REPORT ON THE SOIL RESOURCES OF GOMOA EAST DISTRICT,
CENTRAL REGION, REGION, GHANA

(CSIR / WAAPP NO. 017)

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Kwadaso, Kumasi

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1.0  INTRODUCTION

1.1  Background

This work provides information on the soil resources of the Gomoa East District. The information is mainly compiled from the detailed reconnaissance soil survey of the Ayensu – Densu Basin by the CSIR- Soil Research Institute (Adu & Asiamah, 1992). The information provided is to assist in the preparation of any development plan for the district and also provide quick information on potential agricultural and other landuse areas upon request by investors.

1.2  Location

The Gomoa East District is located in the Central Region of Ghana. The southern part is bounded by the sea and the Efutu Municipality (Winneba), the west by Gomoa West District, the north by Agona and Awutu Senya District and the east by Awutu Senya District.

Map 1. Location of Gomoa East District
1.3 Objectives

The objective of this work is to

- describe the morphological characteristics of the soils within the district
- assess the suitability to crop production
- map the distribution of the soils

1.4 Method of study

Literature on previous works done in the area was used in the preparation of this report. The information was largely extracted from detailed reconnaissance soil survey of the Ayensu – Densu Basin (Adu & Asiamah, 1992). There were field checks to update the existing information. Soil observations were done along randomly laid transects within each soil association unit as established by Adu and Asiamah (1992). With the aid of contours superimposed on the soil associations, sub-units were established within some of them.

Profile pits were dug and sampled on the major soil units for laboratory analysis.

The soil map was digitized, using the Arc-GIS software.
2.0 THE PHYSICAL ENVIRONMENT

2.1 Climate

The rainfall is generally low along the coast and gradually increases northwards. For example, Winneba has an annual rainfall of about 845mm while Swedru just north of the district has 1195mm. The rainfall is highly variable with annual totals varying from year to year and even the monthly totals also vary from year to year.

The rains generally fall in two seasons. The major rainy season is from March / April to June while the minor season is from September to November. The main dry season is from December to February and a minor one from mid-July to mid-August.

2.2 Vegetation and land use

Broadly, two types of vegetation was identified namely the Moist Semi-Deciduous Forest to the north and the Coastal Savanna to the south. Some places were found to have forest – savanna transition characteristics.

The forest traits are exhibited in areas around Gomoa Afrantse, the District capital. Cocoa plantations are common in this area.

The coastal savanna consists of grassland with scattered patches of thickets.

Farming is the major land use in the district. The major crops grown are cocoa, coconut, oil palm, mango, maize, cassava, plantain, cocoyam, pineapple, water melon and vegetables.

2.3 Relief and drainage

The district falls within the coastal plains. The relief is largely undulating. However, the area is interrupted by a number of hills. The Yenku hills form a broad ridge with a maximum height of 215m. The slopes are generally moderate; but become steep in a few places.

The Togo rocks also give rise to hills along the coast at Nyanyanu and the Senya Beraku area.

The district is drained by the Ayensu river and its tributaries.
Map 2. Relief and drainage
3.0 THE SOILS OF THE DISTRICT

3.1 General

Soils vary in the landscape and also differ by the parent material from which they were developed. In the Gomoa East District, the parent materials from which the soils were developed are granites, Upper Birimian rocks, the Togo rocks, sandstone and river alluvium (Adu & Asiamah, 1992).

The groups of soils or soil associations (Adu and Asiamah, 1992)* that occur over each of the parent materials are listed as follows:

1. Soils developed over granite
   - Adawso – Bawjiase / Nta – Ofin Compound Association
   - Nsaba – Swedru / Ofin Compound Association
   - Simpa – Agawtaw Complex

2. Soils developed over Upper Birimian Rocks
   - Adzintam – Yenku Association
   - Osibi – Bumbi Association

3. Soils developed over Voltaian and Togo Rocks
   - Fete – Bediesi Complex

4. Soils derived from River Alluvium
   - Ayensu – chichiwere Association

*Soil association – see appendix for definition

In the current study, the soil units derived from the field checks and on which the description is based in this report is as follows:

SOILS DEVELOPED OVER GRANITE

1. Adawso – Bawiase Upland Association
2. Nsaba – Swedru Upland Association
3. Nta – Ofin Lowland Association
4. Nyanao
SOILS DEVELOPED OVER UPPER BIRIMIAN ROCKS

5. Yenku Consociation
6. Adzintam – Mankoadzi Association
7. Osibi – Bumbi Association
8. Simpa – Agawtaw Complex

SOILS DEVELOPED OVER TOGO ROCKS

9. Fete – Korle Upland Association
10. Beraku – Krabo

SOILS DEVELOPED FROM RIVER ALLUVIUM

11. Birim – Chichiwere Association

Description of the soils and their suitability for crop production

SOILS DEVELOPED OVER GRANITE

Adawso- Bawjiasi Upland Association

This is the most extensive soil association in the district covering about .......... ha. Major settlements occurring within this soil this unit are Gomoa Dominase, Potsen Nkwanta, Ojobi, Gomoa Amoanda, Gomoa Manso and Gomoa Wasa.

The soils generally occur over undulating topography with slopes of 3 – 8%. Individual soils within this soil association are Adawso, Bawjiasi, Adaiso and Akroso series.** The soils occur on the upland.
Adawso series (Haplic Lixisol – endoskeketic)

Adawso series is a deep (>120 cm), moderately well drained soil. The topsoil is dark grayish brown to brown, loose sandy loam. The underlying subsoil consists of strong brown and red sandy clay, which contains many quartz gravel and few ironstone concretions. Adawso soils are found as middle and lower slope associates of Bawjiasi series but over a great deal of the area in which they occur, they occupy the upper slopes and summits of undulations to the exclusion of the Bawjiasi soils.

A variant of Adawso series, named Adaiso series, consists of pale brown to white excessively drained sandy soil. It is very gravelly and stony throughout the profile and usually contains very little soil matrix. It occurs in association with Adawso series and also found on similar sites.

**soil series – see appendix for definition

Bawjiasi series (Haplic Lixisol)

Bawjiasi series occurs on summits and upper slopes of undulations. The soil is deep (>120 cm) and well drained. The topsoil is grey-brown loamy sand overlying reddish brown sandy or gritty clay subsoil. The subsoil contains many quartz gravel and sometimes few ironstone concretions.

Agricultural suitability: Adawso and Bawjiasi series

Adawso and Bawjiasi series are the most extensive soils in the district. Because they originate from the granite, they are light to medium textured. The soils are deep and have good drainage. Their limitation is the gravelly subsoil, which reduces the soils’ capacity to hold moisture for an appreciable period making it easily droughty at the onset of any drought. Nutrient holding capacity is also affected. However, these limitations can be ameliorated by application of organic manure, mulching, cover cropping. Inorganic fertilizer application in combination with the organic manure will yield very good results.

The sandy topsoils are susceptible to erosion and will require prevention measures.

The soils can be grown to a wide range of climatically suited crops like maize, cassava, cowpea, groundnuts, vegetables, pineapple, coconut, mango etc.

Due to the generally low rainfall, irrigation will be necessary for any crop of high economic returns.
Nsaba – Swedru Association

This soil association occurs on gentle undulations or gently rolling topography. The soils of this association consist of Swedru, Nsaba and Akroso series.

Swedru series
Swedru series are deep, well drained soils which occur on nearly flat summits and gently to moderately steep upper slopes. They are developed over biotite schists weathered fragments. The surface horizons consist of grey-brown clay loam and overlie red clay subsoil containing moderate amounts of quartz and ironstone gravel.

Nsaba series
Nsaba series comprises the brown less well-drained associate of Swedru series occurring at lower elevations of the slopes of hills and undulations.
Locally, Swedru and Nsaba series may be very gritty or gravelly and this may be due to the presence of abundant quartz veins in the profile.

**Akroso series (Gleyic Lixisol)**

*Akroso series* is a hillwash soil found in drainage grooves and on the middle to lower slopes of small valleys in a position above Nta series in the catena. The soil is deep (> 120 cm) and free of concretions and gravels.

The topsoil is dark grayish brown sandy loam about 16 cm thick. It is friable with moderate fine granular structure. The underlying subsoil is yellowish brown to brownish yellow loamy sand to a depth of 68 cm with weak fine granular structure. Below 68 cm the texture becomes sandy clay loam with moderate medium subangular blocky structure. From 95 cm, the profile consists of faint brownish yellow mottles.

*Nta and Ofin series also occur in the valleys of this soil association. These soils have been described under Adawso – Bawjiase / Nta – Ofin Compound Association.*

**Agricultural suitability: Nsaba – Swedru Association**

The agricultural use of Nsaba-Swedru Association is as described for Adawso-Bawjiase / Nta-Ofin Compound Association.
Nta – Ofin Association

Nta series (Gleyic Arenosol)

Nta soils are developed in the transported medium to coarse sands occurring in the upper and middle parts of drainage grooves and on the lower slopes of small valleys. This soil is characteristically sandy. The soil is moderately deep to deep, imperfect to poorly drained. It consists of dark brown, loamy sand with a granular structure in the topsoil. The underlying subsoil is pale brown coarse sand with single grain loose structure. It is faintly mottled yellowish brown.

Ofin series (Fluvisol)

Ofin series occurs within the flat but narrow valley bottoms. It is a deep, poorly drained grey alluvial sand, which overlies a varying amount of stream gravel.
Agricultural suitability: Nta and Ofin series

Nta soils are characteristically sandy. As a result they are easily droughty and rapidly become impoverished. Under low rainfall conditions perennial tree crops are marginal. They can be used for annual and semi-perennial food crops. However, the soil will require adequate manuring and fertilization for good yields.

Ofin soils are waterlogged and often flooded during the wet seasons and dry out rapidly at the onset of the dry season. It is sandy like Nta soils and therefore low in plant food. Since it is close to the stream course its use for agricultural purpose should be done with great caution.

Nyanao [Lithic Leptosol]

Nyanao soils are found on the summits and slopes of rocky inselbergs and small rocky hillocks. It is a skeletal soil developed over various types of granitic rocks in which humous horizon directly overlies solid rock, rock brash or little-weathered bedrock. This rocky unit is very common between Potsen Nkwanta and Akotsi.

Economic potential of Nyanao soil unit

Agriculturally, Nyanao soils are not suitable. However they have great potential for quarry development. In this current era of fast growth and development, particularly in the construction industry, the rocks are a great asset as rock chippings and quarry dust. If left without control or direction, this unit may be sold out by land owners for building purpose. To avoid future conflict in terms of quarries being close to residential houses, the District Assembly could take steps to acquire these rocky lands and ensuring adequate buffer is created with residential buildings. This is urgent, considering the fast expansion of Accra close to these areas.
SOILS DEVELOPED OVER UPPER BIRIMIAN ROCKS

The Upper Birimian rocks consist predominantly of volcanic lavas, schists, phyllites and greywackes with minor intrusions of granite.

The upland soils developed over the upper Birimian rocks consists of Yenku, Adzintam and Mankoadzi series while the lowland consists of Osibi, Bumbi and Tachem series. These soils occur around Gomoa Mangoase, Oguakrom, Abongi and the Yenku Forest Reserve. They been further delineated into sub-units described as follows:

Yenku series [Lithic Leptosol]

*Yenku series* is a shallow soil which occurs on the summit of the few isolated hills of the area. Rock boulders and outcrops occur on some of the summits. The soil is well drained and consists of about 10 cm thick dark brown loam topsoil overlying a reddish brown fine sandy clay loam subsoil containing few to many pieces of decomposing rock.

Yenku soils are shallow with inadequate rooting room for plant development. *Yenku soils are shallow and unsuitable for cultivation.*
**Adzintam series (Haplic Lixisol)**

Adzintam series are red, well drained, clay loams to clays found on the upper to middle slope sites of low hills within the area. The profile consists of dark reddish brown loam topsoil, which overlies reddish brown to red clay loam and silty clay containing many quartz gravel and stones. Ironstone concretions occur deep in the profile. The profile depth is over 140 cm.

**Mankoadzi series**

*Mankoadzi series* has similar profile characteristics as Adzintam series except for colour. It is therefore considered as the middle slope associate of Adzintam series. It is moderately well drained consists of dark brown loam topsoil overlying dark brown to reddish brown loam to clay subsoil containing many quartz gravel and stones and many ironstone concretions.

**Agricultural suitability: Yenku, Adzintam and Mankoadzi series**

Adzintam and Mankoadze series are deep, medium-textured, well drained soils with satisfactory moisture-holding capacity. Due to the gravelly subsoil and low rainfall of the area, they are liable to become droughty in prolonged dry seasons.

With adequate water supplies and fertilizers, the soils may be grown to a wide range of crops including maize, cassava, vegetables, pineapple etc.
Osibi - Bumbi Association

**Osibi series (Vertic Luvisol; Vertisol)**

*Osibi series* occurs on very gently undulating land and on lower slope to wide valley bottom sites with gradients generally from 0 – 2%. The soil is poorly drained, very dark grey to olive brown almost plastic clays. The profile consists of 0 – 13 cm very dark grey loam or clay loam topsoil, which overlies light olive brown clay with few ironstone and manganese dioxide concretions to a depth of about 150 cm. At some locations, the bedrock could be reached at 60 cm.

<table>
<thead>
<tr>
<th>Hor</th>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap</td>
<td>0-15</td>
<td>Dk reddish brown; silt loam; friable</td>
</tr>
<tr>
<td>Btc1</td>
<td>15-40</td>
<td>Reddish brown; silty clay; subangular blocky; common medium gravel</td>
</tr>
<tr>
<td>Btc2</td>
<td>40-60</td>
<td>Yellowish red; silty clay; subangular blocky; common angular gravel</td>
</tr>
<tr>
<td></td>
<td>60-85</td>
<td>Yellowish red; silty clay; subangular blocky; many angular blocky</td>
</tr>
<tr>
<td></td>
<td>85-120</td>
<td>Yellowish red; silty clay loam; sub angular blocky; many coarse angular gravel</td>
</tr>
</tbody>
</table>
Bumbi series (Gleyic Vertisol; Luvic Gleysol)

_Bumbi series_ occurs within depressions and wide flat valley bottoms. The soil is poorly drained. The topsoil consists of black loam, which overlies very dark grey clay, slightly mottled olive brown subsoil containing few manganese dioxide concretions. The soil is deep with depth of over 150 cm.

Tachem series (Luvic Gleysol)

_Tachem series_ consists of poorly drained grayish brown cracking clays with prominent dark reddish brown mottles. They occur on low valley slopes and within wide nearly flat valley bottom under short grass or coastal thicket vegetation. The profile consists of 0 – 15cm of very dark grey or black clay overlying, from 15 – 30cm, brown or dark brown clay. Below this depth occur light brownish grey or grayish brownish clay extending downwards to a depth of 50 – 90cm. The layer below, up to 120cm, consists of grey or brown prominently mottled red cracking clay with occasional manganese dioxide and rare polished ironstone concretions.

**Agricultural suitability: Osibi, Bumbi and Tachem series**

(Console: Osibi, Bumbi and Tachem series, because of the very heavy clay, have slow internal drainage, slow run-off, slow permeability and high water-holding capacity. They are waterlogged, or partly flooded in the rainy seasons and become very dry and hard in prolonged dry seasons. The clay mineral is the 2:1 type (montmorillonite) with soil reaction (pH) being moderately acid to near neutral (pH 5.6 – 6.5).

Due to the heaviness of the soil, it is difficult to work. If it is drained and irrigated the soils are considered very good for rice, sugar cane and vegetables.
Simpa – Agawtaw Complex (Haplic Solonetz)

The topography of this soil unit is very gently undulating and slopes in most areas are less than 3 percent. Well defined stream courses are few and valleys are broad and wide. The major soils are Simpa and Agawtaw series. They are developed over Dahomean acid schists and gneisses. The major upland soil is Simpa series which consists of pale-coloured sand overlying gravelly sandy loam to sandy clay. The major lowland soil is Agawtaw series and consists of grey brown compact sodic hard pan sometimes calcareous clays. The topographic relationship is not simple. Patches of Adawso series may be found within the Simpa areas while Nta series may also occur within the Agawtaw areas.

Agricultural suitability: Simpa and Agawtaw series

The soils in this complex are little cultivated at present but large areas could be mechanically cultivated (Adu & Asiamah, 1992). Cassava is mostly grown on the Simpa soils sometimes intermixed with yams, maize, cocoyams, groundnuts, sorghum, millet, bambara beans, suitable pulses etc. Irrigation will very much increase crop production on this soil unit. However, it is worth mentioning that as a result of the urban sprawl from Accra just limited space is left of this soil unit. It is virtually covered by residential buildings.

SOILS DEVELOPED OVER VOLTAIAN AND TOGO ROCKS

Fete – Bediesi Complex

This soil unit is a complex because the soils are developed from two different parent materials namely the Togo rocks and the Voltaian sandstone (Adu and Asiamah, 1992). The soils developed over the Togo rocks consist of Fete – Krabo Simple Association and over the Voltaian sandstone is the Bediesi – Bejua Simple Association. However, in the Gomoa East District, the soils are largely developed over the Togo Rocks and therefore the soils described are those.
**Fete – Korle Upland Association**

The constituent soils of this association are Korle, Fete, Mamfe, Oyarifa, Beraku and Krabo series.

**Korle series (Haplic Leptosol)**

Korle series are shallow soils occurring over small and low hills. The soils consist of red, well drained, clay loams which contain brashy and softish Togo quartzite schist at a shallow depth.

**Fete series (Haplic Leptosol)**

Fete series is excessively drained and consists of a shallow sandy topsoil, often containing small pieces of rock, merging directly into pale grey-brown to pale yellowish brown sand, sandy loam or sandy clay loam containing abundant pieces of rock. The pieces of rock can either be sandstone or hard quartzite.

**Agricultural suitability: Korle and Fete series**

*Korle and Fete soils are shallow soils found on hills are shallow soils that are not suitable any meaningful agriculture.*
Mamfe series (Haplic Lixisol)

*Mamfe series* comprises red concretionary clays occurring on gentle to moderate upper slopes on the Togo range summit. The topsoil consists of dark grayish brown sandy loam or clay loam, often including a moderate amount of ironstone and quartz gravel. The underlying subsoil from 15 – 30 cm is brownish red to red clay loam or clay full of ironstone concretions and varying amounts of quartz stones and gravel. The profile continues deep to over 120 cm. Beyond 60 cm the profile is red and often mottled yellow with decomposed rock.

**Agricultural suitability: Mamfe series**

Mamfe series are deep soils suitable for crop production. However, Mamfe soils are limited by their gravelly subsoil, which make them suitable for only hand cultivation.

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Beraku – Krabo Lowland Association

Beraku series

*Beraku series* comprises seasonally ill-drained pale-coloured sands occurring on gentle lower slopes and developed in slopewash.

The topsoil consists of about 15 cm of dark grey-brown to dark brown sandy loam, which overlies grey-brown or brown sandy loam which becomes slightly mottled yellow-brown below 45cm depth. Towards the base of the profile a layer of quartz gravel may be encountered. Locally, seepage ironpan could also be encountered at the base of the profile but normally below 45 cm.

Krabo series (Haplic Arenosol)

*Krabo series* comprises grey-brown, silty clay valley bottom soils associated with Beraku series.

The topsoil consists of dark grey brown, silty loam. This is underlain by grey-brown faintly mottled yellow or brown silty loam to silty clay.
Krabo soils are waterlogged and periodically flooded during the rainy seasons, but dry out during the dry season except near semi-perennial streams.

**Agricultural suitability: Beraku and Krabo series**

Beraku and Krabo soils occur in the valley and so are susceptible to periodic waterlogging. They could be used for large scale agricultural production if drainage is controlled.

<table>
<thead>
<tr>
<th>Krabo (Haplic Arenosol)</th>
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<tbody>
<tr>
<td><strong>Hor</strong></td>
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<tr>
<td>Ap</td>
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<tr>
<td>AC</td>
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<td>C</td>
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<td>C</td>
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</tbody>
</table>
SOILS DERIVED FROM RIVER ALLUVIUM

Ayensu – Chichiwere Association

Soils in this association are distributed along the Ayensu river. They comprise old terrace soils (Birim and Awaham series); the actual floodplains (Densi series) and the river levee soils (Kakum and Chichiwere series).

Birim and Awaham series

These soils occur at areas towards the outer edges of the Ayensu floodplain where they occur as remnants of the river terrace now a few metres above the present floodplain.

Birim series consists of dark brown fine sandy loam topsoil overlying reddish brown or yellowish red sandy clay which at depth becomes gritty and mottled red or pinkish grey. Since it is alluvial in origin, the profile is variable in texture.

Where river pebbles are abundant in the profile and close to the surface, the soil is known as Awaham series.

Agricultural suitability: Birim and Awaham series

Birim series are moderately well-drained and are presently rarely flooded. They are deep and easy to work with machines because they are free of gravel and stones to considerable depth in the profile. The soils have moderately slow internal drainage, slow to medium surface runoff, moderate permeability and good moisture storage capacity. The soil is suitable for a wide range of tree and arable crops.

Awaham series are too shallow and pebbly and so are unsuitable for agriculture.

Densi series

Densi series occur on the broad flat alluvial floodplain of the Ayensu river. They are poorly to very poorly drained grey clays. The soil exhibits several layers of different periods of deposits. The topsoil is very dark greyish brown loam overlying greyish brown clay loam and light brownish grey clay loam with yellowish red mottles.
Kakum series

*Kakum series* occur as alluvial levees along the Ayensu river. They are deep, moderately to imperfectly drained yellowish brown to brownish yellow alluvial sandy loams to clay loams.

The profile consists of greyish brown to pale brown sandy loam topsoil. The underlying subsoil is yellowish brown sandy loam to sandy clay loam and clay loam. From 45cm, the soil is mottled yellow to a depth of about 120 cm.

Chichiwere series

*Chichiwere series* consists of very deep, pale brown or yellowish brown, fine sand developed in the Ayensu levee. They are found in small patches where the river has sorted the material carried in suspension at high floods and deposited mostly sand. The texture of these soils vary from sand to loamy sand but may occasionally be sandy loam further away from the river.

**Agricultural suitability: Densu, Kakum and Chichiwere series**

*Densu and Kakum series* are subject to flooding. The soils have slow internal drainage, very slow surface run-off, very slow permeability and a high water-holding capacity within the subsoils where clay content is more than 30%.

The development of these soils require drainage and irrigation to ensure high yields of rice, sugar cane and vegetables.

*Chichiwere series* is sand and so has rapid internal drainage. The soil dries out rapidly. The sites are recommended for nurseries and vegetable growing.
Map 3. Spatial distribution of the soils and their description
LAND EVALUATION

Introduction

The soils of Gomoa East District are evaluated for the production of crops predominant in the area. The crops include maize, cassava, cucumba, plantain, pineapple, cocoa, oil palm, coconut. The FAO Framework for Land Evaluation (FAO, 1976) and Guidelines for Land Evaluation for Rainfed Agriculture (FAO, 1984) were adopted for the assessment. Evaluation of the land (soil) units is based on major land/soil characteristics derived from the soil investigations. These are rockiness, soil depth, texture, drainage, graveliness and slope. The observed soil parameters of the major soils in each soil unit are matched against rated land characteristics for crop production.

The Evaluation Process
The evaluation process involves a first order, which is the highest level of classification, indicating whether the land or soil unit is suitable or not suitable and these are represented by the letters S (suitable) and N (not suitable).

There are different classes of suitability which indicate the degree of suitability and are indicated as follows: S1 – highly suitable, S2 – moderately suitable, S3 – marginally suitable, N1 – currently not suitable and N2 – permanently not suitable. S1 (highly suitable) has little or no limitation to the intended land use. S2 (moderately suitable) has moderately severe limitations that can be corrected or managed at a moderate acceptable cost for a reasonable crop yield.

The limitations increase in severity from S3 to N2 with corresponding increase and unacceptable cost of amendments (definitions in Appendix 4d).

The types of limitations, which are referred to as Land Suitability Subclasses, indicate the kind of limitation, therefore the main improvement measures required to upgrade the productivity of the soils. They are represented by lower case letters. For this study the following subclasses were used in the evaluation to reflect the kind of limitations associated with the mapping units.

- **w**: wetness (drainage class and flooding hazard indicative of oxygen availability)
- **d**: shallow depth (<30 cm) – rooting condition
- **s**: soil texture (moisture retention and workability)
- **c**: coarse fragment (concretions, gravel)
- **r**: rockiness
- **t**: topography (slope)

*The definitions of the suitability orders and classes (FAO, 1983) are presented in Appendix III.*
<table>
<thead>
<tr>
<th>Land Characteristics</th>
<th>Class, degree of limitation and rating scale</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>S1*</td>
</tr>
<tr>
<td><strong>Topography(t)</strong></td>
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<tr>
<td>Slope (%)</td>
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<td>0 - 4</td>
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<td>4 – 8</td>
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<td>&gt;16</td>
<td></td>
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<tr>
<td><strong>Wetness (w)</strong></td>
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<tr>
<td>Drainage</td>
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<tr>
<td>Well drained</td>
<td></td>
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<tr>
<td><strong>Physical soil characteristics</strong></td>
<td></td>
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<tr>
<td>Surface texture (s)</td>
<td></td>
</tr>
<tr>
<td>SL, SiL, L, SiCL**</td>
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<tr>
<td>Coarse fragment % (c)</td>
<td></td>
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<tr>
<td>&lt;3</td>
<td></td>
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<tr>
<td>Soil depth (cm) (d)</td>
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<tr>
<td>&gt;120</td>
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</tbody>
</table>

*S1 - Highly suitable; S2 - Moderately suitable; S3 - Marginally suitable; N1 - Currently not suitable; N2 - Permanently not suitable

**SL - sandy loam, LS - loamy sand, SiL - silty loam, SiCL - silty clay loam, SiC - silty clay, L - loam, CL - clay loam,

SCL - sandy clay loam, SC - sandy clay, C - clay, L - sand

Table 2a. Ratings for landscape and soil characteristics of the soil units for crop production (granitic rocks)

<table>
<thead>
<tr>
<th>Soil unit/ Crops</th>
<th>Texture</th>
<th>Effective depth (cm)</th>
<th>Topsoil 0-20 cm</th>
<th>Subsoil 20-50 cm</th>
<th>Drainage</th>
<th>(Coarse fragments) gravel and concretions</th>
<th>Topography/ slope (%)</th>
<th>Limitations to crop</th>
<th>SSC*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adawso - Bawjiase</strong></td>
<td>&gt;120</td>
<td>S1</td>
<td>SL, S1</td>
<td>SiL, SCL, S1</td>
<td>Well / Moderate S1 – S2</td>
<td>Many (25%) S3</td>
<td>5 – 8 S2</td>
<td>Graveliness</td>
<td>S3c</td>
</tr>
<tr>
<td><strong>Nsaba - Swedru</strong></td>
<td>&gt;120</td>
<td>S1</td>
<td>SiL, SL</td>
<td>SiCL, SCL, S3</td>
<td>Well / Moderate S1 – S2</td>
<td>Many (25%) S3</td>
<td>5 – 8 S2</td>
<td>Graveliness</td>
<td>S3c</td>
</tr>
<tr>
<td><strong>Nta - Ofin</strong></td>
<td>&gt;120</td>
<td>S1</td>
<td>LS, S3</td>
<td>LS, S1</td>
<td>Poor S3</td>
<td>Nil S1</td>
<td>1 – 3 S1</td>
<td>Sandy texture; Poor drainage</td>
<td>S3ws</td>
</tr>
<tr>
<td><strong>Nyanao</strong></td>
<td>&lt;20</td>
<td>N</td>
<td>SL, S1</td>
<td>Rocky</td>
<td>Well S1</td>
<td>8 – 16 S3</td>
<td>Shallow depth with rock outcrops</td>
<td>Nr</td>
<td></td>
</tr>
<tr>
<td><strong>Simpa - Agawtaw</strong></td>
<td>&lt;120</td>
<td>SL</td>
<td>SCL / Compact</td>
<td>Moderate / Poor</td>
<td>Many / Nil</td>
<td>8 – 16 S3</td>
<td>Gravelly upland; Hard subsoil clay</td>
<td>S3ws</td>
<td></td>
</tr>
</tbody>
</table>
**SSC* – Soil suitability classification**

### Table 2b. Ratings for landscape and soil characteristics of the soil units for crop production (Upper Birimian rocks)

<table>
<thead>
<tr>
<th>Soil unit/ Crops</th>
<th>Texture</th>
<th>Effective depth (cm)</th>
<th>Topsoil 0-20 cm</th>
<th>Subsoil 20-50 cm</th>
<th>Drainage</th>
<th>(Coarse fragments) gravel and concretions</th>
<th>Topography/slope (%)</th>
<th>Limitations to crop SSC*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yenku</td>
<td></td>
<td>&gt; 30</td>
<td>S1, S1</td>
<td>rocky</td>
<td>Well / Moderate S1 – S2</td>
<td>Many (25%) S1 – S2</td>
<td>8 - 16 S3</td>
<td>Shallow depth; Graveliness; topography Nrc</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50</td>
<td>SL, SL</td>
<td>SiL, CL</td>
<td>Well / Moderate S1 – S2</td>
<td>Many (25%) S1 – S2</td>
<td>5 – 8 S2</td>
<td>Graveliness; Effective depth S3dc</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;120</td>
<td>L, CL</td>
<td>C</td>
<td>Poor</td>
<td>Nil</td>
<td>1 – 3 S1</td>
<td>Clay texture; Poor drainage S3ws</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50</td>
<td>S1, S3</td>
<td>C</td>
<td>Poor</td>
<td>Nil</td>
<td>1 – 3 S1</td>
<td>Clay texture; Poor drainage S3ws</td>
</tr>
</tbody>
</table>

### Table 2c. Ratings for landscape and soil characteristics of the soil units for crop production (Togo rocks / River Alluvium )

<table>
<thead>
<tr>
<th>Soil unit/ Crops</th>
<th>Texture</th>
<th>Effective depth (cm)</th>
<th>Topsoil 0-20 cm</th>
<th>Subsoil 20-50 cm</th>
<th>Drainage</th>
<th>(Coarse fragments) gravel and concretions</th>
<th>Topography/slope (%)</th>
<th>Limitations to crop SSC*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fete – Korle</td>
<td></td>
<td>&gt; 30</td>
<td>SiL, S1</td>
<td>Excessive</td>
<td>Many (25%) S1 – S3</td>
<td>8 - 16 S2</td>
<td>Shallow depth; graveliness S3dc</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50</td>
<td>SL, S1</td>
<td>LS, S</td>
<td>Imperfect to poor S3</td>
<td>1 – 3 S2</td>
<td>Poor drainage; Sandy texture S3ws</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;120</td>
<td>L, SL, S</td>
<td>S1 – S3</td>
<td>Imperfect / Poor S3</td>
<td>Nil S1</td>
<td>1 – 3 S1</td>
<td>Sandy texture; Poor drainage S3ws</td>
</tr>
</tbody>
</table>
From Tables 2a – c, four groups of suitability subclasses are derived from the soil units. They are,

1. **Marginally suitable soils highly gravelly in their subsoils**. Adawso - Bawjiase and Nsaba – Swedru constitute this group and are the good agricultural soils in the District. They occur over undulating topography with slopes of 5 – 12% which make them highly susceptible to erosion. Erosion prevention measures are very important not only on farmlands but also in settlements sited on this group of soils. The gravelly subsoil may have the tendency of making the soil easily droughty during the dry season and at any relatively short dry spell at the beginning of the rainy season. However, the organic matter content if improved, would increase the moisture holding capacity of the soils. This unit is suitable for a variety of crops. The northern part which consists of forest, is cultivated to crops like cocoa, oil palm, citrus, avocado pear, pineapple, plantain, maize, cassava, vegetable. The southern part which is part of the coastal savanna is also cultivated to mangoes, pineapple, cucumba, maize, cassava, pawpaw and all kinds of vegetables.

2. **Marginally suitable soils that are sandy or heavy clay and poorly drained**. Soil units in this group are Nta – Ofin, Simpa – Agawtaw, Osibi – Bumbi, Beraku – Krabo and Birim – Chichiwere. They occur over lowlands, flood plains and valley bottoms on nearly flat terrain of 1 – 3%. Most of the unit is subject to seasonal flooding. The cultivation of such areas should be timed such that crop growth would avoid the peak of the rains when flooding occurs. They are also often used for dry season vegetables normally started at the end of the rainy season in October. Some areas which are not flooded could be cultivated in the rainy season. Due to the deposit of alluvial sands in some of the lowlands, sand winning is common with serious excavation of some areas of this unit.

3. **Marginally suitable soils having shallow depth and high amount of gravel**. Soil units found in this group are Adzintam – Mankoadze and Fete – Korle. They occur over
moderately steep (8 – 16% slope) isolated hills. The soils are generally shallow and skeletal, containing rock brashes and quartz gravel. Patches of moderately deep, well drained soils may occur within the unit. The soils are suitable for shallow rooted crops such as maize, cucumba, pineapple and vegetables.

4. **Non-suitable soils having very shallow depth and rock outcrops / boulders.** This group consists of Nyanao and Yenku soil units which are normally rocky and occur over hill summits. Nyanao soil unit is quite extensive with the potential of quarry establishment on it particularly between Potsen and Akotsi.
4.0 CONCLUSIONS

Generally, the soils of the district are moderately suitable for agriculture. They are deep with medium-textured subsoil. There are only few areas of shallow soils. Most of the soils have sandy topsoil, which make them susceptible to erosion. Erosion prevention measures are important in the cultivation of the soils. Practices such as cover cropping, mulching, avoidance of burning etc., to protect the topsoil are very useful.

Slopes are gentle over most of the soil units which make them suitable for mechanized agriculture in many areas.

Due to intense agricultural use of the land, the soils are infertile and would require good management practices to improve upon the fertility for good crop yields.

Rainfall is generally low and for any commercial agricultural venture irrigation is recommended.

Nyanao soil unit which consists of granitic outcrops and boulders have the potential of quarry development. At the same time residential settlements are fast expanding into these areas. Considering the economic importance which would go far into the future, it is recommended that government (the District Assembly) acquires such areas and ensuring a sufficient buffer to avoid potential conflict between residential houses and future quarry establishments.
GENERAL OBSERVATIONS

1. Farming is the major economic activity. Major commercial crops - pineapple, mango, coconut, cocoa. Food crops – maize, cassava, plantain

2. Settlement expansion particularly in areas to the east which are closer to Accra. For example the Simpa - Agawtaw soil unit is almost covered by settlement. Proper physical planning is required

3. The extent of granitic rocks (Nyanao soil unit) is quite significant. This is important as a resource for quarry rocks in the construction industry

4. There is a beautiful beach which can be developed into resort

Reference

Appendix

1. Soil series and Soil association

The landscape consists of many individual soils which differ by the parent material from which they were formed and also by their physiographic position (summit, upper, middle and lower slopes and valley bottom). The individual soil is known as soil series. Soil series are defined as soils with similar profile morphology derived from similar parent materials under similar conditions of climate, vegetation, relief and drainage.

Where the soil series (individual soils) are combined into larger assemblages for mapping purposes they are known as soil associations. This is defined as a group of soil series formed from related parent materials and possessing a similar profile morphology but differentiated by relief and drainage. Thus, the soil map produced for this work is on soil association.
2. Profile descriptions

Profile description of Adzintam series

<table>
<thead>
<tr>
<th>Location</th>
<th>Osamkrom</th>
<th>Lat</th>
<th>$05^o 28' 49.6''N$</th>
<th>Long</th>
<th>$00^o 40' 51.3''W$</th>
<th>District</th>
<th>Gomoa East</th>
<th>Region</th>
<th>Central</th>
<th>Date</th>
<th>7th May, 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent Material</td>
<td>Soil series</td>
<td>Adzintam</td>
<td>Classif</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physiographic position</td>
<td>Summit</td>
<td>Landform</td>
<td>Undulating</td>
<td>Slope</td>
<td>3%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Veget</td>
<td>Dense shrub cover</td>
<td>Land use</td>
<td>Fallow</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drainage</td>
<td>well</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td>Description</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ap</td>
<td>0 - 15</td>
<td>Dark reddish brown (Syr 3/4), silt loam; weak fine sub-angular blocky; hard (dry), friable (moist), slightly sticky, slightly plastic; few fine angular quartz gravel; common very fine roots; gradual and smooth boundary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Btc1</td>
<td>15- 40</td>
<td>Reddish brown (Syr 5/4); silty clay; moderate fine subangular blocky;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Profile description of Swedru series

<table>
<thead>
<tr>
<th>Location</th>
<th>Afrantse</th>
<th>Lat</th>
<th>05° 31’ 25.5”N</th>
<th>Long</th>
<th>00° 44’ 57.5”W</th>
</tr>
</thead>
<tbody>
<tr>
<td>District</td>
<td>Gomoa East</td>
<td>Region</td>
<td>Central</td>
<td>Date</td>
<td>10th May, 2012</td>
</tr>
<tr>
<td>Parent Material</td>
<td>Granite</td>
<td>Soil series</td>
<td>Swedru</td>
<td>Classif</td>
<td></td>
</tr>
<tr>
<td>Physiographic position</td>
<td>Upper</td>
<td>Landform</td>
<td>Undulating</td>
<td>Slope</td>
<td>3%</td>
</tr>
<tr>
<td>Veget</td>
<td>Forb regrowth</td>
<td>Land use</td>
<td>Fallow / cassava nearby</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drainage</td>
<td>well</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap</td>
<td>0 - 10</td>
<td>Dark reddish brown (5yr 3/4), silt loam; weak fine sub-angular blocky; friable (moist), slightly sticky, slightly plastic; many very fine, few medium roots; clear and smooth boundary</td>
</tr>
<tr>
<td>Bcs1</td>
<td>10- 30</td>
<td>Reddish brown (5yr 4/4); sandy loam; loose (structureless); abundant medium quartz gravel and few ironstone concretions; few very fine</td>
</tr>
</tbody>
</table>
and few medium roots; clear and smooth boundary

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bcs2</td>
<td>30 - 50</td>
<td>Yellowish red (2.5yr 4/6); sandy loam; loose (structureless); many medium, few coarse gravel; many ironstone concretions; very few very fine, few medium roots; clear and smooth boundary</td>
</tr>
<tr>
<td></td>
<td>50 - 80</td>
<td>Red (2.5yr 5/8); silty clay loam; weak medium sub angular blocky; firm; many fine and coarse gravel; many ironstone concretions; very few very fine roots; clear and smooth boundary</td>
</tr>
<tr>
<td></td>
<td>80 – 110+</td>
<td>Red (2.5yr 5/8); clay; moderate medium subangular blocky; firm; few fine quartz gravel; common ironstone concretions</td>
</tr>
<tr>
<td>Horizon</td>
<td>Depth (cm)</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>2A</td>
<td>30 - 45</td>
<td>Brown (10yr 4/3); sandy clay loam; weak medium granular to weak subangular blocky; firm, sticky, plastic; few very fine roots; clear and smooth boundary</td>
</tr>
<tr>
<td>Btcs1</td>
<td>45 - 70</td>
<td>Strong brown (7.5yr 5/6); silty clay loam; structureless, loose; abundant medium quartz gravel; common ironstone concretions; clear and smooth boundary</td>
</tr>
<tr>
<td>Btcs2</td>
<td>70 – 100+</td>
<td>Yellowish red (5yr 5/8); silty clay loam; weak medium subangular blocky; many medium and coarse quartz gravel; common ironstone concretions</td>
</tr>
</tbody>
</table>

Profile description of Krabo series

<table>
<thead>
<tr>
<th>Location</th>
<th>Gomoa Fete</th>
<th>Lat</th>
<th>05° 26’ 3.3”N</th>
<th>Long</th>
<th>00° 29’ 5.4”W</th>
</tr>
</thead>
<tbody>
<tr>
<td>District</td>
<td>Gomoa East</td>
<td>Region</td>
<td>Central</td>
<td>Date</td>
<td>8th May, 2012</td>
</tr>
<tr>
<td>Parent Material</td>
<td>Colluvio-alluvium</td>
<td>Soil series</td>
<td>Bawjiase</td>
<td>Classif</td>
<td></td>
</tr>
<tr>
<td>Physiographic position</td>
<td>Lower</td>
<td>Landform</td>
<td>Undulating</td>
<td>Slope</td>
<td>2 - 3%</td>
</tr>
<tr>
<td>Veget Land use</td>
<td>Fallow and excavations for sand wining</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drainage</td>
<td>Imperfect / excessive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ap</td>
<td>0 - 15</td>
<td>Dark grey (10yr 4/1), sandy loam; weak fine granular; friable, non-sticky, non-plastic; many very fine, many fine roots; clear and smooth boundary</td>
</tr>
<tr>
<td>AC</td>
<td>15- 40</td>
<td>Yellowish brown (10yr 5/4); sand; weak fine granular; friable, non-sticky, non-plastic; many fine, very few coarse roots; clear and smooth boundary</td>
</tr>
<tr>
<td>C</td>
<td>40 - 60</td>
<td>Yellowish brown (10yr 5/6); sand; structureless, loose; common fine roots; clear and smooth boundary</td>
</tr>
<tr>
<td>----</td>
<td>---------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>C</td>
<td>60 - 75</td>
<td>Brownish yellow (10yr 6/6); mottled few fine faint yellow (10yr 7/8) sand; structureless, loose; common very fine roots; clear and smooth boundary</td>
</tr>
<tr>
<td>C</td>
<td>75 – 90+</td>
<td>Pale brown (10yr 7/3); mottled common fine faint yellowish brown (10yr 5/6); sand; structureless, loose; common iron and manganese dioxide concretions; very few very fine roots.</td>
</tr>
</tbody>
</table>