APPLICATION OF GNSS TECHNOLOGY IN AGRICULTURE

Case Study Botswana

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MINISTRY OF AGRICULTURE

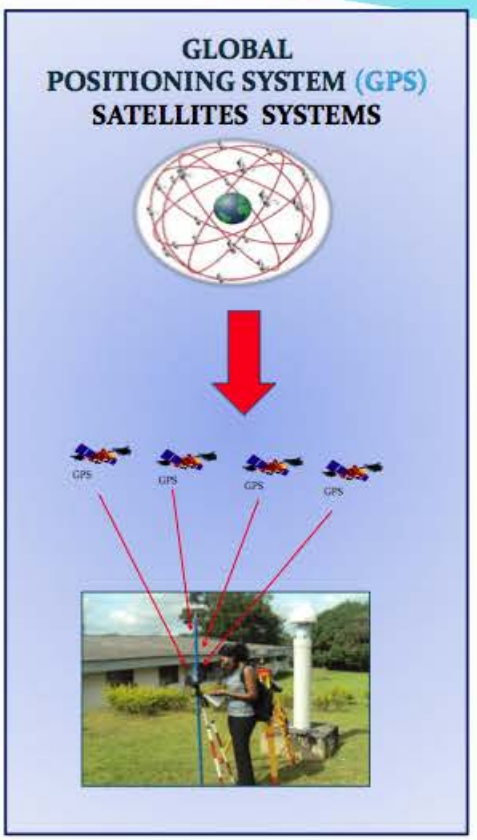
BOTSWANA

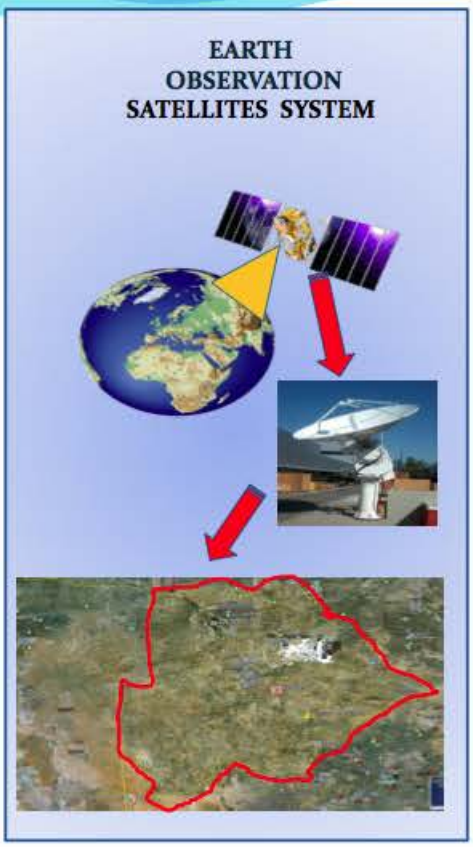
PRESENTATION OUTLINE

- INTRODUCTION
- GPS SYSTEM
- BENEFITS OF GNSS IN AGRICULTURE
- BACKGROUND ON BOTSWANA
- APPLICATIONS OF GNSS IN AGRICULTURE: CASE-STUDY IN BOTSWANA
- RECOMMENDATIONS

INTRODUCTION

The Global Navigation Satellite System (GNSS) is a constellation of orbiting satellites together with ground based equipment enabling a user to determine his position, with respect to a given coordinate system, using signal transmitted by satellites.





Globally countries have been and are currently using GNSS as a tool for sustainable agriculture for;

1). Assuring food security through Remote Sensing, Global Positioning Systems and Geographical Information System.

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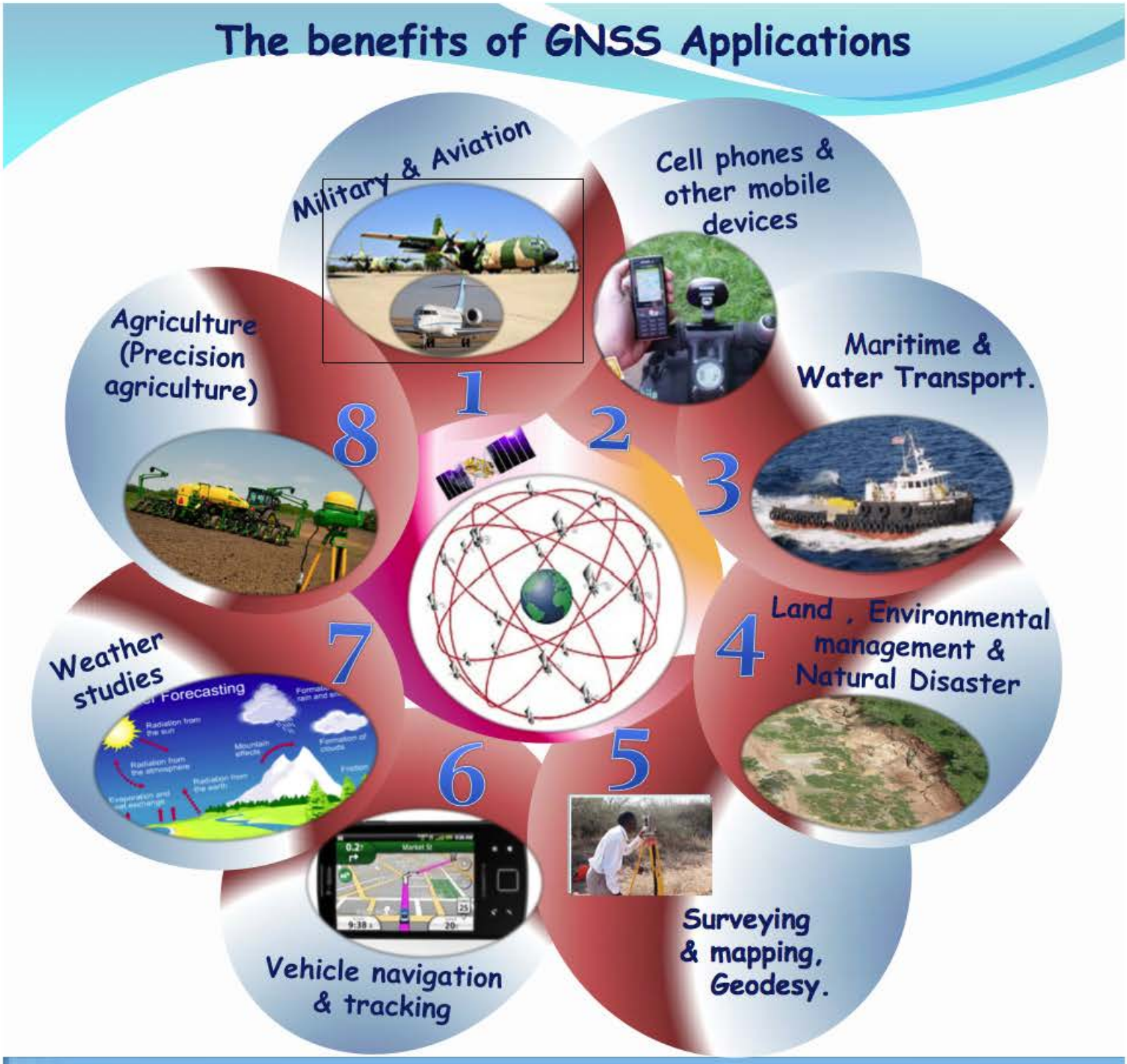
This Presentation is focused on the benefits of GNSS by the Government of Botswana on agriculture to improve food security.

The benefits of GNSS Applications



BACKGROUND INFO ON BOTSWANA

Geography
Botswana is a landlocked country located in southern Africa.
Neigbouring countries;
Namibia- West, South Africa -South, Zimbabwe - East & Zambia - North.
About 70% of the country is covered by the Kalahari Desert.
Covering an area of 224,610 square miles,
Botswana is the 47th largest country in the world.

The estimated population is 2,029,307.

Area: 582,000 sq. km. (224,710 sq. mi.), about the size of Texas.

Terrain: Desert and savanna.

Climate: Mostly subtropical.

Agriculture
More than one-half of the population lives in rural areas and is largely dependent on subsistence crop and livestock farming.

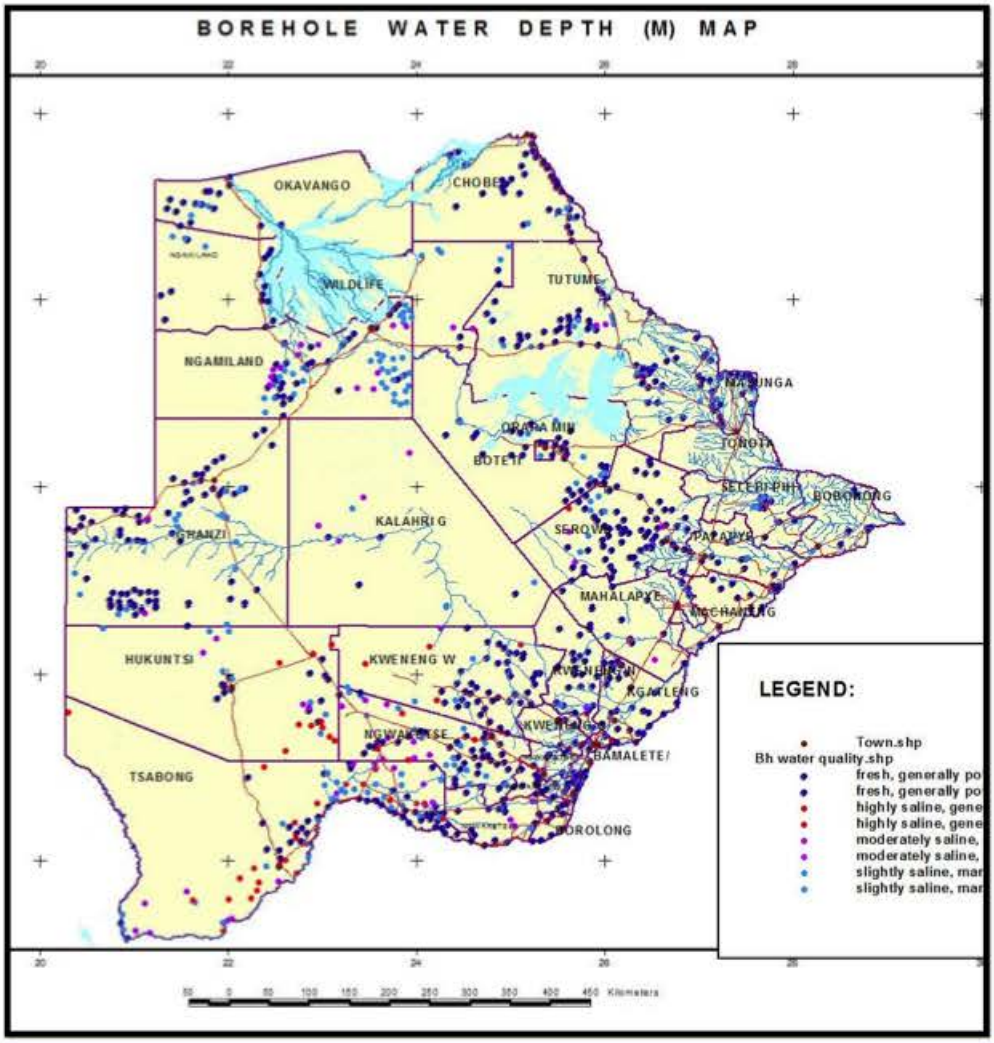
Rainfall
Botswana s environment is semi arid with very low rainfall. Botswana has four seasons: Summer, Autumn, Winter and Spring and Winters are dry. The rain season period is very short – (September to April)with the average rainfall of 10 – 250 mm per year.

APPLICATIONS OF GNSS IN AGRICULTURE

CASE STUDY - BOTSWANA

1. Water Management
2. Agricultural Land use mapping
3. Soil surveying & mapping
4. Management of migration pest & control
5. Management of animal disease & control
6. Conservation of Agricultural land & Management
7. Precision Farming e.g Pandamatenga farms
8. Spatial Database Management
9. Avail & transfer Agricultural Information & technology to our farmers

1. Water Management

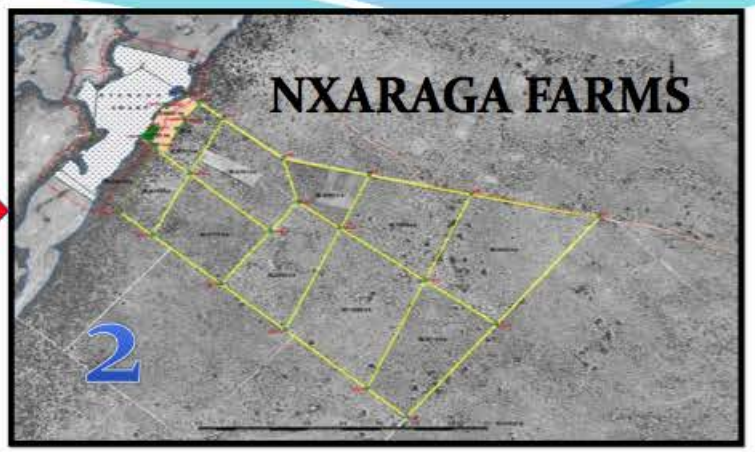


Above Picture:
Taking the position of a Borehole on the ground using GPS machine to create a Borehole Database of Botswana.

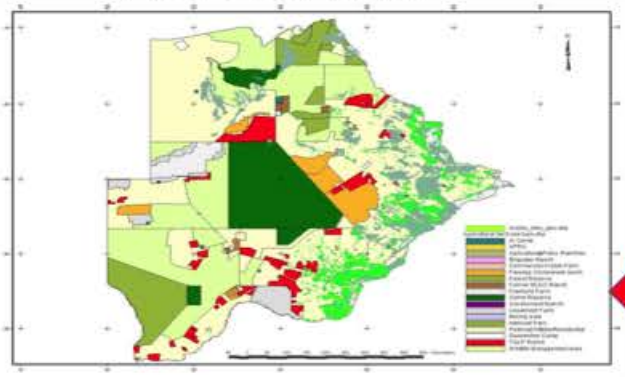
The Map above shows:
The distribution of Boreholes and water quality in Botswana. The dark blue colour being fresh water and the red dots being highly saline water. All these points were taken by the GPS machine and produced the map.

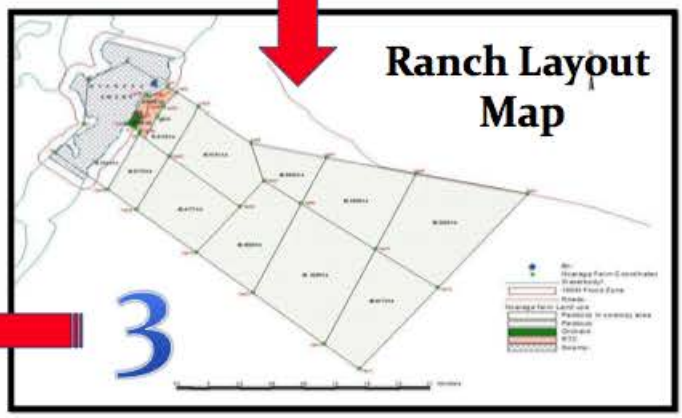
2. Surveying & Mapping of Agricultural land

Ranch alignment



LAND USE MAP





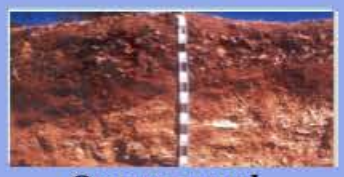
The above picture and maps shows;

1. Ranch Alignment & picking points (corners using GPS machine to be plotted on the Maps
2. The demarcation of ranches for livestock production.
3. The production of agricultural Land use map to provide land use advisory services to land allocation authorities

3. Soil Surveying & Mapping

1

SOIL SAMPLING



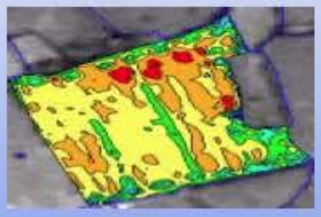
Quartz gravel

Red Sandy Soil

Vertisol
(Black Cotton Soil)

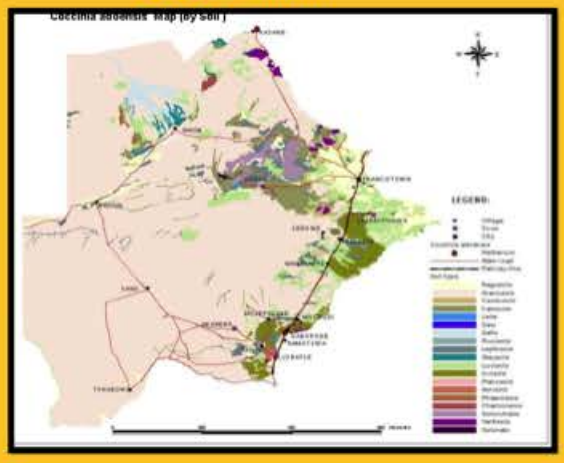
2

Soil interpretation & analysis

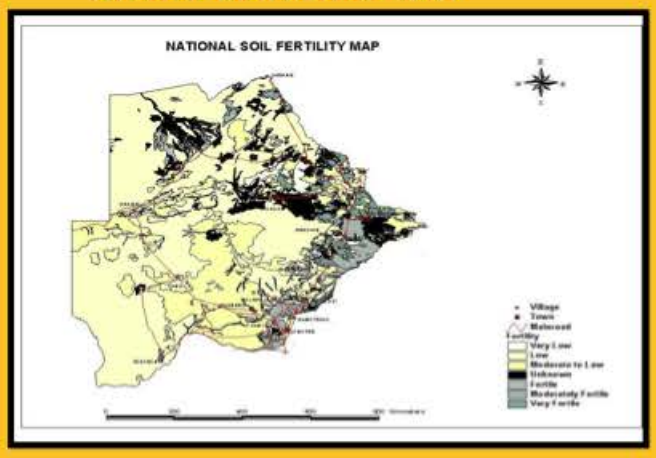


3

SOIL MAP



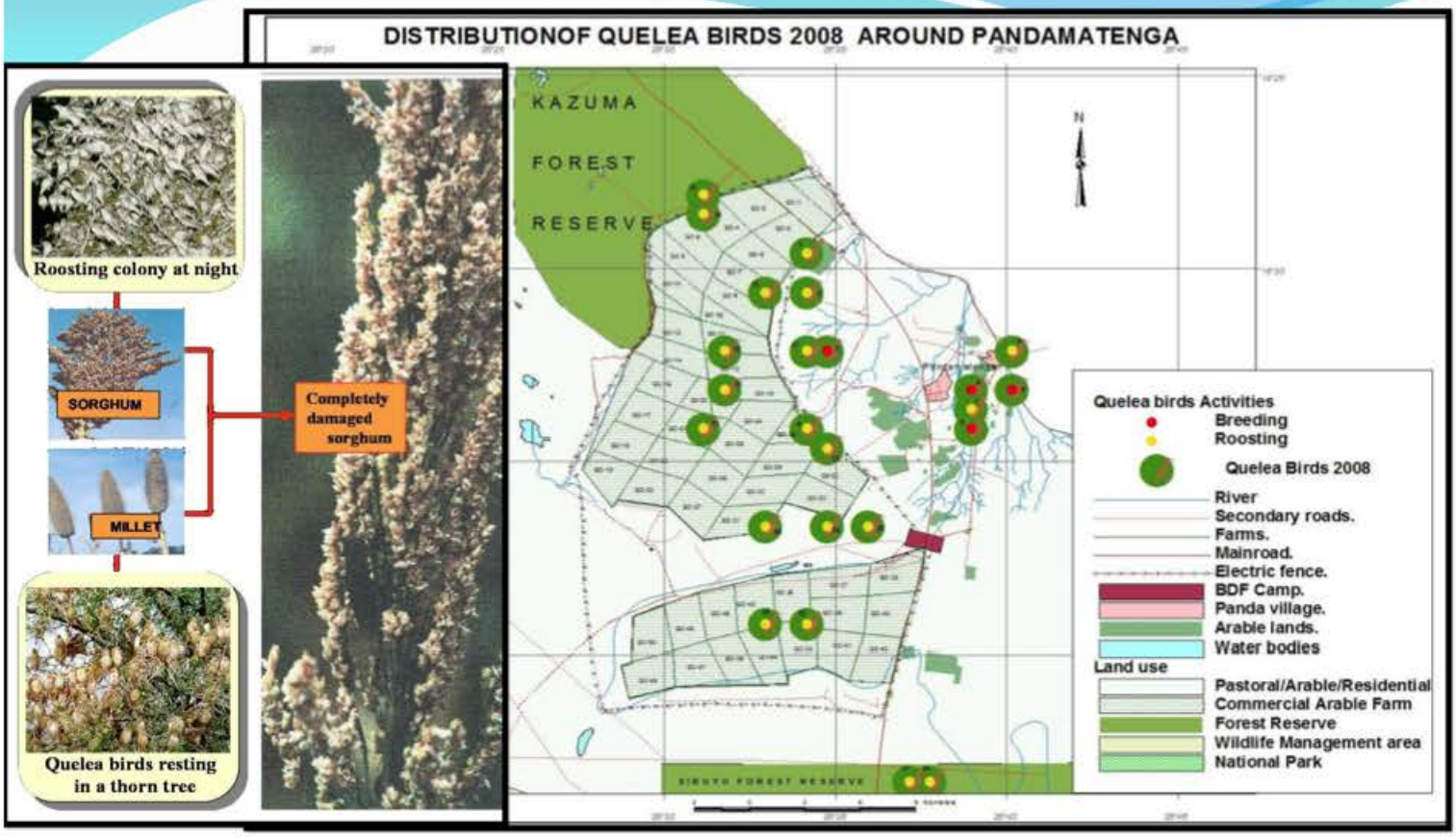
SOIL FERTILITY MAP



The above Pictures and maps shows;

1. Soil sampling – all sampling points are surveyed mapped using GPS machine and record all the characteristics of the soil.
2. Soil Interpretation on the map Showing different types of soil and texture.
3. Map Production – created by data from the field surveying using GPS machine.

4. Management of migration pests & control



The Map above shows;

The distribution of quelea birds around Pandamatenga commercial Farms being food basket of Botswana in sorghum production.

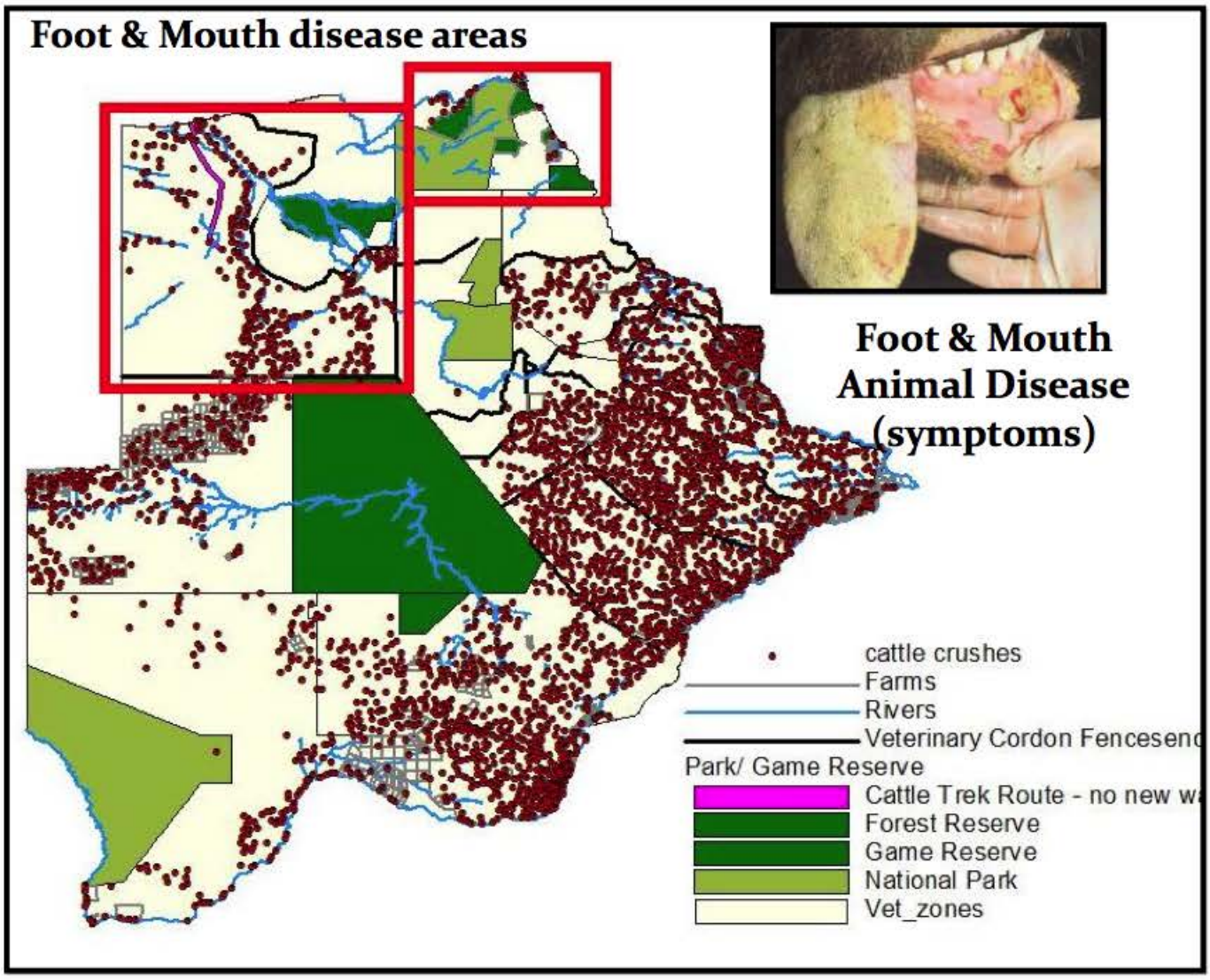
The breeding and Roosting colonies have been mapped using the GPS machine.

PEST CONTROL

Spraying optimization (Mounting GPS)

Less toxic chemicals to non - target mammals pesticide are used to control quelea birds, Eg Queltox (Fenthion 64% ULV)

5. Management of animal disease & control



The above map shows;
The Distribution of cattle crushes (red dots), Foot & Mouth disease areas (marked in red box), and the Control Zones mapped by using GPS machine.

6. Conservation of Agricultural land & Management

Sand Dune Stabilization

3. Reduce the wind erosion allow sedimentation position

Water Harvesting (Semi-Luna)

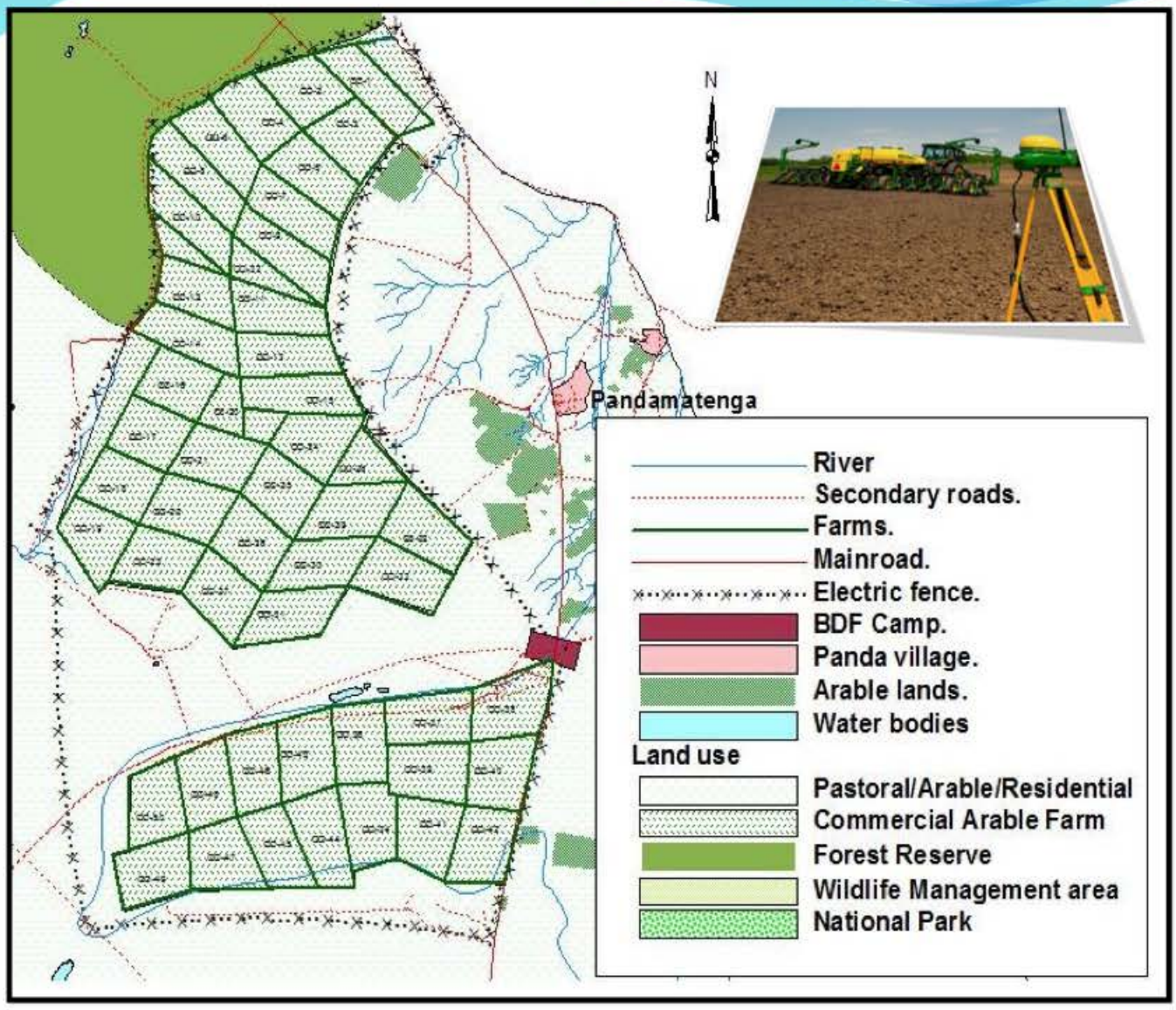
2.Water harvesting promotes ground water recharge and the re – use of harvested rain water.

Gabion construction as a way of reclaiming land

3. Reduce the flow velocities and allow sedimentation position

GULLY RECLAMATION

7. Precision Farming in Pandamatenga farms

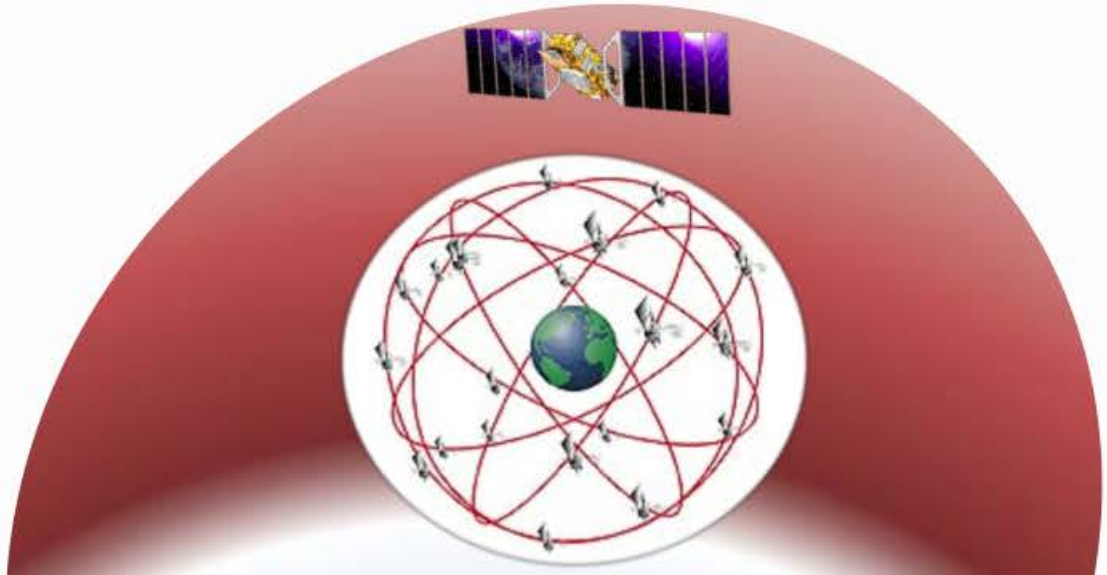


The map above shows;
Pandamatenga commercial farms where precision farming is practiced in Botswana

CONCLUSION

For an improve results in crop and animal production, the agricultural extension officers are equipped with necessary information (obtainable from GPS & field work survey) in respect of;

1. Borehole Water quality map
2. Soil fertility map
3. Soil water content map.
4. Areas prone to pest attack and animal diseases.
5. Agricultural land use map.



THANK YOU!

RECOMMENDATIONS

There is a need for the requisite manpower training in the Science and applications of GNSS for general national developments.