Application of GIS and Remote Sensing in Irrigation and Drainage

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Outline of the Presentation

About Geospatial Media and Communications
- What we do, Vision, Mission, Knowledge Dissemination

Overview of the Irrigation and Drainage Sector
- Introduction, Resource Segments, Market Trends and Opportunities and Challenges

Application of Remote Sensing and Geospatial Technologies in Agriculture

Research Study: Market Overview, trends and Opportunities in the Irrigation and Drainage Sector
About Geospatial Media and Communications

Established in 1997, headquartered at Noida, India with regional offices in Kuala Lumpur, Dubai, Johannesburg, The Netherlands, US, Mexico and Brazil. Geospatial Media and Communications is an internationally credible premier organisation working to promote and propagate use and application of geospatial technologies and sciences in different sectors.

What we do

- Media
  - Publications
  - GeoBuiz [http://geobuiz.com/]

- Communications
  - Conferences
    - Global - Geospatial World Forum
    - South Asia - GeoSmart India (India Geospatial Forum)
    - Middle East - Middle East Geospatial Forum
    - Africa - Africa Geospatial Forum
    - Asia - Asia Geospatial Forum
    - Latin America - Latin America Geospatial Forum

About Geospatial Media and Communications – Agri

VISION

Industrialization of the geospatial technology in Agriculture.

Expanding the horizons of geospatial industry to support Agriculture productivity in lieu of growing global demand for food.

Sustainable development of the planet by the ‘G’-tech innovations in Agriculture.

MISSION

Is to bridge the gap between key stakeholders of the economy and bring the convergence between them.
Dissemination of information from all sources

- **Magazine** - Successfully connecting with Global Geospatial Stakeholders across the world; with over 16,000 copies circulation monthly.
- **Online Portal** - Successfully connecting with more than 70,000 Global Geospatial Stakeholders across the world.
- **Research Reports**.

**Introduction**

Irrigation is one of the most important inputs for an efficient and sustainable agricultural production.

Necessary in arid areas or during a period of inadequate rainfall

Irrigation and Drainage is referred as artificial application of water to land and artificial removal of excess water from land, respectively.

Irrigated agriculture contributes about 40 percent of the global food production from an estimated 20% of agricultural land, or about 300 million hectares globally.

Irrigated farmland typically generates three times the production of an equivalent area farmed under dry-land systems.

The developing countries as a whole are expected to expand their irrigated area from 202 million hectares in 1997/99 to 242 million hectares by 2030 - FAO

Sprinkler irrigation ("big gun") in South Canada. Source: STAUFFER 2011
Resource Segments

**Crop Production**
- Purpose is to produce crops that have economic and social value.
- Properly managed irrigation can increase crop yields, reduce risks, increase product quality, reduce pest pressures, and precisely deliver & manage nutrients.

**Water Use**
- Agriculture is the biggest water user, with irrigation accounting for 70% of global water withdrawals.
- Agriculture industry is adversely affected by a significant decrease in the ground water levels; hence, there is a need to locate efficient ways of supplying water to meet agricultural needs and conserve water for future use.

**Land / Soil reclamation**
- A combination of drainage and irrigation is being used to reclaim large areas of land that have been abandoned because of salt accumulation.
- Large areas in the United States, India, and the Middle East are potentially available for reclamation.
- Netherlands have reclaimed land from the sea by the use of drainage.

Need: Efficient, wise and responsible use of resources with good management and technologies.

Market Trends and Opportunities

**Budget Focus**
- Increasing Market Demand
- Innovative Technology use
- Increasing Private Investments
- Improving Water Use Productivity

**Mapping Irrigated Areas**
- Diversification of crops
- Modernization and Automation

**Modernization and Automation**
Challenges

- Efficient Irrigation Management
- Water Quality and Management
- Increasing pressure on land and energy sources
- Development of irrigation infrastructure
- Soil Erosion
- Environmental Issues and Health

Geospatial+ Irrigation
Geospatial Technologies

Remote Sensing

- Aerial
- Space
- LIDAR
- UAV’S
- Laser Scanning

GIS

- GPS

ICT

BIG DATA

SMART SENSORS

Core Geospatial Technologies

Technology Implementation

Crop Production
- Type of crop
- Soil Condition
- Type of Irrigation Method
- Water Availability
- Other Parameters – slope, drainage, climate, fertility

Irrigation Infrastructure
- Canals
- Reservoirs
- Dams
- Annicuts
- Tanks
- Pipelines

Modern Irrigation System Planning
- Water Supply
- Transport System
- Water Application
- Evaporation and Seepage Control

Satellite data based identification of the water supply source: surface and subsurface.

Satellite data based identification of the irrigation infrastructure: canals, dams, pipelines, Annicuts, weir etc.

GIS based identification of water flow direction, area, slope and drainage.

GPS based water supply instruments – sprinklers, sprayers etc.

Smart Sensors for measuring Soil Moisture.

Aerial application of pesticides, guided by satellite navigation.

Drone/UAV based monitoring of crop – type and yield.
New Technologies in Irrigation and Drainage Sector

FieldNET Mobile: Remote Irrigation Management

Retooling drip irrigation technology

Center pivot technology

Smart Irrigation Management App – Connected Farm Irrigate

- GPS-controlled solution is installed on the pivot, and growers can remotely control their irrigators.
- Variable rate irrigation
- Reports on water and fertilizer application.
- The system allows for increased efficiency and reduced energy costs.

Smart Irrigation Controllers

Wireless sprinkler controllers to manage the watering of the field remotely using smart device

- Integrate real-time weather forecast data
- Controls systems in the world using home WiFi and ethernet connection
- Sync with moisture sensors installed in the field
Smart Irrigation Practices

Soil Moisture Sensors
- Accurate
- Repeatable
- Samples a relatively large area
- One sensor for all sites & depths

Drone/UAV – Spraying pesticide over crops
- Precise
- Less time Consuming
- Larger Area
- Efficient

Scope of agriculture industry with G-tech
- Easy and timely data acquisition
- Temporal and real time (time series ) data availability
- Optimized use of resources like water, seeds, fertilizers, agrochemicals
- Efficient management of resources and data in a centralized database
- Better visualization of agriculture objects using satellite imagery
- Enhanced planning tools and techniques for agriculture activities
- Better analytical capabilities
- Accurate assessments
- Optimized on farm decision making
- Easy Dissemination of agriculture data all over the globe through web capabilities and interoperability services
- Accurate field mapping and measurements
- Real time monitoring and managing farm operations
Market Research Report - 2015

“Geospatial Technologies in Agriculture - Trends and Prospects”

Most Widely Used Geospatial Technology

GIS is the most widely used Technology worldwide
Most Widely Used Geospatial Technology

GIS is the most widely used Technology in Asia Pacific

GNSS/GPS is the most widely used Technology in Europe

Adoption level of Precision Farming Techniques

Indonesia, Japan, Australia, Philippines, Malaysia
Future of Geospatial Technology in Agriculture Industry in India

Macro and Micro Level Implementation areas

Macro Level Activities
- Agriculture Hazards: 14%
- Mapping of Plantation Crops and Surveying: 25%
- Mapping of Soil Properties: 31%

Micro Level Activities
- Wastelands Mapping: 10%
- Identification of Water Management: 21%
- Site Suitability Analysis: 16%
- Variable Rate Technology: 21%
Value Proposition of Geospatial Technology in Agriculture Industry

Present and future focus segments – Users and Technology Providers
World wide Challenges of Geospatial Technology in Agriculture Industry

- Lack of support from higher authorities (6%)
- Lack of skilled manpower (25%)
- Lack of clear geospatial policies (12%)
- Inadequacy by the people at grassroot level (12%)
- High cost of the hardware/software (24%)
- Lack of understanding in the correct applications of the technology (11%)

Inferences and Geospatial Market Ahead

- Micro Irrigation market is one of the fastest growing market
- Drip irrigation is the most efficient method of irrigation, with efficiencies ranging between 90%-95%.
- Need for conservation management and irrigation practices that enhance infiltration, reduce runoff, and improve water quality on a wide range of irrigated soils.
- Best management practices for irrigation using waste water.
- Dependable and sustainable energy for the Nation’s irrigation needs – solar, wind, biofuels.
- Precision irrigation systems and technologies for site-specific management of high-value crops.
Thank you

....MANY MORE OPPORTUNITIES TO PARTNER

- Research Studies
- Capacity building through Conferences and Publications

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