AgRISTARS

A Joint Program for Agriculture and Resources Inventory Surveys Through Aerospace Remote Sensing

Foreign Commodity Production Forecasting

June 1981

PROJECT COMMUNICATIONS/DOCUMENTATION STANDARDS MANUAL

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16. Abstract

This document establishs those standards and conventions to be used in the AgRISTARS - Foreign Commodity Production Forcasting Project communications/documentations. These standards apply to the identification and description of remote sensing technical crop estimation analysis procedures.

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FCPF PROJECT
COMMUNICATIONS/DOCUMENTATION
STANDARDS MANUAL

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THIS DOCUMENT PROVIDES TECHNICAL MANAGEMENT GUIDELINES
FOR THE FOREIGN COMMODITY PRODUCTION FORECASTING PROJECT
OF THE AgRISTARS PROGRAM

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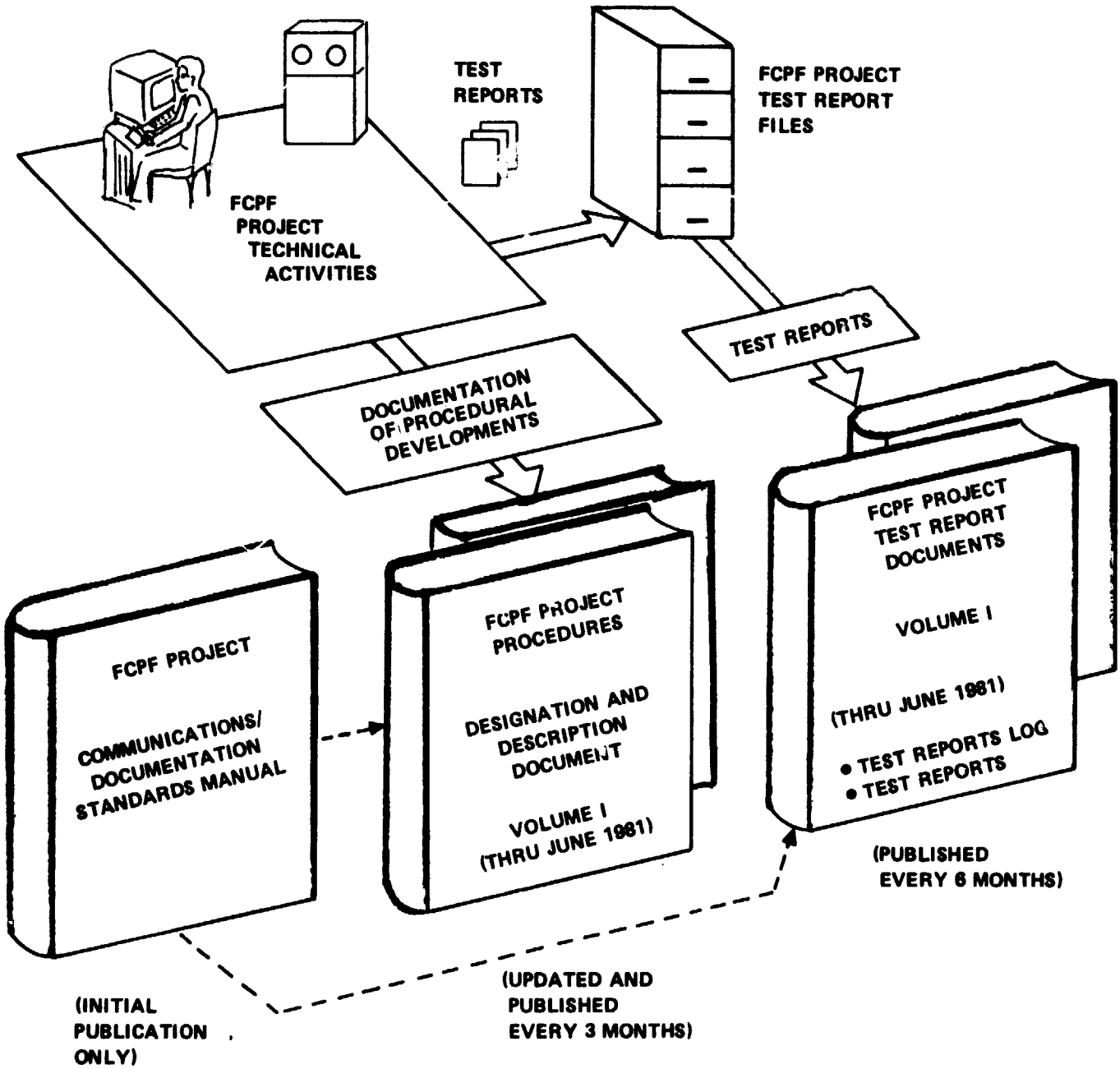
FOREWORD

In order to improve technical and management communication within the Foreign Commodity Production Forecasting (FCPF Project with other AgRISTARS projects and program management, it has become necessary to establish some conventions and standards for reporting on remote sensing technical analysis procedures development and testing.

This document establishes those standards ard conventions to be used in FCPF communications/documentations for identifying and describing remote sensing technical analysis procedures and reporting of test results to AgRISTARS project and program management.

This FCPF Standards Manual will be periodically updated on a scheduled (every 3 months) basis. The related FCPF Test Reports Document will also be published on a scheduled basis but on a 6-month cycle and will present all test results which occurred during this period.

FCPF PROJECT
COMMUNICATIONS/DOCUMENTATION
STANDARDS MANUAL
AND
RELATED DOCUMENTATION



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REFERENCES:

JSC-17154 FCPF PROJECT PROCEDURES

DESIGNATION AND DESCRIPTION DOCUMENT, VOLUME I, JUNE 1981.

Contains documentation of FCPF procedures through June 1981. Subsequent volumes of this document will be issued every three months and will contain procedures updates and new procedures developed during the period covered by the volume.

JSC-17155 FCPF TEST REPORTS DOCUMENT, VOLUME I, JUNE 1981

Contains FCPF Test Reports Documentation of tests that have been completed and reported to the Project Manager through June 1981. New Test Reports will be documented every 6 months in subsequent issues of this volume.

1. INTRODUCTION

1.1 BACKGROUND

The AgRISTARS Foreign Commodity Production Forecasting (FCPF) Project's developmental activities are producing a number of different analysis procedures. Some of these software procedures are new analytical concepts while others are derivatives of older procedures. As testing on these analytical variants proceed, it has become apparent that a standard system of identification and documentation of the analytical procedures is required as well as some documentation conventions relative to the reprinting of developmental and evaluation test results.

1.2 OBJECTIVES

The purpose of this document is to: (a) establish standard working terminology for technical project and programmatic communications among and between FCPF Project technologists and managers as well as with other AgRISTARS projects and program management. (b) provide basic reference material for FCPF project technologists, and (c) provide introductory training material for new FCPF technical personnel.

2. APPROACH

This FCPF Standards Document will present communications/documentation guidelines organized into the following two sections:

- o Procedural Documentation
- o Test/Experiment Reporting Documentation

Within these sections, the required standard documentation elements are identified and discussed. Figure 1 contains a summary enumeration and description of these elements. Standard formats and related coding requirements and guidelines are presented in the following sections.

Also being published separately at this time are the FCPF Standards Procedural documentation of all the current FCPF remote sensing analytical procedures. This procedural documentation is included in the FCPF Procedures Designation and Description Document, Volume I, dated June 1981.

In addition, the initial publication of the FCPF Test Reports Document, Volume I, date June 1981 is being released which includes the first three test reports to be published in accordance with the FCPF Communication/ Documentations Standards.

3. REMOTE SENSING ANALYSIS PROCEDURES COMMUNICATION/DOCUMENTATION STANDARDS

The purpose of the Procedures Section of the FCPF Communication/ Documentation Standards is to:

- o Establish a procedural systems structure and define the functional levels of remote sensing software and FCPF technologies in the context of agricultural information systems.
- o Define a coding system for designation of agricultural remote sensing analytical procedures.
- o Establish a system of describing the analytical procedures.
- o Provide guidelines for the documentation of the relationship of the procedure to previous procedures.
- o Provide standard formats for presentation of procedural documentation.

3.1 FCPF PROCEDURAL SYSTEMS STRUCTURE

The categorization of the remote sensing agricultural information system into function levels provides a reference context for project and program communications/documentation and provides a framework for technical discussions and test reporting.

Figure 2 presents definitions and examples of the function levels or building blocks of the remote sensing agricultural information system.

Another "illustration" or diagram describing the interrelationships between the various functional levels and also identifying the various types (component level) of procedures used in the system, is presented in Figure 3. Another diagram of an alternate configuration of this Remote Sensing Agricultural Information System is presented in Figure 3A to illustrate that there are other potential configurations of this system.

3.2 STANDARD HEADING FOR PROCEDURAL DOCUMENTATION

There are a number of informational items that are of significance and should be referenced in all procedural documentation. This "header" type information can be categorized and efficiently presented if a standard heading is used in all such documentation. To simplify this process, a standard FCPF heading format has been created and is presented in Figure 4 along with guidelines for completing this heading information.

3.3 CRITERIA FOR PROCEDURES DESIGNATION

The criteria to be used in designation of procedures is:

- o Minor developmental variations in a Procedure will be designated as a variant and given a modifying letter designator (e.g., SSG-1 A . What constitutes a minor variation maybe quite different from procedure to procedure, but in essence it means that the basic structure of the procedure has not been altered but only a minor modification has been made. However, it is important that minor modifications are identified.
- o Major developmental changes in a procedure or the development of a new analytical procedure will be given new numerical designators (e.g., if SSG-1A is the last developmental variant, then the new procedure would be designated SSG-2).

3.4 STANDARD FORMATS FOR PROCEDURAL DOCUMENTATION

In Figure 1, five elements of Procedural Documentation were identified. The first is the updated Procedural Development Family Tree. This standard graphics format identifies the procedure (Procedure Code/Procedure Name) and depicts it on a vertical graph representing time and technology development. Figure 5 contains a completed guideline example of this procedural document. Its purpose is to provide a simplified graphical depiction of the deviation of current procedures and their relationship to past procedures. Direct and indirect relationships to parent procedures should be shown. The other four documentation elements are correlated.

Their purpose is to give a summary overview of the procedural content and to provide a pointer or reference to more detailed documentation of the procedure.

A guideline example of the four procedural formats is presented in Figure 7 (Sheets 1, 2, 3, 4). The Procedural Summary Sheet's purpose is to provide somewhat of an executive summary of the procedures. Namely, to provide a rationale as to why the procedure was developed, its relationship to past procedures, some general information on data requirement such as the number of acquisitions required during a growing season in order to process the segment with the procedure, etc. What performance information on the procedure has been acquired to date should also be provided.

Sheets 2 and 3 are the summary technical descriptions of the remote sensing analytical procedure. Both sheets utilize the standard procedures heading form. The guidelines for completing the heading are presented in Figure 4, and the guidelines for development of the function flow diagrams are presented in Figure 6. Also provided in this illustration is an example of a functional grouping heading. (This one is for Area Estimation.) This heading provides a mechanism for standardizing the segmentation of the procedure function flows into the significant parts. This standard heading groups is an important aspect of these diagrams. By having a common structural arrangement for a type of procedure (e.g., Area Estimation, Sampling, Aggregation, Crop Calendars, Yield, Data, etc.), it allows a quick general comparison to be made between different procedures and of the manner in which particular functional groups of procedures are accomplished. This function grouping heading will be different for the different types of procedures. (For example, sampling procedures will be different, aggregation procedures will be different, etc.)

The functions or actions required by the procedures are numbered on the flow chart. The rationale for this requirement is to provide an easy mechanism for referencing the individual steps if they are to be referred to or discussed. Also, these numbers serve as the basic reference for the verbal descriptions of each function that are included on the Procedural Function description chart, (Figure 7, Sheet 2).

One of the objectives of the FCPF Communication/Documentation Standards is to serve as a training and familiarization document. It is with this in mind that the procedural documentation requires that a reference to the detailed documentation of a procedure be provided. (Figure 7 (Sheet 4) is a guideline example of the standard format to be used for this document action. This form requires that technical and software references be provided along with identification of the technical consultant for the procedure.

Copies of these standard forms will be made available to FCPF technologists to assist them in providing the standard "information" on procedural development.

4. TEST REPORTING COMMUNICATIONS/DOCUMENTATION CONVENTIONS

Previous FCPF test reporting documentation has suffered from not always covering all aspects and/or information that is necessary to provide a basis for project presentation to higher AgRISTARS management levels, other AgRISTARS projects and government agencies requesting information on FCPF project accomplishments. As a result, test results presentation have been more lengthy and not as thorough as desirable. Queries from Project Managers have been required to get information and no permanent file of test results have been maintained. This has led to many redundant documentation burdens upon technical and management personnel.

The purpose of defining conventions for Test Reporting Communications/ Documentation standards is to provide definitive guidelines as to the type of information required and in a form that will simplify the preparation of the test reporting documentation and will eleminate much of the redundancy in the test reporting process.

4.1 STANDARD HEADING AND FORMATS FOR TEST REPORT DOCUMENTATION

Test Reporting Documentation will be prepared and presented on standard formats that will be suitable for viewgraph presentations as well as for documentation requirements.

The basic elements of the Test/Experiment Reporting Documentation are summarized in Figure 1. They include Test Description, Procedural Documentation, Data Set Description, Test Results, Procedures Efficiency Data, and Results Evaluations/Recommendations.

All of these data will be presented with standard test documentation header information. Figure 8 presents guidelines for the completion of this header requested information. With this header information, the Test Report is put in the context of the test suitation.

Figure 9 (Sheets 1 through 5) contains the five basic formats to be used in Test Reporting. Requiring the use of these forms is not intended to restrict the creative presentation of data and if after completing the initial sheet 4 (Test Results), other data may be presented using full sized pages, if required, to effectively present the test results. In addition to the Test Reporting Sheets, Procedural documentation in the form specified in Section 1 is presented to clarify and describe the procedure being tested. The map of test segment locations locates the data used in the test and on (sheet 3) provides the rationale for data set selection and further discussion of the data set if required. Examples of completed Test Reports (1, 2, and 3 are provided in Appendix B as further guideline examples of the conventions to be used in Test Reporting.

FIGURE 1. FCPF STANDARDS BASIC
DOCUMENTATION ELEMENTS SUMMARY

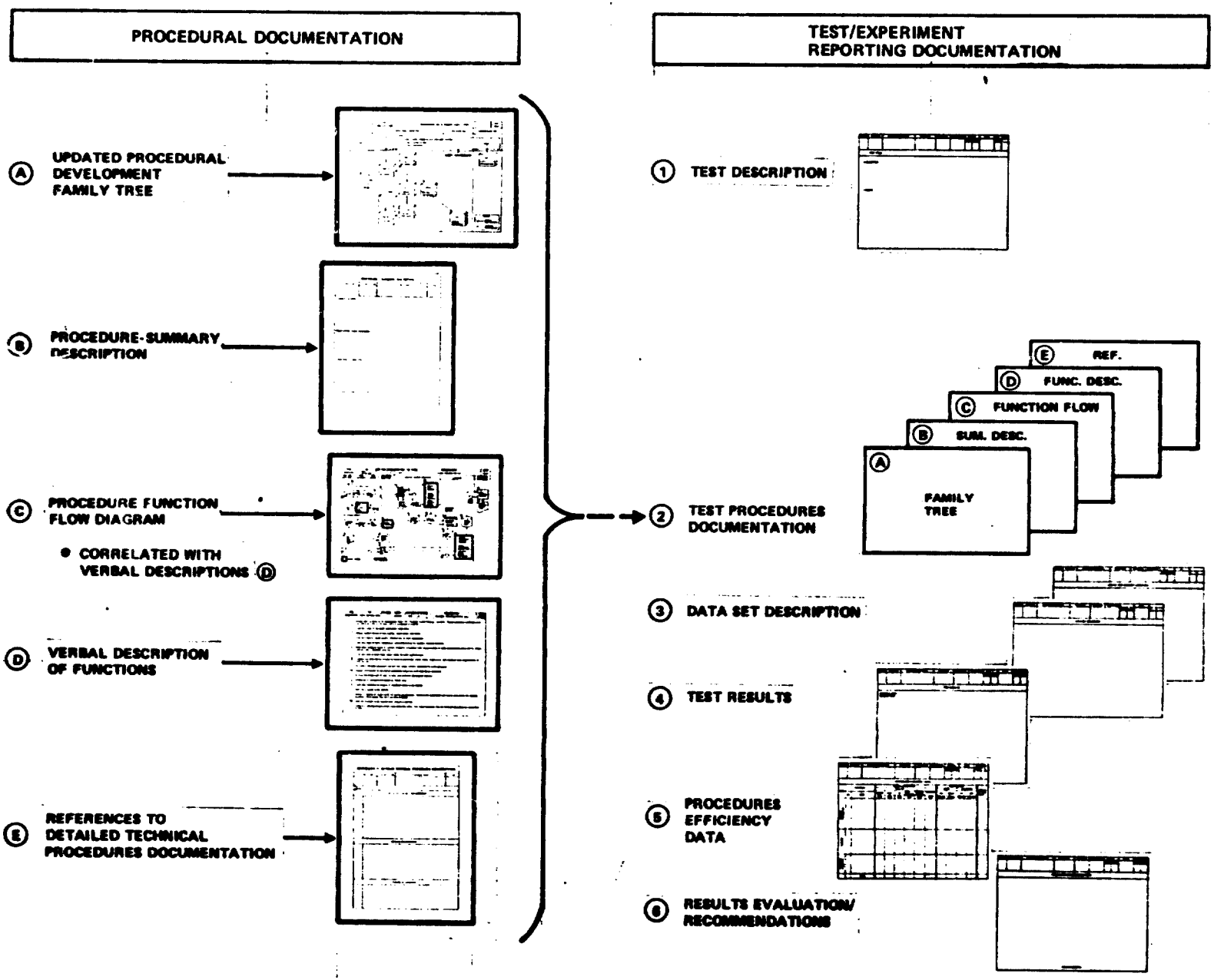
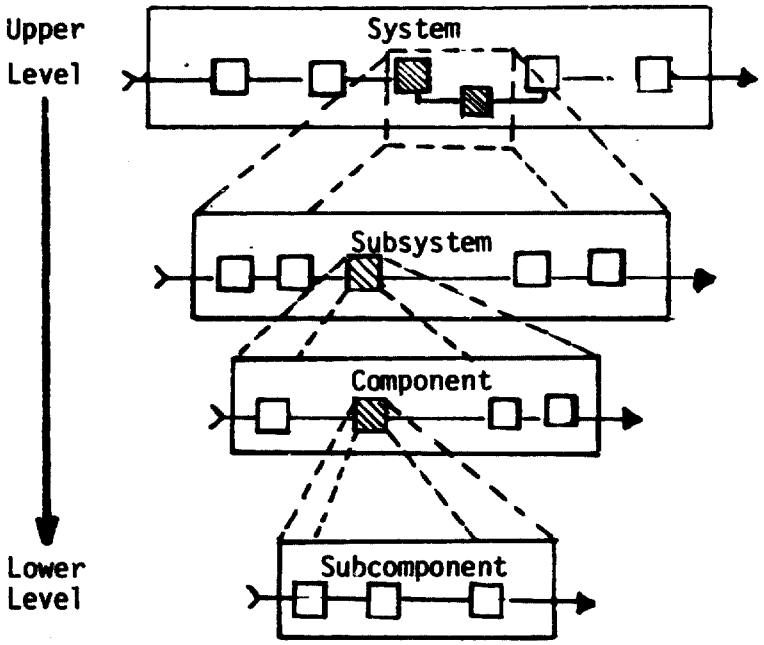


Figure 2. Functional Levels or Building Blocks of Remote Sensing Agricultural Information



- A unique network of required actions of functional subelements (manual or machine/software) encompassing the selection, acquisition, processing, analysis, and evaluation of remote sensed data necessary for development of agricultural information products (Example - Crop Production Estimate).
- A unique integrated network of functional components which constitute a major subassemblage of the system. (Example - Area Estimation/Crop Calendar Subsystem).
- A unique integrated network of functional subcomponents which constitute the major procedural types or subassemblages of the subsystem. (Examples - Sampling, Data, Area, Yield, Crop Calendar, Aggregation, Performance Evaluation).
- A unique integrated network of functional elements/algorithms which constitute a subassemblage of the component (Example - Labeling Subcomponent of Area Estimation).

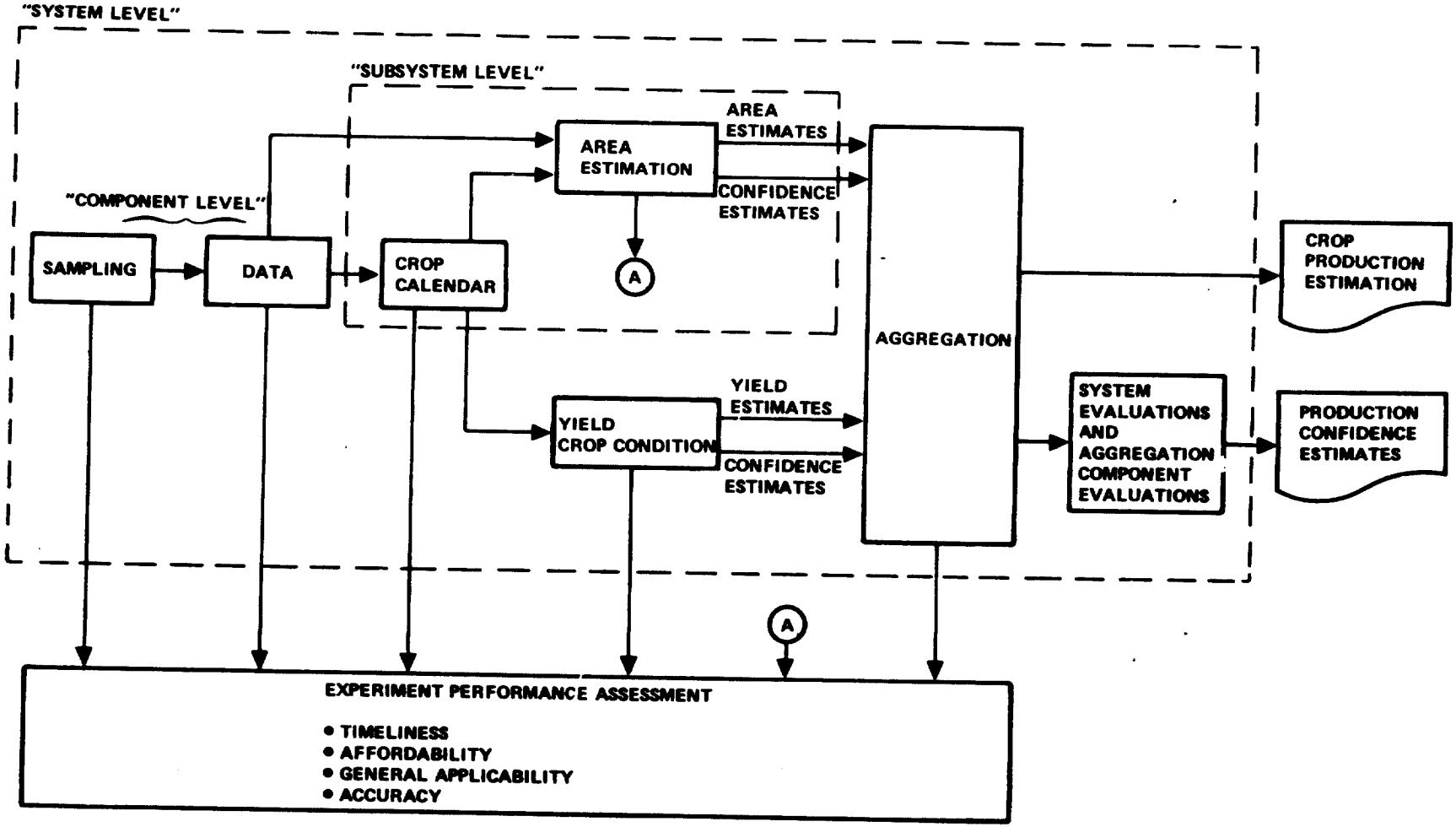


Figure 3.– A representative remote sensing agricultural information system procedural types/functional levels.

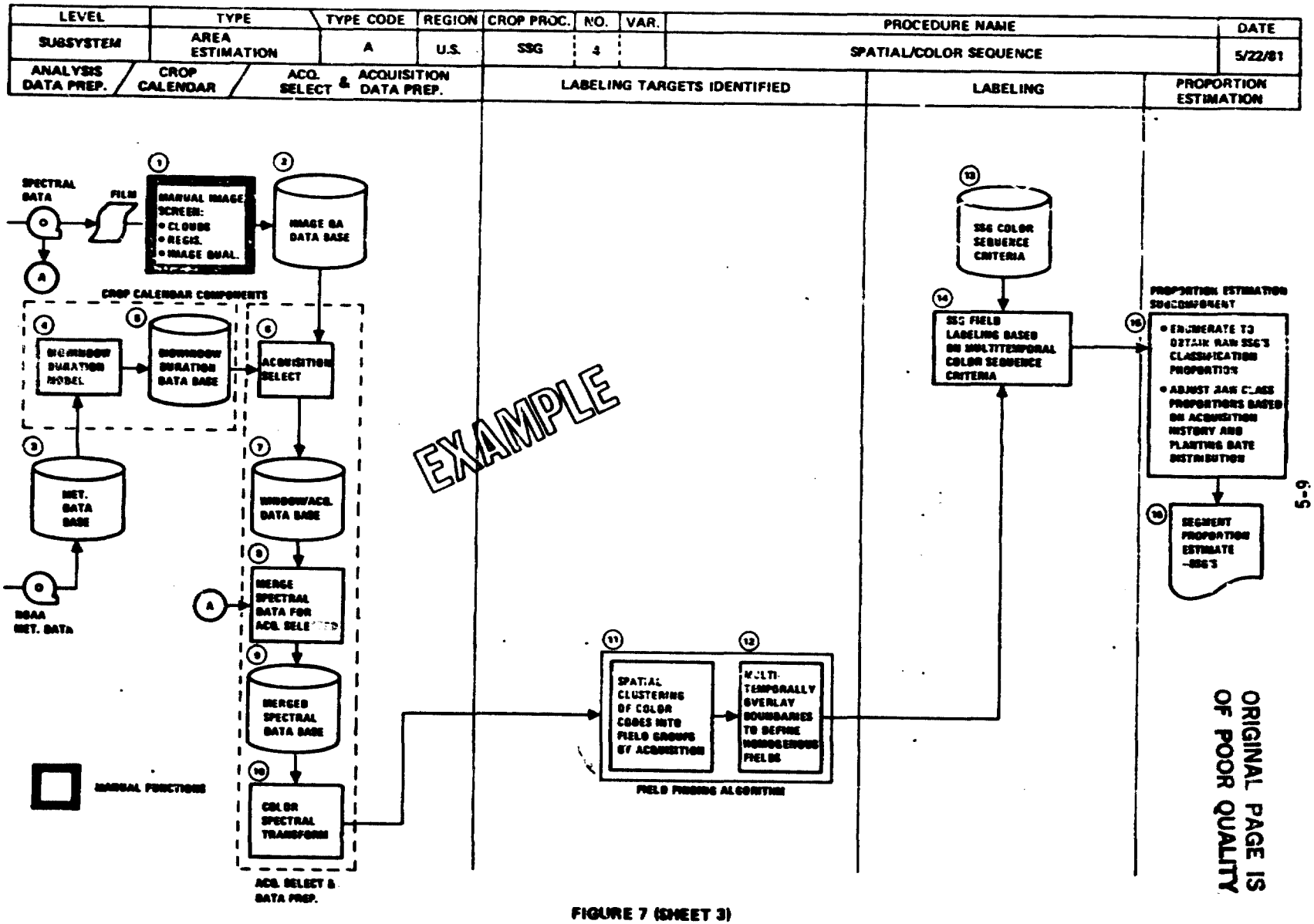


FIGURE 7 (SHEET 3)

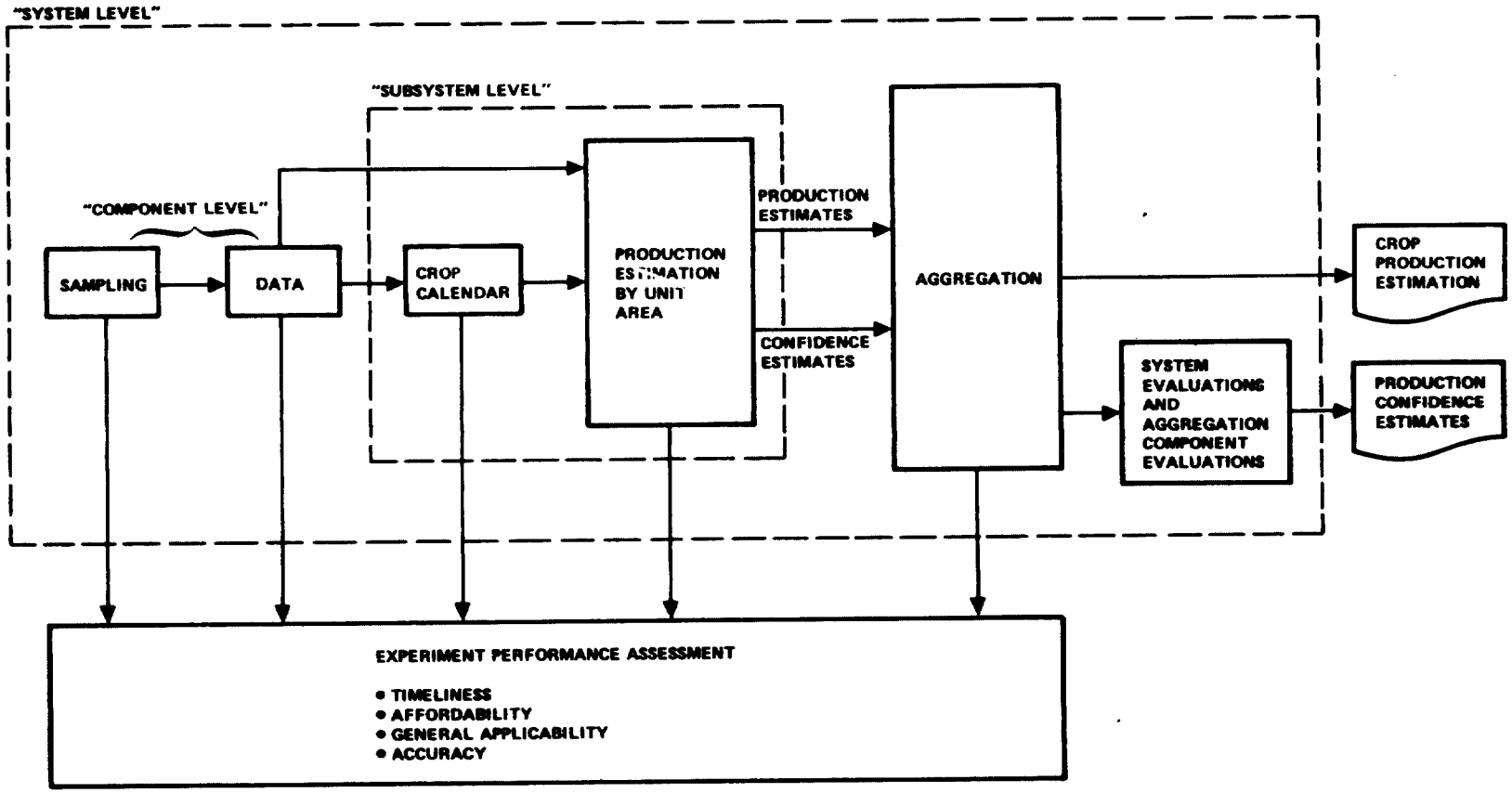
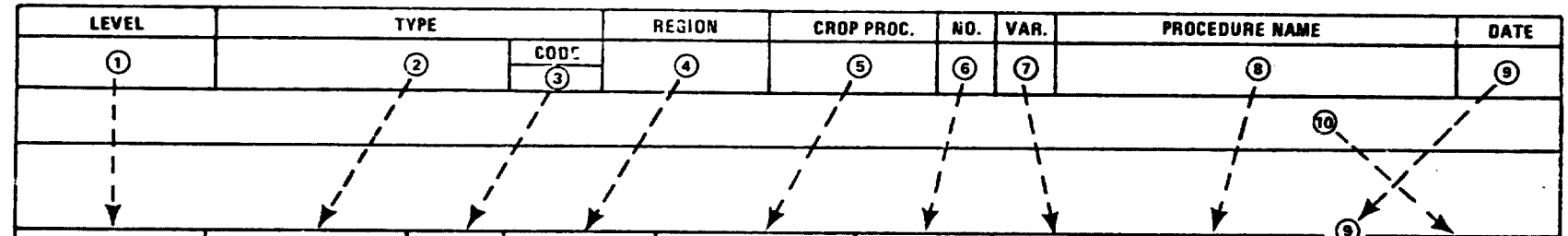


Figure 3A.— An alternate remote sensing agricultural information system configuration.



① LEVEL OF PROCEDURE	② PROCEDURE TYPE	③ TYPE CODE	④ REGION WHERE PROCEDURE CAN BE USED	⑤ CROP PROCEDURE CODES	⑥ PROCEDURE NUMERICAL DESIGNATOR	⑦ PROCEDURAL VARIANT DESIGNATOR	⑧ NAME GIVEN PROCEDURE	⑨ DATE OF PROCEDURAL DOCUMENTATION	⑩ STANDARD HEADING
• SYSTEM • SUBSYSTEM • COMPONENT • SUBCOMPONENT	• AREA ESTIMATION • CROP CALENDAR • YIELD • SAMPLING • AGGREGATION	A C Y S AG	U.S./CAN.	CODE SSG - SPRING SMALL GRAINS WSG - WINTER SMALL GRAINS B - BARLEY C/S - CORN/ SOYBEANS MC - MULTICROP CT - COTTON SUN - SUNFLOWER	1 . . . N	A . . . Z DESIGNATES A VARIANT ON A NUMBERED PROCEDURE WHICH HAS ONLY MINOR CHANGES FROM THE PARENT PROCEDURE	(SHOULD BE TECHNICAL DESCRIPTOR OF PROCEDURE) - CLASSY/ REFORMATTED (2A) - SPATIAL/ COLOR SEQ.	REPRESENTS LATEST VERSION AS OF DATE NOTE	STANDARD GROUPING OF FUNCTIONS FOR PARTICULAR PROCEDURE TYPE 1 • AREA ESTIMATION • SAMPLING, ETC.

GUIDELINES FOR COMPLETING PROCEDURAL DOCUMENTATION HEADINGS

FIGURE 4

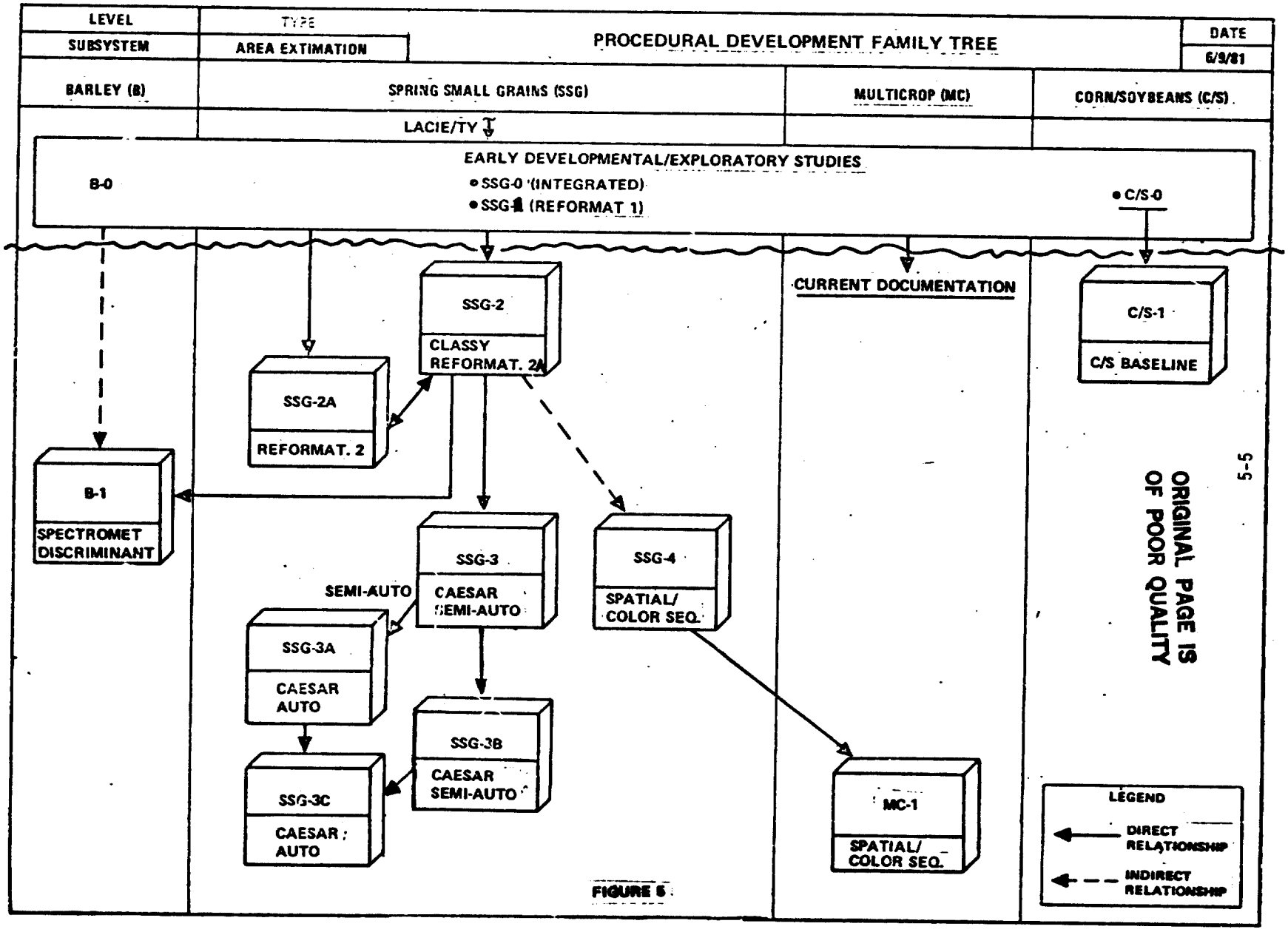

LEVEL
TYPE
SUBSYSTEM
AREA EXTIMATION
PROCEDURAL DEVELOPMENT FAMILY TREE
DATE
6/9/81
BARLEY (B)
SPRING SMALL GRAINS (SSG)
MULTICROP (MC)
CORN/SOYBEANS (C/S)
LACIE/TY
EARLY DEVELOPMENTAL/EXPLORATORY STUDIES
B-0
• SSG-0 (INTEGRATED)
• SSG-1 (REFORMAT 1)
• C/S-0
CURRENT DOCUMENTATION
SSG-2
CLASSY
REFORMAT. 2A
SSG-2A
REFORMAT. 2
C/S-1
C/S BASELINE
B-1
SPECTROMET
DISCRIMINANT
SSG-3
CAESAR
SEMI-AUTO
SEMI-AUTO
SSG-4
SPATIAL/
COLOR SEQ.
SSG-3A
CAESAR
AUTO
SSG-3B
CAESAR
SEMI-AUTO
SSG-3C
CAESAR
AUTO
MC-1
SPATIAL/
COLOR SEQ.
LEGEND
DIRECT
RELATIONSHIP
INDIRECT
RELATIONSHIP
ORIGINAL PAGE IS
OF POOR QUALITY
5-5

FIGURE 5

LEVEL	TYPE		REGION	CORP PROC.	NO.	VAR.	PROCEDURE NAME	DATE
SUBSYSTEM	AREA EST.	CODE	U.S.	MC	1		MULTICROP SPATIAL/COLOR SEQUENCE	6/17/81
ANALYSIS DATA PREP.	CROP CALENDAR	ACQ. SELECT & ACQUISITION DATA PREP.	LABELING TARGET IDENTIFICATION		LABELING		PROPORTION ESTIMATION	

EXAMPLE OF FUNCTION GROUPING HEADINGS (THESE ARE FOR THE AREA ESTIMATION SUBSYSTEM PROCEDURE)

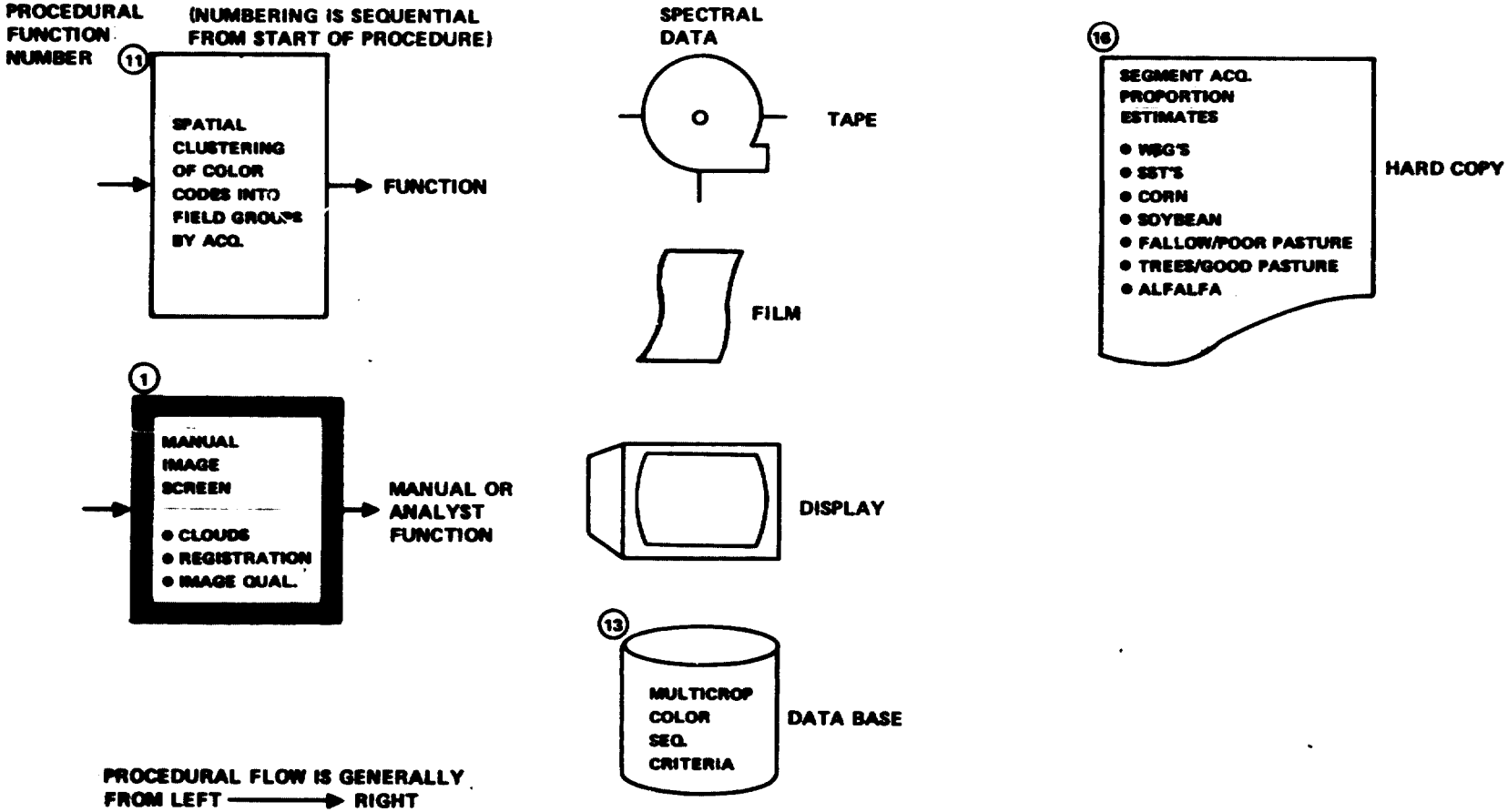


FIGURE 6. – SYMBOLS FOR FUNCTION FLOW DIAGRAMS.

PROCEDURE - SUMMARY DESCRIPTION

Procedure type	Procedure code	Procedure name	Level
AREA ESTIMATION			SUBSYSTEM

•Purpose/rationale:

--Indicate why procedure was created.

Examples: o To improve labeling functions.
o To address a specific problem with a particular procedure.
o To make a particular procedure more efficient with respect to
o To develop an alternative technology.

EXAMPLE GUIDELINES

•Relationship to past procedures:

--Indicate to which parent procedure this procedure is related.

Example: - This procedure is derived from _____.
or
This is a new procedure.

--Indicate what improvements have been incorporated into this procedure.

Example--Improved a particular function.
--Increased the efficiency.

•Data/resource requirements:

--Crop Calendar data function is satisifed by a _____

--Daily met (temp) from standard operational network required to support acquisition select _____

--Landsat digital and film products required from a minimum of _____ acquisitions/ segment during Early, Mid, Late season.

--Approximate manual operations time per segment _____.

--Approximate CPU operations time per segment _____.

•Summary of performance to date:

Summarize test results to date.

Figure 7 (Sheet 1)

LEVEL	TYPE	TYPE CODE	REGION	CROP PROC.	NO.	VAR.	PROCEDURE NAME	DATE
SUBSYSTEM	AREA ESTIMATION		US/CAN	SSG	4		SPATIAL/COLOR SEQUENCE	

(1) Visual determination of acquisition quality with respect to clouds, misregistration, and noise.

(2) File of acquisition quality ratings.

(3) Meteorological data for each segment (maximum/minimum temperatures).

(4) Meteorological model for predicting the beginning and end dates of each spectral biowindow.

(5) Data base containing biowindow dates for each segment.

(6) Acquisition selection algorithm to choose best available combination of acquisitions, or reject segment as nonprocessable.

(7) Listing of acquisitions chosen for each segment.

(8) Merging of spectral data for each segment.

(9) Merged spectral data for all chosen acquisitions.

(10) Normalization through division by channel means followed by conversion to channel rankings codes.

(11) Definition of boundaries of vegetated areas in each acquisition using channel ranking codes.

(12) Overlaying of vegetated areas on all acquisitions to define fields which follow homogeneous sequences of vegetated and nonvegetated areas.

(13) Predetermined labeling logic algorithm that states which vegetation/nonvegetation sequences are to be considered spring small grains.

(14) Labeling of each field as spring small grains or other.

(15) Summing of number of pixels contained in fields labeled spring small grains to obtain conservative estimate of SSG proportion. This is followed by an increase in the estimate based on the calculated omission rate which is modeled using interaction of acquisition history and predetermined planting data distribution. This accounts for fields which were missed due to early or late planting.

(16) Final spring small grains proportion estimate for each segment.

FIGURE 7 (SHEET 2)

REFERENCES TO DETAILED TECHNICAL PROCEDURES DOCUMENTATION

Procedure type	Procedure code	Procedure name	Level
AREA EST.	SSG-4	SPATIAL/COLOR SEQ.	SUBSYSTEM

Ref. number	TITLE
Technical description of documentation	
1.	TECHNICAL REPORT – Interpretation of Landsat digital data using a cubic color model based on relative energies. Cate et al., AgRISTARS SR-L0-00418, JSC-13776, Feb. 1980.
2.	Spatial/Color Sequence Proportion Estimation Techniques. T. B. Dennis, AgRISTARS SR-L0-04028, JSC-16848, Dec. 1980.
Software documentation	
3.	As Built Design Specification (in review)
Procedural consultant(s)	
	R. B. Cate T. B. Dennis

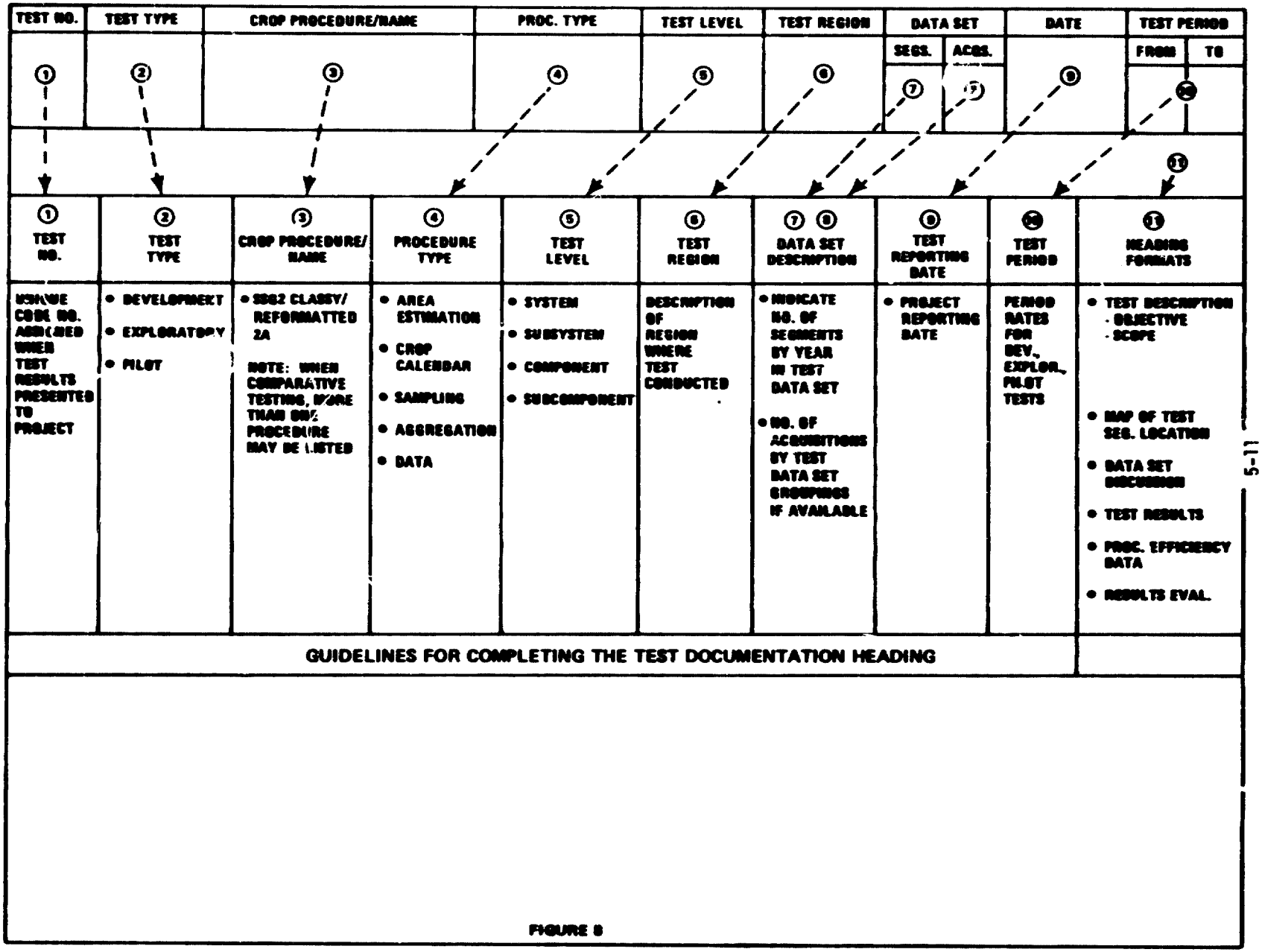

TEST NO.
TEST TYPE
CROP PROCEDURE/NAME
PROC. TYPE
TEST LEVEL
TEST REGION
DATA SET
SEGS.
ACQS.
DATE
TEST PERIOD
FROM
TO
① TEST NO.
USE/WE CODE NO. ASSIGNED WHEN TEST RESULTS PRESENTED TO PROJECT
② TEST TYPE
• DEVELOPMENT
• EXPLORATORY
• PILOT
③ CROP PROCEDURE/ NAME
• SB82 CLASSY/ REFORMATTED 2A
NOTE: WHEN COMPARATIVE TESTING, MORE THAN ONE PROCEDURE MAY BE LISTED
④ PROCEDURE TYPE
• AREA ESTIMATION
• CROP CALENDAR
• SAMPLING
• AGGREGATION
• DATA
⑤ TEST LEVEL
• SYSTEM
• SUBSYSTEM
• COMPONENT
• SUBCOMPONENT
⑥ TEST REGION
DESCRIPTION OF REGION WHERE TEST CONDUCTED
⑦ ⑧ DATA SET DESCRIPTION
• INDICATE NO. OF SEGMENTS BY YEAR IN TEST DATA SET
• NO. OF ACQUISITIONS BY TEST DATA SET GROUPINGS IF AVAILABLE
⑨ TEST REPORTING DATE
• PROJECT REPORTING DATE
⑩ TEST PERIOD
PERIOD DATES FOR DEV., EXPLOR., PILOT TESTS
⑪ HEADING FORMATS
• TEST DESCRIPTION
- OBJECTIVE
- SCOPE
• MAP OF TEST SEG. LOCATION
• DATA SET DISCUSSION
• TEST RESULTS
• PROC. EFFICIENCY DATA
• RESULTS EVAL.
GUIDELINES FOR COMPLETING THE TEST DOCUMENTATION HEADING

FIGURE 8

TEST NO.	TEST TYPE	CROP PROCEDURE/NAME	PROC. TYPE	TEST LEVEL	TEST REGION	DATA SET		DATE	TEST PERIOD	
						SEGS.	ACQS.		FROM	TO

TEST TITLE

- OBJECTIVE:

- SCOPE:

FIGURE 9 (SHEET 1)

TEST NO.	TEST TYPE	CROP PROCEDURE/NAME	PROC. TYPE	TEST LEVEL	TEST REGION	DATA SET		DATE	TEST PERIOD	
						SEGS.	ACQS.		FROM	TO

MAP OF TEST SEGMENT LOCATIONS

FIGURE 9 (SHEET 2)

TEST NO.	TEST TYPE	CROP PROCEDURE/NAME	PROC. TYPE	TEST LEVEL	TEST REGION	DATA SET		DATE	TEST PERIOD	
						SEGS.	ACQS.		FROM	TO

DATA SET DISCUSSION

FIGURE 9 (SHEET 3)

TEST NO.	TEST TYPE	CROP PROCEDURE/NAME	PROC. TYPE	TEST LEVEL	TEST REGION	DATA SET		DATE	TEST PERIOD	
						SEGS.	ACQS.		FROM	TO

TEST RESULTS

GENERAL TEST DESCRIPTION:

FIGURE 9 (SHEET 4)

TEST NO.	TEST TYPE	CROP PROCEDURE/NAME	PROC. TYPE	TEST LEVEL	TEST REGION	DATA SET		DATE	TEST PERIOD	
						SEGS.	ACQS.		FROM	TO

PROCEDURES EFFICIENCY DATA

GROUP	FUNCTION		MANUAL OPERATIONS						COMPUTER OPS.				THROUGH-PUT TIME (DAYS)
			ANALYST					TECHNICIAN	BATCH		INTERACTIVE		
	NO.	NAME	CONTACT	CLER.	QA	DATA HANDLING	STATUS & TRACKING		CPU	CONNECT	CPU	OPR.	
			MIN	MIN	MIN	MIN	MIN	MIN	MIN: SEC	MIN:SEC	MIN: SEC	MIN: SEC	
DATA PREP. FOR ANALYSIS													
LABELING													
PROPORTION ESTIMATION													
		TOTAL											

FIGURE 9 (SHEET 5)

TEST NO.	TEST TYPE	CROP PROCEDURE/NAME	PROC. TYPE	TEST LEVEL	TEST REGION	DATA SET		DATE	TEST PERIOD	
						SEGS.	ACQS.		FROM	TO

EVALUATIONS/RECOMMENDATIONS

FIGURE 9 (SHEET 6)