AN EXPLANATORY MANUAL FOR CIAT's COMPUTERIZED LAND RESOURCE STUDY OF TROPICAL AMERICA

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Centro Internacional de Agricultura Tropical
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CONTENTS

LIST OF FIGURES

APPENDICES

ABSTRACT

The evaluation of land resources is a fundamental research strategy for the development of germplasm-based technology to help improve agricultural production in the developing Tropics. CIAT's study, which started in mid-1977, now covers 850 million ha of Tropical America, and reduces land resource information to a common base in terms of land systems, defined as repetitive patterns of climate, landscape and soils. Climate was analized by Hargreaves' water balance methodology using long-term data from 1144 meteorological stations. Land systems were delineated using 1 to 1,000,000 satellite and side-looking radar imagery as a geographic base, for both extrapolating information when little was available and summarizing detailed work in the few areas where it had been carried out. Within the land systems, soils were separately described in terms of the major landscape topographical facets. A large part of the work involved the review of existing literature, but field work was carried out over representative transects to help fill knowledge gaps and standardize criteria.

The land resource information was summarized on a series of formats and then recorded in a computerized data storage, retrieval and analysis system. This facilitated not only the retrieval and collation of data in terms of numbers and thematic maps, but also the investigation of interrelated factors. Additionally, the system can be linked to other data sources such as socio-economic information, to help develop geographically oriented priorities for

agricultural research and development. The system is flexible and can be updated as new data becomes available.

The study is an example of technology development between CIAT scientists and scientists in the several countries comprising Tropical America; in Brazil it is being carried out as a joint project with EMBRAPA (Empresa Brasileira de Pesquisa Agropecuária).

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INTRODUCTION

An up-to-date appraisal of agricultural land resources that reflects the ever-accumulating knowledge about our environment from both surveys and fundamental scientific discovery, has become a basic research strategy to guide the selection and development of germplasm-based** technology to help improve agricultural production in the developing Tropics. Over Tropical America, the area of special interest to CIAT, the land resource information in terms of climate, landscape, vegetation and soils is far from comprehensive and has not been well integrated. In order to address this problem, in mid-1977 CIAT commissioned a specific study of the Oxisol and Ultisol regions, the Target Area of the Tropical Pastures Program to help establish soundly based guidelines for technological priorities (1). In 1979 the study was extended to other regions to serve a similar purpose

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** Seeds and vegetative propagating material.

for CIAT's other commodity programs. The study was in fact proven widely applicable to crop and forage production on many types of land throughout Tropical America. It represents not only the work of the principal scientists involved, but also valuable contributions from the many scientists who have cooperated with the endeavor in the several countries. In Brazil, the study was carried out as a joint effort with CPAC-EMBRAPA (Centro de Pesquisa Agropecuária dos Cerrados-Empresa Brasilera de Pesquisa Agropecuária).

To facilitate the analysis of the basic resource data, a computerized data storage, retrieval and analytical system, or "data bank", was set up. The information recorded in the data bank is now available as a series of computer tapes. This will facilitate independent analyses by workers in different disciplines with varying objectives. Consequently, this manual was written to provide users with a guide to the scope of the study, a synthesis of the methodology adopted in summarizing agricultural land resources, a summary and explanation of the land resource characteristics collated and coded, and information as to how the study was computerized to facilitate information retrieval and evaluation.

THE SCOPE OF THE STUDY

Figure 1 indicates the geographical extension of the study; it currently covers about 850 million ha of mainly lowland Tropical America. Land system maps (maps illustrating geographical units in terms of areas or groups of areas throughout which there is a recurring pattern of climate, landscape and soils), at a scale of 1 to 1,000,000, are identified using the International Chart of the World on the millionth scale index (Figure 2). For example, the land systems map between longitudes 48° and 54°W and latitudes 8° and 12°S, is identified as SC-22. It is also referred to by its common Brazilian name "Tocantins (2).

Land systems maps are also used as transparent overlays for topographical maps (Figure 3). They are available on special request; however, they have been computerized and recorded on magnetic tape as an integral part of the computerized analytical system. In this way the user of the study is provided not only with a land systems map printout facility, but also with a thematic map compilation and printout capacity. Thematic maps can be printed according to virtually any of the parameters used to describe the land systems.

The climatic, landscape, vegetation and soil information collected for the study has been collated, and then recorded on magnetic tape as an integral part of the computerized retrieval and analytical facility. Consequently, geographically oriented facts and figures about the land resources may be compiled in convenient printout form without having to resort to tedious fact-finding by sorting through masses of printed material; further, possible interrelationships of parameters can readily be established and proven. Figure 4 illustrates how the system provided an answer to a question as to the amount of land with Al toxicity problems over the central-west of Brazil (Fig. 5), the area covered by maps SC-22, SC-23, SD-21, SD-22, SD-23, SE-21, SE-22, SE-23 and SF-21, respectively. Clearly, it is necessary to understand the methodology used for the study and the way the land resource characteristics were classified and coded in order to fully appreciate its technical scope, and to use the computer to best effect.

It should be noted that the study was carried out using data from many sources. These varied in detail, precision and accuracy; many parts will undoubtedly need judicious revision as more precise and accurate information becomes available. However, the methodology adopted and the flexibility of the analytical system will enable the updating of information and its expansion to meet future needs.

THE DESCRIPTION AND COLLATION OF LAND RESOURCE DATA

In order to provide a geographical summary of the land resources, it was decided to modify the land systems approach developed by Christian and Stewart in 1953 (3) in their study of the land resources of the Katherine-Darwin region of Northern Australia. For this study, a land system was defined as "an area or group of areas throughout which there is a recurring pattern of climate, landscape and soils". The environmental parameters were arranged in categorical order to form a true land classification:

1. Climate
    a) Radiant energy received

b) Temperature

c) Potential evapotranspiration

d) Water balance

e) Other climatic factors

2. Landscape

f) Land-form

g) Hydrology

h) Vegetation

3. Soil

i) Soil physical characteristics

j) Soil chemical characteristics

These were the principal parameters used to delineate a land system. Paradoxically, the delineation of land systems was effectively used, not only to describe the land resources of regions where little or no information was available, but also to condense and summarize the copious amounts of printed information occasionally available for some regions of limited geographical extent, where detailed studies including soil surveys, climatological studies and in-field experimentation had been carried out. Principal bibliographic sources have been summarized in Appendix I. Where information was not available, field work was carried out, albeit superficially, in order to obtain a better idea of the resources. Nevertheless, whilst the study does incorporate some original research, the bulk of the information has come from previous studies; it has mainly been an exercise in compiling, collating and extrapolating this information to a common base.

Satellite and radar imagery at a scale of 1 to 1,000,000 was found to provide an accurate geographical base. Radar imagery was available for the Amazonian area of Brazil (4) and was used for the delineation of land systems. By using the 1 to 1,000,000 satellite and radar imagery, the topographical inaccuracies of many existing maps were avoided. As a result, however, the transparent overlay maps of land systems rarely fit perfectly over existing topographical maps; exceptions are those based on radar imagery throughout Amazonia.

Climate

Data from 1144 meteorological stations throughout Central and South America were initially analyzed, and the analyses for selected representative stations incorporated as an integral part of the land resource data bank. This work was carried out by J.K. Hancock, R.W. Hill and G.H. Hargreaves. Their entire study is available either as a printout with explanatory text (5), or as a computer tape.

The methodology used for calculating potential evapotranspiration (ETP) followed that described by Hargreaves in 1977 (6). This method was selected in deference to the many other methods available, as it gave a realistic estimate of ETP using the available climatic data, as shown by Hargreaves (9). It is very important that ETP be calculated as accurately as possible to determine the water balance and growing seasons, and provide a guide as to the total amount of energy available for plant growth. Solar radiation and temperature are the most important factors in determining ETP.

Figure 6 shows a straight printout of the climatic analysis used for land system No. 1. The data recorded and calculated are:

MEAN TEMP	–	Mean temperature in degrees Celsius
PCT SUN	–	Percent possible sunshine
MEAN RAD	–	Mean solar radiation in Langleys per day
PRECIP	–	Mean precipitation in millimeters
POT ET	–	Potential evapotranspiration in millimeters
DEF PREC	–	Precipitation deficit in millimeters
DEP PREC	–	Dependable precipitation in millimeters
MAI	–	Moisture Availability Index

For some stations, the relative humidity was also estimated and appears on the printout as MEAN RH.

When temperature data were not available for a station, an estimation was made based on stations closely related geographically and by taking into account the relationship between elevation and temperature. Temperature decreases by an amount of about 0.0055 times the elevation in meters, or 5.5°C for every 1000 meters of increase in elevation.

When solar radiation data was not available for a station, estimates were made from solar radiation maps developed by Loft *et al.* (8), or were computed from a multiple regression equation using such values as longitude, latitude and precipitation. The solar radiation (RS), in Langleys per day, was converted to equivalent millimeters of evaporation per month (RSM) by correcting for the number of days in the month (DM) and the latent heat of vaporization of water (L) as

$$RSM = 10\ DM \times RS/L$$

The average L for a month was calculated from the mean monthly air temperature in degrees celsius (TMC) by the equation:

$$L = 595.9 - 0.55 \times TMC$$

Potential evapotranspiration (ETP), in millimeters per month, was approximated by:

$ETP = 0.0075 \times RSM \times TMC$, after Hargreaves (7).

The precipitation deficit in millimeters is the difference between the precipitation and the potential evapotranspiration.

Dependable precipitation, usually referred to as PD, is the 75% probability of precipitation occurrence, which can be described as the amount of precipitation that will be equaled or exceeded in three out of four years. This was calculated by using the mean monthly precipitation given by Wernstedt (9) in a straight line relationship that changed according to the area being analyzed. These relationships were developed from previous studies that used yearly rainfall records and a gamma distribution calculation to estimate the 75% probability of occurrence (9). The equation used in each country or area was:

$$PD = A + B \times PM.$$

where PD is the dependable or 75% probability of precipitation, PM is the mean monthly precipitation and A and B take the following values for each country or area (Figure 7):

	A value	B value
Central America	-23.0	0.84
Brazil		
Area I	-20.0	0.85
Area II	- 9.0	0.57
Area III	-23.0	0.79
Area IV	-11.0	0.67
Area V	-11.0	0.67
Bolivia	-10.0	0.69
Colombia	-25.0	0.84
Ecuador	- 5.0	0.64
French Guiana	-14.0	0.77
Guyana	-14.0	0.77
Paraguay	-10.0	0.69

	A value	B value
Peru		
Area I	- 1.0	0.18
Area II	- 5.0	0.70
Surinam	-14.0	0.77
Uruguay	-10.0	0.69
Venezuela	-14.0	0.77
Caribbean Islands	-23.0	0.84

The moisture availability index (MAI) is a moisture adequacy index at the 75% probability level of precipitation occurrence. It is defined as dependable precipitation divided by évapotranspiration. The equation is:

$$MAI = PD/ETP$$

A MAI value of 1.00 means that dependable precipitation equals potential evapotranspiration. In order to develop some form of standard classification for measuring moisture adequacies or deficits from the climatic conditions as the necessity arises, Hargreaves (10) proposed that MAI be adopted as a standard index for measuring water deficiencies and excesses, and that the following classification be used:

MAI = 0.00 to 0.33	very deficient
MAI = 0.34 to 0.67	moderately deficient
MAI = 0.68 to 1.00	somewhat deficient
MAI = 1.01 to 1.33	adequate
MAI = 1.34 and above	excessive

This classification seems applicable for the more favorable soil conditions. However, Hargreaves notes "when the soil moisture storage capacity is adequate for less than a week, the correlation between MAI and crop production probably will be lowered".

Apart from the climatic work leading to the estimation of the water balance, separate note was taken of other climatic hazards such as hurricanes.

It should be noted that a system of direct access information storage and retrieval files has recently been developed in CIAT to manage the meteorological data from this study and from other sources. These files (SAMM DATA) allow easy programmer access to the data and can be updated to incorporate better estimates of climatic parameters as they become available. A manual describing the program structure and use will be available in 1980. The operation of this additional system, and the ongoing active accumulation of climatic data, should provide for a more comprehensive analysis of climate in the future.

A land system, therefore was limited to an area with a defined pattern of climate. This was the first limitation imposed in delineating its boundaries; the second was landscape.

Landscape

Farming is carried out on units of land. The landscape, especially topographical and hydrological aspects, is often critical in determining the type of farming systems adopted. For this reason, in considering practical agricultural production and evaluating land as a resource for farming, it is very necessary to have a clear appraisal of landscape characteristics. All too often soil surveys have failed to provide an accurate picture of the landscape.

Satellite and side-looking radar imagery, and in some cases normal aerial photography, were used to help define land system boundaries. Figure 8 illustrates land system mapping on a satellite image (11) between longitudes 48°20' and 49°45'W, and latitudes 7°45' and 9°20'S. Techniques for interpreting satellite imagery and remote sensing techniques generally are well-documented (12, 13), and advances in this field of endeavour continue to be made almost daily (14, 15). With the exception of Amazonia, most of the delineation of land systems was carried out using satellite imagery, using black and white photographic prints of the spectral bands 5 and 7. Band 5 (lower red), gave a useful image of vegetation and topography, and band 7, the near-infrared end of the spectrum, gave better haze penetration and land-water discrimination.

Satellite imagery (11) dates to the ERTS (Earth Resources Survey) Program of NASA (National Aeronautics and Space Administration), a civil entity of the United States government and the launching of the satellite LANDSAT-1 in 1972. This was followed by the launching of LANDSAT-2 in 1975, and additional satellites with more sophisticated sensing equipment are planned. Each image covers 185 sq km of territory and the resolution is better than 100 m. color composites, a false color obtained by the integration of the four spectral bands, would have been ideal for much of the initial work in delineating land systems, but owing to their high cost it was decided to use black and white reproductions of band 5 and where considered more suitable, band 7.

Unfortunately, satellite imagery has one major drawback. Due to the relatively short period of time the LANDSAT satellites have been transmitting, and because orbits are designed to provide a pass over the same area at relatively infrequent intervals (originally 20 times a year, but now more frequently with LANDSAT-2 in operation), it is not surprising to find that for the wetter areas of Tropical America it is difficult to get cloud-free imagery. The largest region affected is the wetter part of Amazonia.

Fortunately, side-looking radar imagery has now become available for most of Brazilian Amazonia (4) and this was used as a geographical base for the delineation of land systems throughout that region. Side-looking radar produces an excellent topographical picture of the landscape, but is not nearly as effective as satellite imagery in helping to interpret land resource characteristics such as vegetative cover and hydrological characteristics. Figure 9 shows land system mapping based on radar imagery along the Amazon river 350 km west of Manaus.

For some other areas, such as the wet eastern piedmont of Bolivia, aerial photography was used for interpreting the landscape picture.

Wherever possible, and especially when little or no information was available in the published literature about land characteristics, field work was done to check the photointerpretation. A small (STOL) plane was used to cover hinterland territories, and every effort made within the close time schedule to examine the principal soil sequences that followed the landscape patterns.

With the delineation of land systems, the landscape within the individual land systems was described in such a way as to enable the computerization of its principal characteristics. Figures 10, 11 and 12 illustrate the Format L 1 used for the description of landscape and the coding of the features of land system No.1 as follows:

ALTITUDE.- Altitude of the major part of the landscape.

GENERALIZED CLASSIFICATION.- Designed to provide a quick, approximate idea of the overall landscape.

GEOLOGICAL NOTES.- These notes are not reproducible by the computer, nor are the HYDROLOGICAL NOTES, but are available by special request.

DISTANCE BETWEEN PERENNIAL STREAMS.- This was given to provide some idea of the hydrology of the landscape, and the availability of year-round water for livestock.

DEPTH OF WELLS.- The depth of wells used by indigenous inhabitants for obtaining drinking water.

GENERALIZED SOIL CLASSIFICATION.- This was included to help soil scientists and agronomists obtain a general picture of the major soils of the landscape. The coding has been recorded in Appendix II, which is explained in detail under the heading "The soils of the Land Facets", page 18.

LANDFORM DIAGRAM.- The subdivision of landscape into facets. This concept is crucial to an understanding of the study. The diagram has been drawn to illustrate major LANDSCAPE FACETS and can be reproduced by the computer (the earlier computer tapes of the study did not contain these diagrams for purely logistic reasons). The identification of landscape facets within land systems is used to bridge the gap between land systems and soil units, as facets are very often relatively uniform insofar as soil characteristics are concerned. In some cases the landscape facets will obviously contain soils with differing properties. However, some level of generalization must be accepted in making an inventory of land resources. The objective of the study is not to replace soil survey work per se; the smallest map unit is the Land System. However, it is axiomatic that the study should provide an inventory of the land characteristics including soil physical and chemical properties of the land facets within the land systems.

Figure 13 illustrates a typical landscape identified as one land system; it is clear that the landscape can be subdivided into facets 1 and 2 to represent the flat plain surface and the minor vale regions. Soils will differ within these facets, but generally the facets are the smallest land units farmed, and for agricultural planning purposes it is necessary to have a generalized picture of their properties. For convenience of computation, land systems have been described in terms of a maximum of three land facets. Figure 14 gives a summary of the vegetation coding used for the landscape diagrams.

LANDSCAPE FACETS, generalized description. This is to provide a general grouping of facet types.

AREAS OF LANDSCAPE FACETS AS PERCENTAGE OF L.S. The percentages are necessary for computation purposes, as land systems and not land facets are the smallest mapping units, and consequently land facet areas cannot be estimated from the maps.

TOPOGRAPHIC CLASSIFICATION, LANDSCAPE FACETS.

The topographic classification of the land facets has been kept simple. The four categories, "flat poor drain" (flat, poor drainage), "less than 8%", "8-30%" and "greater than 30%", were chosen to provide a practical guide to topographical differences that can also be useful in estimating mechanization costs.

ALTITUDE in meters. This is the average altitude of the facets.

ORIGINAL VEGETATION CLASSIFICATION

Code	Classification
Seas. In P	Seasonally inundated pampas
CL + CS	Campo Limpo, grassland + Campo Sujo, grassland with occasional shrubs
CC	Campo Cerrado, open savanna
C	Cerrado, intermediate savanna
Cd	Cerradão, closed savanna with continuous forest canopy

The latter four categories are commonly used throughout Brazil to classify savanna vegetation, and are detailed by Eiten (16).

TRF	Tropical rain forest
SESF	Tropical, semi-evergreen seasonal forest
SDSF	Semi-deciduous seasonal forest

These three terms refer to well-drained forest, and are used as per the definitions of Eyre (12) for tropical forests.

Caat.	Caatinga (scrubby woodland with some cerrado species) is used per the accepted sense in Brazil (16).
Other	Other types of vegetation, such as palm forests, swamp communities.

INDUCED VEGETATION.- Only two categories were separated as it is difficult to identify crop types without detailed ground-truth studies. Further, as the satellite imagery used covered the period 1973 to 1976, the figures can only be regarded as approximations.

The soils of the Landscape Facets

Soils were classified as far as the Great Group category of the U.S. Department of Agriculture's Soil Taxonomy (18) system, then categorized in terms of their physical and chemical properties to facilitate description. Figures 15, 16 and 17 illustrate Format S_1 used to record the soil classification, soil physical properties, soil chemical properties, and a summary according to the soil fertility capability classification coding (19).

In the U.S. Soil Taxonomy, soils are not grouped according to "similar physical and chemical properties that reflect their response to management and manipulation for use", until the soil Family category is reached. This follows a subdivision of the Great Groups into Sub-groups, according to the scheme:

ORDER

(10) - Suborder

(47) - Great Group

(230) - Subgroup

(970 in the USA) - Family

The Order category broadly separates soils according to their gross morphology by the presence or absence of diagnostic horizons or features.

The Suborder separates the Orders according to criteria that distinguish the major reasons for absence of horizon differentiation, principally as related to moisture and temperature regimes.

The Great group attempts to separate soils according to the complete assemblage of their several horizons and the most significant properties of the whole soil.

The Subgroup category, however, is virtually only a separation of the Great group category in terms of soils which:

a) Follow the central concept of the Great group.

b) Are intergrades or transitional forms to other Orders, Suborders or Great groups.

c) Are extragrades. Soils that have some properties not representative of the Subgroups.

In other words, the separation according to Subgroups is a convenience that does not add very much to our knowledge concerning the characteristics of the soils. For this reason, it was decided to classify soils only as far at the Great group level, then describe them in terms of their physical and chemical characteristics in such a way as to facilitate the computer grouping and comparison of properties.

The coding used for the soil classification has been recorded in Appendix II. It should be noted that the Suborder code assumes the prefix of the order code, and likewise the Great Group code the prefix of the Order and Suborder code. For example, the Great Group classification Haplustox is coded "O US HA". O for Oxisol--the Order, US for Ustox--the Suborder and finally HA the Great group--Haplustox.

Whilst soils have been classified according to the U.S. Soil Taxonomy, an approximate correlation of this system has been made with the FAO legend (20) and the Brasilian Classification System (21), Appendix III.

Soil Physical Properties

The soil physical properties have been classified and coded in terms of slope, texture, presence of coarse material, depth, initial infiltration rate, hydraulic conductivity, drainage, water-holding capacity, temperature regime, moisture regime and presence of expanding clays. The categorization is designed to evaluate the suitability of soils for crop production from a physical standpoint. It contains the elements necessary to apply the technique developed by Mansfield (22) for assessing land capability for arable crops based on soil physical limitations, and those necessary to use the Soil Fertility Capability Classification (FCC) method of Buol et al. (19).

SLOPE.- This is a repetition of the categories of Format L, mainly for convenience of computerization. The codes used are given after the categories: e.g. $< 8\%$, B (B = bajo or low), 8-30%, M (M = medium or mediano), and $> 30\%$, A (A = alto or high)

TEXTURE.- Soil texture often affects the available water-holding capacity, the root development of crops, the ease of harvesting root or tuber crops, and correlates with some soil chemical characteristics. It should be noted that the texture is given for both the "topsoil" and the "subsoil", defined as the 0-20 cm and 20-50 cm depths, respectively. This definition follows the FCC philosophy. Mansfield also limited his textural description to the upper 50 cm of the soil, as it is the depth in which the greatest volume of plant feeder roots grows and absorbs nutrients. The definitions of texture are those used by Buol _et al._ (19) viz.

S = Sandy -loamy sands and sands

L = Loamy- less than 35% clay but not loamy sand or sand

C = Clayey- more than 35% clay

O = Organic - more than 30% organic matter to a depth of 50 cm or more (included in the "Topsoil texture" classification for convenience).

R = Rock or other root-restricting layer.

The coding "FCC type" refers to the Fertility Capability Classification "Type", the highest category of that technical soil classification system. It is determined by the average textures of the plow layer or upper 20 cm, whichever is shallower. The coding FCC sub-type refers to the FCC "Substrata Type", the texture of the subsoil to a depth of 50 cm.

COARSE MATERIAL.- This term refers to the presence of rock particles greater than 2 mm in diameter. The presence of coarse material can influence crop growth by affecting the available water-holding capacity of a soil, and, in some cases root penetration and development.

DEPTH.- Soil depth largely determines the potential rooting volume available in a soil, or the depth of the soil environment throughout which roots may absorb water and minerals. The rating refers to the effective depth to which plants can freely penetrate and are not limited by rock, hard-pans of water-tables.

INITIAL INFILTRATION RATE.- This refers to the ability of a mulched soil to absorb water during the first hour of rainfall after the

50 cm depth has dried out, according to the classification:

High = A

Medium = M

Low = B

The rating expresses the potential of a soil to absorb water from rains at the start of the wet season or during the drier period of the year, rather than losing it as run-off. For soils on slopes, it reflects their susceptibility to erosion.

HYDRAULIC CONDUCTIVITY.- This refers to the ability of soils to continue absorbing water over a prolonged period of time. The classification provisionally used was:

High = A

Medium = M

Low = B

A measure of the hydraulic conductivity is important in regions with periods of high rainfall during which time the soil may become water-logged for prolonged periods of time. This is a common wet season phenomenon in Ultisols found in plains areas.

DRAINAGE.- The rating reflects the amount of water-logging (the occurrence of anaerobic conditions). Generally this implies the presence of a water-table within 60 cm of the soil surface for a prolonged period of time, but may also refer to special circumstances such as annual flooding. Specifically, the rating is defined as:

Good	=	B	- Insignificant amount of water-logging.
Deficient	=	D	- Some water-logging, of importance to the growth of susceptible plants.
Poor	=	G	- FCC modifier (FCC M). Water-logging to the extent that all but very water-tolerant plants are seriously affected. This corresponds to the FCC "Condition modifier" g that refers to a gley condition within 60 cm of the surface as an indication of water saturation, and fits the Aquic soil moisture regime definition in the U.S. Soil Taxonomy.

MOISTURE-HOLDING CAPACITY.- The following levels were used to define the classes:

High	=	A	-greater than 150 mm per 100 cm depth
Medium	=	M	-75 to 150 mm per 100 cm depth
Low	=	B	-less than 75 mm per 100 cm depth

TEMPERATURE REGIMES.- These regimes follow the definitions given in the U.S. Soil Taxonomy, and are summarized on Figure 15.

MOISTURE REGIME.- The classes approximate the regimes given in the U.S. Soil Taxonomy in the following way:

UDIC = U -The Aquic and Udic regimes of U.S. Soil Taxonomy.

USTIC = SD -FCC M d. The Ustic regime of U.S. Soil Taxonomy, and the FCC condition modifier d, which refers to an annual dry season of more than 60 days.

XERIC = XD -FCC M d. The Aridic, Torric and Xeric regimes of U.S. Soil Taxonomy, and the FCC condition modifier d.

As it is rarely possible to obtain measured figures for the soil moisture regimes, in practice the criterion was based on the annual water balance figures calculated using Hargreaves' method (6) and defining a dry month as a month with a Moisture Availability Index (MAI) less than 0.34, viz.

UDIC = U - less than 3 consecutive months with a MAI less than 0.34

USTIC = SD - FCC M d. 3 to 6 consecutive months with MAI less than 0.34.

XERIC = XD - FCC M d. More than 6 consecutive months with a MAI less than 0.34.

EXPANDING CLAYS.- This factor has been introduced to take into account soils with significant amounts of expanding clays, particularly montmorillonite, that often hold abnormally high amounts of moisture and may cause tillage and drainage problems.

Soil Chemical Properties

Soil Chemical Properties for both the topsoil (0–20 cm) and the subsoil (20–50 cm) were coded on the continuation of Format S_1 illustrated by Figures 16 and 17. Some explanatory notes follow.

pH - This refers to pH in water, 1:1 soil to water ratio. A pH of less than 5.3 was considered to approximate the FCC modifier h. Above pH 5.4, Al is virtually insoluble and not found either in the exchange complex or in the soil solution; below about pH 5.3 the amount of Al in soil solution may be very significant. The use of pH 5.3 as a critical level separates those soils for which the formula developed by Cochrane et al. (23) for estimating the liming of acid mineral soils, might profitably be applied.

EXCHANGEABLE Al.- (IN KCl extraction).

EXCHANGEABLE Ca, Mg and Na.- (INKCl extraction). The classification A, M and B (high, medium and low), is a first attempt to equate soil nutrient levels with crop needs in the following sense:

A = adequate for most crops

M = inadequate for crops requiring high levels of the nutrient.

B inadequate for most crops except those tolerant to low levels of the nutrient.

EXCHANGEABLE K.- (IN KCl extraction). The tentative classification of A, M and K follows that of A, M and B for exchangeable Ca, Mg and Na. The classification K (FCC modifier k) is also qualified by the FCC criteria, less than 10% weatherable minerals in the silt and sand fraction within 50 cm of the soil surface or K less than 2% of the sum of the bases if the sum of the bases is less than 10 meq/100 gm soil.

TOTAL EXCHANGEABLE BASES (TEB).-This is the sum of the exchangeable Ca, Mg, K, and Na. In some acid mineral soils, Mn and Fe levels obtained by extraction with INKCl, may be high and contribute to the TEB. Zn and Cu levels might also be included, but in practice are generally so low as to be insignificant.

CATION EXCHANGE CAPACITY (CEC).-This is the sum of the TEB plus the exchangeable Al. (The level, less than 4 meq/100 gm soil would correspond approximately to less than 7 meq/100 gm soil, if the CEC is determined by the sum of the cations at pH 7.0, and to less than 10 when determined by the sum of the cations at pH 8.2 (Buol et al. (19)).

The classification of TEB and CEC in terms of A, M and B clearly has no direct significance with respect to plant nutrient needs. However, they are considered convenient groupings to help with the interpretation of the soil nutrient supplying ability, when considered with other factors which taken together provide an idea of the ability of a soil to retain nutrients and its state of leaching.

% ORGANIC MATTER (% OM).- The classification A, M and B has been made to help with the overall interpretation of soil fertility. % OM was determined by multiplying the organic C by 1.7.

PHOSPHORUS in ppm.- The levels refer to P extracted by the Bray II method (24). In very approximate terms, the following table gives a comparison of P levels extracted by the Bray II method, the Truog method (25), the Olsen method (26), and the "available P" method of Vettori (27).

Classification	P (ppm)			
	Bray II	Truog	Olsen	"Avail."(27)
A	>7	>5	>3	>7
M	3-7	2-5	1-3	3-7
B	<3	<2	<1	<3

The Bray II method appears more satisfactory for acid, mineral soils. The classification A, M and B is used in the same sense as it was used for extractable Ca, Mg, Na and K to equate soil levels with plant tolerance.

PHOSPHORUS FIXATION.- Phosphorus fixation is often a problem in soils with a clay content greater than 35% and a ratio of free Fe_2O_3/% clay greater than 0.15 (19). It is also a common problem in allophane-rich soils. In the absence of more specific information, these parameters indicate the probable level of P fixation.

MANGANESE, ppm. The levels refer to Mn extracted with INKCl. The criteria B, S and T define low, satisfactory and toxic levels respectively. However, the definition of Mn toxicity as greater than 35 ppm (or alternatively greater than 1% saturation of CEC is provisional as plants appear to vary considerably in their ability to withstand high levels of Mn in the soil solution. Additionally Mn levels tend to build up, sometimes for relatively short periods, under reducing conditions (28).

SULPHUR.- The classification low, medium, high and unknown has been made without attempting to define a standard procedure for extracting soil S and only reflects what is currently known about S deficiencies as established through experimental work. It is probable that S deficiencies are more widely spread than indicated by the present study.

ZINC, ppm. The classification is based on extraction with INKCl. Only the classes B (low), S (satisfactory) and U (unknown) have been used. These levels are based on relatively few studies with commercial crops; little is known concerning crop tolerance to different levels of Zn.

IRON, ppm. The classification is based on iron extraction with INKCl; it is very approximate and does not take crop differences into account. At level A some crops (e.q., rice) may suffer from excess Fe. Like Mn, soil Fe levels vary with oxidation and reduction conditions (27). Temporary Fe deficiency often occurs as plant roots grow through well-aerated, unsaturated topsoils. As the roots penetrate saturated subsoils, the Fe deficiency generally disappears.

COPPER, ppm. The classification is based on Cu extracted with INKCl. Little is known about Cu levels, although there is some evidence to suggest that they are highly correlated with P levels on some soils.

BORON, ppm. The classification is based on B extracted by refluxing with hot (100°C) water for 10 minutes. The level given approximates the critical value found for several crops including sugar-cane.

MOLYBDENUM, ppm. This classification is based on INKCl extracted Mo. Little is known aoout soil Mo levels in the region.

FREE CALCIUM CARBONATE. This was determined by dropping 30% HCl onto soil samples taken from 0-50 cm.

The presence of free calcium and magnesium carbonates detected in this way is also used as an FCC modifier.

SALINITY, mmho. This is the salinity of the saturated extract at 24°C of soil samples taken to a depth of 1 m. The levels are based on the general values developed by the U.S. Salinity Laboratory (29) that purport to separate those soils with sufficient salinity to present problems for most crops. The FCC system uses the same criteria. It should be noted, however, that some crops are susceptible to significantly lower levels of soil salinity. The 4.0 mmho level approximates a 1:2.5 soil:water extract conductivity reading of 400 μ mho (Some soil laboratories use this later criterion as a gross check for soil conductivity problems).

NATRIC. Sodium levels were given separate mention to identify problem soils. Sodium affects clay dispersion and moisture availability. The levels refer to readings for soil samples taken to a soil depth of 50 cm in the same sense as the FCC modifier n, and are those limits set by the U.S. Soil Salinity Laboratory (29).

CAT CLAY. This is identified by a pH in 1:1 soil: H_2O extracts greater than 3.5 after drying and /or, Jarosite mottles with hues 2.5Y or yellower and chromas 6 or more within a depth of 60 cm. (30). It is used with this definition as a FCC modifier.

X-RAY AMORPHOUS. Greater than 35% clay and pH less than 10 in IN NaF, or positive to field NaF test, or other indirect evidences of allophane in the clay fraction of the surface 20 cm of the soil. This is virtually the same definition as FCC modifier "x". It attempts to identify soils with allophane-dominated mineralogy; which usually have high P fixing capacity and low rates of mineralization.

ELEMENTS OF IMPORTANCE MAINLY TO ANIMAL NUTRITION. This evaluation is based purely on specific knowledge about these elements with relation to soil areas. For example, it has been established that certain soils are associated with I deficiency in animals.

FERTILITY CAPABILITY CLASSIFICATION. This is a summary of the FCC type and substrate types and modifiers for convenience of identification and comparison of gross fertility problems affecting the soils.

<u>A note on the landscape facets of the land systems</u>:

It should be emphasized that each landscape facet within a land system is described and collated separately: Format S_1, figures 15, 16 and 17, is filled in for each major facet of the land system identified. The limit of describing a maximum of three major landscape facets within a land system was imposed purely for the convenience of managing the data within the computerized data bank. This limit can easily be extended to handle more detailed studies in the future.

With the completion of the collection and collation work, the land resource information is passed onto the computer center for recording in the data bank.

COMPUTERIZATION: The data management system

Because of the quantity and diversification of data from the study and in view of the likely interaction within these data and with data from elsewhere, especially economic parameters, it was decided to create a computerized system of data management (data base) that would facilitate diverse analyses and decision making.

The methodology adopted for the creation of the system was based largely on the SAS (Statistical Analysis System, Institute Inc. (31)) language. The work was carried out using an IBM 370/145 computer belonging to DANE (Departamento Administrativo Nacional de Estadística of the Colombian Government), using a terminal (IBM-3780) at CIAT, Palmira.

Design specification

Basic Files: A land system is defined by climate, landscape, vegetation and soil data. These, together with the geographical location are stored in four basic files:

1. File Climate

Contents: Climatological data for different meteorological stations as both monthly and annual averages.

Variables:

CODEST The station code by which a station is identified that also serves to interact with other files.

NOMBRE	Name of the station (maximum of 20 characters)	
LATGD	Degrees of latitude	The meteorological station coordinates
LATMN	Minutes of latitude	
LNGGD	Degrees of longitude	
LNGMN	Minutes of longitude	
ALT	Altitude. In meters above mean sea level.	

TEMP 1 – TEMP 13 — Average temperature in °C. For this and the following variables it should be noted that the number following the name indicates the month. 1 = January, 2 = February, . . . , 12 = December and 13 is the annual figure.

HUMD 1 – HUMD 13 — Mean relative humidity (%)

SUNS 1 – SUNS 13 — Percent possible sunshine

RADS 1 – RADS 13 — Mean solar radiation in Langleys per day

PREC 1 – PREC 13 — Mean precipitation in millimeters

EVTR 1 – EVTR 13 — Potential evapotranspiration in millimeters

PRDF 1 – PRDF 13 — Precipitation deficit in millimeters

DPPR 1 – DPPR 13 — Dependable precipitation in millimeters

MAI 1 – MAI 13 — Moisture Availability Index.

Codification: This comes with the climatic data tape.

2. File LANDSYST

Contents: The landscape characteristics of the land systems

Variables: The following variables are recorded on Format L1, pages 1 and 2, Figures 10 and 11 and have been explained on pages 14 and 15 of the text.

LANDSYS	The land system code to identify a land system and interact with other files.
AREA	The area of the land system in hundreds of square kilometers ($km^2 \times 100$) estimated from map measurements.
ALTITUDE	The altitude of the major part of the landscape.
L 17	Their description, type and values may be found on Format L1, pages 1 and 2, Figures 10 and 11.
L 18	
L 19	
L 20	
L 21	
L 23	
L 25	
L 27	
L 25-28	
PHYSUNIT	Physiographic unit number.
CODEST	The code of the meteorological station most typical of the land system.
Codification:	This is carried out on Format L1, pages 1 and 2, Figures 10 and 11.

3. File LANDFAC

Contents: The characteristics common to a landscape facet of each land system.

Variables: Refer to Figure 12 (Format L1), page 3 for the record of the following variables, and pages 16 and 17 of the text for an explanation.

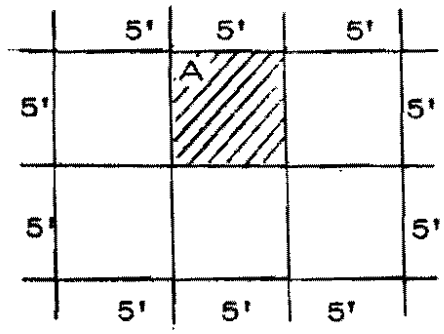
LANDSYS	The code of the land system to which the land facet belongs.
FAC	The land facet code 1, 2 or 3 (a maximum of three facets per land system).
GENDES	Landscape facets, generalized description.
PERC-LS	Areas of landscape facets as a percentage of the land system. Note: If there is only one facet described for the land system, it will be noted as 99% and must be converted to 100%.
TC 1 to TC 4 OVC1 to OVC9 OVCA IVAPP IVAPC	Their description, type and values may be found on Format L1 page 3, Figure 12. There are also variables that contain the areas for each of the items; the names of these variables are formed by prefixing the letter A to the name in question, e.g. A OVCA.
F1 to F59	Their description, type and values may be found on Format S1, pages 1 to 3, Figures 15, 16, and 17.

Codification: This is made on Format L1 page 3, Figure 12, and Format S1, pages 1 to 3, Figures 15, 16 and 17

4. File DISTRIBU

Contents: The distribution of the land system geographical codes for each 5 minutes of longitude by 5 minutes of latitude of the aereal extent of a land system.

The longitude and latitude identifies the northwest corner of the rectangle to which the code applies. Diagrammatically, the longitude and latitude A indicates the shaded rentangle.



Variables:

LONGITUD — The longitude of the coordinates of point A in minutes (degrees x 60 + minutes)

LATITUD — The latitude of the coordinates of point A in minutes (degrees x 60 + minutes). This is negative for the Northern Hemisphere and positive for the Southern Hemisphere.

LANDSYS — This is the code of the land system that predominates in the shaded area.

Codification: This is carried out on code sheets according to the distribution indicated on Format FC Ø 1, Figure 18. The western-most rectangle is identified by the code of the land system predominating in that area and the identification of land systems is continued to the east. If no data exists, a period records this fact.

The input of data to the system

The input is achieved from:

a) Formats - These are used for the LANDSYST and LANDFAC files. Part of the information on Format L_1, as already indicated, goes to the LANDSYST file and part to the LANDFAC. All the information on Format S_1 passes to the LANDFAC file.

b) Grid - From the land system codes applied to each 5' x 5' rectangle of the land system maps, the western rectangle is identified (latitude and longitude) and the rest of the grid identified by inference.

c) Tape - The climatic tape of Hancock et al.'s study (5) is used as the source for the climatological data. The description of this comes with the tape.

The data output

From the four principal relationships (files) it is possible to generate different information according to the varying needs of the users of the Land Resource Evaluation study. Basic information output would include:

- Printouts of the land resource information for individual land systems in terms of the collated climatic landscape, vegetation and soil data; Figure 19 illustrates this capacity.
- Lists of comparative data for selected properties of any predetermined group of land systems or geographical area. This is shown by Appendix IV which gives a

printout of such lists for the central-west area of Brazil.

- Areal totals for any recorded characteristic in terms of the values assigned to those characteristics either descriptive or numerical, over any predefined geographical area. Figure 4 and Appendix V illustrate this capacity.
- Maps of the land systems of any given area. Figure 20 is an example of the land systems map printout of Tocantins(SC-22); see also Appendix VI.
- Thematic maps of any of the characteristics evaluated according to the classification of those characteristics, for any geographical area. Figure 21 provides an example by showing the percentage of Al saturation in the topsoil of map SC-22, Tocantins; refer also to Appendix VII.

Further, it was envisaged that the system would have the capacity to

- Identify possible correlations between any of the characteristics described. Figure 22 a part of Appendix VIII, is an example of how the vegetation of the central-west of Brazil was compared to the total wet season potential evapotranspiration, a rating generated from the climatic data by totalling the potential evapotranspiration figures for those months with an MAI greater than 0.33.

- Permit the analysis of the land resource data in terms of other types of information obtained from other types of study, particularly economic studies.

The methodology already developed by SAS which integrates the management of data according to their Relational Data Base Concept. with procedures for statistical analyses and those that facilitates reporting, was chosen to implement the major part of the storage, analysis and retrieval system.

The SAS files as a component of the data base to date are:

In the O.S. File the following SAS files are found:

CLIMA

LANDSYS

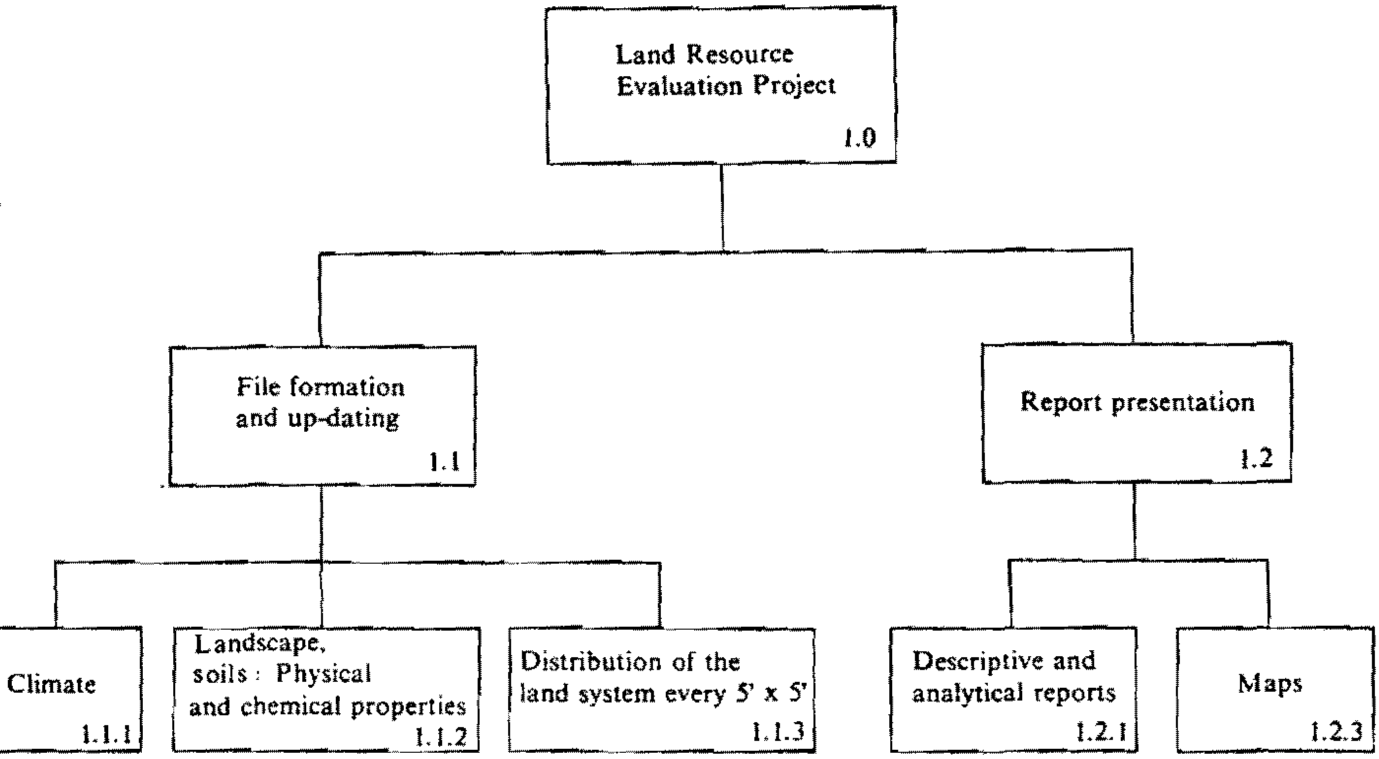
LANDFAC 2

AR1	-	Río San Francisco	SC-23
AR2	-	Cuiaba	SC-21
AR3	-	Tocantis	SC-22
AR4	-	Brasilia	SD-23
AR5	-	Goiás	SD-22
AR6	-	Goiania	SE-22
AR7	-	Corumba	SE-21
AR8	-	Rio Apa	SF-21
AR9	-	Belo Horizonte	SE-23

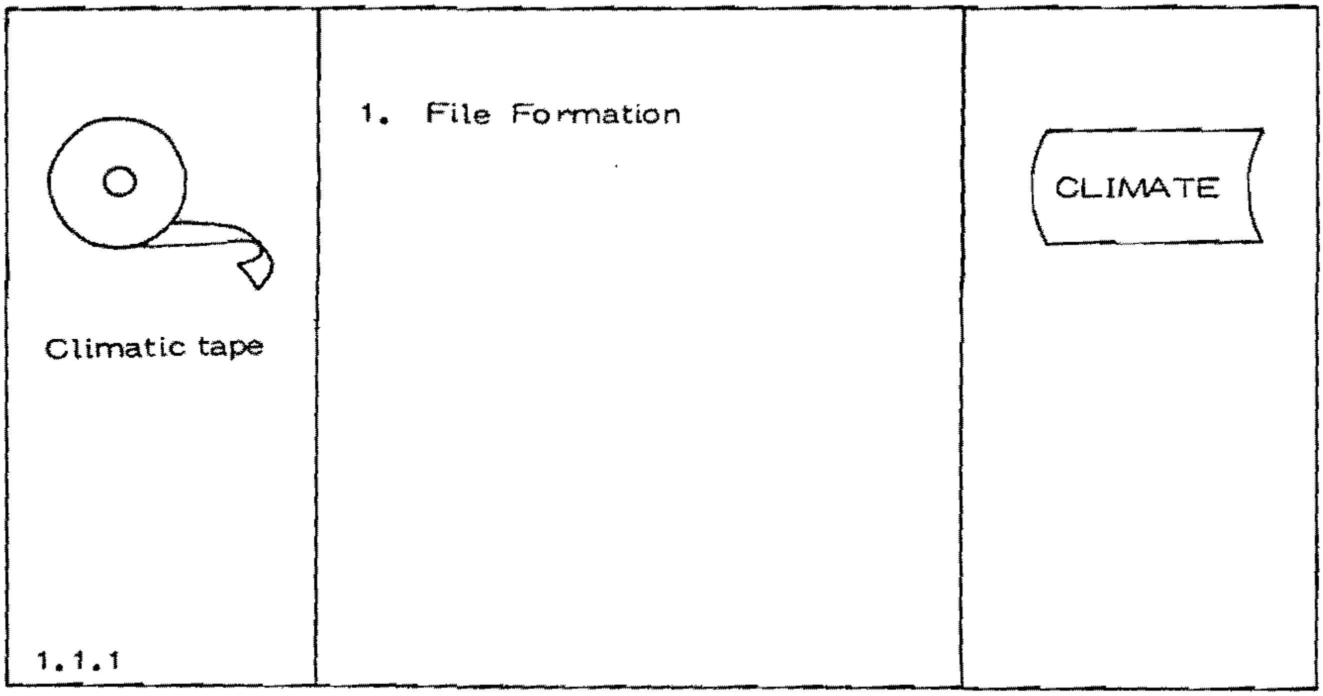
(The distribution of the land systems over central-west Brazil).

Further files have been and continue to be created for the other maps.

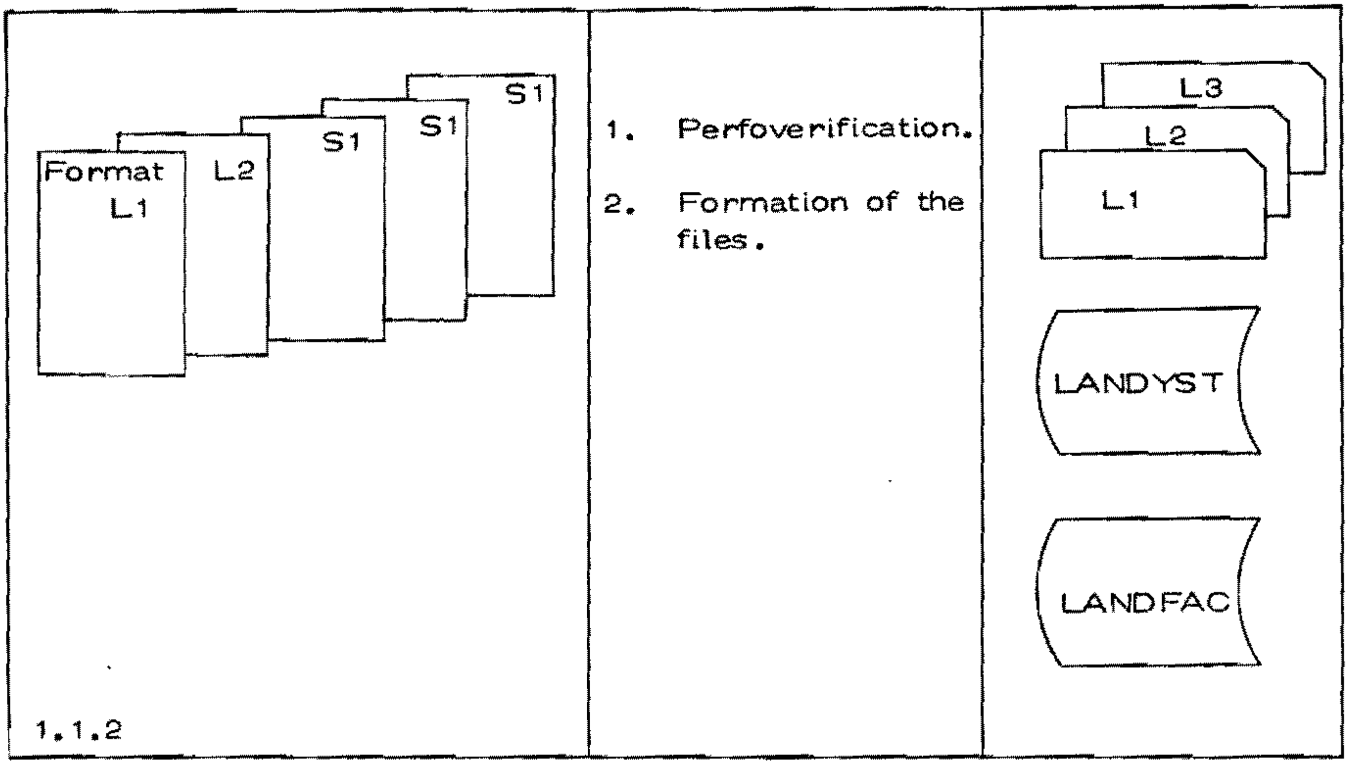
The General Description of the system may be explained diagrammatically:



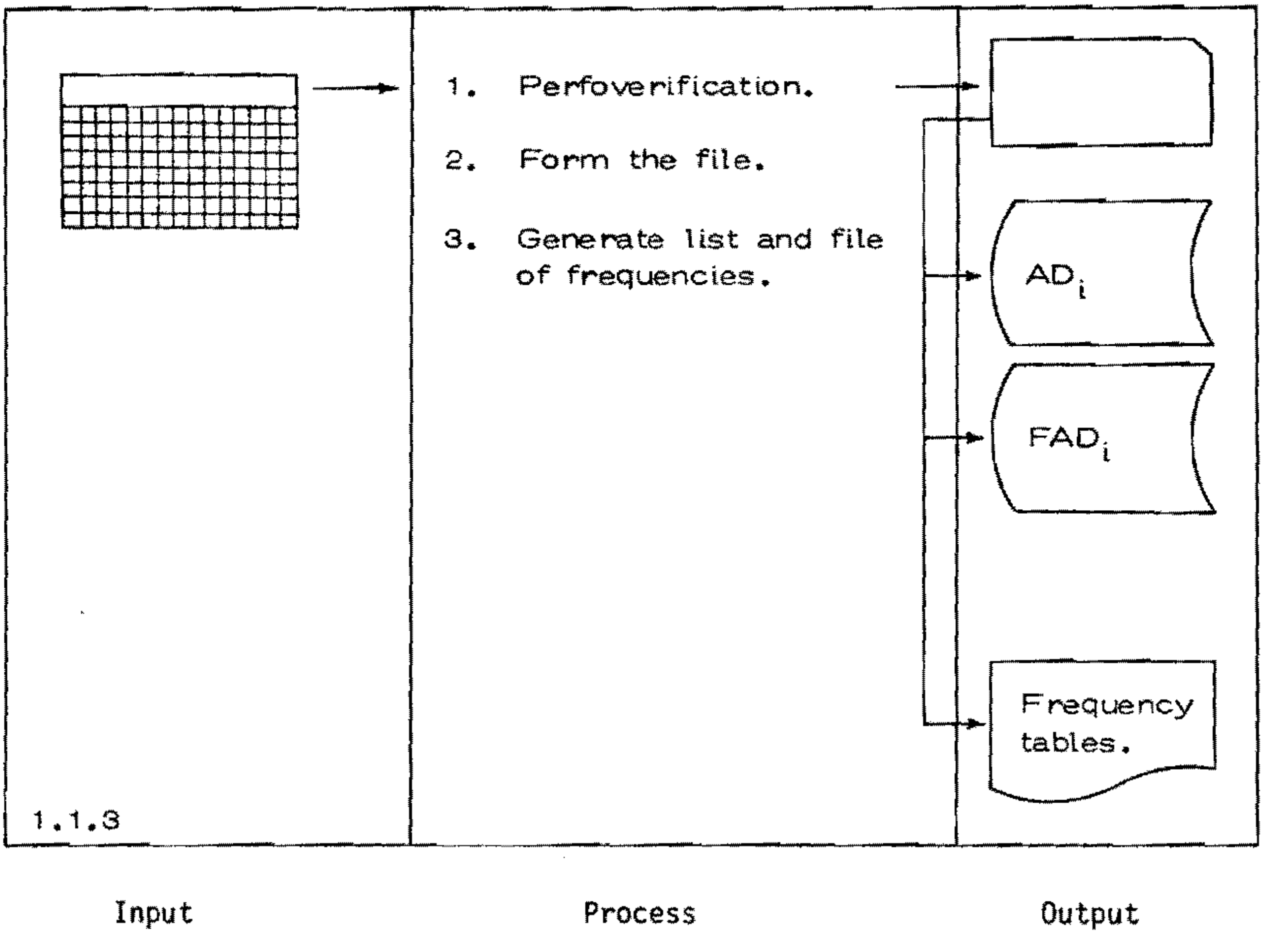
e numbers inside the blocks refer to the more detailed input-process-output description the following pages.



Input Process Output



Input Process Output


1. Perfoverification.
2. Form the file.
3. Generate list and file of frequencies.
AD_i
FAD_i
Frequency tables.
1.1.3
Input
Process
Output

CLIMATE . LANDSCAPE . SOIL . DISTRIBUTION .2	. On the basis of the information or analysis requested, one or more of the four basic files are inter-related. . Reports to present the information are already available. . Listing of the files in a legible format. e.g. Climatic data lists. Landscape data lists and soil data for the different land systems. Additionally, the totals of the areas for each value of the variables for landscape and soil have been obtained. For new questions, the soft-ware developed by SAS will be used, and this is facilitated by using the groupings referred to in SAS as MACROS.	Lists Reports and analysis Maps

Procedures are being developed in order to answer the many questions arising from the study; a programming manual and users' guide should be completed by mid-1980. These manuals are being produced and added to as the many questions that the study can help resolve are being answered. Meanwhile, CIAT's Data Services Unit is available to help investigators use the study to best effect.

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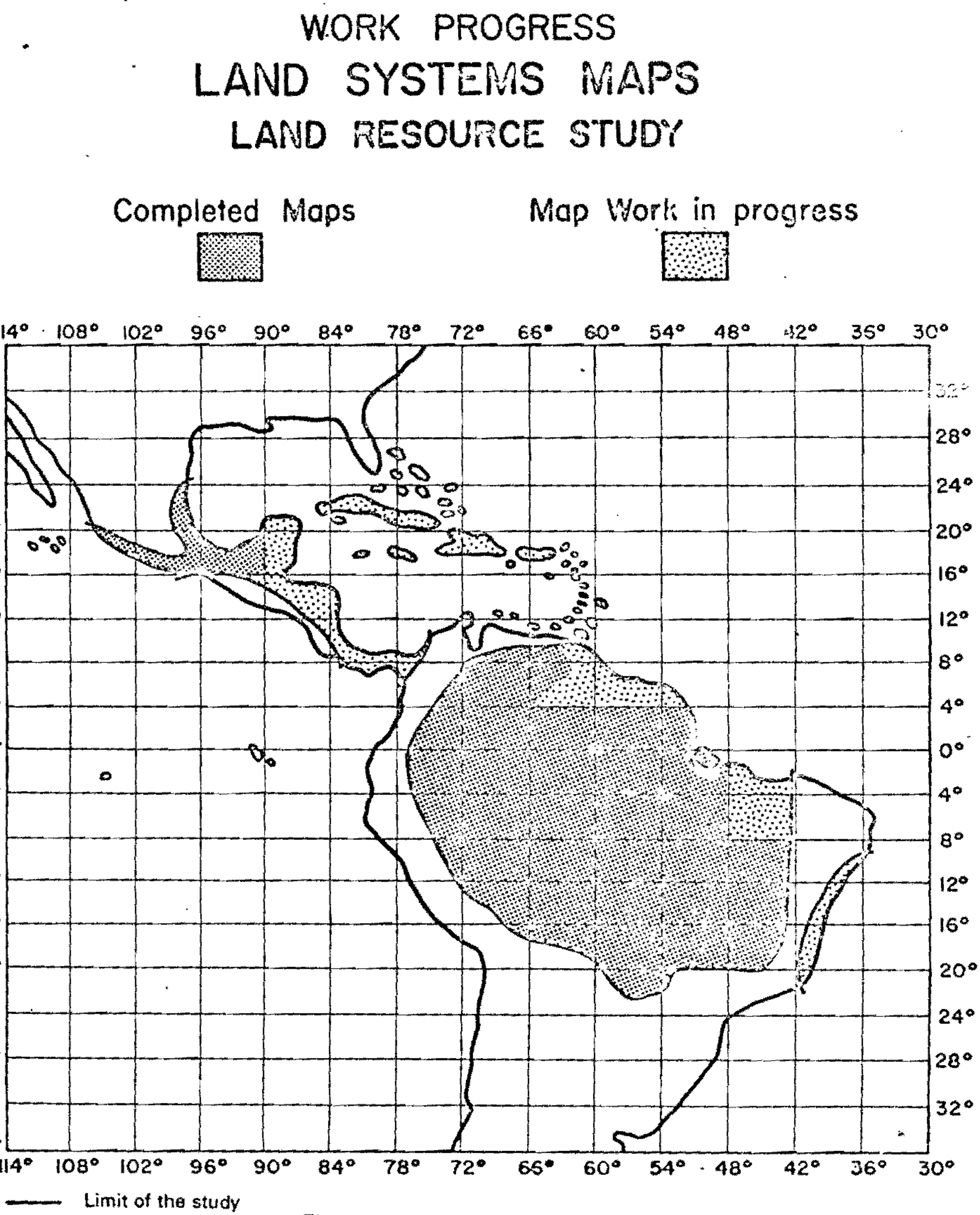


Figure 1. The geographical extent of the study

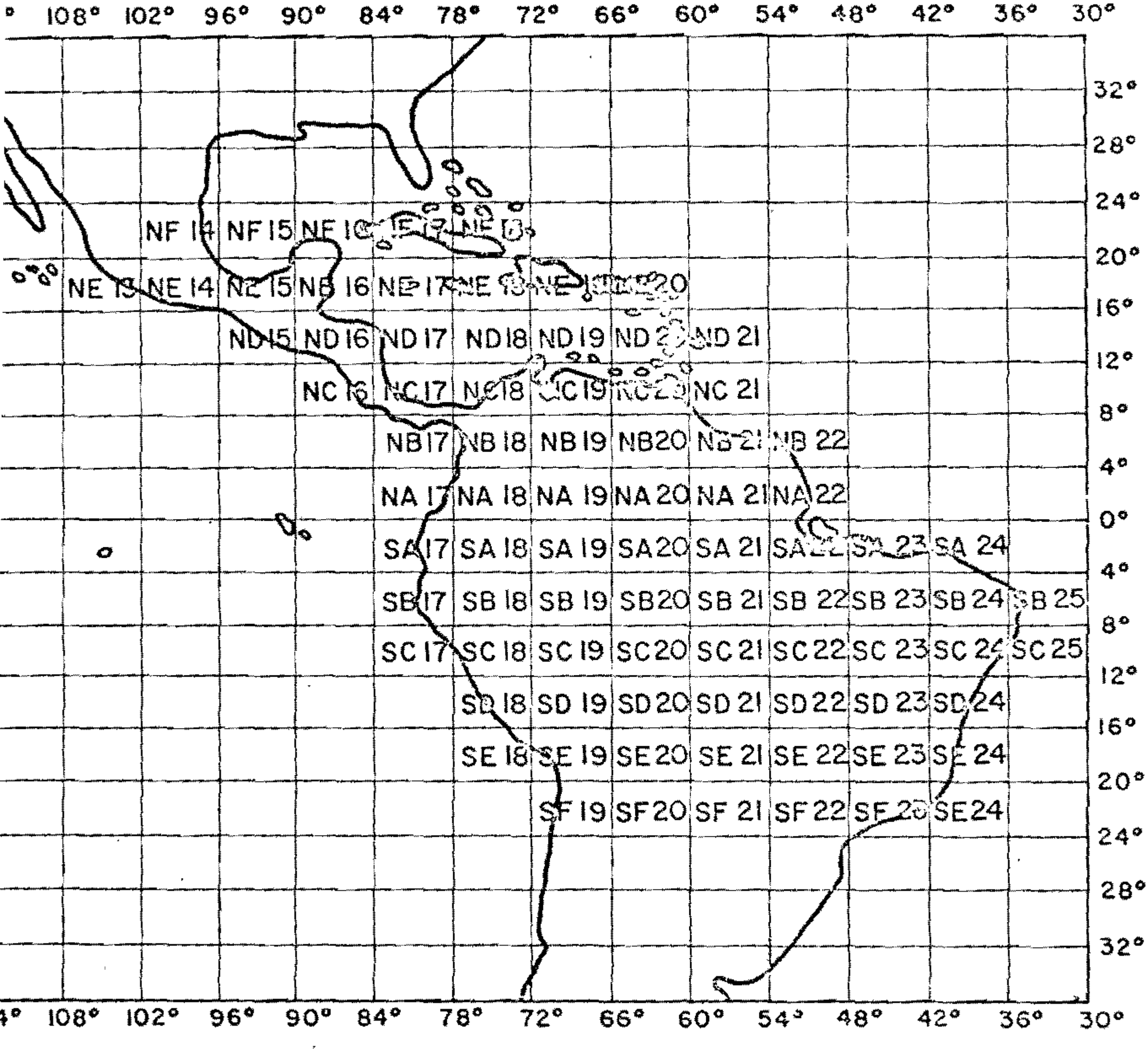


Figure 2. Code for the International Chart of the World on the millionth scale

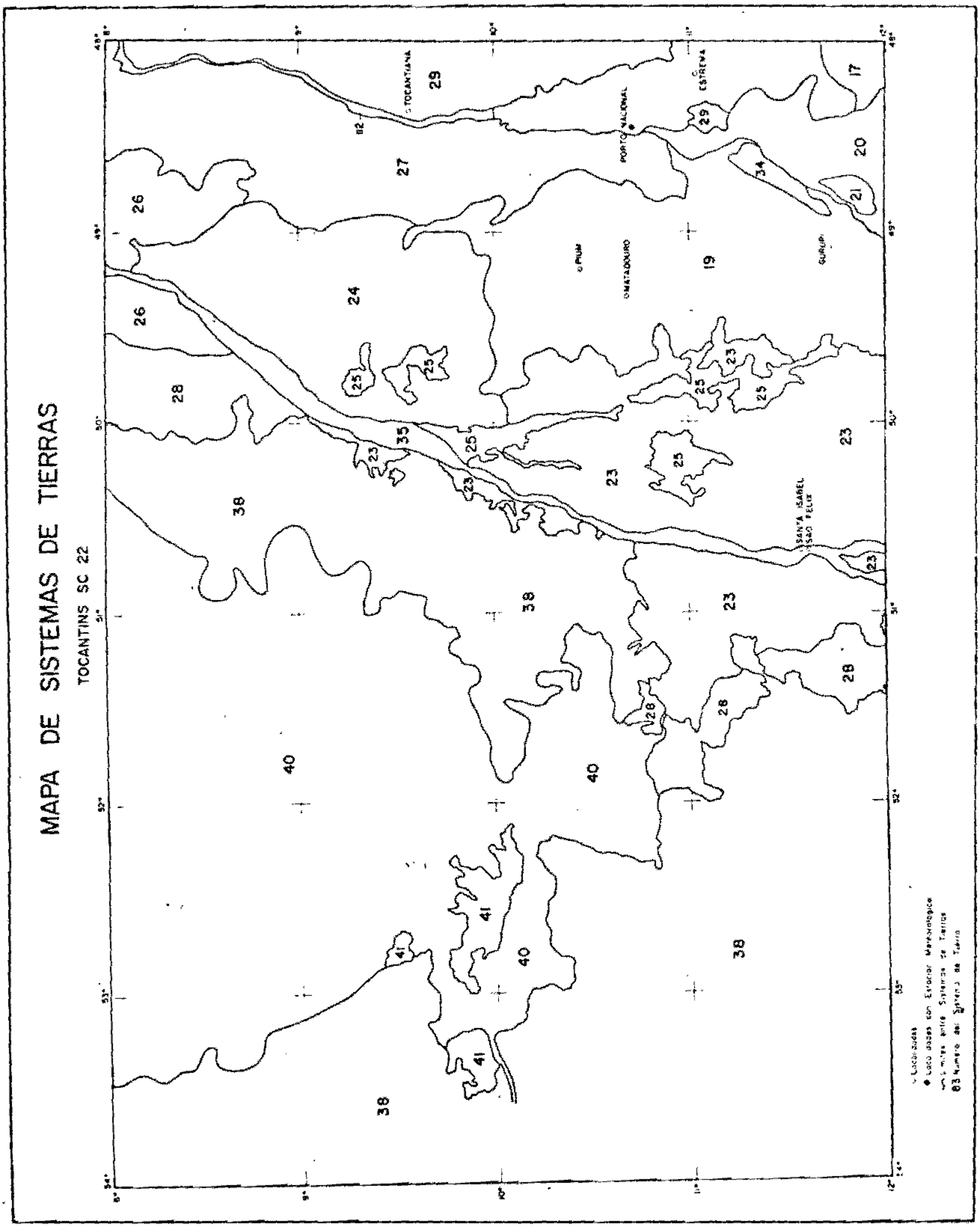


Figure 3. Land systems map SC-22, Tocantins, prepared as an over-lay for topographical maps.

LAND RESOURCE STUDY OF TROPICAL AMERICA

PERCENT AL SATURATION

TOPSOIL'S AL SATURATION %	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
◻ 10%	9506	9506	39.160	39.160
10-40 %	2362	11868	9.730	48.890
40-70 %	4385	16253	18.064	66.954
70%	8022	24275	33.046	100.000

SUBSOIL'S AL SATURATION % MEQ/100 GM	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
◻ 10%	11780	11780	48.527	48.527
10-40 %	3836	15616	15.802	64.330
40-70 %	2088	17704	8.601	72.931
70%	6571	24275	27.069	100.000

Figure 4. Percent Al Saturation levels, Central—west Brazil.

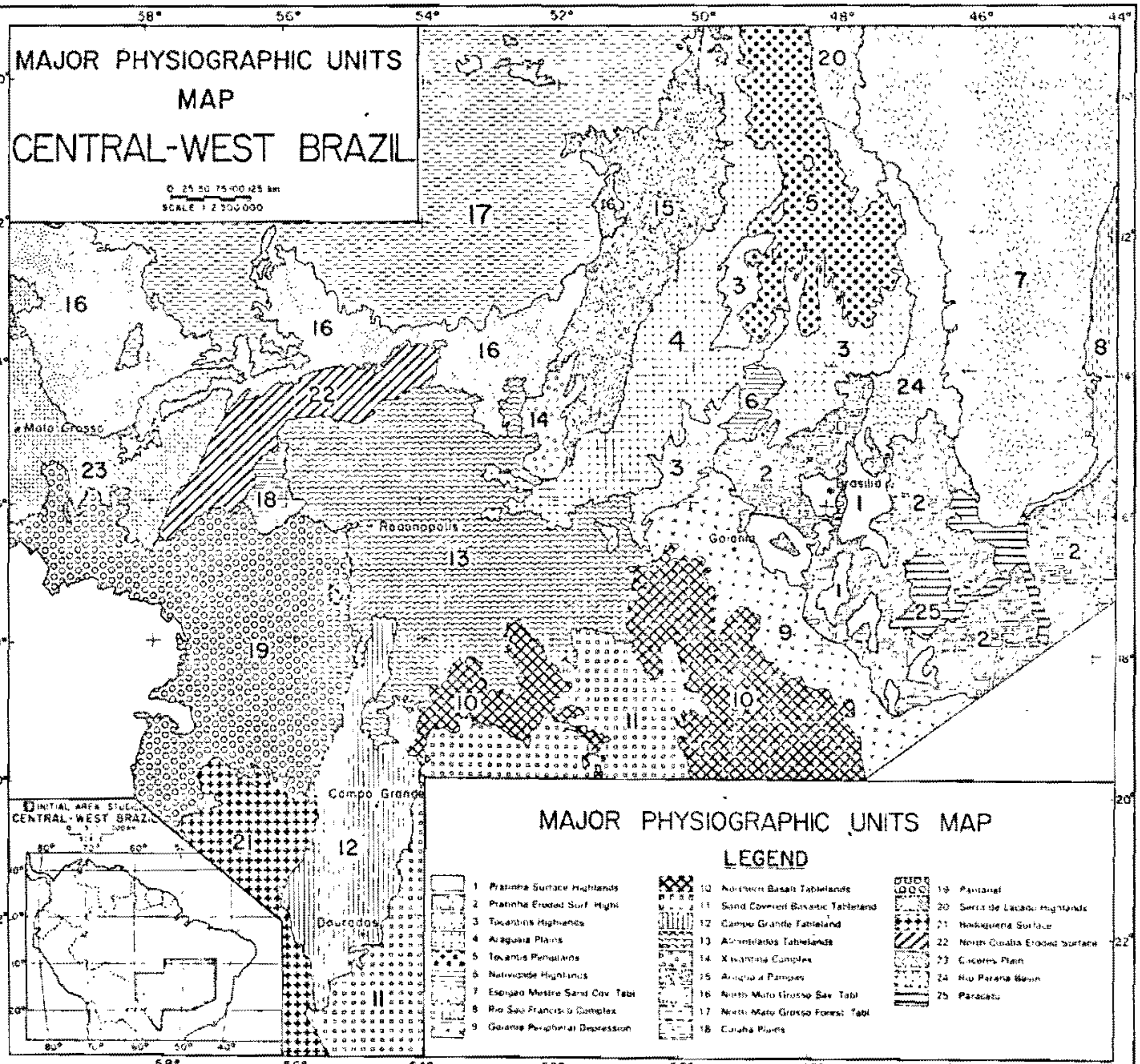


Figure 5. Central-west Brazil

TARGET AREA SURVEY

POTENTIAL EVAPOTRANSPIRATION AND PRECIPITATION DEFECIT FOR BRAZIL

2070 LUZIANIA LAT 16.15 LON 47.56 958. METERS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
MEAN TEMP	21.9	22.0	21.7	21.1	19.4	18.3	18.1	20.0	22.1	22.3	21.9	21.6	20.9
REL HUM	72	78	79	61	52	41	38	43	63	75	79	87	64
PCT SUN	59	52	51	69	76	84	87	83	67	55	50	40	64
MEAN RAD.	574	523	481	495	452	440	461	512	526	529	527	475	500
PRECIP.	228	201	229	96	16	7	4	5	27	130	215	317	1475
POT ET	164	135	136	134	120	110	118	139	146	152	145	134	1632
DEF PREC	-65	-66	-93	38	104	103	114	133	119	22	-70	-183	157
DEP PREC	141	123	142	53	0	0	0	0	7	76	132	200	
MAI	0.86	0.91	1.04	0.40	0.00	0.00	0.00	0.00	0.05	0.50	0.91	1.43	

Figure 6. Printout of climatic data, land system No 1.

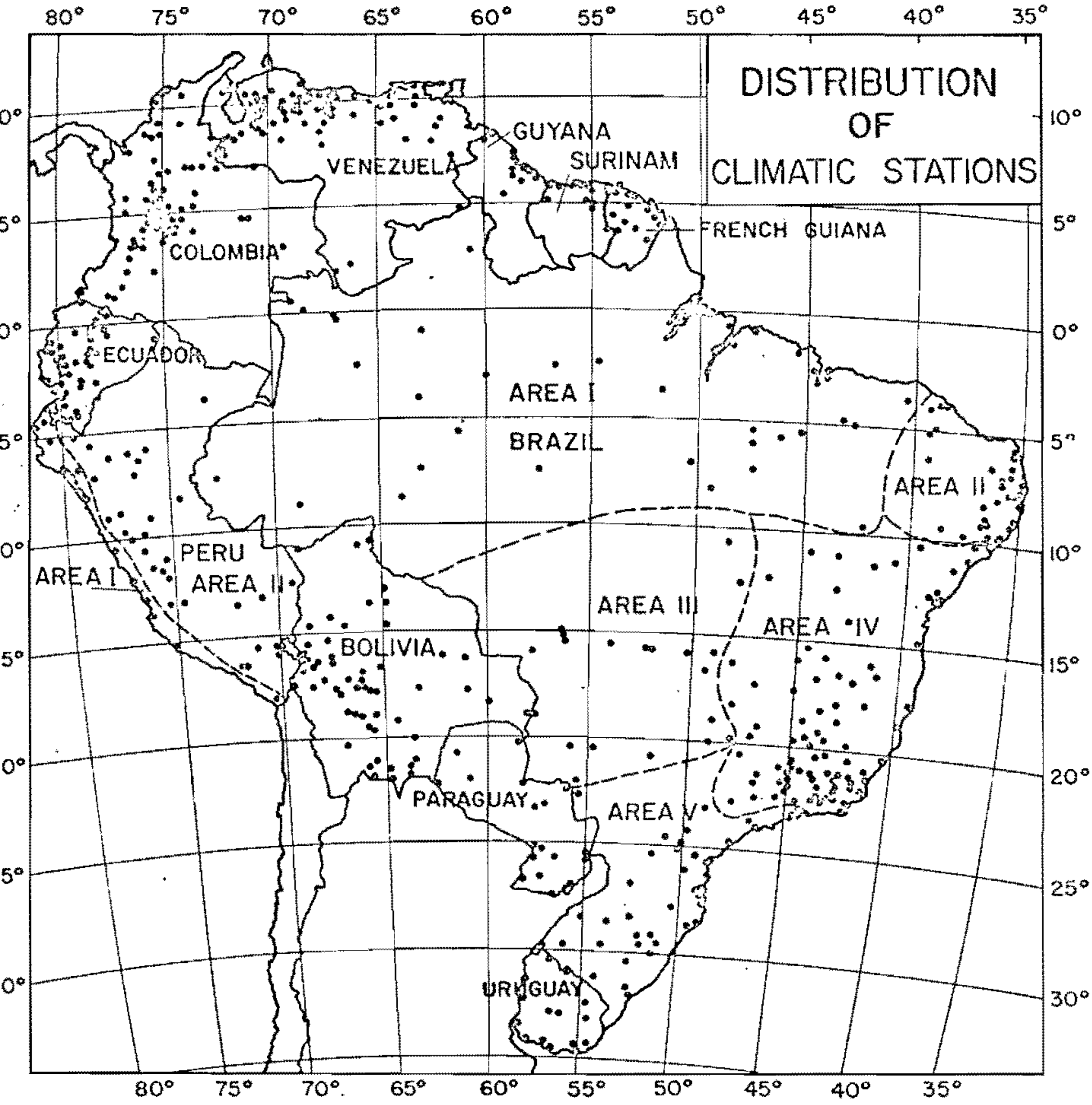
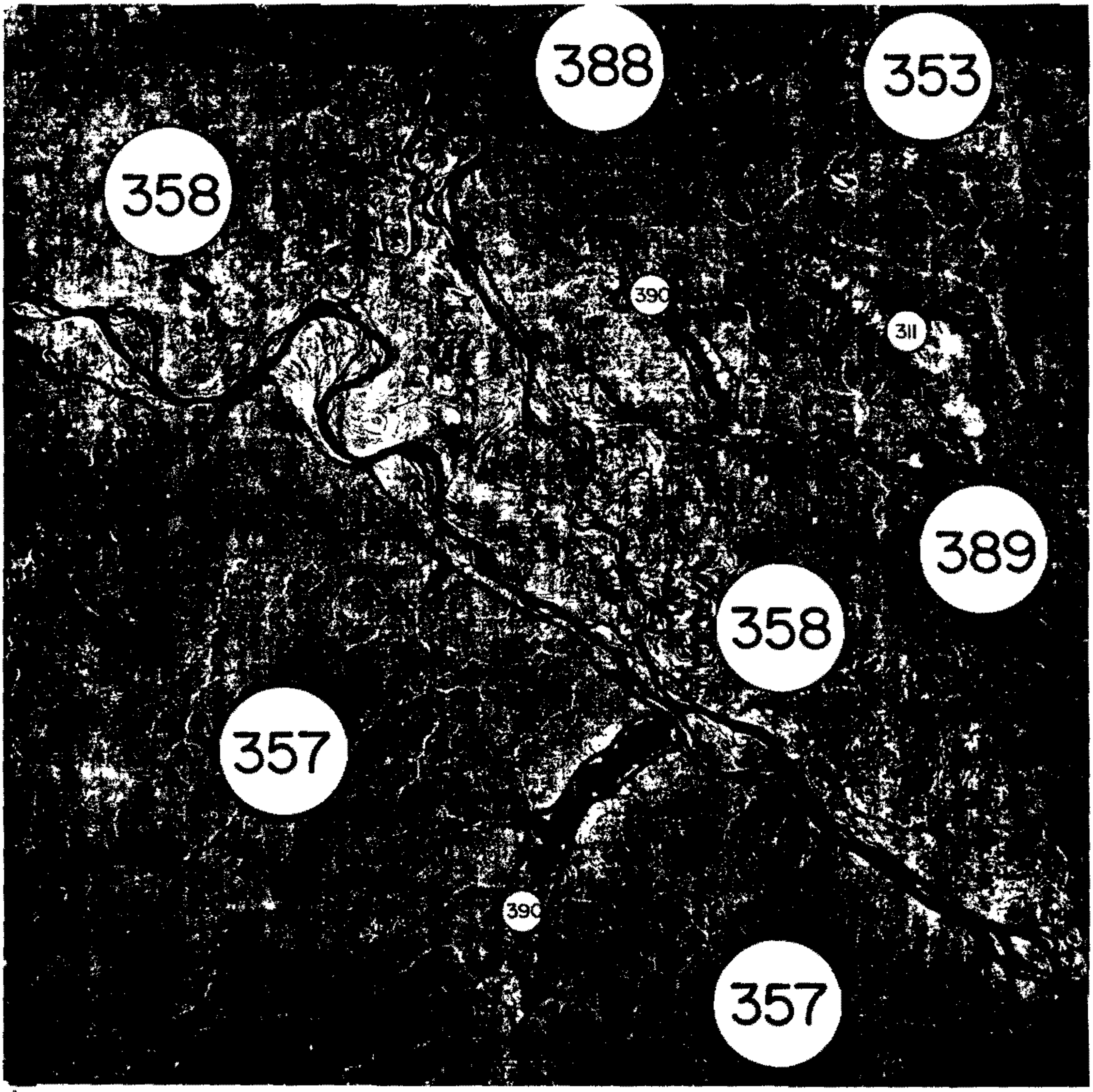


Figure 7. Regions for dependable precipitation calculations. "O" indicates climatic stations.

Figure 8. Land system delineation on satellite imagery



RADAR IMAGE

Figure 9. Land system delineation on radar imagery

Study No. and Card No. 1 [| 1]

LANDSCAPE

Var.No.			
	LAND SYSTEM No.	3 [		1]	LANDSYS
	AREA in Km x 10^2	7 [	2	0	9]	AREA
	ALTITUDE in mts	12 [1	1	0	0]	ALTITUDE

GENERALIZED CLASSIFICATION

Lowlands, below 900 m	B
Uplands, above 900 m	A
Well drained lands	S
Poorly drained lands	I
Flat lands, slopes < 8%	P
Hilly lands, slopes > 8%	C
Savannas	S
Forests	M
Others	O

17 [A | S | P | S]
L17 L18 L19 L20

GEOLOGICAL NOTES

A part of the Pre-cambrian crystalline tablelands consiting of metamorphic and volcanic rock covered with localized detrital sediments of lesser age. Micas,micaceous gneiss, quartz, marbles and occasional granites form the parent rock of the soil. An occasional stony laterite cap may be seen near the plateau edge.

HYDROLOGICAL NOTES

Lagoons in vicinity of Brasilia are man-made. Subterranean water apparently is plentiful.

DISTANCE BETWEEN PERENNIAL STREAMS

0-5 Km	1
5-10 Km	2
>10 Km	3
Unknown	4

21 [2] L21

DEPTH OF WELLS

0-5 m	1
5-10 m	2
>10 m	3
Unknown	0

23 [2] L23

Figure 10. Format L1, first page.

Var.No. GENERALIZED SOIL CLASSIFICATION ACCORDING TO SOIL TAXONOMY.

ORDERS

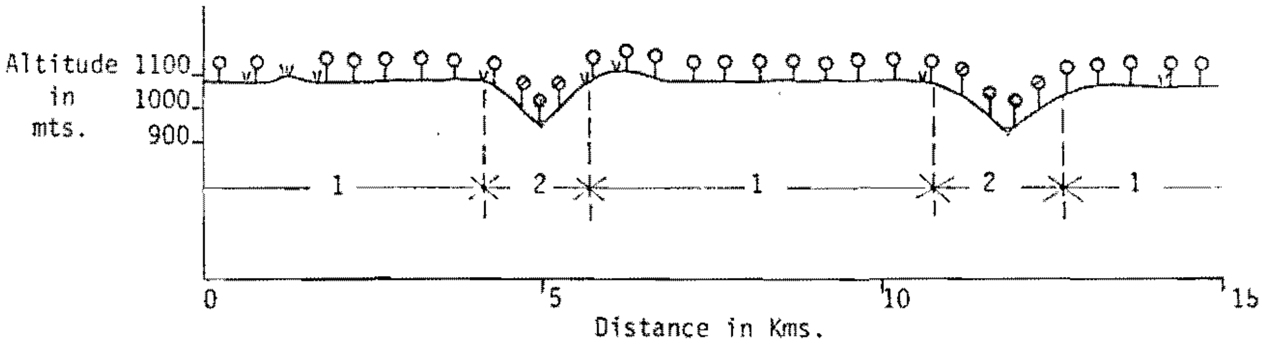
Alfisol	A
Aridisol	D
Entisol	E
Histosol	H
Inceptisol	I
Mollisol	M
Oxisol	O
Spodosol	S
Ultisol	U
Vertisol	V

25 [O]
27 [U][S]
L25-28

SUBORDERS

See complementary code.

LANDFORM DIAGRAM. Subdivision of Landscape into Facets.



Physiographic unit [ ][ ][1] PHYSUNIT
30

LANDSCAPE FACETS, generalized description

Plain	P
Depression	D
Valley	V
Valley Bottom	B
Convex sloping terrain	X
Concave sloping terrain	N
Rolling terrain, slopes <30%	C
Hilly terrain, slopes >30%	M
Crest	R
Plateau	A
Escarpment	E
Terrace	T
Other	O

Figure 11. Format L1 (cont.), second page.

Var.No.

	Var.		
Landscape facet No.1	33	A	GENDES
Landscape facet No.2	34	V	
Landscape facet No.3	35		

AREAS OF LANDSCAPE FACETS AS PERCENTAGE OF L.S.

	Var.		
Landscape facet No.1	36	85	PERC_LS
Landscape facet No.2	38	15	
Landscape facet No.3	40		

TOPOGRAPHIC CLASSIFICATION, LANDSCAPE FACETS

	Var.	TC1 Flat Poor Drain.	TC2 < 8%	TC3 8-30%	TC4 > 30%
Landscape facet No.1	42		90	10	
Landscape facet No.2	50			50	50
Landscape facet No.3	58				

ALTITUDE in mts.

	Var.	
Landscape facet No.1	66	1050
Landscape facet No.2	70	900
Landscape facet No.3	74	

Duplicar hasta columna 5

ORIGINAL VEGETATION CLASSIFICATION, LANDSCAPE FACETS, PERCENTAGES.

If "other" state.	Var.	OVC1 Seas. In.P.	OVC2 CL+ CS	OVC3 CC	OVC4 C	OVC5 Cd	OVC6 TRF	OVC7 SESF	OVC8 SDS	OVC9 Caat	OVC? Other
Landscape facet No.1	6			50	50						
Landscape facet No.2	26				20	[illegible]0					
Landscape facet No.3	46										

INDUCED VEGETATION, ACTUAL PERCENTAGE

	Var.	IVPP Pasture	IVAPC Crops
Landscape facet No.1	66	40	05
Landscape facet No.2	70	10	
Landscape facet No.3	74		

Figure 12. Format L1 (cont.), third page.

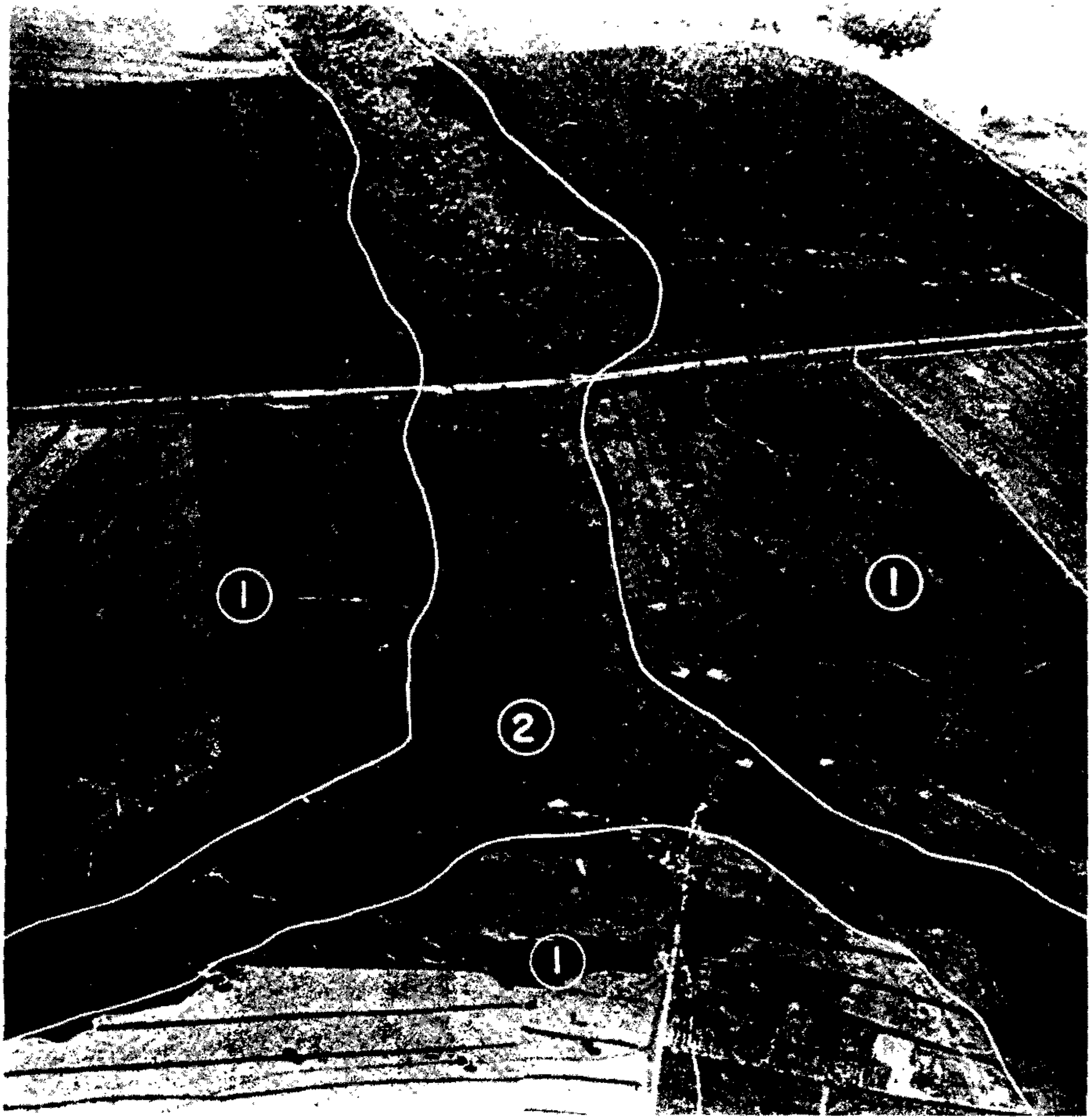


Figure 13. A typical land system, No. 49 showing a clear subdivision into two principal land facets, 1 and 2.

Symbol	DESCRIPTION
|/	Seasonally inundated pampa (grasslands). Campo limpo (grasslands on well drained lands) Campo sujo (grasslands on well drained lands with ocassional shrubs)
	Campo cerrado (open savanna)
	Cerrado (savanna)
	Cerradão (closed savanna)
	Forest
	Palm forest
	Caatinga (dry forest)

Figure 14. The vegetation code used on the land form diagrams.

Study No. and Card No. [1] [S][1]

LAND SYSTEM No. [3] [ ][ ][1] LANDSYS

LANDSCAPE FACET No. [5] [1] FAC

LANDSCAPE FACET AS PERCENTAGE OF L.S. [7] [8][4]

SOIL CLASSIFICATION

According to Soil Taxonomy

ORDERS [9] [O] F1

Alfisol	A
Aridisol	D
Entisol	E
Histosol	H
Inceptisol	I
Mollisol	M
Oxisol	O
Spodosol	S
Ultisol	U
Vertisol	V

SUBORDERS [SUBORD = F1+F2] [10] [U][S] F2

See complementary code

GREAT GROUP [GREATGR = F1+F2+F3] [12] [A][C] F3

See complementary code

SOIL PHYSICAL PROPERTIES

SLOPE [14] [B] F4

< 8%	B
8-30%	M
> 30%	A

TEXTURE TOPSOIL. 0-20 cm. [15] [C] F5

Sand	S	FCC	type
Loam	L	FCC	type
Clay	C	FCC	type
Organic	O	FCC	type

TEXTURE, SUBSOIL 20-50 cm. [16] [C] F6

Sand	S	FCC	sub-type
Loam	L	FCC	sub-type
Clay	C	FCC	sub-type
Rock	R	FCC	sub-type

Rock or other hard root restricting layer.

COARSE MATERIAL

< 15%	B
15-35%	M
> 35%	A

TOPSOIL (> 2mm diam.) [17] [B] F7

SUBSOIL (> 2mm diam.) [18] [B] F8

DEPTH [19] [P] F9

> 150 cm	P
50-150 cm	M
20- 50 cm	S
< 20	L

INITIAL INFILTRATION RATE [20] [A] F10

High	A
Medium	M
Low	B

HYDRAULIC CONDUCTIVITY [21] [A] F11

High	A
Medium	M
Low	B

DRAINAGE [22] [B] F12

Good	B
Deficient	D
Poor	G FCC modifer (FCC M.)

MOISTURE HOLDING CAPACITY [23] [B] F13

High	A
Medium	M
Low	B

TEMPERATURE REGIME [24] [I] F14

	Mean ann.	temp-var*	
Isohyperthermic	> 22°C	< 5°C	S
Isothermic	15-22°C	< 5°C	I
Hyperthermic	> 22°C	> 5°C	H
Thermic	15-22°C	> 5°C	T

MOISTURE REGIME [25] [S][D] F15

UDIC	U	
USTIC	SD	FCC M.
XERIC	XD	FCC M.

EXPANDING CLAYS [27] [O] F16

>35% clay and >50' 2:1 expanding clays, COLE 0.09 V FCC M

Less than V O

* Variation between 3 hotest months and 3 coolest months at 50 cms depth.

Figure 15. Format S1, first page.

SOIL CHEMICAL PROPERTIES
Analysis According to Nth. Carolina Methodology

T - Topsoil 0-20cm(approx.) S-subsoil 20-50 cm (approx.)

pH — 28 T [H] F17, S [H] F18

> 7.3	A
5.3-7.3	M
< 5.3	H FCC M.

Al SATURATION — 30 T [A] F19, S [H] F20

40-70 %	H
10-40 %	M
< 10 %	B
>70 %	A FCC M.
Unknown	U

EXCHANGEABLE Al
meq/100 gm soil — 32 T [A] F21, S [M] F22

> 1.5	A
0.5-1.5	M
< 0.5	B
Unknown	U

EXCHANGEABLE Ca
meq/100 gm soil — 34 T [B] F23, S [B] F24

> 4.0	A
0.4-4.0	M
< 0.4	B
Unknown	U

EXCHANGEABLE Mg
meq/100 gm soil — 36 T [M] F25, S [B] F26

> 0.8	A
0.2-0.8	M
< 0.2	B
Unknown	U

EXCHANGEABLE K
meq/100 gm soil — 38 T [K] F27, S [K] F28

> 0.3	A
0.15-0.3	M
< 0.15	K FCC M
Unknown	U

EXCHANGEABLE Na
meq/100 gm soil — 40 T [B] F29, S [B] F30

> 0.2	A
0.1-0.2	M
< 0.1	B
Unknown	U

TOTAL EXCHANGEABLE BASES
meq/100 gm soil — 42 T [B] F31, S [B] F32

> 6	A
2 - 6	M
< 2	B
Unknown	U

CATION EXCHANGEABLE CAPACITY
meq/100 gm soil — 44 T [L] F33, S [L] F34

> 8	A
4-8	M
< 4	E FCC M.
Unknown	U

ORGANIC MATTER % — 46 T [M] F35, S [B] F36

> 4.5	A
1.5-4.5	M
< 1.5	B
Unknown	U

PHOSPHORUS ppm — 48 T [B] F37, S [B] F38

> 7	A
3-7	M
< 3	B
Unknown	U

PHOSPHORUS FIXATION — 50 T [I] F39

>35%Clay %free Fe_2O_3/%Clay > 15 I FCC M.
<than specification for I 0

MANGANESE ppm — 51 T [U] F40

< 8 ppm	B
8-20 ppm	S
> 35 ppm	T but variable (poss. > 1% Mn saturation)
Unknown	U

SULPHUR — 52 T [U] F41

Low	B
Medium	S
High	A
Unknown	U

ZINC ppm — 53 T [B] F42

< 1.5	B
> 1.5	S
Unknown	U

IRON ppm — 54 T [U] F43

< 10	B
10-80	S
> 80	A
Unknown	U

COPPER ppm — 55 T [U] F44

< 0.15	B
> 0.15	S
Unknown	U

BORON ppm — 56 T [U] F45

< 0.3	B
> 0.3	S
Unknown	U

Figure 16. Format S1, continued, second page.

SOIL CHEMICAL PROPERTIES (Cont.)

T-Topsoil 0-20cm (approx.) S-Subsoil 20 -50cm (approx.)

MOLYBDENUM ppm — 57 T [U] F46

< 0.5 B
> 0.5 S
Unknown U

FREE CALCIUM CARBONATE — 58 T [A] F47

Present B FCC M.
Absent A
Unknown U

SALINITY mmhos — 59 T [B] F48

0-4 B
> 4 S FCC M.
Unknown U

NATRIC % Na saturation of CEC — 60 [B] F49 T

0-15 B
> 15 N FCC M.
Unknown U

CAT CLAY
pH in 1:1H_2O < 3.5 after drying soil

Cat Clay C FCC M. — 61 [N] F50 T
Not Cat Clay N
Unknown U

X-RAY AMORPHOUS > 35% Clay and pH > 10 in
1N NaF or positive to field NaF test
or other indirect evidence of allophane
dominance in clay fraction.

62 T [N] F51

X-ray amorphous X FCC M.
Not X-ray amorphous N
Unknown U

ELEMENTS OF IMPORTANCE MAINLY TO ANIMAL NUTRITION

Satisfactory S
Deficient D
Unknown U

63 T

Co [U] F52
I [D] F53
Se [U] F54
Cr [U] F55
Ni 66 [U] F56
Others [U] F57

FERTILITY CAPABILITY CLASSIFICATION
Summary (See separate notes)

Type and substratatypes 69 [C][C] F58
Modifiers 71 [ ][D][H][A][K][E][I] F59

Figure 17. Format S1 continued, third page.

TOCANTIS SC 22

10

FORMA PARA CODIFICACION

UNIDAD DE SERVICIOS DE DATOS

PROYECTO	LAND RESOURCE STUDY OF TROPICAL AMERICA	CODIGO / PROYECTO	PAGINA No. DE
USUARIO	RESPONSABLE GRISALFS	FECHA	

LONGITUD	LATITUD																	
49 45	8 00	28	28	28	26	26	26	35	26	26	26	26	26	26	26	27	27	27
49 45	8 05	28	28	26	26	26	26	35	26	26	26	26	26	26	26	27	27	27
49 45	8 10	28	28	26	26	26	25	24	24	26	26	26	26	26	26	27	27	27
49 45	8 15	28	28	26	26	26	35	24	24	26	26	26	25	26	27	27	27	27
49 45	8 20	28	28	26	26	26	24	24	24	26	26	26	25	25	27	27	27	27
49 45	8 25	28	26	26	26	35	24	24	24	24	26	26	26	27	27	27	27	27
49 45	8 30	28	26	26	35	24	24	24	24	24	26	26	26	26	27	27	27	27
49 45	8 35	28	26	35	24	24	24	24	24	24	24	26	26	26	26	27	27	27
49 45	8 40	28	35	24	24	24	24	24	24	24	24	24	26	26	26	27	27	27
49 45	8 45	35	35	24	24	24	24	24	24	24	24	24	27	27	27	27	27	27
49 45	8 50	35	24	24	24	24	24	24	24	24	24	27	27	27	27	27	27	27
49 45	8 55	24	24	24	24	24	24	24	24	24	24	27	27	27	27	27	27	27
49 45	9 00	24	24	24	24	24	24	24	24	24	27	27	27	27	27	27	27	27
49 45	9 05	24	24	24	24	24	24	24	24	24	27	27	27	27	27	27	27	27
49 45	9 10	24	24	24	24	24	24	24	24	24	24	27	27	27	27	27	27	27
49 45	9 15	25	24	24	24	24	24	24	24	24	24	27	27	27	27	27	27	27
49 45	9 20	24	24	24	24	24	24	24	24	24	24	27	27	27	27	27	27	112
49 45	9 25	24	24	24	24	24	24	24	24	24	24	27	27	27	27	27	27	29
49 45	9 30	25	24	24	24	24	24	24	24	24	24	27	27	27	27	27	27	29
49 45	9 35	25	25	24	24	24	24	24	24	24	27	27	27	27	27	27	27	29
49 45	9 40	25	24	24	24	24	24	24	24	24	19	27	27	27	27	27	27	29
49 45	9 45	24	24	24	24	24	24	24	24	24	19	27	27	27	27	27	27	29
49 45	9 50	24	24	24	24	24	24	24	24	24	19	19	27	27	27	27	27	112
49 45	9 55	24	24	24	24	24	19	24	19	19	19	19	27	27	27	27	27	112
49 45	10 00	19	19	19	19	19	19	19	19	19	19	19	27	27	27	27	27	17

Figure 18. Format FC 01.

= LAND RESOURCE STUDY OF TROPICAL AMERICA =

LAND SYSTEM -0001

CLIMATE

2073 LUZIANIA LAT 16 15 LON 47 56 958. METERS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
MEAN TEMP	21.9	22.0	21.7	21.1	19.4	18.3	18.1	20.0	22.1	22.3	21.9	21.6	20.9
MEAN R.H.	72	78	79	61	52	41	38	43	63	75	77	87	64
PCT SUN	57	52	51	69	76	84	87	83	67	55	53	40	64
MEAN RAD.	574	523	481	495	452	443	461	512	526	527	527	475	500
PRECIP.	228	201	229	96	16	7	4	5	27	130	215	317	1475
POT ET	164	135	136	134	120	110	118	139	145	152	145	134	1632
DEF PREC	-65	-66	-93	38	104	103	114	133	119	22	-73	-183	157
DEP PREC	141	123	142	53	0	0	0	0	7	75	132	206	
MAI	0.86	0.91	1.04	0.40	0.00	0.03	0.00	0.00	0.05	0.50	0.91	1.49	

LANDSCAPE

AREA 20900 KM2

ALTITUDE 1100 MTS.

GENERALIZED CLASSIFICATION

UPLANDS. ABOVE 900 M
WELL DRAINED LANDS
FLAT LANDS. SLOPES < 8%
SAVANNAS

DISTANCE BETWEEN PERENNIAL STREAMS
5-10 KM

DEPTH OF WELLS
5-10 M

GENERALIZED SOIL CLASSIFICATION

ORDER OXISOL
SUBORDER USTOX

PHYSIOGRAPHIC UNIT 1

LAND SYSTEM-0001

LANSCAPE FACETS

	FACETS 1	2	3
GENERALIZED DESCRIPTION	A	V	
PERCENTAGE OF L.S	85	15	
TOPOGRAPHIC CLASSIFICATION (PERCENTAGES)			
FLAT POOR DRAINAGE			
< 8%	90		
8-30%	10	50	
> 30%		50	
ALTITUDE	1050	900	
ORIGINAL VEGETATION CLASSIFICATION (PERCENTAGES)			
SEAS.IN.P			
CL+CS			
CC	50		
C	50	20	
CD		80	
TRF			
SESF			
SDSF			
CAAT			
OTHER			
INDUCED VEGETATION (PERCENTAGE)			
PASTURE	40	10	
CROPS	5		
SOIL CLASSIFICATION			
ORDERS	O	O	
SUBORDERS	OUS	OUS	
GREAT GROUP	OUSAC	OUSAC	
SOIL PHYSICAL PROPERTIES			
SLOPE	B	A	
DEPTH	P	P	
INIT.INFIL.RATE	A	A	
HYDRAUL.CONDUCT.	A	A	
DRAINAGE	B	B	
MOIST.HOLD.CAP.	B	B	
TEMP.REGIME	I	I	
MOIST.REGIME	SO	SO	
EXPANDING CLAYS	O	O	

	FACETS 1 T	1 S	2 T	2 S	3 T	3 S
TEXTURE	C	C	L	L		
COARSE MATERIAL	B	B	B	B		
SOIL CHEMICAL PROPERTIES						
PH	H	H	H	H		
AL SATURATION	A	H	A	H		
EXCHANGEABLE AL	A	M	A	M		
EXCHANGEABLE CA	B	B	B	B		
EXCHANGEABLE MG	M	B	M	B		
EXCHANGEABLE K	K	K	K	K		
EXCHANGEABLE NA	B	B	B	B		
TOTAL EXCHANG.BASES	B	B	B	B		
CATION EXCH.CAPAC.	E	E	E	E		
ORGANIC MATTER %	M	B	M	B		
PHOSPHORUS-PPM	B	B	M	B		
PHOSPHORUS FIXATION	I		I			
MANGANESE-PPM	U		U			
SULPHUR	U		U			
ZINC-PPM	B		B			
IRON-PPM	U		U			
COOPER-PPM	U		U			
BORON-PPM	U		U			
MOLYBDENUM-PPM	U		U			
FREE CALCIUM CARB	A		A			
SALINITY-MMHOS	B		B			
NATRIC	B		B			
CAT CLAY	N		N			
X-RAY AMORPHUS	N		N			
ELEMENTS OF IMPORTANCE MAINLY TO ANIMAL NUTRITION						
CO	U		U			
I	D		D			
SE	U		U			
CR	U		U			
NI	U		U			
OTHERS	U		U			

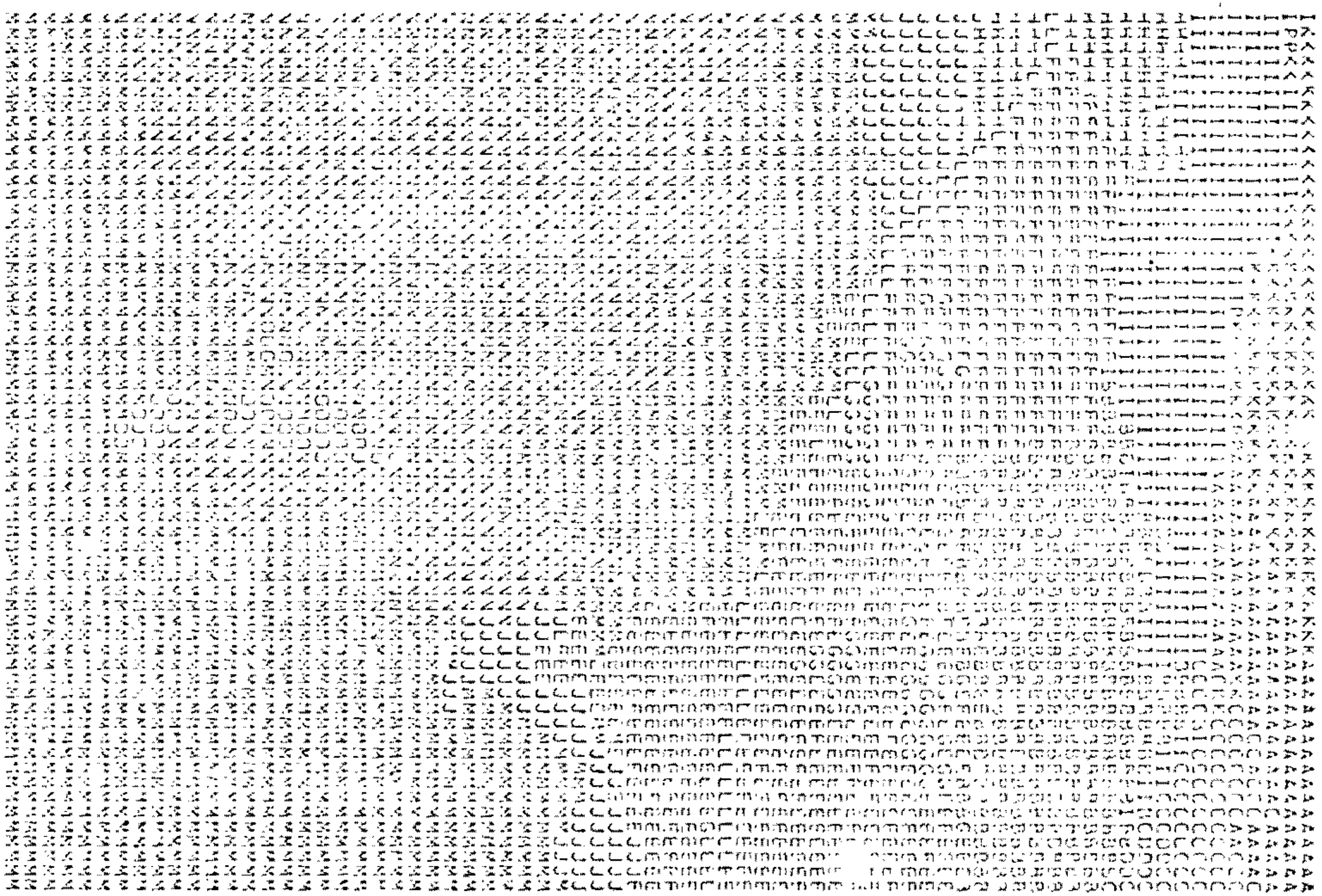
FERTILITY CAPABILITY CLASSIFICATION

TYPE AND SUBSTRATA TYPES CC LL

MODIFIERS FACET 1 OHAES
2 OHAEI
3

Figure 19. A printout of the description for land system No. 1.

A COMPUTER PRINTOUT OF LAND SYSTEMS MAP SC-22 TOCANTINS



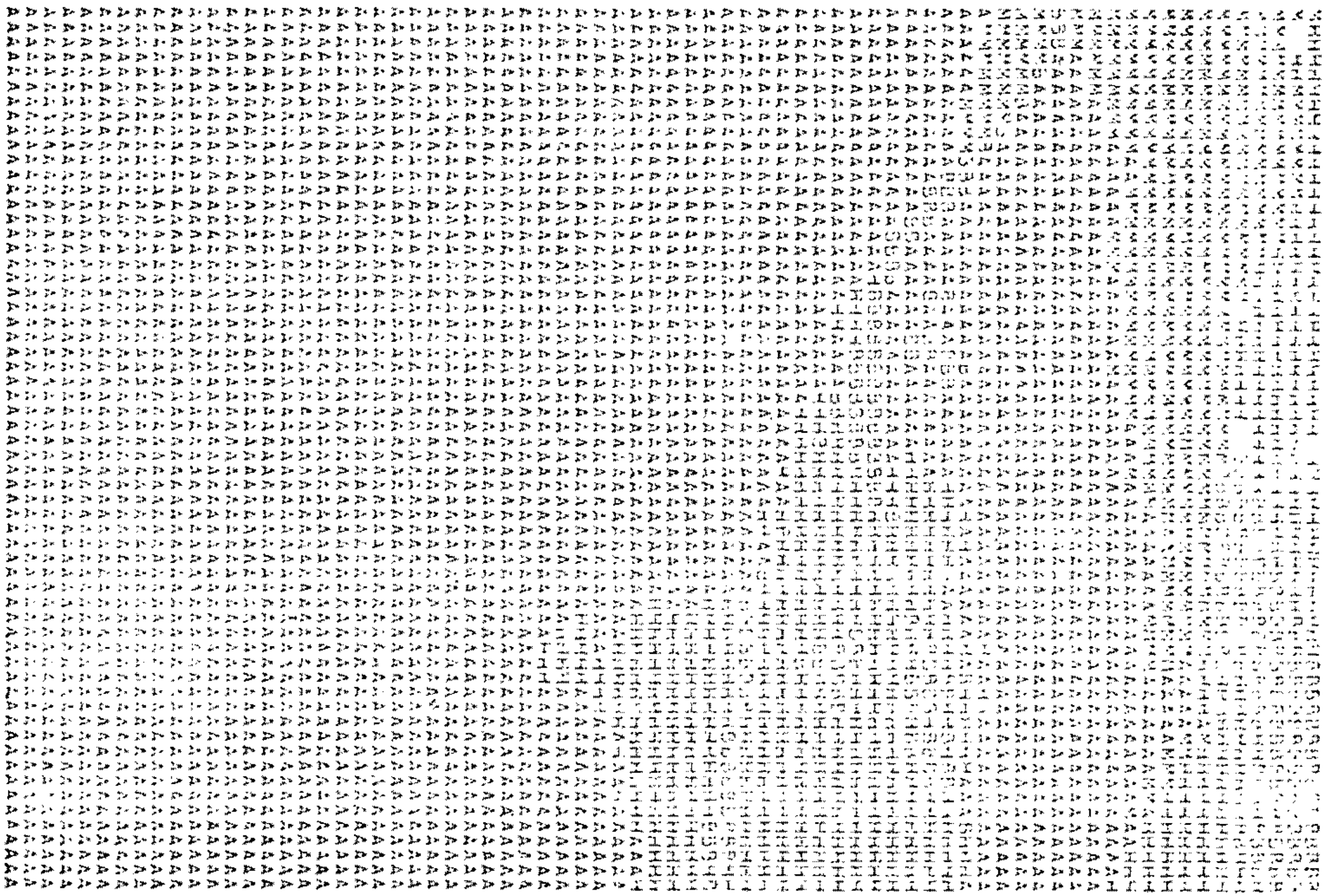
LANDSYSTEMS CODE:

A = LS No. 17, B = LS No. 19, C = LS No. 20, D = LS No. 21, E = LS No. 23, F = LS No. 24,
G = LS No. 25, H = LS No. 26, I = LS No. 27, J = LS No. 28, K = LS No. 29, L = LS No. 35,
M = LS No. 30, N = LS No. 40, O = LS No. 41, P = LS No.112

Figure 20. A printout of land systems map SC-22, Tocantins

LAND RESOURCE STUDY OF TROPICAL AMERICA

A COMPUTER PRINTOUT OF % AL SATURATION LEVELS OF TOPSOIL, MAP SC-22 TOCANTINS



CODE: A > 70% H 40-70% M 10-40% B < 10%

Figure 21. A thematic map printout. % Al saturation levels (Map SC-22, Tocantins)

TABLE OF GTWSPE BY COD

GTWSPE COD

FREQUENCY / PERCENT / ROW PCT / COL PCT

GTWSPE	SEAS.IN.	CL+CS	CC	C	CD	TRF	SESF	SDSF	CAAT	OTHER	TOTAL
DE 650 A 699	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	2 0.56 66.67 15.38	1 0.28 33.33 4.17	3 0.84
DE 700 A 749	2 0.56 11.11 5.41	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.28 5.56 2.04	0 0.00 0.00 0.00	3 0.84 16.67 15.00	7 1.97 38.89 16.28	3 0.84 16.67 23.08	2 0.56 11.11 8.33	18 5.06
DE 800 A 849	1 0.28 20.00 2.70	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.28 20.00 2.33	3 0.84 60.00 23.08	0 0.00 0.00 0.00	5 1.40
DE 850 A 899	3 0.84 15.00 8.11	2 0.56 10.00 5.00	3 0.84 15.00 5.26	3 0.84 15.00 4.17	4 1.12 20.00 8.16	0 0.00 0.00 0.00	0 0.00 0.00 0.00	4 1.12 20.00 9.30	0 0.00 0.00 0.00	1 0.28 5.00 4.17	20 5.62
DE 900 A 949	8 2.25 9.64 21.62	13 3.65 15.66 32.50	17 4.78 20.48 29.82	20 5.62 24.10 27.78	10 2.81 12.05 20.41	1 0.28 1.20 100.00	6 1.69 7.23 30.00	5 1.40 6.02 11.63	0 0.00 0.00 0.00	3 0.84 3.61 12.50	83 23.31
DE 950 A 999	5 1.40 6.67 13.51	5 1.40 6.67 12.50	13 3.65 17.33 22.81	21 5.90 28.00 29.17	17 4.78 22.67 34.69	0 0.00 0.00 0.00	4 1.12 5.33 20.00	9 2.53 12.00 20.93	0 0.00 0.00 0.00	1 0.28 1.33 4.17	75 21.07
DE 1000 A 1049	6 1.69 10.71 16.22	6 1.69 10.71 15.00	11 3.09 19.64 19.30	14 3.93 25.00 19.44	9 2.53 16.07 18.37	0 0.00 0.00 0.00	3 0.84 5.36 15.00	5 1.40 8.93 11.63	1 0.28 1.79 7.69	1 0.28 1.79 4.17	56 15.73
DE 1050 A 1099	2 0.56 8.33 5.41	8 2.25 33.33 20.00	5 1.40 20.83 8.77	3 0.84 12.50 4.17	1 0.28 4.17 2.04	0 0.00 0.00 0.00	3 0.84 12.50 15.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	2 0.56 8.33 8.33	24 6.74
DE 1100 A 1149	9 2.53 15.52 24.32	4 1.12 6.90 10.00	8 2.25 13.79 14.04	10 2.81 17.24 13.89	7 1.97 12.07 14.29	0 0.00 0.00 0.00	1 0.28 1.72 5.00	7 1.97 12.07 16.28	3 0.84 5.17 23.08	9 2.53 15.52 37.50	58 16.29
DE 1200 A 1249	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.28 25.00 1.39	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.28 25.00 2.33	1 0.28 25.00 7.69	1 0.28 25.00 4.17	4 1.12
MAYOR DE 1250	1 0.28 10.00 2.70	2 0.56 20.00 5.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	4 1.12 40.00 9.30	0 0.00 0.00 0.00	3 0.84 30.00 12.50	10 2.81
TOTAL	37 10.39	40 11.24	57 16.01	72 20.22	49 13.76	1 0.28	20 5.62	43 12.08	13 3.65	24 6.74	356 100.00

Natural Vegetation Classes Code

Seas. In. P. Seasonally inundated pampas

CL + CS Campo Limpo + Campo Sujo (Cerrado or savanna vegetation)

CC Campo Cerrado (Cerrados or savanna vegetation)

C Cerrado (Cerrados or savanna vegetation)

CD Cerradao (Cerrados or savanna vegetation)

TRF Tropical Rainforest

SESF Tropical Semi-evergreen seasonal forest

SDSF Semi-deciduos sea[illegible]

Caat Caatinga (shrubby woodland)

Figure 22. Comparison of the frequency of occurrence of the native vegetation classes with total wet season potential evapotranspiration regimes.

APPENDIX 1

PRINCIPAL BIBLIOGRAPHIC REFERENCES USED IN THE STUDY TO DATE (MAY 1979) FOR BOLIVIA, BRAZIL, COLOMBIA, PERU, MEXICO AND VENEZUELA

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APPENDIX II

The Code Letters used for computerizing the Orders, Suborders and Great Groups of the U.S.Soil Taxonomy.

- Order	Code	Suborder	Code	Great group	Code
Alfisols	A	Aqualfs	AQ	Albaqualfs	AL
				Duraqualfs	DU
				Fragiaqualfs	FR
				Glossaqualfs	GL
				Natraqualfs	NA
				Ochraqualfs	OC
				Plinthaqualfs	PL
				Tropaqualfs	TR
				Umbraqualfs	UM
		Boralfs	BO	Cryoboralfs	CR
				Eutroboralfs	EU
				Fragiboralfs	FR
				Glossoboralfs	GL
				Natriboralfs	NA
				Paleboralfs	PA
		Udalfs	UD	Agrudalfs	AG
				Ferrudalfs	FE
				Fragiudalfs	FR
				Fraglossudalfs	FL
				Glossudalfs	GL
				Hapludalfs	HA
				Natrudalfs	NA
				Paleudalfs	PA
				Rhodudalfs	RH
				Tropudalfs	TR
		Ustalfs	US	Durustalfs	DU
				Haplustalfs	HA
				Natrustalfs	NA
				Paleustalfs	PA
				Plinthustalfs	PL
				Rhodustalfs	RH
		Xeralfs	XE	Durixeralfs	DU
				Haploxeralfs	HA
				Natrixeralfs	NA
				Palexeralfs	PA
				Plinthoxeralfs	PL
				Rhodoxeralfs	RH
Aridisols		Argids	AR	Durargids	DU
				Haplargids	HA
				Nadurargids	ND
				Natrargids	NA
				Paleargids	PA
		Orthids	OR	Calciorthids	CA
				Camborthids	CM
				Durorthids	DU
				Gypsiorthids	GY
				Paleorthids	PA
				Salorthids	SA

APPENDIX II. (Cont'd)

Order	Code	Suborder	Code	Great group	Code
Entisols	E	Aquents	AQ	Cryaquents	CR
				Fluvaquents	FL
				Haplaquents	HA
				Hydraquents	HY
				Psammaquents	PS
				Sulfaquents	SU
				Tropaquents	TR
		Arents	AR	Arents	AR
		Fluvents	FL	Cryofluvents	CR
				Torrifluvents	TO
				Tropofluvents	TR
				Udifluvents	UD
				Ustifluvents	US
				Xerofluvents	XE
		Orthents	OR	Cryorthents	CR
				Torriorthents	TO
				Troporthents	TR
				Udorthents	UD
				Ustorthents	US
				Xerorthents	XE
		Psamments	PS	Cryopsamments	CR
				Quartzipsamments	QU
				Torripsamments	TO
				Tropopsamments	TR
				Udipsamments	UD
				Ustipsamments	US
				Xeropsamments	XE
Histosols	H	Fibrists	FI	Borofibrists	BO
				Cryofibrists	CR
				Luvifibrists	LU
				Medifibrists	ME
				Sphagnofibrists	SP
				Tropofibrists	TR
		Folists	FO	Borofolists	BO
				Cryofolists	CR
				Tropofolists	TR
		Hemists	HE	Borohemists	BO
				Cryohemists	CR
				Luvihemists	LU
				Medihemists	ME
				Sulfihemists	SI
				Sulfohemists	SO
				Tropohemists	TR
		Saprists	SA	Borosaprists	BO
				Cryosaprists	CR
				Medisaprists	ME
				Troposaprists	TR
Inceptisols	I	Andepts	AN	Cryandepts	CR
				Durandepts	DU
				Dystrandepts	DY
				Eutrandepts	EU
				Hydrandepts	HY
				Placandepts	PL
				Vitrandepts	VI

APPENDIX II. (Cont'd)

Order	Code	Suborder	Code	Great group	Code
		Aquepts	AQ	Andaquepts	AN
				Cryaquepts	CR
				Fragiaquepts	FR
				Haplaquepts	HA
				Humaquepts	HU
				Placaquepts	PA
				Plinthaquepts	PL
				Sulfaquepts	SU
				Tropaquepts	TR
		Ochrepts	OC	Cryochrepts	CR
				Durochrepts	DU
				Dystrochrepts	DY
				Eutrochrepts	EU
				Fragiochrepts	FR
				Ustochrepts	US
				Xerochrepts	XE
		Plaggepts	PL	Plaggepts	PL
		Tropepts	TR	Dystropepts	DY
				Eutropepts	EU
				Humitropepts	HU
				Sombritropepts	SO
				Ustropepts	US
		Umbrepts	UM	Cryumbrepts	CR
				Fragiumbrepts	FR
				Haplumbrepts	HA
				Xerumbrepts	XE
Mollisols		Albolls	AL	Argialbolls	AR
				Natralbolls	NA
		Aquolls	AQ	Argiaquolls	AR
				Calciaquolls	CA
				Cryaquolls	CR
				Duraquolls	DU
				Haplaquolls	HA
				Natraquolls	NA
		Borolls	BO	Argiborolls	AR
				Calciborolls	CA
				Cryoborolls	CR
				Haploborolls	HA
				Natriborolls	NA
				Paleborolls	PA
				Vermiborolls	VE
		Rendolls	RE	Rendolls	RE
		Udolls	UD	Argiudolls	AR
				Hapludolls	HA
				Paleudolls	PA
				Vermudolls	VE
		Ustolls	US	Argiustolls	AR
				Calciustolls	CA
				Durustolls	DU
				Haplustolls	HA
				Natrustolls	NA
				Paleustolls	PA
				Vermustolls	VE

APPENDIX II. (Cont'd)

Order	Code	Suborder	Code	Great group	Code
		Xerolls	XE	Argixerolls	AR
				Calcixerolls	CA
				Durixerolls	DU
				Haploxerolls	HA
				Natrixerolls	NA
				Palexerolls	PA
Oxisols	O	Aquox	AQ	Gibbsiaquox	GI
				Ochraquox	OC
				Plinthaquox	PL
				Umbraquox	UM
		Humox	HU	Acrohumox	AC
				Gibbsihumox	GI
				Haplohumox	HA
				Sombrihumox	SO
		Orthox	OR	Acrorthox	AC
				Eutrorthox	EU
				Gibbsiorthox	GI
				Haplorthox	HA
				Sombriorthox	SO
				Umbriorthox	UM
		Torrox	TO	Torrox	TO
		Ustox	US	Acrustox	AC
				Eutrustox	EU
				Sombriustox	SO
				Haplustox	HA
Spodosols	S	Aquods	AQ	Cryaquods	CR
				Duraquods	DU
				Fragiaquods	FR
				Haplaquods	HA
				Placaquods	PL
				Sideraquods	SI
				Tropaquods	TR
		Ferrods	FE	Ferrods	FE
		Humods	HU	Cryohumods	CR
				Fragihumods	FR
				Haplohumods	HA
				Placohumods	PC
				Tropohumods	TR
		Orthods	OR	Cryorthods	CR
				Fragiorthods	FR
				Haplorthods	HA
				Placorthods	PC
				Troporthods	TR
Ultisols	U	Aquults	AQ	Albaquults	AL
				Fragiaquults	FR
				Ochraquults	OC
				Paleaquults	PA
				Plinthaquults	PL
				Tropaquults	TR
				Umbraquults	UM
		Humults	HU	Haplohumults	HA
				Palehumults	PA
				Plinthohumults	PL
				Sombrihumults	SO
				Tropohumults	TR

APPENDIX II.(Cont'd)

Orders	Code	Suborder	Code	Great group	Code
		Udults	UD	Fragiudults	FR
				Hapludults	HA
				Paleudults	PA
				Plinthudults	PL
				Rhodudults	RH
				Tropudults	TR
		Ustults	US	Haplustults	HA
				Paleustults	PA
				Plinthustults	PL
				Rhodustults	RH
		Xerults	XE	Haploxerults	HA
				Palexerults	PA
Vertisols	V	Torrerts	TO	Torrerts	TO
		Uderts	UD	Chromuderts	CH
				Pelluderts	PE
		Usterts	US	Chromusterts	CH
				Pellusterts	PE
		Xererts	XE	Chromoxererts	CH
				Pelloxererts	PE

APPENDIX III

An approximate correlation between the Soil Taxonomy Great Group, the FAO Legend and the Brazilian Soil Classification System.

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APPENDIX III (Cont'd.)

USDA	FAO	BRAZIL
ALFISOLS	Luvisols (3)	Terra Roxa Estruturada (3)
	Eutric Nitosols (3)	Podzolico Vermelho Amarelo Equivalente Eutrófico (3)
AQUALFS	Gleyic Luvisols (1)	
Albaqualfs	Eutric Planosols (1), (2)	Planosols (1)
	Orthic Solonetz (1)	Solos Hidromorficos Cinzentos Eutróficos (2)
Duraqualfs		
Fragiaqualfs		
Glossaqualfs	Gleyic Podzoluvisols (1)	
Natraqualfs	Gleyic Solonetz (1), (2)	Solonetz Solodizado (2)
	Solodic Planosols (2)	Planosol (2)
	Eutric Planosols (2)	
Ochraqualfs		
Plinthaqualfs		
Tropaqualfs	Eutric Gleysols (2)	Solos Gley Pouco Húmicos Eutróficos (2)
	Eutric Planosols (2)	Solos Hidromórficos Cinzentos Eutróficos (2)
Umbraqualfs		
BORALFS		
Cryoboralfs		
Eutroboralfs	Albic Luvisols (1)	
Fragiboralfs		
Glossoboralfs	Eutric Podzoluvisols (1)	
Natriboralfs		
Paleoboralfs		
UDALFS		
Agrudalfs		
Ferrudalfs		
Fragiudalfs		
Fraglossudalfs		
Glossudalfs	Eutric Podzoluvisols (1)	
Hapludalfs	Orthic Luvisols (1)	
Natrudalfs		
Paleudalfs	Eutric Nitosols (1), (2)	Terra Roxa Estruturada medium to high base status (1)

APPENDIX III (Cont'd.)

U S D A	F A O	BRAZIL
	Ferric Luvisols (2)	Laterítico Bruno Avermelhado Eutrófico (2)
		Podzolico Vermelho Amarelo Equivalente Eutrófico (2)
Rhodudalfs	Eutric Nitosols (1)	
Tropudalfs	Eutric Nitosols (1)	Terra Roxa Estruturada medium to high base status (1)
	Ferric Luvisols (2)	Lateritico Bruno Avermelhado Eutrófico (2)
		Podzólico Vermelho Amarelo Equivalente Eutrófico (2)
USTALFS		
Durustalfs		
Haplustalfs	Calcic Luvisols (1)	Podzolico Vermelho Amarelo Equivalente Eutrófico (2)
	Ferric Luvisols (2)	
Natrustalfs	Gleyic Solonetz (1),(2)	Solonetz Solidizado (2)
	Solodic Planosols (2)	Planosol (2)
	Eutric Planosols (2)	
Paleustalfs	Eutric Planosols (1)	Planosol (1)
	Eutric (Rhodic) Nitosols (2)	Laterítico Bruno Avermelhado Eutrófico (2)
	Ferric Luvisols (2)	Podzólico Vermelho Amarelo Equivalente Eutrófico (2)
Plinthustalfs	Plinthic Luvisols (1), (2)	Laterita Hidromorfica Eutrófica (2)
Rhodustalfs	Luvic Yermosols (1)	Terra Roxa Estruturada medium to high base status (1)
	Ferric Luvisols (2)	Podzolico Vermelho Amarelo Equivalente Eutrófico (2)
		Solos Brunos Não Calcicos (2)
XERALFS		
Durixeralfs		
Haploxeralfs	Chromic Luvisols (1)	
	Orthic Luvisols (1)	
Natrixeralfs	Orthic Solonetz (1)	
Palexeralfs	Eutric Planosol (1)	Planosol (1)
Plinthoxeralfs	Plinthic Luvisols (1)	
Rhodoxeralfs	Chromic Luvisols (1)	

APPENDIX III (Cont'd.)

U S D A	F A O	BRAZIL
ARIDISOLS	Typic Yermosols (1)	Soils with Natric B horizon (3)
ARGIDS	Luvic Yermosols (1)	
Durargids	Luvic Xerosols (1)	
Haplargids	Luvic Xerosols (1)	
Nadurargids	Orthic Solonetz (1)	
Natrargids	Orthic Solonetz (1)	
Paleargids	Eutric Planosols (1)	Planosol (1)
ORTHIDS		
Calciorthids	Calcic Xerols (1)	
	Calcic Yermosols (1)	
	Gypsic Xerosols (1)	
Camborthids	Haplic Xerosols (1)	
	Haplic Yermosols (1)	
Durorthids	Haplic Xerosols (1)	
	Haplic Yermosols (1)	
Gypsiorthids	Gypsic Yermosols (1)	
Paleorthids		
Salorthids	Orthic Solonchaks (1)	
ENTISOLS		Regosols (3)
AQUENTS		
Cryaquents		
Fluvaquents		
Haplaquents	Eu-Dystric Gleysols (1)	
Hidraquents		
Psammaquents	Eu-Dystric Gleysols (1)	
Sulfaquents		
Tropaquents	Eu-Dystric Gleysols (1)	Solos Gley Pouco Húmicos Distróficos y Eutróficos (2)
ARENTS		
Arents		
FLUVENTS	Fluvisols (1)	
Cryofluvents		
Torrifluvents		
Tropofluvents	Eu-Dystric Fluvisols (1)	Solos Aluviais Eutróficos y Distróficos (2)
	Dystric Cambisols (1)	
	Gleyic Cambisols (1)	
Udifluvents		
Ustifluvents		
Xerofluvents		

APPENDIX III (Cont'd.)

USDA	FAO	BRAZIL
ORTHENTS	Regosols (1)	
Cryorthents	Gelic Regosols (1)	
Torriorthents		
Troporthents		
Udorthents		
Ustorthents		
Xerorthents		
PSAMMENTS	Regosols (1) Arenosols (1) Ferralic Arenosols (3)	Red and Yellow Sands (3)
Cryopsamments	Gelic Regosols (1)	
Quartzipsamments	Albic Arenosols (1) Ferralic Arenosols (2)	Red and Yellow Sands (1) Areias Quartzosas Vermelhas Amarelas (2)
Torripsamments	Albic Arenosols (1), (2)	Areias Cinzentas com fragipan (2)
Udipsamments	Albic Arenosols (1)	
Ustipsamments		
Xeropsamments		
HISTOSOLS	Histosols (1)	Solos Orgánicos (2)
INCEPTISOLS	Cambisols (3)	Soils with incipient B horizon (3)
ANDEPTS	Andosols (1)	
Cryandepts		
Durandepts		
Dystrandepts	Ochric Andosols (1) Humic Andosols (1)	
Eutrandepts	Mollic Andosols (1)	
Hydrandepts	Humic Andosols (1)	
Placandepts		
Vitrandepts	Vitric Andosols (1)	
AQUEPTS		
Andaquepts	Eu-Dystric Gleysols (1)	
Cryaquepts	Gelic Gleysols (1)	
Fragiaquepts	Eu-Dystric Gleysols (1)	
Halaquepts	Gleyic Solonchak (2)	Solos Salinos Costeiros Indiscriminados (2)
Haplaquepts	Eu-Dystric Gleysols (1)	

APPENDIX III (Cont'd.)

U S D A	F A O	BRAZIL
Humaquepts	Humic Gleysols (1)	
Placaquepts		
Plinthaquepts	Plinthic Gleysols (1), (2)	Laterita Hidromorfica Distrófica (2)
	Plinthic Acrisols (2)	
	Plinthic Ferralsols	
Sulfaquepts		
Tropaquepts	Eu-Dystric Gleysols (1), (2)	Solos Gley Húmicos Distróficos (2)
	Humic Gleysols (2)	Solos Gley Pouco Húmicos Distróficos (2)
OCHREPTS		
Cryochrepts	Gelic Cambisols (1)	
Durochrepts		
Dystrochrepts	Dystric Cambisols (1)	
Eutrochrepts	Eutric Cambisols (1)	
	Calcic Cambisols (1)	
Fragiochrepts		
Ustochrepts	Calcic Cambisols (1)	
	Eutric Cambisols (1)	
Xerochrepts	Eutric Cambisols (1)	
	Calcic Cambisols (1)	
	Chromic Cambisols (1)	
PLAGGEPTS		
Plaggepts		
TROPEPTS		
(Oxic Tropepts)	Ferralic Cambisols (1)	
Dystropepts	Dystric Cambisols (1)	
Eutropepts	Eutric Cambisols (1)	
Humitropepts	Humic Cambisols (1)	
Sombritropepts		
Ustropepts		
UMBREPTS		
Cryumbrepts		
Fragiumbrepts		
Haplumbrepts	Humic Cambisols (1)	
	Rankers (1)	
Xerumbrepts		

APPENDIX III (Cont'd.)

USDA	FAO	BRAZIL
MOLLISOLS		
ALBOLLS		
Argialbolls	Mollic Planosols (1)	
Natralbolls	Mollic Solonetz (1)	
AQUOLLS		
Argiaquolls	Gleyic Phaeozems (1)	Solos Gley Húmicos Eutróficos (2)
	Mollic Gleysols (1), (2)	
Calciaquolls		
Cryaquolls		
Duraquolls		
Haplaquolls	Mollic Gleysols (1),(2)	Solos Gley Húmicos Eutróficos (2)
Natraquolls		
BOROLLS		
Argiborolls	Orthic Greyzems (1)	
	Luvic Chernozems (1)	
Calciborolls	Calcic Chernozems (1)	
Cryoborolls		
Haploborolls	Haplic Chermozems (1)	
Natriborolls	Mollic Solonetz (1)	
Paleborolls		
Vermiborolls	Haplic Chernozems (1)	
RENDOLLS		
Rendolls	Rendzinas (1)	
UDOLLS		
Argiudolls	Luvic Phaeozems (1), (2)	Brunizem Avermelhado (2)
Hapludolls	Haplic Phaeozems (1)	
	Eutric Fluvisols (1)	Solos Aluviais Eutróficos (2)
Paleudolls	Luvic Phaeozems (1), (2)	Brunizem Avermelhado (2)
Vermudolls	Calcic Phaeozems (1)	
USTOLLS		
Argiustolls	Luvic Phaeozems (1)	
	Luvic Kastanozems (1)	Brunizem Avermelhado (2)

APPENDIX III (Cont'd.)

USDA	FAO	BRAZIL
Calciustolls	Calcic Kastanozems (2)	
Durustolls		
Haplustolls	Haplic Kastanozems (1)	
Natrustolls	Mollic Solonetz (1)	
Paleustolls	Luvic Phaeozems (1), (2)	Brunizem Avermelhado (2)
Vermustolls		
XEROLLS		
Argixerolls		
Calcixerolls		
Durixerolls		
Haploxerolls		
Natrixerolls	Mollic Solonetz (1)	
Palexerolls		
OXISOLS		
AQUOX		
Gibbsiaquox		
Ochraquox	Dystric Gleysols (2)	Solos Gley Pouco Humicos Distróficos y Eutróficos (2)
Plinthaquox	Plinthic Ferralsols (1), (2) Plinthic Gleysols (1), (2) Plinthic Acrisols (2)	Laterita Hidromorfica Distrófica (2)
Umbraquox	Humic Gleysols (2)	Solos Gley Húmicos Distróficos (2)
HUMOX		
Acrohumox		
Gibbsihumox		
Haplohumox		
Sombrihumox		
ORTHOX	Orthic, Acric y Xantic Ferralsols (3)	
Acrorthox	Acric Ferralsols (1), (2) Orthic Ferralsols (1), (2) Rhodic Ferralsols (1), (2) Humic Ferralsols (2)	Latosol Vermelho Amarelo Distrófico (2) Latosol Vermelho Escuro Distrófico (2) (Rhodic Ferralsol=) Latosol Roxo (1)

APPENDIX III (Cont'd.)

USDA	FAO	BRAZIL
Eutrorthox	Orthic Ferralsols (1)	Latosol Roxo Eutrófico (2)
	Rhodic Ferralsols (1), (2), (3)	Latosol Vermelho Escuro Eutrófico (2)
		Latosol Roxo or Terra Roxa Legítima (Dusky Red Latosol) (3)
Gibbsiorthox		
Haplorthox	Acric Ferralsols (1)	Latosol Amarelo Distrófico (2)
	Orthic Ferralsols (1)	Latosol Roxo Distrófico (2)
	Rhodic Ferralsols (1), (2)	Latosol Vermelho Amarelo Distrófico (2)
	Xantic Ferralsols (1), (2)	Latosol Vermelho Escuro Distrófico (2)
	Humic Ferralsols (2)	(Xantic F=) Pale Yellow Latoso (1)
		(Rhodic F=) Latosol Roxo (1)
Sombriorthox		
Umbriorthox	Xantic Ferralsols (1)	
	Humic Ferralsols (1)	
TORROX	Rhodic Ferralsols (1)	Latosol Vermelho Amarelo Eutrófico y Distrófico (2)
	Acric Ferralsols (1), (2)	Red Yellow Latosol (1)
	Orthic Ferralsols (1), (2)	
	Humic Ferralsols (2)	
USTOX	Orthic Ferralsols (3)	Latosol Amarelo (3)
	Acric Ferralsols (3)	Latosol Vermelho Amarelo (3)
	Xantic Ferralsols (3)	Latosol Vermelho Escuro (3)
Acrustox	Orthic Ferralsols (1)	Latosol Vermelho Amarelo Distrófico (2)
	Acric Ferralsols (1), (2)	Latosol Vermelho Escuro Distrófico (2)
	Rhodic Ferralsols (2)	
	Humic Ferralsols (2)	
Eutrustox	Orthic Ferralsols (1), (2)	Latosol Roxo Eutrófico (2)
	Rhodic Ferralsols (1), (2), (3)	Latosol Vermelho Amarelo Eutrófico (2)
		Latosol Vermelho Escuro Eutrófico (2)
		Latosol Roxo or Terra Roxa Legitima (Dusky Red Latosol) (3)

APPENDIX III (Cont'd.)

USDA	FAO	BRAZIL
Sombriustox		
Haplustox	Orthic Ferralsols (1)	Latosol Roxo Distrófico (2)
	Acric Ferralsols (1), (2)	Latosol Vermelho Amarelo Distrófico (2)
	Rhodic Ferralsols (2)	Latosol Vermelho Escuro Distrófico (2)
	Humic Ferralsols (2)	
SPODOSOLS	Podzols (1)	Podzols (3)
AQUODS	Gleyic Podzols (1)	
Cryaquods		
Duraquods		
Fragiaquods		
Haplaquods		
Placaquods		
Sideraquods		
Tropaquods	Gleyic Podzols (2)	Podzol Hidromorfico (2)
FERRODS		
Ferrods	Ferric Podzols (1)	
HUMODS		
Cryohumods	Humic Podzols (1)	
Fragihumods		
Haplohumods		
Placohumods	Placic Podzols (1)	
Tropohumods		
ORTHODS		
Cryorthods		
Fragiorthods		
Haplorthods		
Placorthords	Placic Podzols (1)	
Troporthods		
ULTISOLS	Acrisols (3)	Podzólico Vermelho Amarelo (Red Yellow Podzolic) (3)
	Dystric Nitosols (3)	
AQUULTS	Gleyic Acrisols (1)	
Albaquults	Dystric Planosols (1), (2)	Planosols (1)
		Solos Hidromorficos Cinzentos Distróficos (2)
Fragiaquults		

APPENDIX III (Cont'd.)

U S D A	F A O	BRAZIL
Ochraquults		
Paleaquults		
Plinthaquults	Plinthic Acrisols (1), (2)	Laterita Hidromorfica Distrófica (2)
	Plinthic Gleysols (1), (2)	
	Plinthic Ferralsols (1), (2)	
Tropaquults	Dystric Planosols (2)	Solos Hidromorficos Cinzentos Distróficos (2)
	Dystric Gleysols (2)	Solos Gley Pouco Húmicos Distróficos (2)
Umbraquults	Humic Gleysols (2)	Solos Gley Húmicos
HUMULTS		
Haplohumults		
Palehumults	Humic Nitosols (1)	
Plinthohumults		
Sombrihumults		
Tropohumults	Humic Nitosols (1)	
UDULTS		
Fragiudults		
Hapludults	Orthic Acrisols (1), (2)	Red Yellow Podzolic Soils, low base status (1)
	Ferric Acrisols (2)	Podzólico Vermelho Amarelo (2)
Paleudults	Dystric (Rhodic) Nitosols (1), (2)	Podzolico Vermelho Amarelo (2)
	Humic (Rhodic) Nitosols (1), (2)	Lateritico Bruno Avermelhado Distrófico
	Ferric Acrisols (2)	
	Orthic Acrisols (2)	
Plinthudults	Plinthic Ferralsols (2)	Laterita Hidromorfica Distrófica (2)
	Plinthic Acrisols (1), (2)	Podzólico Vermelho Amarelo Plinthico (2)
Rhodoudults	Dystric Nitosols (1)	Podzólico Vermelho Amarelo (2)
	Ferric Acrisols (2)	
	Orthic Acrisols (2)	
	Dystric (Rhodic) Nitosols (1)	

APPENDIX III (Cont'd.)

U S D A	F A O	BRAZIL
Tropoudults	Humic (Rhodic) Nitosols (2)	Terra Roxa Estruturada low base status (1)
	Ferric Acrisols (2)	Podzolico Vermelho Amarelo (2)
	Orthic Acrisols (2)	Lateritico Bruno Avermelhado Distrófico (2)
USTULTS		
Haplustults	Ferric Acrisols (2)	Red Yellow Podzolic Soils low base status
	Orthic Acrisols (1), (2)	Podzólico Vermelho Amarelo (2)
Paleustults	Orthic Acrisols (1)	Podzólico Vermelho Amarelo (2)
	Ferric Acrisols (1), (2)	
Plinthustults	Plinthic Acrisols (1), (2)	Laterita Hidromorfica Distrófica (2)
	Plinthic Ferralsols (2)	Podzólico Vermelho Amarelo Plinthico (2)
Rhodoustults	Dystric Nitosols (1)	Terra Roxa Estruturada low base status (1)
	Orthic Aerisols (1)	Podzólico Vermelho Amarelo (2)
	Ferric Acrisols (2)	
XERULTS		
Haploxerults	Orthic Acrisols (1)	Red Yellow Podzolic Soils low base status (1)
Palexerults	Ferric Acrisols Dystric Nitosols (1)	Terra Roxa estruturada low base status (1)
VERTISOLS	Vertisols	Solos Grumossolicos (2)

APPENDIX IV

A printout of landscape and land facet variables of central-west Brazil, maps SC-22, SC-23, SD-21, SD-22, SD-23, SE-21, SE-22, SE-23 and SF-21, respectively.

LANDSCAPE

OBS	LANDSYS	AREA	ALTITUDE	L17	L18	L19	L20	L21	L23	L25_28	PHYSUNIT
1	1	209	1100	A	S	P	S	2	2	OUS	1
2	2	121	1000	A	S	P	S	2	3	OUS	1
3	3	150	1000	A	S	C	S	1	3	OUS	2
4	4	134	900	A	S	C	S	1	3	OUS	4
5	5	134	900	A	S	C	S	1	3	OUS	2
6	6	91	800	B	S	C	S	2	3	OUS	3
7	7	126	600	B	S	P	S	2	3	OUS	3
8	8	4	650	B	S	C	S	2	3	OUS	2
9	9	132	1100	A	S	P	S	1	3	OUS	3
10	10	76	700	B	S	C	M	1	2	OUS	3
11	11	74	550	B	S	P	M	1	2	OUS	5
12	12	145	400	B	S	P	S	1	2	UUS	6
13	13	580	700	B	S	C	O	3	3	EPS	7
14	14	2632	800	B	S	P	O	3	3	EPS	7
15	15	347	700	B	S	P	S	1	2	OUS	9
16	16	81	600	B	S	P	S	1	2	OUS	3
17	17	349	350	B	S	P	S	1	2	UUS	5
18	18	335	700	A	S	C	S	1	3	OUS	4
19	19	585	350	B	S	P	S	1	2	OUS	4
20	20	186	400	B	S	P	S	1	2	OUS	5
21	21	89	450	B	S	P	S	1	3	OUS	3
22	22	220	300	B	S	P	S	1	2	OUS	14
23	23	591	250	B	T	P	S	1	1	UAO	15
24	24	164	300	B	S	P	S	1	2	OUS	15
25	25	46	250	B	S	P	M	1	1	FFL	15
26	26	57	300	B	S	P	M	1	2	OUS	29
27	27	180	350	B	S	P	S	2	2	OUS	28
28	28	561	400	B	S	P	S	1	3	OUS	16
29	29	282	600	B	S	C	S	1	3	ITR	3
30	30	72	250	B	S	P	M	1	1	FFL	14
31	31	48	500	B	S	P	S	2	3	OUS	16
32	32	65	350	B	S	P	S	1	3	OUS	14
33	33	31	300	B	S	P	S	1	2	OUS	14
34	34	236	500	B	S	C	S	2	3	OUS	13
35	35	977	.	B	S	P	M	1	1	FFL	15
36	36	380	650	B	S	P	S	1	2	OUS	26
37	37	48	450	B	S	C	S	1	3	OUS	26
38	38	1580	350	B	S	P	M	1	2	UUD	17
39	39	177	500	B	S	C	S	2	2	OUS	22
40	40	678	350	B	S	C	S	1	2	OOR	17
41	41	27	400	B	S	P	S	1	2	OOR	16
42	42	229	600	B	S	C	S	2	3	OUS	16
43	43	136	550	B	S	P	S	1	2	OUS	13
44	44	88	500	B	S	P	M	1	2	OUS	13
45	45	115	450	B	S	P	M	1	2	AUS	10
46	46	167	800	B	S	P	S	1	2	OUS	10
47	47	174	600	B	S	P	S	2	3	EPS	11
48	48	540	400	B	S	P	S	1	2	EPS	11
49	49	180	800	B	S	P	S	1	2	OUS	13
50	50	193	700	B	S	C	S	2	2	OUS	13
51	51	30	400	B	S	P	S	1	2	OUS	11
52	52	218	700	B	S	P	S	2	3	OUS	11
53	53	160	550	B	S	P	S	2	3	OUS	13
54	54	206	800	B	S	P	S	2	2	OUS	13
55	55	67	800	B	S	P	S	3	3	OUS	13
56	56	35	350	B	S	C	S	1	2	OUS	18
57	57	101	200	B	S	P	S	1	1	OUS	18
58	58	76	600	B	S	C	S	2	3	AUS	16
59	59	58	400	B	S	P	S	2	2	OUS	16
60	60	512	400	B	S	P	M	1	1	OOR	16
61	61	108	600	B	S	P	M	3	3	EPS	16

APPENDIX IV (Cont'd.)

CENTRO INTERNACIONAL DE AGRICULTURA T

TARGET AREA SURVEY 15 14 SATURDAY, MARCH 17,

LANDSCAPE

OBS	LANDSYS	AREA	ALTITUDE	L17	L18	L19	L20	L21	L23	L25 28	PHYSUNIT
62	62	578	600	B	S	P	S	3	3	EPS	16
63	63	72	350	B	S	P	S	2	3	AUS	16
64	64	247	300	B	S	P	M	1	2	UUS	16
65	65	173	150	B	S	P	M	1	1	UUS	23
66	66	220	90	B	S	P	S	1	1	UUS	19
67	67	76	250	B	S	P	S	1	2	OUS	22
68	68	152	75	B	I	P	S	1	1	AAO	19
69	69	57	375	B	S	P	S	1	1	OUS	12
70	70	118	250	B	S	P	S	1	2	EPS	21
71	71	75	550	B	S	P	S	2	2	OUS	11
72	72	126	450	B	S	P	S	1	1	OUS	12
73	73	163	400	B	S	P	M	1	1	UUS	12
74	74	43	300	B	S	P	S	2	2	AUS	12
75	75	19	500	B	S	P	S	3	3	OUS	12
76	76	89	300	B	S	P	S	2	2	OUS	12
77	77	172	350	B	S	P	M	1	2	AUS	21
78	78	55	300	B	S	P	S	3	2	OUS	21
79	79	28	500	B	S	C	M	2	2	FOR	21
80	80	68	350	B	S	C	S	2	3	AUS	21
81	81	83	200	B	S	P	S	2	2	AUS	21
82	82	51	100	B	I	P	M	2	1	AUS	19
83	83	76	80	B	I	P	S	1	1	EFL	19
84	84	263	400	B	S	P	M	1	2	EPS	11
85	85	36	450	B	S	P	S	2	2	EPS	11
86	86	11	550	B	S	P	M	1	2	AUS	12
87	87	51	700	B	S	P	S	1	1	OUS	10
88	88	115	1050	B	S	P	S	1	2	OUS	2
89	89	196	800	B	S	P	S	1	2	OUS	2
90	90	55	600	B	S	P	S	+	+		+
91	91	18	800	B	S	P	S	+	+		+
92	92	180	450	B	S	P	S	1	1	EFL	25
93	93	120	525	B	S	P	S	2	2	AUS	25
94	94	56	750	B	S	P	S	1	2	OUS	30
95	95	491	800	B	S	C	M	1	2	OUS	31
96	96	865	470	B	S	P	M	2	2	ITR	25
97	97	305	800	B	S	C	M	1	2	OUS	25
98	98	89	450	B	S	P	M	1	2	ITR	31
99	99	737	80	B	I	P	S	1	1	UAO	19
100	100	75	80	B	I	P	S	1	1	UAO	19
101	101	243	75	B	I	P	S	1	1	AAO	19
102	102	291	150	B	S	P	M	2	2	OUS	27
103	103	808	300	B	S	C	S	3	3	AUS	27
104	104	23	300	B	S	C	M	2	3	AUS	27
105	105	63	80	B	I	P	S	1	1	FAO	19
106	106	68	80	B	I	P	S	1	1	AAO	19
107	107	33	350	B	S	C	S	2	2	OUS	12
108	108	144	250	B	S	P	S	2	2	OUS	12
109	109	82	400	B	S	P	S	2	2	OUS	12
110	110	102	600	B	S	P	S	2	3	EPS	7
111	111	107	200	B	S	P	S	2	3		+

APPENDIX (Cont'd.)

LANDSCAPE FACET-GENERALIZED DESCRIPTION

OBS	LANDSYS	FAC	GENDES	PERC LS	IC1	IC2	IC3	IC4	OVC1	OVC2	OVC3	OVC4	OVC5	OVC6	OVC7	OVC8	OVC9	OVCA	IVAPP	IVA
1	1	1	A	85	+	30	10	+	+	+	50	50	+	+	+	+	+	+	60	5
2	1	2	V	15	+	+	50	50	+	+	+	20	80	+	+	+	+	+	10	+
3	2	1	A	80	+	30	10	+	+	+	50	50	+	+	+	+	+	+	60	5
4	2	2	V	20	+	+	50	50	+	+	+	20	80	+	+	+	+	+	10	+
5	3	1	C	80	+	20	80	+	+	+	30	70	+	+	+	+	+	+	35	5
6	3	2	V	20	+	+	20	80	+	+	+	70	30	+	+	+	+	+	5	+
7	4	1	C	75	+	15	85	+	+	+	30	70	+	+	+	+	+	+	30	5
8	4	2	V	25	+	+	15	85	+	+	+	70	30	+	+	+	+	+	5	+
9	5	1	X	60	+	20	80	+	+	+	25	75	+	+	+	+	+	+	30	+
10	5	2	N	40	+	20	60	20	+	+	+	60	40	+	+	+	+	+	30	5
11	6	1	M	99	+	+	40	60	+	10	20	70	+	+	+	+	+	+	10	+
12	7	1	A	60	+	90	10	+	+	10	20	70	+	+	+	+	+	+	20	+
13	7	2	V	40	+	+	30	70	+	30	20	50	+	+	+	+	+	+	+	+
14	8	1	M	60	+	+	50	50	+	10	30	60	+	+	+	+	+	+	10	+
15	9	2	B	40	+	70	30	+	+	+	+	+	60	+	+	40	+	+	20	10
16	9	1	A	70	+	90	10	+	+	+	10	90	+	+	+	+	+	+	20	5
17	9	2	V	30	+	+	70	30	+	+	+	30	70	+	+	+	+	+	5	+
18	10	1	B	55	+	80	20	+	+	+	+	+	20	+	+	80	+	+	40	30
19	10	2	M	45	+	+	20	80	+	+	+	+	+	+	+	+	+	+	20	0
20	11	1	B	75	+	60	40	+	+	+	+	60	25	+	+	15	+	+	30	40
21	11	2	M	25	+	10	20	70	+	+	20	80	+	+	+	+	+	+	10	0
22	12	1	P	60	+	90	10	+	+	+	+	40	10	+	+	50	+	+	30	20
23	12	2	C	30	+	+	80	20	+	+	+	60	5	+	+	+	35	+	20	0
24	12	3	D	10	99	+	+	+	99	+	+	+	+	+	+	+	+	+	0	0
25	13	1	A	50	+	99	+	+	+	+	+	+	+	+	+	+	99	+	5	0
26	13	2	V	40	+	30	50	20	+	+	+	+	+	+	+	+	99	+	5	0
27	14	1	A	90	+	99	+	+	+	+	+	+	+	+	+	+	99	+	0	0
28	14	2	V	10	+	30	30	40	+	+	+	+	+	+	+	+	90	10	0	0
29	15	1	P	60	+	80	20	+	+	+	+	+	40	+	+	60	+	+	30	30
30	15	2	C	40	+	20	60	20	+	+	+	80	20	+	+	+	+	+	25	5
31	16	1	P	75	+	50	50	+	+	+	+	80	10	+	+	10	+	+	30	10
32	16	2	M	25	+	+	30	70	+	+	20	80	+	+	+	+	+	+	5	+
33	17	1	P	70	+	80	20	+	+	+	+	70	20	+	+	10	+	+	20	10
34	17	2	P	15	99	+	+	+	99	+	+	+	+	+	+	+	+	+	0	0
35	17	3	C	15	+	+	60	40	+	+	30	70	+	+	+	+	+	+	0	0
36	18	1	M	80	+	+	30	70	+	15	15	70	+	+	+	+	+	+	15	+
37	18	2	B	20	+	50	50	+	+	+	+	40	40	+	+	20	+	+	20	10
38	19	1	P	85	+	80	20	+	+	+	20	70	10	+	+	+	+	+	20	10
39	19	2	V	15	20	+	40	40	40	20	20	10	10	+	+	+	+	+	5	+
40	20	1	P	85	+	80	20	+	+	30	50	20	+	+	+	+	+	+	20	10
41	20	2	V	15	20	+	40	40	40	40	20	+	+	+	+	+	+	+	10	0
42	21	1	P	75	+	80	20	+	+	+	70	30	+	+	+	+	+	+	15	5
43	21	2	V	25	30	20	20	30	30	20	30	20	+	+	+	+	+	+	5	0
44	22	1	P	85	+	90	10	+	+	+	+	+	20	+	80	+	+	+	10	10
45	22	2	V	15	+	+	30	70	+	+	+	+	10	+	90	+	+	+	0	0
46	23	1	P	75	99	+	+	+	99	+	+	+	+	+	+	+	+	+	0	0
47	23	2	P	25	40	60	+	+	+	+	50	50	+	+	+	+	+	+	0	0
48	24	1	P	85	+	70	30	+	+	30	70	+	+	+	+	+	+	+	10	0
49	24	2	V	15	+	20	30	50	+	30	60	+	10	+	+	+	+	+	0	0
50	25	1	P	60	+	99	+	+	+	+	+	+	+	+	99	+	+	+	5	10
51	25	2	D	40	99	+	+	+	50	+	+	+	+	+	50	+	+	+	0	5
52	26	1	P	75	+	90	10	+	+	+	+	+	+	+	99	+	+	+	5	5
53	26	2	C	25	+	20	70	10	+	+	+	+	+	+	80	20	+	+	0	0
54	27	1	A	65	+	80	20	+	+	+	25	75	+	+	+	+	+	+	15	5
55	27	2	A	35	+	30	10	+	+	50	25	25	+	+	+	+	+	+	20	+
56	28	1	P	85	10	80	10	+	10	10	20	60	+	+	+	+	+	+	5	0
57	28	2	D	15	30	30	40	+	30	50	+	+	+	+	+	+	+	20	0	0
58	29	1	M	85	+	+	20	80	+	+	50	+	+	+	+	+	50	+	5	0
59	29	2	B	20	+	70	30	+	+	+	+	+	30	+	+	70	+	+	5	+
60	30	1	P	85	+	90	10	+	+	+	+	+	10	+	90	+	+	+	10	20
61	30	2	D	15	50	30	10	10	20	+	+	+	+	+	80	+	+	+	0	0

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY — 15.14 SATURDAY, MARCH 17,

LANDSCAPE FACET—GENERALIZED DESCRIPTION

OBS	LANDSYS	FAC	GENDES	PERC LS	TC1	TC2	TC3	TC4	OVC1	OVC2	OVC3	OVC4	OVC5	OVC6	OVC7	OVC8	OVC9	OVCA	IVAPP	IVA
62	31	1	P	90	+	20	10	+	+	40	60	+	+	+	+	+	+	+	10	0
63	31	2	V	10	20	20	30	30	20	+	+	+	40	+	+	40	+	+	0	0
64	32	1	P	80	+	80	20	+	+	+	30	70	+	+	+	+	+	+	20	5
65	32	2	V	20	+	20	40	40	+	+	+	30	70	+	+	+	+	+	0	0
66	33	1	P	80	+	20	20	60	+	50	50	+	+	+	+	+	+	+	20	15
67	33	2	E	20	+	80	20	+	+	+	+	80	20	+	+	+	+	+	0	0
68	34	1	C	70	+	+	60	40	+	30	30	+	+	+	+	60	+	+	15	0
69	34	2	P	30	+	80	20	+	+	+	+	20	+	+	+	80	+	+	15	15
70	35	1	T	60	20	80	+	+	+	+	+	2	20	+	80	+	+	20	5	5
71	35	2	D	40	80	20	+	+	80	+	+	+	+	+	+	+	+	20	0	0
72	36	1	A	85	+	30	10	+	+	+	+	80	20	+	+	+	+	+	20	10
73	36	2	D	15	+	+	80	20	80	20	+	+	+	+	+	+	+	+	5	5
74	37	1	C	55	+	60	30	30	+	10	20	70	+	+	+	+	+	+	0	0
75	37	2	V	45	+	30	40	30	+	+	+	20	60	+	+	20	+	+	0	0
76	38	1	P	90	+	80	20	+	+	+	+	+	+	80	20	+	+	+	2	0
77	38	2	D	10	90	10	+	+	90	+	+	+	+	+	+	+	+	+	0	0
78	39	1	V	55	+	10	30	60	+	25	25	20	15	+	15	+	+	+	0	0
79	39	1	V	55	+	10	30	60	+	25	25	20	15	+	15	+	+	+	0	0
80	40	1	C	99	+	30	50	20	+	+	+	+	10	+	90	+	+	+	0	0
81	41	1	P	99	+	80	20	+	+	+	+	70	30	+	+	+	+	+	0	0
82	42	1	C	55	+	50	50	+	+	+	20	80	+	+	+	+	+	+	5	5
83	42	2	V	50	+	20	40	40	+	+	+	60	30	+	+	10	+	+	5	0
84	43	1	A	95	+	30	10	+	+	+	+	10	90	+	+	+	+	+	40	40
85	43	2	D	15	50	25	25	+	50	+	+	+	25	+	+	25	+	+	20	5
86	44	1	A	85	+	30	10	+	+	+	+	+	30	+	+	70	+	+	45	40
87	44	2	D	15	50	+	50	+	50	+	+	+	+	+	+	50	+	+	20	10
88	45	1	P	85	+	30	10	+	+	+	+	+	20	+	+	30	+	+	45	45
89	45	2	V	15	20	20	60	10	+	+	+	+	30	+	+	70	+	+	35	15
90	46	1	A	85	+	30	10	+	+	+	+	80	20	+	+	+	+	+	45	30
91	46	2	D	15	50	20	20	10	50	+	20	20	+	+	+	+	+	10	20	10
92	47	1	P	85	+	80	20	+	+	20	50	30	+	+	+	+	+	+	15	5
93	47	2	V	15	20	30	30	20	10	30	60	+	+	+	+	+	+	+	5	5
94	48	1	P	80	+	20	10	+	+	+	+	10	20	+	+	+	70	+	8	2
95	48	2	D	20	60	20	20	+	60	+	+	+	10	+	+	+	20	0	2	2
96	49	1	A	85	+	30	10	+	+	+	20	80	+	+	+	+	+	+	45	15
97	49	2	D	15	50	25	25	+	90	+	+	+	+	+	+	+	+	10	10	5
98	50	1	C	85	+	20	60	20	+	10	20	70	+	+	+	+	+	+	20	10
99	50	2	A	15	20	20	20	40	30	30	20	20	+	+	+	+	+	+	5	0
100	51	1	P	85	+	30	10	+	+	+	+	10	20	+	+	70	+	+	50	30
101	51	2	D	15	40	20	20	+	90	+	+	+	+	+	+	+	+	10	20	10
102	52	2	A	10	20	20	40	20	60	+	+	+	+	+	+	+	+	40	10	5
103	52	2	A	10	20	20	40	20	60	+	+	+	+	+	+	+	+	40	10	5
104	53	1	A	65	+	70	30	+	+	20	60	20	+	+	+	+	+	+	5	0
105	53	2	V	35	+	30	30	40	+	30	50	10	10	+	+	+	+	+	0	5
106	54	1	P	80	+	30	+	+	+	+	80	20	+	+	+	+	+	+	10	10
107	54	2	D	10	40	20	30	10	40	40	10	+	+	+	+	+	+	10	5	2
108	54	3	D	10	93	+	+	+	99	+	+	+	+	+	+	+	+	+	0	0
109	55	1	A	95	+	33	+	+	+	30	70	+	+	+	+	+	+	+	0	0
110	55	2	D	5	+	60	40	+	80	+	+	+	10	+	+	+	+	10	0	0
111	56	1	C	70	+	70	30	+	+	+	+	20	20	+	+	60	+	+	20	10
112	56	2	E	30	+	+	30	70	+	+	60	20	+	+	+	20	+	+	0	0
113	57	1	P	70	20	80	+	+	+	+	+	20	20	+	+	50	+	+	50	15
114	57	2	P	30	70	30	+	+	70	+	+	+	+	+	+	30	+	+	30	20
115	58	1	M	70	+	30	30	40	+	70	30	+	+	+	+	+	+	+	0	0
116	58	2	B	30	+	60	40	+	+	10	20	70	+	+	+	+	+	+	5	5
117	59	1	A	85	10	70	20	+	10	20	70	+	+	+	+	+	+	+	10	0
118	59	2	D	15	30	30	40	+	30	50	+	+	+	+	+	+	+	20	0	0
119	60	1	P	85	+	20	10	+	+	+	+	+	10	+	90	+	+	+	1	1
120	60	2	D	15	+	20	60	20	+	+	+	+	+	+	80	+	+	20	0	0
121	61	1	C	99	+	60	40	+	+	+	+	+	+	+	+	+	+	99	0	0
122	62	1	A	95	+	10	+	+	+	10	+	+	+	+	+	+	+	+	0	0

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY 15:14 SATURDAY, MARCH 17,

LANDSCAPE FACET-GENERALIZED DESCRIPTION

OBS	LANDSYS	FAC	GENDES	PERC LS	IC1	IC2	IC3	ICA	OVC1	OVC2	OVC3	OVC4	OVC5	OVC6	OVC7	OVC8	OVC9	OVCA	IVAPP	IV
123	62	2	V	5	20	30	50	+	+	30	+	+	+	+	70	+	+	+	0	
124	63	1	C	70	+	50	30	20	+	+	+	+	+	+	+	50	50	+	10	
125	63	2	V	30	+	30	30	40	+	+	+	+	+	+	+	99	+	+	0	
126	64	1	P	80	20	80	+	+	+	+	+	+	10	+	+	90	+	+	15	
127	64	2	P	20	70	30	+	+	+	+	+	+	+	+	50	30	+	20	5	
128	65	1	P	60	10	90	+	+	+	+	+	+	+	+	20	80	+	+	5	
129	65	2	P	40	80	20	+	+	10	+	+	+	+	+	70	20	+	+	0	
130	66	1	P	55	50	50	+	+	+	+	+	+	+	+	+	50	50	+	0	
131	66	2	D	45	80	20	+	+	80	+	+	+	+	+	+	+	20	+	0	
132	67	1	P	65	+	50	50	+	+	20	30	50	+	+	+	+	+	+	10	
133	67	2	C	35	+	20	40	40	+	40	40	20	+	+	+	+	+	+	5	
134	68	1	P	95	95	5	+	+	99	+	+	+	+	+	+	+	+	+	0	
135	69	2	C	5	+	40	40	20	+	+	+	+	+	+	+	50	50	+	0	
136	69	1	A	80	+	80	20	+	+	+	+	50	+	+	+	50	+	+	55	2
137	69	2	V	20	+	20	40	40	40	+	+	20	+	+	+	+	+	20	20	1
138	70	1	C	60	+	40	40	20	+	+	+	10	+	+	+	+	90	99	10	
139	70	2	A	40	+	60	40	+	+	+	+	+	+	+	+	99	+	+	5	
140	71	1	A	90	+	80	20	+	+	+	70	20	+	+	+	10	+	+	10	
141	71	2	D	10	+	20	60	20	40	+	40	+	+	+	+	+	+	20	5	
142	72	1	P	85	+	80	20	+	+	+	+	+	+	+	+	10	+	90	10	
143	72	2	D	15	20	20	40	20	20	70	+	+	+	+	10	+	+	+	5	
144	73	1	A	85	+	90	10	+	+	+	+	+	+	+	+	90	+	10	55	2
145	73	2	D	15	20	20	50	10	20	+	+	+	+	+	+	70	+	10	40	2
146	74	1	P	75	+	60	30	10	+	10	+	+	+	+	+	20	+	70	10	
147	74	2	V	25	+	20	40	40	+	30	+	+	+	+	+	70	+	+	5	
148	75	1	A	99	+	99	+	+	+	+	50	50	+	+	+	+	+	+	10	
149	76	1	A	56	+	80	20	+	+	+	50	+	+	+	+	50	+	+	15	
150	76	2	D	40	50	75	25	+	+	+	40	+	+	+	+	50	+	10	20	1
151	77	1	P	80	+	30	10	+	+	+	+	+	10	+	+	80	10	+	10	
152	77	2	D	20	20	30	40	10	20	70	+	+	+	+	+	+	+	10	20	
153	78	1	P	70	10	30	+	+	+	50	50	+	+	+	+	+	+	+	10	
154	78	2	D	15	90	10	+	+	90	10	+	+	+	+	+	+	+	+	0	
155	78	3	V	15	30	40	30	+	30	+	30	+	+	+	+	50	+	+	0	
156	79	1	M	85	+	20	30	50	+	+	+	+	+	+	+	80	20	+	0	
157	79	2	P	15	+	70	30	+	+	60	+	+	+	+	+	40	+	+	20	
158	80	1	C	75	+	40	40	20	+	+	+	+	+	+	+	70	30	+	1	
159	80	2	V	25	40	30	30	+	50	30	+	+	+	+	+	+	20	+	0	
160	81	1	P	55	+	60	40	+	+	+	+	+	+	+	+	10	+	90	5	
161	81	2	C	45	+	40	60	+	+	+	+	+	+	+	+	10	+	90	5	
162	82	1	P	85	40	60	+	+	+	+	+	+	+	+	10	90	+	+	+	
163	82	2	D	15	80	20	+	+	30	+	+	+	+	+	+	10	+	+	+	
164	83	1	T	60	90	10	+	+	80	+	+	+	+	+	+	+	20	+	0	
165	83	2	T	40	30	70	+	+	20	+	+	+	+	+	+	+	80	+	5	
166	84	1	P	75	+	90	10	+	+	+	+	+	+	+	70	30	+	+	50	1
167	84	2	D	25	40	30	30	+	40	+	+	+	+	+	40	10	+	10	50	
168	85	1	P	85	+	90	10	+	+	20	+	+	+	+	+	+	80	+	15	
169	85	2	D	15	50	25	25	+	50	+	+	+	+	+	20	+	30	+	10	
170	86	1	A	85	+	90	10	+	+	+	+	+	+	+	99	+	+	+	35	2
171	86	2	D	15	50	25	25	+	10	+	+	+	+	+	90	+	+	+	10	
172	87	1	P	75	+	90	10	+	+	+	+	90	10	+	+	+	+	+	40	2
173	87	2	V	25	+	20	60	20	+	+	+	40	60	+	+	+	+	+	20	2
174	88	1	C	60	+	60	40	+	+	+	40	60	+	+	+	+	+	+	10	
175	88	2	V	40	10	70	40	30	+	+	20	60	20	+	+	+	+	+	10	
176	89	1	C	70	+	60	40	+	+	+	20	80	+	+	+	+	+	+	10	
177	89	2	V	30	10	30	40	20	10	10	30	30	20	+	+	+	+	+	10	
178	92	1	T	80	20	80	+	+	+	+	+	+	+	+	+	50	50	+	5	
179	92	2	T	20	80	20	+	+	+	80	+	+	+	+	+	+	70	+	+	
180	93	1	P	80	20	80	+	+	+	+	+	+	+	+	+	30	70	+	10	
181	93	2	P	20	90	10	+	+	40	+	+	+	+	+	+	+	40	+	0	
182	94	1	A	45	+	60	40	+	+	+	+	+	+	+	+	20	80	+	5	
183	94	2	V	35	+	40	60	+	+	+	+	+	+	+	+	30	70	+	0	

APPENDIX IV (Cont'd.)

CENTRO INTERNACIONAL DE AGRICULTURA

TARGET AREA SURVEY — 15.16 SATURDAY, MARCH 17,

LANDSCAPE FACET–GENERALIZED DESCRIPTION

BS	LANDSYS	FAC	GENDES	PERC LS	TC1	TC2	TC3	TC4	OVC1	OVC2	OVC3	OVC4	OVC5	OVC6	OVC7	OVC8	OVC9	OVCA	IVAP2	IVA
84	95	1	M	99	+	10	40	50	+	+	+	+	+	+	20	80	+	+	2	0
85	96	1	P	65	10	90	+	+	+	+	+	+	+	+	10	80	10	+	10	2
86	96	2	P	35	30	10	+	+	10	+	+	+	+	+	10	60	20	+	0	0
87	97	1	C	99	+	40	60	+	+	+	+	+	+	+	+	80	20	+	2	0
88	98	1	A	99	10	70	10	10	5	+	+	+	+	+	+	80	15	+	10	5
89	99	1	P	85	80	20	+	+	80	20	+	+	+	+	+	+	+	+	0	0
90	99	2	P	15	20	80	+	+	20	+	40	40	+	+	+	+	+	+	2	0
91	100	1	P	85	80	20	+	+	80	20	+	+	+	+	+	+	+	+	0	0
92	100	2	P	15	20	80	+	+	20	+	40	40	+	+	+	+	+	+	5	0
93	101	1	P	85	90	10	+	+	90	10	+	+	+	+	+	+	+	+	0	0
94	101	2	P	15	30	70	+	+	10	20	+	70	+	+	+	+	+	+	5	0
95	102	1	C	85	+	50	30	20	+	+	+	+	+	+	+	80	20	+	1	0
96	102	2	A	15	90	10	+	+	80	10	+	+	+	+	+	10	+	+	0	0
97	103	1	C	99	+	30	50	20	+	40	+	+	+	+	+	30	30	+	1	0
98	104	1	M	40	+	60	40	+	+	+	+	+	+	+	+	70	30	+	10	5
99	104	2	P	30	60	40	+	+	+	+	+	+	+	+	+	90	10	+	0	0
100	104	3	M	30	+	20	40	40	+	+	+	+	+	+	+	10	90	+	0	0
101	105	1	P	99	99	+	+	+	99	+	+	+	+	+	+	+	+	+	0	0
102	106	1	P	99	99	+	+	+	99	+	+	+	+	+	+	+	+	+	0	0
103	107	1	C	65	+	50	25	25	+	+	+	20	+	+	+	+	80	+	2	0
104	107	2	V	35	10	20	40	30	+	30	+	20	+	+	+	+	50	+	0	0
105	108	1	M	70	10	90	10	+	+	+	+	20	+	+	+	+	80	+	10	2
106	108	2	A	30	+	70	50	30	+	+	20	20	+	+	+	+	60	+	2	0
107	109	1	A	85	10	70	20	+	+	+	+	80	+	+	+	+	20	+	10	2
108	109	2	O	15	20	30	50	+	20	50	+	30	+	+	+	+	+	+	5	0
109	110	1	A	80	+	+	40	60	+	+	+	10	+	+	+	+	90	+	10	+
110	110	2	X	20	+	80	20	+	+	+	+	60	+	+	+	+	40	+	15	5

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY

LANDSCAPE FACET-SOIL CLASSIFICATION

OBS	LANDSYS	FAC	E1	E2	E3	SUBORD	GREATGR
1	1	1	O	US	AC	OUS	OUSAC
2	1	2	O	US	AC	OUS	OUSAC
3	2	1	O	US	AC	OUS	OUSAC
4	2	2	O	US	AC	OUS	OUSAC
5	3	1	O	US	AC	OUS	OUSAC
6	3	2	O	US	AC	OUS	OUSAC
7	4	1	O	US	AC	OUS	OUSAC
8	4	2	O	US	HA	OUS	OUSHA
9	5	1	O	US	AC	OUS	OUSAC
10	5	2	O	US	HA	OUS	OUSHA
11	6	1	O	US	HA	OUS	OUSHA
12	7	1	O	US	HA	OUS	OUSHA
13	7	2	E	PS	OU	EPS	EPSOU
14	8	1	O	US	HA	OUS	OUSHA
15	8	2	E	FL	US	EFL	EFLUS
16	9	1	O	US	AC	OUS	OUSAC
17	9	2	O	US	HA	OUS	OUSHA
18	10	1	O	US	EU	OUS	OUSEU
19	10	2	O	US	HA	OUS	OUSHA
20	11	1	O	US	HA	OUS	OUSHA
21	11	2	O	US	AC	OUS	OUSAC
22	12	1	U	US	EU	UUS	UUSEU
23	12	2	O	US	HA	OUS	OUSHA
24	12	3	E	AQ	HY	EAQ	EAQHY
25	13	1	E	PS	OU	EPS	EPSOU
26	13	2	E	PS	OU	EPS	EPSOU
27	14	1	E	PS	OU	EPS	EPSOU
28	14	2	E	PS	OU	EPS	EPSOU
29	15	1	O	US	EU	OUS	OUSEU
30	15	2	O	US	HA	OUS	OUSHA
31	16	1	O	US	HA	OUS	OUSHA
32	16	2	O	US	HA	OUS	OUSHA
33	17	1	U	US	RH	UUS	UUSRH
34	17	2	E	AQ	HY	EAQ	EAQHY
35	17	3	O	US	AC	OUS	OUSAC
36	18	1	O	US	HA	OUS	OUSHA
37	18	2	O	US	EU	OUS	OUSEU
38	19	1	O	US	AC	OUS	OUSAC
39	19	2	A	AQ	TR	AAQ	AAQTR
40	20	1	O	US	AC	OUS	OUSAC
41	20	2	A	AQ	TR	AAQ	AAQTR
42	21	1	O	US	AC	OUS	OUSAC
43	21	2	O	US	HA	OUS	OUSHA
44	22	1	O	US	EU	OUS	OUSEU
45	22	2	A	AQ	TR	AAQ	AAQTR
46	23	1	U	AQ	PL	UAQ	UAQPL
47	23	2	U	UD	PL	UUD	UUDPL
48	24	1	O	US	AC	OUS	OUSAC
49	24	2	O	US	AC	OUS	OUSAC
50	25	1	E	FL	TR	EFL	EFLTR
51	25	2	E	AQ	TR	EAQ	EAQTR
52	26	1	O	US	EU	OUS	OUSEU
53	26	2	O	US	EU	OUS	OUSEU
54	27	1	O	US	HA	OUS	OUSHA
55	27	2	O	US	AC	OUS	OUSAC
56	28	1	O	US	AC	OUS	OUSAC
57	28	2	O	US	EU	OUS	OUSEU
58	29	1	I	TR	DY	ITR	ITRDY
59	29	2	O	US	EU	OUS	OUSEU
60	30	1	E	FL	TR	EFL	EFLTR
61	30	2	E	AQ	FL	EAQ	EAQFL

APPENDIX IV (Cont'd.)

15 16 SATURDAY, MARCH 17

TARGET AREA SURVEY
LANDSCAPE FACET-SOIL CLASSIFICATION

OBS	LANDSYS	FAC	F1	F2	F3	SUBORD	GREATGR
62	31	1	O	US	AC	OUS	OUSAC
63	31	2	O	US	AC	OUS	OUSAC
64	32	1	O	US	HA	OUS	OUSHA
65	32	2	O	US	HA	OUS	OUSHA
66	33	1	O	US	HA	OUS	OUSHA
67	33	2	E	OR	US	EOR	EORUS
68	34	1	O	US	HA	OUS	OUSHA
69	34	2	E	PS	OU	EPS	EPSOU
70	35	1	E	FL	OU	EFL	EFLOU
71	35	2	E	AQ	TR	EAQ	EAQTR
72	36	1	O	US	AC	OUS	OUSAC
73	36	2	A	AQ	TR	AAQ	AAQTR
74	37	1	O	US	HA	OUS	OUSHA
75	37	2	O	US	EU	OUS	OUSEU
76	38	1	U	UD	TR	UUD	UUDTR
77	38	2	U	AQ	TR	UAQ	UAQTR
78	39	1	O	US	HA	OUS	OUSHA
79	39	1	O	US	AC	OUS	OUSAC
80	40	1	O	OR	AC	OOR	OORAC
81	41	1	O	OR	TR	OOR	OORTR
82	42	1	O	US	HA	OUS	OUSHA
83	42	2	O	US	HA	OUS	OUSHA
84	43	1	O	US	EU	OUS	OUSEU
85	43	2	A	AQ	TR	AAQ	AAQTR
86	44	1	O	US	EU	OUS	OUSEU
87	44	2	A	AQ	TR	AAQ	AAQTR
88	45	1	A	US	EU	AUS	AUSEU
89	45	2	A	US	EU	AUS	AUSEU
90	46	1	O	US	EU	OUS	OUSEU
91	46	2	A	UD	RH	AUD	AUDRH
92	47	1	E	PS	OU	EPS	EPSOU
93	47	2	E	PS	OU	EPS	EPSOU
94	48	1	E	PS	OU	EPS	EPSOU
95	48	2	U	AQ	TR	UAQ	UAQTR
96	49	1	O	US	EU	OUS	OUSEU
97	49	2	A	AQ	TR	AAQ	AAQTR
98	50	1	O	US	HA	OUS	OUSHA
99	50	2	A	UD	RH	AUD	AUDRH
100	51	1	O	US	HA	OUS	OUSHA
101	51	2	U	AQ	TR	UAQ	UAQTR
102	52	2	O	US	HA	OUS	OUSHA
103	52	2	U	UD	TR	UUD	UUDTR
104	53	1	O	US	HA	OUS	OUSHA
105	53	2	O	US	HA	OUS	OUSHA
106	54	1	O	US	HA	OUS	OUSHA
107	54	2	A	AQ	TR	AAQ	AAQTR
108	54	3	U	AQ	TR	UAQ	UAQTR
109	55	1	O	US	HA	OUS	OUSHA
110	55	2	E	PS	OU	EPS	EPSOU
111	56	1	O	US	HA	OUS	OUSHA
112	56	2	I	TR	OY	ITR	ITROY
113	57	1	O	US	EU	OUS	OUSEU
114	57	2	E	FL	TR	EFL	EFLTR
115	58	1	I	TR	OY	ITR	ITROY
116	58	2	A	US	RH	AUS	AUSRH
117	59	1	O	US	AC	OUS	OUSAC
118	59	2	O	US	EU	OUS	OUSEU
119	60	1	O	OR	AC	OOR	OORAC
120	60	2	O	OR	AC	OOR	OORAC
121	61	1	E	PS	US	EPS	EPSUS
122	62	1	E	PS	OU	EPS	EPSOU

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY — 15 14 SATURDAY, MARCH 17, 197

LANDSCAPE FACET-SOIL CLASSIFICATION

OBS	LANDSYS	FAC	F1	F2	F3	SUBORD	GREATGR
123	62	2	E	PS	OU	EPS	EPSOU
124	63	1	U	US	HA	UUS	UUSHA
125	63	2	A	US	RH	AUS	AUSRH
126	64	1	U	US	HA	UUS	UUSHA
127	64	2	A	AQ	TR	AAQ	AAQTR
128	65	1	U	US	HA	UUS	UUSHA
129	65	2	U	AQ	TR	UAQ	UAQTR
130	66	1	U	US	HA	UUS	UUSHA
131	66	2	U	AQ	TR	UAQ	UAQTR
132	67	1	O	US	HA	OUS	OUSHA
133	67	2	O	US	HA	OUS	OUSHA
134	68	1	A	AQ	TR	AAQ	AAQTR
135	68	2	A	US	HA	AUS	AUSHA
136	69	1	O	US	FU	OUS	OUSFU
137	69	2	O	US	FU	OUS	OUSFU
138	70	1	E	PS	US	EPS	EPSUS
139	70	2	A	US	HA	AUS	AUSHA
140	71	1	O	US	HA	OUS	OUSHA
141	71	2	O	US	HA	OUS	OUSHA
142	72	1	O	US	HA	OUS	OUSHA
143	72	2	O	US	HA	OUS	OUSHA
144	73	1	U	US	RH	UUS	UUSRH
145	73	2	A	US	RH	AUS	AUSRH
146	74	1	A	US	HA	AUS	AUSHA
147	74	2	A	US	HA	AUS	AUSHA
148	75	1	O	US	AC	OUS	OUSAC
149	76	1	O	US	HA	OUS	OUSHA
150	76	2	O	US	HA	OUS	OUSHA
151	77	1	A	US	RH	AUS	AUSRH
152	77	2	A	US	RH	AUS	AUSRH
153	78	1	O	US	HA	OUS	OUSHA
154	78	2	U	AQ	TR	UAQ	UAQTR
155	78	3	O	US	FU	OUS	OUSFU
156	79	1	E	OR	US	EOR	EORUS
157	79	2	A	US	RH	AUS	AUSRH
158	80	1	A	US	HA	AUS	AUSHA
159	80	2	A	AQ	TR	AAQ	AAQTR
160	81	1	A	US	HA	AUS	AUSHA
161	81	2	A	US	HA	AUS	AUSHA
162	82	1	A	US	HA	AUS	AUSHA
163	82	2	A	UD	HA	AUD	AUDHA
164	83	1	E	FL	TR	EFL	EFLTR
165	83	2	E	FL	TR	EFL	EFLTR
166	84	1	E	PS	TR	EPS	EPSTR
167	84	2	U	AQ	TR	UAQ	UAQTR
168	85	1	E	PS	OU	EPS	EPSOU
169	85	2	E	AQ	PS	EAQ	EAQPS
170	86	1	A	US	RH	AUS	AUSRH
171	86	2	A	AQ	TR	AAQ	AAQTR
172	87	1	O	US	FU	OUS	OUSFU
173	87	2	O	US	FU	OUS	OUSFU
174	88	1	O	US	AC	OUS	OUSAC
175	88	2	O	US	HA	OUS	OUSHA
176	89	1	O	US	AC	OUS	OUSAC
177	89	2	O	US	HA	OUS	OUSHA
178	92	1	E	FL	TR	EFL	EFLTR
179	92	2	E	FL	TR	EFL	EFLTR
180	93	1	E	FL	TR	EFL	EFLTR
181	93	2	E	AQ	TR	EAQ	EAQTR
182	94	1	O	US	HA	OUS	OUSHA
183	94	2	O	US	HA	OUS	OUSHA

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY
LANDSCAPE FACET-SOIL CLASSIFICATION

15 14 SATURDAY, MARCH 17, 19

OBS	LANDSYS	FAC	F1	F2	F3	SUBORD	GREATGR
184	95	1	O	US	FU	OUS	OUSFU
185	96	1	I	TR	US	ITR	ITRUS
186	96	2	I	AQ	TR	IAQ	IAQTR
187	97	1	O	US	FU	OUS	OUSFU
188	98	1	I	TR	US	ITR	ITRUS
189	99	1	U	AQ	TR	UAQ	UAQTR
190	99	2	U	US	HA	UUS	UUSHA
191	100	1	U	AQ	TR	UAQ	UAQTR
192	100	2	U	US	HA	UUS	UUSHA
193	101	1	A	AQ	TR	AAQ	AAQTR
194	101	2	A	US	TR	AUS	AUSTR
195	102	1	O	US	HA	OUS	OUSHA
196	102	2	A	AQ	TR	AAQ	AAQTR
197	103	1	A	US	HA	AUS	AUSHA
198	104	1	A	US	HA	AUS	AUSHA
199	104	2	A	AQ	TR	AAQ	AAQTR
200	104	3	F	OR	TO	FOR	FORTO
201	105	1	F	AQ	FL	FAQ	FAQFL
202	106	1	A	AQ	TR	AAQ	AAQTR
203	107	1	O	US	HA	OUS	OUSHA
204	107	2	O	US	HA	OUS	OUSHA
205	108	1	O	US	FU	OUS	OUSFU
206	108	2	O	US	HA	OUS	OUSHA
207	109	1	O	US	AC	OUS	OUSAC
208	109	2	O	US	HA	OUS	OUSHA
209	110	1	F	PS	OU	FPS	FPSOU
210	110	2	U	US	SH	UUS	UUSSH

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY — 15:14 SATURDAY, MARCH 17, 1

LANDSCAPE FACET-SOIL PHYSICAL PROPERTIES

OBS	LANDSYS	FAC	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	ALTITUDE
1	1	1	B	C	C	B	B	P	A	A	B	B	I	SD	O	1050
2	1	2	A	L	L	B	B	P	A	A	B	B	I	SD	O	900
3	2	1	B	C	C	B	B	P	A	A	B	B	I	SD	O	1000
4	2	2	A	L	L	B	B	P	A	A	B	B	I	SD	O	850
5	3	1	M	C	C	B	B	P	A	A	B	B	I	SD	O	1000
6	3	2	A	L	L	B	B	P	A	A	B	A	I	SD	O	800
7	4	1	M	I	I	B	B	P	A	A	B	A	I	SD	O	900
8	4	2	A	L	L	B	B	P	A	A	B	B	S	SD	O	750
9	5	1	M	C	C	B	B	P	A	A	B	B	I	U	O	900
10	5	2	M	L	L	B	B	P	A	A	B	B	I	SD	O	800
11	6	1	A	I	I	M	M	M	A	A	B	A	I	SD	O	800
12	7	1	B	L	L	B	B	P	A	A	B	B	S	SD	O	600
13	7	2	A	S	S	B	B	P	A	A	B	B	S	SD	O	500
14	8	1	A	L	L	B	M	S	A	A	B	B	I	SD	O	650
15	8	2	B	I	I	B	B	P	M	M	B	M	S	SD	O	500
16	9	1	B	C	C	B	B	P	A	A	B	B	I	SD	O	1100
17	9	2	M	I	I	B	B	M	A	A	B	B	I	SD	O	950
18	10	1	B	C	C	B	B	P	M	M	B	M	S	SD	O	650
19	10	2	A	L	I	B	M	S	A	A	B	B	S	SD	O	350
20	11	1	B	C	C	B	B	P	M	M	B	M	S	SD	O	550
21	11	2	A	L	L	B	M	M	A	A	B	B	S	SD	O	550
22	12	1	B	C	C	B	B	P	M	M	B	M	S	SD	O	400
23	12	2	B	L	S	B	B	P	A	A	B	B	S	SD	O	500
24	12	3	B	C	C	B	A	S	B	B	G	A	S	SD	O	375
25	13	1	B	S	S	B	B	P	A	A	B	B	S	XD	O	700
26	13	2	M	S	S	B	B	P	A	A	B	B	S	XD	O	500
27	14	1	B	S	S	B	B	P	A	A	B	B	S	XD	O	800
28	14	2	B	S	S	B	B	P	A	A	B	B	S	XD	O	+
29	15	1	B	C	C	B	B	P	M	M	B	M	S	SD	O	700
30	15	2	M	L	L	B	B	M	A	A	B	B	S	SD	O	600
31	16	1	B	C	C	A	B	P	A	A	B	B	S	SD	O	600
32	16	2	A	L	L	B	M	M	A	A	B	A	S	SD	O	500
33	17	1	B	C	C	B	B	P	M	M	B	M	S	SD	O	350
34	17	2	B	C	C	B	B	S	B	B	G	A	S	SD	O	325
35	17	3	B	L	S	B	B	P	A	A	B	B	S	SD	O	450
36	18	1	A	L	L	B	M	M	A	A	B	B	S	SD	O	700
37	18	2	B	L	L	B	B	P	M	M	B	M	S	SD	O	550
38	19	1	B	C	C	B	B	P	A	A	B	B	S	U	O	350
39	19	2	M	L	C	B	M	M	M	M	G	M	S	U	O	325
40	20	1	B	L	L	B	M	P	A	A	B	B	S	SD	O	400
41	20	2	M	L	C	B	M	M	M	M	G	M	S	U	O	375
42	21	1	B	L	S	B	M	P	A	A	B	B	S	SD	O	450
43	21	2	M	L	L	B	M	M	A	A	B	B	S	SD	O	450
44	22	1	B	C	C	B	B	P	M	M	B	M	S	SD	O	300
45	22	2	M	L	C	B	B	M	M	B	G	M	S	U	O	300
46	23	1	B	S	C	B	A	M	B	B	G	M	S	U	O	250
47	23	2	B	S	C	B	M	M	A	B	D	M	S	U	O	250
48	24	1	B	L	L	M	A	M	A	A	G	B	S	SD	O	300
49	24	2	A	L	L	B	A	M	A	M	B	B	S	SD	O	250
50	25	1	B	L	L	B	B	P	M	M	D	M	S	U	O	250
51	25	2	B	L	C	B	B	M	B	B	G	M	S	U	O	225
52	26	1	B	C	C	B	B	P	M	M	B	M	S	SD	O	300
53	26	2	M	I	L	B	B	M	M	M	B	M	S	SD	O	325
54	27	1	B	L	S	B	B	P	A	A	B	B	S	SD	O	300
55	27	2	B	C	C	B	B	P	M	M	B	M	S	SD	O	400
56	28	1	B	L	L	B	B	P	A	A	B	B	S	SD	O	400
57	28	2	M	L	L	B	B	M	A	A	B	M	S	SD	O	375
58	29	1	A	C	B	B	M	S	M	M	B	B	S	SD	O	600
59	29	2	B	I	I	B	M	P	M	M	B	M	S	SD	O	250
60	30	1	B	L	L	B	B	P	M	M	B	M	S	SD	O	250
61	30	2	B	L	C	B	M	M	M	M	D	M	S	U	O	225

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY

LANDSCAPE FACET-SOIL PHYSICAL PROPERTIES

15 14 SATURDAY, MARCH 17,

OBS	LANDSYS	FAC	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	ALTITUDE
62	31	1	R	L	L	R	R	P	A	A	R	R	S	SD	O	500
63	31	2	M	L	L	R	M	M	A	A	R	M	S	SD	O	450
64	32	1	R	L	L	R	M	P	A	A	R	R	S	SD	O	350
65	32	2	M	L	L	R	M	M	A	A	R	M	S	SD	O	300
66	33	1	R	L	L	R	M	P	A	M	R	M	S	SD	O	300
67	33	2	A	L	L	R	M	S	A	A	R	R	S	SD	O	500
68	34	1	M	L	L	R	M	M	A	A	R	R	S	SD	O	500
69	34	2	R	S	S	R	R	P	A	A	R	R	S	SD	O	350
70	35	1	R	S	S	R	R	P	A	A	O	R	S	U	O	250
71	35	2	R	S	S	R	R	M	A	M	G	R	S	U	O	225
72	36	1	R	C	C	R	R	P	A	A	R	A	S	SD	O	650
73	36	2	M	C	C	R	R	M	M	M	G	M	S	U	O	625
74	37	1	R	C	C	R	A	P	A	A	R	R	S	SD	O	650
75	37	2	M	L	L	R	M	M	A	A	R	M	S	SD	O	550
76	38	1	R	L	C	R	M	P	A	M	R	M	S	U	O	350
77	38	2	R	L	C	R	R	S	M	R	G	A	S	U	O	250
78	39	1	A	L	L	R	M	M	A	A	R	R	S	SD	O	400
79	39	1	R	C	C	R	R	P	A	A	R	R	S	SD	O	400
80	40	1	M	L	L	R	R	P	A	M	R	M	S	U	O	350
81	41	1	R	L	L	R	M	P	A	A	R	R	S	U	O	400
82	42	1	M	L	L	R	R	M	A	A	R	R	S	SD	O	600
83	42	2	M	L	L	R	M	M	A	A	R	R	S	SD	O	400
84	43	1	R	C	C	R	R	P	A	A	R	M	S	SD	O	550
85	43	2	M	C	C	R	R	M	M	M	G	M	S	U	O	500
86	44	1	R	C	C	R	R	P	A	A	R	R	S	SD	O	500
87	44	2	M	C	C	R	R	M	M	M	G	M	S	U	O	450
88	45	1	R	C	C	R	R	P	M	M	R	M	S	SD	O	450
89	45	2	M	C	C	R	R	M	M	M	R	M	S	SD	O	400
90	46	1	R	C	C	R	A	P	A	M	R	R	S	SD	O	800
91	46	2	M	L	C	R	R	M	M	M	G	M	S	U	O	750
92	47	1	R	S	S	R	R	P	A	A	R	R	S	SD	O	600
93	47	2	M	S	S	R	R	P	A	A	R	R	S	SD	O	550
94	48	1	R	S	S	R	R	P	A	A	R	R	S	SD	O	400
95	48	2	M	S	L	R	R	M	A	M	G	M	S	U	O	350
96	49	1	R	C	C	R	R	P	A	A	R	R	S	SD	O	800
97	49	2	M	L	C	R	R	M	M	R	G	M	S	U	O	775
98	50	1	M	L	L	R	R	M	A	A	R	R	S	SD	O	700
99	50	2	M	L	C	R	R	M	A	M	G	M	S	U	O	650
100	51	1	R	L	L	R	R	P	A	A	R	R	S	SD	O	400
101	51	2	M	S	L	R	R	M	A	M	G	M	S	U	O	375
102	52	2	R	L	L	R	R	P	A	A	R	R	S	SD	O	650
103	52	2	M	S	L	R	R	M	A	M	G	M	S	U	O	650
104	53	1	R	L	L	R	R	P	A	A	R	R	S	SD	O	600
105	53	2	M	S	S	R	R	M	A	A	R	R	S	SD	O	450
106	54	1	R	C	C	R	R	P	A	A	R	R	S	SD	O	800
107	54	2	M	L	C	R	R	M	A	R	G	M	S	U	O	775
108	54	3	R	L	C	R	R	M	M	R	G	M	S	U	O	795
109	55	1	R	S	S	R	R	P	A	A	R	R	S	SD	O	800
110	55	2	M	S	S	R	R	P	A	A	G	R	S	U	O	775
111	56	1	R	L	L	R	R	P	A	A	R	R	S	SD	O	350
112	56	2	M	L	S	R	M	M	M	M	R	M	S	SD	O	600
113	57	1	R	L	L	R	R	P	A	A	R	R	S	SD	O	225
114	57	2	R	L	L	R	R	P	M	M	G	M	S	SD	O	175
115	58	1	A	L	R	R	A	S	A	M	R	R	S	SD	O	800
116	58	2	R	L	C	R	R	P	M	M	R	M	S	SD	O	450
117	59	1	R	C	C	R	R	P	A	A	R	M	S	SD	O	400
118	59	2	M	C	C	R	R	M	A	A	R	M	S	SD	O	375
119	60	1	R	L	L	R	R	P	A	M	R	M	S	U	O	400
120	60	2	M	L	L	R	R	M	A	M	R	M	S	U	O	350
121	61	1	R	S	S	R	R	P	A	A	R	M	S	SD	O	600
122	62	1	R	S	S	R	R	P	A	A	R	R	S	SD	O	600

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY — 15 14 SATURDAY, MARCH 17, 1

LANDSCAPE FACET-SOIL PHYSICAL PROPERTIES

OBS	LANDSYS	FAC	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	ALTITUDE
123	62	2	M	S	S	R	R	P	A	A	R	R	S	SD	O	575
124	63	1	M	L	C	R	R	P	A	M	R	R	S	SD	O	350
125	63	2	A	L	C	R	M	M	M	M	R	M	S	SD	O	275
126	64	1	R	L	C	R	R	P	A	M	B	M	S	SD	O	350
127	64	2	R	S	C	R	R	M	A	M	G	M	S	U	O	250
128	65	1	R	L	C	R	R	P	A	R	B	M	S	SD	O	150
129	65	2	R	L	C	R	R	M	M	M	G	M	S	U	O	125
130	66	1	R	L	C	R	R	P	M	R	D	M	S	SD	O	100
131	66	2	R	L	C	R	R	M	M	M	G	M	S	U	O	90
132	67	1	R	L	L	R	R	P	A	A	B	R	S	SD	O	200
133	67	2	R	L	L	R	M	M	A	A	R	R	S	SD	O	300
134	68	1	R	C	C	R	R	M	R	R	G	R	S	U	O	75
135	68	2	M	L	L	R	M	P	M	M	R	M	S	SD	O	+
136	69	1	R	L	L	R	R	P	A	A	R	M	S	SD	O	375
137	69	2	M	L	L	R	R	P	A	A	D	M	S	SD	O	325
138	70	1	R	S	S	R	R	P	A	A	B	R	S	SD	O	300
139	70	2	R	S	L	R	R	P	M	M	D	M	S	SD	O	200
140	71	1	R	L	L	R	R	P	A	A	R	R	S	SD	O	550
141	71	2	M	L	L	R	R	M	A	M	D	R	S	SD	O	525
142	72	1	R	S	S	R	R	P	A	A	R	R	S	SD	O	450
143	72	2	M	S	S	R	R	M	A	M	D	M	S	SD	O	425
144	73	1	R	C	C	R	R	P	A	M	G	M	S	SD	O	400
145	73	2	M	C	C	R	R	M	M	M	D	M	S	SD	O	375
146	74	1	R	L	C	R	R	P	M	M	B	M	S	SD	O	300
147	74	2	M	L	L	R	M	M	M	M	R	M	S	SD	O	250
148	75	1	R	C	C	R	M	P	A	A	R	A	S	SD	O	500
149	76	1	R	S	S	R	R	P	A	A	R	R	S	SD	O	300
150	76	2	M	L	L	R	R	P	A	A	D	M	S	SD	O	250
151	77	1	R	L	C	R	R	P	A	M	R	M	S	SD	O	350
152	77	2	M	L	C	R	R	M	A	M	D	M	S	SD	O	325
153	78	1	R	C	C	R	R	P	A	M	R	R	S	SD	O	300
154	78	2	R	C	C	R	R	M	M	R	G	M	S	SD	O	295
155	78	3	M	C	C	R	R	M	A	M	R	M	S	SD	O	275
156	79	1	A	L	L	B	M	M	A	A	R	R	S	SD	O	500
157	79	2	R	L	L	R	R	P	M	M	R	M	S	SD	O	350
158	80	1	M	L	L	R	M	M	M	M	B	M	S	SD	O	400
159	80	2	R	L	C	R	R	M	M	R	G	M	S	SD	O	300
160	81	1	R	L	C	R	R	P	M	M	B	M	S	SD	O	+
161	81	2	M	L	L	R	R	M	M	M	R	M	S	SD	O	+
162	82	1	R	L	C	R	R	P	M	R	D	M	S	SD	O	100
163	2	2	R	C	C	R	R	M	R	R	G	A	S	U	U	90
164	83	1	R	L	L	R	R	M	M	M	G	M	S	U	O	80
165	83	2	R	L	L	R	R	P	M	M	R	M	S	SD	O	110
166	84	1	R	S	L	R	R	P	A	A	R	R	S	SD	O	400
167	84	2	M	S	L	R	R	M	A	M	G	M	H	U	O	350
168	85	1	R	S	S	R	R	P	A	A	R	R	H	SD	O	450
169	85	2	M	S	S	R	R	P	A	A	G	R	H	U	O	400
170	86	1	R	C	C	R	R	P	M	M	R	M	H	SD	O	550
171	86	2	R	C	C	R	R	M	R	R	G	R	H	U	O	525
172	87	1	R	L	L	R	R	P	A	A	B	R	S	SD	O	700
173	87	2	M	L	L	R	R	M	A	A	R	R	S	SD	O	675
174	88	1	R	C	C	R	R	P	A	A	R	R	S	SD	O	1000
175	88	2	M	L	L	R	M	M	A	A	R	R	S	SD	O	900
176	89	1	R	L	L	R	R	P	A	A	R	R	S	SD	O	800
177	89	2	M	L	L	R	P	M	A	A	R	R	S	SD	O	750
178	92	1	R	L	L	R	R	P	M	M	R	M	S	SD	O	450
179	92	2	R	L	L	R	R	P	M	M	G	M	S	U	O	400
180	93	1	R	S	S	R	R	P	A	A	R	R	S	SD	O	525
181	93	2	R	S	S	R	R	M	A	A	G	R	S	U	O	500
182	94	1	R	L	L	R	R	P	A	A	R	A	S	SD	O	750
183	94	2	M	L	L	R	R	M	A	A	R	A	S	SD	O	650

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY — 15 14 SATURDAY, MARCH 17, 19

LANDSCAPE FACET-SOIL PHYSICAL PROPERTIES

OBS	LANDSYS	FAC	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	ALTITUDE
184	95	1	A	L	L	B	M	M	A	M	B	M	S	SD	O	800
185	96	1	B	L	L	B	B	P	M	M	B	M	S	SD	O	470
186	96	2	B	C	C	B	B	M	B	B	G	M	S	U	O	440
187	97	1	A	L	L	B	B	P	A	M	B	M	S	SD	O	800
188	98	1	B	L	L	B	B	P	M	M	B	M	S	SD	O	450
189	99	1	B	L	C	B	B	M	M	B	G	A	S	U	O	75
190	99	2	B	L	C	B	B	P	M	M	B	M	S	SD	O	80
191	100	1	B	L	C	B	B	M	M	B	G	A	S	U	O	75
192	100	2	B	C	C	B	B	P	M	M	B	M	S	SD	O	80
193	101	1	B	L	C	B	B	M	M	M	G	A	S	U	O	+
194	101	2	B	L	C	B	B	P	M	B	D	M	S	SD	O	+
195	102	1	B	L	L	B	B	P	A	A	B	B	S	SD	O	+
196	102	2	B	L	C	B	B	M	M	B	G	A	S	U	O	+
197	103	1	M	L	C	B	B	P	M	M	B	M	S	SD	O	+
198	104	1	M	L	C	B	B	P	M	M	B	M	S	SD	O	+
199	104	2	B	C	C	B	B	M	M	B	G	M	S	U	O	+
200	104	3	A	L	P	B	M	S	A	M	B	B	S	XD	O	+
201	105	1	B	L	L	B	B	M	M	M	G	M	S	U	O	+
202	106	1	B	L	C	B	B	M	M	B	G	M	S	U	O	+
203	107	1	M	L	L	B	B	P	A	A	B	B	S	SD	O	+
204	107	2	A	S	S	B	B	M	A	A	B	B	S	SD	O	+
205	108	1	A	C	C	B	B	P	A	A	B	B	S	SD	O	+
206	108	2	M	L	L	B	B	M	A	A	B	B	S	SD	O	+
207	109	1	A	L	L	B	B	P	A	A	B	B	S	SD	O	+
208	109	2	B	L	L	B	B	M	A	M	D	M	S	SD	O	+
209	110	1	A	S	S	B	M	M	A	A	B	B	S	SD	O	+
210	110	2	B	C	C	B	B	P	M	M	B	M	S	SD	O	+

APPENDIX IV (Cont'd.)

CENTRO INTERNACIONAL DE AGRICULTURA

TARGET AREA SURVEY 15.14 SATURDAY, MARCH 17,

LANDSCAPE FACET-SOIL CHEMICAL PROPERTIES

S	LANDSYS	FAC	F17	F18	F19	F20	F21	F22	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33	F34	F35	F36	F37	F38	F39	F40	F41	F42	F43	F44
1	1	1	H	H	A	H	A	M	B	B	M	B	B	B	B	B	A	B	E	E	M	B	B	B	I	U	U	B	U	U
2	1	2	H	H	A	H	A	M	B	B	H	H	B	B	H	B	B	B	E	E	M	B	M	B	I	U	U	B	U	U
3	2	1	H	H	A	A	A	M	B	B	M	B	B	B	B	B	A	B	E	E	M	B	B	B	I	U	U	B	U	U
4	2	2	H	H	A	H	A	M	B	B	M	B	B	B	B	B	B	B	E	F	M	B	B	B	I	U	U	B	U	U
5	3	1	H	H	A	H	A	M	B	B	H	A	B	B	B	B	B	B	E	E	M	B	B	B	I	U	U	B	U	U
6	3	2	H	H	A	H	A	M	B	B	M	A	B	B	B	B	B	B	E	E	M	B	H	B	O	U	U	B	U	U
7	4	1	M	M	A	H	A	M	B	B	M	H	B	B	B	B	B	B	E	E	M	B	B	B	O	U	U	B	U	U
8	4	2	H	H	H	H	M	B	B	B	M	H	A	B	B	B	B	B	E	E	M	B	M	B	O	U	U	U	U	U
9	5	1	H	H	A	H	A	M	B	B	H	H	B	B	B	B	B	B	E	E	M	B	B	B	I	U	U	B	U	U
0	5	2	H	M	A	M	M	B	M	B	M	B	B	B	B	B	M	B	M	F	M	B	M	B	O	U	U	S	U	U
1	6	1	H	H	A	M	A	M	M	B	M	A	B	B	B	B	B	B	E	E	M	B	B	B	O	U	U	U	U	U
2	7	1	H	H	A	H	A	M	B	B	M	B	B	B	B	B	B	B	E	F	M	B	B	B	O	U	U	A	U	U
3	7	2	M	M	B	K	B	K	M	B	M	A	B	B	B	B	M	B	M	E	M	B	B	B	O	U	U	B	U	U
4	8	1	H	H	M	M	M	M	M	B	M	A	B	B	B	B	B	B	E	F	M	B	M	B	O	U	U	U	U	U
5	8	2	M	M	M	B	B	B	M	M	M	M	M	M	M	M	M	M	M	M	M	B	M	B	O	U	U	S	U	U
6	9	1	H	M	A	M	A	M	B	B	M	H	B	B	B	B	B	B	E	E	M	B	B	B	I	U	U	A	U	U
7	9	2	H	H	A	M	A	M	B	B	M	H	A	B	B	B	B	B	E	E	M	B	B	B	O	U	U	U	U	U
8	10	1	M	H	M	B	M	B	M	B	M	M	M	B	H	B	M	M	M	M	M	B	M	B	O	U	U	U	U	U
9	10	2	M	H	A	M	M	B	B	B	M	M	B	B	B	B	B	B	E	E	M	B	B	B	O	U	U	U	U	U
0	11	1	H	M	A	M	M	B	A	B	M	M	B	B	B	B	B	B	M	F	M	B	B	B	O	U	U	U	U	U
1	11	2	H	H	A	M	M	B	B	B	M	A	B	B	A	B	B	B	E	F	M	B	M	B	O	U	U	U	U	U
2	12	1	M	H	B	B	B	B	A	M	A	M	M	M	M	M	A	M	A	M	M	B	M	B	O	U	U	U	U	U
3	12	2	H	H	A	M	M	M	B	B	B	B	K	K	A	B	A	B	E	E	M	B	A	B	O	U	U	U	U	U
4	12	3	M	M	B	M	B	B	A	A	A	M	M	M	M	M	A	A	A	A	A	M	M	M	O	U	U	U	U	U
5	13	1	M	M	B	B	B	B	M	B	M	H	K	K	A	B	B	B	E	E	M	B	M	B	O	U	U	B	U	U
6	13	2	M	M	B	M	B	B	M	B	M	K	B	B	A	B	B	A	E	E	M	B	M	B	O	U	U	U	U	U
7	14	1	M	M	B	A	B	B	M	B	M	H	K	K	A	B	B	B	E	E	M	B	M	B	O	U	U	A	U	U
8	14	2	M	M	A	M	B	B	M	M	H	H	K	K	B	B	B	B	E	E	M	B	M	B	O	U	U	B	U	U
9	15	1	H	H	M	A	M	B	M	B	M	A	M	B	A	B	M	B	M	F	M	B	M	B	O	U	U	U	U	U
0	15	2	H	M	M	M	A	B	B	B	H	H	B	B	B	B	B	B	E	E	M	B	A	B	O	U	U	U	U	U
1	16	1	M	H	H	A	M	B	B	B	M	A	B	B	B	B	B	B	E	E	M	B	B	B	I	U	U	U	U	U
2	16	2	H	H	M	B	M	B	B	B	M	H	B	B	B	B	B	B	E	E	M	B	B	B	O	U	U	U	U	U
3	17	1	M	H	B	A	B	B	A	M	A	M	M	M	A	M	A	M	A	M	M	B	M	B	O	U	U	U	U	U
4	17	2	M	M	B	H	B	B	A	A	A	M	M	M	M	M	A	A	A	A	A	M	M	M	O	U	U	U	U	U
5	17	3	H	M	A	M	M	B	B	B	B	A	K	K	A	B	B	B	E	E	M	B	B	B	O	U	U	U	U	U
6	18	1	H	H	H	B	M	B	B	A	M	H	A	B	H	B	B	B	E	E	M	B	B	B	O	U	U	U	U	U
7	18	2	M	M	H	B	M	B	M	B	M	H	M	B	B	B	M	B	M	E	M	B	M	B	O	U	U	U	U	U
8	19	1	H	H	A	B	M	B	B	B	M	A	B	B	H	B	B	B	E	F	M	B	B	B	O	U	U	U	U	U
9	19	2	M	M	B	B	M	B	M	M	M	M	M	M	M	B	M	M	M	M	A	B	M	B	O	U	U	U	U	U
0	20	1	H	H	H	B	M	B	B	B	B	B	K	K	B	B	B	B	E	F	M	B	B	B	O	U	U	U	U	U
1	20	2	M	M	B	B	M	B	M	M	M	H	M	B	B	B	M	M	M	M	A	B	M	B	O	U	U	U	U	U
2	21	1	H	H	H	H	M	B	B	B	M	H	B	B	B	B	B	B	E	F	M	B	B	B	O	U	U	U	U	U
3	21	2	H	H	M	B	M	B	M	B	M	B	B	B	A	B	B	B	M	E	M	B	M	B	O	U	U	U	U	U
4	22	1	M	H	B	B	B	B	M	B	M	M	M	M	B	B	M	B	M	E	A	B	M	B	O	U	U	U	U	U
5	22	2	M	M	B	B	B	B	M	M	M	H	M	M	M	B	H	M	M	E	A	B	M	B	O	U	U	U	U	U
6	23	1	H	M	H	B	M	B	B	B	B	B	B	B	A	A	B	B	E	E	A	B	B	B	O	U	U	U	U	U
7	23	2	H	M	A	M	M	B	B	B	B	H	B	B	A	B	B	B	E	E	M	B	B	B	O	U	U	U	U	U
8	24	1	H	H	A	M	A	M	B	B	B	B	K	A	H	B	B	B	E	E	M	B	B	B	I	U	U	B	U	U
9	24	2	M	M	H	M	M	B	B	B	B	H	B	B	A	B	A	B	E	E	A	B	B	B	O	U	U	B	U	U
0	25	1	M	M	B	B	B	B	M	B	M	H	M	B	M	B	M	B	M	M	A	B	M	B	O	U	U	S	U	U
1	25	2	M	M	B	B	B	B	M	M	M	M	M	B	A	B	M	M	M	M	A	B	M	B	O	U	U	S	U	U
2	26	1	M	H	M	B	H	M	M	B	M	H	M	B	H	B	M	B	H	F	M	B	M	B	O	U	U	U	U	U
3	26	2	M	H	M	B	M	B	M	B	M	K	M	B	A	B	M	M	M	E	M	B	M	B	O	U	U	U	U	U
4	27	1	H	M	M	B	M	H	B	B	M	H	K	B	H	B	B	B	F	F	M	B	B	B	O	U	U	B	U	U
5	27	2	H	H	A	M	A	F	B	B	M	H	B	B	H	B	B	B	E	E	M	B	B	B	I	U	U	B	U	U
6	28	1	H	H	A	A	A	A	B	B	M	H	B	B	B	B	B	B	E	E	M	B	B	B	I	U	U	B	U	U
7	28	2	M	H	H	M	A	M	M	B	M	H	M	B	B	B	B	B	M	E	M	B	M	B	O	U	U	U	U	U
8	29	1	M	M	M	B	M	B	M	B	M	H	B	B	B	B	M	B	M	M	A	B	M	B	O	U	U	U	U	U
9	29	2	M	M	B	B	B	B	M	B	M	E	M	B	B	B	M	B	M	E	M	B	M	B	O	U	U	U	U	U
0	30	1	M	M	B	B	B	B	M	M	M	M	M	B	B	B	M	M	M	M	M	B	M	B	O	U	U	U	U	U
1	30	2	M	M	B	B	B	B	M	M	M	M	M	M	M	B	B	M	M	M	A	B	M	B	O	U	U	U	U	U

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY — 15 14 SATURDAY, MARCH 17,

LANDSCAPE FACET-SOIL CHEMICAL PROPERTIES

LANDSYS	FAC	F17	F18	F19	F20	F21	F22	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33	F34	F35	F36	F37	F38	F39	F40	F41	F42	F43	F44
31	1	H	M	A	M	A	M	R	R	R	A	R	R	R	R	R	R	F	F	M	R	R	R	I	U	U	U	U	U
31	2	H	M	H	M	M	R	R	R	M	R	R	R	R	R	R	R	E	F	M	R	R	R	O	U	U	U	U	U
32	1	H	M	A	M	M	R	R	R	M	A	R	R	R	R	R	R	F	F	M	R	R	R	O	U	U	R	U	U
32	2	H	M	A	R	M	R	R	R	M	R	R	R	R	R	R	R	F	E	M	R	B	R	O	U	U	R	U	U
33	1	H	M	A	R	M	R	R	R	M	M	R	R	R	R	R	R	F	F	M	R	R	R	O	U	U	U	U	U
33	2	M	M	R	R	R	R	M	R	M	R	M	R	R	R	M	R	M	F	M	R	R	R	O	U	U	U	U	U
34	1	H	H	A	R	M	R	R	R	M	A	R	R	R	R	R	R	F	F	M	R	R	R	O	U	U	U	U	U
34	2	M	M	R	R	R	R	R	R	R	R	K	K	R	R	R	R	M	E	M	R	R	R	O	U	U	R	U	U
35	1	M	M	R	R	R	R	M	R	M	R	R	R	R	R	M	R	M	F	M	R	M	R	O	U	R	U	U	U
35	2	M	M	R	R	R	R	M	R	M	R	R	R	R	R	M	R	M	F	A	R	M	R	O	U	U	U	U	U
36	1	H	H	A	M	A	R	R	R	M	R	R	R	R	R	R	R	F	F	M	R	R	R	I	U	U	R	U	U
36	2	M	M	R	R	R	R	A	M	A	M	M	M	M	R	M	M	A	M	A	R	M	R	O	U	U	U	U	U
37	1	M	H	A	M	A	M	R	R	R	R	R	R	R	R	R	R	F	F	M	R	R	R	I	U	U	R	U	U
37	2	M	M	H	R	M	R	M	R	M	R	M	R	R	R	M	M	M	F	M	R	M	R	O	U	U	U	U	U
38	1	M	H	A	A	M	M	M	R	M	A	R	R	R	R	R	R	E	F	M	R	R	R	O	U	U	U	U	U
39	2	M	M	R	R	R	R	M	M	M	M	M	M	M	R	M	M	M	M	A	R	M	R	O	U	U	U	U	U
39	1	M	M	A	R	M	R	R	R	R	R	R	R	R	R	R	R	E	E	M	R	R	R	O	U	U	U	U	U
39	1	H	H	A	M	M	R	R	R	R	R	R	R	R	R	R	R	E	E	M	R	R	R	I	U	U	R	U	U
40	1	H	M	A	M	M	R	M	R	M	R	R	R	R	R	R	R	M	F	M	R	R	R	O	U	U	U	U	U
41	1	H	M	A	R	A	R	R	R	R	R	R	R	R	R	R	R	F	F	M	R	R	R	I	U	U	U	U	U
42	1	H	H	H	R	M	R	R	R	R	A	K	K	R	R	R	R	E	F	M	R	R	R	O	U	U	R	U	U
42	2	H	H	M	M	M	R	B	R	R	A	K	K	R	R	R	B	E	E	M	B	B	B	O	U	U	R	U	U
43	1	M	M	A	M	A	M	M	R	M	A	R	R	R	R	M	R	M	F	M	R	R	R	I	U	U	R	U	U
43	2	M	M	H	R	M	R	M	M	M	M	M	R	M	R	M	M	M	M	A	R	M	B	O	U	U	U	U	U
44	1	M	H	H	M	M	R	M	R	M	A	M	R	R	R	M	R	M	F	M	P	M	R	I	U	U	U	U	U
44	2	M	M	M	R	M	R	M	M	M	M	M	H	M	R	M	M	M	M	A	R	M	R	O	U	U	U	U	U
45	1	H	M	H	M	M	R	M	R	M	A	M	R	R	R	M	R	M	F	M	R	M	R	I	U	U	U	U	U
45	2	M	M	M	R	M	R	M	R	M	H	M	R	B	R	M	R	M	F	M	R	M	R	I	U	U	U	U	U
46	1	M	M	M	M	M	R	R	R	M	A	M	R	R	R	M	R	M	E	M	R	M	R	I	U	U	R	U	U
46	2	M	M	R	M	R	R	M	R	M	M	M	M	M	R	M	M	A	M	A	R	M	R	O	U	U	U	U	U
47	1	M	M	R	R	R	R	R	R	M	A	K	K	R	R	R	R	F	F	M	R	R	R	O	U	U	R	U	U
47	2	M	M	R	R	R	R	R	R	M	A	K	K	B	R	R	R	E	E	M	R	B	R	O	U	U	R	U	U
48	1	H	M	M	A	M	M	M	R	R	A	K	K	R	R	R	R	E	E	M	R	R	R	O	U	U	M	U	U
48	2	H	H	R	H	R	M	R	R	M	M	K	K	R	R	R	R	F	F	M	P	M	R	O	U	U	U	U	U
49	1	M	M	A	M	A	M	M	R	M	A	R	R	R	R	M	R	E	E	M	R	R	R	I	U	U	R	U	U
49	2	M	M	R	R	R	R	M	M	M	M	M	M	M	R	M	M	M	M	A	B	M	R	O	U	U	U	U	U
50	1	M	H	M	M	M	M	M	R	M	A	R	R	R	R	R	R	M	E	M	R	R	R	O	U	U	U	U	U
50	2	M	M	R	R	R	R	M	M	M	M	M	M	M	R	M	M	M	M	A	R	M	R	O	U	U	U	U	U
51	1	M	H	M	M	M	R	R	R	R	R	K	K	R	R	R	R	F	E	M	R	R	R	O	U	U	R	U	U
51	2	M	M	R	R	R	R	R	R	M	H	R	R	R	R	R	R	F	F	A	R	M	R	O	U	U	U	U	U
52	2	M	M	M	M	M	R	R	R	M	M	R	R	R	R	R	R	E	E	M	R	R	R	O	U	U	R	U	U
52	2	H	H	M	M	M	M	R	R	M	M	R	R	R	R	R	R	M	M	A	R	M	R	O	U	U	U	U	U
53	1	M	M	M	R	M	R	R	R	R	A	K	K	R	R	R	R	F	F	M	R	R	R	O	U	U	U	U	U
53	2	H	M	M	R	M	R	R	R	R	H	K	K	R	R	R	R	F	F	M	R	R	R	O	U	U	U	U	U
54	1	H	M	A	A	A	M	R	R	R	M	R	R	R	R	R	R	E	E	M	R	R	R	I	U	U	R	U	U
54	2	M	M	M	R	M	R	M	M	M	M	M	R	R	R	R	R	M	M	A	R	M	R	O	U	U	U	U	U
54	3	M	M	A	R	A	R	M	M	R	M	R	R	R	R	R	R	F	M	A	R	M	R	O	U	U	U	U	U
55	1	H	M	A	M	M	R	R	R	R	M	K	K	M	R	M	R	F	F	M	R	R	R	O	U	U	R	U	U
55	2	M	H	R	R	R	R	R	R	R	M	K	K	R	R	R	R	E	F	M	R	R	R	O	U	U	U	U	U
56	1	H	M	A	M	M	R	R	R	R	M	R	R	M	R	R	R	F	F	M	R	R	R	O	U	U	U	U	U
56	2	M	M	R	R	R	R	M	R	M	R	R	R	R	R	M	R	M	F	M	R	M	R	O	U	U	U	U	U
57	1	M	M	M	A	M	R	M	R	M	M	M	R	R	R	M	R	M	F	M	R	M	R	O	U	U	R	U	U
57	2	M	M	R	R	R	R	M	M	M	M	M	M	M	R	M	R	M	F	M	R	M	R	O	U	U	U	U	U
58	1	M	M	R	R	R	R	M	R	M	M	M	R	R	R	M	R	M	F	M	R	M	R	O	U	U	U	U	U
58	2	M	F	R	R	R	R	M	R	M	M	R	R	R	R	M	R	M	F	A	R	M	R	O	U	U	U	U	U
59	1	H	M	A	A	A	A	R	R	R	H	R	R	H	R	R	R	F	F	M	R	R	R	I	U	U	R	U	U
59	2	H	H	H	M	A	M	M	R	M	M	M	R	R	R	R	R	M	F	M	R	M	R	O	U	U	U	U	U
60	1	H	H	H	A	M	A	M	R	M	H	M	R	M	R	M	R	F	F	M	R	M	R	O	U	U	U	U	U
60	2	M	H	M	H	M	M	M	R	M	H	M	R	R	R	R	R	E	E	M	R	M	R	O	U	U	U	U	U
61	1	M	M	R	R	R	R	R	R	R	H	M	K	M	R	R	R	F	F	M	R	M	R	O	U	U	R	U	U
62	1	M	H	M	M	M	M	R	R	M	M	K	K	R	R	R	R	F	F	R	R	R	R	O	U	U	R	U	U

APPENDIX IV (Cont'd.)

CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

TARGET AREA SURVEY   15.14 SATURDAY, MARCH 17, 1

LANDSCAPE FACET-SOIL CHEMICAL PROPERTIES

LANDSYS	FAC	E17	E18	E19	E20	E21	E22	E23	E24	E25	E26	E27	E28	E29	E30	E31	E32	E33	E34	E35	E36	E37	E38	E39	E40	E41	E42	E43	E44
62	2	M	M	M	M	M	M	B	B	B	B	B	B	B	B	B	B	F	F	M	B	M	B	O	U	U	U	U	U
63	1	M	M	A	M	A	M	M	B	M	M	M	B	B	B	M	B	E	F	M	B	M	B	O	U	U	U	U	U
63	2	M	M	B	M	B	M	M	M	M	M	M	B	B	B	M	B	M	E	M	B	M	B	O	U	U	U	U	U
64	1	M	M	B	A	B	A	M	B	M	M	M	B	M	B	M	B	M	F	M	B	M	B	O	U	U	U	U	U
64	2	M	M	B	M	B	A	M	M	M	M	M	B	B	B	M	B	M	F	A	B	M	B	O	U	U	U	U	U
65	1	M	M	A	A	A	A	M	B	M	A	B	B	B	A	A	B	E	F	M	B	M	B	O	U	U	U	U	U
65	2	M	M	B	M	B	A	M	M	M	M	M	M	A	B	M	B	M	F	A	B	M	B	O	U	U	U	U	U
66	1	M	M	B	M	B	A	M	B	M	M	M	B	B	B	M	B	M	F	M	B	M	B	O	U	U	U	U	U
66	2	M	M	B	M	B	M	M	M	M	M	M	B	M	B	M	B	M	F	M	B	M	B	O	U	U	U	U	U
67	1	M	M	A	A	M	M	M	B	M	M	B	B	B	B	B	B	E	F	M	B	B	B	O	U	U	U	U	U
67	2	M	M	A	A	M	M	B	B	B	A	B	B	B	B	B	B	F	F	M	B	B	A	O	U	U	U	U	U
68	1	M	M	B	B	B	B	M	M	M	M	M	M	M	M	M	M	A	M	M	B	M	B	O	U	U	U	U	U
68	2	M	M	B	B	B	B	M	M	M	M	M	B	M	B	M	B	M	M	M	B	M	A	O	U	U	U	U	U
69	1	M	M	A	M	M	M	M	B	B	M	B	K	B	B	M	B	F	E	M	B	M	B	O	U	U	U	U	U
69	2	M	M	M	A	M	M	M	B	M	B	B	B	B	B	B	B	M	F	M	B	M	B	O	U	U	U	U	U
70	1	M	M	A	A	A	A	M	B	M	B	M	B	B	B	B	B	M	F	M	B	B	B	O	U	U	U	U	U
70	2	M	M	B	B	B	B	M	M	M	M	B	M	B	B	M	B	M	F	M	B	B	B	O	U	U	U	U	U
71	1	M	M	A	A	A	M	M	B	M	B	B	B	M	B	M	B	E	E	M	B	M	B	I	U	U	U	U	U
71	2	M	M	M	M	M	M	M	B	M	B	M	B	B	B	M	B	F	F	M	B	M	B	I	U	U	U	U	U
72	1	M	M	M	M	M	B	B	B	B	B	K	K	B	B	B	B	E	F	M	B	B	B	O	U	U	B	U	U
72	2	M	M	M	M	M	B	B	B	B	B	K	K	B	B	B	B	E	F	M	B	B	B	O	U	U	U	U	U
73	1	M	M	B	M	B	M	M	M	M	M	A	M	M	M	A	M	M	E	M	B	A	B	I	U	U	U	U	U
73	2	M	M	B	B	B	B	A	M	A	M	M	B	M	M	M	M	A	M	A	B	A	B	O	U	U	U	U	U
74	1	M	M	B	B	B	B	M	M	M	M	M	B	M	B	M	M	M	M	M	B	M	B	O	U	U	U	U	U
74	2	M	M	B	B	B	B	M	M	M	M	M	B	M	B	M	B	M	M	M	B	M	B	O	U	U	U	U	U
75	1	M	M	A	A	A	M	B	B	B	M	B	A	B	B	M	B	E	F	M	B	M	B	I	U	U	B	U	U
76	1	M	M	A	M	M	M	B	B	B	A	K	K	B	B	B	B	E	E	M	B	M	B	O	U	U	B	U	U
76	2	M	M	M	M	M	M	M	B	M	A	B	B	B	B	B	A	E	E	M	B	M	B	O	U	U	U	U	U
77	1	M	M	B	A	B	B	M	M	M	M	M	B	B	B	M	M	M	M	M	B	M	B	O	U	U	U	U	U
77	2	M	M	B	B	B	B	M	M	M	M	B	B	B	B	M	B	M	M	M	B	M	B	O	U	U	U	U	U
78	1	M	M	A	A	A	M	M	B	M	A	B	B	B	B	B	A	E	F	M	B	M	B	I	U	U	U	U	U
78	2	M	M	M	A	M	M	M	B	M	M	B	B	B	B	M	B	M	E	M	B	B	B	I	U	U	U	U	U
78	3	M	M	M	A	M	M	M	B	M	M	B	B	B	B	M	B	M	F	M	B	M	B	I	U	U	U	U	U
79	1	M	M	B	B	B	B	M	M	M	M	M	B	M	B	M	M	A	M	M	B	M	B	O	U	U	U	U	U
79	2	M	M	B	M	B	M	M	B	M	B	M	B	B	B	M	B	M	F	M	B	B	B	O	U	U	U	U	U
80	1	M	M	B	B	B	B	M	M	M	M	M	B	M	B	A	M	A	M	M	B	M	B	O	U	U	U	U	U
80	2	M	M	B	B	B	B	M	M	M	M	M	B	M	B	A	M	A	M	M	B	A	B	O	U	U	U	U	U
81	1	M	M	B	B	B	B	A	M	A	M	M	M	M	B	M	B	A	M	M	B	M	B	O	U	U	U	U	U
81	2	M	M	B	B	B	B	M	B	M	B	M	B	M	B	M	B	M	F	M	B	M	B	O	U	U	U	U	U
82	1	M	M	B	B	B	B	A	M	A	M	M	B	M	B	A	M	A	M	M	B	M	B	O	U	U	U	U	U
82	2	M	M	B	B	B	B	A	A	A	M	M	B	M	B	A	M	A	M	A	M	M	B	O	U	U	U	U	U
83	1	M	M	B	B	B	B	A	A	A	A	M	B	M	B	A	M	A	M	M	B	M	B	O	U	U	U	U	U
83	2	M	M	A	B	B	B	A	M	A	M	M	B	M	B	A	M	A	M	M	B	M	B	O	U	U	U	U	U
84	1	M	M	M	A	M	M	B	B	B	B	K	K	B	B	B	B	E	F	M	B	B	B	O	U	U	B	U	U
84	2	M	M	M	M	M	M	B	B	B	B	K	K	B	B	B	B	E	F	M	B	M	B	O	U	U	U	U	U
85	1	M	M	M	M	M	B	B	B	B	B	K	K	B	B	B	B	E	E	M	B	B	B	O	U	U	B	U	U
85	2	M	M	M	M	M	B	B	B	B	M	K	K	B	B	B	B	E	E	M	B	B	B	O	U	U	B	U	U
86	1	M	M	B	B	B	B	A	M	A	M	A	M	A	M	A	M	A	M	M	B	A	M	O	U	U	U	U	U
86	2	M	M	B	B	B	B	A	M	A	M	A	M	M	B	A	M	A	M	A	B	A	M	O	U	U	U	U	U
87	1	M	M	A	A	M	M	M	B	M	M	B	K	B	P	B	B	E	F	M	B	M	B	O	U	U	U	U	U
87	2	M	M	A	A	M	M	M	B	M	M	B	B	B	B	B	B	F	F	M	B	M	B	O	U	U	U	U	U
88	1	M	M	A	A	A	M	B	B	B	B	B	K	B	B	B	B	E	F	M	B	B	B	I	U	U	B	U	U
88	2	M	M	A	A	M	M	B	B	B	M	B	B	B	B	B	B	E	E	M	B	M	B	O	U	U	B	U	U
89	1	M	M	A	A	M	M	B	B	B	B	B	K	M	B	B	B	F	F	M	B	M	B	O	U	U	B	U	U
89	2	M	M	A	A	M	B	B	B	B	M	B	B	B	B	B	B	E	F	M	B	B	B	O	U	U	U	U	U
92	1	M	M	B	B	B	B	A	M	A	M	M	M	M	M	A	M	A	M	M	B	A	M	O	U	U	U	U	U
92	2	M	M	B	B	B	B	A	M	A	M	M	M	M	B	A	M	A	M	M	B	A	M	O	U	U	U	U	U
93	1	M	M	B	B	B	B	M	B	M	M	B	B	M	B	B	B	M	M	M	B	M	B	O	U	U	U	U	U
93	2	M	M	B	B	B	B	M	B	M	M	B	B	B	B	B	B	M	M	M	B	M	B	O	U	U	U	U	U
94	1	M	M	A	A	M	M	B	B	B	M	M	B	M	B	B	B	F	F	M	B	B	B	O	U	U	U	U	U
94	2	M	M	A	A	M	M	B	B	B	B	B	B	B	B	B	B	E	F	M	B	B	B	O	U	U	U	U	U

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY — 15 14 SATURDAY, MARCH 17, 197

LANDSCAPE FACET-SOIL CHEMICAL PROPERTIES

LANDSYS	FAC	F17	F18	F19	F20	F21	F22	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33	F34	F35	F36	F37	F38	F39	F40	F41	F42	F43	F44	F45
95	1	M	H	A	A	A	M	M	R	M	M	R	R	R	R	R	R	F	F	M	R	M	R	O	U	U	U	U	U	U
96	1	M	M	R	R	R	R	M	M	M	R	R	R	R	R	M	R	M	F	M	R	M	M	O	U	U	U	U	U	U
96	2	M	M	R	R	R	R	M	M	M	M	M	A	R	R	M	M	M	M	M	R	M	R	O	U	U	U	U	U	U
97	1	H	H	A	A	A	M	M	R	M	R	R	R	M	R	R	R	F	F	M	R	M	R	O	U	U	U	U	U	U
98	1	M	M	R	A	R	R	M	M	M	M	A	R	M	R	M	R	M	F	M	R	M	R	O	U	U	U	U	U	U
99	1	H	H	H	A	A	A	M	R	M	M	R	R	M	R	R	R	M	F	M	R	M	R	O	U	U	U	U	U	U
99	2	H	H	A	A	A	M	R	R	R	M	R	R	A	R	R	R	F	F	M	R	M	R	O	U	U	U	U	U	U
100	1	H	H	H	A	A	A	M	R	M	M	R	R	R	R	R	R	M	F	M	R	M	R	O	U	U	U	U	U	U
100	2	H	H	A	A	A	M	R	R	R	M	R	R	A	R	R	R	F	F	M	R	M	R	O	U	U	U	U	U	U
101	1	M	H	M	A	M	A	M	R	M	R	R	R	M	R	M	R	M	F	M	R	M	R	O	U	U	U	U	U	U
101	2	M	H	H	S	A	A	M	R	M	M	R	R	M	R	M	R	M	F	M	R	R	R	I	U	U	U	U	U	U
102	1	H	H	H	A	M	M	M	R	M	R	R	R	R	R	R	R	M	F	M	R	M	R	O	U	U	U	U	U	U
102	2	M	M	R	R	R	R	M	M	M	M	M	R	R	R	M	M	M	M	M	R	R	R	O	U	U	U	U	U	U
103	1	M	M	R	R	R	R	M	M	M	M	R	R	M	R	M	M	M	M	M	R	M	R	O	U	U	U	U	U	U
104	1	M	M	R	M	R	M	M	R	M	M	R	K	R	R	M	R	M	F	M	R	M	R	O	U	U	U	U	U	U
104	2	M	M	R	R	R	R	M	M	M	M	M	R	R	R	M	M	A	M	M	R	M	R	O	U	U	U	U	U	U
104	3	M	M	R	R	R	R	M	M	M	M	R	M	R	R	M	M	A	M	M	R	M	M	O	U	U	U	U	U	U
105	1	M	M	R	R	R	R	A	M	A	M	M	R	R	R	A	M	A	M	A	R	A	R	O	U	U	U	U	U	U
106	1	M	M	R	R	R	R	M	R	M	M	M	R	R	R	M	R	M	F	M	R	M	R	O	U	U	U	U	U	U
107	1	H	H	M	M	M	R	R	R	M	A	R	R	R	R	R	R	F	F	M	R	B	R	O	U	U	U	U	U	U
107	2	H	M	H	A	M	M	M	R	M	R	K	R	R	R	R	R	F	F	M	R	R	R	O	U	U	R	U	U	U
108	1	H	H	A	A	A	M	M	R	M	A	A	R	R	R	R	R	M	F	M	R	R	R	I	U	U	U	U	U	U
108	2	H	H	M	H	M	M	M	R	M	M	R	R	R	R	M	R	M	F	M	R	M	R	O	U	U	U	U	U	U
109	1	H	H	H	M	M	M	R	B	R	M	R	R	R	R	R	R	F	F	M	R	S	R	I	U	U	R	U	U	U
109	2	H	H	H	A	M	M	M	R	M	R	R	R	R	R	R	R	M	F	M	R	M	R	I	U	U	U	U	U	U
110	1	H	H	M	R	M	R	R	B	M	R	R	R	R	R	R	R	F	F	M	R	B	B	O	U	U	R	U	U	U
110	2	M	H	R	R	R	R	A	M	A	M	M	M	M	M	A	M	A	M	M	R	M	B	O	U	U	U	U	U	U

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY — 16 23 SATURDAY, MARCH 17, 1…

LANDSCAPE FACET-SOIL CHEMICAL PROPERTIES (CONT.)

OBS	LANDSYS	FAC	F46	F47	F48	F49	F50	F51	F52	F53	F54	F55	F56	F57
1	1	1	U	A	B	B	N	N	U	D	U	U	U	U
2	1	2	U	A	B	B	N	N	U	D	U	U	U	U
3	2	1	U	A	B	B	N	N	U	D	U	U	U	U
4	2	2	U	A	B	B	N	N	U	D	U	U	U	U
5	3	1	U	U	B	B	N	N	U	D	U	U	U	U
6	3	2	U	A	B	B	N	N	U	D	U	U	U	U
7	4	1	U	A	B	B	N	N	U	D	U	U	U	U
8	4	2	U	A	B	B	U	U	U	U	U	U	U	U
9	5	1	U	A	B	B	N	N	U	D	U	U	U	U
10	5	2	U	A	B	B	U	U	U	U	U	U	U	U
11	6	1	U	A	B	B	N	N	U	U	U	U	U	U
12	7	1	U	A	B	B	N	N	U	U	U	U	U	U
13	7	2	U	A	B	B	N	N	U	U	U	U	U	U
14	8	1	U	A	B	B	N	N	U	U	U	U	U	U
15	8	2	U	A	B	B	N	N	U	U	U	U	U	U
16	9	1	U	A	B	B	N	N	U	D	U	U	U	U
17	9	2	U	A	B	B	N	N	U	U	U	U	U	U
18	10	1	U	A	B	B	N	N	U	U	U	U	U	U
19	10	2	U	A	B	B	N	N	U	U	U	U	U	U
20	11	1	U	A	B	B	U	U	U	U	U	U	U	U
21	11	2	U	U	U	U	U	N	U	U	U	U	U	U
22	12	1	U	A	B	B	N	N	U	U	U	U	U	U
23	12	2	U	U	U	U	N	N	U	U	U	U	U	U
24	12	3	U	A	B	B	N	N	U	U	U	U	U	U
25	13	1	U	A	B	B	N	N	U	U	U	U	U	U
26	13	2	U	A	B	B	N	N	U	U	U	U	U	U
27	14	1	U	A	B	B	N	N	U	U	U	U	U	U
28	14	2	U	A	B	B	N	N	U	U	U	U	U	U
29	15	1	U	A	B	B	N	N	U	U	U	U	U	U
30	15	2	U	A	B	B	N	N	U	U	U	U	U	U
31	16	1	U	A	B	B	N	N	U	U	U	U	U	U
32	16	2	U	A	B	B	N	N	U	U	U	U	U	U
33	17	1	U	A	B	B	N	N	U	U	U	U	U	U
34	17	2	U	A	B	B	N	N	U	U	U	U	U	U
35	17	3	U	U	U	U	N	N	U	U	U	U	U	U
36	18	1	U	A	B	B	N	N	U	U	U	U	U	U
37	18	2	U	A	B	B	N	N	U	U	U	U	U	U
38	19	1	U	A	B	B	N	N	U	U	U	U	U	U
39	19	2	U	A	B	B	N	N	U	U	U	U	U	U
40	20	1	U	U	U	U	N	N	U	U	U	U	U	U
41	20	2	U	U	U	B	N	N	U	U	U	U	U	U
42	21	1	U	U	U	U	N	N	U	U	U	U	U	U
43	21	2	U	A	B	B	N	N	U	U	U	U	U	U
44	22	1	U	A	B	B	N	N	U	U	U	U	U	U
45	22	2	U	A	B	B	N	N	U	U	U	U	U	U
46	23	1	U	A	B	B	N	N	U	U	U	U	U	U
47	23	2	U	A	B	B	N	N	U	D	U	U	U	U
48	24	1	U	A	B	B	N	N	U	D	U	U	U	U
49	24	2	U	A	B	B	N	N	U	U	U	U	U	U
50	25	1	U	A	B	B	N	N	U	U	U	U	U	U
51	25	2	U	A	B	B	N	N	U	U	U	U	U	U
52	26	1	U	A	B	B	N	N	U	U	U	U	U	U
53	26	2	U	A	B	B	N	N	U	U	U	U	U	U
54	27	1	U	A	B	B	N	N	U	U	U	U	U	U
55	27	2	U	A	B	B	N	N	U	D	U	U	U	U
56	28	1	U	A	B	B	N	N	U	U	U	U	U	U
57	28	2	U	A	B	B	N	N	U	U	U	U	U	U
58	29	1	U	A	B	B	N	N	U	U	U	U	U	U
59	29	2	U	A	B	B	N	N	U	U	U	U	U	U
60	30	1	U	A	B	B	N	N	U	U	U	U	U	U
61	30	2	U	A	B	B	N	N	U	U	U	U	U	U

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY — 16.23 SATURDAY, MARCH 17, 197

LANDSCAPE FACET-SOIL CHEMICAL PROPERTIES (CONT.)

OBS	LANDSYS	F45	F46	F47	F48	F49	F50	F51	F52	F53	F54	F55	F56	F57
62	31	1	U	A	A	B	N	N	U	D	U	U	U	U
63	31	2	U	A	A	B	N	N	U	U	U	U	U	U
64	32	1	U	A	A	B	N	N	U	D	U	U	U	U
65	32	2	U	A	A	B	N	N	U	D	U	U	U	U
66	33	1	U	A	A	B	N	N	U	U	U	U	U	U
67	33	2	U	A	A	B	N	N	U	U	U	U	U	U
68	34	1	U	A	A	B	N	N	U	U	U	U	U	U
69	34	2	U	A	A	B	N	N	U	D	U	U	U	U
70	35	1	U	A	A	B	N	N	U	U	U	U	U	U
71	35	2	U	A	A	B	N	N	U	U	U	U	U	U
72	36	1	U	A	A	B	N	N	U	U	U	U	U	U
73	36	2	U	A	A	B	N	N	U	U	U	U	U	U
74	37	1	U	A	A	B	N	N	U	U	U	U	U	U
75	37	2	U	A	A	B	N	N	U	U	U	U	U	U
76	38	1	U	A	A	B	N	N	U	U	U	U	U	U
77	38	2	U	A	A	B	N	N	U	U	U	U	U	U
78	39	1	U	A	A	B	N	N	U	U	U	U	U	U
79	39	1	A	A	A	B	N	N	U	U	U	U	U	U
80	40	1	U	A	A	B	N	N	U	U	U	U	U	U
81	41	1	U	A	A	B	N	N	U	U	U	U	U	U
82	42	1	U	A	A	B	N	N	U	U	U	U	U	U
83	42	2	U	A	A	B	N	N	U	U	U	U	U	U
84	43	1	U	A	A	B	N	N	U	U	U	U	U	U
85	43	2	U	A	A	B	N	N	U	U	U	U	U	U
86	44	1	U	A	A	B	N	N	U	U	U	U	U	U
87	44	2	U	A	A	B	N	N	U	U	U	U	U	U
88	45	1	U	A	A	B	N	N	U	U	U	U	U	U
89	45	2	U	A	A	B	N	N	U	U	U	U	U	U
90	46	1	U	A	A	B	N	N	U	U	U	U	U	U
91	46	2	U	A	A	B	N	N	U	U	U	U	U	U
92	47	1	U	A	A	B	N	N	U	U	U	U	U	U
93	47	2	U	A	A	B	N	N	U	U	U	U	U	U
94	48	1	U	A	A	B	N	N	U	U	U	U	U	U
95	48	2	U	A	A	B	N	N	U	U	U	U	U	U
96	49	1	U	A	A	B	N	N	U	U	U	U	U	U
97	49	2	U	A	A	B	N	N	U	U	U	U	U	U
98	50	1	U	A	A	B	N	N	U	U	U	U	U	U
99	50	2	U	A	A	B	N	N	U	U	U	U	U	U
100	51	1	U	A	A	B	N	N	U	U	U	U	U	U
101	51	2	U	A	A	B	N	N	U	U	U	U	U	U
102	52	2	U	A	A	B	N	N	U	U	U	U	U	U
103	52	2	U	A	A	B	N	N	U	U	U	U	U	U
104	53	1	U	A	A	B	N	N	U	U	U	U	U	U
105	53	2	A	A	A	B	N	N	U	U	U	U	U	U
106	54	1	U	A	A	B	N	N	U	U	U	U	U	U
107	54	2	U	A	A	B	N	N	U	U	U	U	U	U
108	54	3	U	A	A	B	N	N	U	U	U	U	U	U
109	55	1	U	A	A	B	N	N	U	U	U	U	U	U
110	55	2	U	A	A	B	N	N	U	U	U	U	U	U
111	56	1	U	A	A	B	N	N	U	U	U	U	U	U
112	56	2	U	A	A	B	N	N	U	U	U	U	U	U
113	57	1	U	A	A	B	N	N	U	U	U	U	U	U
114	57	2	U	A	A	B	N	N	U	U	U	U	U	U
115	58	1	U	A	A	B	N	N	U	U	U	U	U	U
116	58	2	U	A	A	B	N	N	U	U	U	U	U	U
117	59	1	U	A	A	B	N	N	U	U	U	U	U	U
118	59	2	U	A	A	B	N	N	U	U	U	U	U	U
119	60	1	U	A	A	B	N	N	U	U	U	U	U	U
120	60	2	U	A	A	B	N	N	U	U	U	U	U	U
121	61	1	U	A	A	B	N	N	U	U	U	U	U	U
122	62	1	U	A	A	B	N	N	U	U	U	U	U	U

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY 16 23 SATURDAY, MARCH 17, 197[illegible]

LANDSCAPE FACET-SOIL CHEMICAL PROPERTIES (CONT.)

OBS	LANDSYS	FAC	F46	F47	F48	F49	F50	F51	F52	F53	F54	F55	F56	F57
123	62	2	U	A	A	A	N	N	U	U	U	U	U	U
124	63	1	U	A	A	A	N	N	U	U	U	U	U	U
125	63	2	U	A	A	A	N	N	U	U	U	U	U	U
126	64	1	U	A	A	A	N	N	U	U	U	U	U	U
127	64	2	U	A	A	A	N	N	U	U	U	U	U	U
128	65	1	U	A	A	A	N	N	U	U	U	U	U	U
129	65	2	U	A	A	A	N	N	U	U	U	U	U	U
130	66	1	U	A	A	A	N	N	U	U	U	U	U	U
131	66	2	U	A	A	A	N	N	U	U	U	U	U	U
132	67	1	U	A	A	A	N	N	U	U	U	U	U	U
133	67	2	U	A	A	A	N	N	U	U	U	U	U	U
134	68	1	U	A	A	A	N	N	U	U	U	U	U	U
135	68	2	U	A	A	A	N	N	U	U	U	U	U	U
136	69	1	U	A	A	A	N	N	U	U	U	U	U	U
137	69	2	U	A	A	A	N	N	U	U	U	U	U	U
138	70	1	U	A	A	A	N	N	U	U	U	U	U	U
139	70	2	U	A	A	A	N	N	U	U	U	U	U	U
140	71	1	U	A	A	A	N	N	U	U	U	U	U	U
141	71	2	U	A	A	A	N	N	U	U	U	U	U	U
142	72	1	U	A	A	A	N	N	U	U	U	U	U	U
143	72	2	U	A	A	A	N	N	U	U	U	U	U	U
144	73	1	U	A	A	A	N	N	U	U	U	U	U	U
145	73	2	U	A	A	A	N	N	U	U	U	U	U	U
146	74	1	U	A	A	A	N	N	U	U	U	U	U	U
147	74	2	U	A	A	A	N	N	U	U	U	U	U	U
148	75	1	U	A	A	A	N	N	U	U	U	U	U	U
149	76	1	U	A	A	A	N	N	U	U	U	U	U	U
150	76	2	U	A	A	A	N	N	U	U	U	U	U	U
151	77	1	U	A	A	A	N	N	U	U	U	U	U	U
152	77	2	U	A	A	A	N	N	U	U	U	U	U	U
153	78	1	U	A	A	A	N	N	U	U	U	U	U	U
154	78	2	U	A	A	A	N	N	U	U	U	U	U	U
155	78	3	U	A	A	A	N	N	U	U	U	U	U	U
156	79	1	U	A	A	A	N	N	U	U	U	U	U	U
157	79	2	U	A	A	A	N	N	U	U	U	U	U	U
158	80	1	U	A	A	A	N	N	U	U	U	U	U	U
159	80	2	U	A	A	A	N	N	U	U	U	U	U	U
160	81	1	U	A	A	A	N	N	U	U	U	U	U	U
161	81	2	U	A	A	A	N	N	U	U	U	U	U	U
162	82	1	U	A	A	A	N	N	U	U	U	U	U	U
163	82	2	U	A	A	A	N	N	U	U	U	U	U	U
164	83	1	U	A	A	A	N	N	U	U	U	U	U	U
165	83	2	U	A	A	A	N	N	U	U	U	U	U	U
166	84	1	U	A	A	A	N	N	U	U	U	U	U	U
167	84	2	U	A	A	A	N	N	U	U	U	U	U	U
168	85	1	U	A	A	A	N	N	U	U	U	U	U	U
169	85	2	U	A	A	A	N	N	U	U	U	U	U	U
170	86	1	U	A	A	A	N	N	U	U	U	U	U	U
171	86	2	U	A	A	A	N	N	U	U	U	U	U	U
172	87	1	U	A	A	A	N	N	U	U	U	U	U	U
173	87	2	U	A	A	A	N	N	U	U	U	U	U	U
174	88	1	U	A	A	A	N	N	U	U	U	U	U	U
175	88	2	U	A	A	A	N	N	U	U	U	U	U	U
176	89	1	U	A	A	A	N	N	U	U	U	U	U	U
177	89	2	U	A	A	A	N	N	U	U	U	U	U	U
178	92	1	U	A	A	A	N	N	U	U	U	U	U	U
179	92	2	U	A	A	A	N	N	U	U	U	U	U	U
180	93	1	U	A	A	A	N	N	U	U	U	U	U	U
181	93	2	U	A	A	A	N	N	U	U	U	U	U	U
182	94	1	U	A	A	A	N	N	U	U	U	U	U	U
183	94	2	U	A	A	A	N	N	U	U	U	U	U	U

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY 16.23 SATURDAY, MARCH 17, 19

LANDSCAPE FACET-SOIL CHEMICAL PROPERTIES (CONT.)

OBS	LANDSYS	FAC	F46	F47	F48	F49	F50	F51	F52	F53	F54	F55	F56	F57
184	95	1	U	A	A	B	N	N	U	U	U	U	U	U
185	96	1	U	A	B	B	N	N	U	U	U	U	U	U
186	96	2	U	A	A	B	N	N	U	U	U	U	U	U
187	97	1	U	A	A	B	N	N	U	U	U	U	U	U
188	98	1	U	A	A	B	N	N	U	U	U	U	U	U
189	99	1	U	A	B	B	N	N	U	U	U	U	U	U
190	99	2	U	A	A	B	N	N	U	U	U	U	U	U
191	100	1	U	A	B	B	N	N	U	U	U	U	U	U
192	100	2	U	A	A	B	N	N	U	U	U	U	U	U
193	101	1	U	A	B	B	N	N	U	U	U	U	U	U
194	101	2	U	A	B	B	N	N	U	U	U	U	U	U
195	102	1	U	A	B	B	N	N	U	U	U	U	U	U
196	102	2	U	A	B	B	N	N	U	U	U	U	U	U
197	103	1	U	A	B	B	N	N	U	U	U	U	U	U
198	104	1	U	A	B	B	N	N	U	U	U	U	U	U
199	104	2	U	A	B	B	N	N	U	U	U	U	U	U
200	104	3	U	A	B	B	N	N	U	U	U	U	U	U
201	105	1	U	A	B	B	N	N	U	U	U	U	U	U
202	106	1	U	A	B	B	N	N	U	U	U	U	U	U
203	107	1	U	A	B	B	N	N	U	U	U	U	U	U
204	107	2	U	A	B	B	N	N	U	U	U	U	U	U
205	108	1	U	A	B	B	N	N	U	U	U	U	U	U
206	108	2	U	A	B	B	N	N	U	U	U	U	U	U
207	109	1	U	A	A	B	N	N	U	U	U	U	U	U
208	109	2	U	A	B	B	N	N	U	U	U	U	U	U
209	110	1	U	A	B	B	N	N	U	U	U	U	U	U
210	110	2	U	A	B	B	N	N	U	U	U	U	U	U

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY — 16.23 SATURDAY, MARCH 17, 1979 — 1

LANDSCAPE FACET-FERTILITY CAPABILITY CLASSIFICATION

OBS	LANDSYS	FAC	FSB	FSQ
1	1	1	CC	DHAEI
2	1	2	LL	DHAEI
3	2	1	CC	DHAEI
4	2	2	LL	DHAEI
5	3	1	CC	DHAEI
6	3	2	LL	DHAE
7	4	1	LL	DHAE
8	4	2	LL	DHE
9	5	1	CC	DHAEI
10	5	2	LL	DHA
11	6	1	LL	DHAE
12	7	1	LL	DHAE
13	7	2	SS	D
14	8	1	LL	DHE
15	8	2	LL	D
16	9	1	CC	DHAEI
17	9	2	CC	DHAE
18	10	1	CC	D
19	10	2	LL	DHAE
20	11	1	LL	DHA
21	11	2	LL	DHAE
22	12	1	CC	D
23	12	2	LS	DHAEK
24	12	3	CC	DK
25	13	1	SS	DKE
26	13	2	SS	DE
27	14	1	SS	DKE
28	14	2	SS	DKE
29	15	1	CC	DH
30	15	2	LL	DHE
31	16	1	CC	DHEI
32	16	2	LL	DHE
33	17	1	CC	D
34	17	2	CC	DG
35	17	3	LS	DHAEK
36	18	1	LL	DHE
37	18	2	LL	D
38	19	1	CC	DHAE
39	19	2	LC	G
40	20	1	LL	DHKE
41	20	2	LC	G
42	21	1	LS	DHE
43	21	2	LL	DH
44	22	1	CC	D
45	22	2	CC	G
46	23	1	SC	GH
47	23	2	SL	GHAE
48	24	1	LL	DHAKEI
49	24	2	LL	DHE
50	25	1	LL	
51	25	2	LC	G
52	26	1	CC	D
53	26	2	LL	DH
54	27	1	LS	DHKE
55	27	2	CC	DHAEI
56	28	1	LL	DHAEI
57	28	2	LL	D
58	29	1	C9	D
59	29	2	LL	D
60	30	1	LL	D
61	30	2	LC	

APPENDIX IV (Cont'd.)

CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

** 2

TARGET AREA SURVEY — 16:33 SATURDAY, MARCH 17, 1979

LANDSCAPE FACET-FERTILITY CAPABILITY CLASSIFICATION

****

OBS	LANDSYS	FAC	ESA	ESB
62	31	1	LL	DHAEI
63	31	2	LL	DHF
64	32	1	LL	DHAE
65	32	2	LL	DHAE
66	33	1	LL	DHAE
67	33	2	LL	D
68	34	1	LL	DHAE
69	34	2	SS	DK
70	35	1	SS	
71	35	2	SS	G
72	36	1	CC	DHAEI
73	36	2	CC	G
74	37	1	CC	DHAEI
75	37	2	LL	DA
76	38	1	LC	HAE
77	38	2	SL	G
78	39	1	LL	DHAE
79	39	1	CC	DHAEI
80	40	1	LL	HA
81	41	1	LL	HAEI
82	42	1	LL	DHKE
83	42	2	LL	DHKE
84	43	1	CC	DHAI
85	43	2	CC	G
86	44	1	CC	DHI
87	44	2	CC	G
88	45	1	CC	DHI
89	45	2	CC	DHI
90	46	1	CC	DHI
91	46	2	LC	G
92	47	1	SS	DKE
93	47	2	SS	DKE
94	48	1	SS	DHKE
95	48	2	SL	GHKE
96	49	1	CC	DHAEI
97	49	2	LC	G
98	50	1	LL	DH
99	50	2	LC	G
100	51	1	LL	DHKE
101	51	2	SL	GHE
102	52	2	LL	DHE
103	52	2	SL	GH
104	53	1	LL	DHKE
105	53	2	SS	DHKE
106	54	1	CC	DHAEI
107	54	2	LC	G
108	54	3	LC	GHAE
109	55	1	SS	DHAKE
110	55	2	SS	GKE
111	56	1	LL	DHAE
112	56	2	LS	D
113	57	1	LL	D
114	57	2	LL	G
115	58	1	LP	D
116	58	2	LC	D
117	59	1	CC	DHAEI
118	59	2	CC	DH
119	60	1	LL	HAE
120	60	2	LL	HAE
121	61	1	SS	DKE
122	62	1	SS	DHKE

APPENDIX IV (Cont'd.)

LANDSCAPE FACET-FERTILITY CAPABILITY CLASSIFICATION

OBS	LANDSYS	FAC	FSA	FSB
123	62	2	SS	DE
124	63	1	LC	DHAE
125	63	2	SC	D
126	64	1	LC	D
127	64	2	SL	G
128	65	1	LC	DHAE
129	65	2	LC	G
130	66	1	LC	D
131	66	2	LC	G
132	67	1	LL	DHAE
133	67	2	LL	DHAE
134	68	1	CC	G
135	68	2	LL	D
136	69	1	LL	DHAE
137	69	2	LL	DH
138	70	1	SS	DHA
139	70	2	SL	D
140	71	1	LL	DHAE
141	71	2	LL	DHE
142	72	1	SS	DHKE
143	72	2	SS	DHKE
144	73	1	CC	D
145	73	2	CC	D
146	74	1	LC	D
147	74	2	LL	D
148	75	1	CC	DHAEI
149	76	1	SS	DHAKE
150	76	2	LL	DHE
151	77	1	LC	D
152	77	2	LC	D
153	78	1	CC	DHAEI
154	78	2	CC	DHI
155	78	3	CC	DH
156	79	1	LL	D
157	79	2	LL	D
158	80	1	LL	D
159	80	2	LC	DG
160	81	1	LC	D
161	81	2	LL	D
162	82	1	LC	D
163	82	2	CC	G
164	83	1	LC	G
165	83	2	LL	D
166	84	1	SL	DHKE
167	84	2	SL	GHKE
168	85	1	SS	DHKE
169	85	2	SS	GHKE
170	86	1	CC	D
171	86	2	CC	G
172	87	1	LL	DHAE
173	87	2	LL	DHAE
174	88	1	CC	DHAEI
175	88	2	LL	DHAE
176	89	1	LL	DHAE
177	89	2	LL	DHAE
178	92	1	LL	D
179	92	2	LL	G
180	93	1	SS	D
181	93	2	SS	G
182	94	1	LL	DHE
183	94	2	LL	DHAE

APPENDIX IV (Cont'd.)

TARGET AREA SURVEY

LANDSCAPE FACET-FERTILITY CAPABILITY CLASSIFICATION

OBS	LANDSYS	FAC	ES8	ES9
184	95	1	LL	DHAE
185	96	1	LL	D
186	96	2	LL	G
187	97	1	LL	DHAE
188	98	1	LL	D
189	99	1	LC	GHA
190	99	2	LC	DHAE
191	100	1	LC	GHA
192	100	2	LC	DHAE
193	101	1	LC	G
194	101	2	LC	D
195	102	1	LL	DH
196	102	2	LC	G
197	103	1	LC	D
198	104	1	LC	D
199	104	2	CC	G
200	104	3	LS	D
201	105	1	LL	G
202	106	1	CL	G
203	107	1	LL	DHE
204	107	2	SS	DHAE
205	108	1	CC	DHAI
206	108	2	LL	DH
207	109	1	LL	DHAE
208	109	2	LL	DHI
209	110	1	SS	DHE
210	110	2	CC	D

APPENDIX V

The % Al saturation in the soils of central-west Brazil

```
*****************************************************************************************
//CIATTCPC JOB (CIAT.TCHRAN).CIATO250A.PORRAS.MSGLEVEL=(2.0).
//  CLASS=G.TIME=5
LOG IEF403I CIATTCPC STARTED TIME=17.32.18 USER=CIAT
LOG 0001 IEF403I CIATTCPC STARTED TIME=17.32.19
LOG CIATTCPC SAS76        3.90 SEC.   192K,   100 IN,    75 OUT,   000 CP
LOG IEF404I CIATTCPC ENDED    TIME=17.33.45
LOG 0001 IEF404I CIATTCPC ENDED    TIME=17.33.45
//  EXEC SAS76.V=766.CLS=A.N=IAB2.COPIAS=2
//STEPLIB DD DSN=CIAT.P.FORMAT.COCHRAN.UNIT=DISK.VOL=SER=DANE33.
//  DISP=SHR
//    DD DSN=SAS.LIBRARY.VS76F.DISP=SHR
//LIBRARY DD DSN=*.STEPLIB.VOL=REF=*.STEPLIB.DISP=OLD
//ET    DD DSN=CIAT.P.ESTIERR.VOL=SER=DANE30.UNIT=DISK.
// DISP=OLD
//SYSIN DD * GENERATED STMT
IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF373I STEP /SAS76    / START 79124.1732
IEF374I STEP /SAS76    / STOP  79124.1733 CPU    OMIN 03.90SEC STOR VIRT 192K
-----------------------------------------------------------------------------------------
JOBNAME  STEPNAME     CPU TIME     USED                                COMP CODE
CIATTCPC SAS76        3.90 SEC.    192K.                               000 CP
-----------------------------------------------------------------------------------------
IEF298I   CIATTCPC SYSOUT=A.
IEF375I   JOB /CIATTCPC/ START 79124.1732
IEF376I   JOB /CIATTCPC/ STOP  79124.1733 CPU    OMIN 03.90SEC
-----------------------------------------------------------------------------------------
*** DEPRO  -  SENCO  ***     SISTEMA/370 MODELO 145, OS/VS1  RELEASE 06.0
-----------------------------------------------------------------------------------------

1                                              S T A T I S T I C A L   A N A L Y S I S   S.

NOTE  THE JOB CIATTCPC HAS BEEN RUN UNDER RELEASE 76.6 OF SAS AT ICA-CIAT(BIOMETRIA


1          TITLE1 '=================================================================='
2            TITLE2 LAND RESOURCE STUDY OF TROPICAL AMERICA
3                    PROC FREQ DATA=   ET.LANDFAC2
4                           TABLES F19 F20
5                         FORMAT F19 $F19F. F20 $F19F.
6             WEIGHT AREAFAC
7          TITLE3 PERCENT AL SATURATION
8          TITLE4 '=================================================================='

NOTE  THE PROCEDURE FREQ USED 3.17 SECONDS AND 138K AND PRINTED PAGE 1.

NOTE  SAS USED 138K MEMORY.

NOTE  BARR. GOODNIGHT. SALL AND HELWIG
      SAS INSTITUTE INC.
      P.O. BOX 10066
      RALEIGH. N.C. 27605

*13 IEF383A PR1 WTR. CHANGE FORM TO IAB2
IEF039I RD1 RDR WAITING FOR WORK
```

APPENDIX V (Cont'd.)

==

LAND RESOURCE STUDY OF TROPICAL AMERICA
PERCENT AL SATURATION

==

TOPSOIL'S AL SATURATION %

F19	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1) □ 10%	9506	9506	39.160	39.160
2) 10-40 %	2362	11868	9.730	48.890
3) 40-70 %	4385	16253	18.054	66.954
4) 70%	8022	24275	33.046	100.000

SUBSOIL'S AL SATURATION % MEQ/100 GM

F20	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1) □ 10%	11780	11780	48.527	48.527
2) 10-40 %	3836	15616	15.802	64.330
3) 40-70 %	2088	17704	8.601	72.931
4) 70%	6571	24275	27.069	100.000

APPENDIX VI

Instructions to produce Land System maps.

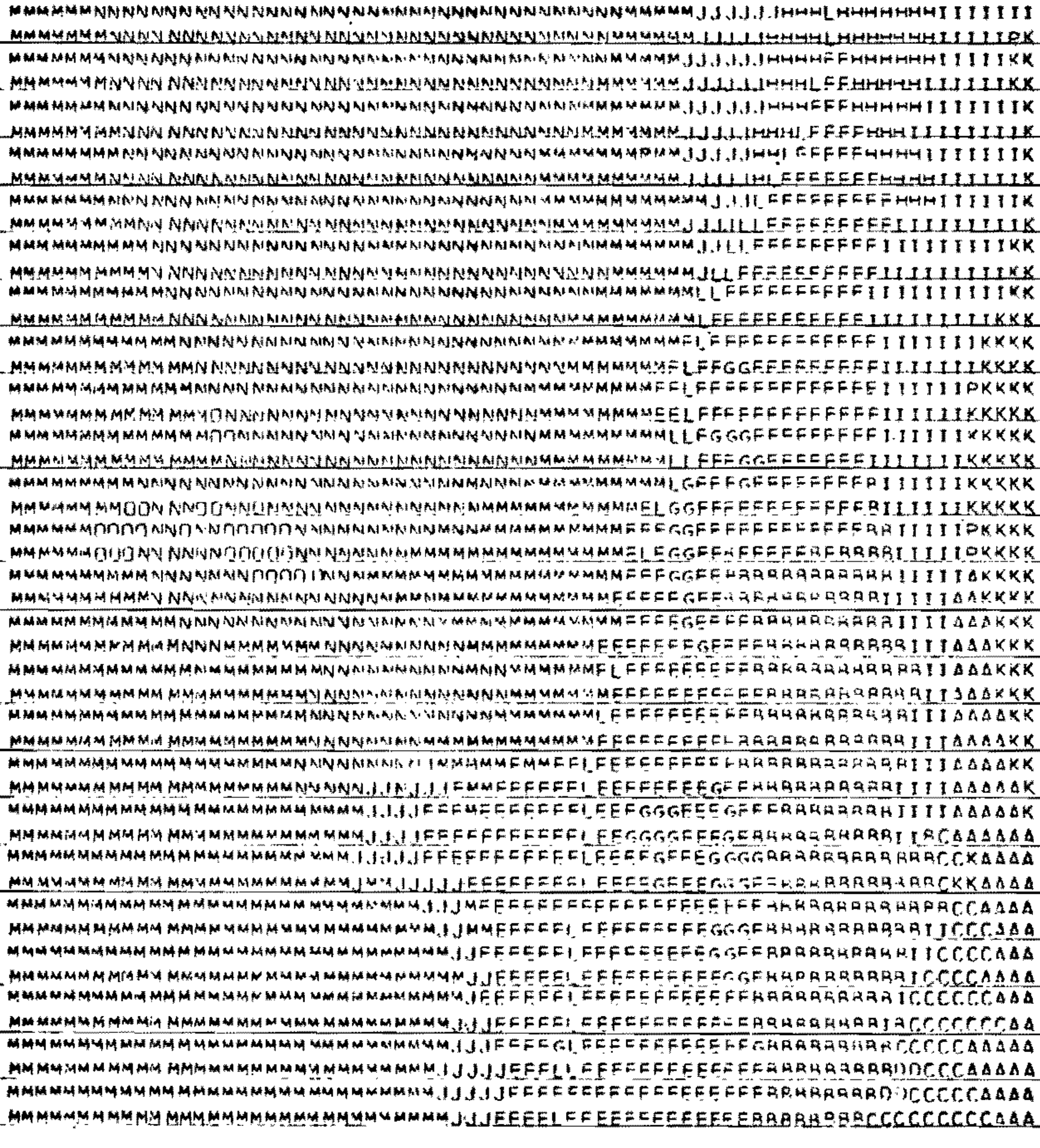
```
//CIATTCPM JOB (CIAT.TCHRAN).CIAT0250A.PORRAS.MSGLEVEL=(2.0).
//  CLASS=F.TIME=5
//  EXEC SAS76.V=765.CLS=A.N=1A82.COPIAS=2
//STEPLIB DD DSN=CIAT.P.FORMAT.COCHRAN.UNIT=DISK.VOL=SER=DANE33.
//  DISP=SHR
//     DD DSN=SAS.LIBRARY.VS766.DISP=SHR
//LIBRARY DD DSN=*.STEPLIB.VOL=REF=*.STEPLIB.DISP=OLD
//R69 DD DSN=CIAT.P.RHIZOBIU.VOL=SER=DANE63.UNIT=DISK.DISP=OLD
 OPTIONS MACROGEN  MISSING=' ;
TITLE1 '***********************************************************'
 TITLE2 LAND RESOURCE STUDY OF TROPICAL AMERICA
      MACRO GRAF1
           DATA  NULL
                SET ARC
                FILE PRINT N=PS
              Y=FLOOR((LATITUD -BASELAT)/5)+4
                X=FLOOR((BASELON-LONGITUD)/5)+6
                PUT #Y @X VAR1 FORM
  %
 PROC FORMAT
           VALUE F1M(MIN=1 MAX=1) 13=A 14=B 17=C 29=D 95=E 96=F 97=G 98=H 112=I
           VALUE F2M(MIN=1 MAX=1)
 28=A  34=B  36=C 38=D  39=E  54=F  56=G  57=H  58=I  59=J  60=K  61=L  62=M
63=N  64=O  65=P  66=Q  67=R  111=S
           VALUE F3M(MIN=1 MAX=1)
17=A  19=B  20=C  21=D  23=E  24=F  25=G  26=H  27=I  28=J  29=K  35=L  38=M  40
=N  41=O  112=P
           VALUE F4M(MIN=1 MAX=1)
 1=A  3=B  5=C  6=D  7=E  8=F  9=G  12=H  14=I  17=J  18=K  29=L  92=M
 95=N  96=O 97=P 98=Q 110=R
           VALUE F5M(MIN=1 MAX=1)
1=A 3=B  5=C  9=D  10=E  11=F  15=G  16=H  17=I  18=J  19=K  20=L  21=M  22=N
23=O  28=P  30=Q  31=R  32=S  33=T   34=U  35=V  36=W  37=X  38=Y  39=Z  42=1

           VALUE F6M(MIN=1 MAX=1)
1=A 3=B 5=C 15=D 16=E 22=F 32=G  34=H  38=I  42=J  43=K  44=L  45=M  46=N  47=O
 48=P 49=Q  50=R 51=S 52=T 53=U  54=V 55=W  71=X  87=Y  107=Z

           VALUE F7M(MIN=1 MAX=1)
34=A  36=B  52=C  53=D  54=E  56=F  57=G  58=H  63=I  65=J  66=K  67=L
 68=M 69=N  70=O  71=P  75=Q  76=R  99=S  100=T  101=U 102=V 103=W  104=X  105=Y
  106=Z  107=1 109=2 110=3
           VALUE F8M(MIN=1 MAX=1)
 68=A 69=B  70=C  71=D  72=E  73=F  74=G  76=H  77=I  78=J  79=K  80=L  81=M
 82=N  83=O  84=P  85=Q  86=R  99=S  109=T
           VALUE F9M(MIN=1 MAX=1)
 1=A  2=B  3=C  4=D  7=E  8=F  14=G  15=H  45=I  46=J  87=K  88=L
89=M  90=N  91=O  92=P  93=Q  94=R
 MACRO VAR1 CODLS %
 MACRO FORM F1M1.% MACRO ARC R69.TCAR1 R69.TCCAR1 %
                                 MACRO BASFLAT 480 % MACRO BASELON  2880 %     GRAF1
MACRO FORM F2M1.% MACRO ARC R69.TCAR2 R69.TCCAR2 %
                                       MACRO BASFLAT 720 % MACRO BASELON 3600% GRAF1
MACRO FORM F3M1.% MACRO ARC R69.TCAR3 %
                                       MACRO BASFLAT  480% MACRO BASELON 3240% GRAF1
MACRO FORM F4M1.% MACRO ARC R69.TCAR4 %
                                       MACRO BASFLAT  720% MACRO BASELON 2880% GRAF1
MACRO FORM F5M1.% MACRO ARC R69.TCAR5 %
                                       MACRO BASFLAT  720% MACRO BASELON 3240% GRAF1
MACRO FORM F6M1.% MACRO ARC R69.TCAR6 %
                                       MACRO BASFLAT 0960% MACRO BASELON 3240% GRAF1
MACRO FORM F7M1.% MACRO ARC R69.TCAR7 %
                                       MACRO BASFLAT 0960% MACRO BASELON 3600% GRAF1
MACRO FORM F8M1.% MACRO ARC R69.TCAR8 %
                                       MACRO BASFLAT 1200% MACRO BASELON 3600% GRAF1
MACRO FORM F9M1.% MACRO ARC R69.TCAR9 %
                                       MACRO BASFLAT  960% MACRO BASELON 2880% GRAF1
/*
//
```

APPENDIX VI (Cont'd.)

LAND RESOURCE STUDY OF TROPICAL AMERI



APPENDIX VII

Instructions for producing a map of the topsoil % Al saturation of map SC-22, Tocant

```
//CIATTCPC JOB (CIAT,TCHRAN),CIAT0250A,PORRAS,MSGLEVEL=(2,0),
//  CLASS=E,TIME=5
//  EXEC SAS76,V=766,CLS=A,N=1482,COPIAS=2,SORT=,LINEAS=200
//WORK DD DSN=CIAT.TRABTC.PORRAS,UNIT=DISK,VOL=SER=DANE04,
// DISP=OLD
//STEPLIB DD DSN=CIAT.P.FORMAT.COCHRAN,UNIT=DISK,VOL=SER=DANE33,
//  DISP=SHR
//   DD DSN=SAS.LIBRARY.VS766,DISP=SHR
//LIBRARY DD DSN=*.STEPLIB,VOL=REF=*.STEPLIB,DISP=OLD
//R69 DD DSN=CIAT.P.RHIZOBIU,VOL=SER=DANE62,UNIT=DISK,DISP=OLD
 OPTIONS MACROGEN  MISSING=' '
TITLE1 '****************************************************************'
 TITLE2 LAND RESOURCE STUDY OF TROPICAL AMERICA
    MACRO XFRE
    PROC FREQ DATA=DSET
         TABLES LANDSYS/OUT=DSET1
  %
    MACRO XUNO
     DATA SOR1 SOR2 SOR3 SOR4   SET DSET  DROP IND
IND=1+( N  GT 1000)+( N  GT 2000)+( N  GT 3000)
         IF IND=1 THEN OUTPUT SOR1
         IF IND=2 THEN OUTPUT SOR2
         IF IND=3 THEN OUTPUT SOR3
         IF IND=4 THEN OUTPUT SOR4
    PROC SORT DATA=SOR1   BY LANDSYS
    PROC SORT DATA=SOR2   BY LANDSYS
    PROC SORT DATA=SOR3   BY LANDSYS
    PROC SORT DATA=SOR4   BY LANDSYS
 DATA ARC2  SET SOR1 SOR2 SOR3 SOR4  BY LANDSYS
 %
    MACRO XUN1
    DATA DSET2  MERGE DSLE(KEEP=LANDSYS FAC LNDSFACP LISTV IN=A)
                      DSET1 (IN=B )
                BY LANDSYS
                 IF B
 IF NOT A THEN PUT  ALL
         PESO=COUNT*LNDSFACP*100
 %
    MACRO XUN2
 PROC FREQ DATA = DSET2   TABLES LISTV LANDSYS*VAR1 / OUT=DSET3
 WEIGHT PESO
 PROC SORT DATA=DSET3 BY LANDSYS COUNT
 DATA DSET4 (KEEP=LANDSYS VAR1 )  SET DSET3  BY LANDSYS   IF LAST.LANDSYS
 DATA DSET5   MERGE DSET4
                   ARC2(IN=B)
           BY LANDSYS KEEP LONGITUD LATITUD VAR1
 %
    MACRO GRAF1
         DATA  NULL
            SET ARC
            FILE PRINT N=PS
           Y=FLOOR((LATITUD -BASELAT)/5)+4
            X=FLOOR((BASELON-LONGITUD)/5)+4
            PUT #Y @X VAR1 FORM
  %
    MACRO XINIT   XUNO XFRE %
 MACRO DSLE R69.LANDFAC2 %
    MACRO XGRAF XUN1 XUN2  GRAF1 %
                             MACRO LISTV F19 F20 % MACRO VAR1 F19 %
 MACRO DSET R69.TCAR3(RENAME=(CODES=LANDSYS))        %
       XINIT
                                MACRO BASELAT 400 % MACRO BASELON 3240%
 MACRO ARC DSET5% MACRO FORM $1. %
  XGRAF
/*
//
```

APPENDIX VII (Cont'd.)

CENTRA
17 39 MON

LAND RESOURCE STUDY OF TROPICAL AMERICA

LANDSYS	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
17	87	87	2.517	2.517
19	261	348	7.552	10.069
20	52	400	1.505	11.574
21	4	404	0.116	11.690
23	354	758	10.243	21.933
24	194	952	5.613	27.546
25	48	1000	1.389	28.935
26	67	1067	1.939	30.874
27	211	1278	6.105	36.979
28	108	1386	3.125	40.104
29	96	1482	2.778	42.882
35	44	1526	1.273	44.155
38	1110	2636	32.118	76.273
40	785	3421	22.714	98.987
41	31	3452	0.897	99.884
112	4	3456	0.116	100.000

CENTR
17 39 MON

LAND RESOURCE STUDY OF TROPICAL AMERICA

TOPSOIL'S AL SATURATION %

F19	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
	0	.	.	.
A	24689500	24689500	71.522	71.522
B	3383000	28072500	9.800	81.322
H	4406000	32478500	12.764	94.086
M	2041500	34520000	5.914	100.000

SUBSOIL'S AL SATURATION % MEQ/100 GM

F20	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
	0	.	.	.
A	10908000	10908000	31.599	31.599
B	11906000	22814000	34.490	66.089
M	11706000	34520000	33.911	100.000

APPENDIX VII (Cont'd.)

TABLE OF LANDSYS BY FIO

**** WARNING: SOME NUMBERS MAY EXCEED FIELD ****

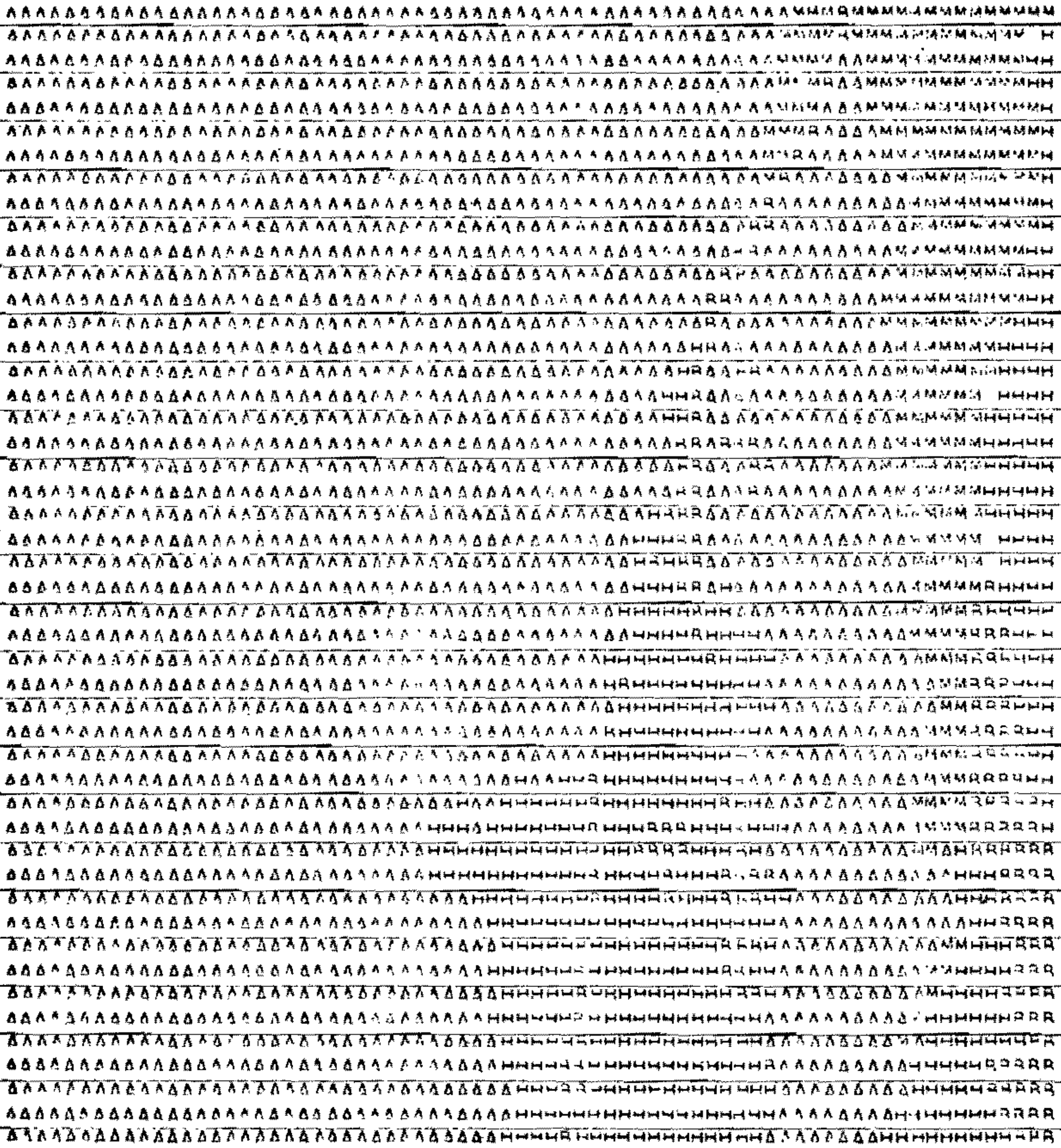
LANDSYS   FIO   IRRIGATIONAL SATURATION %

FREQUENCY
PERCENT
ROW PCT
COL PCT

LANDSYS		A	B	M	N	TOTAL
17	0	130500	739500	0	0	870000
	.	0.38	2.14	0.00	0.00	2.52
	.	15.00	85.00	0.00	0.00	
	.	0.53	21.84	0.00	0.00	
18	0	2218500	391500	0	0	2610000
	.	6.43	1.13	0.00	0.00	7.56
	.	85.00	15.00	0.00	0.00	
	.	8.99	11.57	0.00	0.00	
20	0	0	78000	442000	0	520000
	.	0.00	0.23	1.28	0.00	1.51
	.	0.00	15.00	85.00	0.00	
	.	0.00	2.31	10.03	0.00	
21	0	0	0	40000	0	40000
	.	0.00	0.00	0.12	0.00	0.12
	.	0.00	0.00	100.00	0.00	
	.	0.00	0.00	0.91	0.00	
23	0	885000	0	2655000	0	3540000
	.	2.56	0.00	7.69	0.00	10.25
	.	25.00	0.00	75.00	0.00	
	.	3.53	0.00	60.26	0.00	
24	0	1649000	0	291000	0	1940000
	.	4.78	0.00	0.84	0.00	5.62
	.	85.00	0.00	15.00	0.00	
	.	6.68	0.00	6.60	0.00	
25	0	0	480000	0	0	480000
	.	0.00	1.39	0.00	0.00	1.39
	.	0.00	100.00	0.00	0.00	
	.	0.00	14.12	0.00	0.00	
26	0	0	0	0	670000	670000
	.	0.00	0.00	0.00	1.94	1.94
	.	0.00	0.00	0.00	100.00	
	.	0.00	0.00	0.00	32.92	
TOTAL	.	4682500	3393000	4406000	2041500	4520000
	.	71.52	9.80	12.76	5.91	100.00
27	0	738500	0	0	1371500	2110000
	.	2.14	0.00	0.00	3.97	6.11
	.	35.00	0.00	0.00	65.00	
	.	2.99	0.00	0.00	67.18	
28	0	918000	0	162000	0	1080000
	.	2.66	0.00	0.47	0.00	3.13
	.	85.00	0.00	15.00	0.00	
	.	3.72	0.00	3.68	0.00	
29	0	0	144000	816000	0	960000
	.	0.00	0.42	2.36	0.00	2.78
	.	0.00	15.00	85.00	0.00	
	.	0.00	4.24	18.52	0.00	
35	0	0	440000	0	0	440000
	.	0.00	1.27	0.00	0.00	1.27
	.	0.00	100.00	0.00	0.00	
	.	0.00	13.01	0.00	0.00	
39	0	9990000	1110000	0	0	1100000
	.	28.94	3.22	0.00	0.00	32.16
	.	90.00	10.00	0.00	0.00	
	.	40.45	32.81	0.00	0.00	
40	0	7850000	0	0	0	7850000
	.	22.74	0.00	0.00	0.00	22.74
	.	100.00	0.00	0.00	0.00	
	.	31.80	0.00	0.00	0.00	
41	0	310000	0	0	0	310000
	.	0.90	0.00	0.00	0.00	0.90
	.	100.00	0.00	0.00	0.00	
	.	1.26	0.00	0.00	0.00	
112	0	0	0	0	0	0
	.	.	.	.	.	0.00
	.	.	.	.	.	
	.	.	.	.	.	
TOTAL	.	4682500	3393000	4406000	2041500	4520000
	.	71.52	9.80	12.76	5.91	100.00

APPENDIX VII (Cont'd.)

LAND RESOURCE STUDY OF TROPICAL AMER



APPENDIX VIII

rocedure for comparing the original vegetation in terms of frequencies of total wet seas
potential evapotranspiration groupings.

```
 //*
.//*
     PROC FORMAT
     VALUE FFA
   400-649=MENOR DE 650
   650-749=DE 650 A 749
   750-849=DE 750 A 849
   850-949=DE 850 A 949
   950-1049=DE 950 A 1049
   1050-1149=DE 1050 A 1149
   1150-1249=DE 1150 A 1249
   1250-5000=MAYOR DE 1250

     VALUE FFB
   12=DE 600 A 649
   13=DE 650 A 699
   14=DE 700 A 749
   15=DE 750 A 799
   16=DE 800 A 849
   17=DE 850 A 899
   18=DE 900 A 949
   19=DE 950 A 999
   20=DE 1000 A 1049
   21=DE 1050 A 1099
   22= DE 1100 A 1149
   23=DE 1150 A 1199
   24=DE 1200 A 1249
   25-40= MAYOR DE 1250

     VALUE FCOD
   1='SEAS.IN.P.'
   2='CL+CS'
   3=CC
   4=C
   5=CD
   6=TRF
   7=SESF
   8=SDSF
   9=C&AT
   10=OTHER

   DATA RA          SET FT.LANDSYST    KEEP CODEST LANDSYS
 PROC SORT    BY CODEST
    DATA RB              SET   RA
                         BY    CODEST
                         IF    FIRST.CODEST
    DATA RC              MERGE       RB(IN=A)
                                 FT.CLIMA(IN=B)
                         BY    CODEST
                         IF    A & B
    DATA RD              SET   RC
          TWSPE=.
          IF MAI1      0.33 AND EVTR1  NE . THEN TWSPE+EVTR1
          IF MAI2      0.33 AND EVTR2  NE . THEN TWSPE+EVTR2
          IF MAI3      0.33 AND EVTR3  NE . THEN TWSPE+EVTR3
          IF MAI4      0.33 AND EVTR4  NE . THEN TWSPE+EVTR4
          IF MAI5      0.33 AND EVTR5  NE . THEN TWSPE+EVTR5
          IF MAI6      0.33 AND EVTR6  NE . THEN TWSPE+EVTR6
          IF MAI7      0.33 AND EVTR7  NE . THEN TWSPE+EVTR7
          IF MAI8      0.33 AND EVTR8  NE . THEN TWSPE+EVTR8
          IF MAI9      0.33 AND EVTR9  NE . THEN TWSPE+EVTR9
          IF MAI10     0.33 AND EVTR10 NE . THEN TWSPE+EVTR10
          IF MAI11     0.33 AND EVTR11 NE . THEN TWSPE+EVTR11
          IF MAI12     0.33 AND EVTR12 NE . THEN TWSPE+EVTR12
          KEEP CODEST     TWSPE
    DATA RE              MERGE       RA    RD
                          BY    CODEST
    * LANDSYS CODEST      TWSPE


    PROC SORT DATA=RE
                    BY   LANDSYS
    DATA RF              SET FT.LANDFACZ  (KEEP=LANDSYS OVC1-OVC9 OVCA ADVC1-ADVC9
                                   FAC   ADVCA)
         IF F12='R'
    DATA RG    FT.RESPA879
         MERGE       RF   (IN=SI) RE
         BY    LANDSYS
         IF SI
     DATA  NULL
         SET RG
         FILE DSS
         PUT TWSPE OVC1-OVC9 OVCA
 MACRO TRARP FT.RESOA879 %
     DATA TRARP
         INFILE DSS
         INPUT TWSPE @        COD=0  GTWSPE=FLOOR(TWSPE/50 )
   SLP   INPUT P.IF @  COD=COD+1
              IF P.IF NE . THEN OUTPUT
              IF COD LT 10 THAN GO TO SLP
    PROC FREQ DATA=TRARP   TABLES    GTWSPE*COD TWSPE*COD
 FORMAT GTWSPE FFB. TWSPE FFA. COD FCOD.
```

APPENDIX VIII (Cont'd.)

TABLE OF TWSPE BY COD

TWSPE COD

FREQUENCY
PERCENT
ROW PCT
COL PCT

TWSPE	SEAS.IN.P..	CL+CS	CC	C	CD	TRF	SESF	SDSF	CAAT	OTHER	TOTAL
DE 650 A 749	2	0	0	0	1	0	3	7	5	3	21
	0.56	0.00	0.00	0.00	0.28	0.00	0.84	1.97	1.40	0.84	5.90
	9.52	0.00	0.00	0.00	4.76	0.00	14.29	33.33	23.81	14.29	
	5.41	0.00	0.00	0.00	2.04	0.00	15.00	15.28	38.46	12.50	
DE 750 A 849	1	0	0	0	0	0	0	1	3	0	5
	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.84	0.00	1.40
	20.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	60.00	0.00	
	2.70	0.00	0.00	0.00	0.00	0.00	0.00	2.33	23.08	0.00	
DE 850 A 949	11	15	20	23	14	1	6	9	0	4	103
	3.09	4.21	5.62	6.46	3.93	0.28	1.69	2.53	0.00	1.12	28.93
	10.68	14.56	19.42	22.33	13.59	0.97	5.83	8.74	0.00	3.88	
	29.73	37.50	35.09	31.94	28.57	100.00	30.00	20.93	0.00	16.67	
DE 950 A 1049	11	11	24	35	26	0	7	14	1	2	131
	3.09	3.09	6.74	9.83	7.30	0.00	1.97	3.93	0.28	0.56	36.80
	8.40	8.40	18.32	26.72	19.85	0.00	5.34	10.69	0.76	1.53	
	29.73	27.50	42.11	48.61	53.06	0.00	35.00	32.56	7.69	8.33	
DE 1050 A 1149	11	12	13	13	8	0	4	7	3	11	82
	3.09	3.37	3.65	3.65	2.25	0.00	1.12	1.97	0.84	3.09	23.03
	13.41	14.63	15.85	15.85	9.76	0.00	4.88	8.54	3.66	13.41	
	29.73	30.00	22.81	18.06	16.33	0.00	20.00	16.28	23.08	45.83	
DE 1150 A 1249	0	0	0	1	0	0	0	1	1	1	4
	0.00	0.00	0.00	0.28	0.00	0.00	0.00	0.28	0.28	0.28	1.12
	0.00	0.00	0.00	25.00	0.00	0.00	0.00	25.00	25.00	25.00	
	0.00	0.00	0.00	1.39	0.00	0.00	0.00	2.33	7.69	4.17	
MAYOR DE 1250	1	2	0	0	0	0	0	4	0	3	10
	0.28	0.56	0.00	0.00	0.00	0.00	0.00	1.12	0.00	0.84	2.81
	10.00	20.00	0.00	0.00	0.00	0.00	0.00	40.00	0.00	30.00	
	2.70	5.00	0.00	0.00	0.00	0.00	0.00	9.30	0.00	12.50	
TOTAL	37	40	57	72	49	1	20	43	13	24	356
	10.39	11.24	16.01	20.22	13.76	0.28	5.62	12.08	3.65	6.74	100.00

APPENDIX VIII (Cont'd.)

TABLE OF GTWSPE BY COD

GTWSPE / COD (FREQUENCY / PERCENT / ROW PCT / COL PCT)	SEAS.IN. P.	CL+CS	CC	C	CD	TRF	SFSF	SOSF	CAAT	OTHER	TOTAL
E 650 A 699	0	0	0	0	0	0	0	0	2	1	3
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.28	0.84
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	66.67	33.33	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.38	4.17	
DE 700 A 749	2	0	0	0	1	0	3	7	3	2	18
	0.56	0.00	0.00	0.00	0.28	0.00	0.84	1.97	0.84	0.56	5.06
	11.11	0.00	0.00	0.00	5.56	0.00	16.67	38.89	16.67	11.11	
	5.41	0.00	0.00	0.00	2.04	0.00	15.00	16.28	23.08	8.33	
E 800 A 849	1	0	0	0	0	0	0	1	3	0	5
	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.84	0.00	1.40
	20.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	60.00	0.00	
	2.70	0.00	0.00	0.00	0.00	0.00	0.00	2.33	23.08	0.00	
DE 850 A 899	3	2	3	3	4	0	0	4	0	1	20
	0.84	0.56	0.84	0.84	1.12	0.00	0.00	1.12	0.00	0.28	5.62
	15.00	10.00	15.00	15.00	20.00	0.00	0.00	20.00	0.00	5.00	
	8.11	5.00	5.26	4.17	8.16	0.00	0.00	9.30	0.00	4.17	
E 900 A 949	8	13	17	20	10	1	6	5	0	3	83
	2.25	3.65	4.78	5.62	2.81	0.28	1.69	1.40	0.00	0.84	23.31
	9.64	15.66	20.48	24.10	12.05	1.20	7.23	6.02	0.00	3.61	
	21.62	32.50	29.82	27.78	20.41	100.00	30.00	11.63	0.00	12.50	
DE 950 A 999	5	5	13	21	17	0	4	9	0	1	75
	1.40	1.40	3.65	5.90	4.78	0.00	1.12	2.53	0.00	0.28	21.07
	6.67	6.67	17.33	28.00	22.67	0.00	5.33	12.00	0.00	1.33	
	13.51	12.50	22.81	29.17	34.69	0.00	20.00	20.93	0.00	4.17	
DE 1000 A 1049	6	6	11	14	9	0	3	5	1	1	56
	1.69	1.69	3.09	3.93	2.53	0.00	0.84	1.40	0.28	0.28	15.73
	10.71	10.71	19.64	25.00	16.07	0.00	5.36	8.93	1.79	1.79	
	16.22	15.00	19.30	19.44	18.37	0.00	15.00	11.63	7.69	4.17	
DE 1050 A 1099	2	8	5	3	1	0	3	0	0	2	24
	0.56	2.25	1.40	0.84	0.28	0.00	0.84	0.00	0.00	0.56	6.74
	8.33	33.33	20.83	12.50	4.17	0.00	12.50	0.00	0.00	8.33	
	5.41	20.00	8.77	4.17	2.04	0.00	15.00	0.00	0.00	8.33	
E 1100 A 1149	9	4	8	10	7	0	1	7	3	9	58
	2.53	1.12	2.25	2.81	1.97	0.00	0.28	1.97	0.84	2.53	16.29
	15.52	6.90	13.79	17.24	12.07	0.00	1.72	12.07	5.17	15.52	
	24.32	10.00	14.04	13.89	14.29	0.00	5.00	16.28	23.08	37.50	
DE 1200 A 1249	0	0	0	1	0	0	0	1	1	1	4
	0.00	0.00	0.00	0.28	0.00	0.00	0.00	0.28	0.28	0.28	1.12
	0.00	0.00	0.00	25.00	0.00	0.00	0.00	25.00	25.00	25.00	
	0.00	0.00	0.00	1.39	0.00	0.00	0.00	2.33	7.69	4.17	
MAYOR DE 1250	1	2	0	0	0	0	0	4	0	3	10
	0.28	0.56	0.00	0.00	0.00	0.00	0.00	1.12	0.00	0.84	2.81
	10.00	20.00	0.00	0.00	0.00	0.00	0.00	40.00	0.00	30.00	
	2.70	5.00	0.00	0.00	0.00	0.00	0.00	9.30	0.00	12.50	
TOTAL	37	40	57	72	49	1	20	43	13	24	356
	10.39	11.24	16.01	20.22	13.76	0.28	5.62	12.08	3.65	6.74	100.00