small to medium-scale farmers often lack access to real-time, location-specific agricultural data and expert guidance, leading to suboptimal farming decisions, resource waste, and reduced yields.

This project addresses these challenges by leveraging NASA's satellite data and AI technology to provide farmers with an accessible, intelligent farming assistant through WebAR technology.

1.2 Business Objectives

- Win the NASA Space Apps Challenge 2025 Farm Navigator competition
- Demonstrate innovative use of NASA satellite data for practical agricultural applications
- Create a scalable prototype for real-world deployment
- Bridge the technology gap for farmers in developing regions
- Reduce agricultural water usage by 20% through optimized irrigation timing
- Improve crop yield predictions by 15% through data-driven recommendations

1.3 Success Criteria

- Successfully demonstrate the solution at NASA Space Apps Challenge
- Achieve 90% user satisfaction in pilot testing
- Process location-based queries in under 3 seconds

- Provide accurate agricultural recommendations 85% of the time
- Complete MVP within 12-week timeline and budget

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2. Business Context

2.1 Current State Analysis

2.1.1 Problem Statement

Farmers currently rely on:

- Traditional knowledge passed through generations
- Generic agricultural guidelines not specific to their land
- Delayed or missing weather information
- Expensive agricultural consultants
- Trial and error methods leading to crop failures

2.1.2 Market Analysis

- **Global Smart Farming Market Size:** $15.3 billion (2023)
- **Expected Growth Rate:** 9.8% CAGR through 2030
- **Target User Base:** 500+ million smallholder farmers globally
- **Smartphone Penetration in Rural Areas:** 60% and growing

2.1.3 Competitive Landscape

Competitor	Strengths	Weaknesses	Our Advantage
FarmLogs	Comprehensive tracking	Desktop-focused, expensive	Mobile-first, AR-enabled
Plantix	Disease detection	Limited to visual diagnosis	Satellite data integration
Climate FieldView	Data analytics	Requires hardware sensors	No hardware needed
Cropin	End-to-end solution	Complex, enterprise-focused	Simple, farmer-friendly

2.2 Future State Vision

Transform farming practices by providing every farmer with:

- Real-time, location-specific agricultural insights
- AI-powered expert guidance available 24/7
- Gamified engagement to encourage best practices

- Data-driven decision support reducing risk and waste

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3. Stakeholder Analysis

3.1 Stakeholder Matrix

Stakeholder	Interest	Influence	Engagement Strategy
NASA Challenge Judges	High	High	Regular demos, clear documentation
Farmers (End Users)	High	Medium	User testing, feedback sessions
Development Team	High	High	Daily standups, clear requirements
Agricultural Advisors	Medium	Medium	Consultation, validation
Government Agencies	Medium	Low	Compliance documentation
Investors/Sponsors	High	Medium	Progress reports, ROI metrics

3.2 User Personas

Persona 1: Small-Scale Farmer

- **Name:** Maria Rodriguez
- **Age:** 45
- **Location:** Rural area with limited internet
- **Tech Savvy:** Low to medium
- **Needs:** Simple, visual guidance for crop management
- **Pain Points:** Limited access to agricultural expertise, unpredictable weather
- **Goals:** Increase yield, reduce water usage, prevent crop failure

Persona 2: Progressive Farmer

- **Name:** John Chen
- **Age:** 32
- **Location:** Semi-urban farming region
- **Tech Savvy:** Medium to high
- **Needs:** Data-driven insights for optimization
- **Pain Points:** Information overload, lack of location-specific data
- **Goals:** Maximize efficiency, adopt sustainable practices

Persona 3: Agricultural Extension Officer

- **Name:** Dr. Sarah Johnson
- **Age:** 38
- **Location:** Regional agricultural office
- **Tech Savvy:** High
- **Needs:** Tools to assist multiple farmers efficiently
- **Pain Points:** Limited time for farm visits, generic advice
- **Goals:** Provide personalized guidance at scale

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4. Business Requirements

4.1 Strategic Alignment

Business Goal	Requirement	Success Metric
Win NASA Challenge	Innovative use of NASA data	Judge scores >85/100
User Adoption	Intuitive interface	<5 minute learning curve
Scalability	Cloud-based architecture	Support 1000+ concurrent users
Sustainability	Low operational costs	<$0.10 per user per month
Impact Measurement	Analytics dashboard	Track key agricultural metrics

4.2 Functional Business Requirements

4.2.1 Information Requirements

ID	Requirement	Business Value	Priority
BR-INFO-001	Provide real-time soil moisture data	Optimize irrigation timing	Critical
BR-INFO-002	Display temperature trends	Prevent heat stress	High
BR-INFO-003	Show vegetation health (NDVI)	Early problem detection	High
BR-INFO-004	Precipitation forecasts	Water management	Medium
BR-INFO-005	Historical data comparison	Trend analysis	Low

4.2.2 Process Requirements

ID	Requirement	Business Value	Priority
BR-PROC-001	Automated data collection from NASA	Reduce manual work	Critical
BR-PROC-002	Instant AR ground detection	Quick field assessment	High
BR-PROC-003	Natural language query processing	Ease of use	High
BR-PROC-004	Proactive alert generation	Prevent crop loss	Medium
BR-PROC-005	Gamified progress tracking	User engagement	Medium

4.2.3 Service Requirements

ID	Requirement	Business Value	Priority
BR-SERV-001	24/7 availability	Always accessible	Critical
BR-SERV-002	Multi-language support	Global reach	Medium
BR-SERV-003	Offline mode capability	Rural accessibility	High
BR-SERV-004	Voice interaction	Hands-free operation	Medium
BR-SERV-005	Expert knowledge base	Trusted guidance	High

4.3 Non-Functional Business Requirements

Category	Requirement	Target	Justification
Accessibility	Works on basic smartphones	Android 8+, iOS 12+	Market penetration
Performance	Fast response time	<3 seconds	User satisfaction
Reliability	System availability	99.5% uptime	Trust building
Usability	Minimal training needed	<10 minutes	Adoption rate
Scalability	Geographic expansion	Global capability	Growth potential

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5. Business Value Proposition

5.1 Value Drivers

5.1.1 Quantifiable Benefits

- **Water Savings:** 20-30% reduction through optimized irrigation
- **Yield Improvement:** 10-15% increase through better timing
- **Cost Reduction:** $200-500 per hectare annually
- **Time Savings:** 2-3 hours per week on decision-making
- **Risk Mitigation:** 25% reduction in crop failure rate

5.1.2 Qualitative Benefits

- Enhanced decision confidence
- Reduced stress and uncertainty
- Knowledge transfer and education
- Environmental sustainability
- Community building through shared insights

5.2 Return on Investment (ROI)

Metric	Year 1	Year 2	Year 3
Development Cost	$150,000	-	-
Operational Cost	$20,000	$30,000	$40,000
Users	1,000	10,000	50,000
Revenue (Grants/Subscriptions)	$50,000	$200,000	$500,000
Net Value	-$120,000	$170,000	$460,000
Cumulative ROI	-80%	33%	153%

5.3 Cost-Benefit Analysis

Cost Category	Amount	Benefit Category	Value
Development	$150,000	Water savings (1000 users)	$200,000/year
Infrastructure	$30,000/year	Yield improvement value	$500,000/year
Maintenance	$20,000/year	Time savings value	$150,000/year
API costs	$10,000/year	Risk reduction value	$300,000/year
Total Costs	**$210,000**	**Total Benefits**	**$1,150,000/year**

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6. Business Process Impact

6.1 Current Process Flow

1. Farmer observes field conditions
2. Consults neighbors or extension officer
3. Makes decision based on limited information
4. Implements action (planting, watering, etc.)
5. Waits to see results

6. Adjusts based on outcomes

6.2 Future Process Flow

1. Farmer opens AR app and scans field
2. Receives instant data-driven insights
3. Asks specific questions via chat/voice
4. Gets personalized recommendations
5. Implements optimized actions
6. Monitors progress with companion avatar
7. Receives proactive alerts for intervention

6.3 Process Improvements

Current Challenge	Solution Impact	Efficiency Gain
Delayed information	Real-time data	48-72 hours saved
Generic advice	Location-specific guidance	30% better accuracy
Reactive approach	Proactive alerts	25% risk reduction
Knowledge gaps	AI-powered expertise	24/7 availability
Isolation	Community features	Shared learning

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7. Risk Analysis

7.1 Business Risks

Risk	Probability	Impact	Mitigation Strategy
Low user adoption	Medium	High	Extensive user testing, simple interface
NASA API limitations	High	Medium	Aggressive caching, fallback data sources
Competition from existing solutions	Medium	Medium	Unique AR/gamification features
Connectivity issues in rural areas	High	High	Offline mode, progressive web app
Inaccurate recommendations	Low	High	Expert validation, conservative advice
Funding shortfall	Medium	High	Multiple funding sources, lean operation

7.2 Technical Risks

Risk	Probability	Impact	Mitigation Strategy
WebAR compatibility	Medium	High	Fallback to standard camera mode

Risk	Probability	Impact	Mitigation Strategy
Data accuracy	Low	High	Multiple data sources, validation
Scalability issues	Medium	Medium	Cloud architecture, load testing
Security breaches	Low	High	Standard security practices, encryption

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8. Implementation Roadmap

8.1 Phase 1: MVP Development (Weeks 1-12)

- **Objective:** NASA Challenge submission
- **Deliverables:** Working prototype with core features
- **Success Criteria:** Successful demo at competition

8.2 Phase 2: Pilot Testing (Months 4-6)

- **Objective:** Real-world validation
- **Deliverables:** Refined application, user feedback report
- **Success Criteria:** 85% user satisfaction

8.3 Phase 3: Scale Preparation (Months 7-12)

- **Objective:** Production readiness
- **Deliverables:** Scalable infrastructure, business model
- **Success Criteria:** 1000+ active users

8.4 Phase 4: Market Launch (Year 2)

- **Objective:** Commercial deployment
- **Deliverables:** Full product, support system
- **Success Criteria:** Sustainable operations

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9. Success Metrics

9.1 Key Performance Indicators (KPIs)

Category	Metric	Target	Measurement Method
Adoption	Monthly Active Users	1000 (Year 1)	Analytics platform
Engagement	Daily Active Users	60% of MAU	Usage logs

Category	Metric	Target	Measurement Method
Performance	Response Time	<3 seconds	Performance monitoring
Accuracy	Recommendation Success	85%	User feedback
Impact	Water Saved	20% reduction	User reports
Satisfaction	Net Promoter Score	>50	Surveys

9.2 Business Outcomes

Outcome	Measurement	Timeline
NASA Challenge Win	Competition results	Month 3
User Testimonials	10+ positive stories	Month 6
Partnership Agreements	2+ organizations	Year 1
Grant Funding	$100,000+ secured	Year 1
Media Coverage	5+ articles	Year 1

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10. Change Management

10.1 Stakeholder Communication Plan

Stakeholder	Method	Frequency	Content
Development Team	Slack, Meetings	Daily	Progress, blockers
NASA Judges	Documentation	As required	Technical specs
Pilot Users	App notifications	Weekly	Updates, tips
Sponsors	Email reports	Monthly	KPIs, milestones
Media	Press releases	Quarterly	Success stories

10.2 Training Requirements

User Group	Training Type	Duration	Materials
Farmers	In-app tutorial	5 minutes	Visual guides
Extension Officers	Webinar	1 hour	Presentation, manual
Support Staff	Documentation	2 hours	Knowledge base

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11. Compliance and Governance

11.1 Regulatory Requirements

- Data privacy compliance (GDPR, CCPA)
- Agricultural advisory regulations
- Accessibility standards (WCAG 2.1)
- API usage terms compliance

11.2 Quality Assurance

- Code review process
- User acceptance testing
- Performance benchmarking
- Security auditing

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12. Budget Summary

12.1 Development Budget

Category	Amount	Percentage
Personnel	$100,000	67%
Infrastructure	$20,000	13%
APIs & Services	$10,000	7%
Testing & QA	$10,000	7%
Marketing	$5,000	3%
Contingency	$5,000	3%
Total	**$150,000**	**100%**

12.2 Operational Budget (Annual)

Category	Amount	Notes
Hosting	$12,000	Cloud services
API Costs	$10,000	NASA, weather, LLM
Maintenance	$20,000	Updates, support
Marketing	$8,000	User acquisition
Total	**$50,000**	Per year

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13. Conclusion

The Real-World AR ChatGPT for Farmers represents a significant opportunity to:

- Demonstrate innovative use of NASA data
- Address real agricultural challenges
- Create sustainable business value
- Build a scalable solution for global impact

The combination of cutting-edge AR technology, AI-powered insights, and gamification creates a unique value proposition that differentiates this solution from existing alternatives.

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14. Appendices

Appendix A: Market Research Data

Detailed market analysis and user research findings

Appendix B: Financial Projections

5-year financial model with assumptions

Appendix C: Technical Architecture

High-level system design and technology stack

Appendix D: Risk Register

Comprehensive risk assessment and mitigation plans

Appendix E: Stakeholder Interviews

Summary of stakeholder consultation findings

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15. Approval

Role	Name	Signature	Date
Business Owner			
Project Sponsor			
Technical Lead			

Role	Name	Signature	Date
Financial Approver			