

Project Management Proposal
for
Sustainable Intensified Agriculture
At Al Dahra's Toshka Land, Egypt

Submitted to
Al Dahra Agriculture

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ROTHAMSTED
RESEARCH

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DRAFT PROPOSAL

Executive Summary

Purpose

This proposal aims to present to Al Dahra Agriculture a comprehensive management solution to leverage the Toshka land in Egypt, within the scope of the food security program of the UAE, through sustainable intensified production of crops, mainly wheat.

Visit to Toshka

During the visit of the ACTENNOVEO/Rothamsted team to Cairo in June 2013, Al Dahra showed interest in a 10T/Ha wheat as a target crop for the Toshka land (129,000 acres). Following a field visit to the land, the team identified its key success factors, namely the abundance of water and power, its proximity to the UAE, and strong relations between the UAE and Egypt.

Food security

Through firsthand assessment and analysis, it was found that the land would add around 67% to arable areas in the UAE; its full utilization for wheat production would cover around 35% of the UAE's consumption of wheat in 2013 and up to 70% in 2020. Such yields would become of strategic importance to the UAE for its food security program.

Proposal

ACTENNOVEO/Rothamsted proposes to project manage the land in three phases: design, execution, and production and intensification. Such a program will have two components: agriculture and urban.

Agriculture component

The objective of the agriculture component would be to deliver in the short term acceptable yields of wheat (10 tons per hectare) through existing technology and careful management, while moving towards much higher yields as part of Rothamsted's 20:20 wheat program through the incorporation of new varieties with enhanced tolerance to abiotic stresses and through an active program of soil enrichment based upon decades of experience on the remediation of soil lacking either nutrients or sufficient organic matter. The required water management and irrigation system will be designed and executed within the scope of this component. Moreover, a capacity building program will be designed and delivered to empower the management, staff, and labor force at Toshka, to work in the most efficient manner in such a highly scientific and advanced environment. This would ensure an optimum level of workforce capable to provide the required farm management performance at the most economical levels. The cornerstone of the agriculture component is a research center that will provide the knowledge base, technology and genetics needed to make this site not only a successful farming operation, but also showcase for international agriculture which demonstrates the potential of combining good agricultural practice with proven state-

of-the-art agricultural sciences. The base of this research center would be located at Rothamsted Research in Harpenden, UK.

Urban component

The objective of the urban component would be to provide the infrastructure, buildings, storage, and security elements required for the efficient implementation of the agricultural program in a timely and cost-effective manner.

Work schedule, cash flow and expected returns

A seven-stage work schedule, from design to execution up to handing over, is expected to span over 4-5 years. However, a financial scenario of a span of 8 years is presented to downsize the negative cash flow to \$53 Million required to execute the total works estimated at \$330,000,000 and an approximate figure of \$40,000,000 required for urban design and supervision and project management over 8 years (\$28,000,000 project management and \$12,000,000 for urban design and supervision). Moreover, the income secured through the sales of wheat, starting year-3 at the assumed rate of \$300/MT, is expected to generate the funds required to bring the program to completion in addition to profitable margins as indicated in Appendix xxxx: Estimates of Firsthand Financial Model.

The way forward

Goals and prospects for the Toshka land serve the food security of the UAE and promise profitability and are all dependent on decisive and proper project and farm system high-tech management. It is ACTENNOVEO/Rothamsted's role to implement and develop such techniques and systems to be deployed through highly advanced LMS and custom-designed software to ensure the setup of a highly efficient agricultural ecosystem. It is imperative that the workforce as well as the management team become highly acquainted with such advanced LMS applications to ensure continuous and intensive production. This highlights the importance of the ongoing research center as well as the experimental farm that will continue hand in hand with the Toshka management in the future, thus reducing risks and ensuring sustainability and profitability.

Introduction and Purpose Statement

Background

Rothamsted Research is the oldest agricultural research station in the world, and is a world-class center of arable crop research. Our cutting edge research has produced many firsts in the areas of fertilizers, insecticides, herbicides and crop improvement. Rothamsted has been in business for 170 years and was started in 1843 by Sir John Bennet Lawes, a local landowner and entrepreneur, who together with Sir Henry Gilbert developed the first inorganic fertilizer. This created the first truly commercial fertilizer business in the world and resulted in Lawes building a substantial fortune. Much of his profits were placed in a Trust, the Lawes Agricultural Trust, which still exists today and helps to fund the research of Rothamsted.

As an institution our primary focus is one high quality fundamental and translational agricultural science with the strategic objective of addressing the world's main challenges in agriculture and food production. To this end, Rothamsted conducts research on an International basis with collaborators in Asia, the Americas, Africa, Australia and throughout Europe. We also provide advanced training and education to tomorrow's agricultural specialists and researchers.

Strategic Alliance

We form strategic alliances only when we are sure that we can perform within the alliance to our highest possible standards and derive significant value from it for the Alliance and for Rothamsted itself. All strategic alliances must therefore be approved by our Board of Directors. In order for us to create a strategic alliance, the Board must be convinced that our participation will be consistent with our mission to "perform world-class research to deliver knowledge, innovation and new practices to increase crop productivity and quality and to develop environmentally sustainable solutions for agriculture". It must also fit within the institute strategy.

Purpose Statement

ACTENNOVEO has a strong reputation in engineering including agricultural engineering and irrigation technology. Rothamsted has a worldwide reputation in agricultural research and translation particularly on arable crops. Its expertise includes agronomy, genetics, soil science, biotechnology, and plant nutrition and crop protection. Rothamsted would therefore propose to take responsibility for managing the agriculture component of the Al Dahra site in Toshka, Egypt (approx. 129,000 acres). This would involve overall strategic planning of the deployment of the site for sustainable intensified agricultural production. Specifically, this would mean setting targets for each of the crops to be deployed in rotation, with careful consideration of the hydrological needs of the crops, the nutrient sources used, soil quality and fertility, crop protection and planned rotation of both crop and chemistries as needed. Because the site will be irrigated, particular attention has to be paid to evaporation and deposition

of salt in the soil. This will require very careful management in order to ensure longer term sustainability. In order to achieve its potential, this site will require the deployment of novel germplasm and varieties to achieve an optimum between productivity and sustainability.

ACTENNOVEO/Rothamsted will achieve this through the execution of a strategic plan that takes into account the long-term needs of this site. The objective would be to deliver in the short term acceptable yields of a cereal such as wheat (10 tons per hectare) through existing technology and careful management, while moving towards much higher yields as part of our 20:20 wheat program through the incorporation of new varieties with enhanced tolerance to abiotic stresses and through an active program of soil enrichment based upon decades of experience on the remediation of soil lacking either nutrients or sufficient organic matter.

Execution Concept

The execution of this strategic plan will require ACTENNOVEO/Rothamsted to project manage the entire program. This will involve hiring key expertise either on a shorter-term consulting basis or as longer-term land managers. Rothamsted has very good connections with companies in both disciplines, who can be relied upon to deliver in these crucial areas. Rothamsted's depth of expertise in all of the key areas will provide support in crop sciences, agronomy, genetics, soil science and plant protection and will provide through a single point of contact a management team that can deploy the correct resources to the project. This will require a significant commitment from Rothamsted, and cannot be achieved without a long-term view.

Research

This inevitably means that the project must invest in underpinning research that will provide the knowledge base, technology and genetics needed to make this site not only a successful farming operation, but also showcase for international agriculture which demonstrates the potential of combining good agricultural practice with cutting-edge agricultural sciences. Thus, Al Dahra will have not only a team committed to the development and good management of the Toshka site, but will also have its own team of researchers focused on genetic traits needed to improve yields under local conditions and on science in support of sustainability, soil quality and water management.

Management

In this partnership, Rothamsted will create at its main Headquarters (Harpenden, near London) an Al-Dahra program, which will consist of a management team fully cognisant of the special needs of the Toshka site. This team will comprise experienced agronomists and soil scientists, who understand the importance of devising agronomic systems with "sustainable intensification". They will also design many of the operations to act as an ongoing source of data so that productivity can be enhanced through an iterative process of using key indicators to improve subsequent performance. This will provide a data resource that would then be applicable to additional sites in Egypt or

other areas where irrigated/partially irrigated agriculture will be required. The management team will be responsible for the ongoing planning and project management of the agricultural aspects of the site, while ensuring that the best expertise is exploited. However, equally important, this group will manage the supporting research efforts to ensure optimal progress in areas that will most benefit the sustainable intensification of the Toshka site. Scientists engaged on these supporting programs will pay regular visits to the site and set up field experiments as part of the translational program. This will also ensure that the scientists involved remain focused on the special needs of this site for both its productivity and profitability, but also as a showcase for technological interventions which will dramatically enhance the site's potential.

This team will be situated in a new facility about to be constructed at Rothamsted, which is designed to provide support to our industrial liaison and translational agricultural programs. This would give the program a very high profile not just in the agricultural and scientific community, but also with the UK Government, who are keen to see British agricultural expertise deployed internationally, particularly with the UAE.

Phases

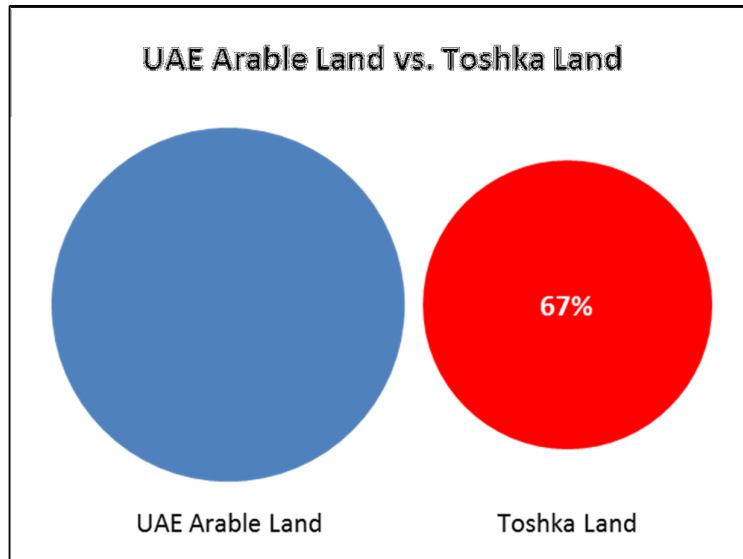
In this respect, our management services shall engulf the three phases required for the full development of this Toshka Land Project.

1. Design Phase
2. Execution Phase
3. Production and Intensification Phase

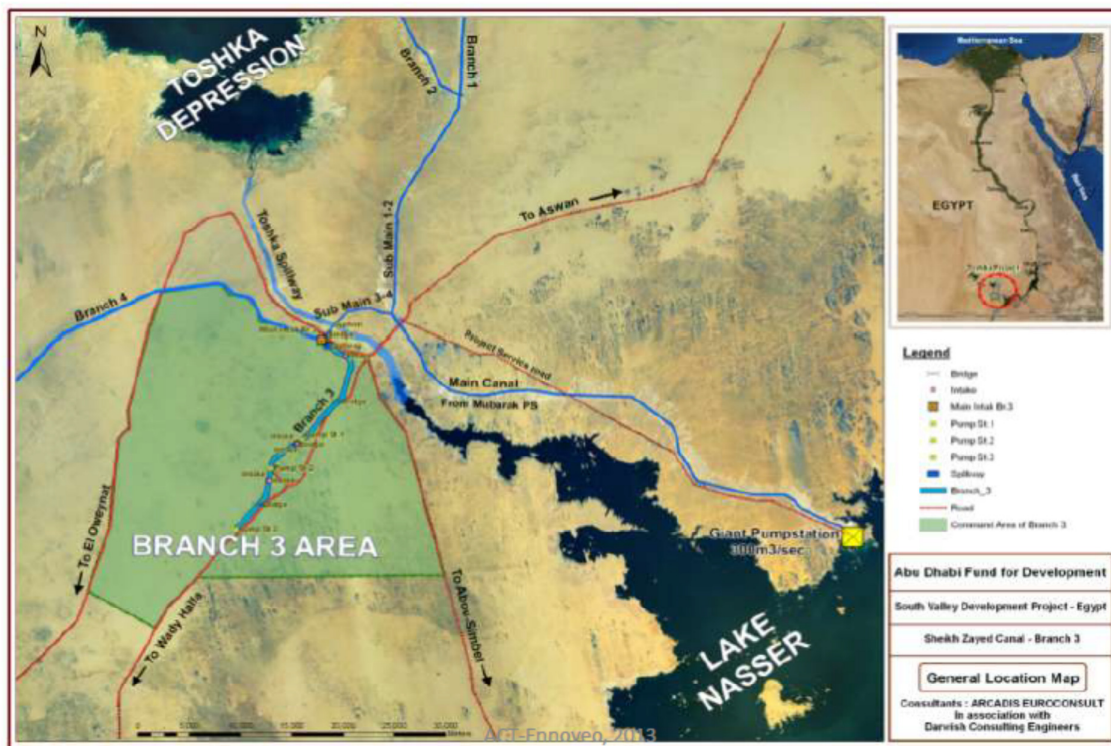
The Introductory Trip

ACTENNOVEO/Rothamsted team's visit to Toshka on June 18th, 2013 observed the following:

- 129,000 acres of almost plain and fertile land
- Abundance of accessible water supply
- Availability of power supply
- Well-developed roadway network
- Proximity to UAE market
- Well established and strong relations between the UAE and Egypt
- The Toshka land's area represents 67% of the UAE's arable land area (43,000 Ha, compared to 64,000 Ha.)



ACTENNOVEO/Rothamsted Team has had the honor of meeting HE Hamad Al Shamsi and the CEO Mr. Husam Hamad. Various discussions were conducted with the Project Manager Mr. Anwar Shagi. Various soil reports and irrigation studies were collected and evaluated along with a general crops report provided by the Toshka Agriculture Research Center.



**Availability of Water & Main Irrigation Infra:
Toshka Main Canal**



**Availability of Main Infra:
On-site Three Lifting Stations**





Proposed Goals, Objectives, and Directives

Food Security

Food Security strategic plans target in general sustainable and secured supply sources at convenient conditions and prices. The Toshka land from this respect has the potential to fulfill the requirements as a strategic national food security support arm for the UAE.

Food security crops can be categorized as:

- Crops for human consumption
- Crops for animal feed

Wheat, corn, maize, barley, etc. are major food security items for human consumption in this respective descending order, wheat being the major food security item required.

Grass hay, of different types and mixtures, is the major food security item for animal feed in the UAE.

Toshka vs. UAE Requirements of Wheat and Hay

Wheat consumption in the UAE in 2012 was 900,000 MT (a 50% increase from 2003); hay consumption in 2012 was expected to reach 1.5 MMT (double the figure of 2006). The 40,000 Ha (100,000 acres) in Toshka have the potential to produce either:

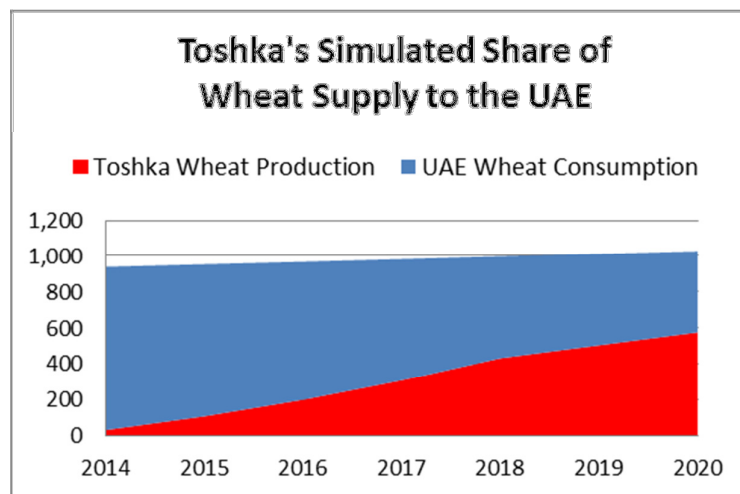
- Wheat: 10T/Ha/Year (suggests around 35% of national yearly consumption)
- Hay: 12T/Ha/Year (suggests around 33% of the national yearly consumption)

Al Dahra, through its partnerships with ACX/Agave has secured sizeable portion of the global hay production.

All-Wheat Scenario

Our firsthand calculations regarding the commercial viability of the financial model for a total wheat scenario shows favorable production costs results, taking into consideration:

- Requirements of secondary water channels and pumps to feed center pivot systems essential for wheat plantation
- Other requirements, including but not limited to: materials, machinery, labor, transport, and required infrastructure, properly depreciated



In conclusion of the above, along with the findings and observations of the introductory trip:

ACTENNOVEO/Rothamsted is aiming to reach 20T/Ha/Year in 2020, suggests the ability of the Toshka land to cover almost 70% to 80% of the national wheat requirement, an estimated simulation is

shown in the graph on the left.

This is the strength of the Toshka land towards a national food security strategy. Notwithstanding a balance between wheat/hay plantation ratio to be identified in the studied scenario

The Design Phase

The design will be carried out in two stages and will be comprised of two components, the agriculture and urban components.

Stage 1: Master Plan and Design Brief

Master Plan

A well-developed 3D model Master Plan and a detailed write up document (agriculture and urban) with an animated movie depicting the various constituent elements of the Toshka land will be the objective of this phase. The elements of the Master Plan and the detailed design document shall include, but will not be limited to:

- **Agriculture Component**
 - Land reclamation
 - Irrigation areas and systems
 - Plantation areas of wheat and hay and rotation
 - Environmental, ecological, and climatic elements
- **Urban Component**
 - Infrastructure systems (power, lighting, telecommunication, security system, etc.)
 - Transportation areas and systems
 - Storage and warehouses areas
 - Workshops (for required machinery and transportation)
 - Fuel storage and delivery
 - Business center
 - Research center
 - Accommodation: temporary and permanent and ancillaries
 - Guard system and control points
 - Clinics, fire station, shops, musallas, canteens, rest houses, etc.

Design Brief: Studies documentation, and reports

1. Agriculture Component
 - a. Agriculture science and research aspects
 - b. Agricultural practices and procedures
 - c. Machinery and operations
 - d. Human Capital and capacity building
 - e. Farm management systems and software (Land Management System, LMS)
2. Urban Component: this is a by-product of the requirements set by the above agriculture studies, resulting in the elements of the urban component part.

Financial Model Plan

- A 10-year financial model estimate and budgetary plan estimates will also be prepared at this design phase along with basic timeline schedules for design.

Stage 2: Detailed Design

Detailed Farm Plan, Phasing, Management Systems Applications and Specifications

In this plan the agriculture components' elements cited above will be detailed in drawings and specifications documentation.

Management of the Detailed Urban Plan

This phase includes the management of the preparation of the urban, architectural, and environmental execution drawings, phasing, and specifications. The elements cited in the Master Plan shall be developed into final execution drawings, specifications.

Detailed Financial Model

A 10-year financial model detailed and budgetary plan detailed estimates will also be prepared along with timeline schedules for construction at this stage.

The Execution Phase

Description and identification

The execution and implementation will be carried out in two stages and is comprised of two components, the agriculture component and the urban component. The two components shall comprise the actual execution of the urban elements determined by the agricultural requirements, and the whole crop production and agri-business process.

The two stages of execution shall comprise of:

Stage 1: Execution of all urban and agricultural elements described in the Design Process

Stage 2: Production and intensification of crops through research and the experimental farm, keeping the farm management abreast of all up-to-date findings and improvements

Roles and Responsibilities

In the execution phase, Rothamsted shall be entirely devoted to and involved in the agricultural component. This is a pre-requisite for the success of the whole exercise from the onset of concept up to handing over of the early crops.

In Stage 2, Rothamsted's role shall be emphasized and magnified through intensive research and development carried out both in the experimental farm proposed on site and in the UK, as described previously. This is a very important factor allowing the crop industry in this Toshka land to flourish and improve, a continuous process keeping the agriculture practices on this project at the state of the art level and with high-tech international standards on all respects (environmental, agricultural sciences and practices, agri-business etc.).

Land Management System

The total management of the agricultural, management, and agri-business elements of the Toshka land enterprise shall be done through a cutting-edge Land Management System. This will ensure the required efficiency keeping all processes running in tight synchronization and consistency at the most cost efficient levels.

The time envisaged for a total implementation of the described activities is around 4 to 5 years. This will necessitate a financial commitment of around \$100,000,000 while in a 8 to 10 year plan would require around half this financial commitment (approximately \$50,000,000). This would require a food security strategic decision to choose between one or the other scenario, keeping in mind that both scenarios are financially viable. The 4-year scenario would require intensive and concentrated resources with limited tolerances; the other scenario is gradual and more tolerable towards risk management factors.

Financial Offer

Work Schedule and Action Plan

Track		Month
	Mobilization	1
Design Phase		
I	Agriculture and Urban Assessments	1-2
II	Master Plan Concept Design and Approvals	2-3
III	Final Master Plan, Phasing, and Approvals	2-3
IV	Detailed Farm Plans, Phasing, Management and Specifications	2-3
V	Management of the Design Development Packages Tender Documents, and Approvals (actual design/supervision by others)	6-8
Execution Phase		
VI.a	Management and Implementation of the Agriculture Construction Phase: Tendering and Execution Phases (management of the selected farm managers)	48 or 96
VI.b	Management of the Urban Construction Phases: Tendering and Execution Phases (project management to selected contractors)	
VII	Production and Intensification <ul style="list-style-type: none"> • Research Center and Experimental Farm • Farm Management Technical Supervision and Monitoring 	Ongoing

Professional Fees

Tasks	Pre-construction	Design of Phase 1	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8	Phase 9	Totals	
Urban Component			30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000		240,000,000	
Area			12,500	25,000	37,500	50,000	62,500	75,000	87,500	100,000	100,000		
Investment: Infra_Setup			30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000		
Investment: Cumulative			30,000,000	60,000,000	90,000,000	120,000,000	150,000,000	180,000,000	210,000,000	240,000,000	240,000,000		
Agriculture Component				2,500,000	5,000,000	7,500,000	10,000,000	12,500,000	15,000,000	17,500,000	20,000,000	90,000,000	
Phase	Fees %												
Mobilization													
1 Agriculture and Urban Assessments	0.85%	2,805,000											
1 Master Plan Concept Design and Approvals												2,805,000	
1 Final Master Plan, Phasing, and Approvals													
4 Detailed Farm Plans, Phasing, Management and Specifications	4.8%		120,000	240,000	360,000	480,000	600,000	720,000	840,000	960,000		4,320,000	
5 Management of the Design Development Packages	1.3%		390,000	390,000	390,000	390,000	390,000	390,000	390,000	390,000		3,120,000	
6.A Management and Implementation of the Agriculture Construction Phase: Tendering and Execution Phases	12.0%				1,070,000	1,150,000	1,230,000	1,310,000	1,390,000	1,470,000	1,550,000	1,630,000	10,800,000
6.B Management of the Urban Construction Phases: Tendering and Execution Phases	2.75%		825,000	825,000	825,000	825,000	825,000	825,000	825,000	825,000	825,000		6,600,000
6.C Capacity Building	1.5%			37,500	75,000	112,500	150,000	187,500	225,000	262,500	300,000		1,350,000
7 Production and Intensification	1.0%			25,000	50,000	75,000	100,000	125,000	150,000	175,000	200,000		900,000
Total/Phase		2,805,000	390,000	1,335,000	2,587,500	2,850,000	3,112,500	3,375,000	3,637,500	3,900,000	3,772,500	2,130,000	29,895,000
Duration: months	8	4	12	12	12	12	12	12	12	12	12		
			-	120,000	1,372,500	1,635,000	1,897,500	2,160,000	2,422,500	2,685,000	2,947,500	2,130,000	17,370,000
			390,000	1,215,000	1,215,000	1,215,000	1,215,000	1,215,000	1,215,000	1,215,000	825,000	-	9,720,000
													27,090,000

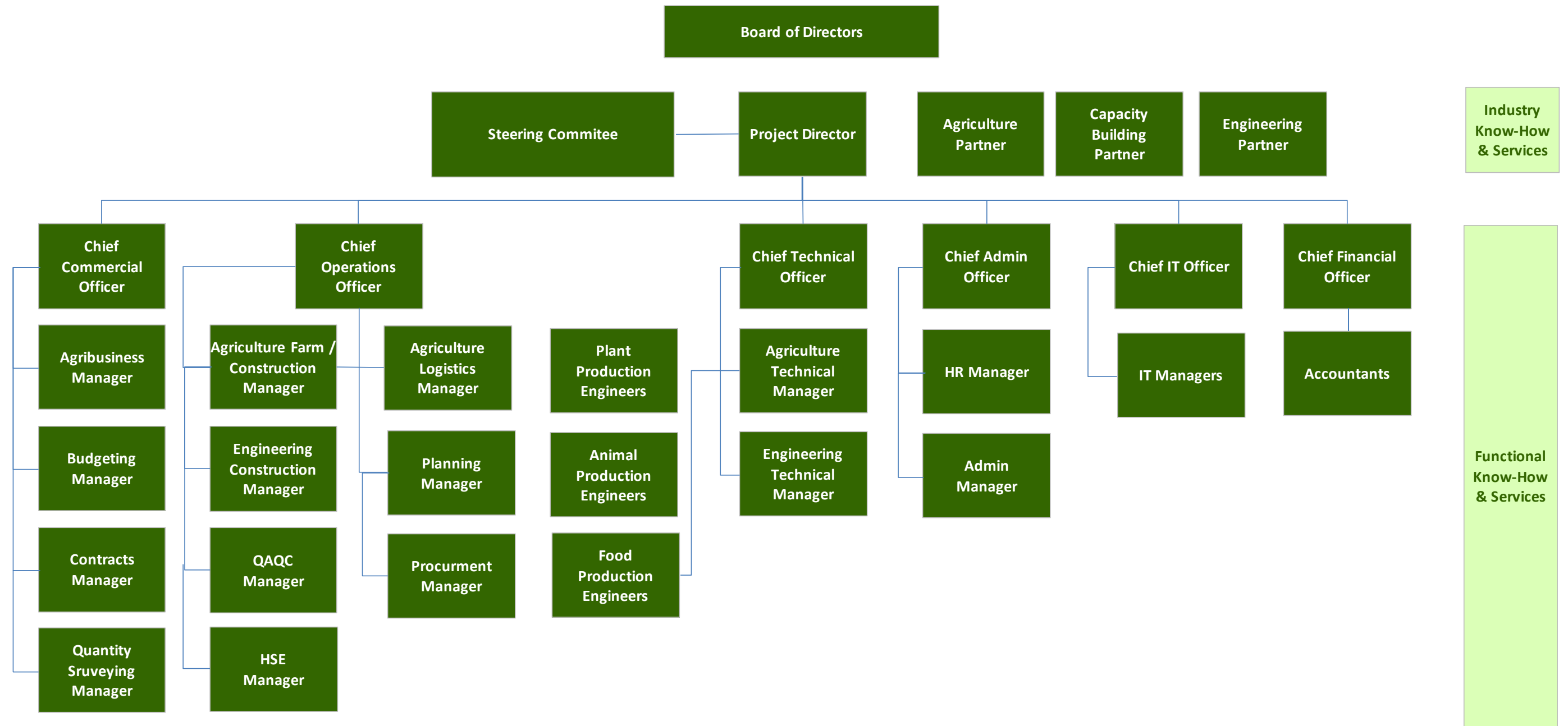
Summary	%	Project	Master Plan	Design & Exec	Grand Total
Preconstruction	0.85%	330,000,000	2,805,000		
Urban	4.1%	240,000,000		9,720,000	
Agriculture	19.3%	90,000,000		17,370,000	
Total			2,805,000	27,090,000	29,895,000

These figures exclude the detailed urban design and supervision fees estimated at \$12,000,000

Timeline

Tasks	Master Plan	Design of Year 1	Y-1	Y-2	Y-3	Y-4	Y-5	Y-6	Y-7	Y-8	Y-9
	8 to 12 Months										
	Mobilization										
1	Agriculture and Urban Assessments										
	Master Plan Concept Design and Approvals										
	Final Master Plan, Phasing, and Approvals										
	Master Planner, architect, electrical, mechanical, structural, financial, environmental, transportation 1,392,000										
	Agri-Master Planner, agronomy, soil, irrigation, environment, plant protection, agriEcology, agribusiness, 1,392,000										
4	Detailed Farm Plans, Phasing, Management and Specifications	4,320,000	540,000	540,000	540,000	540,000	540,000	540,000	540,000	540,000	
	Project Director, agronomy, soil, irrigation, environment, plant protection, agriEcology, agribusiness,										
5	Management of the Design Development Packages	3,120,000	390,000	390,000	390,000	390,000	390,000	390,000	390,000	390,000	
	Master Planner, architect, electrical, mechanical, structural, financial, environmental, transportation										
6.A	Management and Implementation of the Agriculture Construction Phase: Tendering and Execution Phases	19,650,000									
6.B	Management of the Urban Construction Phases: Tendering and Execution Phases										
6.C	Capacity Building										
7	Production and Intensification										
	For team details refer to Project Management Unit and Support activities		2,456,250	2,456,250	2,456,250	2,456,250	2,456,250	2,456,250	2,456,250	2,456,250	2,456,250

Organizational Chart



About us

ACTENNOVEO

ACTENNOVEO is a multi-disciplinary project integration management consultant focusing on Agriculture. It provides a strong integration management platform to coordinate and integrate the various works of local and world-renowned specialized consultants. Its team has a deep experience in managing multi-disciplinary large scale projects internationally.

ACTENNOVEO's services include consultancy and management of agricultural projects, agri-business, agri-infrastructure and logistic. Emphasizing the importance of farm management for successful agriculture/agri-business, ACTENNOVEO excels at the art of implementing processes necessary for consistency and sustainability. Our staff is highly acquainted with GAP, Good Agricultural Practices, and similar codes of practice and standards, which are applied at both the field and digital levels through our LMS, Land Management System, to ensure high-tech management and controls.

It works in close collaboration with its strategic partners Rothamsted Research, SETS, and Ennoveo which bring in world-class experience in agriculture, engineering and capacity building respectively.

Rothamsted Research

Rothamsted Research operates five departments, or fields of research, to improve efficiency of crop production:

AgroEcology

- Understand the ecological mechanisms that deliver sustainable crop production
- Studies the combined effects of : insects, pollination, weed, soil

Plant Biology and Crop Science

- Increase crop productivity through world-class plant biology and crop science research that delivers new knowledge, innovation and practices
- Main programs
 - **20:20 Wheat®**: Increasing wheat productivity to yield 20 tonnes per hectare in 20 years
 - **Cropping Carbon**: better utilization of carbon for better agriculture and environment
 - **Designing Seeds**: improved seeds for better production and food

- **Sustainable Systems:** modeling agricultural systems with minimal environment impact

Biological Chemistry and Crop Protection

- Protection of crops through genetics and pesticides

Computational and Systems Biology

- Undertakes research and development in mathematical, statistical and computational solutions to biological problems at all levels of biological scale
- Develop methods, models and software which contribute to all of the strategic programmes within Rothamsted Research.

Sustainable Soils and Grassland Systems

- Understand, model and manipulate processes in soils
- Improve the function, resilience and sustainability of farming systems

SETS

SETS International is a leading Middle-East-based engineering and management consulting firm with an exceptional record of excellence in providing creative, sustainable, and cost effective services in Engineering, Planning and Design, Transportation, Logistics and Supply Chain Management, Environmental, Hydrology and Irrigation, and Program Management.

Its prestigious portfolio covers high profile projects around the Middle East and beyond. SETS brings management rigor to its technical thoroughness in managing its international and complex projects.

SETS has succeeded in forging a wide international network of partners with the most exclusive consultants worldwide, and has established trustworthy and outstanding relationships, satisfying prestigious and discriminating clients.

Ennoveo

Ennoveo processes and innovations are based on over 12 years of experience in global blended learning (Face-to-Face and Online). It applies its innovative methodology of “Learn-As-You-Work™” which has proven to be both extremely efficient in linking theory to practice and cost-efficient as learners are able to learn and practice their learning in their workplace.

Communities of practice are created through the Ennoveo professional development process; their key role is to nurture motivation, commitment, and knowledge of learners and to secure higher performance in the workplace.

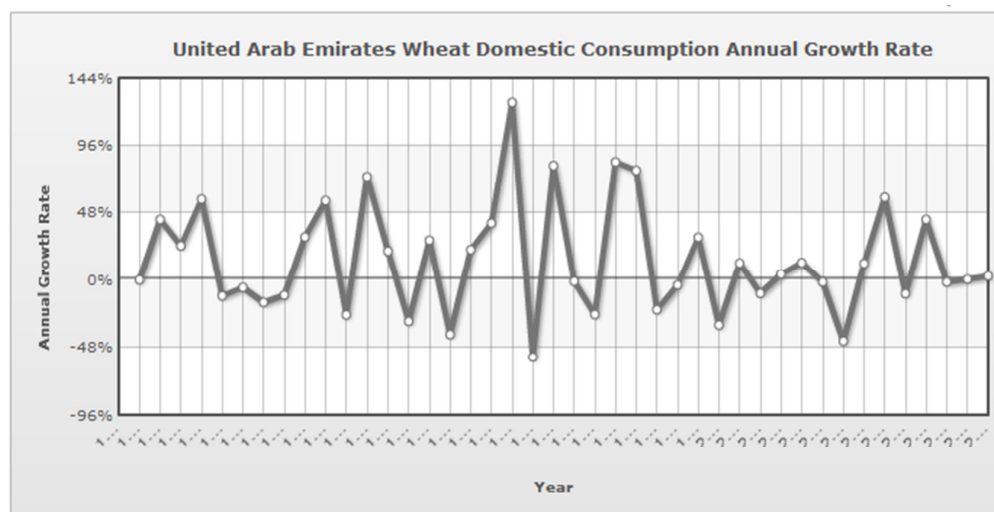
Ennoveo provides holistic solutions focused on the needs of local participants, the resulting programs and certificates are continuously quality assured by educational and vocational institutions based in the United Kingdom.

Appendices

1. Wheat consumption statistics in the UAE
2. Hay requirements of the UAE
3. Arable land in the UAE
4. Feasibility study of center pivot
5. Cash flow of the All-Wheat Scenario at Toshka
6. Good Agricultural Practices, GAP

Appendix 1: Wheat consumption statistics in the UAE

<http://www.indexmundi.com/agriculture/?country=ae&commodity=wheat&graph=production>



Market Year	Domestic Consumption	Unit of Measure	Growth Rate
2003	635	(1000 MT)	4.10 %
2004	713	(1000 MT)	12.28 %
2005	701	(1000 MT)	-1.68 %
2006	397	(1000 MT)	-43.37 %
2007	444	(1000 MT)	11.84 %
2008	706	(1000 MT)	59.01 %
2009	637	(1000 MT)	-9.77 %
2010	911	(1000 MT)	43.01 %
2011	896	(1000 MT)	-1.65 %
2012	900	(1000 MT)	0.45 %
2013	925	(1000 MT)	2.78 %

Appendix 2: Hay requirements of the UAE



THIS REPORT CONTAINS ASSESSMENTS OF COMMODITY AND TRADE ISSUES MADE BY USDA STAFF AND NOT NECESSARILY STATEMENTS OF OFFICIAL U.S. GOVERNMENT POLICY

Voluntary Public

Date: 6/14/2012

GAIN Report Number: UAE 2012 - 08

United Arab Emirates

Post: Dubai

U.S. Hay Exports to the UAE on the rise

Report Categories:

Market Development Reports

Approved By:

Jude Akhidenor

Prepared By:

Mohamed Taha

Report Highlights:

The rapidly expanding UAE market presents tremendous opportunities for U.S. hay exporters. In 2012, UAE is expected to import at least 1.5 million metric tons of hay compared to 600,000 MT in 2006. In value, U.S. hay exports to the UAE grew from \$8 million in 2006 to \$171 million in 2011, with exports for 2012 expected to surpass the 2011 level.

Appendix 3: Arable land in the UAE



COUNTRIES

INDICATORS

CALENDAR

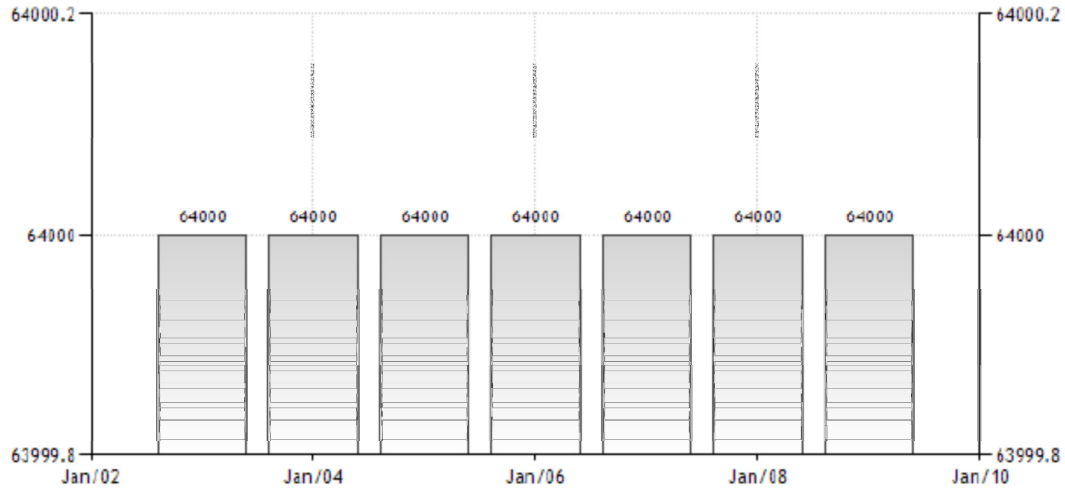
FORECASTS

SOLUTIONS

ARABLE LAND (HECTARES) IN THE UNITED ARAB EMIRATES

The Arable land (hectares) in the United Arab Emirates was 64000 in 2009, according to a World Bank report, published in 2010. Arable land (in hectares) includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded. This page includes a historical data chart, news and forecasts for Arable land (hectares) in the United Arab Emirates.

1967 TO 2013 CHART STATS FORECAST **SIGNUP TO EXPORT DATA** **USE ADVANCED TOOLS**



WORLD BANK INDICATORS - UNITED ARAB EMIRATES - LAND USE

	Previous	Last	
Agricultural land (sq. km) in United Arab Emirates	5690.0	5690.0	View Chart
Agricultural land (% of land area) in United Arab Emirates	6.8	6.8	View Chart
Arable land (hectares) in United Arab Emirates	64000.0	64000.0	View Chart
Arable land (hectares per person) in United Arab Emirates	0.0	0.0	View Chart
Arable land (% of land area) in United Arab Emirates	0.8	0.8	View Chart
Permanent cropland (% of land area) in United Arab Emirates	2.4	2.4	View Chart
Forest area (sq. km) in United Arab Emirates	3128.0		View Chart
Forest area (% of land area) in United Arab Emirates	3.7		View Chart
Average precipitation in depth (mm per year) in United Arab Emirates	78.0	78.0	View Chart
Land area (sq. km) in United Arab Emirates	83600.0	83600.0	View Chart

[MORE RELATED INDICATORS](#)

<http://www.tradingeconomics.com/united-arab-emirates/arable-land-hectares-wb-data.html>

Appendix 4: Feasibility study of center pivot



BIOSYSTEMS ENGINEERING SERIES
TIMELY INFORMATION
 Agriculture, Natural Resources & Forestry

Department of Biosystems Engineering, Auburn University, AL 36849-5626

BSEN-IRR-08-01

OCTOBER, 2008

60 Acre Pivot Irrigation Cost Analysis

COST ANALYSIS OF IRRIGATION SYSTEM CENTER PIVOT SYSTEM

60 Acre Coverage 1 Pivot Point	Initial Cost	Years Useful Life	Yearly Depreciation
A. Basic System – Investment Cost			
1. System - Electric Drive	\$ 35,154	20	\$1,758
Length – <u>837</u> feet plus			
end gun coverage = <u>100</u> feet			
Systems Options (including):			
End Gun & Automatic End Gun Control			
Running Lights – Automatic Stop -			
Booster Pump – Sprinkler Package -			
Low Pressure Shut-off			
2. Freight, Installation	\$10,000	20	500
3. Power Unit and Pump	\$ 4,439	20	222
<u>15</u> Horsepower 3PH Electric Motor			
“Across-the-line” Starter			
Centrifugal Pump <u>450</u> GPM @ <u>107'</u> TDH			
4. Generator for Pivot (NOT REQUIRED)			
<u>1200'</u> feet, PIVOT power and safety wire	\$ 6,000	15	400
5. PVC Pipe (Installed) -	\$ 9,720	20	486
<u>6</u> inch x <u>1200</u> feet @ \$ <u>8.10</u> per foot			
6. Pipe Valves, Fittings, Concrete	\$ 4,888	20	244
7. Miscellaneous	\$ 3,204	---	---
TOTAL COST	\$73,405		3610
TOTAL COST PER ACRE	\$ 1,223		60

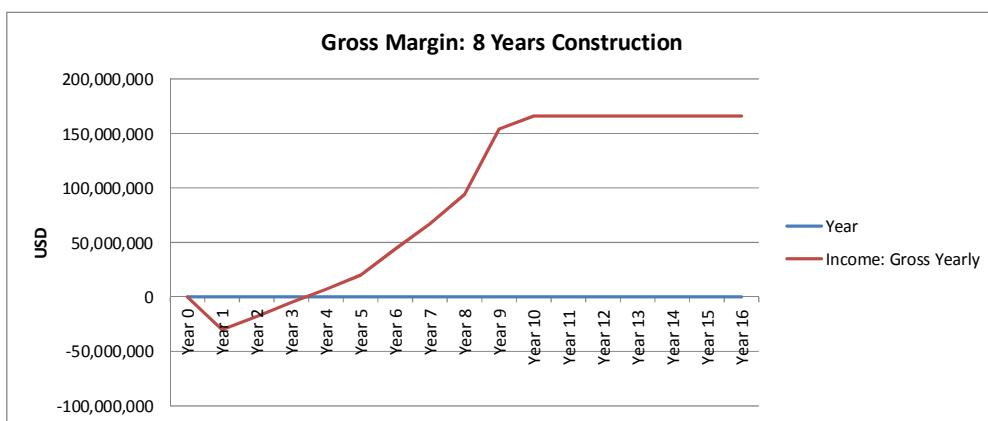
Appendix 5: Estimated Cash flow of the All-Wheat Scenario at Toshka

Scenario-1: 8 Years Construction

Operations \$/Acre	Arable Area Acres	Years	Acres ready per year	T/Ha	T/Acre	Wheat Price USD/T
200	100,000	8	12,500	10	4	300

Increase in wheat yield Year 5 onwards >>>	15%	25%	35%	45%	55%	55%	55%	55%	55%	55%	55%	55%	55%
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Year	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16
Investment: Infra, Setup		30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000								
Area ready for planting		12,500	25,000	37,500	50,000	62,500	75,000	87,500	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Operations: Acres			2,500,000	5,000,000	7,500,000	10,000,000	12,500,000	15,000,000	17,500,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000
Operations: Cost /Year	0	30,000,000	32,500,000	35,000,000	37,500,000	40,000,000	42,500,000	45,000,000	47,500,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000
Operations: Cumulative Cost		30,000,000	62,500,000	97,500,000	135,000,000	175,000,000	217,500,000	262,500,000	310,000,000	330,000,000	350,000,000	370,000,000	390,000,000	410,000,000	430,000,000	450,000,000	470,000,000
Wheat: Tons Produced			50,000	100,000	150,000	200,000	287,500	375,000	472,500	580,000	620,000	620,000	620,000	620,000	620,000	620,000	620,000
Wheat: Yearly Sales			15,000,000	30,000,000	45,000,000	60,000,000	86,250,000	112,500,000	141,750,000	174,000,000	186,000,000	186,000,000	186,000,000	186,000,000	186,000,000	186,000,000	186,000,000
Wheat: Cumulative Sales			15,000,000	45,000,000	90,000,000	150,000,000	236,250,000	348,750,000	490,500,000	664,500,000	850,500,000	1,036,500,000	1,222,500,000	1,408,500,000	1,594,500,000	1,780,500,000	1,966,500,000
Income: Gross Yearly	-	(30,000,000)	(17,500,000)	(5,000,000)	7,500,000	20,000,000	43,750,000	67,500,000	94,250,000	154,000,000	166,000,000	166,000,000	166,000,000	166,000,000	166,000,000	166,000,000	166,000,000
Income: Cumulative		(30,000,000)	(47,500,000)	(52,500,000)	(45,000,000)	(25,000,000)	18,750,000	86,250,000	180,500,000	334,500,000	500,500,000	666,500,000	832,500,000	998,500,000	1,164,500,000	1,330,500,000	1,496,500,000
									240,000,000								
Investment: Cumulative		30,000,000	62,500,000	97,500,000	135,000,000	175,000,000	217,500,000	262,500,000	310,000,000	330,000,000	350,000,000	370,000,000	390,000,000	410,000,000	430,000,000	450,000,000	470,000,000
ROI			-76%	-54%	-33%	-14%	9%	33%	58%	101%	143%	180%	213%	244%	271%	296%	318%



Scenario-2: 4 Years Construction

Operations \$/Acre	Arable Area Acres	Years	Acres ready per year	T/Ha	T/Acre	Wheat Price USD/T
200	100,000	4	25,000	10	4	300

Increase in wheat yield Year 5 onwards >>>	15%	25%	35%	45%	55%	55%	55%	55%	55%	55%	55%	55%	55%
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Year	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16
Investment: Infra, Setup		60,000,000	60,000,000	60,000,000	60,000,000												
Area ready for planting		25,000	50,000	75,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Operations: Acres			5,000,000	10,000,000	15,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000
Operations: Cost /Year	0	60,000,000	65,000,000	70,000,000	75,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000
Operations: Cumulative Cost		60,000,000	125,000,000	195,000,000	270,000,000	290,000,000	310,000,000	330,000,000	350,000,000	370,000,000	390,000,000	410,000,000	430,000,000	450,000,000	470,000,000	490,000,000	510,000,000
Wheat: Tons Produced			100,000	200,000	300,000	400,000	460,000	500,000	540,000	580,000	620,000	620,000	620,000	620,000	620,000	620,000	620,000
Wheat: Yearly Sales			30,000,000	60,000,000	90,000,000	120,000,000	138,000,000	150,000,000	162,000,000	174,000,000	186,000,000	186,000,000	186,000,000	186,000,000	186,000,000	186,000,000	186,000,000
Wheat: Cumulative Sales			30,000,000	90,000,000	180,000,000	300,000,000	438,000,000	588,000,000	750,000,000	924,000,000	1,110,000,000	1,296,000,000	1,482,000,000	1,668,000,000	1,854,000,000	2,040,000,000	2,226,000,000
Income: Gross Yearly	-	(60,000,000)	(35,000,000)	(10,000,000)	15,000,000	100,000,000	118,000,000	130,000,000	142,000,000	154,000,000	166,000,000	166,000,000	166,000,000	166,000,000	166,000,000	166,000,000	166,000,000
Income: Cumulative	-	(60,000,000)	(95,000,000)	(105,000,000)	(90,000,000)	10,000,000	128,000,000	258,000,000	400,000,000	554,000,000	720,000,000	886,000,000	1,052,000,000	1,218,000,000	1,384,000,000	1,550,000,000	1,716,000,000
Investment: Cumulative		60,000,000	125,000,000	195,000,000	270,000,000	290,000,000	310,000,000	330,000,000	350,000,000	370,000,000	390,000,000	410,000,000	430,000,000	450,000,000	470,000,000	490,000,000	510,000,000
ROI			-76%	-54%	-33%	3%	41%	78%	114%	150%	185%	216%	245%	271%	294%	316%	336%

