Capacity Building of the COCOBOD's CSSVD Unit for Digital Maps Management in Support of the Cocoa Swollen Shoot Viral Disease Control Management Program

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Key words: Disease control map conversion to digital and attributes database development

SUMMARY

One major environmental problem facing Ghana's cocoa industry is the Cocoa Swollen Shoot Viral Disease (CSSVD). The only remedy is cutting down the infected cocoa trees to prevent spread to other neighbouring cocoa trees. This viral disease vector spread is the mealy bug. It thrives on host trees some of which provide shade to the cocoa trees. Since it was detected in the 1930s, the control program has created a stock of cartographic information in the form hand drafted maps of farms that were treated. A cartographic unit was established within the Cocoa Division of the then Ministry of Agriculture for this purpose. The field mapping was carried out by a core of field assistants (FAs), who were trained in the use of chain and compass methods of surveying. The work of the FAs in connection with the Swollen Shoot Disease Control was and is still to search for outbreaks, carry out chain and compass survey of the location of the farm sites and to measure the outbreak and treated areas. The chain and compass measurements were then brought to the drawing office for conversion into hand-drawn maps. The base map into which the field data were transferred was the Ghana Survey Topographic Map sheets (the 1/62,500 series and the 1/50,000 series). The cocoa farm maps were organized into Cocoa Block Maps, which were in turn organized into Cocoa Sector Maps. Over 3000 Sector Maps exist in hand-drawn mode, some on non-shrinkable, others on shrinkable tracing material. With the arrival of the digital technology, the need has arisen for conversion of the Sector Maps to digital for downstream geographic information system-driven management of the records. The cartographic staff of the COCOBOD's CSSVD Unit needed to be up-graded with the digital culture. The project for the digital technology conversion has largely succeeded. GIS-equipment procurement and installation of the database, re-training of the CSSVD staff have been completed. The Centre for Remote Sensing and Geographic Information Services (CERSGIS) carried out the Capacity-building Project.

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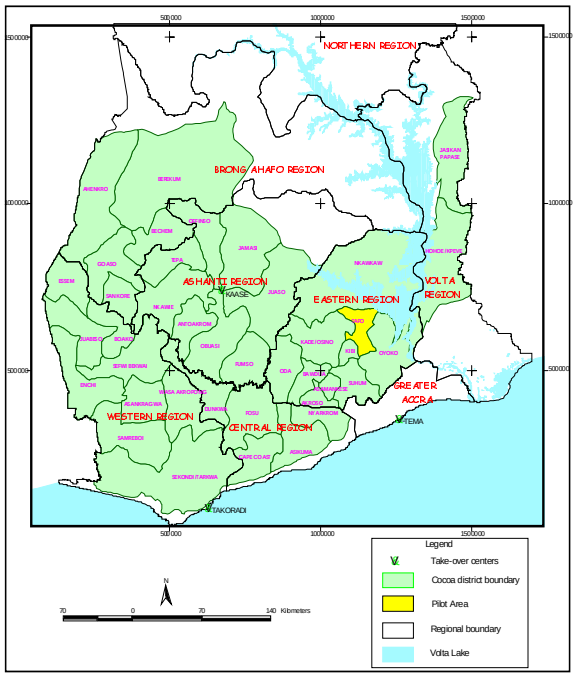
1. BACKGROUND

The Cocoa Swollen Shoot Viral disease Control Programme is effectively to control the spread of the viral disease. The only control measure is through cutting down the affected trees to prevent spreading to other trees. Farmers have to be compensated in order to willingly allow the trees to be cut down. The task of locating infected areas and cutting of the infected trees is currently the responsibility of the Government.
The resources for control programme and the areas the control programme has treated need to be efficiently documented in order to monitor the performances and the outcomes. For this reason a GIS is needed for managing the spatial data.



The Ghana COCOBOD has over the years documented manually the control operations with the result that over 2000 cocoa sector maps were drawn manually. These form the basis for the GIS database.

Fig.1: Location of pilot area (highlighted) used for developing the prototype Cocoa Swollen Shoot Control Management Information System (CoSSCoMIS).

2. OBJECTIVES

The objectives of the assignment were to:

- convert all hard copy cocoa sector and farm area maps to a GIS format
- Digitally harmonize cocoa sector and farm area maps with the 1:50,000 national topographic map series

- Design and develop a prototype GIS database as a data management tool to assist in decision-making concerning resource management of the cocoa swollen shoot viral disease control programme
- Develop capacity within the Cocoa Swollen Shoot Viral Disease Control Unit to convert analogue maps and effectively use the Cocoa Swollen Shoot Control Management Information System (COSSCOMIS) for monitoring the Cocoa Swollen Shoot Viral Disease.

3. NEEDS ASSESSMENT

Prior to the digital conversion of the hard copy cocoa sector and farm area maps a needs assessment for the GIS setup was conducted. This entailed the assessment of existing computer systems and peripherals, inspection of physical structures to determine suitable locations and laboratory space for setting up GIS laboratories at the head office and two out stations, as well as the review of the existing cocoa sector manuscript maps.

4. SECTOR MAP AND ATTRIBUTE DATA CONVERSION

The Cocoa Sector Maps, compiled from chain and compass surveys carried out by Field Survey Assistants using the Survey of Ghana 1:50,000 topographic map series as the base map information. The manuscript Sector Map scale was 1:7,920, enlarged from the Topographic base map. The compilation was initially plotted on a tracing paper enlarged with the mechanical pantograph, and finally traced onto a cartridge or mounted paper manually.

The initial digital conversion of these maps revealed serious discrepancies which required careful editing with reference to the Topographic maps (Fig. 1 and Fig. 2). The output from the digital conversion of these map manuscripts are compared in Fig. 1 and Fig. 2. The map shows serious matching errors, which demanded intensive editing to achieve the standard in Fig. 2.

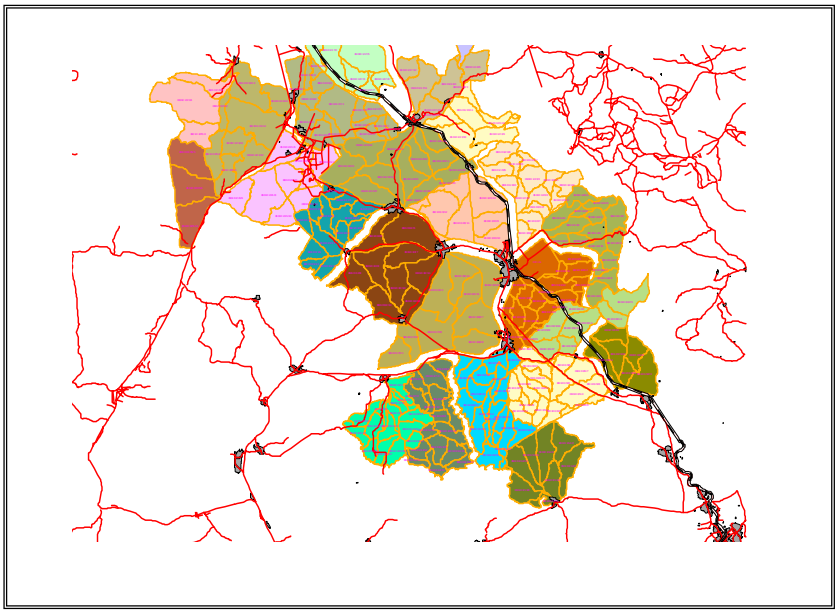


Fig.2: Discrepant sector boundaries for a pilot Cocoa District. Errors (boundary mismatch) accruing from digitizing the old and torn manuscripts of the coco sector maps

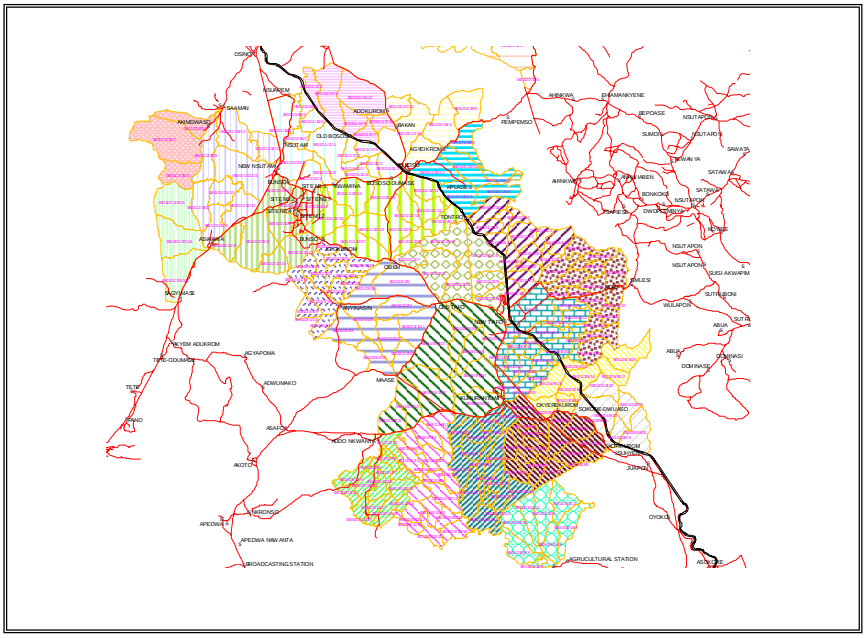


Fig.3: After careful editing the errors of boundary mismatching are eliminated and the output harmonizes with the other linear features

The converted and harmonised cocoa sector maps were overlaid with cocoa farm area boundaries and other georeferenced map/data layers in order to create the necessary synergy that will be used for crop condition assessment.

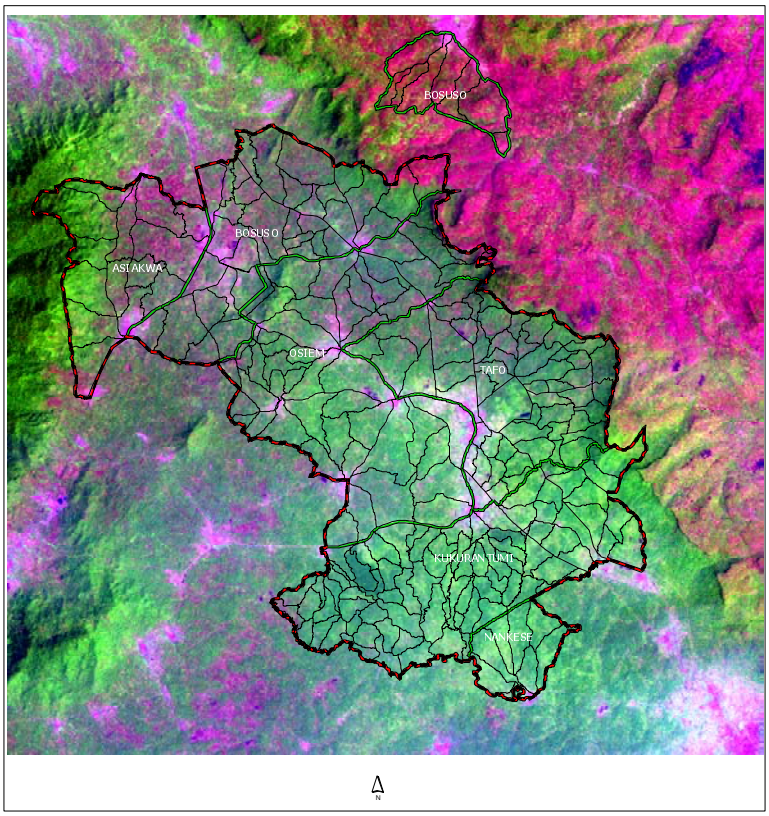


Fig.4: Relating the cocoa sector maps in digital format to satellite images for land cover study of the cocoa landscapes

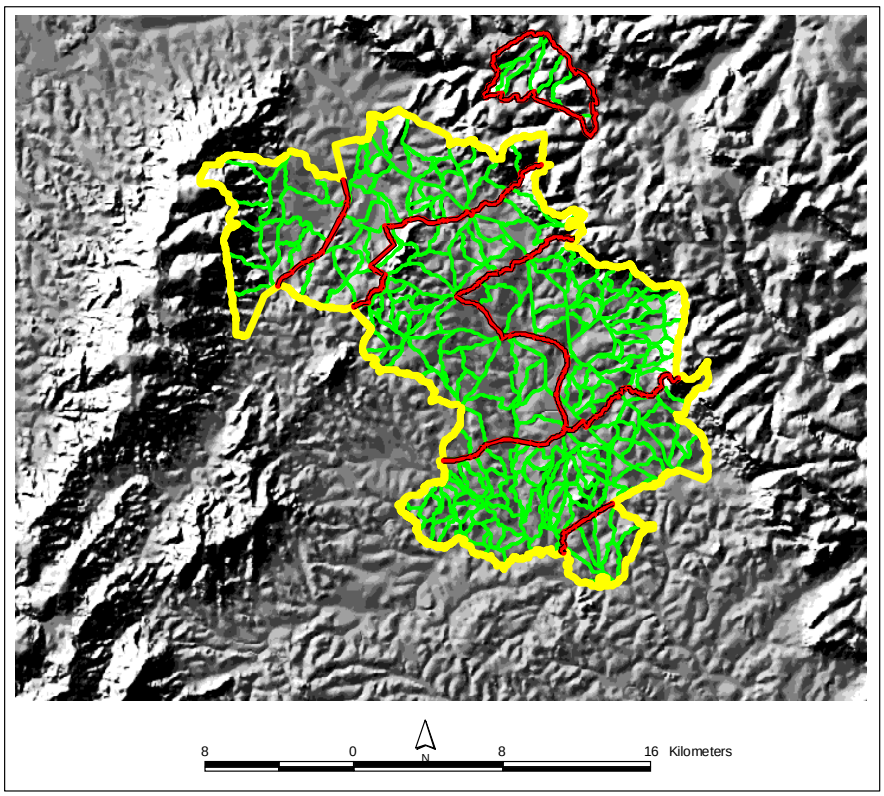


Fig.5: Relating the digitized sector map to the physical landscape – the relief, topography and drainage in order to visualize the watershed function of the cocoa ecosystem.

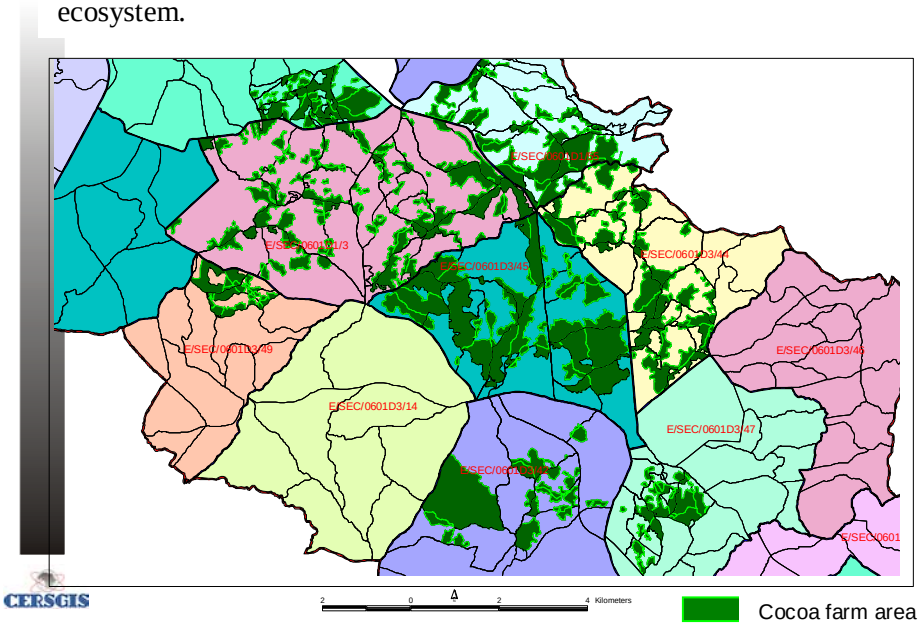


Fig.6: Cocoa farm distribution geo-visualized in relation to the sector maps in order to see sector density.

Attributes for the cocoa farm area layer which included the following were used to generate attribute-based maps for field reconnaissance survey:

- Cocoa type
- Age of farm
- Acreage/ farm condition
- Farm condition
- Occurrence of swollen shoot
- Severity of capsid damage
- Presence of blackpod

The output maps from the spatial analysis provide the required spatial picture for strategic planning of problem-solving interventions.

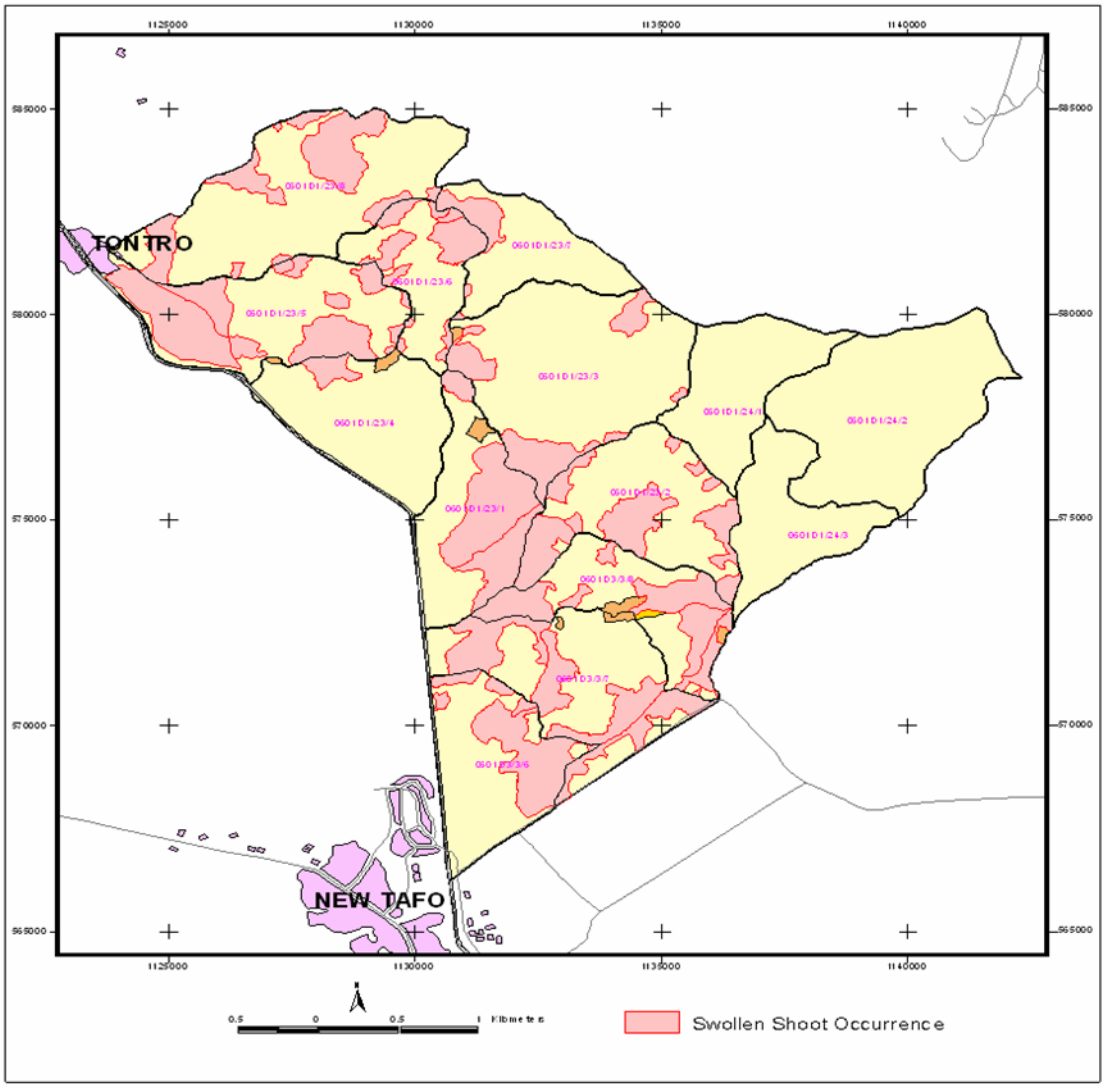


Fig.7: Attribute-based spatial analysis with an output map indicating occurrence of swollen shoot within the pilot area

5. STAFF TRAINING AND CAPACITY BUILDING

Five selected staff from the cartographic section of CSSVDU was trained on-site in computer appreciation, followed by GIS and data management training at CERSGIS, which included intensive hands-on exercises in the CERSGIS GIS laboratory.

Certificated Trainees

Trained participants at work in the CSSVDU (HQ) GIS laboratory

CERSGIS has facilitated the procurement and installation of GIS hard/software at the CSSVDU Head office and is providing technical backstopping to adequately equip the trained personnel for the task ahead.

6. CONCLUSION

So far, the Headquarters Laboratory has been established and is fully operational. Two supporting regional laboratories are also being established. It is expected that the present scope will be up-scaled to include other cocoa production problems (environmental and socio-economic) with a view to promoting integrated and cross-sector planning for not only restoring Ghana's leadership position in world trade in cocoa but rehabilitating the degraded cocoa forest as a close-substitute to the rainforest ecosystem. While CERSGIS is continually providing the technical back-up for sustaining the project, it is also exploring how the scale-up project will be strategized for holistic approach to the cocoa industry as a whole in relation to current environmental and biodiversity issues of the cocoa production in the tropical forest of West and Central Africa.

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