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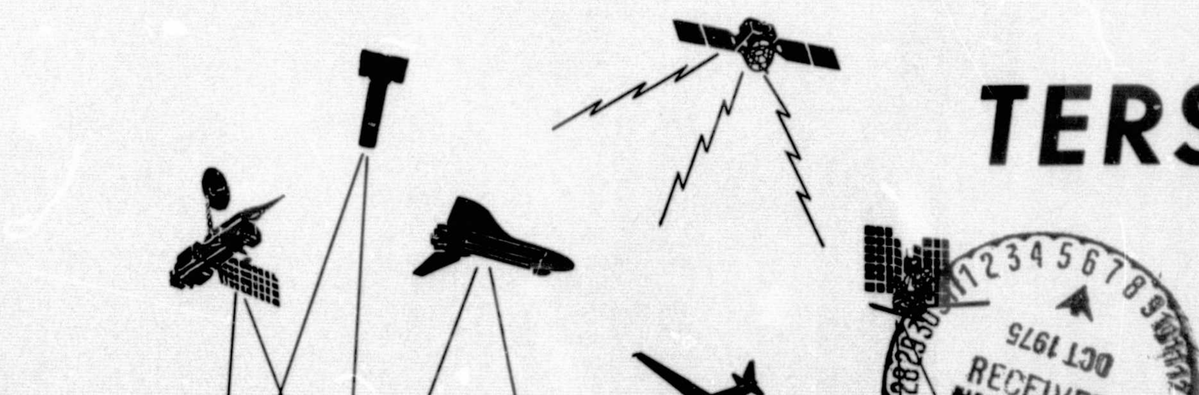
# definition of the

# TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA

## VOLUME 5
## DETAILED SYSTEM REQUIREMENTS: TWO CASE STUDIES



TERSSE



GENERAL ELECTRIC
SPACE DIVISION

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# TERSSE

## DEFINITION OF THE TOTAL EARTH RESOURCES SYSTEM FOR THE SHUTTLE ERA

## VOLUME 5

## DETAILED SYSTEM REQUIREMENTS: TWO CASE STUDIES

PREPARED FOR

EARTH RESOURCES PROGRAM OFFICE
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# PREFACE

The pressing need to survey and manage the earth's resources and environment, to better understand remotely sensible phenomena, to continue technological development, and to improve management systems are all elements of a future Earth Resources System. The Space Shuttle brings a new capability to Earth Resources Survey including direct observation by experienced earth scientists, quick reaction capability, spaceborne facilities for experimentation and sensor evaluation, and more effective means for launching and servicing long mission life space systems.

The Space Shuttle is, however, only one element in a complex system of data gathering, translation, distribution and utilization functions. While the Shuttle most decidedly has a role in the total Earth Resources Program, the central question is the form of the future Earth Resources system itself. It is only by analyzing this form and accounting for all elements of the system that the proper role of the Shuttle in it can be made visible.

This study, entitled TERSSE, Total Earth Resources System for the Shuttle Era, was established to investigate the form of this future Earth Resources System. Most of the constituent system elements of the future ER system and the key issues which concern the future ER program are both complex and interrelated in nature. The purpose of this study has been to investigate these items in the context of the total system utilizing a rigorous, comprehensive, systems oriented methodology.

The results of this study are reported in eight separate volumes plus an Executive Summary; their titles are:

Volume 1 Earth Resources Program Scope and Information Needs

Volume 2 An Assessment of the Current State-of-the-Art

Volume 3 Mission and System Requirements for the Total Earth Resources System

Volume 4 The Role of the Shuttle in the Earth Resources Program

Volume 5 Detailed System Requirements: Two Case Studies

Volume 6 An Early Shuttle Pallet Concept for the Earth Resources Program

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# SECTION 1

# INTRODUCTION AND SUMMARY

In its study to define the Total Earth Resources System for the Shuttle Era (TERSSE), the General Electric study team identified thirty major resource management missions which can reasonably be expected to be performed by the TERSSE in the 1980's. Each of these thirty missions was detailed to a level to permit establishment of total system performance requirements and to determine the nature of the Shuttle's role in the future program.

One of the major conclusions reached early in the study was that the Earth Resources Program must position itself in the near future to solve the very difficult problems associated with bringing to operational use those missions identified as cost/beneficial and technically feasible. A part of this process is the development of an understanding of the form and function of a system designed to perform an operational mission. With this in mind, two of the thirty TERSSE missions were selected for more detailed study. In question were the detailed resource manager (user) functions, their current methods of performing their function, the information flows and information requirements embodied in their function and the characteristics of the observation system which would, in the future, assist in the management of the resource involved.

The two resource management missions selected for study were (1) World Crop Survey and (2) Land Resources Management. These two missions were found to represent opposite ends of the TERSSE spectrum in several regards as is illustrated in Figure 1-1. The World Crop Survey Mission is fundamentally a polar satellite job, while the more fragmented Land Resource Management tasks are best suited to Shuttle sortie flights and aircraft augmented by the contextual overview of the polar spacecraft. The World Crop Survey mission is primarily involved with aggregating a large number of information segments (i.e., field contents) into a few global answers or outputs distributed via a very few users. The Land Resources Management mission, on the other hand, has value primarily in its devotion to identification, classification, and location of many single cells of homogeneous use or interest and

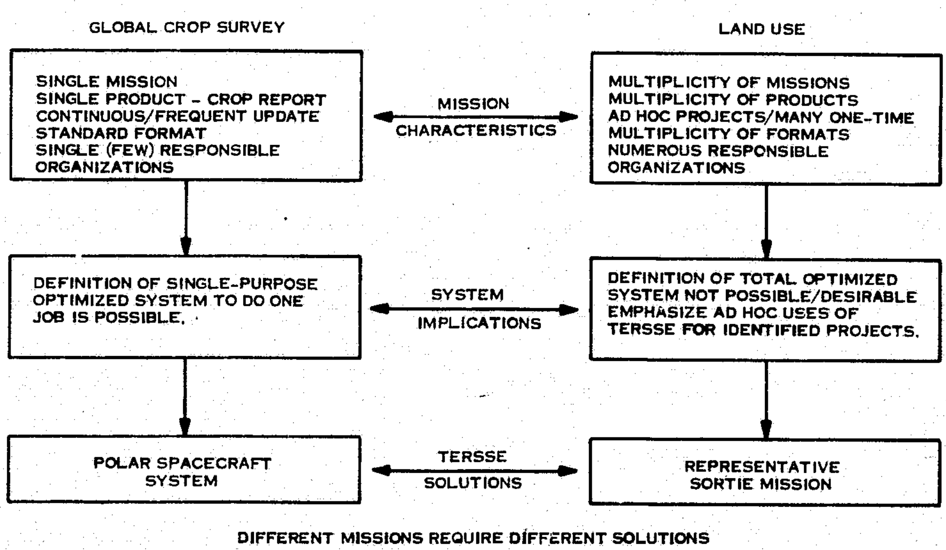


Figure 1-1. The Two Cases

preserving the essential granularity of such information. It serves a multiplicity of resource managers who operate over widely-varying geographical extents and with widely-varying objectives, thus requiring widely-varying product formats and contents.

As a consequence of this polarity, the two case studies reported herein provide more than just a detailed examination of the nature of two primary TERSSE missions. They also jointly serve as a strong reinforcement to our conclusions that different missions require different systems and that each mission must be analyzed in its entirety early in the development process to permit proper system development decisions.

## 1.1 WORLD CROP SURVEY

World Crop Survey is a single mission resulting in a single type of output product consisting of crop statistics and forecasts. Though this output may appear in a multitude of formats from several possible sources, there is, basically, a single informational output. Furthermore, this information is more or less continuously sought, and as such must be frequently updated. The temporal relationship between crop planting, growing, and harvesting seasons on a global basis, is such that there are observations to be made somewhere all of the time.

The format by which formal crop information is distributed to the user community has been standardized to great detail by the USDA. The agencies generating and disseminating these products have clearly established responsibility to do so. There is little reason or motivation within the user community to either alter the known and standard output products they use or the source from where they are obtained. The available products satisfy the users in their frequency of issuance, their format, and in the nature of their informational content. What is desired, particularly for foreign crop data, is an improvement in the accuracy of the crop data reported and in the timeliness with which it is made available.

With respect to the accuracy of the data, it was determined that although this is adequate on a national basis for U.S. data, significant errors are encountered in estimates for any given region for individual crops or individual states. By and large, national estimates for U.S. crops are accurate to better than 95%. With regard to foreign crop data, it was determined that both the accuracy and timeliness are inadequate. Whereas errors in foreign crop data, particularly production forecasts, currently run 15% to 20% on the average, it is desired to reduce this average error to 5%, approximately that achieved within the U.S. With respect to timeliness, it is highly desirable for U.S. agricultural interests if the availability of foreign crop data could be approximately six months earlier, with a monthly update cycle.

These improvements in data quality could be incorporated into the current output products with no apparent change to the users, with the exception of the fact that the value of the information placed in their hands would be greatly enhanced.

To obtain this information improvement remotely-sensed data from polar satellites, together with data from satellite-integrated automatic data collection platforms, will provide the necessary data on the number of acres cultivated and harvested by crop type. (Eventually such systems will also provide parametric measurements of crop yield.) These data fed to the appropriate agencies of the U.S. Department of Agriculture, combined with their conventional information sources, mail surveys, foreign agricultural attache reports, meteorological data obtained from NOAA satellite systems, and in-situ measurements and observations will permit the generation of all required output products. The final production estimates will be disseminated exactly as today. It is also envisioned that some processed data could be delivered directly to the private sector or to research activities within the academic community for a parallel but independent analysis and interpretation.

To accomplish these objectives, many observation system improvements to the current ERTS capability will have to be implemented, as listed in Figure 1-2. The most important of these is the observation repeat cycle. In order to assure monthly update of information with a 90% probability, new observations must occur every fourteen to sixteen days, leading to an orbital repeat cycle of seven days to account for the phenological determinants of the information required as well as the probability that the desired targets will be cloud-covered. For improved discrimination of spectral signatures and the reduction of training site processing costs, observations must be made in additional spectral channels and corrections for atmospheric effects on the spectral content of upwelling radiation must be made.

**WORLD CROP SURVEY**

- TWICE-MONTHLY OBSERVATIONS DESIREABLE IN HIGH PERCENTAGE OF DATA SAMPLES
- SEVEN-DAY REPEAT CYCLE, 420 KM SWATH REQUIRED FOR ADEQUATE CLOUD-COVER AVOIDANCE
- 80 M RESOLUTION ADEQUATE FOR DEMONSTRATION; 30 - 35 M SERVES MUCH LARGER PERCENTAGE OF FIELD SIZES
- DATA PROCESSING TIME LAG SHOULD BE FEW DAYS

Figure 1-2. ERS Requirements for World Crop Survey

With regard to spatial resolution, actual field size distributions throughout the world have not been adequately determined. However consideration of FAO published data on the size distribution of farm holdings around the world, and an analysis of Skylab S-190B data suggest that fields as small as 20 acres need to be recognized. Thus, while the current 80-meter IFOV on ERTS is adequate for system demonstration, an improvement of spatial resolution to the order of 30-40 meter IFOV may be required to operationally accomplish the crop survey mission to the desired accuracy.

The principal improvement necessary in the ground data processing segment of the system relates to increasing its productivity and throughput efficiency. A timeliness of 48-hours from overflight to acreage estimate will be necessary if the data gathered in two "looks" per update cycle is to be used at least 90% of the time. Involved in these developments would be such improvements as all-digital, short lag-time preprocessing, new extractive processing algorithms, development of new user models, and the development of oblique data processing techniques.

## 1.2 LAND RESOURCES MANAGEMENT

Land resources management is not really a single mission (nor even a few missions). It is rather a complex integration of a multiplicity of missions, wherein informational requirements, and hence output products, depend on the specific management decision to be made, the use being considered for the land, and the spatial entity within which the decision is to be made, as shown in Figure 1-3. A vast number of agencies and organizations are involved in land management planning and decisions with requirements for great numbers of different output products of different informational content and format. In that many of these problems or decisions are one-time or very infrequently made, the conclusion is drawn that they are best addressed on an 'ad-hoc' basis. It would follow then that a single

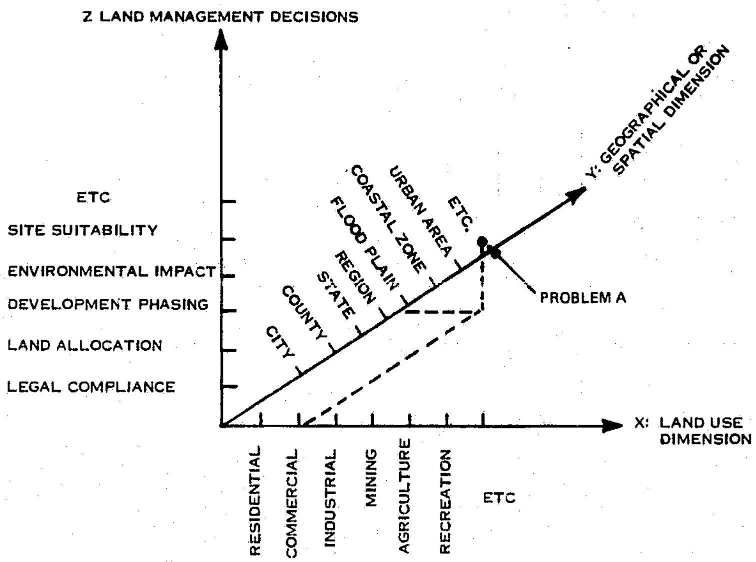


Figure 1-3. Land Resources Management Space

optimized system solution is not feasible. Rather, each operational problem should be addressed in an individual way, with possibly small groups of related problems (for example, the same decision in several different cities) being treated in parallel.

Although the multiplicity of land resource management problems result in there being a multiplicity of information requirements, certain generalizations can be made concerning the remote sensing platforms and sensors to be used. Quite different from the crop survey mission considered, all of the land missions have relatively long periods of time between required data updates. Annual data updates would be extraordinary to this user community; they currently work with updates every ten years, and even that is not always feasible.

Major output products for all these types of missions are maps and map overlays. This is the data presentation medium with which the majority of users are accustomed to working. However, most users, as well, will require a fully digital data base in which all the basic information from which their charts and overlays are prepared is included in even finer detail. The availability of a digital data base will permit simple compilation, rapid accessibility, and flexible updating of a vast array of statistical data that are required by both land use planners and land resource managers.

By virtue of the detail customarily included in their data bases, land resource management agencies will continue to require that any remotely sensed data be of very high resolution, say IFOV's of one to twenty meters. In many cases, however, it is important to note that remotely sensed data are only an ancillary input to ground-based data.

The foregoing set of general requirements, summarized in Figure 1-4, lead to the conclusion that the ad-hoc land resources missions are best served by the Shuttle Sortie and high-altitude aircraft carrying both film cameras and multispectral scanners, with a contextual overview being provided by polar satellites.

During the course of this study, the operational problems of several different land resources management missions were studied. Two, the Delaware Valley Regional Planning Commission (DVRPC) and the Bureau of Census/USGS Census Cities Program, will be reviewed here as illustrations.

In the case of the DVRPC problem of annual updates to their computer data base, Shuttle flights of opportunity and aircraft would provide a major improvement to the commission's data via a combination of scanner imagery at 20-meter and 1-meter resolution respectively, as well as film imagery at a scale of 1:5000. The scanner data would be converted to bulk media, preprocessed for frame-to-frame and geometric corrections. The extractive processing of the scanner and film data would involve both man/machine interactive training as well as normal photointerpretive techniques. These output data could be directly used, with appropriate gridding and coordinate transformation processes, to prepare and update the DVRPC computer data base for its nine county areas of southeastern Pennsylvania and southern New Jersey.

**LAND USE**

- MAPS/OVERLAYS A MAJOR OUTPUT PRODUCT
- DIGITAL DATA BASES APPEARING/BEING USED
- UPDATE CYCLES: 1 YEAR - 10 YEARS
- RESOLUTIONS HIGH/MAP SCALES LARGE/AREAS SMALL AND FRAGMENTED
- REMOTE SENSING ONLY ANCILLARY INPUT IN MANY CASES

Figure 1-4. ERS Requirements for Land Resources Management

Land use maps, at a scale of 1:62,500, as well as a variety of statistical tabulations in the full detail available in the computer, are currently issued for the use of the state and county planning commissions. In support of these planning activities, the DVRPC also publishes a series of 29 environmental overlays, drawn at a scale of 1:125,000 that would be prepared both from data derived from the remotely sensed observations as well as from conventional sources which would provide socioeconomic, physiographic and environmental data.

The final products of the DVRPC are regional planning programs. By charter, they must regularly submit such reports as Comprehensive Regional Plans, Transportation Plans, or Open Space Plans. In this format, scales of the order of 1:125,000 are used for presentation of the land resource information.

The second illustration involves a national, rather than regional, problem: the U.S. Census. Both film and scanner data were determined to be of use in providing the basic data required for the mission. The principal purpose of this activity is to provide the Census Bureau with the basic map and chart material required to properly plan the implementation of the 1980 Census. Multi-band film cameras with a ground resolution of 5 to 8 meters, a resolution sufficient to discern but not necessarily recognize streets and structures, combined with a multi-spectral scanner with an IFOV of 25 meters$^2$ and a spectral sensitivity sufficient to provide $2^8$ gray levels in each spectral band sensed, would be capable of providing the required input data. It has been determined that measurements would be necessary in four visible bands, two near-infrared bands, and one band in the thermal IR region. Through appropriate preprocessing and extractive processing techniques, along with conventional photointerpretation techniques, output products in the form of thematic maps would be derived.

A second principal output would be field enumerable imagery, photo-mapped to a scale of 1:24,000, that could be used in the field by the Bureau of Census field personnel. In preparation for the actual Census enumeration, a field plan must be developed to assure that the appropriate samples are taken in the desired geographical locations. For this planning phase, computer-compatible data with the multi spectral scanner data and thematic maps at 1:24,000 with land use categorized down to Level 3 of the Anderson Land Use Classification Scheme (Appendix Q) will be combined to produce computer compatible digital themes (tapes) that will be aggregated and overlaid with user-supplied boundaries and classification schemes. From these planning charts, the field enumerators can be given their specific assignments for census day and appropriate ground census activity strategies can be set.

SECTION 2

WORLD CROP SURVEY MISSION STUDY

## 2.1 INTRODUCTION

### 2.1.1 STUDY RATIONALE

Crop statistics are utilized for a wide range of purposes by a number of resource managers and users. Users in the private sector such as farmers, processors, and handlers, continually rely upon them in making production and marketing decisions. Within the public sector, crop statistics are employed by administrators, legislators, and others concerned with the formulation and implementation of agricultural policies and programs. In addition, data on crops are widely utilized in the areas of economic analysis and agricultural research.

Two of the most important types of crop statistics to a wide range of users are acreage and yield. Acreage measurements pertain to the amount of land occupied by a particular crop. Yield measurements pertain to the amount of output per unit of area — such as the bushels of corn produced per acre. Yield is a variable throughout the growing season, however, in that crops — like any other plants — are susceptible to a variety of stress factors that affect their productivity. Together, acreage and yield statistics are used to generate estimates and forecasts of production, these estimates being tempered by observations of acreage actually harvested.

At present, a number of organizations in the U.S. and throughout the world are engaged in the collection, processing, and dissemination of data on acreage, yield, and in crop production forecasting. In the U.S., these functions are primarily carried out by the Statistical Reporting Service (SRS) and the Foreign Agricultural Service (FAS), both of which are agencies of the U.S. Department of Agriculture.

Published statistical data for the United States is generally quite good. Current SRS procedures produce national crop production data usually accurate to better than 5% (estimated production compared to post-facto determination). There may be some variability from area to area or crop to crop, but by and large, this level of accuracy is attained. The accuracy with which production for crops of all major commodities can be made for the U.S. is also approaching the 5% level. Figure 2-1 shows how the SRS capability in this regard has been improving in the last few decades. Actually, for the U.S., several crop production forecasts are made during the growth cycle of a given crop. An initial production forecast is made based on planting intentions and probable yield. Subsequently, as actual acreages and crop yield estimates are derived, more accurate production forecasts can be made, culminating in a final production estimate at the conclusion of the harvest that is usually quite accurate. Figure 2-2 shows a plot of the average production estimate error for winter wheat for the years 1957-1972. This curve is typical of the results achieved for all major crops within the U.S.

With respect to crop statistics for the rest of the world, the quality of data varies widely. Among the advanced agricultural nations, the detail and quality of data can approximate that of U.S. data. In the lesser developed countries, however, agricultural data tends to be spotty and inaccurate, if not totally unavailable.

With respect to total world crop production forecasts, it is found that in general, the forecasts are more variable and less accurate. Tables 2-1 and 2-2 show some samples of FAS forecasts for wheat and corn production in the

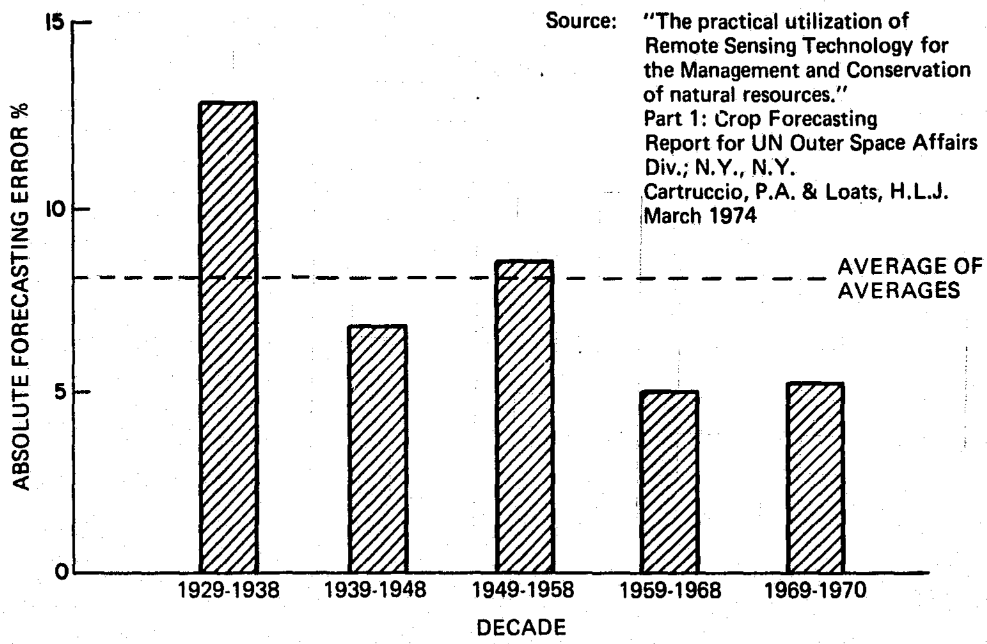


Figure 2-1. Trend of Average USDA Forecasting Errors (Major Commodities)

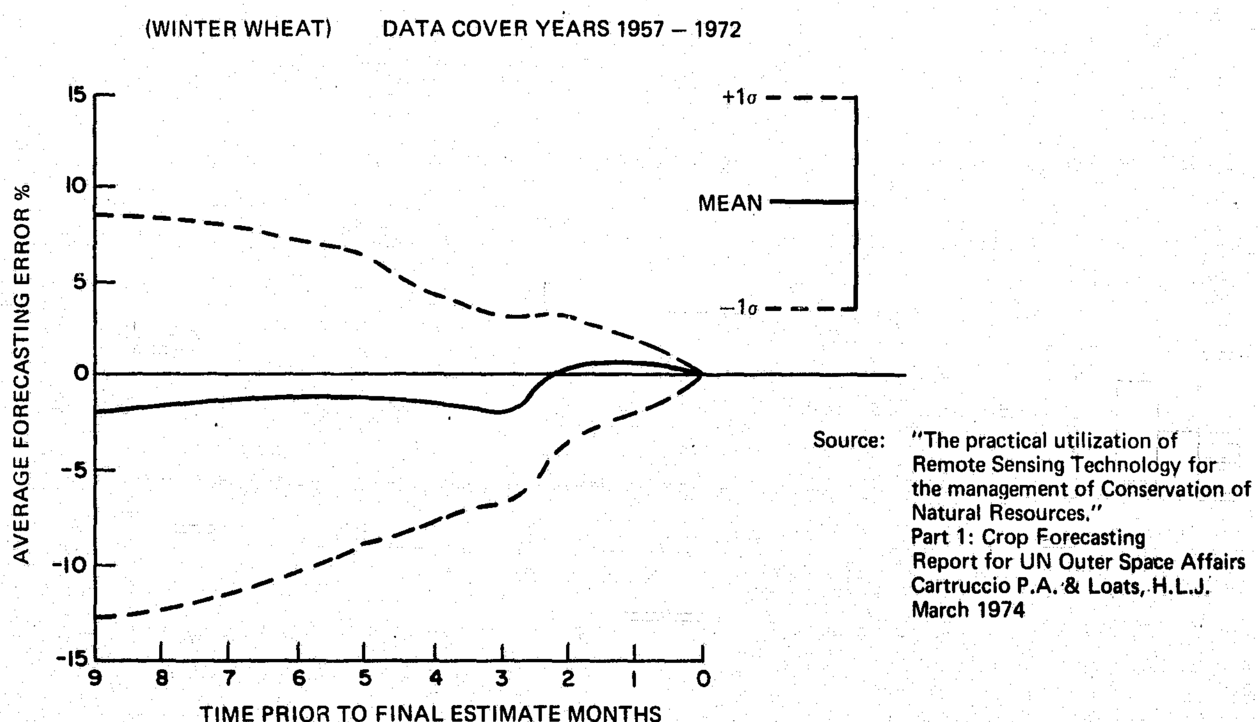


Figure 2-2. USDA-SRS Average Crop Forecasting Error versus Time Prior to Crop Year Close

Table 2-1. FAS Crop Production Forecasts for Wheat

| | Production (X1000 metric tons) | | | |
|---|---|---|---|---|
| | 1972 | 1971 | 1970 | 1969 |
| **USSR** | | | | |
| March Forecast | 62,300 | 75,000 | 80,000 | 65,200 |
| September Forecast | 62,300 | 70,000 | 72,400 | |
| Final Estimate | 85,800 | 81,900 | 80,000 | 62,300 |
| **Argentina** | | | | |
| March Forecast | 8,250 | 5,200 | 4,215 | 6,800 |
| September Forecast | 6,500 | —* | —* | |
| Final Estimate | 7,050 | 5,440 | 4,250 | 7,020 |
| **Brazil** | | | | |
| March Forecast | 700 | 2,000 | 1,686 | 1,100 |
| September Forecast | 2,000 | —* | —* | |
| Final Estimate | 680 | 2,030 | 1,734 | 1,146 |

*Not available at this time this year largely as a result of country being in Southern Hemisphere and growing season being different from season in Northern Hemisphere.

Table 2-2. FAS Crop Production Forecasts for Corn

| | Production (X1000 metric tons) | | | |
|---|---|---|---|---|
| | 1972 | 1971 | 1970 | 1969 |
| **USSR** | | | | |
| June Forecast | 8,100 | 8,100 | 7,500 | |
| December Forecast | 9,500 | 9,500 | 10,900 | |
| Final Estimate | 9,800 | 7,100 | 13,500 | 14,161 |
| **Argentina** | | | | |
| June Forecast | 9,800 | 5,800 | 9,900 | |
| December Forecast | —* | —* | —* | |
| Final Estimate | 9,200 | 5,860 | 9,930 | 9,360 |
| **Brazil** | | | | |
| June Forecast | 14,300 | 14,500 | 14,000 | |
| December Forecast | —* | —* | —* | |
| Final Estimate | 14,300 | 12,900 | 13,500 | 14,100 |

*Not available at this time this year largely as a result of country being in Southern Hemisphere and growing season being different from season in Northern Hemisphere.

USSR, Argentina, and Brazil. Errors as large as 66% and 30% for the Brazilian and Russian wheat crops in 1972, or 49% for the Russian corn crop in 1970 are seen. In general, it is believed that curves much like are shown in Figure 2-2 are valid for world crop production; the initial estimates (nine months prior to harvest) falling between 15 and 20% error. The key problem in world crop forecasts is that data collection is so difficult that very few additional pre-harvest estimates are available to U. S. agricultural interests. So that until post facto production estimates become available, usually six months too late for any benefit, only the initial crop forecasts can be used. Thus, in practice, U. S. interests are dealing with undesirably inaccurate data.

The particular TERSSE mission of interest here is to carry out routine global crop surveys from which global statistics on acreage, yield, and production, at least as accurate as achieved now within the U. S., can be developed. Although accomplishment of this mission would provide data of great value to all nations, attention in this study was restricted to U. S. users only.

Within the framework of the total TERSSE study, the system performance required to meet the needs of a wide array of resource management missions is being defined (refer to TERSSE report Volume 3). The purpose of this task is to refine the definition of the system performance requirements for this particular mission. By focusing the analysis on a representative set of key users and crops, it was possible to develop an in-depth characterization of the demands this mission would place on the TERSSE.

An iterative procedure was used to select the users and crops to be analyzed in the study. The selection of users proceeded by first establishing a scheme for the categorization of users. The categories were as follows:

1. Federal agencies
2. State agencies
3. Local agencies
4. Intergovernmental agencies
5. Academic organizations
6. Agribusinesses

The classification scheme was utilized as a guide for generating an initial user list. To qualify for inclusion in the final set, a user had to be believed to have a major and ongoing need for global crop data. The objective was to identify those users that were "system drivers."

Once the users and their information requirements had been identified, it was then necessary to determine which specific crops would be surveyed in this study. As with the selection of users, the selection of crops was carried out by means of a screening process which took into account their importance to the U. S. and the world export market.

### 2.1.2 WORK FLOW

The study work flow utilized for this task is schematically shown in Figure 2-3.

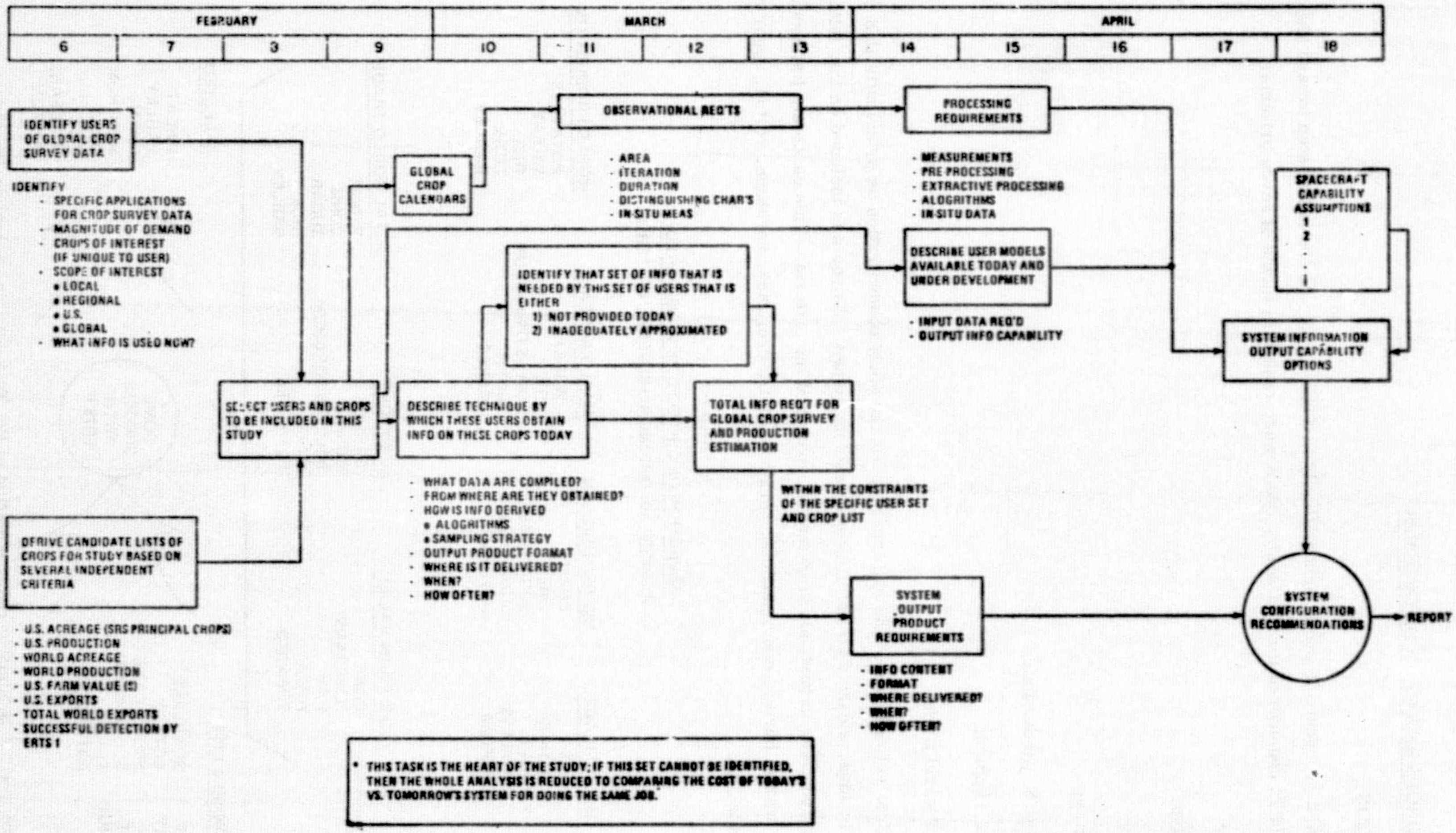


Figure 2-3. Schematic Representation of the World Crop Survey Study Task Flow

## 2.2 SELECTION OF CROPS AND CROP DATA USERS

### 2.2.1 CROP SELECTION

The entire crop selection procedure is shown schematically in Figure 2-4. As the initial step toward identifying a list of crops that should be considered for this study, crops were ranked in terms of seven criteria:

1. U. S. acreage;
2. U. S. production;
3. world acreage;
4. world production;
5. farm value of U. S. production;
6. volume of U. S. exports;
7. total volume of world trade.

The inclusion here of U. S. related data in the criteria reflects the study concentration on principally U. S. users. On the basis of these rankings, a candidate list of crops was established. A crop was included on this initial list only if its ranking indicated clear importance in regard to several of the criteria. This candidate list was comprised of the following crops: wheat, barley, corn, millets, sorghum, oats, rye, rice, soybeans, cotton, sugar cane, sugar beet, flax, and potatoes.

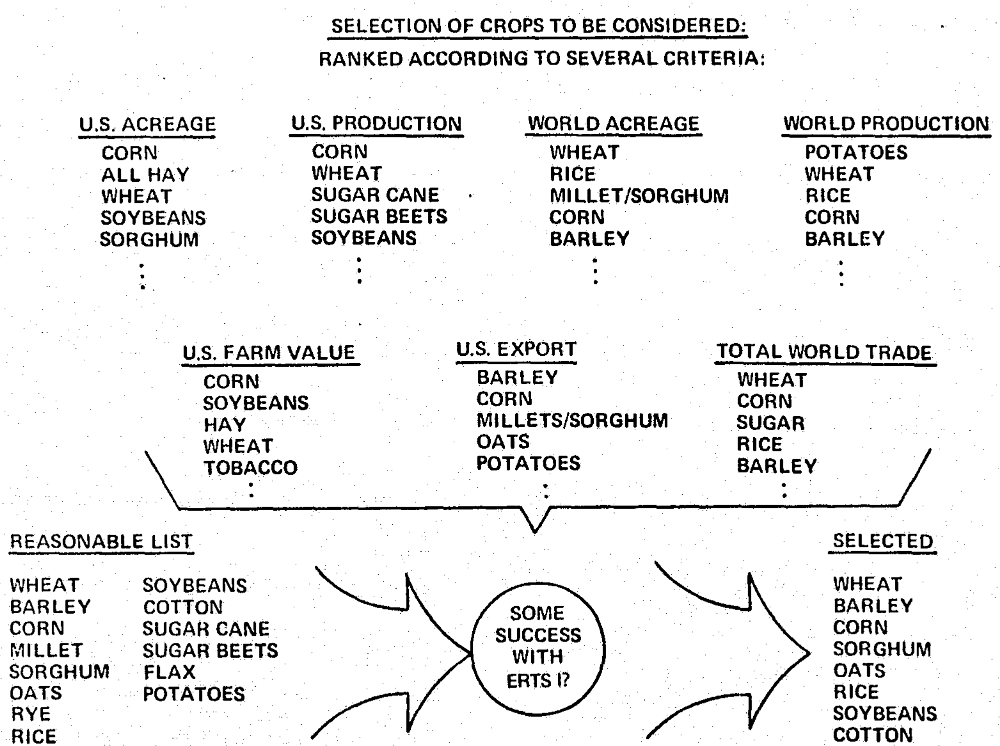


Figure 2-4. A Schematic Representation of the Task 3A Crop Selection Procedure

As a final screening process, this candidate list was then evaluated in terms of results thus far obtained from ERTS. This was intended to give full assurance to one of the basic assumptions of this study, namely, that the missions being considered must have a high probability of being able to be accomplished operationally in the Shuttle Era. The application of this screening criterion resulted in the final selection of wheat, barley, corn, sorghum, oats, rice, soybeans, and cotton as the crops to be included in this study.

### 2.2.2 USER IDENTIFICATION

In identifying the community of potential users of TERSSE world crop survey data, the study team, as directed, has considered only U. S. users. Initially, the user community was divided into five groups of user types: federal, state, local, academic, and private. Comprehensive lists of users were then developed for each of these groups, as shown in Table 2-3. However, because of the practical constraints of time and effort, only a representative sample of these users could be investigated in depth. In prioritizing the contact of the study team with these user organizations, full consideration was given to the probable impact of these organizations on the TERSSE from the points of view of being providers of information to the agricultural community as well as users of crop data.

Table 2-3. Potential U. S. Users of World Crop Survey Data

Federal:

1. Statistical Reporting Service (USDA)
2. Agricultural Stabilization & Conservation Service (USDA)
3. Economic Research Service (USDA)
4. Foreign Agricultural Service (USDA)
5. Soil Conservation Service (USDA)
6. Animal & Plant Health Inspection Service (USDA)
7. Extension Service (USDA)
8. Agricultural Marketing Service (USDA)
9. Commodity Exchange Authority (USDA)
10. Commodity Credit Corp. (USDA)
11. Export Marketing Service (USDA)
12. Federal Crop Insurance Corp. (USDA)
13. Bureau of Reclamation (USDI)
14. Geological Survey (USDI)
15. Bureau of Indian Affairs (USDI)
16. Bureau of Sport Fisheries & Wildlife (USDI)
17. Corps of Engineers (DOD)
18. Dept. of Housing and Urban Development
19. Economic Development Administration (DOC)
20. Dept. of State
21. Tennessee Valley Authority
22. Various regional and river basin commissions

State:

1. Departments of Agriculture
2. Resource development/planning agencies
3. Departments of employment/human resources

Local:

1. County agricultural extension offices
2. Water/irrigation districts
3. City and county planning departments (sometimes metropolitan, e.g. DURPC)
4. Soil conservation districts

Academic:

1. Universities (especially state land grant)
2. Research organizations

Private Sector:

1. Family farms
2. Corporate farms
3. Commodity storage firms (e.g., elevators and warehouses)
4. Banks/savings & loan institutions
5. Farm credit organizations
6. Farm lobby groups (e.g., National Farm Bureaus)
7. Marketing associations (e.g. Sunkist)
8. Cooperatives
9. Food processes
10. Wholesalers and retailers of fresh and processed commodities
11. Brokers
12. Commodity exchanges
13. Transport companies (mainly rail and truck)
14. Producers & distributors of farm machinery
15. Producers & distributors of agricultural chemicals (e.g., pesticides, fertilizers, soil amendments)
16. Producers & distributors of seed and nursery stock
17. Insurance companies
18. Providers of harvesting services (e.g., wheat harvesters)
19. Exporters/importers of raw and processed commodities
20. The media (radio & TV; newspapers, magazines)
21. The consumer

The representative federal users investigated, SRS, FAS, and ERS, along with the international organization FAO will be discussed in the following section on Major Sources of Crop Information, while other federal users of world crop data along with users selected from the state, local, academic, and private sector groups will be discussed in the subsequent section on "Crop Data Users".

## 2.3 MAJOR SOURCES OF CROP INFORMATION

### 2.3.1 INTRODUCTION

Two of the indicated federal users, the SRS and the FAS, as well as the UN's FAO are major collectors of crop data, and as such would be users of basic world crop survey data from the TERSSE. The remaining selected federal user, the ERS, is primarily a compiler of data collected by these as well as other data gathering agencies. Each organization publishes and distributes agricultural documents which collectively represent the major sources of crop information available today to U.S. agricultural interests. A comprehensive list of releases and documents published by the federal organizations listed above and by others within the USDA have been compiled by M. W. Johnson of the Publications Division of the USDA and is issued as List No. 11, July 1971.

The SRS is the main U.S. agency responsible for the gathering and dissemination of U.S. agricultural data, while the FAS is the major U.S. agency associated with gathering and dissemination of foreign agricultural data. The FAO, a United Nations organization, also collects, compiles, and distributes global crop data worldwide. The ERS uses information collected by these organizations to prepare numerous types of economics-oriented agricultural information and statistics. A more detailed discussion of the activities and outputs of the SRS, FAS, FAO, and ERS is presented below.

### 2.3.2 STATISTICAL REPORTING SERVICE

The Statistical Reporting Service (SRS) is the principal U.S. data gathering agency within the U.S. Department of Agriculture; therefore, it is a very important potential user of TERSSE agricultural data output. The basic mission of SRS is to provide coordinated leadership for the statistical reporting research and service programs of USDA and to provide a channel for the orderly flow of statistical intelligence pertaining to the Nation's agricultural economy. SRS performs functions in the areas of crop and livestock estimates, coordination and improvement of USDA statistical programs requirements, and survey of market potentials for agricultural products. The data collected and analyzed is used by an almost endless number of federal, state, and local agencies, academic institutions, and private organizations. SRS-generated statistics are used to facilitate the myriad management decisions required to enable U.S. agriculture to achieve the success it has, wherein 5% of our population living on farms supplies the rest of the domestic population and permits the export of more than one-seventh of U.S. farm output. An extensive listing and discussion of users of reports issued by SRS appears in Agriculture - Environmental and Consumer Protection Appropriations for 1973, one of a series of documents presented at hearings before a subcommittee of the Committee on Appropriations, House of Representatives, 92 Congress, 2nd Session. This discussion, which summarizes rather well the interests of the users of SRS publications, appears as Appendix A to this TERSSE report.

SRS is composed of four divisions, the Crop Reporting Board, and forty-four state statistical field offices. The Agricultural Estimates Division has the responsibility for defining data inputs and outputs, prescribing the statistical techniques and methodologies to be used in SRS surveys, and serving as the principal contact point with data users. The Survey and Data Division is responsible for the design and initial clearance of forms, formulation of data collection instructions, conduct of training schools, data processing, and publication of reports. The Standards and Research Division performs methodological research, conducts consumer preference surveys, and obtains approval from the Office of Management and Budget for USDA survey plans and questionnaires. The Washington Data Processing Center basically functions as a computer service center for USDA activities in the Washington, D. C. area.

The Crop Reporting Board has the responsibility of reviewing and adopting the agricultural estimates which are published in official USDA crop and livestock reports on specific dates. Unlike the four divisions discussed above, the Board is not a fixed element of SRS, but is convened periodically. Permanent members of the Board are the Deputy Administrator of SRS, who serves as board chairman, the Director of the Agricultural Estimates Division who is the Vice Chairman, and the Chief, Data Services Branch, Survey and Data Division, who serves as Secretary. The Board members are designated by the chairman for each report from commodity specialists of the Agricultural Estimates Division, and statisticians from other SRS divisions and from state statistical offices. State representation on the Board changes for each report, both to provide representation of all portions of the country and to assure that statisticians with firsthand knowledge of the important producing areas contribute to the final determination of the forecasts and estimates.

The SRS also has forty-four state statistical offices which serve the fifty states. The six New England states are handled from one office in Boston. Maryland and Delaware are handled from one office in College Park, Maryland. Elsewhere, there is an office in each state. These offices report directly to the Office of the Administrator of SRS and are responsible for collecting and processing data for transmittal to the Survey and Data Division in Washington, publishing statistical information relevant to their states, and maintaining contact with the states' agricultural community.

The SRS Crop Statistics Program encompasses all major crops including field crops, field and vegetable seeds, fruits, nuts, fresh market and commercial processing vegetables, flowers and foliage plants, and naval stores. The consumption of fertilizer is also covered in the program. Of most interest to this study task are the SRS activities relating to the preparation and publication of crop estimates, forecasts, and related data for the eight crops previously selected for investigation.

Estimates and forecasts by the SRS are based largely on the use of probability and non-probability enumerations. Ancillary data is obtained from sources such as the Census of Agriculture, acreage reports from the Agricultural Stabilization and Conservation Service, and a variety of privately prepared reports.

The non-probability survey method is the only type used for yield estimation for certain crops. Crop reporters, who maintain a relationship over the years with USDA, report the agricultural situation and outlook in their community in relation to previous years. In addition, surveys are conducted using lists of farmers as the sample population. Examples of some of the forms used for these surveys during different times of the year are shown in Appendix B. This material is included to illustrate the nature of the basic crop information compiled by SRS. Also, surveys are conducted by giving postcards to mailmen for distribution to "representative" people on the mail routes.

Regression techniques are employed using census data to remove the known persistent bias from non-probability survey estimates. Although no comprehensive studies of the validity of the non-probability survey method have been performed, they are generally considered to be more accurate than probability surveys for acreage estimation of several minor crops for which the sampling error associated with a probability survey is very high.

Increasingly, SRS is relying upon a probability sampling method for the estimation of crop acreage and for the estimation of yield for a small number of major crops. In the probability sampling method, a stratified area sampling plan is employed. Area frames are constructed using photo mosaics at the scale of 1" = 1 mile. Each area frame is divided into strata according to intensity of agriculture. This permits the use of lighter sampling in the less cultivated and heavier in the more intensely cultivated areas as is shown in Figure 2-5. Each stratum is is then divided further, the smallest level of division being the sampling unit. Sizes of the sampling units vary from about one mile square for intensely cultivated land to ten miles square or more for less cultivated land. Sampling unit data is collected by enumerators supplied with 1:7500 scale air photo and county road maps. These enumerators interview all farmers within the unit and plot their findings on the air photo map. The data obtained from each sample unit is "expanded" to the stratum level and used to ultimately produce forecasts and estimates for the entire area frame. The expansion factor used for a particular sample unit is the inverse of the probability of selection of that sample unit within the stratum in which it appears.

Sampling errors are the inaccuracies that occur because only part of the total population is surveyed. Non-sampling errors are the inaccuracies that occur because of imperfections in survey methods. For instance, in estimating wheat acreage planted, USDA cannot afford to survey all wheat farmers, so a representative sample is selected.

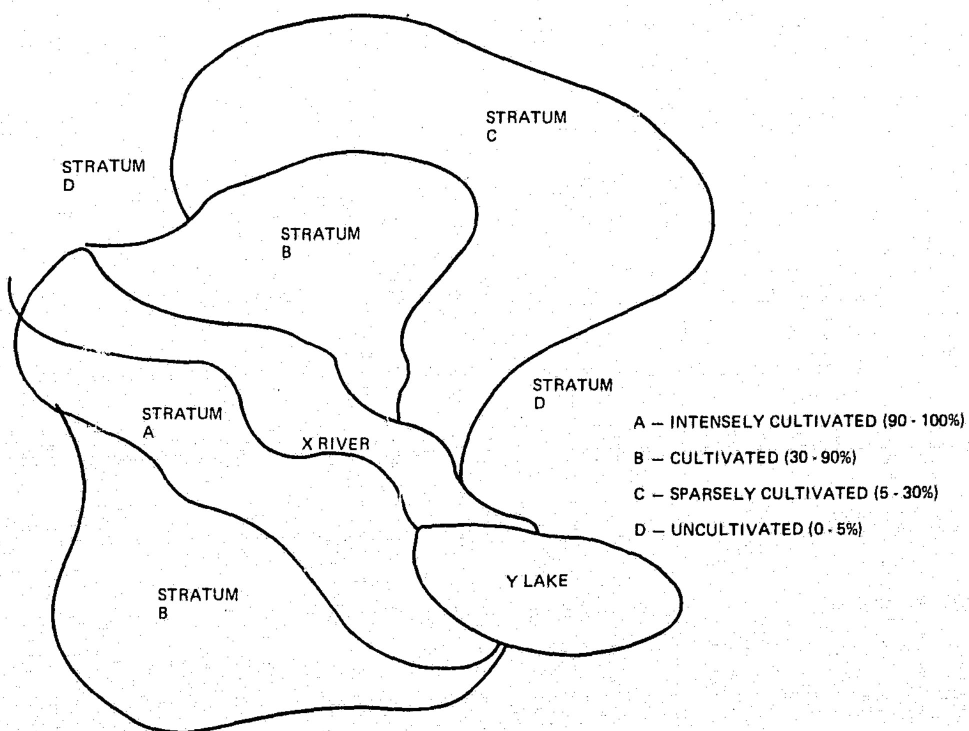


Figure 2-5. Area Stratification by Intensity of Agriculture

Because that sample can not perfectly mirror the population of all wheat farmers, sampling errors are introduced. Additional imperfections (nonsampling errors) can occur as a result of errors in crop identification or crop acreage estimates within each sample. These could be introduced by inaccurate reporting on the part of the farmers or the enumerators. The sampling and nonsampling errors must be combined to produce an estimate of total error. The functional sources of sampling and nonsampling errors of probability surveys can be summarized as follows:

The sampling errors are principally:

- Sample size
- Percentage of total area sampled
- Overall sampling design, including stratification effectiveness
- Geographic size of a sampling unit;

Whereas the nonsampling errors are principally:

- Errors made by the ground enumerators
- Inaccuracy of farmers responses
- Imperfections of the measurement procedures set up by USDA

Kelly[1] presents a fairly thorough discussion of sampling and agricultural statistics problems as well as a discussion of various national programs of agricultural statistics.

The estimates and forecasts are first developed at the forty-four SRS field offices located throughout the U. S. At the field office level, sample data is edited, analyzed, and expanded into state averages or totals called "indications." Subsequently, the state-level data is transmitted to the SRS Crop Reporting Board for review. Once all the data has been reviewed, the Crop Reporting Board then establishes official estimates and forecasts for the entire nation and the states.

The first survey of the season estimates intentions to plant. This is a nonprobability survey, computed in March. The first acreage survey for most crops is the June enumerative survey, a probability survey. All later probability surveys employ subsamples of the June survey sample. Some nonprobability acreage sampling is also done in June. Acreage estimates are updated periodically throughout the growing season.

The first yield forecast for most crops is computed in August. The objective yield probability survey is conducted for a limited number of crop types. Nonprobability yield surveys are conducted for the many other crop types. These forcasted yields are updated periodically through the growing season. In November and December, post-harvest surveys are conducted to estimate, as closely as possible, actual production. A schematic representation of the entire SRS crop forecasting procedure is shown in Figure 2-6.

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[1] Kelly, Bruce W., "Sampling & Statistical Problems," in Committee on Remote Sensing for Agricultural Purposes, National Research Council, Remote Sensing with Special Reference to Agriculture and Forestry (Washington, D. C.: National Academy of Sciences, 1970), pp. 324-353.

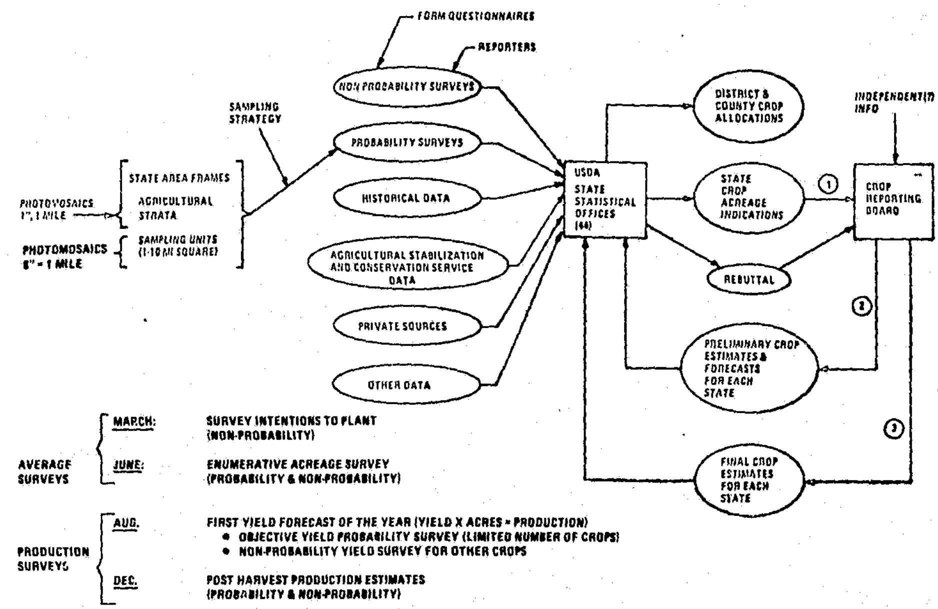


Figure 2-6. Statistical Reporting Service Crop Forecasting Procedure

It should be noted that the time when a specific type of crop data is collected is also dependent upon the crop involved, that is, the month when the planting intention, acreage enumeration, production forecast, and final production estimate is made is determined by the crop calendar (growing season) of the crop. For example, a March 14, 1974 release by the Crop Reporting Board of SRS contains planting acreage intentions for most of the crops that will be harvested in 1974, including corn, sorghum soybeans, tobacco, cotton, and spring wheat; whereas, the acreages of winter wheat seeded in the fall of '73 for harvest in '74 was contained in a December 21, 1973 release.

As alluded to above, the Crop Reporting Board of SRS prepares periodic "releases" of crop and livestock production and related reports. The law which requires the Department of Agriculture to issue monthly crop reports states that a report is to be printed and distributed before the 12th of each month. It is to contain statements on the condition of crops by states for the U. S. and must contain such explanations and comparisons as may be useful. The types of information published by the Crop Reporting Board and their 1974 release dates are shown in Table 2-4. Reports are released in Washington, D. C. on the dates shown, with local segments of many of them being issued on the same day at the SRS field offices.

The impact of the crop data released by the Crop Reporting Board upon agri-business and indeed the entire U. S. economy is enormous; therefore, a strict information preparation and release procedure has been adopted. In the case of crops defined by law as "speculative," presently including corn, wheat, oats, cotton, and soybeans, a "lockup" procedure is strictly followed. It is felt that since these commodities are traded in the commodity futures market, anyone having access in advance to official production forecasts would have clear advantages.

Reports of survey data on the speculative commodities from the major producing states go through the mails in distinctive envelopes and receive special handling. When they arrive in Washington, they are placed in a special steel box that is secured with two separate locks. The key to one lock is retained in the Office of the Secretary, and the other is in the custody of the Chairman of the Crop Reporting Board.

# Table 2-4. 1974 Calendar of Crop, Livestock, and Price Reports[1]

| (Released 3:00 p.m. unless noted.) | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crop Production | 9 | 8 | 8 | 10 | 8 | 10 | 11 | 12 | 11 | 10 | 8 | 10 |
| Annual Summary 1973 | 16 | | | | | | | | | | | |
| Prospective Plantings, 1974 | 22 | | 14 | | | | | | | | | |
| Winter Wheat 1975 | | | | | | | | | | | | 23 |
| Crop Values | 16 | | | | | | | | | | | |
| Exports | Every Friday. | | | | | | | | | | | |
| **Field and Seed Crops** | | | | | | | | | | | | |
| Field Crops - Annual Summary 1973 | | | | | 10 | | | | | | | |
| Potatoes and Sweetpotatoes - Annual Summary 1973 | | | | | | | | 23 | | | | |
| Seed Crops | 16 | | 18 | | | 20 | 16 | 2, 5, 15, 22 | | 10, 22 | | |
| Annual Summary 1973 | | | | | 30 | | | | | | | |
| Small Grains—Annual Summary in Crop Production | | | | | | | | | | | | 10 |
| Popcorn, Acreage | | | | | | | 12 | | | | | |
| Popcorn, Production and Value | 16 | | | | | | | | | | | |
| Grains Stocks | 24 | | | 24 | | | 24 | | | 24 | | |
| Hop Stocks | | | 19 | | | | | | 17 | | | |
| Naval Stores | 21 | 20 | 20 | 19 | 21 | 20 | 19 | 20 | 23 | 21 | 20 | 20 |
| Annual Summary 1973 | | | | | 16 | | | | | | | |
| Peanut Stocks and Processing | 25 | 25 | 25 | 25 | 24 | 25 | 25 | 26 | 26 | 25 | 25 | 23 |
| Seasonal Report | | | | | | | | | 19 | | | |
| Potato Stocks | 9 | 8 | 8 | 10 | | | | | | | | 10 |
| Rice Stocks | 24 | | | 24 | | | | 26 | | 24 | | |
| Soybean Stocks | | | | | | | | | 20 | | | |
| **Fruits and Nuts** | | | | | | | | | | | | |
| Apples - by Varieties | | | | | | | | 14 | | | | |
| Fruits, Citrus - Annual Summary 1973-1974 | | | | | | | | | | 1 | | |
| Noncitrus Fruits, Nuts - Annual Summary[2] | 14 | | | | | | 11 | | | | | |
| Cranberries - Indicated Production (1:00 P.M.) | | | | | | | | 20 | | | | |
| Cherries | | | | | | 21 | | | | | | |
| **Vegetables** | | | | | | | | | | | | |
| Onion Stocks | 18 | | | | | | | | | | | |
| Vegetables - Fresh Market | 8 | | 8 | 8 | 8 | 7 | 8 | 8 | 9 | 8 | 8 | |
| Vegetables - Processing | | | 29 | | | 27 | 9 | 8 | 10 | | 15 | 19 |
| Cucumbers for Pickles, Stocks | | | | | | | | | | | 15 | |
| Celery Report (Fla., Calif., Ohio, N.Y., and Mich.) | 4 | 5 | 5 | 4 | 6 | 4 | 5 | 5 | 4 | 4 | 5 | 5 |
| Tomatoes, Released at Orlando Fla. | Each Tuesday during planting and harvest seasons (usually Sept.-May) | | | | | | | | | | | |
| Vegetable Seed Stocks | | | | | | | | 16 | | | | |
| **Dairy Products** | | | | | | | | | | | | |
| Milk Production | 10 | 11 | 11 | 11 | 9 | 11 | 12 | 13 | 12 | 11 | 11 | 11 |
| Milk Cow Numbers | | 11 | | | | | | | | | | |
| Milk - Production, Disposition, and Income 1972-1973, by States | | | | 22 | | | | | | | | |
| Production of Manufactured Dairy Products, 1973 | | | | | | 20 | | | | | | |
| Dairy Products: | 30 | 28 | 29 | 30 | 31 | | 1, 30 | 30 | 30 | 31 | 29 | 31 |
| American Cheese Production - Released at Madison, Wis. | Every Wednesday | | | | | | | | | | | |
| Creamery Butter Production - Released at Madison, Wis. | Every Tuesday | | | | | | | | | | | |
| **Livestock and Products** | | | | | | | | | | | | |
| Cattle | | 1 | | | | | 26 | | | | | |
| Sheep and Goats, Jan. 1, 1974 | 28 | | | | | | | | | | | |
| Meat Animals - Disposition and Income | | | | 12 | | | | | | | | |
| Livestock Slaughter and Meat Production | 29 | 27 | 28 | 29 | 30 | 28 | 30 | 29 | 27 | 30 | 27 | 30 |
| Annual Summary 1973 | | | | 29 | | | | | | | | |
| Cattle and Calves on Feed | 18 | 13 | 13 | 18 | 14 | 13 | 18 | 14 | 13 | 18 | 13 | 13 |
| All States, Annual Summary | 18 | | | | | | | | | | | |
| Hogs and Pigs | | | 22 | | | 21 | | | 20 | | | 23 |
| Sheep and Lambs on Feed | 16 | | 14 | | | | | | | | 14 | |
| Wool and Mohair Production and Value 1973 | | | | 12 | | | | | | | | |
| Lamb Crop and Wool Production 1974 | | | | | | | 23 | | | | | |
| Special Wheat Pasture in Crop Production | | | | | | | | | | 10 | 8 | 10 |
| Honey | 15 | | | | | | | | 25 | | | |
| Mink | | | | | 10 | | | | | | | |

Table 2-4. 1974 Calendar of Crop, Livestock, and Price Reports[1] (Continued)

| (Released 3:00 p.m. unless noted.) | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Poultry and Eggs** | | | | | | | | | | | | |
| Chickens, Eggs and Commercial Broilers: Disposition and Income | | | | 3 | | | | | | | | |
| Commercial Broilers, 22 States 1973 | | | 6 | | | | | | | | | |
| Egg Products | 9 | 6 | 6 | 3, 30 | 29 | 24 | 24 | 23 | 20 | 16 | 13 | 12 |
| Eggs, Chickens and Turkeys | 18 | 20 | 19 | 18 | 17 | 18 | 18 | 16 | 18 | 18 | 19 | 18 |
| Layers, and Egg Production 1972 & 1973 | | 20 | | | | | | | | | | |
| Poultry - Slaughter and Processing | 4 | 1 | 7 | 4 | 2 | 3 | 3 | 1 | 3 | 3 | 1 | 5 |
| Chicken Inventory | 18 | | | | | | | | | | | |
| Hatchery Production | | | 19 | | | | | | | | | |
| Turkeys - Production and Income | | | 7 | | | | | | | | | |
| Turkey Breeder Hens, Dec. 1, 1973, Turkey Raised - Intention - 1974 | 9 | | | | | | | | | | | |
| Turkey Breeder Hens, 1975 Intentions | | | | | | | | | 18 | | | |
| Turkeys Raised 1974 | | | | | | | | 23 | | | | |
| Turkey Hatchery Report - released in States concerned | | | | | | Every Thursday | | | | | | |
| Broiler Hatchery Report - Released at Richmond, Va. | | | | | | Every Wednesday | | | | | | |
| **Other Reports** | | | | | | | | | | | | |
| Agricultural Prices | 31 | 28 | 29 | 30 | 31 | 28 | 31 | 30 | 30 | 31 | 29 | 31 |
| Agricultural Prices, Annual Summary 1973 | | | | | | June | | | | | | |
| Prices Received by Farmers for Manufacturing Grade Milk in Minnesota and Wisconsin | | | | | | | 31 | | | | | |
| Cold Storage | 17 | 19 | 18 | 19 | 17 | 18 | 19 | 19 | 18 | 17 | 18 | 18 |
| Regional 1973 | | | 22 | | | | | | | | | |
| Warehouse Capacity | | | 1 | | | | | | | | | |
| Commercial Fertilizers | 29 | 28 | 29 | 30 | 31 | 28 | 31 | 30 | 30 | 30 | 29 | 31 |
| Commercial Fertilizers, year ended June 30, 1973 | | | | | 7 | 7 | | | | | | |
| Commercial Fertilizers, year ended June 30, 1974 | | | | | | | | | | | 1 | |
| Flowers and Foliage Plants, 1973 | | | 27 | | | | | | | | | |
| Farm Labor | 14 | 8 | 11 | 12 | 8 | 10 | 12 | 9 | 10 | 11 | 8 | 10 |
| Farm Numbers and Land in Farms | 4 | | | | | | | | | | | 30 |
| Mushrooms | | | | | | | | 21 | | | | |

[1] Actual titles are given unless several reports with different titles but similar content are released during the month or year, in which case reports are grouped under one heading.

[2] Report of July 11 is a midyear supplement.

Early in the morning on crop report day, the Chairman of the Crop Reporting Board and a representative of the Secretary, under armed guard, open the box, remove the reports, and take them to the board rooms.

While crop reports are being prepared, the board rooms are locked and placed under uniformed guard. Guards also patrol the area outside the lockup quarters. The window blinds are closed and sealed, and all telephones are disconnected. Food is sent in to the employees. There is no communication out of the area until the Board emerges to release its report to the waiting news media.

The Secretary or his representative usually enters the lockup quarters about 15 minutes before 3 p.m. The Board members explain the forecasts and the logic behind them. The Secretary then signs the report, and it is issued promptly at 3 p.m.

Release of somewhat less influential statistics is preceded by a "small area lockup" lasting from 12:30 to 3:00 p.m. Other Crop Reporting Board releases are simply made available at 3:00 p.m. on the designated day.

The information collected by SRS on crops in general is published in reports entitled Crop Production. A brief description of the contents of the various issues and the release dates of Crop Production reports published during 1974 are presented in Appendix C. Relevant pages from a typical Crop Production report issued May 8, 1974 are also included in Appendix C. As may be seen, in addition to a discussion of various aspects of the '74 winter wheat crop and a listing of acreage, yield, and production statistics for '72-'74, the report presents and discusses orange, grapefruit, peach, potato, and almond production forecasts. A detailed breakdown is also given of the final 1973 and 1972 production estimates of various unprocessed cotton and tobacco products. As indicated earlier, the same level of information on all crops does not appear in every report due to differences in planting calendars.

In January of each year an annual summary of acreage, yield, and production estimates is published. This report presents values of production for the previous decade as well as acreage and yield information for the previous three years. Some examples of the format with which the data are presented are also included in Appendix C.

A description and the release dates of the SRS reports on specific crops is presented in Appendix D. The format of one of these reports, Grain Stocks, is also illustrated in this Appendix.

In addition to these crop-related issuances, the Weekly Weather & Crop Bulletin is published as a joint effort between the SRS and the National Oceanic and Atmospheric Administration (NOAA). It summarizes weather and its effects on crops for the previous week. Condensed state summaries give both weather and farm progress for 43 states and the New England area. The information routinely published in this document is shown in Table 2-5.

The SRS also publishes a periodical, Agricultural Situation, issued eleven times a year. This document presents articles on current trends in agriculture and the latest in research. Regular features include a tabular summary of key agricultural statistics and review and outlook of current production, supply, and price trends.

Table 2-5. Items Published Regularly in Weekly Weather and Crop Bulletin

| | |
|---|---|
| **Weather Summaries:** | |
| Weather of the Week | Each issue |
| Weather, Monthly Summaries | First issue of each month |
| Weather, Seasonal Summaries | Second issue of Mar., June, Sept., and Dec. |
| Precipitation, 3-month Summaries | Second issue of Jan., Feb., Apr., May, July, Aug., Oct., and Nov. |
| **Agricultural Summaries:** | |
| Small Grains | Each issue |
| Corn | April to December |
| Soybeans | April to December |
| Cotton | April to January |
| Other Crops | Each issue |
| Pastures and Livestock | Each issue |
| Condensed Telegraphic Summaries | Each issue |
| Water Supply Forecasts for Western States | January to April |
| Floods | Whenever they occur |
| World Weather and Agriculture | As appropriate |
| **Charts:** | |
| Weekly: | |
| Total Precipitation | Each issue |
| Departure of Average Temperature from Normal (°) | Each issue |
| Depth of Snow on Ground, Inches | December to March |
| Total Growing Degree Days | April to November |
| Crops Moisture Index | April to November |
| Monthly: | |
| Temperature Departure from 30-Year Mean | First issue of following month |
| Total Precipitation, Inches | First issue of following month |
| Percentage of Normal Precipitation | First issue of following month |
| Weather Highlights | First issue after 20th of following month |
| Bimonthly: | |
| Average Monthly Weather Outlook | First issue after 1st and 15th of each month |
| Seasonal: | |
| Temperature Departure from 30-Year Mean (°F) | Second issue of Mar., June, Sept., and Dec. |
| Total Precipitation, Inches | Second issue of Mar., June, Sept., and Dec. |
| Percentage of Normal Precipitation for Season | Second issue of Mar., June, Sept., and Dec. |
| Percentage of Normal Precipitation for Previous 3 months | Second issue of Jan., Feb., Apr., May, July, Aug., Oct., and Nov. |
| **Tabulations:** | |
| Temperature and Precipitation Data for Week | Each issue |
| Temperature and Precipitation Data for Month | First issue of following month |
| Heating Degree Days for Month | First issue of following month |

## 2.3.3 FOREIGN AGRICULTURE SERVICE

### 2.3.3.1 Introduction

The Foreign Agriculture Service (FAS) is a part of USDA, and functions as a service and promotion agency for the U. S. Agricultural export sector.

FAS presently constitutes the most important domestic source of information on global crop conditions. In pursuing its basic mission of expanding foreign markets for U. S. farm commodities, FAS performs work in three broad areas: (1) the increase of the volume of U. S. agricultural exports to dollar markets; (2) the operation of a global agricultural intelligence system; and (3) the provision to the American consumer of information on foreign farm products.

To encourage increased American agricultural exports, the FAS works principally in two ways. First, FAS works in various ways to persuade foreign governments to lower trade barriers which have been imposed against American farm products; and second, FAS attempts to develop foreign markets by cooperating with major U. S. trade and commodity organizations in promotional projects abroad.

The second major area of work of the FAS involves the operation of a global agricultural intelligence system which provides data on the production, trade, and consumption of more than 200 farm commodities. In addition, the system also provides information on weather, political and economic conditions, and other factors having a bearing upon agriculture.

The FAS represents the main source of information available to the American consumer on foreign agricultural commodities. As such, the FAS provides information pertaining to the quantity, quality, and availability of foreign farm products. The information primarily deals with products which are not grown domestically, such as coffee, cocoa, tea, bananas, spices, and vegetable fibers. Information is also provided for some products which are grown domestically, such as sugar, but for which overseas sources represent a major segment of the supply required for domestic consumption.

### 2.3.3.2 FAS Global Agricultural Intelligence System

The core of the FAS intelligence system is comprised of agricultural attaches. As of 1970, attaches were stationed at 60 posts around the world, covering more than 100 countries. Some of the attaches cover only the countries in which they are stationed. Others are responsible for covering a region. The attaches visit all countries, with the exception of mainland China and some of the countries in the Soviet block. In situations where direct contact is not possible, as with mainland China, information is obtained from indirect sources.

The attache is responsible for preparing field reports pertaining to agricultural conditions in his territory. Such reports contain a variety of information. In addition to providing facts about production, trade, and consumption, they also deal with such things as weather and political and economic conditions. The worldwide reporting activities of the agricultural attaches are based upon a master schedule which is developed in Washington. Central coordination is necessary in order that all information pertaining to a given commodity can be collected, assembled, and sent to Washington at fixed dates. Receipt of information on fixed dates makes it possible to carry out full, worldwide analysis at one time. The frequency of report submittal varies according to commodity. Preparation procedures and format which apply to attache field reports are outlined in detail in the FAS "Redbook."

Although the schedule of required reports constitutes the heart of the intelligence effort, the attache also collects foreign publications dealing with various aspects of agriculture in the territory which he covers.

Each year more than 5,000 reports and 2,500 foreign publications are forwarded by attaches to the FAS headquarters in Washington. The majority of these reports deal with such items as changes in anticipated production levels, weather damage, pest infestation, new tariff decisions, and major changes in agricultural policy.

The majority of reports are sent to Washington by means of fast mail; however, in situations where information is urgently needed, use is made of cable facilities.

In gathering the data for a report, attaches follow no set pattern. To a great extent, the pattern of acquisition is dependent upon the availability of reliable data. In countries with well-developed agricultural statistical sources, much of the required data can be obtained from government sources. On the other hand, in countries with primitive statistical services, information may be spotty, nonexistent, or subject to scrutiny. Cross-checking of data under such circumstances is often impossible.

Depending on the commodity for which information is required, the attache will interview businessmen, importers, exporters, processing organizations, and other sources. However, even when information is reasonably complete, it is still necessary for the attache to observe physically the crop or livestock condition in the field, factory, or processing plant. Crops are rarely concentrated in one area; hence, the attache must visit a large number of scattered fields in order to develop a basis upon which to forecast and estimate production levels. In many instances, the task is complicated by factors such as language barriers, poor roads, inadequate communications facilities, and lack of historical data.

Upon receipt in Washington, the field reports are processed immediately and relayed to the appropriate individuals or commodity or trade divisions. At this point, the data in the field reports are analyzed, and summaries are published, or otherwise distributed to users in the U.S. who have an interest in foreign trade.

A diagram of the flow of information through the FAS is detailed in Figure 2-7.

#### 2.3.3.3 Data Summaries and Publications of the FAS

The data collected by the attaches are analyzed and summarized and may be published individually, as parts of regional or worldwide digests, or as parts of a weekly magazine. The major beneficiaries of this information are producers, traders, and processors; however, banks, brokers, farm and trade organizations, universities, and the media are also important users of FAS publications. Some of the major publications of FAS include: Foreign Agriculture magazine, World Agricultural Production and Trade Statistical Report, Foreign Agriculture Circulars, and a variety of special reports.

Foreign Agriculture magazine reports weekly on foreign agricultural conditions and developments of consequence to U.S. producers, processors, distributors and users of farm products. Principal emphasis is on current and background information useful to export marketing, including programs to expand U.S. agricultural exports.

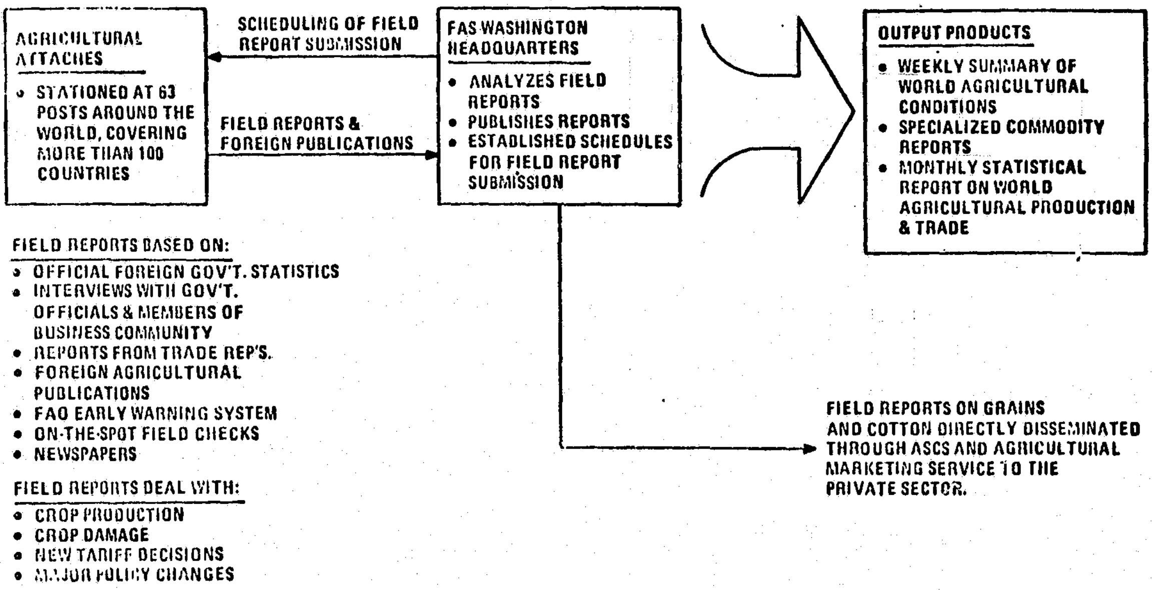


Figure 2-7. Information Flow in the Foreign Agricultural Service

Current news items and statistics on various commodities are included in the magazine section entitled "Crops and Market Shorts."

World Agricultural Production and Trade Statistical Report is published monthly, and provides statistical summaries on the production and trade of the principal commodities which move in world trade. The specific commodity summaries are released according to a pre-published schedule. The schedule for January-June 1974 entitled Release Date of 1974 World Agricultural and Trade Statistical Report is included as Appendix E. Text and table summarizing 1973 world wheat production from the January 1974 issue of World Agricultural Production and Trade Statistical Report is included as Appendix F to provide a sample of the publication's tabular presentation of statistical data.

The FAS issues a number of Foreign Agriculture Circulars at irregular intervals during the year on various commodities and export services for the food and agricultural trade. The circulars provide data on world trade, production, stocks, and consumption of various commodities for specific time frames. A list of available circulars and a sample of the tabular presentation of data extracted from Foreign Agriculture Circular FG 15-73, December 14, 1973 are included as Appendix G.

Special reports on foreign agriculture, particularly relating to agricultural commodity and trade policy developments are also published by the FAS. These reports appear in two different series — FAS-M and FAR. The FAS-M series consists of reports on recent developments; the FAR series consists of more comprehensive reports covering situations in greater depth. A list of these reports currently available is included as Appendix H.

## 2.3.4 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

### 2.3.4.1 Introduction

The mission of the Food and Agriculture Organization of the United Nations (FAO) is to raise the levels of nutrition for all people, to improve the production and distribution of food and other agricultural products globally, and in general to better the conditions of rural populations throughout the world. In achieving their goals, the FAO carries out a program of collecting, assembling, assessing and disseminating world agricultural crop data. Sources, publications and questionnaires of the FAO include: Early Warning System for Food Shortages, World Census of Agriculture, FAO Production Yearbook, a variety of questionnaires, and others. Discussions of a few of these FAO information sources are included below.

### 2.3.4.2 Early Warning System for Food Shortages

The Early Warning System for Food Shortages (EWS) was established in May 1968 so that the FAO and World Food Programme (the food aid operational arm of the UN and FAO) could attempt to foresee incidents of major food shortages such as those due to local crop failure. The EWS was designed to assist the FAO and WFP in local planning and in the assessment of emergency food aid requirements.

The EWS has established a regular reporting system in about 70 developing countries with the objective of providing advance warning of food scarcities resulting from adverse crop conditions. Under the system, FAO and WFP field officers compile standard Food Situation Reports each month.

The standard Food Situation Report (FSR) is divided into two parts. Part A includes the field officers' report on crop and weather conditions, classifying these in four categories: above average, average, below average, and partial failure. Part B contains the Shortage Report, which, when necessary, includes condifential information on certain sensitive items. The reporting officers are also instructed that if an abnormal shortage is threatening, supplementary information should also be provided. Such supplementary information usually takes the form of press clippings or a letter giving additional data and even the personal judgment of the reporting officer.

Based on the receipt and analysis of the Food Situation Report, supplemented by available and reliable information from other sources, monthly summaries of food crop conditions are prepared. These are circulated to officers in FAO and WFP, to interested governments and organizations which operate food aid programs, and to some developing countries at their own request. In each monthly summary, those countries from which there is an early warning of poor harvests, or in which uncertain crop conditions are reported, and those countries in which food shortages already exist, are identified. The monthly summaries also include information concerning the crop situation and weather conditions, mostly in qualitative terms of the participating countries. An example of the front page and a page from the text of the monthly report dated 20 February 1974 are shown as Appendix I.

### 2.3.4.3 World Census of Agriculture

The FAO has endeavored to conduct a World Census of Agriculture once each decade. The objectives of the FOA-sponsored census have been:

1. To provide an overall view of the structure of agriculture for each country by supplying an agricultural inventory, measures of social and economic characteristics of holdings, and means for interrelating the characteristics of holdings and holders.

2. To provide a reliable current agricultural statistical base by providing benchmarks and sampling frames for current surveys, and by making available to all nations data with which current national agricultural statistics may be compared.

3. To provide a nucleus of personnel trained and experienced in collecting, compiling, and analyzing data for agricultural holdings and for agriculture.

To conduct such a census the participating countries sponsor the collection of quantitative information on agricultural structure within each country during a single agricultural year. The coverage of the country may be achieved either by complete enumeration or by sampling. In either case, enumeration may be done by interview, mail collection of census data, or by objective procedures, such as measurement of areas, counting of livestock or combinations of these methods. Ideally, the census is to cover all agricultural holdings in a country, whatever their size and wherever they are located. Practical considerations, however, prove to limit these ideal conditions.

The scope of the census includes the following areas:

1. The number of agricultural holdings and their principal characteristics, such as size, form of tenure, utilization of the land by broad classes, and type of holding (whether producing mainly for home consumption or for sale, etc.);

2. The area under crops and the volume of production of the principal crops;

3. The number of livestock and the volume of production of some livestock products;

4. The number and characteristics of persons employed in agriculture, the extent to which the work on holdings is carried on by the households or by hired agricultural workers;

5. The number and some characteristics of the farm population;

6. The number of agricultural machines owned, the use of agricultural machinery under different arrangements and availability of transport facilities;

7. Irrigation and drainage;

8. The use of fertilizers and soil dressings;

9. Wood and fishery products obtained from agricultural holdings;

10. The extent to which agriculture is associated with other industries.

The tabulation of census results is dependent on the speed and accuracy of the information returned by the participating countries. Coverage in the publication of the FAO World Census of Agriculture is limited with respect to its explanations, analysis, and completeness of data by the availability of published census materials from the various countries.

2.3.4.4 Production Yearbook

The FAO Production Yearbook contains annual data of many aspects of food and agriculture including population, index numbers of agriculture and food production, food supplies, prices, freight rates, and wages. Information found in the Yearbook is obtained primarily from replies to FAO Annual Questionnaire for the Production Yearbook and consultation with participating countries. As initiated in the 1966 edition of the Yearbook, the time reference policy, with a few exceptions, is based on the calendar year period. That is to say, the data for any particular crop refers to the calendar year in which the entire harvest or bulk thereof took place.

Livestock statistics are given for calendar years unless otherwise specified. For prices, the time reference for each annual average is indicated under the calendar year in which the beginning month of the season falls. In the case of wholesale, export and import prices, annual averages have been calculated on the calendar year rather than the split year basis. Annual producer prices are compiled on a split year basis, following, in most cases, national statistical practices.

Figures for crop areas generally refer to harvested areas except for certain crops in certain countries where the only data available is for sown areas. Data on grapes, abaca, agaves and other hard fibers generally refer to planted areas. All yields for individual countries are computed from detailed production and area data. Continental, regional, and world totals are computed from the individual country yields. The continental regional and world totals are shown for land use and population data, for crops, for major species of livestock, for meat, wool, cocoons, fertilizers, and tractors. Due to sparce data from some countries, the FAO indicated that certain totals and geographical coverage may not be complete.

2.3.4.5 Questionnaires and Other FAO Publications

Questionnaires distributed to participating countries provide the basis for statistical information which is published or, in other ways, distributed by the FAO. A variety of these questionnaires are briefly presented below. The FAO Annual Trade Questionnaire EC-2 is the basic information source used in compiling the FAO Trade Yearbook. This questionnaire, example presented in Appendix J, provides information on national external trade and external trade of overseas territories on an annual basis.

Much of the data collected for publication in the State of Food and Agriculture and other statistical publications of the FAO are gathered by means of the Special Questionnaire on Agricultural Production Statistics for the Calculation of Index Numbers of Agricultural Production. The mission of this questionnaire is to provide a means of placing the index number calculations of the FAO on a more up-to-date basis. A copy of this questionnaire is also shown in Appendix J. Special study groups of the FAO conduct statistical data collection by means of questionnaires such as FAO Questionnaire on Area Production and Utilization of Rice included in Appendix J, and the FAO Questionnaire on Area, Production and Utilization of Cereals (excluding rice). A listing of additional FAO publications along with those mentioned is available in the Bibliographic Catalogue of FAO Publications.

The aforementioned FAO questionnaires have been included in Appendix J to this report to serve as the simplest form in which to note the type and comprehensiveness of world agricultural data that are routinely available to any organization or individual that desires it. Of course, the information called for in the forms may or may not be provided by the nations queries. It is very much in the realm of this study to note that many nations do not respond fully to the questionnaires; several nations cannot in that they do not have the manpower, the facilities, or the mechanism whereby such information could be gathered. Thus, a very pertinent question remains as to the final accuracy and adequacy of the data published. Its scope and quantity leave no doubt.

## 2.3.5 ECONOMIC RESEARCH SERVICE

### 2.3.5.1 Introduction

The mission of the Economic Research Service (ERS) of the USDA is to analyze factors affecting farm production and their relationship to the environment, prices and income, and the outlook for various commodities. In carrying out this mission, ERS conducts studies pertaining to production efficiency, marketing costs and potentials, rural development and natural resources, agricultural trade and production, and government policies. Included among its publications are: (1) periodic economic reports; (2) annual summaries; (3) periodicals; and (4) nonperiodic reports.

### 2.3.5.2 Periodic Economic Reports

Periodic reports that analyze the economic situation of U. S. agriculture include Situation Reports, Supply-Demand Estimates Reports, Farm Finance Reports, Farm Costs, Return & Efficiency Reports, Foreign Agricultural Trade Reports, and Rural Population Reports.

Situation reports, issued 1 to 6 times a year for each of twelve farm commodity groups, summarize the current situation for each commodity and present the economic outlook for agriculture. They keep up with the current supplies, prices, and outlook and review developments in farm income, farm costs, farm finance, farm real estate, fertilizers, food marketing, and retailing. Brief descriptions of the various Situation Reports published are given in Appendix K. The release dates for the ERS Situation Reports are shown in Table 2-6. Of particular interest are

Table 2-6. 1974 Calendar of Situation Reports

Summaries will be released to the press by the ERS Information Division, USDA, on the date shown in parentheses. The completed report will be released to the public on the following date.

| Report | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cotton Situation | | (12) 21 | | (3) 11 | (23) | 1 | | (22) 30 | | | (1) 11 | |
| Dairy Situation | | | (6) 14 | | (3) 13 | | (2) 11 | | (4) 12 | | (6) 14 | |
| Fats & Oils Situation | (31) | 8 | | (1) 9 | | (21) | 1 | | (26) | 4 | (15) 25 | |
| Feed Situation | | (7) 15 | | | (16) 24 | | | (28) | 6 | | (14) 22 | |
| Fruit Situation | | (20) 28 | | | | (25) | 3 | (29) | 9 | | (5) 13 | |
| Livestock & Meat Situation | | (21) | 1 | (30) | 8 | | (3) 12 | (14) 22 | | (9) 18 | (20) 29 | |
| Poultry & Egg Situation | | (22) | 5 | (23) | 1 | (20) 28 | | | (20) 30 | | (21) | 2 |
| Rice Situation | | | (22) | 1 | | | | | (30) | 8 | | |
| Tobacco Situation | | | (15) 25 | | | (14) 24 | | | (13) 23 | | | (13) 23 |
| Vegetable Situation | | (1) 11 | | (22) 30 | | | (24) | 1 | | (23) | 1 | |
| Wheat Situation | (30) | 7 | | | (20) 29 | | (31) | 8 | | | (12) 20 | |
| Wool Situation | | | | (24) | 3 | | | | | (17) 30 | | |
| Agricultural Finance Outlook | | | (7) 15 | | | | | | | | (18) 26 | |
| Agricultural Outlook Digest[1] | (28) | 5 (27) | 7 (26) | 3 (26) | 6 (24) | 2 (26) | 5 (26) | 5 (26) | 4 (25) | 3 (29) | 6 (26) | 5 |
| Demand & Price Situation | | (15) 26 | | | (10) 20 | | | (27) | 5 | | (11) 19 | |
| Fertilizer Situation | (16) 25 | | | | | | | | | | | (16) 24 |
| Farm Cost Situation | | (26) | 6 | | | | | | | | | |
| Farm Income Situation | | 22 | | | | | 30 | | | | | |
| Farm Real Estate Market Developments | | | | | | | (16) 24 | | | | | |
| Marketing & Transportation Situation | | (19) 27 | | | (13) 21 | | | (9) 19 | | | (13) 21 | |
| National Food Situation | | (14) 25 | | | (8) 16 | | | (23) | 3 | | (8) 18 | |
| World Agricultural Situation | | | | | | | | (30) | 10 | | (25) | 4 |
| Supply-Demand Estimates[2] | 17, 23, 25 | | 15 | 25 | 9 | | 12, 25 | 13 | 12 | 11, 25 | 11 | 11, 24 |

[1]Press summary released on date in parentheses only when new analyses are carried.
[2]Additional unscheduled reports may be issued as conditions warrant.

the Commodity Situation Reports. For example, a March '74 Rice Situation Report contains both a text and tabular summary, a discussion of the '73-'74 situation, an evaluation of the outlook for '74-'75, a look at the world rice situation, and numerous tables which present statistics regarding both U.S. and world acreage, production, price, and export information. The situation for the 1973/74 section of the March '74 issue, is provided as an example in Appendix L.

Typical of the other situation reports are the Agricultural Outlook Digest, a sample of which is shown as Appendix M, and the Fertilizer Situation Report, published annually, looks at the estimated fertilizer production capacity and the potential fertilizer demand of the coming year and analyzes U. S. fertilizer use of the past year. The report reviews foreign trade in fertilizer, economic aspects of this trade, and historical economic and fertilizer use statistics. Special reports about production, consumption and distribution of fertilizer are prepared for each issue.

Supply-Demand Estimates Reports update USDA forecasts of the supply-demand balance for major farm commodities. The assessments are made by an inter-agency board of USDA experts and released in tabular form, with a brief commentary, after 3 p.m. on the day following the issuance of major crop production, grain stocks, or planting intentions reports by the SRS (see bottom line of Table 2-6). They present statistics by crop, covering the balance of supply (production, stocks, imports) and demand (domestic use, exports, carry-over) for the current marketing season. Rough indications of the supply-demand balance for one season ahead may also be included. Foreign agricultural trade reports include a monthly statistical review of our foreign agricultural trade and a semi-annual review of world monetary conditions in relation to agricultural trade. The monthly statistical and analytical review, Foreign Agricultural Trade of the United States, emphasizes the current status and outlook for U. S. agricultural trade, including exports under specified government-financed programs, commercial exports, price developments, and quantity index for selected commodity groups. A world trade section shows farm commodity trade and the U. S. share.

Two annual supplements are published, one by calendar year and the other by fiscal year. They present detailed tables of the quantity and value of annual exports and imports of principal products for two years in both commodity-by-country and country-by-commodity [illegible] Commodity totals for exports and imports are given for two years, and quantity indices of annual exports [illegible] ports for several years are shown for historical series or principal commodities and commodity groups. Country totals for all agricultural and non-agricultural commodities and trans-shipments through Canada, the Netherlands, and Belgium are also included. Both publications include data for commodity groupings, trade blocs, and regional areas.

The remaining periodic ERS economic reports previously listed are of less immediate interest from the viewpoint of crop production or acreage statistics.

2.3.5.3 Annual Summaries

The ERS publishes two principal annual summaries: Agricultural Statistics is a comprehensive statistical report containing both current and historical agricultural data. It is revised annually. In concert, the Handbook of Agricultural Charts, which provides 186 charts with accompanying data that cover key factors in the economic situation and outlook for agriculture, is also published and revised annually.

2.3.5.4 Periodicals

The ERS has three principal periodicals: Farm Index, Agricultural Economics Research, and Agricultural Finance and Income Review.

Farm Index features monthly, in non-technical language, results of ERS's research program. Articles are grouped into five sections: farms, rural, marketing, foreign, and consumer. Regular features include a digest of the agricultural outlook, a table with the latest figures for 45 leading indicators of economic developments in agriculture, marketing, and the general economy.

Agricultural Economics Research is a quarterly containing technical articles on methods, results, and findings of research in agricultural economics. It includes interim reports on work in progress, articles on research methods or techniques, and articles on new areas of research. Each issue also carries book reviews.

Agricultural Finance and Income Review annually reviews developments and research findings in agricultural finance and income. Articles report on issues related to farm and rural credit, financial management, insurance, income, agribusiness and financial institutions, rural government, taxation, and rural development. Reviews of pertinent books are again included.

2.3.5.5 Non-Periodic Reports

The USDA publishes many non-periodic reports of agriculture economics and statistics. These include research reports and statistical supplements, technical, statistical, and marketing bulletins, speeches, and agricultural handbooks. Comprehensive publication lists of new non-periodic reports are routinely published by the ERS.

Typical of the type of non-periodic reports that are of interest to the list of users being considered in this study is Foreign Agriculture Economic Report No. 85: Forecasting Wheat Production in Turkey. In summary, this study developed a method of providing preharvest forecasts of Turkish wheat production. The basic approach was development of a mathematical relationship between weather conditions during different parts of the growing season and wheat yields. Other relationships were developed to explain variations in area planted and in total production. These relationships gave a reliable set of forecasts for 1969-71; however, statistical tests on the relationships indicated that, normally, errors larger than those obtained would be expected. The study indicated that the most important variables affecting production in any one year were, in addition to area planted, January, February, and May weather conditions and the level of fertilizer application.

## 2.4 DISCUSSION OF CROP DATA USERS

### 2.4.1 INTRODUCTION

In addition to the four crop information source organizations discussed above, numerous potential users of crop data were contacted during the course of the study. Included were Federal Agencies, the FAO, state government agencies, academic users, county agents and private sector users. A brief discussion of the interest of these potential users in world crop data and a discussion of the degree to which they are being satisfied by presently available data follows.

### 2.4.2 OTHER FEDERAL GOVERNMENT USERS

As was indicated in the earlier discussion on the USDA Statistical Reporting Service, Section 2.3.2, there are many agencies of the Federal Government that need and utilize crop data. These agencies range across all of the Executive Departments, from State to the Treasury. These applications of crop data are outlined in Appendix A. In this study, we concentrated on the Department of Agriculture.

Since the U. S. crop statistics appear to be both reasonably accurate and timely, the major potential benefit of a World Crop Survey system to U. S. users would accrue from the provision of foreign crop statistics. An Agricultural Marketing Service (AMS) representative expressed the view that the volume, quality, and timeliness of FAS foreign crop information was inadequate for AMS purposes. This is especially true for countries such as the Soviet Union and the Peoples Republic of China, in which statistical information is spotty, or subject to scrutiny. Poor data also exists in many underdeveloped countries where crop statistical information networks are primative or non-existent.

In 1973, the Agricultural Stabilization and Conservation Service was principally concerned with compliance with assigned acreage allotments. For this purpose they contracted out aerial survey missions in which photos were made at scales of 1":660' and 1":1000'. At that time, they sampled only 25% of the ownership units for each crop; the selection of the units to be surveyed being obtained by drawing lots.

A potential ASCS use of world crop data could be in the organization and operation of a purposeful food stabilization program now being seriously considered in the wake of the 1974 World Food Conference. Such a program would involve the stockpiling of grains or other stores and offering them to countries throughout the world where shortages occur. In many of the underdeveloped countries where crop information is poor or lacking there is little warning of imminent food shortages. A satellite-based crop survey, yield, and production monitoring system could potentially serve as an effective early warning system against such occurrences. In addition, maintenance of practical yet adequate stockpile quantities would involve day-to-day decisions and make more accurate and timely data than is presently available, a critical requirement. FAO and numerous organizations concerned with feeding starving people in countries throughout the world strongly endorse such a purposeful stabilization program.

In Muscle Shoals, Alabama, the TVA operates the National Fertilizer Development Center. This is the leading experimental center in the U. S. for the development of more effective and lower cost fertilizers. They are also heavily involved in assisting food-deficient nations to build a more viable and productive agriculture. To this end, they have need for crop acreage and yield data by country so that projections of worldwide requirements for fertilizer can be made. It was determined that the TVA presently uses the global crop data published by the FAO, but they would find more timely and comprehensive world crop data to be most useful.

2.4.3 STATE AND ACADEMIC USERS

In general, State Government and University users of crop data are almost solely interested in detailed information from within their State, for use by local agribusiness concerns and for the distribution of educational information. State agricultural agencies often perform data collection and information dissemination through personnel based locally throughout their State. Though some of the collected information is published for local distribution much of the data is forwarded to larger agricultural information agencies such as the SRS. Similar procedures are also carried out by the operational arm of land grant colleges and universities in the form of county extension offices. The data published or otherwise distributed on the local level are primarily concerned with serving the unique needs of the specific crop producing areas within the state. Contact with several county agents in Pennsylvania and Maryland indicated that little or no detailed data from within counties is available from the SRS. They simply use the State level SRS data.

On the National level, the SRS claims an error of only 3-4% in their crop statistics of U. S. acreage planted and production. Local estimates (county level) are not nearly as good, with error rates ranging as high as 20%. These local accuracies could be improved by increasing the size and/or number of sampling units, both of which might be directly available from a global crop survey system.

The county agents also have a major interest in local weather conditions and how they may effect planting and spraying schedules as well as overall yield within the county.

For the most part, the State Universities and their extension services are very strictly State oriented. One main exception is the Departments of Agricultural Economics. They are vitally involved in developing guidance in the marketing or exporting of state produced commodities. As such, they are users of U. S. and World crop data. In most cases, the present data from within the U. S. is adequate; but again, timely information on the acreages, production, and yields of countries who are receiving the state exports or competing with the state on the world market would be of use.

In discussions with the Agricultural Economics Department at the Pennsylvania State University, it was learned that, principally, data was desired on the major U. S. crop exports, such as wheat, rice, cotton, corn, soybeans, and tobacco. However, the greatest benefit would be accrued from timely and accurate data on rice and wheat, because many of the countries that import these specific grains are the underdeveloped countries and as such have very poor crop information systems, if they have any at all.

On the other hand, corn and soybeans, for example, go mainly to Europe and Japan where good crop data collections systems exist, and hence our knowledge of those crops is better.

On a slightly different slant, U. S. cotton exports go to industrialized countries, but most of the competition to U. S. firms comes from either less developed countries, such as Mexico, or from countries from which data is less accessible, such as China. Thus, better knowledge of export potential here would be of great value.

### 2.4.4 PRIVATE SECTOR

Potential users of U. S. and world crop data in the private sector can be found in a wide variety of agriculture-related industries and services. Included among these are wholesalers, retailers, banks, brokers, credit organizations, storage operators, food and fiber processors, equipment suppliers, the news media, producers, distributors, and transporters. The timeliness and accuracy of the crop data can have an effect on the economic structure which sustains this private sector of agriculture.

The media (wire services, radio, T. V., newspapers, and magazines) are often the most efficient means of distributing important acreage, production, yield, and economic impact information of agricultural products. Though, at present, most of the media only report data collected or compiled by other agencies such as SRS, the potential exists for directly reporting U. S. or world crop data obtained from a system such as TERSSE. Reuters News Service, for example, operates a worldwide commodity news wire that would obviously be enhanced by improved world crop data. At the moment, their commodity reports are based on Government data tempered by private "informed" sources. However, in discussions with the Study team, it was pointed out that it was difficult to imagine having the source of this data be anyone but the Federal Government because of the difficulties inherent in any one sector of the agricultural economy gaining early access to such information.

In discussions with a large Agribusiness concern primarily involved in the production of cotton, it was learned that they are generally content with the statistics received from the USDA. For the larger concerns this is usually supplemented by information provided by their own agents, which would always be an integral part of their own data collection effort no matter what sort of system provided the U. S. data.

However, data on foreign cotton production (e. g., USSR, Mexico, and China) would be of extreme value to this agribusiness concern. Yet, as was pointed out in the discussions with Reuters, it was not clear that this level of interest would survive for a moment if such information were not available to a business on an exclusive basis. It is probable that some larger individual private sector users would be interested in receiving raw data for their own manipulation and interpretation rather than solely depending on the Federal Government's interpretation of it.

## 2.5 OBSERVATION SYSTEM REQUIREMENTS

Previous sections of the report have described the need for improvements in world crop forecasting, defined the users of such data and the formats, update cycles, and dissemination procedures for it. We now turn to a discussion of aspects of the implementation of the observation system necessary to achieve the desired improvement.

The discussion will first address the subject of crop calendars to analyze the annual dynamics of the phenomena to be observed. It will then turn to the question of satellite coverage cycles as affected by the rhythms of crops and bureaucracy. Sensor requirements will then be discussed, followed by a recommended set of system development improvements and their implementation on future polar spacecraft.

### 2.5.1 CROP CALENDARS AND COVERAGE AREAS

A crop calendar contains data on the life cycle of crops and may be represented by parameters such as planting and harvesting dates. With respect to a satellite system the calendar is a vital input to the required frequency of coverage - and hence the type of orbit desired - as well as to the delineation of ground system schedules, data processing, and information dissemination. On the global scale it is apparent that at any point in time several of the crops considered somewhere in the world are in some growth or harvesting phase that needs to be monitored. There is something to be monitored, somewhere, all of the time.

This discussion will view the scale of a global crop calendar by concentrating on the selected crops and on representative geographical areas, such as the United States, Latin America, and Mainland China. A global rice harvest calendar is also included to provide an example of total compilation.

2.5.1.1 U. S. Planting and Harvesting Dates

The crop calendar data presented for the United States for wheat, barley, corn, sorghum, oats, rice, soybeans, and cotton was taken from the USDA-SRS Agricultural Handbook No. 283, Usual Planting and Harvesting Dates. The approximate range of planting and harvesting dates of the selected crops are outlined in Table 2-7.

Table 2-7 gives the extreme data ranges. Detailed information on the usual planting and harvesting dates for these crops and a more detailed breakdown on planting and harvesting dates for each state are included in Appendix N. Appendix N also illustrates the principal areas where each crop is grown so that the required coverage patterns can be planned. These dates are pretty well available for most crops on a global basis.

Table 2-7. Approximate Range of U. S. Planting and Harvesting Dates for Selected Crops

| Crop | Planting | Harvesting |
|---|---|---|
| Spring Wheat | Feb 1 - June 1 | July 25 - Sept 30 |
| Winter Wheat | Aug 15 - Feb 15 | May 10 - Sept 20 |
| Barley (Fall sown | Aug 15 - Apr 15 | May 20 - Sept 30 |
| Barley (Spring sown) | Jan 30 - May 25 | Aug 5 - Sept 20 |
| Corn | Mar 1 - June 2 | Aug 1 - Jan 1 |
| Sorghum | Mar 1 - July 25 | July 1 - Dec 15 |
| Oats | Feb 25 - June 10 | July 1 - Oct 15 |
| Rice | Mar 20 - June 5 | July 30 - Nov 30 |
| Soybeans | May 1 - July 15 | Sept 15 - Dec 20 |
| Cotton | Mar 5 - June 20 | Aug 1 - Jan 15 |

2.5.1.2 Latin American Planting and Harvesting Dates

To contrast Southern Hemisphere crop schedules with those shown for the United States, the crop calendars for the two Latin American countries, Brazil and Argentina, are shown in Tables 2-8 and 2-9, respectively.

The planting and harvesting dates of the wide variety of crops grown in Argentina span every month of the year. Furthermore, due to the relative phasing of the Northern and Southern Hemisphere seasons, most of the selected crop planting and harvesting dates for Argentina are approximately six months out of phase with those in the U. S. as seen in Table 2-8. These planting and harvesting dates have been extracted from Coyner[1].

[1]Coyner, Mary S., Planting and Harvesting Seasons in Latin America, USDA Publication FAS-M-37.

Table 2-8. Planting and Harvesting Seasons in Latin America
(By Mary S. Coyner)

## ARGENTINA

| Commodity | Planting season | Harvesting season |
|---|---|---|
| **Beverages:** | | |
| Yerba maté (plants) | May-August | March-September. |
| **Cereals and grains:** | | |
| Barley | June-August | November-January. |
| Birdseed | September-December | December-January. |
| Corn | ....do. | March-June. |
| Millet | October-December | Do. |
| Oats | June-August | November-January. |
| Rice | September-December | March-June. |
| Rye | June-August | November-January. |
| Wheat | April-August | Do. |
| **Feedstuffs:** | | |
| Alfalfa | March-April | January-April (seed). |
| Broomcorn | October-December | March-June (seed). |
| Sudangrass | ....do. | Do. |
| Other sorghums | ....do. | March-June. |
| **Fibers:** | | |
| Cotton | September-November | February-July. |
| Hemp | September-October | February-March. |
| Jute | September-November | April-June. |
| **Fruits:** | | |
| Apples | --- | December-May. |
| Apricots | --- | November-January. |
| Cherries | --- | Do. |
| Grapes | --- | January-May. |
| Lemons | --- | All year; April-October, Main crop. |
| Mandarins | --- | April-October. |
| Oranges | --- | Do. |
| Peaches | --- | December-February. |
| Pears | --- | December-April. |
| Plums | --- | December-February. |
| Quinces | --- | Do. |
| Raspberries | --- | January-March. |
| Strawberries | --- | September-December. |
| **Oilseeds:** | | |
| Castorbeans | September-October | February-May. |
| Cottonseed | September-November | February-June. |

Table 2-8. Planting and Harvesting Seasons in Latin America (Continued)
(By Mary S. Coyner)

| Commodity | Planting season | Harvesting season |
|---|---|---|
| Oilseeds--Continued | | |
| Flaxseed | May-September | November-January. |
| Peanuts | October-December | March-May. |
| Ramie seed | September-October | December-April. |
| Rape | May-August | November-January. |
| Sunflower | October-January | March-June. |
| Tung nuts | --- | March-May. |
| Miscellaneous crops: | | |
| Hops | September-November | March-April. |
| Sugarcane | June-October | July-September. |
| Tobacco: | | |
| Seedbeds | August-September | --- |
| Transplanting | October-November | February-May. |
| Vegetables: | | |
| Asparagus | August-October | November-January. |
| Beans, dry | September-January | April-May. |
| Beans, string | September-December | December-May. |
| Beets | All year | All year. |
| Cabbages | ....do. | Do. |
| Cantaloups | August-October | March-June. |
| Cucumbers | July-January | December-April. |
| Eggplant | September-January | January-April. |
| Garbanzos | August-September | December-January. |
| Garlic | February-May | December-May. |
| Lettuce | All year | All year. |
| Mandioca | August-October | March-August. |
| Onions | September-November | December-March. |
| Peas | June-September | November-January. |
| Peppers | ....do. | December-May. |
| Potatoes: | | |
| Early | June-August | October-November. |
| Semiearly | July-September | November-February. |
| Semilate | September-February | March-April. |
| Late | January-February | May-August. |
| Radishes | All year | All year. |
| Squash | September-December | December-April. |
| Sweetpotatoes | September-November | April-June. |
| Tomatoes | July-February | November-July. |
| Turnips | All year | All year. |
| Watermelons | August-October | January-March. |

Table 2-9. Planting and Harvesting Seasons in Latin America
(By Mary S. Coyner)

**BRAZIL**

| | Planting season | Harvesting season |
|---|---|---|
| Beverages: | | |
| Cacao: | | |
| Bahia: | | |
| Main crop | --- | September-January. |
| Intermediate crop | --- | April-August. |
| Para: | | |
| Small crop | --- | December-March. |
| Large crop | --- | April-September. |
| Coffee: | | |
| São Paulo, Paraná, Goiás. | October | May-September. |
| Minas Gerais, Rio de Janeiro. | ....do | April-August. |
| Espírito Santo | ....do | March-August. |
| Tea: | | |
| São Paulo: | | |
| Seed | June-July | --- |
| Transplanting | October-January | June-August. |
| Minas Gerais: | | |
| Seed | May | --- |
| Transplanting | November-December | All year. |

Table 2-9. Planting and Harvesting Seasons in Latin America (Continued)
(By Mary S. Coyner)

BRAZIL--Continued

| Commodity | Planting season | Harvesting season |
|---|---|---|
| Cereals and grains: | | |
| Barley: | | |
| Rio de Janeiro, Minas Gerais, and São Paulo. | March-May | June-September. |
| Paraná, Santa Catarina, & Rio Grande do Sul. | May-July | November-December. |
| Corn: | | |
| Amazonas, Pará, Acre, & Maranhão. | November-December | May-June. |
| Piauí, Ceará, Rio G. do Norte, Paraíba, Pernambuco, Alagôas, Sergipe, & Bahia. | February-March | June-July. |
| Minas Gerais | October-November | March-June. |
| Espírito Santo, Rio de Janeiro, Goiáz, & Mato Grosso. | September-December | March-April. |
| São Paulo | October | April-June. |
| Paraná & Santa Catarina. | September-December | March-July. |
| Rio Grande do Sul | ....do. | April-May. |
| Oats: | | |
| Minas Gerais | March-May. | June-September. |
| São Paulo | ....do. | November-January. |
| Paraná, Santa Catarina: | | |
| Forage | May-July | November-January. |
| Grains | March-May | September-October. |
| Rio Grande do Sul: | | |
| Forage | March-July | July-December. |
| Grain | June-July | November-December. |
| Rice: | | |
| Pará, Acre, Maranhão, Amazonas, Piauí, Ceará, Rio Grande do Norte, & Paraíba. | November-December | April-May. |
| Pernambuco, Alagôas, Sergipe, & Bahia. | March-May | August-October. |
| Espírito Santo, Rio de Janeiro, Minas Gerais. | September-December | February-May. |
| Goiás & Mato Grosso | ....do. | Do. |
| São Paulo | September-November | March-May. |
| Paraná, Santa Catarina. | August-November | January-May. |
| Rio Grande do Sul | October-November | March-May. |
| Rye: | | |
| Rio de Janeiro, S. Paulo. | March-May | August-October. |
| Paraná | June-July | November-December. |
| Santa Catarina, Rio Grande do Sul. | May-June | November-December. |
| Wheat | March-July | November-January. |

Table 2-9. Planting and Harvesting Seasons in Latin America (Continued)
(By Mary S. Coyner)

BRAZIL--Continued

| Commodity | Planting season | Harvesting season |
|---|---|---|
| Feedstuffs: | | |
| Cowpeas and soybeans: | | |
| Central states | October-November | March-April. |
| Southern states | August-January | December-April. |
| Fibers: | | |
| Cotton: | | |
| Pará | January-April (annual) | August-October. |
| Maranhão | January-August (annual and tree types). | June-January. |
| Piauí | November-April (annual and tree types). | June-December. |
| Ceará | January, February, May, June (annual and tree types). | August-December. |
| Rio Grande do Norte | December-May (tree type). | July-November. |
| Paraíba | December-June (annual and tree types). | July-January. |
| Alagôas | January-September (annual and tree types). | September-April. |
| Pernambuco | February-May (annual and tree types. | August-January. |
| Sergipe | March-May (annual and tree types). | October-December. |
| Bahia | April-June and October-December (annual and tree types). | November-December, March-May. |
| Amazonas | May, October-December (annual). | November, June-August. |
| Minas Gerais | September-December (annual and tree types). | April-September. |
| São Paulo and Paraná | September-November (annual). | March-June. |
| Goiás and Mato Grosso | September-December (annual and tree types). | April-August. |
| Rio de Janeiro | October-December (annual). | April, June, July. |
| Fruits: | | |
| Apples (Rio Grande do Sul). | --- | December-March. |
| Bananas (harvested all year). | --- | Starts in September. Heaviest months: January-February. |
| Grapes (Rio Grande do Sul). | --- | January-March. |
| Oranges: | | |
| São Paulo | --- | April-September. |
| Rio de Janeiro | --- | May-December. |
| Peaches (Rio Grande do Sul). | --- | December-April. |
| Pineapples: | | |
| Pernambuco | --- | September-January. |
| Paraíba | --- | August-December. |
| Alagôas | --- | September-January. |
| [illegible] | --- | November-February. |
| [illegible] | --- | January-December. |

Table 2-9. Planting and Harvesting Seasons in Latin America (Continued)
(By Mary S. Coyner)

| Commodity | Planting season | Harvesting season |
|---|---|---|
| Fruits--Continued | | |
| Pineapples--Continued | | |
| Pará | --- | July-October. |
| Maranhão | --- | August-October. |
| Ceará | --- | September-December. |
| Rio de Janeiro | --- | October-January. |
| São Paulo | --- | December-April. |
| Paraná | --- | December-March. |
| Oilseeds: | | |
| Castor-beans: | | |
| Ceará | --- | July-September. |
| São Paulo | --- | February-June. |
| N. Bahia | --- | July-September. |
| S. Bahia | --- | March-May. |
| Flaxseed | June-July | November-December. |
| Peanuts (São Paulo): | | |
| First crop | October-November | January-February. |
| Second crop | February-March | May-June. |
| Miscellaneous crops: | | |
| Pyrethrum | September | November-February. |
| Sugarcane: | | |
| Northeast: | | |
| Lowlands | June, July, November-January | August-December. |
| Uplands | May-June | Do. |
| Southern | September-October | Do. |
| São Paulo | January-March | June-October. |
| Tobacco: | | |
| Bahia: | | |
| Seeding | March-May | --- |
| Transplanting | April-July | August-January. |
| Minas Gerais: | | |
| Seeding | January-March | --- |
| Transplanting | February-May | June-October. |
| São Paulo: | | |
| Seeding | August-November | --- |
| Transplanting | September-January | January-June. |
| Santa Catarina: | | |
| Seeding | July-September | --- |
| Transplanting | August-November | December-April. |
| Rio Grande do Sul: | | |
| Seeding | August-September | --- |
| Transplanting | September-November | January-April. |
| Vegetables: | | |
| Beans (first crop): | | |
| Amazonas, Pará, Acre, and Maranhão. | November-December | May-June. |

Table 2-9. Planting and Harvesting Seasons in Latin America (Continued)
(By Mary S. Coyner)

BRAZIL--Continued

| Commodity | Planting season | Harvesting season |
|---|---|---|
| Vegetables--Continued | | |
| Beans(first crop)--Continued | | |
| Piaui, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagôas, Sergipe, and Bahia. | February-March | June-July. |
| Espírito Santo, Rio de Janeiro, Minas Gerais, Mato Grosso, Goiás, and São Paulo. | October-December | March-July. |
| | ....do. | |
| Paraná, Santa Catarina. | September-December | March-July. |
| Rio Grande do Sul | ....do. | April-May. |
| Mandioca:[1] | | |
| North Brazil (normally) | January-May | July-November. |
| South Brazil (normally). | October-December | March-October. |
| Potatoes: | | |
| Ceará, Paraíba, Alagôas and Sergipe. | February-March | June-July. |
| Bahia | March | July. |
| Espírito Santo, Rio de Janeiro. | February-March | Do. |
| Minas Gerais, Goiás, and Mato Grosso: | | |
| Dry season crop | February-May | May-August. |
| Wet season crop | October-December | January-April. |
| São Paulo: | | |
| Dry season crop | February-March | May-July. |
| Wet season crop | August-September | November-January. |
| Alta Sorocabana zone. | April-May | July-September. |
| Irrigated crop | April-June | September-October. |
| Paraná, Santa Catarina, and Rio Grande do Sul. | August-October, January-February. | November-January, May-June. |
| Onions[2] | April-June | September-February. (4-8 months after planting). |
| Cauliflower[2] | February-June | June-December. |
| Cabbage[2] | March-July | Do. |
| Lettuce[2] | March-August | June-November. |
| Peas[2] | April-August | October-November. |
| Tomatoes[2] | June-October | November-March. |

Brazil, being wholly within the tropics and sub-tropics, shows a crop calendar more related to climatic zones than to seasons. Planting and harvesting such crops as corn and cotton, as shown in Table 2-9, are mostly a function of the elevation and precipitation distribution. Nonetheless, the resulting impact on observation requirements is that monitoring of the crops in question must be carried out essentially throughout the year.

2.5.1.3 Peoples Republic of China Planting and Harvesting Dates

Mainland China encompasses a very large area covering numerous climatic and agricultural zones. Again, it becomes apparent that during any particular time of the year some crop is being either planted or harvested. A crop calendar of Mainland China, based on a publication by the Chinese Academy of Agricultural Sciences published in Peking in 1960, is shown in Appendix O. The calendar was prepared by the Foreign Agriculture Service as AGR-92, dated March 15, 1967. For each of the agricultural regions identified in the map, the succeeding pages describe the activities as a function of time of year. The tabulation proceeds from February to February in blocks of time related to climate or agricultural events.

2.5.1.4 Global Rice Harvesting Periods

A convenient format for summarizing global crop calendar data for specified crops is shown in Figure 2-8. This figure depicts the periods of the year in which rice is being harvested in many areas of the world. From the chart it is obvious that rice harvest is occurring somewhere in the world throughout the entire year. To fully summarize the observational timing requirements for the global crop survey mission, a similar depiction for planting and harvesting of all the selected crops will have to be developed.

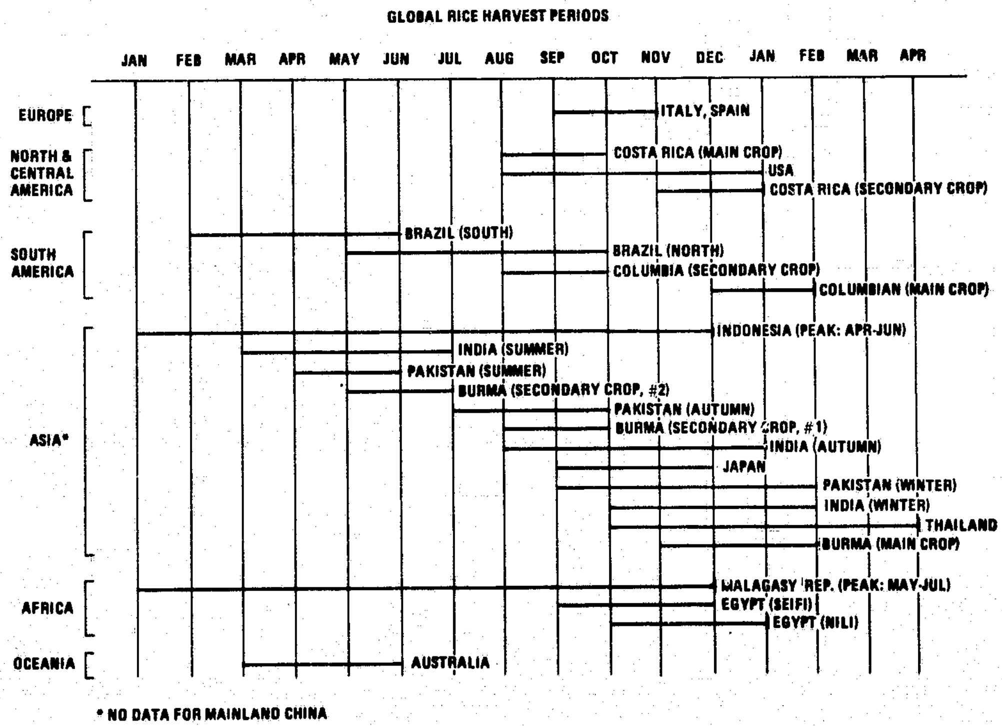


Figure 2-8. Global Rice Harvest Periods

2.5.1.5 Area Coverage Requirements

A good first approximation to the areal coverage requirements for a world crop survey is a delineation by crop of the countries accounting for a major fraction of the world production of that crop. Such data was made available to the study team by the Reports and Statistics Division of the Foreign Agricultural Service.

In the first cut analysis shown in Figures 2-9 through 2-16, coverage maps were simply drawn for the major producing countries for each crop. Actually, from the point of view of determining the potential coverage from geostationary satellites or the number of orbit revolutions during which a low-altitude satellite would have to make observations, the level of detail shown in these maps is sufficient, considering that the total coverage requirement would be an integration of the specific areas for all crops.

2.5.2 COVERAGE CYCLE

As was noted in Section 2.3, agricultural statistical products, depending on the specific commodity involved are generally developed and issued on a monthly basis, supplemented by seasonal and annual summary reports. New information is not necessarily available on all crops for all countries every month. However, what information is available, based on the phase and period of the crop cycles as well as the efficiency of the data collection process, for such factors as planting intentions, acreage planted, production outlooks, crop yields, progress of the harvest, and final production estimates, is issued monthly. This long established practice is therefore defined to be the update cycle requirement for world crop progress and production information.

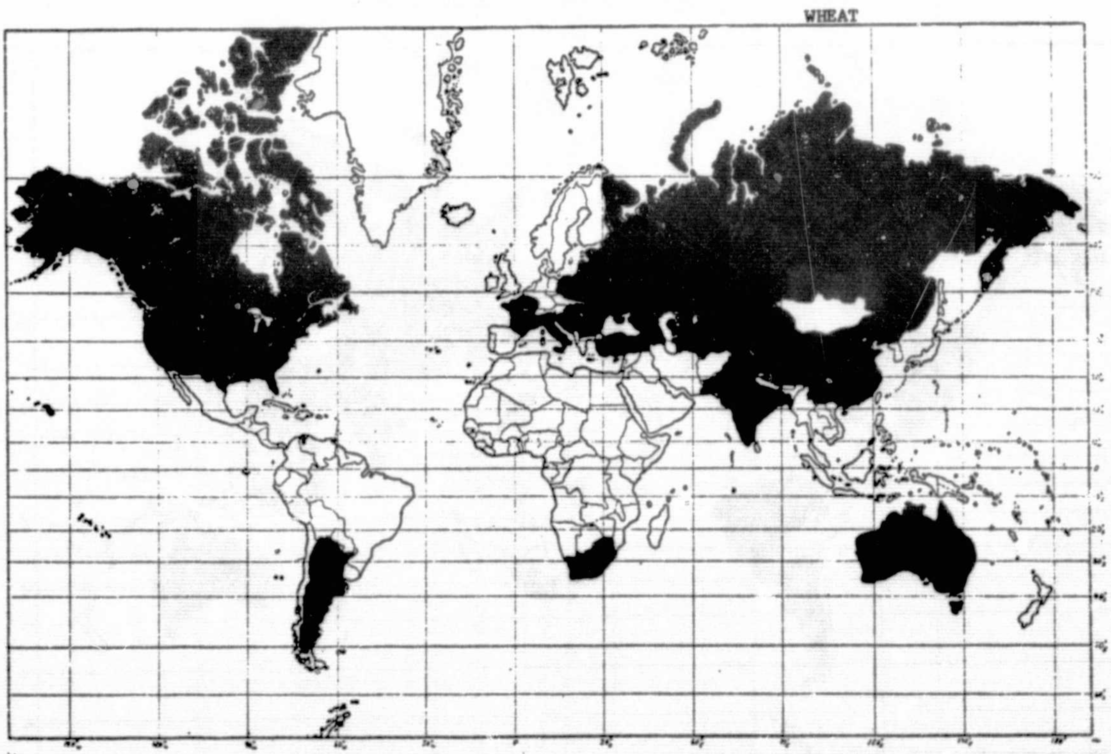


Figure 2-9. Major Wheat Producing Countries

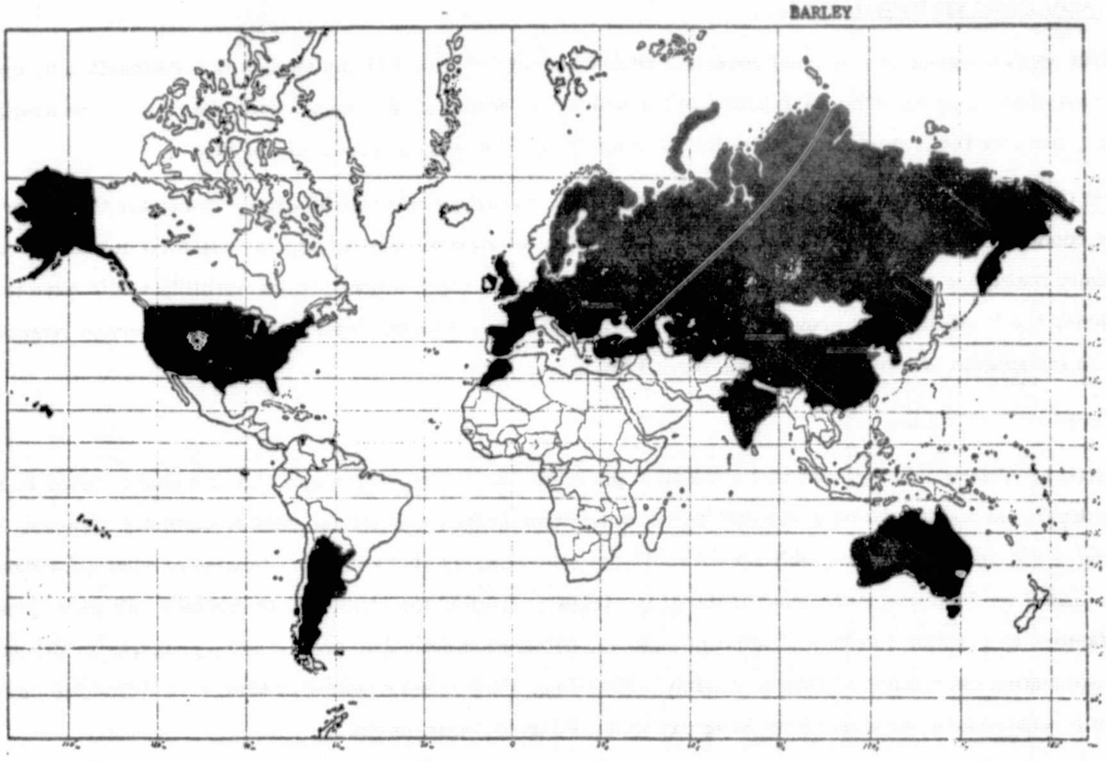


Figure 2-10. Major Barley Producing Countries

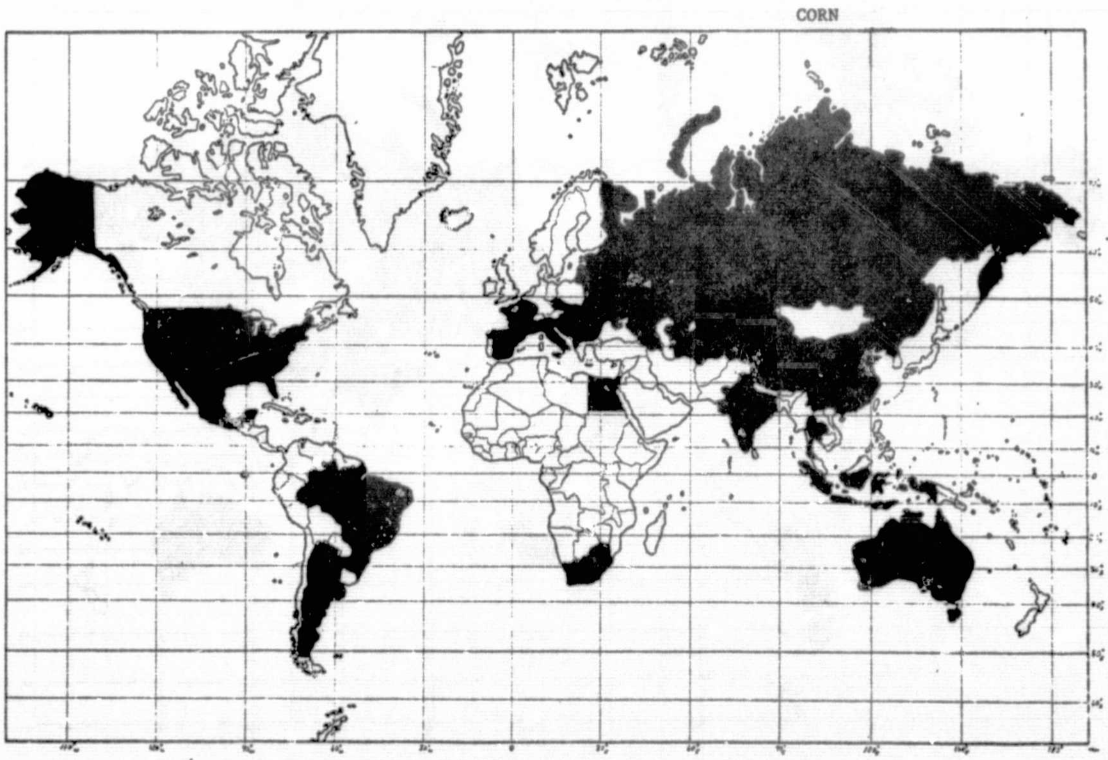


Figure 2-11. Major Corn Producing Countries

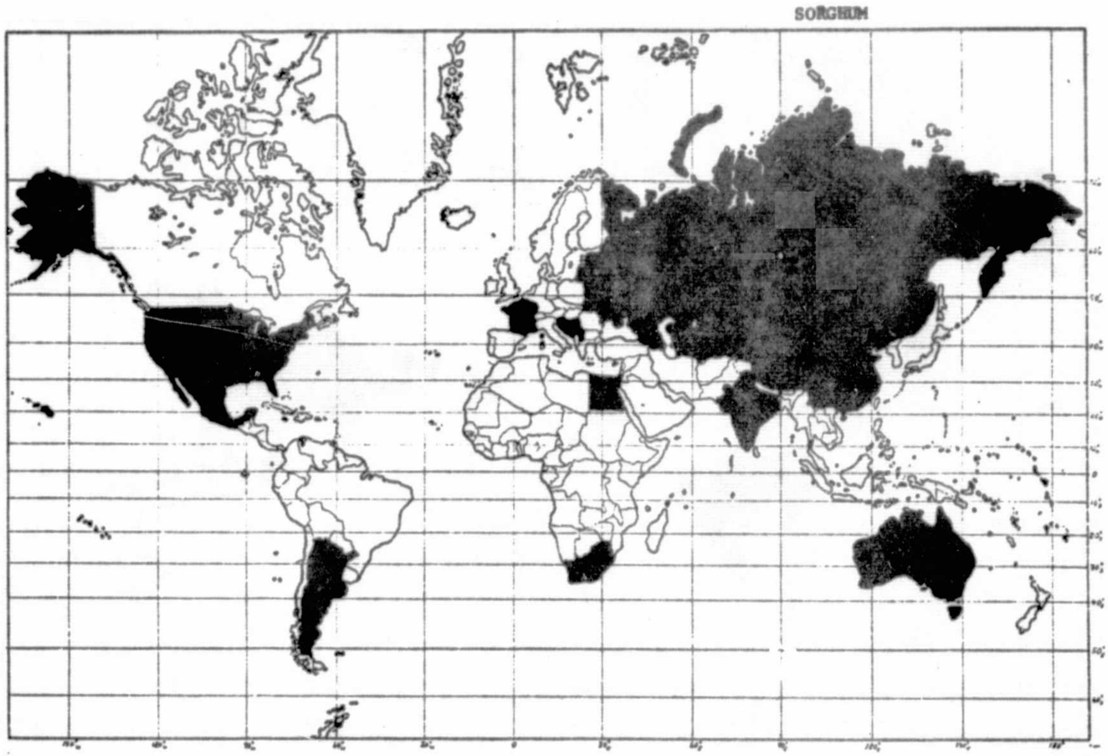


Figure 2-12. Major Sorghum Producing Countries

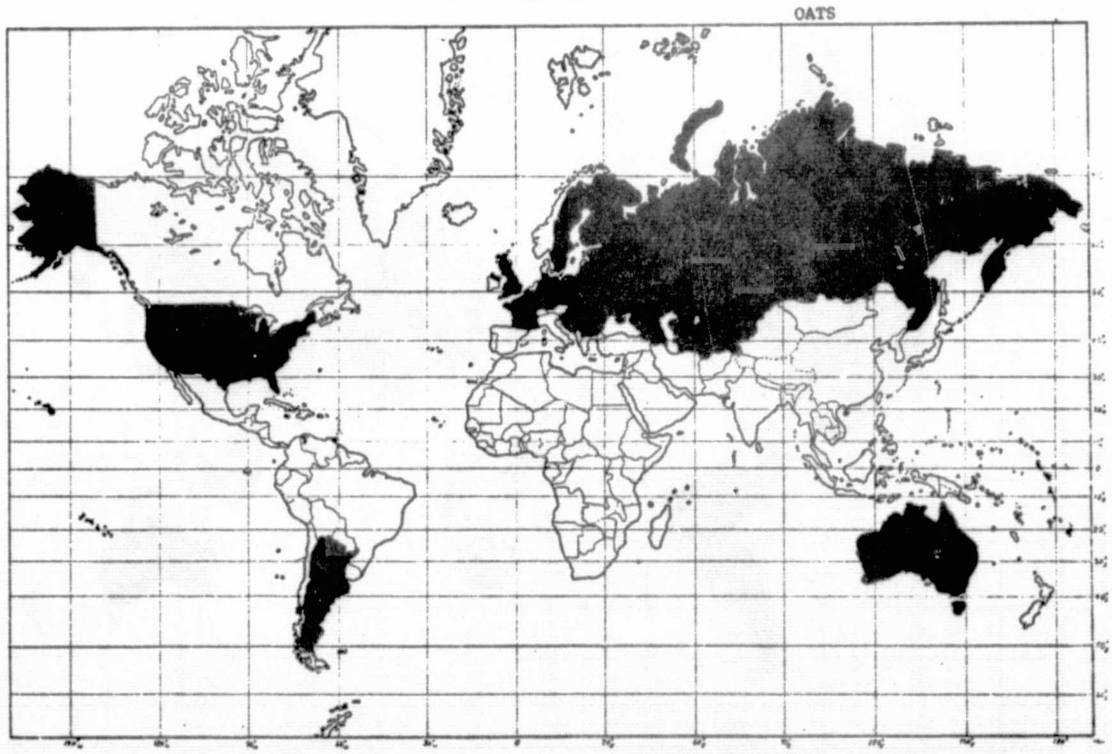


Figure 2-13. Major Oats Producing Countries

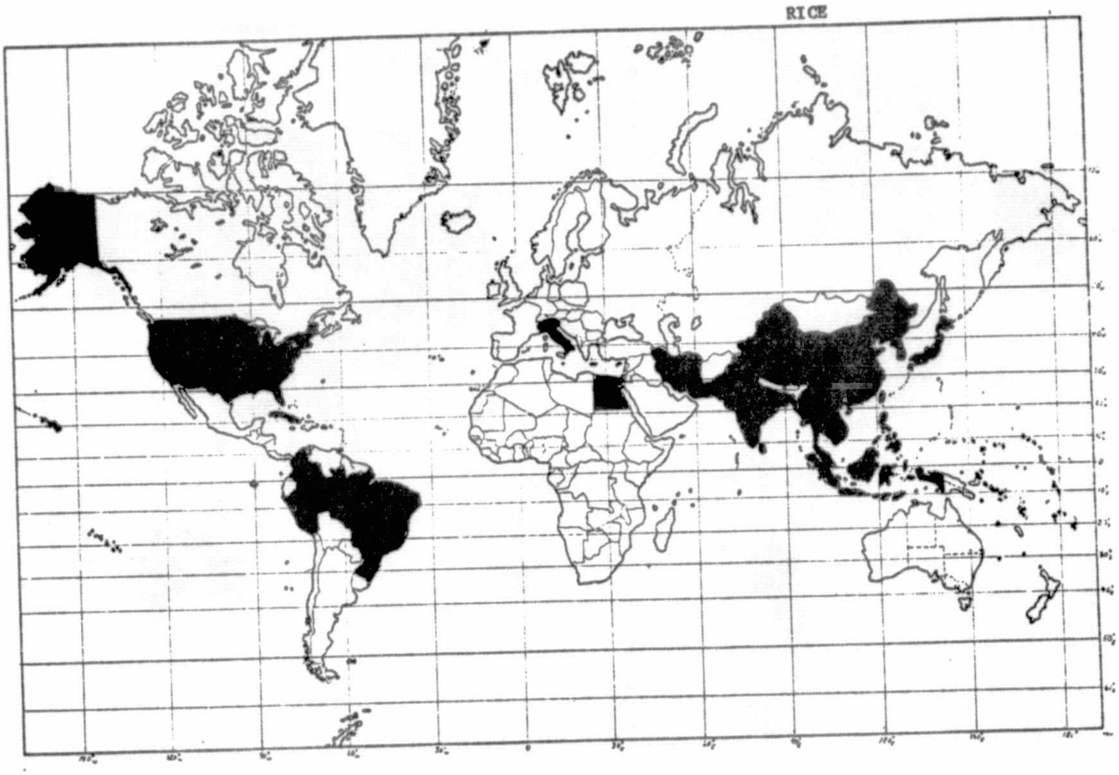


Figure 2-14. Major Rice Producing Countries

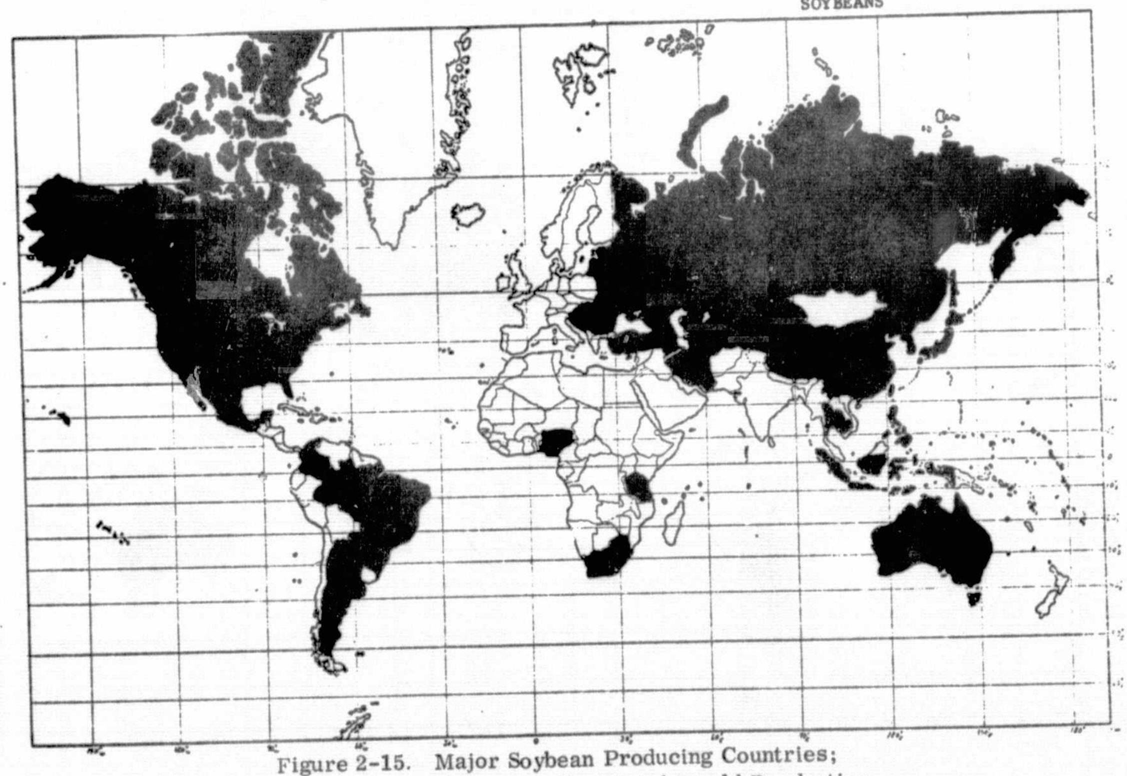


Figure 2-15. Major Soybean Producing Countries; Includes 99% of Total World Production

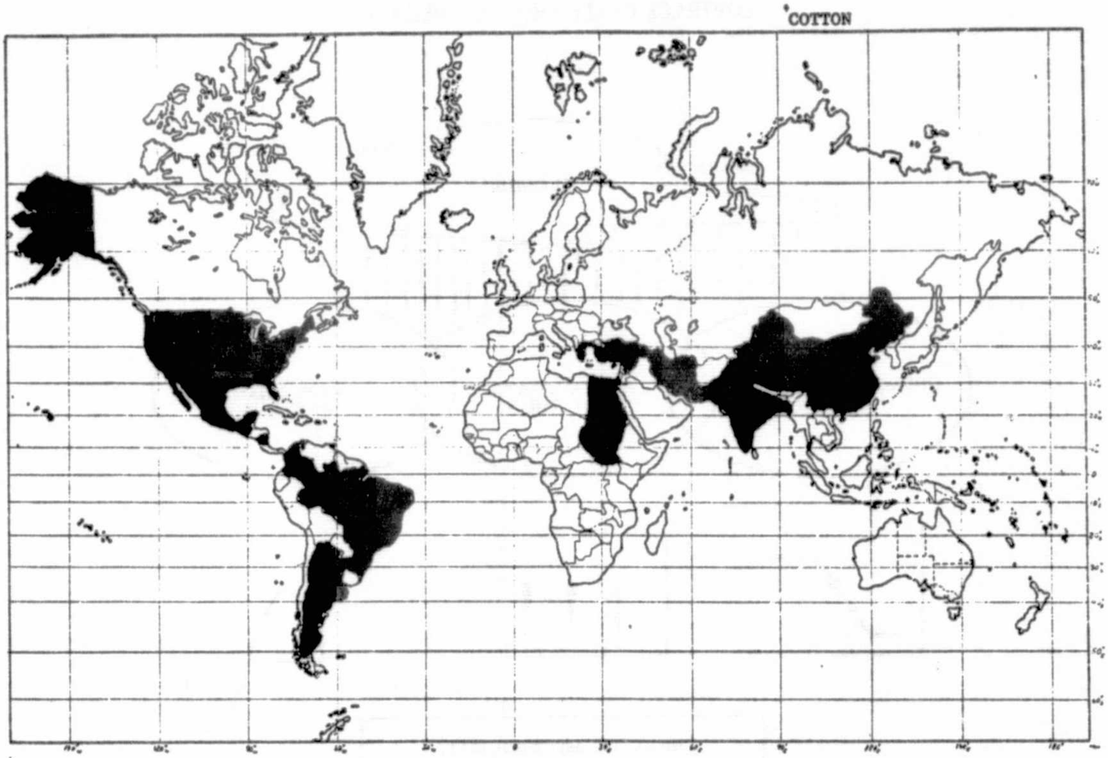


Figure 2-16. Major Cotton Producing Countries;
Includes 75% of Total World Production

The update cycle represents the outside limit on the coverage cycle; that is, the frequency with which data must be obtained in order to produce the required monthly reports. If all the desired information could be assuredly obtained in a single observation, then the coverage cycle would also be once per month. However, there are several factors that influence the coverage cycle, as shown schematically in Figure 2-17. The term "Bureaucratic rhythms" refers to the required monthly reporting frequency or update cycle, as well as the seasonal and annual summaries also produced.

The "phenological rhythms" (temporal cycle of resource to be measured) refer to the growth and development characteristics of plants as a function of time that are useful in the identification of individual crops, their vigor and the nature of various stresses to which they may be subjected. It is through the observation of the rate and nature of these biological changes that it appears to be possible to provide useful crop surveys through remote sensing techniques. The use of temporal data generally provides a significant increase in the ability to accurately classify crops. Similar phenomena would also permit the recognition of the onset and progress of crop harvests. The specific phenological factors that are observed for the determination of agricultural information do in many cases depend on the manner in which the observations are being made. Consider the differences in observations made by a man standing in a field visually noting for example, plant characteristics or insect damage, or by a satellite-borne sensor attempting to determine the same information by measurement of changing spectral characteristics. In either case, some set of measurements on the time rate of change of the characteristics of the plants and fields is a vital determinant of the various types of crop information needed. For example, Figure 2-18 shows how

COVERAGE CYCLE - RHYTHM METHOD

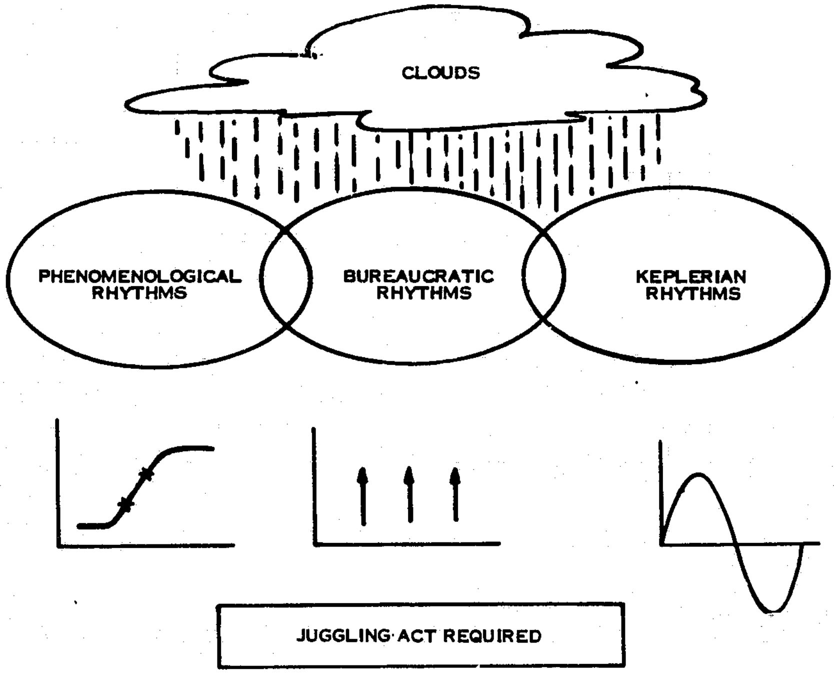


Figure 2-17. Schematic Representation of the Factors Affecting the Coverage Cycle for Global Crop Data

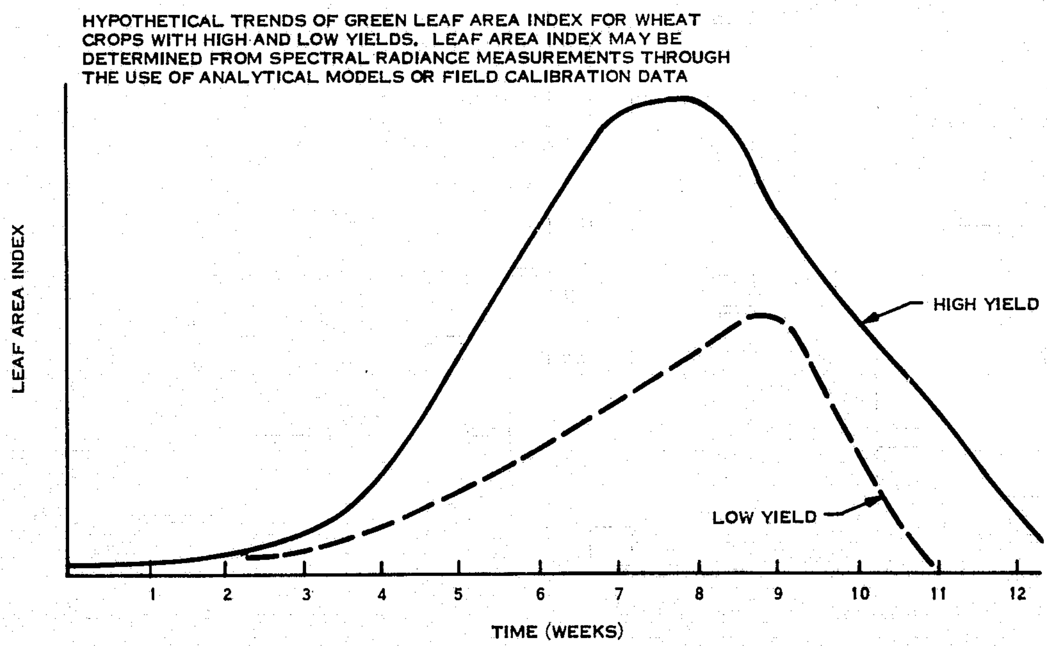


Figure 2-18. Hypothetical Trends of Green Leaf Area Index for Wheat Crops with High and Low Yields.

theoretically the green leaf area index for wheat might vary as a function of the productivity of two different wheat fields. Measurement of the slopes of these curves through a series of measurements a week apart could be used to estimate the expected yield of these fields. It is clear that in order to "catch" this phenological rhythm by temporal measurements a minimum of two observations will have to be made during each update cycle. For certain crops or crop stress factors more frequent observations could be necessary.

It can be seen from the crop calendars shown in Section 2.5.1 and the monthly update cycle requirement that coverage is required of all of the earth's agricultural regions, then the most logical observational platforms are satellites. In this case, two other factors influence the observational coverage cycle: the motion of a satellite in its orbit, the Keplerian rhythms, and the earth's cloud cover.

The orbital period of a satellite is related to its mean distance from the center of the earth. Furthermore, the width of the ground swath beneath the satellite that can be viewed with minimum degradation in resolution due to the curvature of the earth increases with increased altitude, although larger and larger optics are required with increasing altitude to maintain the desired resolution. Thus, there is a series of trade-offs that must be made between the width of the coverage swath used, spacecraft orbital altitude, size of the optics required for the sensors, the resulting size and weight of the sensors, and the frequency with which the same ground areas can be viewed from any given spacecraft. Figure 2-19 illustrates one of many trade off curves needed, showing the relationship between

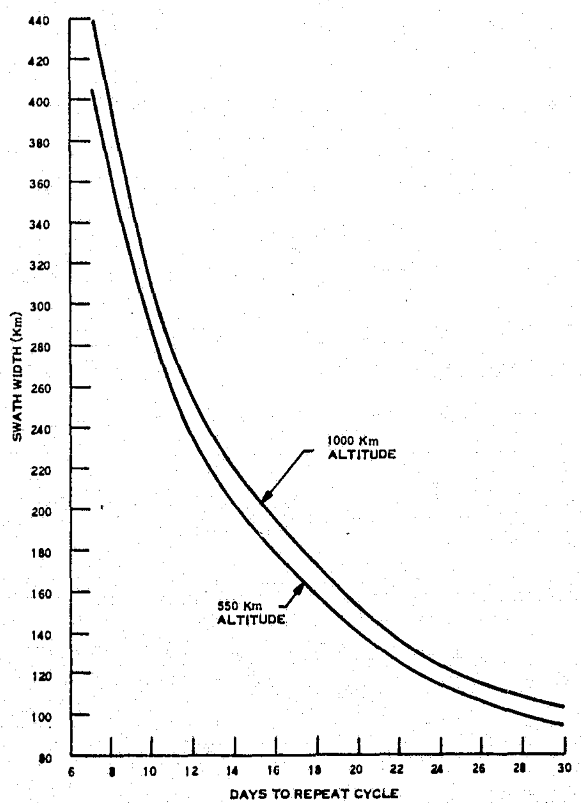


Figure 2-19. Relationship Between Coverage Repetition Period and Swath Width for Satellites at 550 Km Altitude or at 1000 Km altitude

swath width and coverage repetition period for satellites at 550 km or 1000 km. The point to be made here is that for specific values of coverage repetition frequency, there are very definite orbital mechanics constraints that must be met and in turn related to the size and weight of the instrumentation that can be accommodated by any given orbit delivery system.

Superimposed over all the other constraints for obtaining the desired coverage frequency is the problem of the earth's cloud cover. From the point of view of quoting the probability of seeing some point on the earth's surface during any season of the year, conventional cloud cover climatological data that have been collected for decades are somewhat misleading. First of all, as satellite imagery has shown, the earth's cloud cover is usually quite discontinuous; samples of sky cover as seen by an observer on the ground cannot be readily interpolated to areas between ground observation points. Furthermore, reports of certain fractions of the sky covered by clouds, usually quoted in octas, tell nothing of the spatial distribution of the clouds. For example, a sky cover of 3 octas could mean a few clouds are scattered over the entire field of view of the observer, or a solid bank of clouds is covering one "corner" of the sky.

Recently, development of a global cloud cover atlas[1] has been initiated jointly by NOAA and the USAF Air Weather Service based on four years of weather satellite data. Full global data on average monthly, seasonal, semi-annual and annual cloud cover have been compiled for each approximately 40 x 40 Km segment of the earth's surface. The major shortcomings of these initial compilations is the relatively short period of time so far compiled and the fact that the data are all for a local sun time of 1400-1600 hours. In areas of important diurnal cloud cover phenomena, e. g., equatorial Brazil or Southern California, this could place a noticeable bias in the data. Figures 2-20 through 2-22 show monthly mean cloud cover values for various geographical areas as abstracted from the referenced satellite cloud atlas. On several of the graphs, the ERTS-1 cloud cover "experience" is indicated. The values indicated for ERTS-1 represent the mean cloud cover encountered during that spacecraft's first 20 passes over the indicated geographical area. This is equivalent to its first year of operation. In comparing the ERTS value with the curves, it must be kept in mind that the ERTS data represents a very small sample during only one year and a single (morning) local sun time.

It follows from examination of the cloud cover data, that if semi-monthly data is required for all major agricultural regions of the world throughout the year, then full global observation coverage on a weekly basis is essential and semiweekly coverage would be desirable. Short of this, there is a good probability in some areas of the world, e. g., central Florida (Figure 2-22) or western Brazil (Figure 2-21) that the necessary number of observations will not be obtained.

### 2.5.3 RESOLUTION

Two primary relationships are required to determine the system resolution required for the world crop survey mission:

1. The distribution of field sizes over the globe, and

2. The maximum acceptable value of IFOV size as a function of field size.

[1] Global Atlas of Relative Cloud Cover, 1967-70. NOAA Dept. of Commerce and USAF Air Weather Service, Washington, D. C., Sept. 1971.

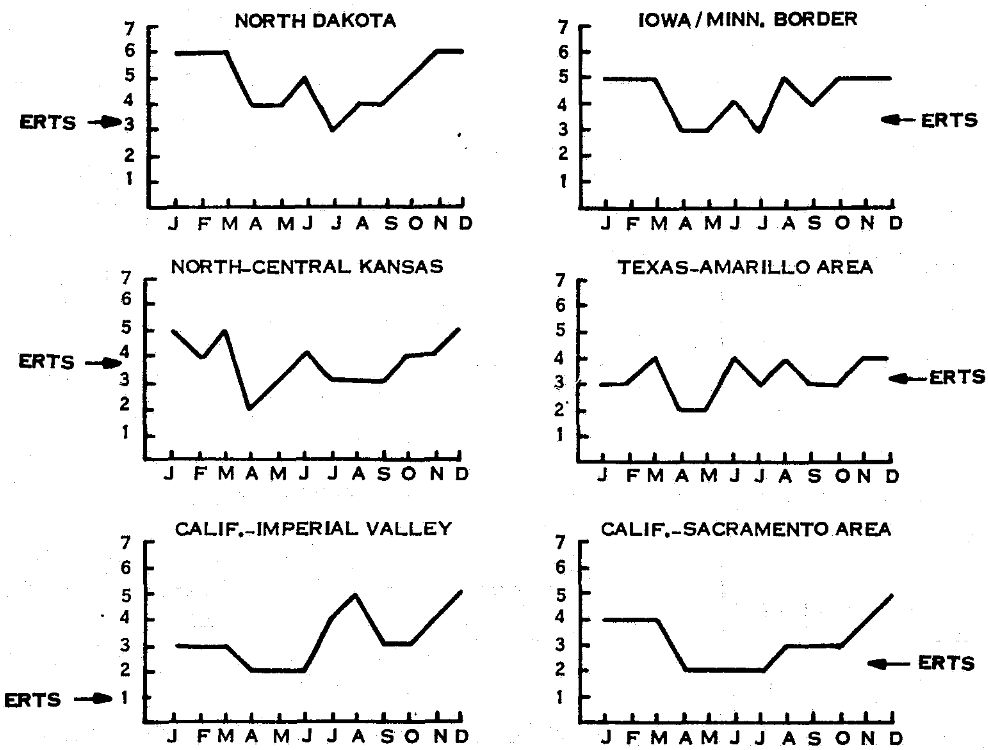


Figure 2-20. Mean Monthly Cloud Cover in Octas for Selected Geographical Areas

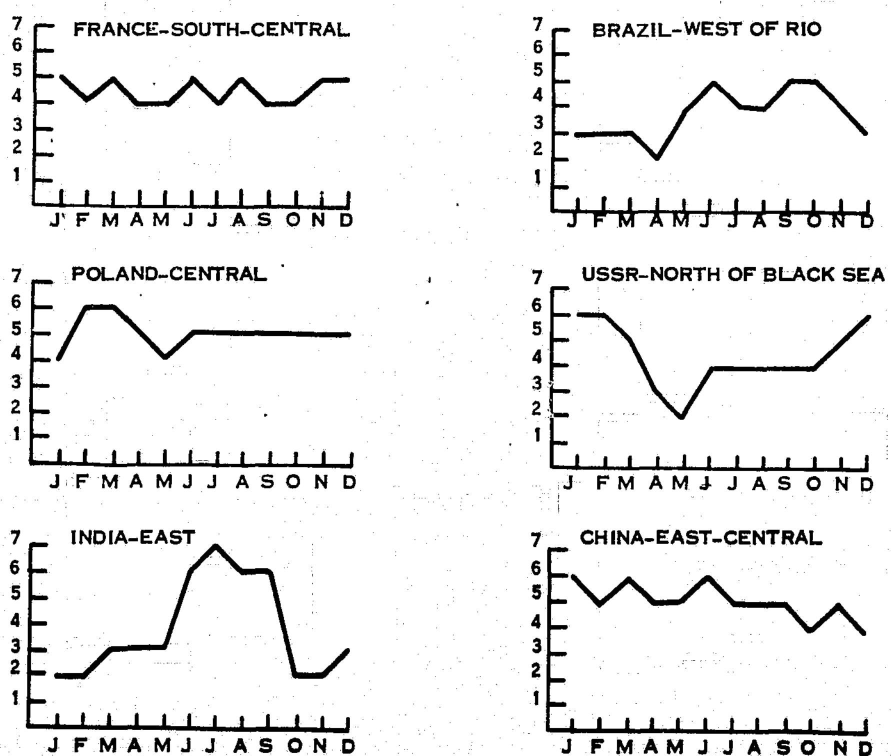


Figure 2-21. Mean Monthly Cloud Cover in Octas for Selected Geographical Areas

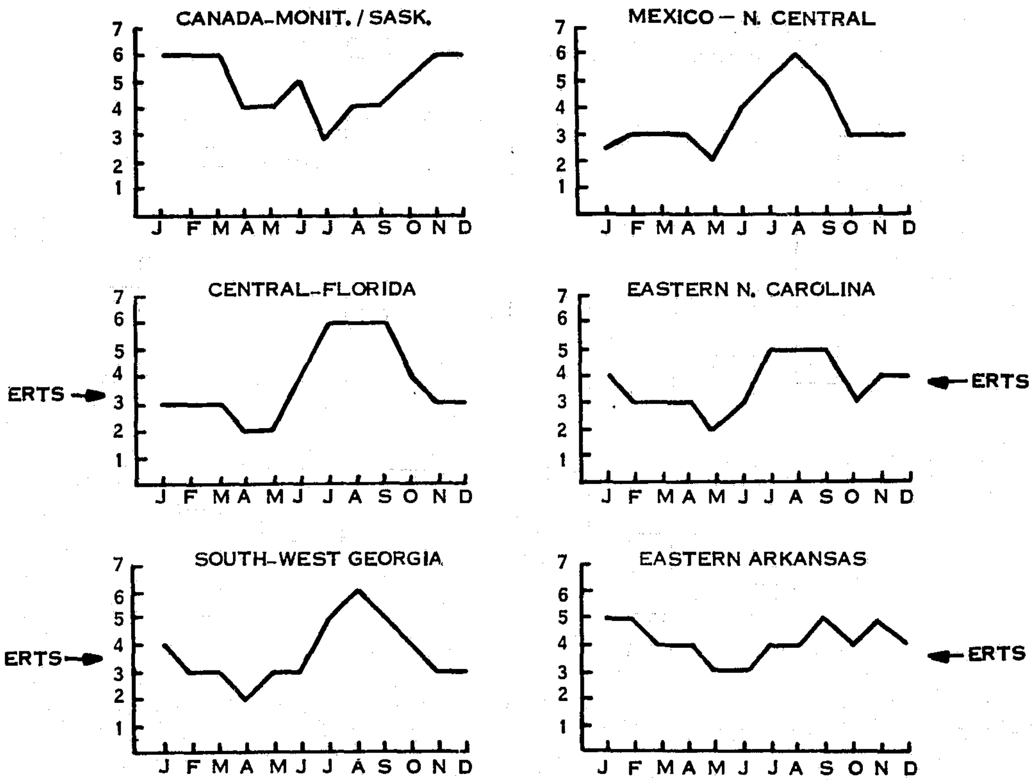


Figure 2-22. Mean Monthly Cloud Cover in Octas for Selected Geographical Areas

With regard to the field size question, the study team encountered substantial difficulty in producing a definitive answer. Other treatments of the world crop survey mission have considered sizes of holdings, not fields; while holdings data is much more readily available and thus easier to evaluate, holdings size distributions do not address the proper system question and can lead to improper conclusions.

In addressing the field size question, the TERSSE team first made an extensive literature search at the National Agricultural Library in Beltsville, Maryland. Documents produced by the UN Food and Agriculture Organization were also consulted.[1,2]

Since such data was felt to be critical to the question of sensor resolution, a more basic approach was then adopted - that of image analysis. ERTS-1 imagery was first examined because of the availability of coverage of most of the globe. Visual inspection of ERTS frames from the major crop growing regions of the world resulted in the conclusion that, with some exceptions in the western U. S., field boundaries were too indistinct in the imagery to permit accurate mensuration for field size distribution. S190A imagery was also visually inspected with much of the same result.

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[1]United Nations, Food and Agricultural Organization, Report on the 1960 World Census of Agriculture, Volume 5, Rome, 1971

[2]United Nations, Food and Agricultural Organization, Program for the 1970 World Census of Agriculture, Rome, 1965.

Imagery from the Earth Terrain Camera, S190B, was then viewed and found to be of sufficient resolution to permit the photointerpretative evaluation sought - that of clearly discerning individual fields and measuring their sizes. A sampling of the imagery was made, subject to the constraints of available coverage (Table 2-10), which covered areas producing one or more of the eight crops selected for the study. In each S190B frame analyzed, one or two segments of intensive agriculture land approximately 13 km (7 nm) by 24 km (13 nm) were selected. For each segment the fields contained in it were measured under 8x magnification, tabulated, and plotted as Figures 2-23 and 2-24. The smallest field measurable from the imagery was estimated to be 6.8 hectares (17 acres); thus the data are plotted as cumulative percentage of total field area contained in fields of size greater than 6.8 hectares and larger numbers. Table 2-11 shows the S190B coverage and frame locations used.

Field size and IFOV are related in two ways:

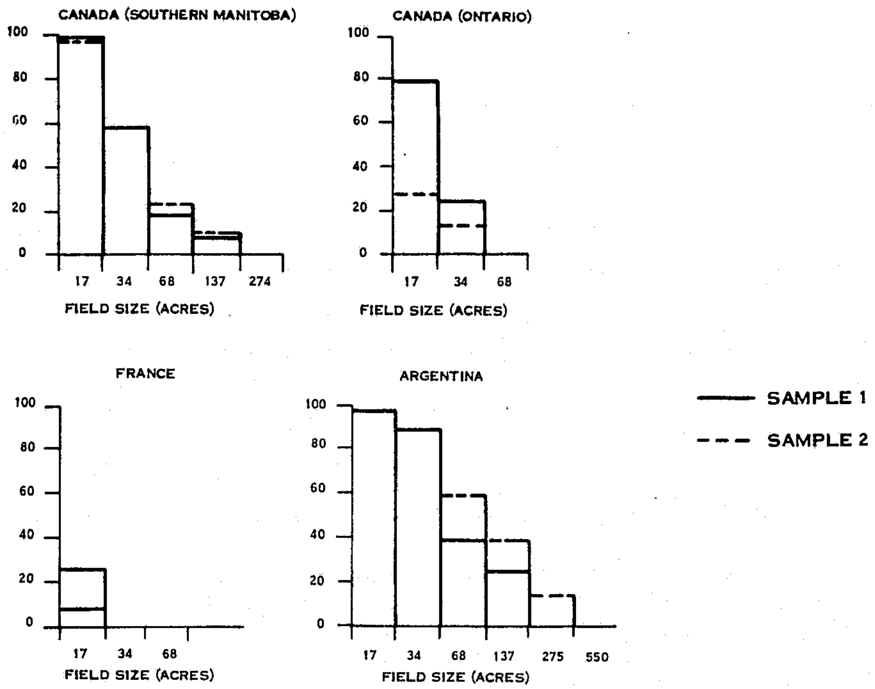
1. The IFOV size affects field area measurement accuracy; and

2. The IFOV size affects crop classification or identification accuracy.

A brief discussion of these two factors follows wherein it will be shown, for the mission under consideration, that the primary concern is classification accuracy, and that field area measurement is of only secondary concern where IFOV size is involved.

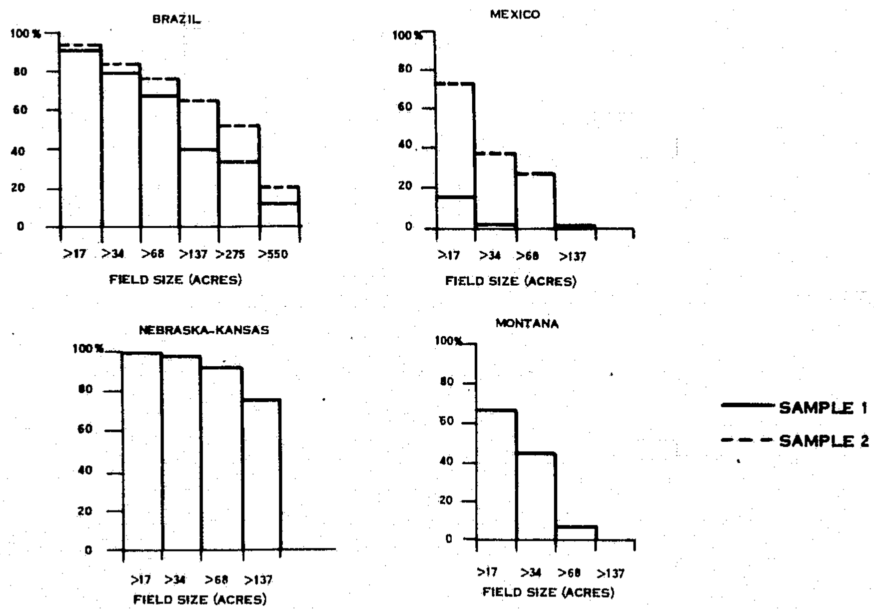
Table 2-10. Availability of S190B Imagery of Important Crop Areas Outside of the U.S.

| Country | S190B Imagery |
|---|---|
| U.S.S.R. | None |
| CHINA | None |
| CANADA | Extreme South only - 4 Passes |
| ENGLAND | None |
| FRANCE | 3 Passes |
| NIGERIA | Solar Intercept Pass only - not calibrated |
| POLAND | None |
| INDIA | None |
| PAKISTAN | None |
| JAPAN | 7 Frames from 1 Pass - all 50% to 100% Cloud Cover |
| INDONESIA | 1 Pass over Borneo - 80% + Cloud Cover No Fields Visible |
| BRAZIL | Several Passes - 1 Useable |
| MEXICO | Several Passes - 1 Useable |




PERCENTAGES SHOWN ARE ACREAGES CONTAINED IN FIELDS
GREATER IN SIZE THAN VALUES SHOWN ON ABCISSA

Figure 2-23. Field Size Distributions as Measured on Sample Areas in S190B Imagery for Selected Areas of the World




PERCENTAGES SHOWN ARE ACREAGES CONTAINED IN FIELDS
GREATER IN SIZE THAN VALUES SHOWN ON ABCISSA

Figure 2-24. Field Size Distributions as Measured on Sample Areas in S190B Imagery for Selected Areas of the World

Table 2-11. Location of "Field Size" Images

| Place | Location* | |
|---|---|---|
| | Longitude | Latitude |
| Brazil | 23:31.7S | 52:43.2W |
| Mexico | 20:44.3N | 100:2.9W |
| France | 43:34N | 2:47.5E |
| Canada - S. Manitoba | 49:12.2N | 99:13.6W |
| Canada - Ontario | 44.2N | 77.7W approximate |
| Nebraska - Kansas | 40:4.1N | 101:30.6W |
| Montana | 47:41.3N | 104:8.1W |
| Argentina | 32:31.9S | 62:40.8W |

*Coordinates of image center

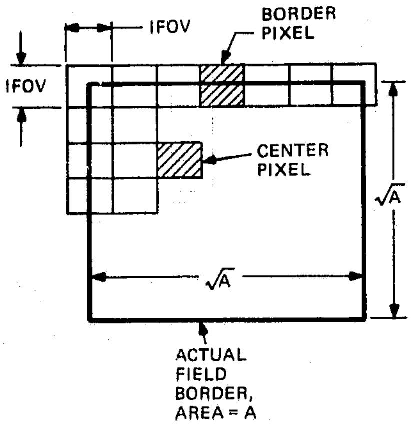
Consider first the measurement of crop area. The error associated with measuring individual fields is shown in Figure 2-25 with a diagram and the appropriate equations. The measurement error is seen to be proportional to the square root of the area. This can be conceptually visualized by realizing that the error is introduced only by the treatment of the border pixel and that the number of border pixels is directly related to the perimeter of the field (perimeter equals $4\sqrt{A}$ for square fields).

When individual fields are aggregated to form a total area measurement over a larger area (e.g. counties, states, countries) the total measurement error is as developed in Figure 2-26. The total acreage error is seen to be a function of the total acreage measured (and only indirectly a function of field size). When the measurement error of an individual field is independent from that of other fields then the combined error is formed as the squareroot of the sum of the squares of the individual errors (the variances add). There is no greater expected aggregate error in measuring, say, four 10 hectare fields than in a single 40 hectare field! This conclusion is extremely important for the mission in question, as the total crop area of even the smaller major producer countries is sufficient to cause aggregated errors to become small, even if individual field errors are quite large.

Figure 2-27 illustrates the area error for the three earlier equations as a function of pixels/area. (Note that area may be either a single field or a total of many fields). It may be seen that, although the error for an 8 hectare field with an IFOV of 80m is quite high, the area measurement for a small county made up of such fields would be less than 1%, given that the fields were identified in the first place.

Which factor brings us to the second type of relationship between field size and IFOV: the ability to classify or identify the field as containing a given crop. Work done to date indicates that consensus on the number of pixels required to accurately classify a field is not yet possible. And the final answer will be technique and crop dependent. However, inferences can be made from ERTS-1 results that 30-50 pixels per field form a lower limit and that upwards of 100 are desirable.

The ultimate limitation to world crop survey posed by resolution is thus not one of area error but of a stratification from the sample of fields smaller than the lower limit of classification. Such a stratification may be able to be coped with in several ways (e.g., by adjusting the final data for small field factors using regression techniques) but it is clear that, all other things being equal, accurate classification to the vicinity of 8 hectares is desirable.




- MAX. HIGH ERROR (ALL BORDER PIXELS CLASSIFIED "YES"):

$$\frac{\text{MEASURED AREA}}{\text{ACTUAL AREA}} = 1 + \frac{\text{IFOV}^2}{A} + \frac{2\,\text{IFOV}}{\sqrt{A}}$$

- MAX. LOW ERROR (ALL BORDER PIXELS CLASSIFIED "NO"):

$$\frac{\text{MEASURED AREA}}{\text{ACTUAL AREA}} = 1 + \frac{\text{IFOV}^2}{A} - \frac{2\,\text{IFOV}}{\sqrt{A}}$$

- NOMINAL ERROR (HALF BORDER PIXELS CLASSIFIED "YES"):

$$\frac{\text{MEASURED AREA}}{\text{ACTUAL AREA}} = 1 + \frac{\text{IFOV}^2}{A}$$

$$\text{ABSOLUTE ERROR} = \text{IFOV}^2 + \begin{cases} +2\,\text{IFOV}\sqrt{A} & \text{(MAX HIGH ERROR)} \\ +0 & \text{(NOMINAL ERROR)} \\ -2\,\text{IFOV}\sqrt{A} & \text{(MAX LOW ERROR)} \end{cases}$$

| THEREFORE ERROR IS PROPORTIONAL TO $\sqrt{A}$ |
|---|

Figure 2-25. Area Measurement


ERROR PER FIELD $= \sigma_A$

TOTAL ERROR $= \sqrt{4\sigma_A^2} = 2\sigma_A$

ERROR $= \sigma_B$

AREA B = 4 AREA A

ASSUME MAX HIGH ERROR

EACH $\sigma_A = \text{IFOV}^2 + 2\,(\text{IFOV})\sqrt{A}$

TOTAL ERROR $= 2\,(\text{IFOV}^2 + 2\,(\text{IFOV})\sqrt{A})$

$= 2\,\text{IFOV}^2 + 4(\text{IFOV})\sqrt{A}$

$\sigma_B = \text{IFOV}^2 + 2(\text{IFOV})\sqrt{B}$

AND $\sqrt{B} = 2\sqrt{A}$

$\sigma_B = \text{IFOV}^2 + 2(\text{IFOV})\,(2\sqrt{A})$

$= \text{IFOV}^2 + 4(\text{IFOV})\sqrt{A}$

$\sigma_B = \text{TOTAL}\,\sigma_A + \text{IFOV}^2$

$\sigma_B = \text{TOTAL}\,\sigma_A$ (FOR ALL PRACTICAL PURPOSES)

- (MEASURED AREA) – (ACTUAL AREA) $\alpha \sqrt{A}$

| THE TOTAL ACREAGE ERROR IS NOT A FUNCTION OF FIELD SIZE BUT OF THE TOTAL ACREAGE MEASURED |
|---|

Figure 2-26. Large Area Measurements

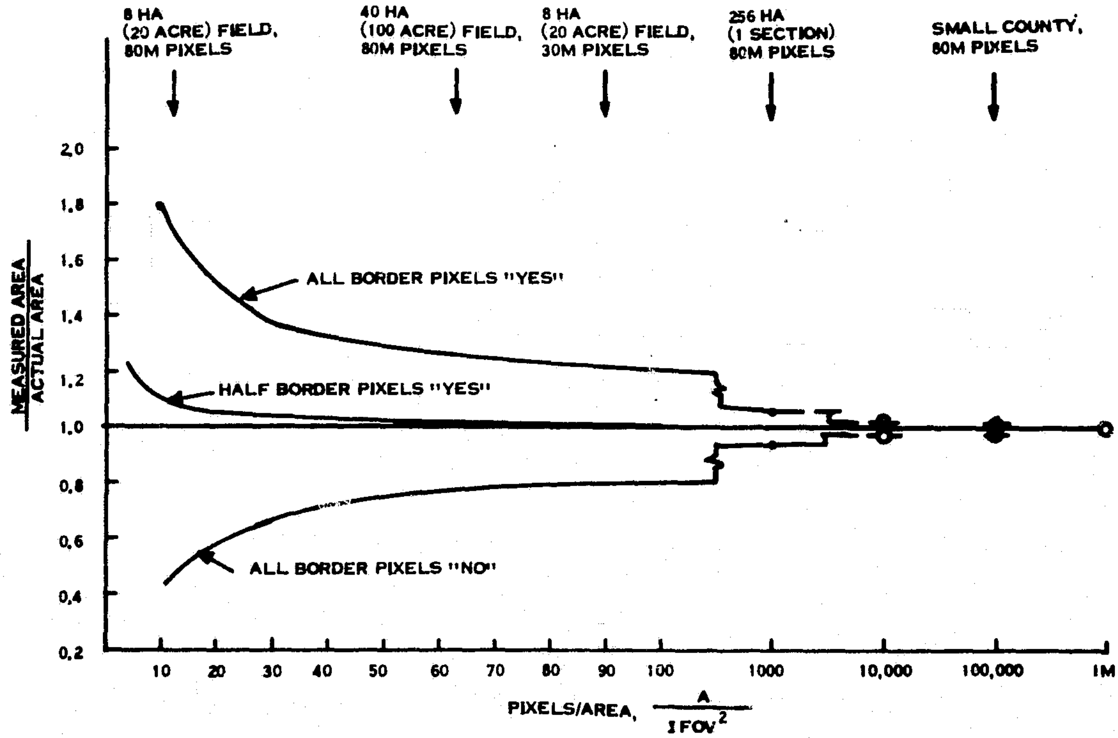



Figure 2-27. Area Measurement Error

The study team has thus concluded that a 30-40m IFOV will ultimately be required for world crop surveys but that the current 80m IFOV is definitely useful to the extent that its stratification of smaller fields from the sample can be corrected by other means.

### 2.5.4 SPECTRAL COVERAGE AND RADIOMETRY

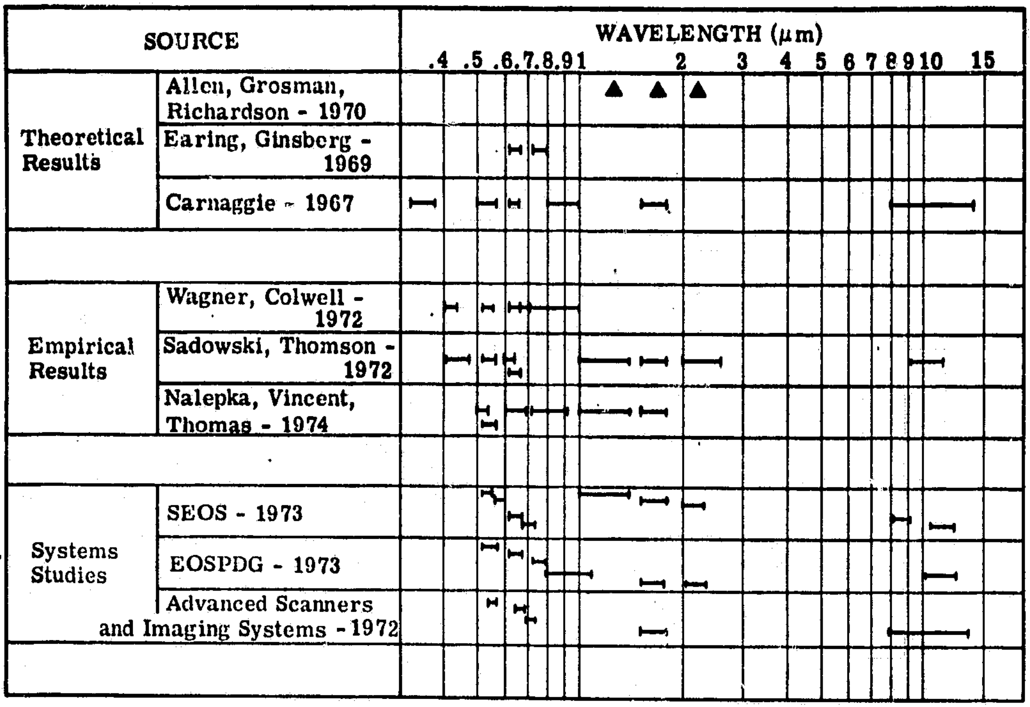
A substantial sensor requirements study was conducted by ERIM, in parallel with the work reported herein, under contract NAS 9-13386, Change Order 3. The ERIM study treated agriculture mission sensor requirements in significant depth; two of the findings of that effort will be reported here in the context of overall observation system requirements:

a) The spectral bands needed for world crop survey;

b) The signal-to-noise performance needed.

Figures 2-28 and 2-29 illustrate the spectral coverage and radiometric performance requirements for an advanced technology sensor optimized for agriculture. These values were selected following a review of previous theoretical and empirical results and were also influenced by specific classification experiments run by ERIM using multi-band aircraft scanner data and various classification algorithms. Specific data regarding these recommendations are contained in the Final Report (to be published) for Contract NAS 9-13386, Change 3.

An additional factor in radiometry which will be of prime importance in the world crop survey mission is that of radiometric correction. Both correction for atmospheric effects and for relative irradiance will be necessary to




LITERATURE SURVEY RESULTS - AG/RANGE/FORESTRY

ERIM

Figure 2-28. Spectral Coverage Requirements

## RADIOMETRIC REQUIREMENTS
### Ag/Range/Forestry

| BAND (μm) | T1/ρ1 | T2/ρ2 | NEΔT/NEΔρ | MEASURED PARAMETER |
|---|---|---|---|---|
| 0.55-0.60 | 0.05 | 0.20 | 0.005 | Chlorophyll transmittance, absorption by other pigments |
| 0.63-0.69 | 0.02 | 0.15 | 0.005 | Chylorophyll-A absorbance |
| 0.69-0.75 | 0.08 | 0.45 | 0.005 | Slope between chlorophyll-A abs. and cell structure |
| 0.75-0.95 | 0.15 | 0.60 | 0.005 | NIR high reflectance (leaf cell structure) |
| 1.55-1.75 | 0.20 | 0.45 | 0.005 | Leaf moisture |
| 2.05-2.35 | 0.15 | 0.30 | 0.005 | Leaf moisture |
| 10.4-12.5 | 270°K | 313°K | 1°K | Temperature |

ERIM

Figure 2-29. Radiometric Performance Requirements achieve a low-cost system. Cost enters the picture because of the global and temporal nature of the problem: the processing of the data involves training for classification. Training is a time-consuming, and hence expensive, segment of extractive processing. Indeed, with the special purpose bulk classifiers which are now state of the art, training has become the major obstacle to rapid extractive processing if it must be performed often.

Signature extension, or the ability to extend the use of a given training set over either a wide geographic or temporal range, is the answer to the training bottleneck. Signature extension for a period of one year has been shown to be possible (for western U. S. cotton, using ERTS CCT data and the GE Image 100), but only under nearly identical atmospheric conditions. Likewise, signature extension over a several hundred mile geographic extent has been carried out several times by ERTS investigators, but only when scene radiance was either relatively constant or was corrected.

In a world crop survey mission, signature extension over many hundreds of miles, for different lighting conditions, and for different atmospheric conditions will, we feel, be a mandatory system capability. To achieve such performance, atmospheric and radiometric corrections will need to be applied to the data. To obtain the correction factors, external data must be introduced. For purposes of atmospheric correction, the water vapor content of the atmosphere is the single largest factor. Not only does water, in the form of haze, reduce overall scene contrast, the radiance effects as a function of spectral interval can be obtained from some knowledge of the water content of the intervening atmosphere. It is therefore recommended that sensing in the 6.3 $\mu$m band be incorporated into the world crop survey system (either as an integral part of the basic sensor or as an ancillary device). For purposes of radiometric intensity correction, an accurate measurement of scene radiance by spectral interval is required. Such an instrument now exists in the S191 filter wheel spectrometer; this instrument could be modified to produce spectral measurements every, say, 10 km along the spacecraft track which would be used to generate radiometric correction functions for signature extension.

### 2.5.5 ANCILLARY DATA

In considering the probable remote sensing technology to be available to the TERSSE, the conclusion has to be drawn that certain data germane to the problem of crop yield and production estimation, will have to be obtained from ancillary sources. Information such as:

- Use of fertilizers and other agrichemicals
- Weather and climate factors
- Some aspects of plant disease and insect stress
- Storage of crops

are basic to the answers ultimately desired from a world crop survey system. Certain of these data are obtained from existing sources, such as NWS, NOAA, FAO, and FAS. Others may never be reliably available on a world-wide basis because of unsophisticated and/or uncooperative nations.

2.5.5.1 Fertilizer and Agrichemicals

The productivity of several of the major grain crops, such as corn and rice, is critically dependent of the type and quantity of fertilizer used. It has been widely speculated that the potential world production of grains in 1974 will be seriously hampered by the shortage of nitrogen fertilizer that has occurred this year.

The available supply of fertilizer very directly and immediately impacts planned crop acreage. In the early Spring, Reuters News Agency reported that India was looking for a large grain crop this year; but, they were short 1,000,000 tons of fertilizer. Major cutbacks in planned crop acreages were therefore being considered.

The use of other soil conditioning chemicals, such as lime, can also be an important factor in estimating the potential productivity of field crops. The data needed, then, for crop yield forecasting would be the quantity and type of fertilizer and soil treatment chemicals used during the cultivation and planting periods for each crop.

2.5.5.2 Weather and Climate

Different field crops are affected in different ways by various weather and climate parameters during various phases of their growth cycle. For example, corn and wheat are differently affected by the rainfall amounts during their growth period. Of course, neither will grow without water. However, wheat can use just so much rainfall; after that point is reached, more rain will cause it to grow no more or better. In fact, a lack of rainfall is desirable during the ripening phase of wheat for proper maturing of the grain. Corn, on the other hand, will only grow more with more rainfall - short of flooding. Temperatures also affect corn differently from wheat. A prolonged heat spell (>90° F) can be disastrous to wheat after it has gone to head. Corn is much more tolerant of temperature extremes.

In order to account for longer term "climatic" type factors that affect crops, such as average temperatures, average rainfall, crop moisture indices, etc., as well as short term weather effects such as hail, frost, flooding, etc., it would be desirable for the TERSSE to have global weather data available on a routine basis.

2.5.5.3 Plant Disease and Insect Stress

Although it may be possible with remote sensing to detect the fact that a certain field crop is under some sort of stress due to insects or plant disease, it may not be possible in the near future to reliably deduce the specific stress agent. To properly and fully assess the impact on crop yield and production, it is essential that the specific problem be identified so that some estimation can be made of the likely rate and extent of crop damage and of the likelihood that farmers could possibly implement some control measures such that the ultimate impact on production would be minimal.

2.5.5.4 Storage of Crops

In estimating final world crop production figures, a currently used piece of information that will likely continue to be needed is the quantity of crops in storage. This can be a very sizable fraction of the output of a given crop. It has been estimated[1] that by the end of the 1974 wheat harvest in the United States, 90% of the wheat produced will be in storage. To fully estimate the final production figures for the major crops of each country, estimates will have to be found for the quantities of those crops that are placed in storage.

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[1] U. S. News & World Report, June 17, 1974, p. 66.

## 2.6 WORLD CROP SURVEY INFORMATION FLOW

The flow of information to produce world crop survey output products as seen for the TERSSE is schematically illustrated in Figure 2-30. The activity indicated in this figure occurring within the U. S. Department of Agriculture is exactly as occurs today. This is consistent with the conclusion reached in this study that the world crop survey output products need not change in their outward appearance. It is accuracy and timeliness of the information they contain that must change. To the users, the outward appearance of the publications and statistical summaries they receive from USDA would not be different; however, their utility should be greatly enhanced.

Remotely sensed radiometric and imagery data from TERSSE aircraft and satellites, as well as in-situ measurements collected by satellites from automatic data collection platforms will be fed into a central processor wherein appropriate geometric and radiometric corrections will be made. Currently available algorithms will produce tabulations of acres cultivated and harvested as a function of crop type, as well as various parameters, such as plant vigor and biomass, relevant to crop yield. The acreage data, in the form of thematic maps and computer compatible products, and the crop yield data in the form of computer compatible products will be fed to those agencies of the USDA currently responsible for producing the user products. It is within the USDA that these new input data sources will be combined with all currently available conventional information sources and ancillary data to produce the standard informational products available to the agricultural community.

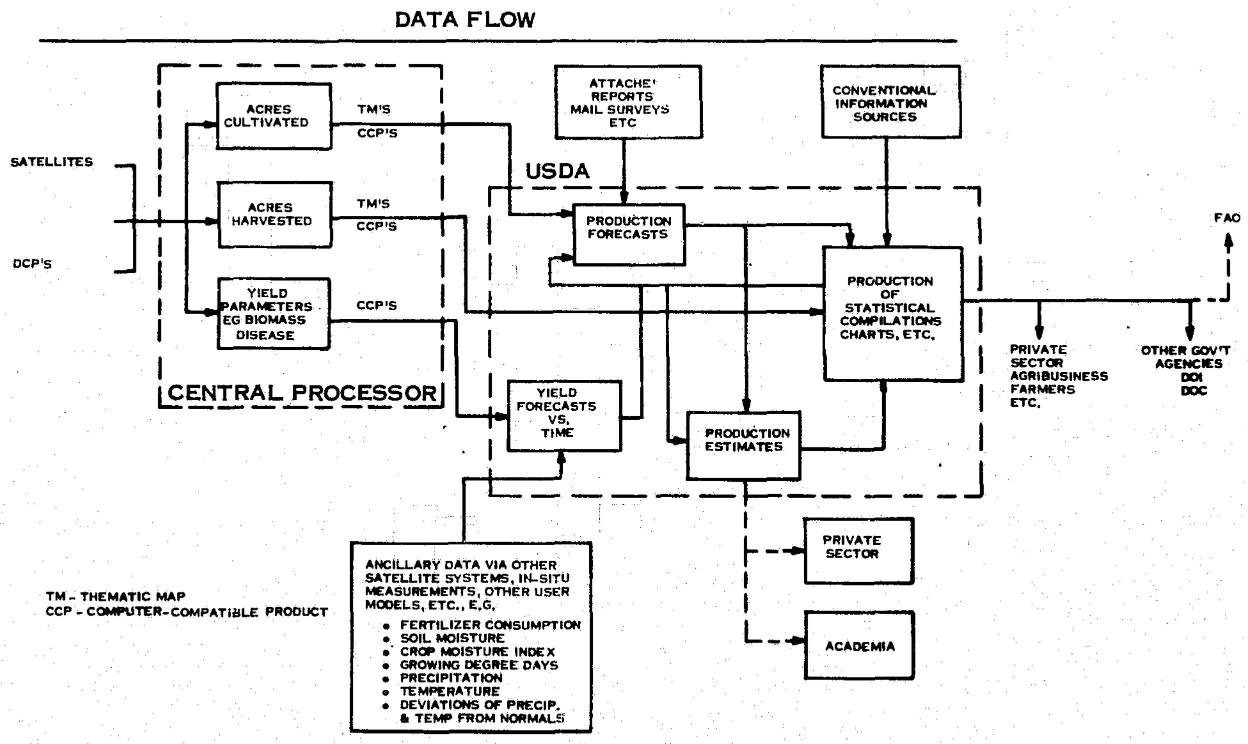


Figure 2-30. Information Flow-World Crop Survey

## SECTION 3

## LAND RESOURCE MANAGEMENT CASE STUDY

### 3.1 INTRODUCTION AND PROBLEM DEFINITION

#### 3.1.1 INTRODUCTION

The objective of this portion of Task 3A is to derive a definition of the TERSSE performance requirements relevant to the management of land resources. Before these requirements can be defined and discussed, however, it is necessary to have a clear understanding of the problems of land-use management and the types of information which are likely to be required by them.

The disappearance of the American frontier has at long last been followed by the disappearance of the American "frontier mentality." The realization has come that land cannot just be sold, bought, exploited, and discarded; it is not a limitless resource. There is no longer anywhere to move on. Our land, like all our other natural resources, must now be carefully conserved.

In the last several decades, motivated by tax and revenue inequities, urban areas rapidly spread beyond their existing boundaries into prime agricultural lands and rather carelessly, onto flood plain areas. Urbanization took place in areas that were geophysically unsuitable, such as those susceptible to geological instabilities, with inadequate water supplies, or with pollution-prone air sheds. Rapidly growing, urban areas represented an economic attraction to the rural population, which resulted in further abandonment of extensive areas of farmlands and extensive areas previously strip mined. In time, these areas were severely damaged by uncontrolled erosion.

Until recently, the only tool that has been available for the control of land use has been the zoning ordinance. The enactment of zoning ordinances has almost solely been the responsibility of local governments, such as counties, cities, townships, or boroughs. History has shown that these regulations have by and large, been used either to protect private investments, or for political or economic expediency rather than for the implementation of an urban growth plan or the achievement of some set of community goals. Adding to this situation has been the confusion arising out of the extraordinary fragmentation of this zoning responsibility. In the United States, there are over 600,000 entities with influence over land use decisions.

One fact stands clear today. Our population is increasing, and the need for land continues to rise. Comprehensive land use planning, considering both natural and human factors, has now become essential. Land is obviously needed for subdivisions, houses, industries, roads, highways, airports, shopping centers, and so forth. However, it is the reckless conversion of land to these uses in deference to the retention of land for open space, recreation, agriculture, timber, minerals, wildlife, wetlands, and pure esthetics that must be managed. For the most part, these conversions of land use are irreversible processes. When wet lands are drained, or valleys flooded, or farmlands subdivided and paved, it is unlikely they will ever be restored. Yet, there can be no question that the expanding population demands the creation of new facilities. In land use management, emphasis must be placed on the control of reckless or ill-considered conversions of land use.

Another very important land use problem is that of secondary developments surrounding major projects such as airports, highways, etc. When the decision has been made to build a new airport, it does not necessarily follow that a wide area surrounding the airport site must be developed. Major highways, which are an economic necessity between major urban centers, have in the past become corridors of uncontrolled and frequently detrimental development. All such development is not necessarily bad; however, similarly, all such development need not proceed without question.

There are other special problems and considerations looming large in future land use management. Just as states and localities must protect areas of critical environmental value and the areas surrounding public facilities against careless development, so must certain necessary regional developments not be excluded by local governments. For example, low and moderate income housing or such facilities as water and sewage treatment plants are agreed upon necessities for which locally acceptable locations are frequently difficult to find.

The location of strip mining sites will become increasingly more important with time, particularly if more and more coal and oil-bearing shale must be mined to meet the nation's energy requirements. Even today, half of all coal and almost all non-fuel mining is accomplished with surface mining techniques. So far, 600,000 hectares (1.5 million acres) of land have been affected by the strip mining of coal and as many as 1.8 million hectares (4.5 million acres) of similar coal deposits still exist. Strip mining activities will become more closely regulated with great emphasis placed on reclamation of the land being guaranteed upon completion of the mining operation before any permission or lease is granted in the first place.

Very careful land use planning must include consideration of geological hazards. In determining the suitability of a designated site for a specified application, the location and potential movement along fault lines, potential volcanic activity, susceptability to land slides or land slumping will be given new consideration. Great improvements are being made even today in the knowledge of the existence and location of these earth hazards. These geological data must be more fully available to the land use manager than ever before.

On a National scale, in addition to the obvious need for continuing preservation of National Parks, National Monuments, National Recreation Areas, National Seashores, and Historic Sites, a very unique problem will be the necessary improvement in accessibility to parks and public recreation areas. In the last ten years, about 400,000 hectares (1,000,000 acres) of land each year have been at least in part, placed into recreational use. Yet, in the United States today, 70% of the people live in urban areas on 1.5% of the land, but only 1/4 of the nation's recreation facilities and only 3% of public recreation land are reasonably accessible to urban dwellers. This is completely inconsistent with the purposes for preserving these land resources.

Current legislation pending before the Congress sets the tone for the organizational concepts and levels of responsibility for management of land resources in the latter '70's and early '80's. For this study, it must be assumed that by the Shuttle Era, every State will have established a Land Use Planning Agency. These State agencies will have the primary authority and responsibility for development and administration of State land use programs and for coordination of single purpose planning for material and human resources. However, again the assumption is that consistent with current thinking, basic zoning decisions will still reside with local governments except for the management of special areas within the State which are of more than local concern. Each State will provide and continuiously update overall State Land Use Plans as guidance or framework within which local governments will work. A systematic planning process will be operative, that involves all the sub-State units in the planning, coordination, and development of land use plans; the States, however, will retain ultimate control over the use of their land resources. Land use decisions will have to be brought to the point where they are based on fully adequate information and an understanding of the impacts of these decisions on the physical, social, and economic environments of the people involved.

One example of the interaction between the States and their internal local governments might be in the management of urban growth. Urbanization has been absorbing land in the U.S. at the rate of 292,000 hectares (730,000 acres) per year during the 1960's. This would have several objectives. It would prevent the spread of suburbia into areas where the required development of supporting facilities would threaten or damage the environment. It would also simply prevent unnecessary loss of open land. Most importantly, the containment of urban growth would serve to retain a strong tax base within the urban areas so that the necessary funds would be available on a local basis to preserve and conserve our cities. Within the State-set boundaries or urban growth guidelines, it will be the responsibility of the local governments to plan and implement specific local development programs.

The States might retain the responsibility for selecting site locations for all major airports, highways, parks, etc. and will at least set the guidelines if not retain the total authority, for the development of lands around those facilities. The management of secondary developments surrounding large public facilities will be a major problem in land resource management, because of the potentially high economic value of such development.

It can also be assumed that the role of the Federal Government in land resource management in the late '70's and early '80's will mainly be that of a catalyst, causing the planning and management function to happen without being directly involved. The Federal Government will provide the incentives to the States - the best incentive being the necessary funds. Of course, the Federal Government will also have the prime responsibility for the management of Federal lands, although it will be absolutely essential for the States to be involved in the coordination and planning for the management of those lands within their borders.

### 3.1.2 PROBLEM DEFINITION

The task of problem definition is a difficult one where the subject of resources management is involved. To begin with, the boundaries of the problem are nebulous. Because of the numerous physical, economic, social, and institutional interrelationships which are involved in all cases, it is extremely difficult to delineate the boundaries between land resources management and other types of resource management, such as water, agriculture, forestry, etc. Yet, at least for the purposes of this study, some arbitrary if not defineable boundaries must be drawn.

Related to the boundary question is the practical matter of determining which user organizations need to be included in the analysis of this problem. Some organizations such as urban and regional planning agencies are clearly involved with the management of land resources; however, there are many other types of organizations whose primary responsibilities lie in other resource management areas, but which are also vitally concerned with land resources and their management. Clearly, for reasons of practicality, not all of these other organizations can be included within the framework of the problem; some selection criterion must be imposed, or very quickly it is found that all the other major resource management problems have been involved.

On another level, the definition of this problem involves the delineation of the fundamental concept and nature of land resources and the meaning of land use. It was felt by the study team that this was a useful effort in that much of the confusion encountered on the subject of land resources management during the course of this study seemed to stem from an inadequate understanding of these concepts. The study team also focused attention upon the process of land utilization - in particular: (1) how the utilization of land is determined; and (2) how different uses of land can give rise to problems of an environmental nature. As will be seen later on, these problems are part of the basic rationale for the management of land use.

### 3.1.3 BASIC CONCEPTS OF LAND AS A RESOURCE

Throughout this entire discussion, the word "resource" will be utilized repeatedly; hence, it would be worthwhile to consider its exact meaning. One useful definition has been given by Zimmerman[1]. He indicates that the word "resource" does not refer to a thing or a substance, per se. Rather, it refers to a concept about the function which a thing or a substance performs, or to an operation in which a thing or a substance may take part. The function or operation is namely that of attaining a given objective such as satisfying a want. Thus, the term "land resources", actually refers to an abstract notion about the use of land rather than the physical "being" of the land, per se.

In addition to the fundamental concept of land as a resource, there are also several lower-order concepts which reflect different ways in which land can be visualized. Depending on the context, land may be thought of as: (1) a physical setting; (2) space; (3) a factor of production; (4) a consumption good; (5) a provider of location and accessibility; and (6) property. Each of these different perspectives is touched upon below.

As a physical setting, land is thought of in terms of the physical properties which it possesses which condition or limit man's use of it for various purposes. Of concern here are such properties as topography and drainage, soil quality, geological structure, vegetative cover, water availability, ground water distribution and so forth. This concept of land pertains most directly to the considerations of the intrinsic physical suitability of the land for different types of human activities.

Land may be thought of as defining a space within which various types of activities and processes occur, and within which natural and man-made phenomena are distributed. This is the concept of land most commonly considered in land use surveys, resulting in such analyses as the acreages consumed by particular forms of agriculture, the amount of land available for urban expansion, the areal extent of a mineral deposit, and so forth.

From an economic standpoint, land may be considered as a factor of production. In this sense, land is viewed in terms of the contribution it makes to the production of goods and services. The most obvious example of this is in the area of agriculture where the natural qualities of the land contribute directly to crop productivity. Land, however, may also contribute to the production process in a less direct fashion such as through the use of its mineral content in various industrial processes.

Land may even be regarded as a type of consumption good which gives rise to satisfaction in its own right. Land is visualized in this fashion, for example, where the possession of a particular parcel of land, in itself, yields a certain level of happiness or satisfaction.

[1] Erich W. Zimmerman, Introduction to World Resources, ed. by Henry L. Hunker (New York, Evanston, and London: Harper and Row, Publishers, 1964), p. 8.

Land is of course immobile and as such must be thought of in terms of its location and the accessibility which its location provides to other points or areas. Together, location and accessibility constitute a major determinant of the use and market value of a given parcel of land.

Finally, land may also be regarded as a form of property. When conceptualized in this manner, land takes on aspects which involve the definition of areas over which individuals exercise the rights and responsibilities of ownership and use. The property concept is extremely important since it plays a significant role in the shaping of attitudes and actions pertaining to the use of land and in the implementation of land use plans developed by state and regional agencies. Cognizant agencies can write such plans, but there is not a direct means at present to compel property owners to comply with them. Land as property is certainly one of the most important concepts of land for the resource management problem.

Having touched upon the basic concepts of land as a resource, it is now appropriate to consider the subject of land use.

### 3.1.4 LAND USE

"Land Use" is a general term encompassing many different concepts of the utilization of land resources. Among these, the central concept is that of activity. According to this concept, the use of land can be characterized in terms of the human activities which are being carried out above, on, and below the surface of the land, such as manufacturing, commerce, agriculture, mining, forestry, etc.

Sometimes man's activities are so closely tied to the natural environment that they become embodied in the physical characteristics of the land. This is frequently the case in agriculture, where in any given area there is a very close relationship between farming practices and the crops which are being cultivated. It therefore becomes possible to characterize the utilization of the land in terms of different types of crops. It is important to recognize, however, that the correspondence between man's activities and the physical properties of the land is not always so neat. For example, consider the practice of forestry. Obviously, not all tree-covered land is involved in the forestry industry while on the other hand, not all forestry activities are carried out on tree-covered land - in other words, a one-to-one relationship between the activity and the nature of the land is not found.

In a parallel fashion, activities may also be embodied in man-made improvements to the land. The relationship is usually so close that activities are frequently identified on the basis of the characteristics of improvements. For instance, it is usually, if not always, the case that different types of residential activities are identified largely through a process of association with dwelling types. This sort of relationship oftentimes leads to a characterization of land use which is based upon a combination of the concepts of activity and man-made improvements. The use category of "single-family detached housing" is an example of this. Of course, it is important to also recognize that different activities are possible with the same types of improvements; and, conversely, that identical activities may be carried out within areas of different improvements.

In certain situations, the concept of intensity may also be employed to characterize the utilization of the land. The term "intensity" refers to the degree of utilization, and can be measured in two ways: (1) in terms of the inputs of labor, capital, and managerial effort per unit of area; or (2) in terms of the utilization or output of goods or services per unit of area[1]. Which of these measurements is utilized depends upon the particular type of activity which happens to be involved. The application of this concept is illustrated by the differentiation of manufacturing activity along the lines of "light", "medium", and "heavy" uses.

In cases where there is no activity or the intensity of activity is extremely low, it is sometimes useful to employ the concept of idleness. A desert, for instance, might be considered as an idle use. The same thing could apply to unused land located at the periphery of a city.

Lastly, the fact that land is also property makes it possible to visualize the use of land resources in terms of <u>ownership</u> categories such as Federal lands, state lands, municipal lands, private lands, etc. This concept is somewhat different from the others in that activity is <u>not</u> involved. Characterization of land resources along ownership lines is useful where interest is centered upon the pattern of control.

The concepts discussed above are reflected in the many <u>land-use classification schemes</u> that have been developed. The form which a particular scheme exhibits depends upon which of these concepts happens to be involved, and the emphasis which is placed upon each. In turn, the relative importance placed upon each of the concepts depends upon the particular nature of the management problem and the objectives which are being pursued.

Classification schemes serve a valuable function by facilitating the systematic handling of land-use data. When developed with the proper amount of judgment, they can be employed in a variety of ways which facilitate more effective utilization of land resources. Some of these include:

1. Supplying the basic information needed for the formulation of land-use plans and programs
2. Providing direction to public and private activities involving the acquisition, development, or settlement of land.
3. Facilitating the improvement of land appraisals, tax assessments, and real estate credit policies.
4. Guiding the allocation of public investment funds.
5. Helping individuals to manage their own properties more effectively.

The most important point to keep in mind about classification schemes is that they are a management tool for analysis of land use but are not a substitute for effective management. Classification has no value in and of itself - its value derives wholly from its ability to facilitate the attainment of management objectives. Thus, the formulation of classification schemes should always be predicated upon the question of what purpose is to be served. This point may appear to be too obvious to mention; however, in practice, there is oftentimes a tendency to place more emphasis on the means than on the objectives which are being sought. Where this occurs, a classification scheme may have little or no practical value.

The most commonly used land classification scheme is the HUD-BPR or minor variations of it, which is shown in Appendix P. For purposes of comparison, an abstraction of the USGS "Circular 671" scheme, the State of Delaware Land Classification scheme , and an adaptation of the HUD-BPR scheme used by the Delaware Valley Regional Planning Commission (DVRPC) are also shown as Appendices Q, R, and S, respectively.

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[1] Marion Clawson with Charles L. Stewart, <u>Land Use Information</u> (Baltimore: The John Hopkins Press, 1965), pp. 20-21.

Land-use categories in the HUD-BPR scheme are identified by numerical codes. The codes range from one to four digits, with the detail of classification increasing with the number of digits involved. Particular emphasis is placed upon the differentiation of industrial and commercial land uses.

The DVRPC scheme is based upon the HUD-BPR system, but has fewer categories and places a greater amount of emphasis on the description of residential uses. A similar emphasis is found in the Delaware scheme which, like the HUD-BPR scheme, is also based on a four-digit code.

In contrast to the abovementioned schemes, the USGS scheme is designed specifically for use with remote sensing. The scheme consists of four levels of land-use categorization, each of which corresponds to a different requirement for sensors, platforms, and ancillary information, as follows:

| Classification Level | Source of Information |
|---|---|
| I | Satellite imagery, with very little supplemental information |
| II | High-altitude and satellite imagery combined with topographic maps |
| III | Medium-altitude remote sensing (1:20,000) combined with detailed topographic maps and substantial amounts of supplemental information |
| IV | Low-altitude imagery with most of the information derived from supplemental sources |

### 3.1.5 THE ALLOCATION OF LAND RESOURCES

Land resource management or the planning of land use is basically an economic problem of resource allocation. It pertains to the question of how a finite supply of land resources shall be allocated among various competing needs. How the allocation is carried out depends upon the nature of the economic system which happens to be involved. In a pure capitalistic system, the allocational problem would be resolved solely through the operation of the market mechanism. At the other extreme, in a centrally-planned economy the allocation would be determined wholly on the basis of administrative decisions. In the U.S., the allocation of land resources has largely been determined through the operation of market forces with local zoning ordinances being one of the few constraints. As a result, the management of land resources in this country is generally no more than a screening device in which various proposed uses of land are approved or disapproved. There is no specific utilization dictated to a land owner; however, attempts are made to induce or influence the preferred patterns of land utilization.

At any given point in time, the amount of land which is available for different uses depends upon the interaction of several factors; e.g., the physical characteristics of the land, and the economic, institutional, and technological contexts within which the utilization of land takes place.

The broad dimensions of the allocational problem are determined by the physical characteristics of the land. Along with the factors of location and accessibility, these characteristics determine the intrinsic suitability of land for different uses. This has been discussed extensively by McHarg[1]. Some of the more important of these characteristics include topography and drainage, climate, availability of water, soil conditions, geological conditions, availability of minerals, etc. In the case of agricultural uses, for example, considerations such as topography, soils, and climate

[1] Ian McHarg, Design with Nature (Garden City, New York: Doubleday/Natural History Press, 1969).

are extremely important. Location and accessibility become more important where commercial agriculture is involved, but they are definitiely less important than are the natural attributes of the land. Almost the direct opposite is true of urban uses, where location and accessibility are of paramount importance, while climate and soils are generally of only secondary importance, in that so many of the problems they pose can be overcome by technology. Within the broad dimensions established by these physical characteristics of the land, the actual utilization of land resources is determined on the basis of economic, institutional, and technological considerations.

With respect to the economic considerations, the concepts of demand, price, cost, and competition are important to bear in mind. In utilizing land resources, man has a natural inclination to first make use of those areas which possess the highest intrinsic suitability for the particular use which he has in mind. Through time, however, the need for additional land makes it necessary to resort to areas with lower and lower intrinsic suitability. Now, as intrinsic suitability declines, development costs rise. For instance, when the demand for additional agricultural land is strong, it sometimes becomes necessary to "create" new agriculatural land through means such as irrigation, drainage, terracing, leaching, etc.

Increasing demand also gives rise to a situation where competition between uses becomes more and more intense. This, in turn, bids up the price of land and also leads to more intensive utilization of the land which is already developed. In the competitive process, available land resources are normally allocated to those uses which are capable of paying the highest prices and which are likely to reap the greatest financial returns.

No serious supply problem will develop as long as each type of use can expand without infringing on areas used for other purposes. Difficulties arise, however, when conflicting uses begin to compete for the same areas. In this situation, the more highly valued and productive uses predominate, and the lower-priority uses are forced to settle for lower-quality areas.

Moreover, once all land in a given region has been brought into use, further expansion of urban uses, cropland, and other high-priority uses can only be attained by infringement upon "residual" areas devoted to lower-priority uses such as forestry, grazing, wildlife habitat, recreation, etc. Over the long run, therefore, the amount of land available for "lesser" uses will gradually diminish unless the operation of the market mechanism is interfered with.

In a theoretical context, one can fully address the allocation process in terms of economic factors, alone. Within the context of the real world, however, institutional factors also play a major role in the allocation of land resources. Among these factors, the most important include law, government, public opinion, and the concept of property rights.

Laws may either limit or expand the opportunities which individuals have to control and exploit land resources. For example, zoning ordinances and building codes directly control the pattern of land utilization by delineating permissible land-using activities, use intensities, and types of man-made improvements to the land. In a less direct fashion, laws for the protection of the environment may also exert a major influence on the use of land resources. This has not been a major factor, but now may begin to become of major importance.

Governments influence the use of land in a variety of ways. Where public lands are involved, governments assume direct responsibility for the management of the land resources. In situations where privately-owned lands are involved, however, the role of governments is largely one of attempting to influence the actions of private decision-makers in such a way that a desirable pattern of land utilization is achieved. Along these lines, some of the measures employed by governments include various types of land-use controls (such as zoning), urban renewal programs, tax concessions and other types of subsidies, land reclamation programs, etc. The Coastal Zone Management Act of 1972 is an example of how through financial incentives, the Federal Government is attempting to motivate the coastal states to develop, amongst other management plans, comprehensive Land Use Plans for their coastal zones.

Quite often, public opinion has a major bearing on the use of land resources. A typical example of this is where pressure on the part of the public induces a government to take measures to protect a fragile environment, such as a wilderness area, from being encroached upon by commercial or other types of development. Public pressure has also been notable in the preservation of many wetlands areas.

In large measure, the incentive to develop, maintain, and improve land resources is spawned by the concept of property rights. This concept forms the basis of the rules and procedures through which property is owned, leased, mortgaged, and legally transferred. As such, it underlies the existence and operation of the economic system[(1)].

Technological factors enter the picture since they affect man's ability to make use of land resources. In an economic sense, they may increase the supply of land resources by facilitating more effective utilization. This would be the case, for example, where improved agricultural techniques make it possible to convert a wasteland into a productive farming area. Available building techniques permit development in areas where the soil and rock structure might not normally be acceptable. Developments such as porous paving materials will permit other developments in aquifer recharge areas previously excluded from use.

At the same time that they affect the supply of land, technological factors may also give rise to new demands for land resources through their effects upon the tastes and preferences of consumers for goods and services. This is explained by the fact that the demand for land is largely a "derived" type of demand — in other words, land is generally not desired for its own sake, but rather as an input to the production of various types of goods and services. By altering the pattern of demand for these goods and services, these factors in turn influence the demand for land resources.

### 3.1.6 THE NEED FOR LAND RESOURCES MANAGEMENT

In the absence of any controls, the market mechanism will allocate available land resources to different uses on the basis of whoever is able and willing to pay the highest price. One can criticize this process on philosophical grounds; however, this issue will not be dealt with here. Rather, this discussion will focus upon the major types of problems to which the market determination of land use can give rise, and the reasons why the solution of these problems requires some form of externally-imposed management.

One possible outcome of the allocation process is that a given piece of land may not be used for a purpose which is <u>compatible</u> with the uses on surrounding pieces of land. An example of this would be the development of an industrial plant in the middle of a residential area. The inhabitants of this area would more than likely react to the plant in a

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[(1)] Raleigh Barlowe, <u>Land Resource Economics</u> (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1958), p. 29.

negative fashion, citing a number of reasons for its undesirability. Some of the reasons cited might include noise, air pollution, adverse effects on property values, increases in traffic hazards, etc. All of these problems fall under the category of spillover effects (or "externalities").

Spillover effects — if negative — can be considered as "costs" which are generated by the industrial activity, but which are passed on to the inhabitants of the surrounding area. In other words, the inhabitants are, in effect, being put in a situation where they must involuntarily bear part of the costs associated with the industrial activity. Of course, barring outside interference, the owner of the plant would have little or no incentive to compensate the inhabitants for these costs since this would adversely affect the profitability of his operation. Furthermore, according to the concept of property rights which prevails in this country, the owner of a piece of land is by and large free to use the land in whatever manner he sees fit. This situation has led some economists to argue for the development of "amenity rights" to protect individuals from negative spillover effects. It is important to recognize, however, that spillover effects may also be positive — as for example, where complementary land uses are involved.

If properly employed, land resource management can be a powerful tool for minimizing the amount of negative spillovers involved in the utilization of land. This, in fact, is one of the avowed purposes of land-use planning. But, in practice, land-use planning is largely ineffective since it lacks the "teeth" to implement its proposals. Thus, in effect, it is not too much of an exaggeration to claim the land-use planning does not exist in the U.S. today and that the utilization of land resources is largely determined solely on the basis of economic motivations and property rights. As will be indicated in later sections, this conclusion was strongly confirmed by several land use planning agencies contacted.

As pointed out earlier, increasing demand for land resources leads to the necessity of having to resort to the use of areas with lower and lower intrinsic suitabilities. In addition to involving higher development costs, the use of such land resources can also involve great potential hazard for human life and property. The best example of this is urban and industrial development on flood plains. Again, the economic pressures for such development is usually so strong that environmental hazards are largely, if not totally, disregarded. In fact, what is encountered is government-sponsored insurance against these very hazards which only serves to encourage this undesirable development. Of course, the straightforward solution to this problem is the outright prohibition of uses which are susceptible to flood damage. But, this would only be possible given the existence of an effective mechanism for land resources management.

Related to the preceding problem is the situation where land-use competition leads to the gradual disappearance of land resources which can be employed by "lower" uses. Although lower-order uses such as open spaces are socially quite valuable, this value is essentially non-pecuniary in nature; hence, in the competition for land resources, these uses are dominated by others which possess greater economic value. As a result, areas valuable for the satisfaction of human amenities have tended to be squandered.

It is difficult to imagine an alternative to the intervention of public policy as the means by which land resources can be preserved for such lower-order uses. Such policy can take the form of direct control such as the prohibition of transition to higher-order uses such as the designation of "wilderness areas" and "scenic and wild rivers" areas, or indirect means such as tax concessions which make the "freezing" of land resources in lower-order uses profitable for the property owner.

## 3.2 STUDY APPROACH

### 3.2.1 INFORMATION REQUIREMENTS VERSUS LAND RESOURCE MANAGEMENT PROBLEMS

In order to derive the specific information requirements related to individual land resource management problems, and in turn, to relate those problems to the specific agencies and user organizations that would be involved, it was felt that some way had to be found to logically structure the total land resource management problem. Only in this way, considering the breadth and nebulosity of the problem, could there be some hope for arriving at consistent answers to similar or related questions of land use management. One useful way developed by the study team to visualize the land resource management problem is to define it in terms of three key aspects or dimensions so that any individual problem could be represented by a single point in a so-called "Land Resource Management" Space. This is schematically illustrated in Figure 3-1.

One dimension of a land management problem is the geographical or spatial identity of the land involved. This is shown as the "y" axis in Figure 3-1. Here the location of a parcel of land is identified in terms of political or jurisdictional entities such as a municipality, state, county, national park, wilderness area, or as being within some physiographic unit such as a flood plain, river basin, coastal zone, or urban area. There is no scale or value

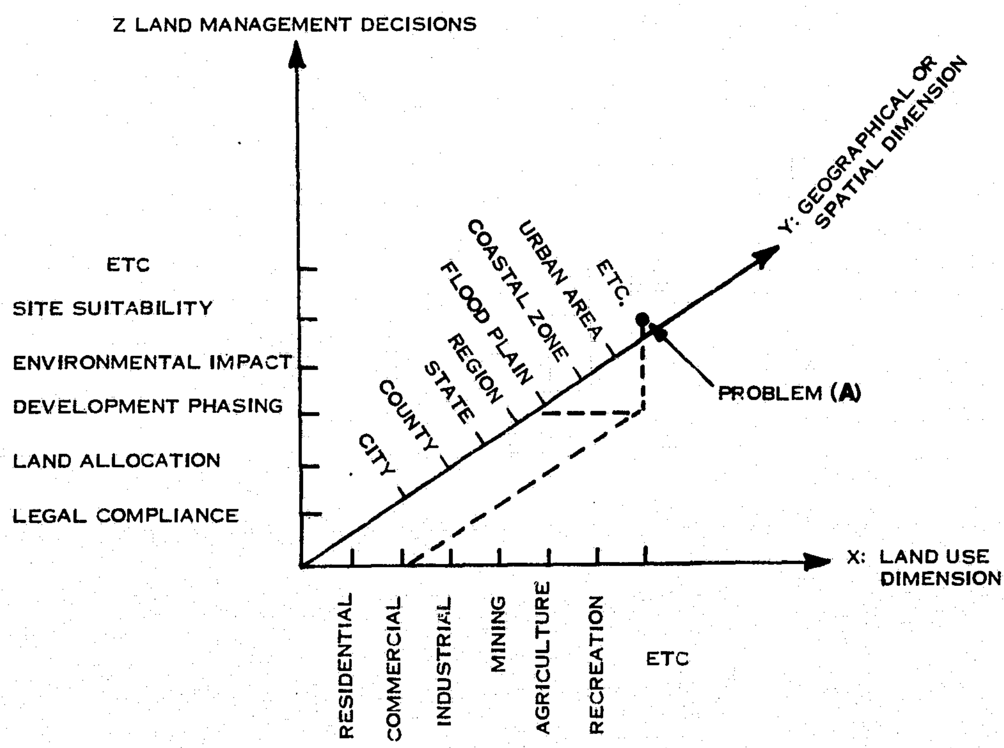



Figure 3-1. Land Resources Management Space
The point "A" represents the problem of the land allocation of commercial development on a flood plain.

implied here or along any of the "axes" shown in Figure 3-1. Each geographical designation is simply represented as a position along this dimension. It is important to note here that obviously these spatial identifications of land areas are not mutually exclusive. As is shown in Figure 3-2, an individual site may be simultaneously within several spatial designations, which only says that there are many ways to geographically describe a given parcel of land. The important point is that the various spatial land entities as noted here, have different land management problems associated with them — and ultimately may therefore have different informational requirements. To define any land management problem, some spatial delimitation must be given.

A second dimension of a land management problem relates to the intended utilization of the land. This is shown as the x-axis in Figure 3-1. Of course, as was explained in detail in Section 3.1.4, the number and definition of these points depends on the manner and detail with which it is chosen to categorize land use. Such broad categories as residential, commercial, industrial, transportation, agriculture, forestry, mining, recreation and open space are typical land use designations. This depicts the fact that the use that is desired to be made of a given parcel of land has associated with it a definite set of land management problems.

The third dimension of the land management problem relates to the specific types of management decisions to be made. These are shown along the z-axis in Figure 3-1. Although the list of possible management decisions is quite long, some of the more commonly discussed decisions are such things as site suitability, economic impact, land allocation, and so forth. This dimension of the problem implies that for any given land use in some spatial location, there are a large array of different management decisions each having an associated required information set.

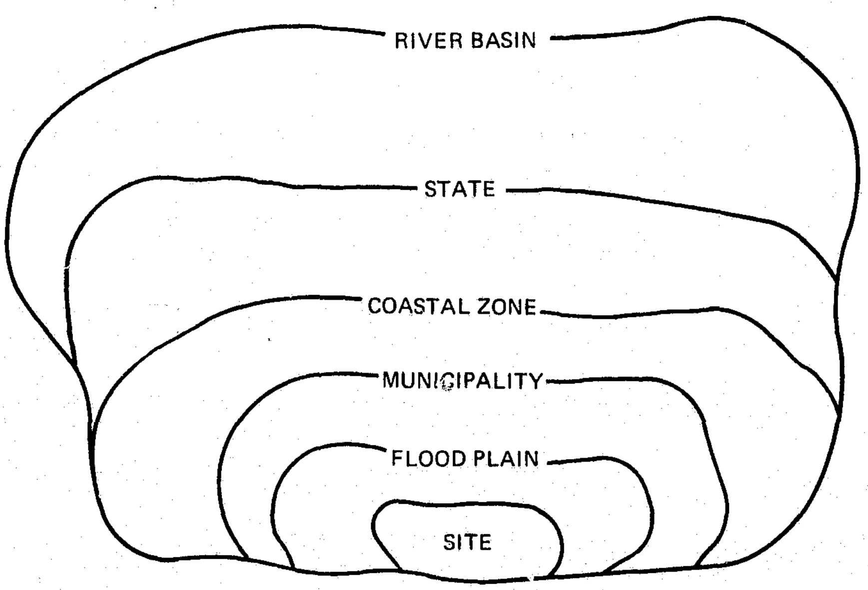



Figure 3-2. Overlap of Spatial Units

A specific class of land resource management problems may now be thought of in this "land management space" as involving a certain management decision concerning some chosen utilization of a parcel of land with a given spatial designation. Such a problem class could then be represented as a point (x, y, z), and would have associated with it a definite required set of information. For example, the point A in Figure 3-1 represents the problem of determining the land allocation of utilizing a tract of land on a flood plain for commercial development. This problem has associated with it a definite set of information requirements, involving natural and physiographic data, economic data, population statistics, historical data, etc. And in a similar manner, each point in this "space" will have an associate information set. In that each of the problems is unique, despite the fact that within any of the "dimensions" of the problem the categories are not mutually exclusive, it is unlikely that the information sets will be identical. Of course, many information requirements will occur within many problems, so that some "standard" subsets of requirements could probably be identified. However, the total set of land resource management information requirements would have to be derived by integration over all of the land resource management "space".

In this study, derivation of this total information need was beyond consideration. However, it was felt that by creating a sample of the information sets for appropriate "planes", good insight could be gained into the TERSSE system performance requirements for the Land Resource Management case.

### 3.2.2 RATIONALE FOR SELECTION OF STUDY AREAS

By investigating the State land management problem in some detail, it was felt that some insight could be gained to the type of problems and associated information that would have to be addressed in response to Federal Land Use legislation, when and if it is passed. Essentially what is done here, referring to Figure 3-3, is to examine the

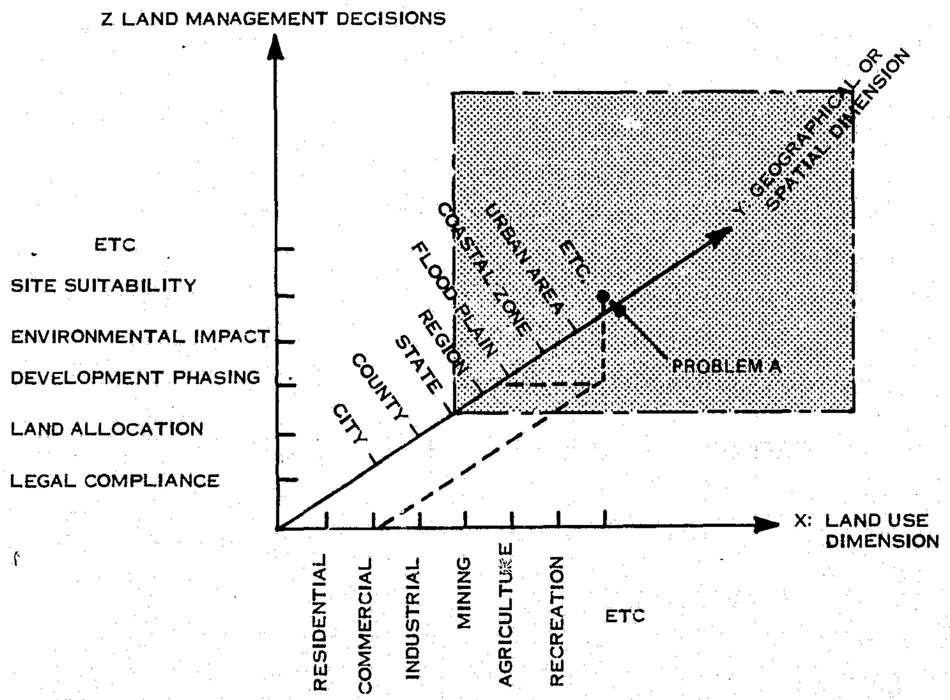



Figure 3-3. State Plane of Resource Management

problems on the x:z plane through the point "State" on the y-axis. For convenience of location and because they have completed an extensive and detailed State land use survey, the study team chose to examine the State of Delaware for this exercise. Although as is suggested here by the analysis above, it should be possible to describe the State of Delaware's information requirements relative to each type of land management decision for each proposed land use, the time and resource constraints of this study precluded carrying the analysis to that depth of detail at this time. It has been possible to summarize the predominant information requirements for land resource management within a State to the point where it is felt that a reasonable estimate could be made of the system performance that would be required of the TERSSE.

To compare the relationship between the sampled information requirements on different x:z planes, it was decided that the x:z plane through the point "river basin" would be investigated as well. In this case, the two agencies most deeply involved in the problems of land use management in the Delaware Valley were used as the principal sources of information, i.e., the Delaware Valley Regional Planning Commission (DVRPC) and the Delaware River Basin Commission (DRBC). Although their jurisdictional boundaries are not identical, there is sufficient overlap to treat the regional planning activities of these agencies collectively.

Probably the best available analogy to eventual Federal land use legislation is the existing "Coastal Zone Management Act of 1972". Essentially it motivates the coastal states to do what Federal land use laws would prevail upon all the States to do; "...through development and implementation of management programs, to achieve wise use of the land and water resources of the coastal zone giving full consideration to ecological, cultural, historic and esthetic values, as well as to the needs for economic development". To be sure, State plans for management of the coastal zone encompass a wider scope than simply land resource management — but not all that much more. Thus it was felt that by considering the demands of the Coastal Zone Act and the response of the States to it, again good insight could be gained into the demand that might be placed on the TERSSE when Federal land management legislation is passed in the future.

And, finally, it was decided that the analysis of a federal-level problem, that of urban area census planning, would be used to illustrate a nationwide mission related to land resources management. This planning involves the rapid study of the demography and physiography of urban areas on a comprehensive scale throughout the nation for the purposes of carrying out a statutorily-based (United States Constitution) task: the U.S. Census. TERSSE support of this planning is characteristic of many of the ad hoc missions that remote sensing can be expected to carry out in the late 1970's and beyond; thus the urban census planning mission has also been used to structure quantitative system requirements which are representative of the land resources management area.

## 3.3 REGIONAL AND URBAN LAND USE MANAGEMENT

### 3.3.1 INTRODUCTION

The purpose of this section is to develop a basis for the identification of information requirements associated with urban and regional planning. Although these types of planning activities are treated together in this discussion, it is important to recognize how their approaches differ. Both are basically concerned with the problem of how to organize the use of space; however, while regional planning focuses upon supra-urban space (i.e., areas larger than a single city), urban planning concentrates primarily on intra-urban space.[1] The two approaches also differ in that regional planning tends to emphasize the economic problem of resource allocation, while urban planning places more emphasis on problems related to community development and the quality of urban life. Regional planning may encompass a river basin and as such would be carried out by organizations such as the Delaware River Basin Commission or the Tennessee Valley Authority. Other regional agencies may have their area of concern defined on the basis of an economic or development problem such as the Appalachian Regional Commission. Urban planning activities are mainly performed by municipal and county planning agencies.

In recent years, there has been a trend towards the integration of urban and regional planning at the level of the metropolitan area. Typically, planning at this level is carried out by especially created organizations whose responsibilities encompass several counties; and, in some cases, even transcend state boundaries.

Because of its dualistic nature, metropolitan planning provides a particularly convenient basis upon which to generalize about the information requirements associated with urban planning and the various aspects of regional planning which pertain to problems of urban development. On the basis of this consideration (and the convenience afforded by proximity) the Delaware Valley Regional Planning Commission (DVRPC) was chosen as one subject for this case study.

The analysis of the DVRPC was based upon a combination of interviews with agency personnel and documented sources of information. Throughout the course of the study, emphasis was placed upon gaining a detailed understanding of DVRPC's resource management mission. As a result, <u>all</u> of the agency's information requirements were considered, regardless of their relationship to remote sensing or the earth sciences. It was felt by the study team that such a comprehensive approach would provide a more accurate assessment of the extent to which TERSSE could be expected to impact this resource management area.

Similarly, the Delaware River Basin Commission (DRBC) whose concern is with a river servicing 10% of the population of the U. S. was used as a case example. Again, the information presented here is based on interviews with many members of the DRBC staff and documentation they supplied to the study team.

### 3.3.2 DELAWARE VALLEY REGIONAL PLANNING COMMISSION

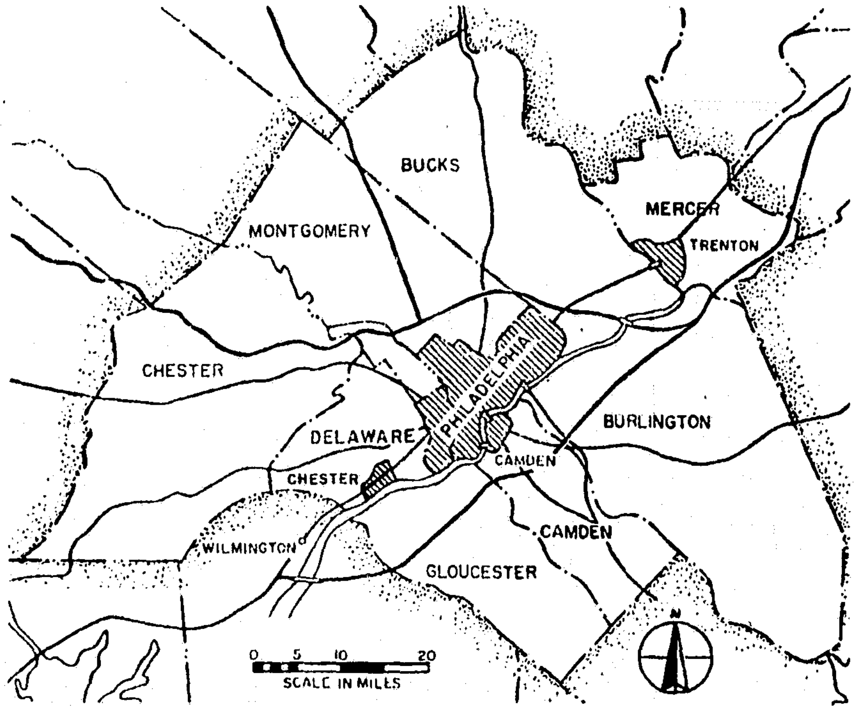
#### 3.3.2.1 Organization[2]

The DVRPC conducts planning activities within a 9,927 $km^2$ (3,833 square miles) metropolitan area known as the Delaware Valley Region, shown in Figure 3-4. The area is situated in the geographical center of the eastern megalopolis and currently has a population of slightly over five million.

An intergovernmental agency, the DVRPC was created in 1965 through an agreement between the states of Pennsylvania and New Jersey. Authority within the Commission is vested in a Board and Executive Committee. The former is responsible for establishing the agency's work program and determining its policy orientation, while the

[1] John Friedmann, "Regional Planning as a Field of Study," in Regional Development and Planning, ed. by John Friedmann and William Alphonso (Cambridge, Mass.: The M.I.T. Press, 1964), p. 63.

[2] Delaware Valley Regional Planning Commission, Overall Program Design: 1974-1976 (Philadelphia: November 1973).




SOURCE: Delaware Valley Regional Planning Commission, Overall Program Design: 1974-1976 (Philadelphia: November 1973), p. 4.

Figure 3-4. The Delaware Valley Region

latter has the function of exercising administrative and fiscal control over the operations of the agency. Membership of the two bodies is shown in Table 3-1.

The DVRPC is strictly an advisory body, and operates through cooperation and consensus among its member governments. It is through its member governments that the DVRPC influences the actual management of resources. Funds for the operation of the agency consist of contributions from the member governments and planning grants from the Federal Government.

3.3.2.2 Agency Role

As stated in its compact, the basic mission of the DVRPC is to organize and conduct a continuing, comprehensive, and coordinated areawide planning program for the Delaware Valley Region. Despite the fact that it lacks governmental authority, the Commission performs several functions which have an important bearing on the area's future pattern of development (resource management). One of these is to ensure that the various state and local agencies within the Delaware Valley Region comply with federal areawide planning requirements. Such compliance is necessary in order to qualify for federal monies; and to facilitate this end, DVRPC encourages and promotes cooperation among all levels of government in the area. As part of this effort, the Commission conducts surveys and studies and prepares plans for the physical development of the Delaware Valley Region.

Table 3-1. DVRPC Board and Executive Committee (*) Membership

| State of Pennsylvania | State of New Jersey |
| --- | --- |
| * Governor's Appointee | * Governor's Appointee |
| * Dept. of Transportation | * Dept. of Transportation |
| * Office of State Planning and Development | * Dept. of Community Affairs |
| City of Chester | * City of Camden |
| * City of Philadelphia | City of Trenton |
| Bucks County | * Burlington County[1] |
| Delaware County | Gloucester County |
| * Montgomery County[2] | Mercer County |
| **Non-Voting Members** | |
| * U. S. Dept. of Housing and Urban Development, Regions II and III | |
| * U. S. Dept. of Transportation, Regions II and III | |

[1]Chosen by four New Jersey counties to represent them on Executive Committee during FY 1973-1974.

[2]Chosen by four Pennsylvania counties to represent them on Executive Committee during FY 1973-1974.

Another major function of DVRPC involves acting as a sounding board for regional problems and the solutions proposed for them. In particular, the Commission provides a regular forum where officials from local and state governments meet for the purposes of resolving conflicts and developing consensus on policies. At present, these forums are held once a month and involve the participation of more than 400 public officials and citizen leaders. Within this overall structure, coordination of the activities of the member governments is achieved through the medium of Technical Advisory Committees (TAC's). There is currently a separate TAC for each of the following areas:

1. Highway plans
2. Transit plans
3. Open space
4. Housing
5. Water supply and waste disposal
6. Data and mapping

Each committee is comprised of representatives from each of the member governments. Present plans call for the establishment of an additional TAC to coordinate areawide activities in the realm of solid waste planning.

A third major function of DVRPC is to act as a Metropolitan Clearinghouse under the Project Notification and Review System of the Federal Office of Management and Budget. In this role, the Commission carries out official reviews of applications by agencies and governments within the region for funds provided by some 105 different federal programs. The clearinghouse process serves a dual purpose: (1) member governments and agencies are kept apprised of one another's proposed actions on a regular basis, so that conflicts between projects can be minimized; and (2) the Commission is given the opportunity to evaluate the extent to which project applications conform to existing areawide plans.

3.3.2.3 Program Areas

The operations of the DVRPC are currently divided into eleven program areas which are listed in Table 3-2. Table 3-3 summarizes proposed work in each of these areas for the period 1974-1976. Each of these areas was assessed by the study team in order to determine its relationship to the TERSSE land-use management mission. Of the eleven, the six shown with an asterisk (*) in Table 3-2 were found to be potential beneficiaries of the TERSSE system output.

Each of the DVRPC Program Areas is further broken down into work elements which involve specific activities. Tables 3-3 to 3-8 summarize these work elements for the six Program Areas believed to be the most relevant to TERSSE.

Table 3-2. Designated Program Areas of the Delaware Valley Regional Planning Commission for 1974-76

| |
|---|
| Policy and Program Development |
| Intergovernmental Coordination and Management |
| *Basic Data and Mapping |
| Economics |
| *Land Use |
| *Open Space |
| *Housing |
| *Transportation |
| *Environment |
| Public Information |
| Program Administration |

3.3.2.4 Information Requirements

Information requirements for the DVRPC were generated from a review of program areas and personal contacts with agency officials. Among the various information requirements which were identified, the single most important is the measurement of change in the pattern of land use. Agency officials indicated that it would be highly desirable to inventory land utilization one or two times per year, but that this was currently impossible because of the high cost of conducting a survey and severe limitations on funding for this purpose. At present, the desired update cycle for land-use maps is about once every five years, but in practice ends up being more like once a decade.

Fundamental to the task of land-use inventory is the question of what type of land-use classification scheme ought to be utilized. Recently DVRPC has been engaged in a project to modify the 88-category HUD/BPR land-use

Table 3-3. Basic Data and Mapping

SOURCE: DVRPC, Overall Program Design: 1974-1976

| Work Element | Objective | Output Products | Comments |
|---|---|---|---|
| 1970 census data for transportation planning | Production of printouts of 1970 Census data to meet requirements of DVRPC Transportation Planning Program. | Printouts of 1970 Census by traffic zone, district, municipality and county. | Output to be used for analysis of [illegible] population and housing. |
| Data Publications | Production of documents containing data, statistics, and summary information for use of DVRPC planning staff, constituent governmental agencies, and public. | 1. Reports containing statistical summaries on population, land use, employment, and housing.<br>2. Same data as above, but on computer tape and printout reports. | Data presented for all municipalities in region. |
| Current Population Estimates | Production of current population estimates for small areas (municipalities) | 1. Reports presenting estimates.<br>2. Data files containing basic data used in preparation of estimates. | |
| Geographic Base File | Maintain Geographic Base File for region as a tool to organize data into the Regional Planning Information System, and to increase the capability for using the Geographic Base File to bring information to bear on specific planning problems. | Up-to-date Geographic Base File. | |
| Regional Base Map | Development of map and photo products based on DVRPC Regional Base Map Series. | 1. Regional Base Map series<br>2. Regional facilities inventory maps<br>3. Census maps<br>4. Air photo enlargements<br>5. Special purpose maps<br>6. Overlays | Typical scales used are 1"-1 mile and 1"-2 miles |
| Natural Feature Maps | Development of maps of selected natural features for Delaware Valley Region as input to Open Space Plan and Land Use Plan processes. | 1"-1 mile maps of following features:<br>. Ecologic-subsurface structure and depth to bedrock<br>. Physiographic - primary and secondary landform classification<br>. Pedological - soil class<br>. Hydrological - surface and ground water areas<br>. Climatological - major microclimes<br>. Vegetative - major vegetative association. | 1. Data base compiled from ERTS imagery, U-2 color IR, and secondary resources.<br>2. Update performed as necessary. |
| Aerial Photography | Obtain photo coverage of region in a form compatible with DVRPC's Regional Base Map series and Central Business District maps. | Photos for use in analysis of land-use change. | 1. Plans call for regular 5-year recursive photo coverage of the region, including both high and low altitude photos.<br>2. Photo atlas sheets to be produced at scales of 1" = 400' and 1" = 800'. |

## Table 3-4. Land Use

SOURCE: DVRPC, Overall Program Design: 1974-1976

| Work Element | Objective | Output Products | Comments |
|---|---|---|---|
| **Land Use Data** | Complete, document and periodically update the comprehensive 1970 land use data file of the nine-county region for use in the DVRPC planning program. | 1. Computer tapes and cards & printouts containing land-use data.<br>2. Annotated aerial photographs showing land use by census block. | 1. Modified HUD/BPR land-use classification scheme used.<br>2. Limited in-site check carried out to supplement photo-interpreted data.<br>3. Data tabulated by census block. |
| **Land Use Maps** | Produce maps showing land use in 1970. | Overlays depicting 1970 land use. | 1. Compilation scale 1"-1 mile.<br>2. Data from 1"-1 mile overlays transformed to series of separations at scale of 1"-2miles or 1"-4 miles. |
| **Land Use Allocation Model** | Select and implement land use model to project land use allocations for land-use plans for the year 2000. | Projected areas for each land use class. | Models such as PLUM & EMPIRIC to be evaluated. |
| **Maintain Land Use Plan** | Update 1985 Regional Land Use Plan. | Updated Regional Land Use Plan showing revised or amended land uses for 1985. | Part of work includes:<br>1. Identification of potential areas for future intensive development.<br>2. Identification of areas requiring varying levels of protection or development control.<br>3. Investigation of applicability of ERTS imagery to identify areas suitable for development as well as requiring varying degrees of protection from development.<br>4. Preparation of environmental assessments of land-use plan amendments.<br>5. Publication of 1985 Regional Land Use Plan map at 1"-4 mi scale.<br>6. Coordinate with Pa. office of State Planning Develop. in preparation of Statewide land-use plan. |
| **Utilities Land Use Study** | Address land-use problems associated with utility placements and alignments so as to minimize or substantially reduce conflicts with other uses. | Maps of existing and proposed utility facilities. | Part of work involves:<br>1. Updating existing maps of electric power facilities, and preparation of similar maps for pipeline, telephone, and other utilities.<br>2. Review of land-use impact of existing facilities, power lines, gas, oil, telephone, and other cable utilities. |
| **Airport Land-Use Study** | Conduct land-use study in support of airport system plan for Delaware Valley Region. | 1. Maps depicting land use (including incompatible use) around airports.<br>2. Maps showing airports in relation to density of population. | |
| **Resource Constraints on Development** | Develop guidelines for land use based on natural resource characteristics. | 1. Principles, standards, and techniques for establishing the "holding capacity" of land areas of major significance-based on studies of natural features, rural areas, and environmental concerns.<br>2. Identified types of restrictions or controls which should be applied to keep development in line with the wise use of the region's resources. | |

Table 3-5. Open Space and Recreation

SOURCE: DVRPC, Overall Program Design: 1974-1976

| Work Elements | Objective | Output Products | Comments |
|---|---|---|---|
| Maintain Open Space Plan | Maintain DVRPC's Open Space Plan and Program in current and up-to-date condition. | Up-to-date Open Space Plan and Capital Plan, including local open space. | Part of work includes:<br>1. Updating open space inventory.<br>2. Amending the Regional Park and Open Space Plan and preparing environmental assessments for all plan amendments. |
| Prepare Trails Plan | Study available trails resources of the region and develop a plan to serve this recreation need. | Maps and technical reports. | Part of the work includes:<br>1. Definition and location of existing proposed, and potential trails systems for the region.<br>2. Surveying trails standards and criteria for use. |
| Rural Areas Study | Study problems and potentials of the regions rural areas and activities, including agriculture and forestry; and develop recommendations that would help those functions to achieve regional economic and open space objectives. | 1. Map of primary active production areas by type.<br>2. Analysis of rural economic viability and problems.<br>3. Policy of agricultural land preservation. | Part of work includes:<br>1. Identification and mapping of the regions primary agriculture and forest areas.<br>2. Evaluation of the region's agriculture economy and development of recommendations to help preserve its viability.<br>3. Identification and measurement of income and racial characteristics.<br>4. Development of policies for rural land use, including environmental assessment of policies recommended. |
| Leisure Space and Facility Needs | Determine nature and extent of needs for leisure facilities in the region. | Maps and reports. | Work includes:<br>1. Identification of types of facilities and space required for leisure activities.<br>2. Classification of types of space by priority of need and potentials for joint development. |
| Open Space Project Review | Review applications for acquisition and development of parts and other open space facilities submitted to DVRPC under the provisions of OMB Circular A-95 Revised. (*) | Reports on applications. | Part of work includes assessment of site suitability. |

(*) OMB Circular A-95 Revised, Federal Register, Vol. 38, No. 228, Nov. 28, 1973, pp. 32874-32881.

Table 3-6. Housing

SOURCE: DVRPC, Overall Program Design: 1974-1976

| Work Element | Objective | Output Products | Comments |
|---|---|---|---|
| Current Housing Estimates | Develop current housing estimates for small areas (municipalities). | 1. Yearly estimates of housing availability.<br>2. Data files containing basic data used in preparation of estimates. | |
| Maintain Housing Plan | Maintain Regional Housing Allocation Plan in a current and up-to-date condition. | No specific output product. | Part of work involves monitoring housing development in the region. |
| Housing Project Review | Review applications for housing projects submitted to DVRPC under provisions on OMB Circular A-95 Revised. | Reports on housing applications. | Part of work involves site suitability analysis. |

Table 3-7. Transportation

SOURCE: DVRPC, Overall Program Design: 1974-1976

| Work Elements | Objective | Output Products | Comments |
|---|---|---|---|
| Route Intersection File | Provide DVRPC with an updated Route and Intersection Inventory which contains descriptive data on the highway network in the region. | 1. Computer tape containing highway link characteristics for the facilities included in the Route and Intersection File update.<br>2. Computer printout listing route and intersection characteristics of facilities. | Part of work involves monitoring of change in highway network. |
| Study of Port Facilities | Formulate recommendations for development of a port plan as part of a comprehensive transportation and land-use plan. | Maps and reports. | Part of work involves:<br>1. Inventory and mapping of port facilities.<br>2. Development of recommendations concerning ground transportation interface with port facilities, water-front, and adjacent land use. |
| Technical Review and Comment: Highway and Transit | Review applications for highway and transit facilities submitted to DVRPC under the provisions of OMB Circular A-95 Revised. | Reports on highway and transit project applications. | Part of work involves site suitability assessment. |

Table 3-8. Environment

SOURCE: DVRPC, Overall Program Design: 1974-1976

| Work Element | Objective | Output Products | Comments |
|---|---|---|---|
| **Environmental Concerns** | Development of an Environmental Overview Statement at the regional (macro) level for the Delaware Valley Region that can be used in detailed environmental impact statements for proposed transportation projects. | A Delaware Valley Environmental Overview Report for use in detailed environmental impact statements. | Part of the work involves:<br>1. Identification of areas in the Delaware Valley Region that are environmentally sensitive or polluted.<br>2. Prediction of environmental impact and identification of environmental "hot spots" caused by implementation of the Regional Transportation Plan. |
| **Airport Noise Study** | Provide inventory of aircraft noise data in support of aircraft system plan for Delaware Valley Region. | 1. Inventory of aircraft noise as it impacts region.<br>2. Map of aircraft noise contours. | |
| **Maintain Water Pollution Control Plan** | Maintain DVRPC's Water Pollution Control Plan and Program in a current up-to-date condition, in order to provide a sound basis for water pollution control coordination and project review, and for the determination of existing or emerging problems and solutions thereto. | Up-to-date Water Pollution Control Plan and Capital Program. | Part of work includes preparation of environmental assessments for all amendments to Regional Water Pollution Control Plan. |
| **Water Quality Management Planning** | Improve the quality and efficiency of the planning to be undertaken under the provisions of Section 601 of the Environmental Protection Act. | Reports containing statistics. | Part of work involves:<br>1. Preparation of employment, land use, economic, & empoyment projections by 5-year increments to the year 2020.<br>2. Provision of assistance to Pa. Dept. of Environmental Resources in developing water use profiles, quantifying urbanization effects on water quality, projecting sewage quantities and quality, inventorying wastewater systems, developing alternative systems in each watershed, & developing final water quality mgmt. plan.<br>3. Assist New Jersey Dept. of Environmental Protection in fashion similar to above. |
| **Maintain Water Quality Management Plan** | Maintain Water Quality Management Plan in a current and up-to-date condition, in order to provide a sound basis for water quality coordination and project review. | Updated plan. | Part of work involves:<br>1. Amending Regional Water Pollution Control Plan to conform with the Water Quality Mgmt. Plan, including environmental assessments for all plan amendments.<br>2. Evaluating impact of Water Quality Mgmt. Plan on other adopted Plans. |
| **Drainage and Flood Control Planning** | Coordinate storm drainage planning within the region and with other functional elements and stimulate and support planning for flood control at the local and subregional level. | Maps and reports. | Part of work involves:<br>1. Definition of major and minor watersheds and determination of the area of each.<br>2. Preparation of map at 1"-1 mile showing 1973 & 1985 land uses, and estimation of potential runoff for 10, 50, and 100 year storm frequency for each drainage basin reflecting land use changes.<br>3. Identification of areas of major flooding.<br>4. Preparation of 1"-1 mile map showing major drainage ways, including existing and proposed open ditch drainage canals, channel improvements, flood retention basins, and flood retarding structures. |
| **Solid Waste Management Planning** | Coordinate solid waste planning within the region and with other functional elements and stimulate and support planning for solid waste management at the local and subregional level. | Plan reports. | Part of work involves:<br>1. Preparation of 1"-1 mile maps of existing county and local solid waste plans in the region.<br>2. Preparation of a Regional Solid Waste Management Plan, including an environmental assessment of the Plan. |
| **Water Supply Project Review** | Review applications for water supply facilities submitted to DVRPC under provisions of OMB Circular A-95 Revised. | Reports on water supply project applications. | Part of work involves site suitability assessments. |
| **Water Pollution Control Project Review** | Review applications for water pollution control facilities submitted DVRPC under provisions of OMB Circular A-95 Revised. | Reports on water pollution control project applications. | Part of work involves site suitability assessments. |

classification scheme (see Appendixes P and S) in such a way that it better suits the needs of the agency. The basic drawbacks of the scheme are that it contains many more categories of land use than are actually required for the majority of planning activities, and that it places insufficient emphasis on the description of residential uses. Present plans call for the compression of the scheme down to twelve to fifteen categories. The detail of information required for most purposes corresponds to at least level III of the classification scheme proposed in USGS Circular 671.

The activities of the DVRPC also require a considerable amount of physiographic and environmental information. Along these lines, the Commission has developed an Environmental Overlay Series of twenty-nine maps for use as an analytical tool in the areas of environmental, transportation, and comprehensive planning. Each of the maps in the series depicts a particular type of feature or parameter. The topics of these overlays are listed in Table 3-9.

The maps are produced at a scale of 1:12,500, and can be obtained as either clear mylar sheets or positive prints. By utilizing the clear sheets in composite, a user may visually assess the intrinsic physical suitability of a particular site for a given use.

Requirements for updating the data on the features and parameters covered by the series vary widely. For example, a one-time inventory of a geological features would be adequate, whereas measurements for many of the environmental parameters would ideally be taken on a daily or more frequent basis.

Table 3-9. DVRPC Environmental Overlay Series

| | | | |
|---|---|---|---|
| 1. | Topography | 15. | Meterological and Air Quality Monitoring Stations |
| 2. | Slope | 16. | Prevailing Winds |
| 3. | Pre-quarternary Geology | 17. | Precipitation |
| 4. | Quarternary Geology | 18. | Temperature |
| 5. | Prime Agriculture Soils | 19. | Evapotranspiration |
| 6. | Surface Waters | 20. | Mean Annual, Maximum 24 Hr. Particulate Matter and Sulfur Dioxide concentrations as Selected Sites |
| 7. | Watershed Boundaries | 21. | Carbon Monoxide Emissions by Traffic District |
| 8. | Floodplains | 22. | Noise Sensitive Areas |
| 9. | Runoff | 23. | Population Density (1970) |
| 10. | Wetlands | 24. | Population Density (1985) |
| 11. | Water Quality Monitoring Stations | 25. | New Development (Residential) |
| 12. | Mean Annual Water Quality Monitoring at Selected Sites<br>Dissolved Oxygen Concentrations<br>Coliform Bacteria Levels (MPN) | 26. | Industrial-Commercial Areas |
| | | 27. | Open Space Inventory |
| | | 28. | Regional Plan for Parks and Recreation areas |
| 13. | Surface Water Quality Classification | 29. | Historic Sites |
| 14. | Forested Areas | | |

SOURCE: Delaware Valley Regional Planning Commission

### 3.3.3 THE DELAWARE RIVER BASIN COMMISSION

#### 3.3.3.1 Organization

The Delaware River Basin covers 34,000 $Km^2$ (13,000 $mi.^2$) area of New York State, Eastern Pennsylvania, Western New Jersey, and Delaware, - an area in which 7,000,000 people live. In that water is also supplied to the New York City metropolitan area via conduits, the Delaware actually serves 22,000,000 people - 10% of the U. S. population. The area included in the Delaware River Basin is shown in Figure 3-5.

The Delaware River Basin Commission is an independent organization created by an Act of Congress and concurrent legislation by the States of New York, New Jersey, Pennsylvania and Delaware. The original Compact became effective on October 27, 1961. The Commissioners are the Governors of the respective States and the U. S. Secretary of the Interior. The organization of the DRBC is shown in Figure 3-6.

#### 3.3.3.2 Role of the DRBC

As defined by the "Compact" the charter of the Delaware River Basin Commission, is that of Water Resources Management; including water supply, water quality, power generation, fish and wildlife, recreation, flood control, navigation, and watershed management. It is the concern of the Commission to evaluate what impact any proposed action or development in the Basin would have on each of these areas of concern and to rule on the acceptability and consequences of the proposition. This, on the surface, seems to say that the DRBC is to do land use management solely from the point of view of water resources, without considering socioeconomic or other natural and physical factors. But in practice, this is not so - for in fact, there are many water management practices that can, for example, be implemented to alter the water supply and water quality conditions - if a given proposal or development is worth it. Thus, all factors are considered. It is simply that in the case of the DRBC, land use management decisions are derived via water resources management practices rather than some other, perhaps equally suitable approach to land use management.

The DRBC is a regulating agency; it can allow or disallow a given development for a reason such as its possible impact on the availability or quality of the water supply. For example, the DRBC has so far denied certain power plant construction applications in the Schuylkill Valley because of the unsure availability of an adequate water supply to meet their needs. As it turns out, a project has been approved by the DRBC to transfer water from the main stem of the Delaware to the Perkiomen Creek, a tributary of the Schuylkill River. When this additional water supply is available in the Schuylkill Valley, approval of the power plant application will be possible. A case of water management, or a land use decision? Of course, it's both; it simply says that land use management in a river basin requires the entire array of water resources information as part of its data base.

#### 3.3.3.3 Information Requirements

Watery Supply

In the area of water supply, the knowledge of the surface water distribution in the Delaware River Basin is pretty good. The biggest need is for information on ground water; e.g.,

- Where is it?
- What is the volume of water?


Figure 3-5. Delaware River Basin

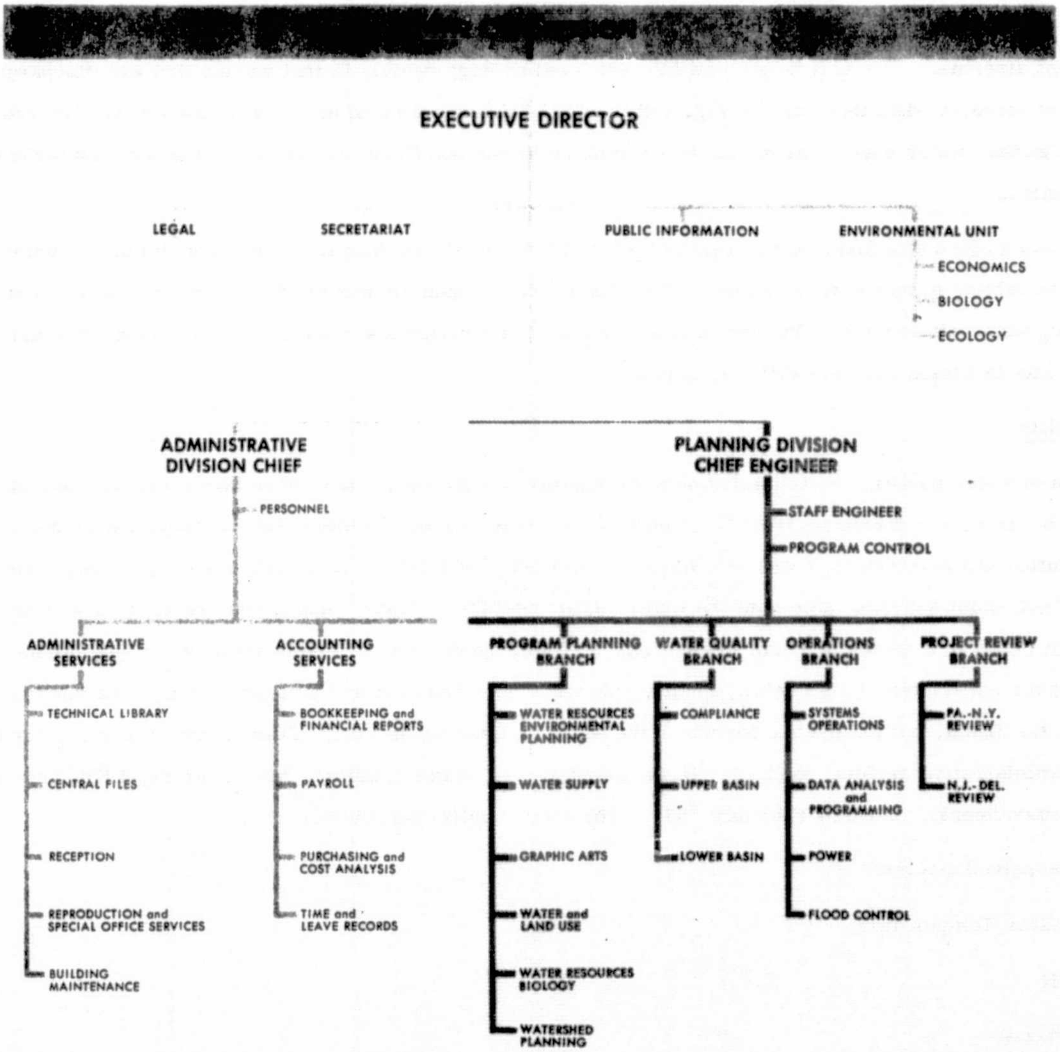



Figure 3-6. The Organization of the DRBC

C-2

- Is it in pools ?
- Can it be mined ?
- Where are the recharge or discharge sites ?

Although some ground water flow measurements and water table level measurements are being made now via a few test wells, the general state of knowledge of ground water - even in this fairly populous region - is very poor.

There are certain classes of information on surface water that are inadequately monitored today; one is the flow in intermittent streams. This is a factor that impacts local ecology heavily in that wastes that are discharged into intermittent streams when they are flowing, continue to be discharged into dry stream beds when they are not flowing. Another water supply parameter that should be better monitored is the sedimentation load being carried in the streams.

Another needed class of information is related to the enforcement function; i.e., the problem of stream encroachment. This relates to cases where someone has "encroached" upon the normal flow or course of a stream, e.g., by diverting water into a pond or by damming a stream. Even though a stream courses through one's private property, this is illegal and very difficult to police.

Water Quality

In the area of water quality, the Commission's information requirements have been fairly well spelled out. In the Delaware Estuary, which extends from the mouth of the river to about Trenton, New Jersey, the primary source of water pollution are point sources whereas above the estuary, the wash off from urban areas, roads, farms, etc. - so called "non-point sources" dominate the water quality problem. Water quality requirements have been spelled out in great detail in a series of Basin Regulations on Water Quality and amendments to those regulations. In fact, for each of the parameters listed below, quality standards have been set and defined not only as a function of location within the Basin, but for the use for which the water is intended as well. These standards are described in the DRBC, Administrative Manual, Part III, "Basin Regulations - Water Quality", November 24, 1970, and subsequent proposed amendments, dated 15 February 1974. The water quality parameters are:

1. Dissolved Oxygen
2. Water Temperature
3. pH
4. Phenols
5. Threshold Odor Number
6. Synthetic detergents (M. B. A. S.)
7. Flourides
8. Alkalinity
9. Radioactivity

10. Turbidity

11. Fecal Coliform

12. Total Dissolved Solids

13. Chlorides

14. Hardness

15. Toxic Substances

    a. arsenic

    b. barium

    c. cadmium

    d. chromium (hexavalent)

    e. lead

    f. mercury

    g. selenium

    h. silver

    i. zinc

Spanning the concerns of water supply and water quality is the problem of industrial impact on ground water. Along the New Jersey boundary of the Delaware estuary, much industrial waste is injected into the ground water by the deposition of wastes in pools and lagoons from where it is leached into the ground water supply. Elsewhere in the Basin, acid, iron, and manganese get into both the surface and ground water from anthracite mines.

Fisheries

As indicated earlier, the DRBC is charged with the conservation of fish and wildlife in the Basin. One concern in the maintenance of healthy fisheries is the concentration of certain toxic pollutants through the food chain, resulting in undesirable levels in species finally consumed by man. Also in relation to fisheries conservation, there are additional water quality parameters that must be monitored, e.g., water temperature, dissolved oxygen, salinity, and water turbidity. The problem of the American Shad, the principal anadromous fish of the Delaware, provides an excellent example of the fisheries problem. The Shad appear to move up-river to spawn in the spring when the water temperature reaches 50° F at the top of the Delaware estuary at Trenton. Through the early summer, as the water temperature warms, the dissolved oxygen content of the water in the estuary continues to fall, until by mid-summer, a 10-mile oxygen block is created, i.e., a 10 mile section of the river where the dissolved oxygen is essentially zero. This conceivable blocks the return of the shad to the Atlantic Ocean in that they cannot survive passage through this section of the river. It is suspected that there may be passages through the "block" in that repeat spawners have been identified by tagging techniques. Actually, the DRBC would ideally like to directly monitor the movement of these anadromous fish. Certainly, it is of critical importance to map the 3-dimensional distribution of dissolved oxygen throughout the Delaware's main stem. Over the last several years, implementation of the Basin water quality regulations has successfully moved the occurrence of the oxygen block later and later into the summer. Whereas ten years ago, it was forming in late May or early June, its formation now takes until late July or early August. Successful adherence to the water quality objectives as, illustrated in Figure 3-7, set for 1977 will probably preclude its formation at all.

The salinity of the lower Delaware estuary also impacts an important fisheries problem. A destructive parasite that affects the lower estuarial oyster beds is the oyster drill. However, the drill will not propagate where the water salinity is less than 15 ppm. Thus, by maintaining sufficient flow in the main stem, the oyster beds can be kept free of this parasite. A capability of routinely monitoring the salinity distribution on the Delaware is the key to properly managing the release of fresh water upstream.

Lastly, the direct monitoring of water temperature itself is basic to fisheries management. In this regard, a very important problem will continue to be hot water discharges into the river from power plants. So, throughout the Basin, but particularly in the vicinity of power plant sites, most water temperature patterns must be monitored.

User Models

The DRBC is carrying out much work on the development of user information models. A basic model of the salinity and dissolved oxygen in the estuary is available in experimental form. However, for lack of supportive data, many simplifying assumptions are built-in; e.g., it is assumed that throughout the estuary the water is fully mixed vertically. This is not likely to be the actual case and in the example of the dissolved oxygen problem it appears to be a very significant difference.

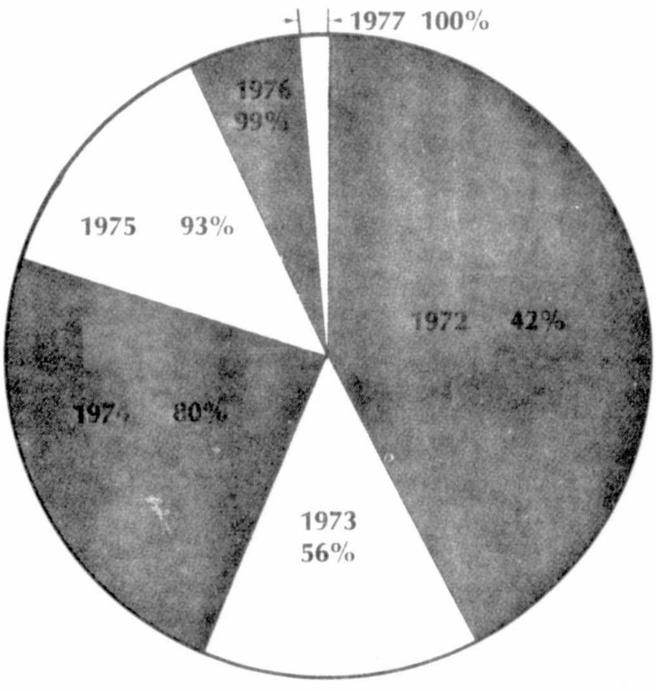
A model is being developed to deal with the dissipation of any water property between a pipe and the stream. There will be generally a mixing zone of about 500 feet over which the given property will be fully diffused. Depending on many river parameters, e.g., thermal stratification, flow rate and pattern, water turbulence, bottom morphology and nature, salinity, etc., the dissipation distance required can vary considerably. Such a model would be of invaluable assistance in the site selection process.

Another type of model being studied is a model that relates human activities to physical parameters of water use and quality. For each type of activity, for example, what would be the water lost per person and, therefore, not returned to the river for reuse? However, this type of modeling work is in its very early stages.

### 3.3.4 SUMMARY OF INFORMATION REQUIREMENTS

In Table 3-10, the information requirements, parameters and output products for urban and regional planning have been summarized. As was explained in the beginning of this section, a specialized case of regional planning is represented by River Basin management. Thus, for illustrative purposes, the information requirements for this specific case are shown in Table 3-11. The specific requirements will undoubtedly have variations for different river basins. However, it is felt that Table 3-11 is representative of these data needs.

**Percentage of Delaware Estuary Dischargers Complying with Allocations by Year**



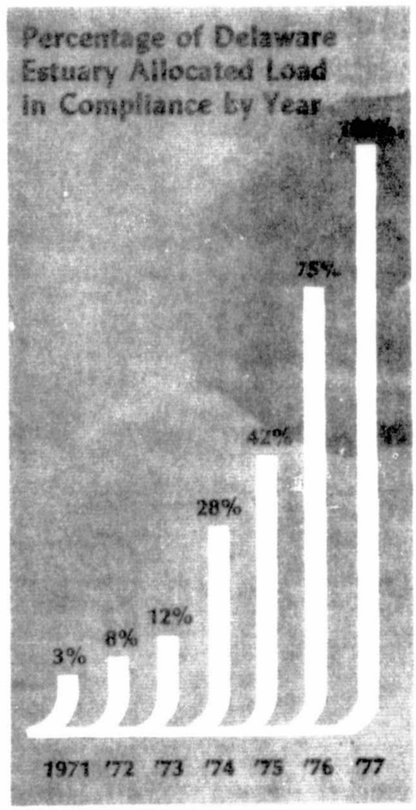




Figure 3-7. Expected Compliance With The DRBC Water Quality Objectives

Table 3-10. Summary of Information Requirements for Urban and Regional Planning

| Information Requirement | Parameters | Output Products |
|---|---|---|
| Land ownership | Boundaries and areas for:<br>• Federal land, by agency<br>• State land<br>• County and municipal land<br>• Private land | • Ownership maps at 1" - 1 mile (larger scales used for detailed planning)<br>• Statistical summaries of acreages in each ownership class |
| Soil properties | Depth, texture, structure, presence of aggregate, wetness, reaction, slope, permeability, erosion hazard, water-holding capacity, inherent fertility. | • Soils maps at 1" - 2 miles or larger<br>• Statistical summaries of acreages in each capability class.<br>• Reports containing soil interpretations. |
| Land use and cover | Boundaries and areas for land-use and cover categories.<br><br>Note: Many different types of classification schemes are currently in use, with the most common being the HUD/BPR or variations of it. | • Land-use/cover maps at 1" - 1 mile for general area-wide planning and 1" - 200' for detailed planning.<br>• Statistical summaries showing acreages in each use/cover category. |
| Mineral deposits | Type, location, areal extent, capacity. | • Minerals maps at 1" - 2 miles.<br>• Statistical summaries of mineral production and reserves. |
| Topography/ landforms | Surface geometry | Topographic/landform maps at 1" - 2 miles (or larger where more detail is required). |
| Geological structure | Surface geometry, attitude, orientation, deformation, weathering, maturity, strata, movement. | Geological maps at 1" - 2 miles. |
| Stratigraphy | Orientation of beds, thickness of beds, cycle of beds, attitude, consolidation, deformation, erosional features, fossilization and organic debris, depositional features, etc. | • Stratigraphic maps at 1" - 2 miles.<br>• Stratigraphic columns. |
| Lithology | Location and extent of different rock types. | Lithologic maps at 1" - 2 miles. |

Table 3-10. Summary of Information Requirements for Urban and Regional Planning (Continued)

| Information Requirement | Parameters | Output Products |
|---|---|---|
| Major vegetative associations | Type, location, extent. | • Maps at 1" - 2 miles showing associations.<br>• Statistical summaries of association acreages. |
| Soil erosion | Type, location, extent, rate of spread. | Maps at 1" - 2 miles (or larger depending on the specific application) |
| Ecological succession | Time rate of change of plant species, their area, and distribution. | Maps at 1" - 2 miles. |
| Air quality | • Total content in a column, vertical distribution, concentration in the atmospheric boundary layer, sources, and sinks for:<br>- Carbon dioxide<br>- Carbon monoxide<br>- Nitrogen compounds<br>- Ozone<br>- Fluorocarbons<br>- Other hydrocarbons (< HC >)<br>• For aerosols:<br>- Spatial distribution<br>- Particle size spectrum<br>- Optical properties as a function of $\lambda$ (reflectivity, absorptivity, angular scattering function). | Statistical summaries. |
| Despoiled land: e.g., from strip mining, poor cultivation practices, deposition of solid wastes, fire, flood erosion, over-irrigation, etc. | • Area/extent, and location.<br>• Characterization of primary causal factor. | Maps at 1" - 2 miles (or larger where detailed information is needed). |
| Urban blight and decay | Location and extent of blighted and decayed areas. | Maps at 1" - 1 mile. |
| Housing | Quality, structural type, density, lot size, stock. | • Maps at 1" - 200'.<br>• Statistical summaries. |

Table 3-10. Summary of Information Requirements for Urban and Regional Planning (Continued)

| Information Requirement | Parameters | Output Products |
|---|---|---|
| Surface water inventory | • Areas of rivers, streams, lakes, ponds, and reservoirs.<br>• Lake, pond, and reservoir levels.<br>• River and stream flow.<br>• Snow cover and depth.<br>• Ice cover and thickness.<br>• Water equivalency of snow pack.<br>• Snow melt runoff.<br>• Wetland zone.<br>• Salt water line of rivers.<br>• Area of flood plains. | • Hydrologic and flood plain maps at 1" - 2 miles.<br>• Statistical summaries. |
| Water quality | Dissolved oxygen, water temperature, pH, phenols, threshold odor number, synthetic detergents (M. B. A. S.), flourides, alkalinity, radioactivity, turbidity, fecal caliform, total dissolved solids, chlorides, hardness, toxic substances (arsenic, barium, cadmium, chromium (hegavalent), lead, mercury, silenium, silver, zinc). | Statistical summaries. |
| Physiography of watersheds | Boundaries, drainage patterns, erosion pattern and rates, surface vegetation, topography. | Maps at 1" - 2 miles. |
| Evaporation rate from water surfaces and bare soil | Water temperature, soil temperature, air temperature, insolation, surface albedo, radiation balance. | Statistical summaries. |
| Evapotranspiration rate of vegetation | Water mass loss rate, insolation, plant albedo, boundary layer winds and humidity, plant geometry, standing biomass. | Statistical summaries. |
| Precipitation and surface water runoff | Form, distribution, rate, amount. | Statistical summaries. |
| Aquifers | Location, depth, size. | Maps at 1" - 2 miles showing location and extent of different types of aquifers. |
| Wetlands | Areal extent, water quality, ecological succession stage, plant communities, mean period of innundation, zonation. | • Thematic maps at 1" - 2 miles.<br>• Statistical summaries. |

Table 3-10. Summary of Information Requirements for Urban and Regional Planning (Continued)

| Information Requirement | Parameters | Output Products |
|---|---|---|
| Climate | Annual mean temperature, seasonal mean temperature, annual precipitation, seasonal precipitation, prevailing winds. | • Climatological maps at various scales.<br>• Statistical summaries. |
| Noise pollution | Location and extent of sensitive areas. | Maps at 1" - 2 miles. |
| Population/ economic characteristics | Growth and distribution of population, urbanization, employment, personal income, education, etc. | • Maps at 1" - 1 mile (or larger where detailed information is needed).<br>• Statistical summaries. |

Table 3-11. Summary of Info. Requirements For River Basin Management

| Info Requirement | Parameters | Output Products |
|---|---|---|
| Land Ownership | Boundaries and areas for:<br>• Federal land, by agency<br>• State land<br>• County & municipal land<br>• Private land | • Ownership maps at 1" - 1 mile (larger scales used for detailed planning)<br>• Statistical summaries of acreages in each ownership class |
| Soil Properties | Depth, texture, structure, presence of aggregate, wetness, reaction, slope, permeability, erosion hazard, water-holding capacity, inherent fertility. | • Soils maps at 1" -2mi. or larger.<br>• Statistical summaries of acreages in each capability class<br>• Reports containing soil interpretations. |
| Land use and cover | Boundaries and areas for land-use and cover categories.<br><br>Note: Many different types of classification schemes are currently utilized. | • Land-use/cover maps at 1"-1 mile<br>• Statistical summaries showing acreages in each use/cover category. |
| Mineral deposits | Type, location, areal extent, capacity. | • Minerals maps at 1" - 2 miles.<br>• Statistical summaries of mineral production and reserves. |
| Topography/land forms | Surface geometry | Topographic/land form maps at 1"-2 miles (or larger where more detail is required) |
| Geological structure | Surface geometry, attitude, orientation, deformation, weathering, maturity, strata, movement. | Geological maps at 1" - 2 miles. |
| Stratigraphy | Orientation of beds, thickness of beds, cycle of beds, attitude, consolidation, deformation, erosional features, fossilation and organic debris, depositional features, color. | • Stratigraphic maps at 1"-2 miles.<br>• Stratigraphic columns. |
| Lithology | Location and extent of different rock types. | Lithologic maps at 1" - 2 miles. |
| Surface water inventory | • Areas of rivers, streams, lakes, ponds, and reservoirs.<br>• Lake, pond, and reservoir levels.<br>• River and stream flow.<br>• Snow cover and depth.<br>• Ice cover and thickness.<br>• Water equivalency of snow pack.<br>• Snow melt runoff.<br>• Wetland zone.<br>• Salt water line of rivers.<br>• Area of flood plains. | • Hydrologic and flood plain maps at 1" - 2 miles.<br>• Statistical summaries. |

Table 3-11. Summary of Info. Requirements For River Basin Management (Continued)

| Info Requirement | Parameters | Output Products |
|---|---|---|
| Water quality | Dissolved oxygen, water temperature, pH, phenols, threshold odor number, synthetic detergents (M.B.A.S.), flourides, alkalinity, radioactivity, turbidity, fecal coliform, total dissolved solids, chlorides, hardness, toxic substances (arsenic, barium, cadmium, chromium (hexavalent), lead, mercury, selenium, silver, zinc). | Statistical summaries. |
| Physiography of watersheds | Boundaries, drainage patterns, erosion pattern and rates, surface vegetation, topography. | Maps at 1"-2 miles |
| Evaporation rate from water surfaces and bare soil | Water temperature, soil temperature, air temperature, insolation, surface albedo, radiation balance. | Statistical summaries. |
| Evapotranspiration rate of vegetation | Water mass loss rate, insolation, plant albedo, boundary layer winds and humidity, plant geometry, standing biomass. | Statistical summaries. |
| Precipitation and surface water runoff | Form, distribution, rate, amount. | Statistical summaries. |
| Aquifers | Location, depth, size. | Maps at 1"-2 miles showing location and extent of different types of aquifers. |
| Wetlands | Areal extent, water quality, ecological succession stage, plant communities, mean period of inundation, zonation | • Thematic maps at 1" - 2 miles<br>• Statistical summaries |
| Vadose water | Depth of unsaturated soil, percent saturation, flow rate, chemical nature of water (e.g., dissolved solids, pH, algae content, bacterial content). | Statistical summaries |
| Ground water below water table | Flow rate, direction of flow, depth of water table, water temperature, chemical nature of water (e.g., dissolved solids, pH, algae content, bacterial content). | Statistical summaries. |

Table 3-11. Summary of Information Requirements for River Basin Management (Continued)

| Info Requirement | Parameters | Output Products |
|---|---|---|
| Farming practices | Tillage method, use of agricultural chemicals, intensity of cultivation, extent of cultivation, irrigation, drainage, crop rotation, time of planting, time of harvest. | • Thematic maps at 1" - 2 miles depicting different parameters.<br>• Statistical summaries. |
| Soil erosion | Type, location, extent, rate of speed | Maps at 1" - 2 miles (or larger depending on the specific application). |
| Grazing land supportive capacity | Acreage of individual forage species, plant density, plant vigor, plant maturity, plant phenology. | • Maps at 1"-2 miles.<br>• Statistical summaries. |
| Crop production | Estimates of output by crop | Statistical summaries. |
| Ecological succession | Time rate of change of plant species, their area, and distribution | Maps at 1" - 2 miles. |
| Despoiled land: e.g., from strip mining, poor cultivation practices, deposition of solid wastes, fire, flood erosion, over-irrigation, etc. | Area/extent, and location; characterization of primary causal factor. | Maps at 1" -2 miles (or larger where detailed information is needed). |
| Timber production | Estimates of output by tree species. | • Thematic maps at 1"- 2 miles (or larger where detailed information is needed).<br>• Statistical summaries. |
| Forest understory | Species, distribution, plant density, plant vigor | • Thematic maps at 1" - 2 miles ( or larger where detailed information is needed).<br>• Statistical summaries. |
| Climate | Annual mean temp., seasonal mean temp., annual precip., seasonal precipitation, prevailing winds. | • Climatological maps at various scales.<br>• Statistical summaries. |
| Major vegetative associations | Type, location, extent. | Maps at 1" - 2 miles. |
| Population/economic characteristics | Growth and distribution of population, urbanization, employment, personal income, education, etc. | • Maps at 1" - 1 mile (or larger where detailed information is needed).<br>• Statistical summaries. |

### 3.3.5 REGIONAL PLANNING INFORMATION FLOW

As an example of the application of TERSSE to a specific operational land use management problem on a regional scale, the basic mission of the Delaware Valley Regional Planning Commission was considered. The Commission desires to annually update their basic computer data base on land use in the Delaware Valley, update those individual charts in their Environmental Overlay Series that so require, and to appropriately adjust their standing Regional Plans.

As is shown schematically in Figure 3-8, very high resolution scanner and imagery data will be obtained from Shuttle flights of opportunity and from TERSSE aircraft. Working charts on a scale of 1:5000 are required by the DVRPC. It is expected that extractive processing procedures implemented for the Shuttle data will be oriented toward automatic change detection to identify those areas of the Valley where land use change had occurred. In turn, the 1 meter aircraft imagery could be used in tandem with field surveyors to identify current land use to the detail and precision that is the current practice of the DVRPC. Ground surveys will continue to be needed at any rate to provide the socio-economic and environmental data not expected to be obtainable from remote sensing.

The rather long interval between required observations - a year - for this application make it particularly appealing as a Shuttle sortie mission. Any available flight of opportunity that will enable imagery to be obtained over the relatively restricted area of interest can be so utilized, with several attempts likely possible in a year's time to assure that cloud-free observations are possible. In view of the fact that their data base is properly updated on the order of every ten years now, annual updates would be very valuable to the Commission.

It should also be noted that development of computer techniques for land use change analysis based more on spectral analytical comparisons, could well relieve the necessity for Shuttle data to be of a resolution as high as 20 meters. If the areas of land use change could more simply be identified, then only those areas would have to be surveyed with aircraft, reducing greatly the cost of the observational data and the cost for introducing changes into the standing geographic computer data base.

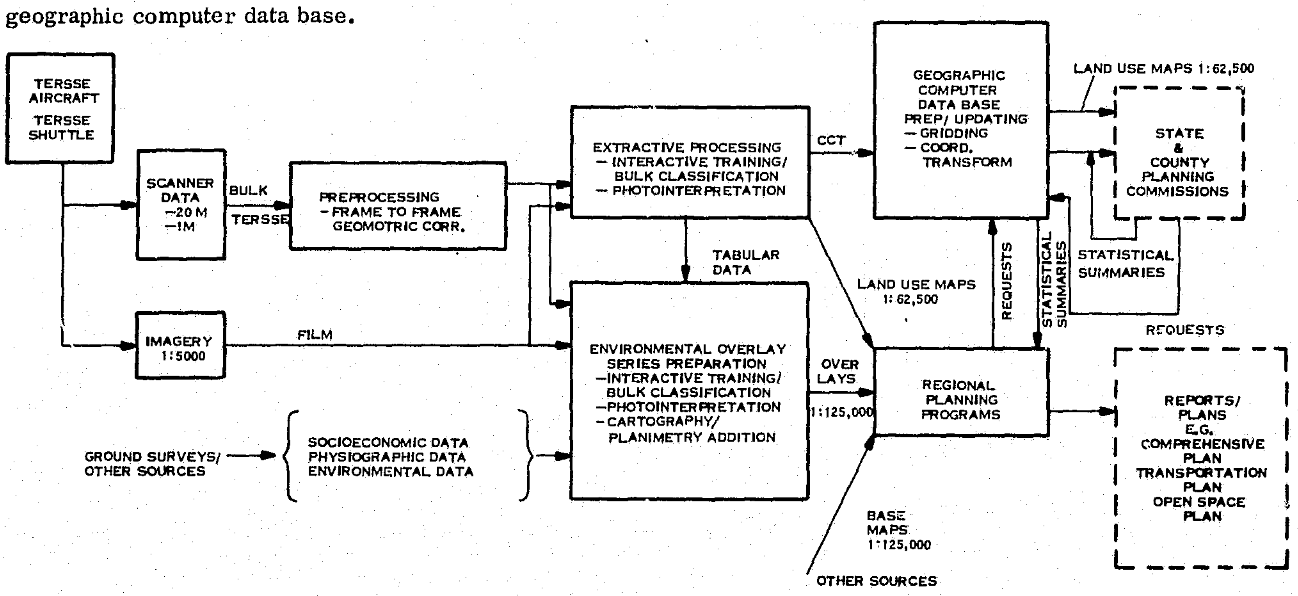



Figure 3-8. Delaware Valley Regional Planning Commission Information Flow

Land use charts would continue to be produced at a scale of 1:62,500 for use by State and County planning agencies. This scale map is sufficient for them, recognizing that they can interrogate the full data base receiving any statistical tabulations on analysis of the data they desire.

Regional planning programs currently depend heavily on having available on a common base map of scale 1:125,000 both the land use data and individual or sets of environmental charts. It is this combination of data products that is the basic input for their standing Regional Plans.

In noting earlier the nature of the Environmental Overlay Series, (see Table 3-9) it should be noted that inputs for these charts are very much the object of other TERSSE observational missions; so that, one of the "other sources" noted for this information in Figure 3-8 is TERSSE itself. The DVRPC has already positively identified an additional 20 titles desired for this overlay series. In addition, consultants to the DVRPC have identified a total of 120 possible subjects for this series. The importance of the TERSSE data processing system as a potential source of information for these charts must not be overlooked.

## 3.4 STATE LAND RESOURCE MANAGEMENT

### 3.4.1 INTRODUCTION

Although relatively few states have so far enacted meaningful land use legislation, an increasing number of states are initiating debate on those issues. The biggest hurdle that has been encountered in all these debates is the question of the level of government at which responsibility for various land management decisions should be retained. For example, the states could retain the responsibility for the land use decisions based upon joint planning with city, county or metropolitan area governments. Alternatively, the state could simply insist on formal planning procedures but allow the zoning decisions to remain with the local governments.

The motivation for state land use planning is two-fold. In the first place, many of the states are certain that federal land use legislation will be enacted, and wish to present an early posture of compliance so that early receipt of federal monies to assist in the implementation of their plans will be possible. Other states have simply come to realize the basic necessity of defining the complex relationships within their state between man's activities and the manner in which the land is used to accommodate these activities.

State land use planning can be used as a tool to investigate, analyze, and address problems related to land-use conflicts. For example, the approach is utilized to determine where intensified use of the land in any specific way would result in basic health or economic problems to specific individuals or to the general public.

It is only through land use analysis, correlated with ancillary information, such as demographic, employment, income, and other available resource prognoses, that the states can hope to predict with any accuracy the probable location and extent of future development, and the resulting requirements for the location and capacity of expended public facilities. The states must know where additional transportation capacity, sewerage treatment plants, water treatment plants, recreational facilities, schools, hospitals, and so forth, will be needed.

In the following sections, the land use planning activities of the State of Delaware are discussed in some detail. Also the Land Oriented Information System (LOIS) being developed by the State of New Jersey is discussed. As was mentioned earlier, the State of Delaware was used by the study team because of its accessibility and because of the extent of the land use planning work that has been accomplished.

In retrospect, this selection may not have been the best because of Delaware's size. Consisting of only three counties and having an area only half as large as that encompassed by the Delaware Valley Regional Planning Commission (DVRPC), it is not clear that Delaware's activities are representative of the problems faced by most of the states.

### 3.4.2 STATE OF DELAWARE LAND USE PLANNING

The Delaware State Planning Office is in the process of preparing a comprehensive state-wide land use plan. The office has taken on this task in anticipation of the passage (in the near future) of national land use legislation which will require that each state prepare such a plan. Although it is expected that the national legislation will allow the states five years for plan preparation and passage, the volume of information required to prepare an adequate plan which will be both workable and long-lived is immense. Thus, by starting the preparation now, Delaware officials hope to be able to do a sufficiently thorough job that their resulting land use plan will provide for ordered development of the state's land resources over a period of many years - and will not require frequent, drastic revisions and modifications.

The first step in the preparation of the plan is the performance of a complete and detailed inventory of present land uses throughout the state. To this end, the Planning Office has developed a modified grid system, dividing the state into manageable segments, with the point of origin being the southwest corner of the state. Within the urbanized areas, tax maps are used to identify each separately owned parcel of land; while in the rural areas, recognizable physical boundaries such as roads, railroad tracks, and streams are utilized to delineate land segments.

Within the grid system, each parcel was inspected so that the actual usage of the parcel could be established. The results of these field inspections are then displayed on large-scale, color-coded maps. Maps were prepared at scales of 1:10,000 and 1:24,000.

A segment of the data grid coordinate system is shown in Figure 3-9. Every town, as is the case for Seaford (092-094) in this figure is kept as one modified grid to facilitate separating data from incorporated and unincorporated areas. An additional capability of this system is that information can be printed directly on maps by computers. In this case, the printed data would appear in the grid areas shown in Figure 3-9.

Using the land use classification scheme reproduced as Appendix R, the computer data base was developed in the format shown in Figures 3-10 through 3-12 inclusive.

Given the completion of the inventory and the creation of a computerized data base, many valuable and accurate planning compilations can be prepared. Subsequently, by comparison with previous inventories, the desired change analyses can be produced.

As is shown in Tables 3-12 and 3-13, the entire state has been broken down by country into urban and non-urban land. The composition of the urban land, which is of prime concern to the DSPO, is further characterized as to whether it is incorporated or unincorporated, as shown in Table 3-14 and as to land use within counties in Table 3-15. Detailed county breakdowns such as shown in Tables 3-16 and 3-17 for Sussex County have been produced for all three counties. The end products are, by county, land use maps as is again shown for Sussex County in Figure 3-13.

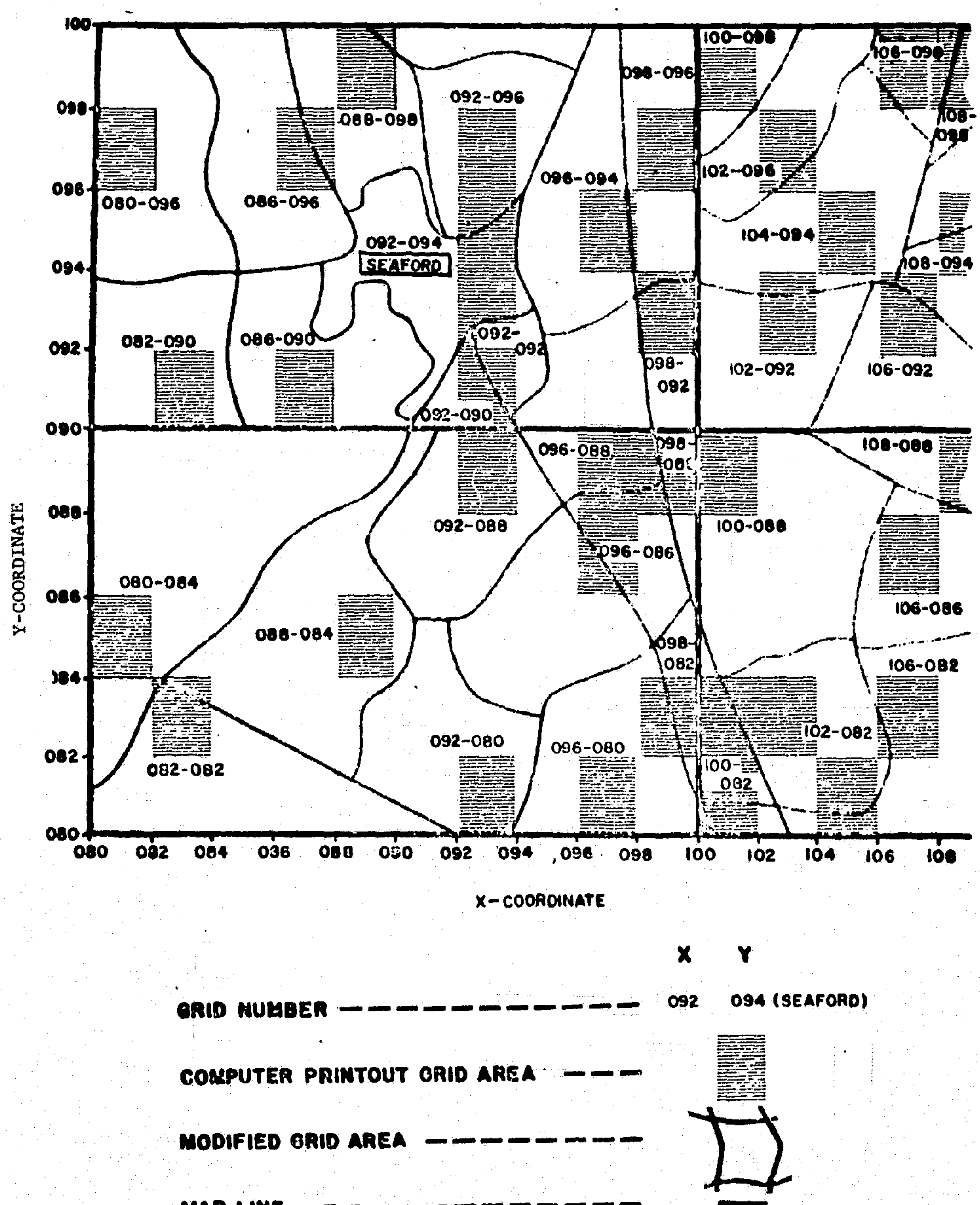



Figure 3-9. Land Use Data Grid Coordinate System

FILE TITLE: DSPO Generalized Land Use Grid Summary

FILE SOURCE: DSPO Land Use Parcel Data

REMARKS: A: For rural area grid summary cards only (not for municipal grids).

DATA NUMBER

NUMBER

DATE OF ENTRY

No. OF UNIT RECORDS

No. OF CHARACTERS/UNIT REC.

No. OF UNIT REC./ REC

No OF WORDS/ RECORD

No OF RECORDS

NOTES

NUMBER OF | SEQUENCE | DATE

| Columns | DESCRIPTION | TOTALS | Columns | DESCRIPTION | TOTALS |
|---|---|---|---|---|---|
| 01–02 | County | | 51–52 | 954X | |
| 03–05 | En. District | | 53–55 | Community Services 5XXX | |
| 06–07 | Pop. Analysis Area | | 56–59 | Transportation 6XXX | |
| 08–09 | Income Postal Zone | | 60–62 | Utilities 7XXX | |
| 10–12 | X Coordinate (Grid No. X / Map No.) | | 63–67 | Used Open Land 8XXX | |
| 13–15 | Y Coordinate (Grid No. Y / Map No.) | | | | |
| 16–17 | Field Sheet Block No. A | | 68–70 | Other Vacant W/Structures 955X-959X | |
| 18–22 | Total Grid Acreage | | 71–75 | Water and Marginal Land 91XX, 92XX, 93XX | |
| 23–26 | Residential (Used) 1XXX | | 76–80 | Agricultural, Extractive and Open Usable Land 0XXX & 9400 (All remaining 9XXX) | |
| 27–30 | Residential (Vacant) 951X | | 81–00 | | |
| 31–34 | Business (Used) 2XXX | | | | |
| 35–37 | Business (Vacant) 952X | | | | |
| 38–41 | Wholesale (Used) 3XXX | | | | |
| 42–44 | Wholesale (Vacant) 953X | | | | |
| 45–48 | Manufacturing (Used) 4XXX | | | | |
| 49–50 | Manufacturing (Vacant) | | | | |

Figure 3-10. Card/Disk/Tape Layout

| | | | |
|---|---|---|---|
| FILE TITLE: | DSPO Residential Grid Summary | DATA NUMBER | |
| | | ___ NUMBER | |
| | | DATE OF ENTRY | |
| FILE SOURCE: | DSPO Land Use Parcel Data | No. OF UNIT RECORDS | |
| | | No. OF CHARACTERS/UNIT REC. | |
| | | No. OF UNIT REC./ REC. | |
| REMARKS: | A: For rural grids only | No OF WORDS/ RECORD | |
| | | No OF RECORDS | |

NOTES:

| | NUMBER | SEQUENCE | DATE |
|---|---|---|---|
| | OF | | |
| | OF | | |
| | OF | | |
| | OF | | |
| | OF | | |

| Col. | DESCRIPTION | | TOTALS |
|---|---|---|---|
| 01 | County | | |
| 02–05 | En. District Number | | |
| 06–07 | Pop. Analysis Area | | |
| 08–09 | Postal Zone | | |
| 10–12 | X Grid Number | | |
| 13–15 | Y | | |
| 16–17 | Field Block Number | A | |
| 18–22 | Total Residential Acreage — 1XXX and 951X | | |
| 23–26 | One-Family Acreage — 111X | | |
| 27–30 | One-Family Uses and Occupied DU's | SINGLE FAMILY | |
| 31–33 | One-Family Seasonal DU's 1115 | SINGLE FAMILY | |
| 34–36 | One-Family Delapidated DU's 3 in Struct. Condition Field | SINGLE FAMILY | |
| 37–38 | One-Family Migrant DU's 1119 | SINGLE FAMILY | |
| 39–42 | Multi-Family Acreage — 12XX, 13XX, 14XX | MULTI-FAMILY | |
| 43–45 | Multi-Family Uses (Count) | MULTI-FAMILY | |
| 46–48 | Multi-Family Total DU's | MULTI-FAMILY | |
| 49–50 | Multi-Family Occupied DU's | MULTI-FAMILY | |
| 51–53 | Multi-Family Seasonal DU's 12X5, 13X5, 14X5 | MULTI-FAMILY | |
| 54–55 | Multi-Family Delapidated DU's 3 in Struct. Condition Field | MULTI-FAMILY | |
| 56–58 | Multi-Family Migrant DU's 12X9, 13X9, 14X9 | MULTI-FAMILY | |
| 59–62 | Trailer Acreage — 117X and 157X | TRAILERS | |
| 63–65 | Trailers ( Count ) | TRAILERS | |
| 66–67 | Trailers Seasonal 1175 and 1575 | TRAILERS | |
| 68–69 | Trailers Delapidated 3 in Struct. Condition Field | TRAILERS | |
| 70–72 | Total DU Count Unused Residential 9510 | SPECIAL DU's | |
| 73–75 | Total Commerical DU's 2XXX and 9520 | SPECIAL DU's | |
| 76–78 | Occupied Commercial DU's 2XXX and 9520 | SPECIAL DU's | |
| 79–00 | | | |

Figure 3-11. Card/Disk/Tape Layout

FILE TITLE: DSPO Commercial Grid Summary

FILE SOURCE: DSPO Land Use Parcel Data

REMARKS: A: For rural area grids only

DATA NUMBER
NUMBER
DATE OF ENTRY
No. OF UNIT RECORDS
No OF CHARACTERS/UNIT REC.
No. OF UNIT REC./ REC.
No. OF WORDS/ RECORD
No OF RECORDS

NOTES

NUMBER OF | SEQUENCE | DATE

| Col. | DESCRIPTION | | TOTALS | Col. | DESCRIPTION | | TOTALS |
|---|---|---|---|---|---|---|---|
| 01–02 | | | | 51–52 | | | |
| 03–05 | En. District | | | 53–54 | Com. & Prof. Services Acreage (26XX) | SERVICE | |
| 06–07 | Pop. Area | | | 55–56 | Total " " " " Uses | SERVICE | |
| 08–09 | Postal Zone | | | 57–60 | Outdoor Recreation Acreage (28XX) | SERVICE | |
| 10–12 | X — Grid Number | | | 61–62 | Total " " " " Uses | SERVICE | |
| 13–15 | Y — Grid Number | | | 63–65 | Other Commercial Acreage | | |
| 16–17 | Field Block Number | A | | 66–67 | Total " " " " Uses | | |
| 18–21 | Total Used Commercial Acres (2XXX Series) | | | 68–71 | Vacant Commercial Acreage 952X | VACANT | |
| 22–24 | Retail Sales Acres (22XX Series) | RETAIL | | 72–73 | Total Vacant Uses | VACANT | |
| 25–26 | Total Retail Sales Uses | RETAIL | | 74 | | | |
| 27–29 | Auto Sales Acres (251X - 255X and 259X) | RETAIL | | 75–79 | | | |
| 30–31 | Total Auto Sales Uses | RETAIL | | 80–81 | | | |
| 32–34 | Transient Lodge Acreage (21XX) | SERVICE | | 82–84 | | | |
| 35–36 | Total " " " " Uses | SERVICE | | 85–86 | | | |
| 37–39 | Consumer Service Acreage (23XX) | SERVICE | | 87–89 | | | |
| 40–41 | Total " " " " Uses | SERVICE | | 90–91 | | | |
| 42–44 | Indoor Recreation Acreage (24XX) | SERVICE | | 92–94 | | | |
| 45–46 | Total " " " " Uses | SERVICE | | 95–96 | | | |
| 47–49 | Auto Services Acreage (256X - 258X) | SERVICE | | 97–99 | | | |
| 50 | Total " " " " Uses | SERVICE | | 00 | | | |

Figure 3-12. Card/Disk/Tape Layout

Table 3-12. Distribution of Urban and Non-Urban Land Between Delaware's Three Counties, 1964

| Type of Use | Delaware | | New Castle Co. | | Kent Co. | | Sussex Co. | |
|---|---|---|---|---|---|---|---|---|
| | Acres | Percent | Acres | Percent | Acres | Percent | Acres | Percent |
| Urban | 103,639 | 100.0 | 52,299 | 50.5 | 20,483 | 19.7 | 30,877 | 29.8 |
| Nonurban | 1,154,983 | 100.0 | 226,036 | 19.6 | 358,717 | 31.1 | 570,230 | 49.3 |
| TOTAL LAND | 1,258,622 | 100.0 | 278,335 | 22.1 | 379,180 | 30.1 | 601,107 | 47.8 |

SOURCE: 1964 field survey

Table 3-13. County Urban and Non-Urban Land Use Distribution, in Delaware, 1964

| Type of Use | Delaware | New Castle Co. | Kent Co. | Sussex Co. |
|---|---|---|---|---|
| | Percent of Total Land | | | |
| Urban | 8.2 | 18.8 | 5.4 | 5.1 |
| Non-urban | 91.8 | 81.2 | 94.6 | 94.9 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |
| Total Land Acreage | 1,258,622 | 278,335 | 379,180 | 601,107 |

SOURCE: 1964 field survey

Table 3-14. Urban Land Use Composition in Delaware, 1964

| Land Use | Statewide | Total Unincorporated | Total Incorporated | Wilmington | Other Incorporated |
|---|---|---|---|---|---|
| | | Percent of Total Urban Land Area | | | |
| Residential | 49.3 | 39.9 | 41.9 | 26.4 | 46.4 |
| Commercial | 3.0 | 2.5 | 5.1 | 5.4 | 5.1 |
| Wholesale, storage and contracting | 1.2 | 0.8 | 2.7 | 4.4 | 2.2 |
| Manufacturing | 4.6 | 3.8 | 8.0 | 7.0 | 8.3 |
| Community Services | 6.4 | 5.9 | 8.4 | 5.6 | 9.2 |
| Transportation | 37.1 | 39.9 | 25.5 | 34.5 | 22.7 |
| Utilities | 0.9 | 0.7 | 1.8 | 4.2 | 1.0 |
| Recreation and Open Uses | 6.5 | 6.5 | 6.6 | 12.5 | 5.1 |
| TOTAL | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Urban Acreage | 103,639 | 83,654 | 19,985 | 4,720 | 15,265 |

SOURCE: 1964 field survey

Table 3-15. County Urban Land Use Composition in Delaware, 1964

| Land Use | Delaware | New Castle Co. | Kent Co. | Sussex Co. |
|---|---|---|---|---|
| | Percent of Total Urban Land Area | | | |
| Residential | 40.3 | 43.0 | 38.1 | 37.3 |
| Commercial | 3.0 | 3.0 | 3.3 | 2.8 |
| Wholesale, Storage & Contracting | 1.2 | 1.1 | 1.2 | 1.4 |
| Manufacturing | 4.6 | 7.3 | 2.5 | 1.4 |
| Community Services | 6.4 | 8.1 | 3.5 | 5.3 |
| Transportation | 37.1 | 29.6 | 46.4 | 43.7 |
| Utilities | 0.9 | 1.4 | 0.5 | 0.3 |
| Recreation & Open Uses | 6.5 | 6.5 | 4.5 | 7.8 |
| TOTAL | 100.0 | 100.0 | 100.0 | 100.0 |
| Urban Acreage | 103,639 | 52,299 | 20,463 | 30,877 |

SOURCE: 1964 field survey

Table 3-16. Distribution of Urban Land Uses in Sussex County, 1964

| Land Use | County | | Unincorporated | | Incorporated | |
|---|---|---|---|---|---|---|
| | Acres | Percent | Acres | Percent | Acres | Percent |
| Residential | 11,521 | 100.0 | 8,546 | 75.0 | 2,975 | 25.8 |
| Commercial | 856 | 100.0 | 528 | 62.0 | 328 | 38.4 |
| Wholesale, Storage & Contracting | 421 | 100.0 | 252 | 60.0 | 170 | 40.3 |
| Manufacturing | 451 | 100.0 | 242 | 54.0 | 209 | 46.4 |
| Community Services | 1,636 | 100.0 | 1,460 | 89.3 | 176 | 10.7 |
| Transportation | 13,490 | 100.0 | 12,228 | 90.7 | 1,261 | 9.3 |
| Utilities | 81 | 100.0 | 43 | 54.0 | 38 | 46.8 |
| Recreation and Open Uses | 2,420 | 100.0 | 1,991 | 82.3 | 429 | 17.7 |
| TOTALS | 30,876 | 100.0 | 25,290 | 81.9 | 5,586 | 18.1 |

Table 3-17. Urban Land Use Composition in Sussex County, 1964

| Land Use | County | Unincorporated | Incorporated |
|---|---|---|---|
| | Percent of Total Area | | |
| Residential | 37.3 | 33.8 | 53.3 |
| Commercial | 2.8 | 2.1 | 5.9 |
| Wholesale, Storage & Contracting | 1.4 | 0.9 | 3.0 |
| Manufacturing | 1.5 | 0.9 | 3.7 |
| Community Service | 5.3 | 5.8 | 3.1 |
| Transportation | 43.7 | 48.4 | 22.6 |
| Utilities | 0.2 | 0.2 | 0.7 |
| Recreation and Open Uses | 7.8 | 7.9 | 7.7 |
| TOTAL | 100.0 | 100.0 | 100.0 |
| Urban Land Acreage | 30,876 | 25,290 | 5,586 |

SOURCE: 1964 field survey

SUSSEX COUNTY

Figure 4 shows the 1964 geographical distribution of Sussex County's major urban land uses. There was no single major concentration of urban uses. However, groups of towns, and in some cases individual towns, formed definite urban development patterns. They included the Seaford-Laurel area, Georgetown, and the Millsboro to Selbyville area.

Sussex County was similar to both Kent and New Castle in that the majority of its urban land use acreage lies outside city limits. Less of its urban acreage was contained within corporate areas than in either of the state's other two counties.

Table IX shows that Sussex County, like New Castle County, had less land in each urban land use category in its incorporated towns than it had out in the county. A smaller percentage of manufacturing land was inside incorporated towns in Sussex County than in Kent County. However, Sussex County towns still contained a higher percentage of this land use than incorporated places in New Castle County. This reflects the tendency for Sussex County industry to locate where city utilities are available although this appears to be less prevalent than in Kent County.

The very small percentage of urban land used for transportation and community services in Sussex County towns reflects the large size of the unincorporated area as well as the county's rural character. Most of the county's road acreage lies outside corporate areas where it serves to connect the widely separated towns, rural developments, and farms. The large percentage of community service acreage outside corporate places is due to the large sites for schools and public institutions out in the county compared to the very small amount of land devoted to municipal buildings. As in Kent County, the large percentage of recreation and open land use acreage in unincorporated places reflects the fact that the majority of urban type recreation areas are located along rivers, ponds, bays, and the ocean outside of incorporated towns.

Table X compares the percentage composition of urban land uses in incorporated areas with the composition of unincorporated areas. Like Kent County towns, the residential nature of Sussex County's incorporated places is shown by a high percentage of residential land use. Sussex County's unincorporated urban use composition was the most rural of the three counties. Sussex County contained a slightly higher percentage of residential acreage outside corporate limits than Kent County, generally in the form of scattered roadside development and farm dwellings.

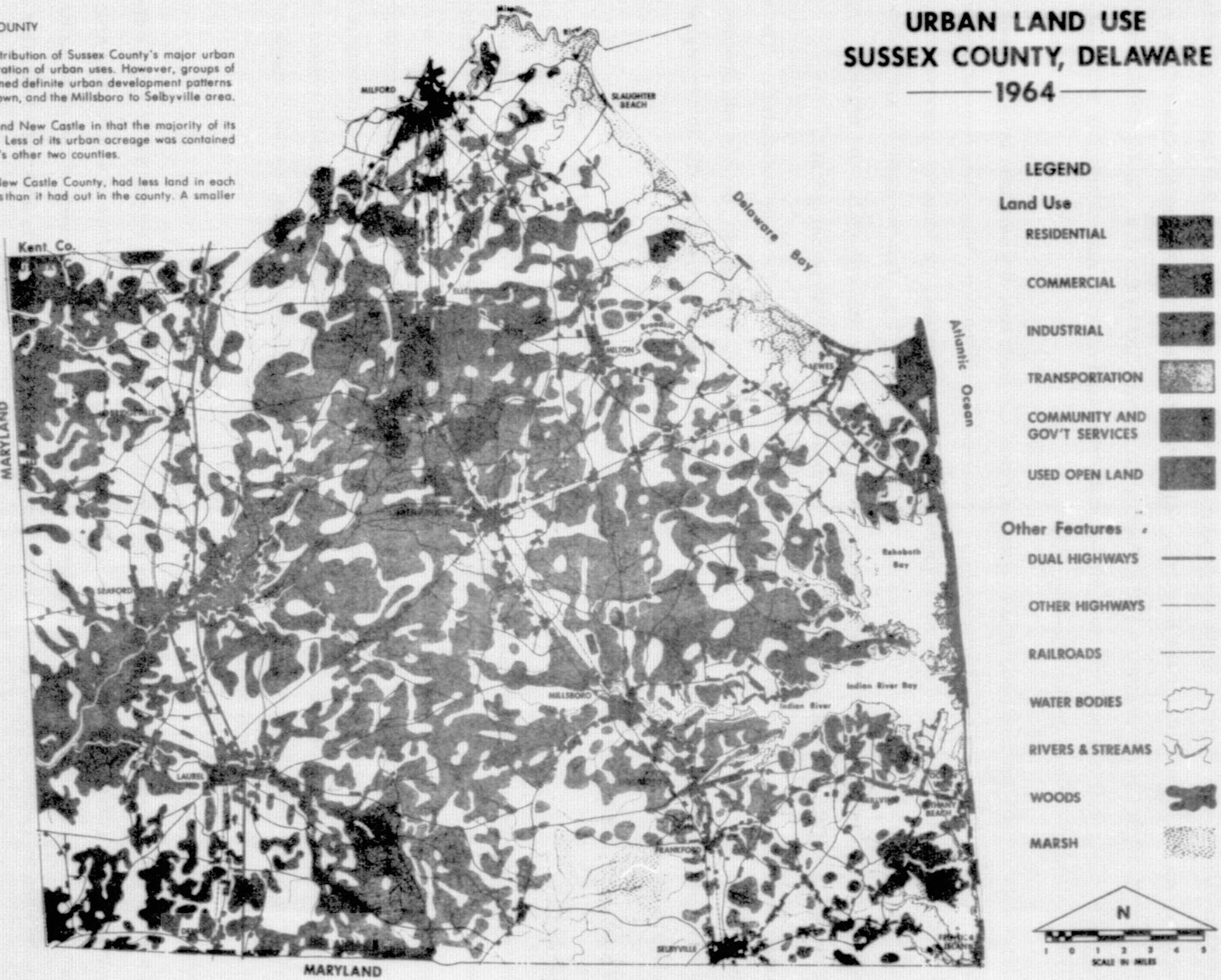



Figure 3-13. Urban Land Use Sussex County, Delaware, 1964

Another important class of data required in the preparation of the land use plan is a detailed knowledge of the soil types, topography, and characteristics of the land area. Much of this information has been obtained from surveys performed by the Department of Agriculture's Soil Conservation Service and by the U.S. Geological Survey. However, the detail of these data is not sufficient for the state-wide land use plan and conceivably will have to be supplemented by additional surveys by the Planning Office.

Once the various sets of data described above have been collected and analyzed, the next task is to establish in detail the state-wide goal for land usage - how much should be preserved for agriculture, what directions should urban development take, what are the requirements for transportation, for recreation, for historic preservation? The answers to these questions will constitute the basis for the comprehensive plan. But the answers are influenced by major political and economic considerations as well as by those of environmental quality and resource preservation. Consequently, structuring the answers is probably the most difficult of the planning tasks.

Once the goals have been established, the plan will be drawn up and presented to the state legislature. Their responsibility is to not only pass legislation implementing the plan but also to establish controls and procedures for enforcement of the requirements of the plan. Present expectations are that this final step will be accomplished in less than five years.

### 3.4.3 STATE OF NEW JERSEY LAND-ORIENTED INFORMATION SYSTEM

#### 3.4.3.1 Introduction

The extent to which land-use management activities are successful is largely dependent upon the ability to make decisions which are timely as well as sound. In turn, such an ability is primarily contingent upon the availability of accurate, meaningful, and up-to-date information about the different aspects of land utilization within an area of interest. Recognizing this fact, several states have begun to take steps towards the development and implementation of automated land-use information systems. These systems are of particular interest since in many respects their structures are quite similar to the land data processing activities envisioned for the TERSSE system. In the following discussion, attention will focus upon a system which is currently being developed by the Division of State and Regional Planning of the State of New Jersey.

#### 3.4.3.2 System Description

The State of New Jersey's Land Oriented Information System (LOIS)[1] is a framework consisting of data, software, and EDP hardware whose purpose is to provide data on the physiographic characteristics of a particular area or the activities which take place upon it. LOIS is designed to serve primarily the data needs of the planning function; and, although the system was initially intended to serve planning at the state level, it is anticipated that this system will serve the needs of the planning organizations at the regional, county, and municipal levels as well.

[1] Division of State and Regional Planning, State of New Jersey, Land Oriented Information System: A Data Resource for Planning (Trenton, N.J.: n.d.).

In general terms, LOIS will be capable of:

1. Merging data from different sources for the purposes of inventory, analysis, and modeling;
2. Displaying data in both tabular and graphic formats;
3. Aggregating data to conform to any geographical area defined by the user;
4. Responding rapidly to specified data requests; and
5. Accommodating and reflecting changes in the planning function and the demand for information.

LOIS will be capable of meeting many basic information demands of local and state planners. The information incorporated into the system will include current land use (e.g., residential, commercial), physical features (e.g., geology, soil type, topography), socioeconomic characteristics (e.g., population, income), and public facilities and services (e.g., airports, highways, water and sewer service areas).

3.4.3.3 Data Sources

The approach being followed in the creation of the LOIS is based upon two assumptions. The first is that it costs less in terms of time, manpower, and funds to make greater use of existing data than to collect new data. The second is that the utility of data collected from various sources and integrated within the framework of a single information system is greater than that of any one or group of files alone.

Thus far, several sources of inputs to the system have been identified. These consist of socio-economic and demographic data generated by the U.S. Census Bureau, and files maintained by state agencies such as the Departments of Environmental Protection, Community Affairs, Transportation, Labor and Industry, and the Treasury. It is anticipated that other files will be established and integrated within the LOIS framework as new regulatory functions are undertaken.

3.4.3.4 Data Integration

Figure 3-14 illustrates the process through which LOIS integrates data and generates output products, and in a large sense represents the TERSSE land data processing problem. All of the data which are integrated by the system are land-oriented and can be assigned to a definable geographic area. The system is capable of defining any type of spatial unit desired, and its associated data as a point, line, or an area on the surface of the earth.

Integration of files is achieved by defining each spatial unit in terms of a standard geographic identifier. The identifier used in this case is the State Plane Coordinate System. In addition to providing a unique pair of coordinates for any point in New Jersey, the coordinate system also indicates the spatial relationship between points throughout the entire state. This makes it possible to generate data in graphic, as well as tabular formats.

To date, work on LOIS has focused upon the generation of specifications for the system design and on the testing of individual system elements on a pilot basis. Passaic Township (Morris County) is being utilized as the test site. In the Passaic test, each lot in the township was assigned a centroid for which a State Plane Coordinate could be generated. In addition, coordinates were also generated for boundaries of utility and railroad rights-of-way, the township boundary, and 3.5-acre grid cells corresponding to the data coding system utilized by the State Bureau of Geology.

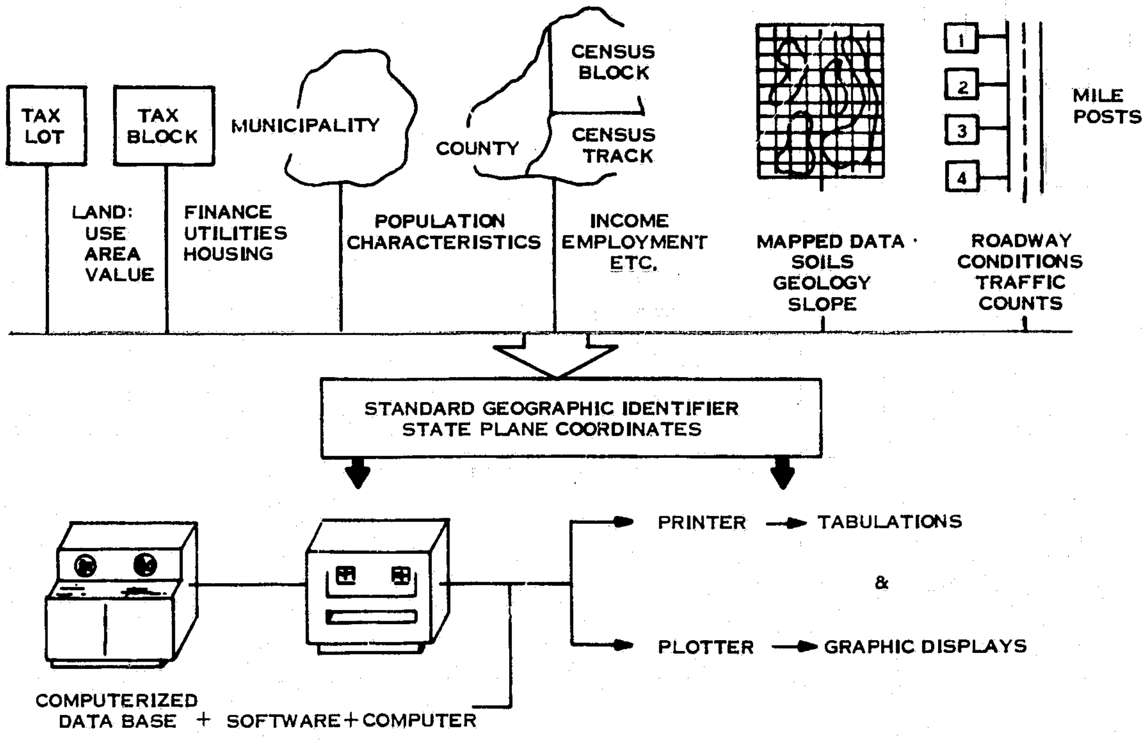



Figure 3-14. A Schematic Representation of the New Jersey Land Oriented Information System (LOIS)

Given the objective of developing a flexible system which is capable of attaining the greatest use of existing data sources, considerable effort is being made to retain the integrity of each element in the data base. For example, if the data describes land at the level of the census tract, the ability to display the data at this level should not be lost as a result of aggregation to some larger spatial unit.

By virtue of the fact that data in the LOIS framework are keyed to the State Plane Coordinate System, users need only perform two steps in order to tap into the data base. They need only specify the data to be displayed and the type of format (tabular or graphic) desired; and define the geographic area of interest in terms of the State Plane Coordinate system or of any spatial unit (e. g., municipality, tract, block) to which State Plane Coordinates are assigned.

3.4.3.5 <u>System Applications</u>

Results thus far obtained from the Passaic test indicate that the system is already capable of partially satisfying the demand for data pertaining to the pattern of current land use. These results, however, fail to indicate the full potential of the system since they were based only upon one township assessment file and a set of tax maps. The range of planning problems which the system could address will be expanded significantly with inputs of data on population, physiographic characteristics, employment, assessed values, availability of public services, etc. Some examples of various potential applications that are conceived are worth noting and nicely illustrate the type of applications envisioned for this type of land data processing system.

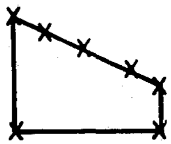
**Example 1: Existing land use inventory**

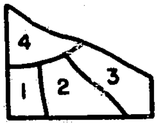
**The Demand:** Display in tabular and graphic form the present distribution of land among specified land use categories within Area X.

**Procedure:**

1. Define Area X as for example

   (a) That area bounded by the following State Plane Coordinate pairs
   OR
   (b) That area composed of the following units (tracts, blocks, municipalities) which can be defined by the State Plane System.

(a) 

(b) 

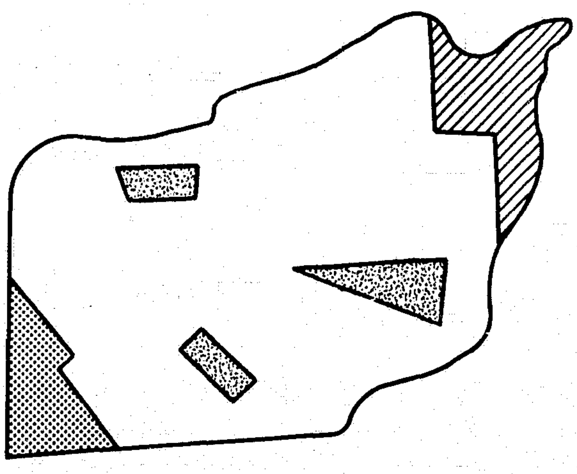

2. Instruct the computer to aggregate the acreage of land in each use category to a specified level and display the results.

Listing

| Land Use | Residential | Industrial | Commercial |
|---|---|---|---|
| Block I | 50 | 20 | 0 |
| Block II | 10 | 40 | 20 |
| Block III | 55 | 5 | 10 |

Map

Predominant Land Use



**Example 2: Site selection and analysis**

Demand: Identify all areas in the state (county, locality) which satisfy the following criteria:

- vacant land of greater than 2 hectares (5 acres) in area
- assessed value of no more than $10,000/hectare (4,000/acre)
- soil type class I (suitable for development)
- slope of less than 5 per cent

Procedure:

1. Instruct the computer to search the data base for occurrences where all of the above characteristics are present.
2. Display the results as specified by the user.

**Example 3: Highway route selection**

Demand: Given three alternative highway routes, which will cost less in terms of:

- Number of people displaced
- Value of property taken
- Amount of developed land involved?

Procedure:

1. Instruct the computer to search the data base pertaining to each route as defined by the user.
2. Aggregate totals of each category for each route.
3. Rank routes and display as specified by the user.

Thus, the LOIS when fully implemented will provide a fundamental and flexible data base to support sound land use decisions and the formulation of an enlightened and useful land use policy. This motivation and the approach being followed in the State of New Jersey may well be directly applicable to the TERSSE.

### 3.4.4 SUMMARY OF INFORMATION REQUIREMENTS

As was indicated in Section 3.2.1, the information required for land use management very closely depends on the specific land management decision to be made. At this point in time, the basic decision concerning the level of responsibility for land management that will be retained at the state government level has not really been firmly made in any state. As a consequence, it is really not possible to specifically list land information requirements for "states" per se.

If the decision is made to allow land use or zoning decisions to remain with local governments then their requirements would be as shown and discussed in Section 3.3.3 (preceeding). It is expected that in this case, the state would have a broader, less detailed need for land use information. If the decision were made that land use decisions were to occur within a state governmental agency, then the state information requirements would become those now indicated as needed for urban and regional land use planning. Actually then, as is implied in Figure 3-1, land information requirements are not related to the level of government at which land management decisions are being made. The identify of the manager is of little consequence. Land information requirements are related only to the area for which the decision is being made, the type of land use involved, and the specific management decision to be made.

## 3.5 COASTAL ZONE MANAGEMENT

### 3.5.1 ANALOGY WITH FEDERAL LAND USE LEGISLATION

Current interest in the environment and ecological sciences at a time when greater and greater demand is being placed on the mineral, food, and recreational resources of the coastal zone, has underscored an awareness among the coastal states that their wetlands and coastal regions are among the more fragile (and vital) of our natural resources. As states begin to recognize their need for logical land utilization, wetlands, long regarded as relatively non-productive, are now receiving high level planning priority, in recognition of their vital role in maintaining a natural ecological balance.

Coastal zone management can be generally defined as the rational prioritization of coastal land usage, in order to (1) serve the widest segment of society as effectively as possible; and (2) minimize the impact to the environment. The problem of coastal zone management is both unique and complex, in that the coastal states must accept the responsibility of providing vital services, such as port facilities, off-shore oil and gas production, maintenance of natural biological cycles to all the states while bearing the majority of the cost and detrimental impact. During the recent energy crisis, oil producing states bordering the Gulf of Mexico expressed displeasure at the reluctance of Atlantic coastal states to develop their off-shore petroleum reserves, or serve as sites for refineries or bulk transfer facilities. In time, economic necessity may override aesthetic considerations.

In order to utilize these unique regions of the coastal states in an optimum manner, and to the benefit of the nation as a whole, a need for coastal zone management has been recognized. This recognition has come from both the Federal Government and, in some cases, from the states themselves. The coastal management aspect of state-federal cooperation is but a small segment of a comprehensive program of land use planning envisioned at all levels of state and local government.

To this end, the Federal Government under the auspices of the Coastal Zone Management Act of 1972, has established the Office of Coastal Environment (OCE) within the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce. The office will serve to coordinate coastal zone management on a state level, through the implementation of federal guidelines and financial support. Under this Act, the Federal Government is authorized to make annual grants to any coastal state "for the purpose of assisting in the development of a management program for the land and water resources of its coastal zone." In this way coastal states will receive the financial support they need while retaining the responsibility to manage their valuable coastal assets.

The Federal Coastal Zone Management Act of 1972 delineates specific management programs for which grants are available. These include:

1. An identification of the boundaries of the coastal zone subject to the management program.
2. A definition of what shall constitute permissible land and water uses within the coastal zone which have a direct and significant impact on the coastal waters.
3. An inventory and designation of areas of particular concern within the coastal zone.
4. An identification of the means by which the state proposes to exert control over the land and water uses referred to in paragraph (2), including a listing of relevant constitutional provisions, legislative enactments, regulations, and judicial decisions.

5. Broad guidelines on priority of uses in particular areas, including specifically those uses of lowest priority.

6. A description of the organizational structure proposed to implement the management program, including the responsibilities and interrelationships of local, areawide, state, regional, and interstate agencies in the management process.

In a very similar way, the pending Federal Land Planning bill also encourages states to develop land management plans. The principal point of contention over this legislation has been at what level of government should land use controls reside over which type of developments and land areas. In no case would it be the Federal Government; the debate is between state versus local control.

For the purposes of this study, it was felt that a detailed consideration of the information requirements emerging from the need for the coastal states to develop management plans would give good insight into the nature of the information requirements that would be generated by federal land use legislation, and in turn to the probable impact of that land use legislation on TERSSE.

Coastal zone planning on the state level has been to a large measure a reaction to federal legislation, i. e., a willingness to meet requirements of the Coastal Zone Management Act in order to qualify for federal funds. The response expected to the pending Federal Land Planning bill by the states will be similar. State programs are presently in various stages of completion, and vary in comprehensiveness and sophistication.

In general, several problems exist at the state and local level which are common to all coastal states, and in fact, provided some of the initial impetus for the federal legislation. Perhaps the most important of these is the understandable tendency on the part of local governments to place local economic and aesthetic interests above larger scale (and perhaps more nebulous) national interests. An economically depressed area may welcome development of the local coastal region for the tax and employment benefits it includes. A local government may decline to host an oil refinery or bulk transfer facility, even though convinced that an acute need for one exists, simply to avoid the negative spillover effects. The average citizen, faced with economic realities or a love of natural beauty, may be disinclined to cooperate with laws set down by those less affected.

Herein then lies the philosophy behind coastal zone management (and indeed, land use planning in general). National needs must be met, and natural resources must be preserved. Priorities must be assigned with foresight and with responsibility to those affected. While, in some cases, local interests must be subjugated for the benefit of society as a whole, legislation must be enacted which will spread both benefits and negative impacts as equitably as possible.

Individual states have attacked these common problems and those unique to their case in different ways, under the general guidance of the Federal Coastal Zone Management Act of 1972. A summary of selected existing significant state programs for the coastal zone is given in Table 3-18.

### 3.5.2 COASTAL ZONE MANAGEMENT IN DELAWARE

#### 3.5.2.1 Definition of the Problem

The study team felt it would be useful and instructive to examine a single state's approach to the coastal management problem in order to understand the complexities involved in coordinating legislation at the federal, state and local levels, and in order to derive a good first cut at a cross section of typical information requirements for this

Table 3-18. Current State Programs in the Coastal Zone

| State | Legislation/Organization | Purpose/Comments |
|---|---|---|
| Alabama | Alabama Development Office | Comprehensive coastal zone plan in preparation. |
| Alaska | Dept. of Natural Resources Division of Marine & Coastal Zone Management | In process of defining environmental base levels. |
| | Alaska Land Act, 1959 Sea Grant Program | Land use classification. |
| California | Coastal Zone Conservation Commission | State-wide |
| | San Francisco Bay Conservation and Development Commission | Preserving the S. F. Bay region. |
| | Coastal Conservation Act, 1972 | Control of development. |
| Connecticut | Dept. of Environmental Protection | Wetlands management. |
| | Wetlands Protection Act, 1969 | Control development, inventory wetlands. |
| Delaware | Comprehensive state-wide program to be discussed in detail in the following section of this report. | |
| Florida | Coastal Coordinating Council | Coastal zone research and planning. |
| | Setback Lines Act, 1971 | Beach preservation. |
| | Land Conservation Act, 1972 | To conserve recreational and endangered lands. |
| | Environmental Land and Water Management Act, 1972 | Land development regulations Coastal Zone Management Atlas in preparation. |
| Georgia | Coastal Marshland Protection Act, 1970 Comprehensive Coastal Zone Plan in progress | To preserve Marshlands. |
| Louisiana | Advisory Commission on Coastal and Marine Resources | To develop a Coastal Zone Mgmt. Plan. |
| | Superport Act, 1972 | Created a deep draft harbor and terminal authority. |
| | Louisiana State University (center for Wetlands Resources) | Completed a study called "Proposed Multiuse Management Plan for the Louisiana Coastal Zone" to contribute to state-wide coastal management. |

Table 3-18. Current State Programs in the Coastal Zone (Continued)

| State | Legislation/Organization | Purpose/Comments |
| --- | --- | --- |
| Maine | Wetlands Preservation Act 1967 various other acts re: site selection, zoning, land use State Planning Office | Control wetlands destruction and development, limit industrial development. Coastal Zoning. |
| Maryland | Maryland Dept. of Natural Resources<br>Wetlands Act, 1970<br>Power Plant Siting Act, 1971<br>Shore Erosion Control Act, 1970 | Coordinate Natural Resources Planning. |
| Massachusetts | Department of Natural Resources Hatch-Jones Act, 1965 | Comprehensive law protecting the environment, including fisheries, wetlands, channel dredging, pollution control. |
| | Coastal Wetlands Protection Act, 1965 | |
| | Commission on Ocean Management | Includes coastal zone management. |
| | Office of Environmental Affairs | State-wide planning |
| North Carolina | Dept. of Natural and Economic Res. Council on Marine Sciences | Coastal Planning and Management. |
| | Estuarine Study Act, 1969 | Coastal Zone, Estuary usage. |
| | Wetlands Protection Act, 1971 Legislation is pending for a State-wide coastal zone management program. | |
| Oregon | Oregon Coastal Conservation and Development Commission | State-wide coordination. |
| | Beach Access Act, 1967 | |
| | Power Plant Siting, 1969 | |
| | Coastal Zone Management Plan, 1971 | Develop & implement natural resources planning. |
| | Coastal Construction Moratorium, 1971 | |

land management problem. The State of Delaware was selected both for convenience and because it has addressed the problem in an aggressive and comprehensive manner. Delaware was also felt to be a good choice for study for several other reasons: (1) Delaware has recently been involved in a deep water port and refinery siting study - consequently, much of the required wetlands inventory/coastal zone usage analysis has already been done by the Environmental Protection Agency, the State Planning Office and the College of Marine Studies of the University of Delaware; (2) Delaware's coastline is varied in physical character and serves a variety of uses - this provides a comprehensive coastal model analogous to many coastal types found in other states; (3) Delaware is a small state in land area and population, permitting an uncomplicated governmental organization along with well defined channels of responsibility - this makes it an easy task to track down information and contact those government officials directly associated with a researcher's area of interest; and (4) the University of Delaware's College of Marine Studies has been given "Sea Grant" status by the Federal Government, making federal funds available for extensive research in coastal zone management related sciences.

With the advantages cited above and a progressive legislature, Delaware has enacted several laws intended to preserve its present natural resources and provide for logical development in the future. It is significant to note that Delaware enacted some of its legislation primarily in recognition of its land management problems, and not just as a response to the Federal Coastal Zone Management Act of 1972.

The Delaware coast has two principal sections. The coast along the Delaware Bay includes the Port of Wilmington and the fringes of Philadelphia's industrial complex. Major shipping lines and waste disposal from this heavily urbanized region contribute to poor water quality and its subsequent adverse effects on the upper Delaware coast. The southern portion of the bay impinges on the Delaware coast as an extensive marsh complex, a vital link in the natural ecosystem. The saline/fresh water interface and a major canal connecting the Delaware and Chesapeake Bays makes this portion of Delaware's coastline an extremely complex and varied system.

Delaware's Atlantic Ocean coastline, from Cape Henlopen and to the south, constitutes a barrier beach - a tidal lagoon coast penetrated by the Indian River inlet near the southern extremity of the state. Without the industrial expansion pressure evident north of the canal, land usage along the Atlantic coast has been primarily recreational. Long shore currents along the coast and a slowly submerging coastline are modifying the southern portion of Delaware to a significant degree - a major factor to consider in the light of future coastal use plans.

Delaware's coastal planning is under the direction of the State Planning Office, with inputs from the State Department of Natural Resources, State Highway Commission and the College of Marine Studies. Recent legislation has been in the form of three acts and a preliminary coastal zone plan generated under one of the acts. This coastal zone plan is a response to federal legislation, and conforms to established federal guidelines in an effort to qualify for financial support. The relevant legislation includes:

1. The State Wetlands Act of 1973
2. The Beach Preservation Act of 1973
3. The Coastal Zone Act of 1971.

The State Wetlands Act of 1973 was enacted to insure proper utilization and management of Delaware's wetlands. The Department of Natural Resources and Environmental Control is designated as the implementing agency, led by a secretary who reports directly to the State Legislature. Local level administration consists of a Wetlands Appeals Board chaired by direct appointment from the Governor, and staffed by members to include farmers, land developers and conservationists. The Wetlands Appeals Board has the following responsibilities:

1. To monitor the destruction of Delaware's wetlands.
2. To determine the environmental impact of all types of development on land erosion, scenic beauty, nat ral ecosystems, tidal cycles, water resources (ground and surface), socio-economic factors (tax and job benefits vs. destruction of wetlands) and the "spill over" effect on lands adjacent to the proposed development.
3. To police wetlands usage, and insure that local legislation is enforced.

The Beach Preservation Act of 1972 was enacted to transfer beach erosion control responsibility from the Department of Highways and Transportation to the Department of Natural Resources and Environmental Control. This was an early step in coordinating land use (particularly coastal zone) planning in the state, by centralizing responsibility into agencies directly involved in natural resources preservation. The primary purpose of the Act is to protect Delaware's beaches from commercial encroachment, erosion and destruction by:

1. Defining, in specific terms, the beach zone.
2. Preventing and repairing erosion damage - construction of necessary jetties, dikes and seawalls.
3. Maintaining the present character of existing beaches.

The Coastal Zone Act of 1971, earliest of Delaware's efforts to manage state natural resources, was enacted to control the location and extent of industrial development in Delaware's coastal areas. The prime purpose of the law is to protect the natural beauty, environment and recreational potential of the Delaware Coast. Implementing the Act is the Delaware State Planning Office through the State Coastal Zone Industrial Control Board. The members of the Board include:

1. Secretary of Natural Resources and Environmental Control
2. Secretary of Community Affairs and Economic Development
3. Chairmen, County Planning Commissions

Their responsibilities:

State planner and State Coastal Zone Industrial Control Board will consider requests for building permits in the Coastal Zone on the basis of:

Environmental impact - pollution, destruction of flora and fauna, drainage, land erosion, water resources.

Economic effects - jobs, taxes, "spillover" land use.

The combination of these State legislative efforts, and the enactment of the Federal Coastal Zone Management Act of 1972 have influenced Delaware to develop a Coastal Zone Plan, now in preliminary form, which will eventually form part of a comprehensive land use management plan for the entire state. The purpose of the plan is to manage efficiently Delaware's coastal zone in accordance with federal legislation. The implementing agency for the Coastal Zone Plan will be the State Planning Office, with inputs from the Governor's Task Force on Marine and Coastal Affairs, and the Governor's Wetlands Action Committee. The preliminary plan aims at determining the manner in which Delaware's coastal zone is to be developed in terms of industry, recreation, and natural preserves. Under the federal legislation, Delaware will now receive financial support to assist in the preparation of a federally approved comprehensive Coastal Zone Management Plan by the end of Fiscal Year 1977. These activities of the State of Delaware in coastal zone management are summarized schematically in Figure 3-15.

3.5.2.2 Data Requirements

In attempting to manage the environment and natural resources, a federal or state generated management program can operate efficiently only if decision makers receive timely and accurate data inputs. Recent developments in computer and remote sensing techniques have enabled data to be gathered, processed and distributed in a timely and cost effective manner.

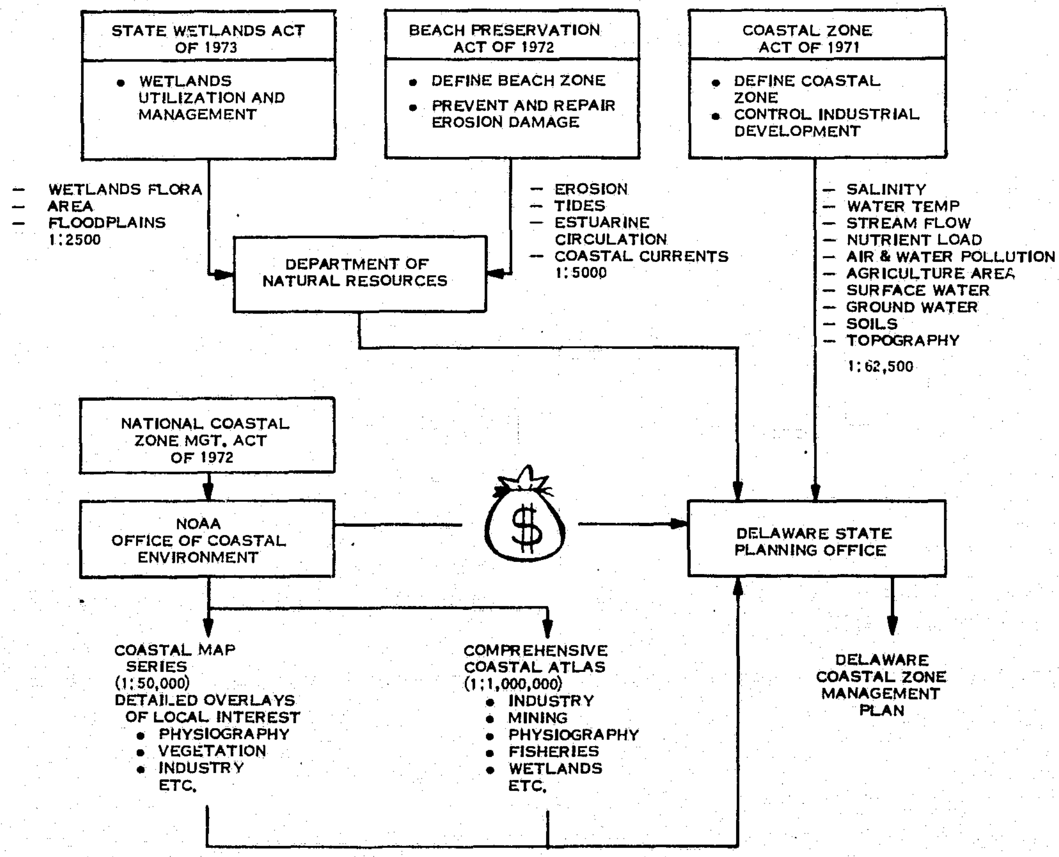



Figure 3-15. State of Delaware Coastal Zone Management

Two sources of information on data required by coastal zone management programs were tapped during this study. Interviews were conducted with representatives from the NOAA, Office of Coastal Zone Management, and with the Delaware State Planning Office.

Office of Coastal Environment (NOAA)

The primary purpose of this agency is to supervise the letting of grants to states for the purpose of logically developing their coastal zone/wetlands regions in accordance with guidelines set down by the Federal Coastal Zone Management Act of 1972. The immediate needs of the coastal states include the following:

1. The strict definition of the seaward and landward coastal boundaries - defining a state's "territorial sea."
2. Accurately delineating the areal distribution of wetlands, tidal ranges, ephemeral (temporary) features such as ponds, streams, sand bars, beaches, etc.

One of the desired outputs of the Coastal Zone Management Office will be a set of maps, the scale (yet to be finally decided) to be between 1:24,000 and 1:50,000. These maps will be useful to all states and interested agencies, and will include a series of overlays with items of local interest. Types of information sought to construct the maps and overlays will include:

1. Elevations, contours, physical features
2. Bathymetry (hydrographic contours), ocean bottom types
3. Accurate location of towns and cities
4. Navigation channels, lights, obstructions
5. Local political boundaries
6. Defense installations
7. Inventory of "made" lands (i.e., artificially constructed islands, fills, barriers)
8. Inventory of "omitted" lands - those missed by human error in previous census
9. Vegetation, soil types, geology, tide lines
10. Transportation and communication, links-roads, railroads, pipelines
11. National parks, landmarks.

Inputs to the maps will be, in part, orthophotographic, and compatible with data collected by remote sensors. Additional data of local interest will be supplied by the states themselves, in overlay format. Other agencies expected to contribute to the effort include the Departments of the Interior, Agriculture, and NOAA's National Ocean Survey.

Another study which is planned by the Coastal Zone Management Office as a followup to the initial mapping effort (just described) involves the compilation of a comprehensive coastal atlas. Desired scale for this effort will be on the order of 1:500,000 to 1:1,000,000, with the following objectives:

1. Develop oil and gas reserves.
2. Select sites for waste disposal (including radioactive material, sewage sludge, and chemical waste).
3. Select off-shore sites for floating nuclear power plants, airports and bulk transfer facilities.
4. Determine the present distribution of off-shore oil and gas wells, "Texas Towers" and stationary ships (e.g., radar picket, light ships and experimental).
5. Determine physical ocean characteristics such as water temperature, salinity, ocean current distribution, climatological zones, and horizontal and vertical advection features.
6. Determine primary productivity and the distribution of commercial shell and fin fishes.
7. Analyze bottom sediment characteristics, perform bathymetry of shipping lanes, and observe sediment transport.
8. Monitor the effects of coastal industry and pollution.
9. Determine extent of wetlands and potential regions for recreational usage.

Delaware State Planning Office

A major and immediate need is for a continuous monitoring system to measure the extent of land use change — such information as urban development, coastal erosion and the loss of agricultural and wetlands. An important consideration is the "types" of land use included in the broad categories. It would appear that the land use categorizations discussed in the earlier section on River Basin planning would be most appropriate for this application. The Delaware State Planning Office (DSPO) utilizes the same land use classification system shown in Appendix R for all its work.

The DSPO has expressed their priority data needs for development of a coastal zone management plan as follows:

1. Priority (1): To determine on a continuing basis where urban development is taking place. This would enable the DSPO to pinpoint encroachment on irreplaceable natural resources such as the wetlands.
2. Priority (2): To subdivide types of urban development into logical categories, e.g., residential, commercial, public utilities, transportation. This is presently being accomplished with reasonable success. In terms of monitoring actual changes in land usage, the DSPO indicated that coverage on an annual basis would be sufficient.

As is described in detail in Section 3.4.2, the State of Delaware has constructed a State Land Use map. This same map has served as a basis for their preliminary Coastal Zone Plan. The 1972 Existing Land Use map and the Coastal Zone Land Use Plan — both preliminary in nature — prepared by the Delaware State Planning Office, are shown in Figure 3-16 and Figure 3-17. On both maps, the legislated boundary of the Delaware Coastal Zone is shown. These maps are shown here simply to indicate the type of products that are desired as an essential result of a state's coastal zone planning effort.

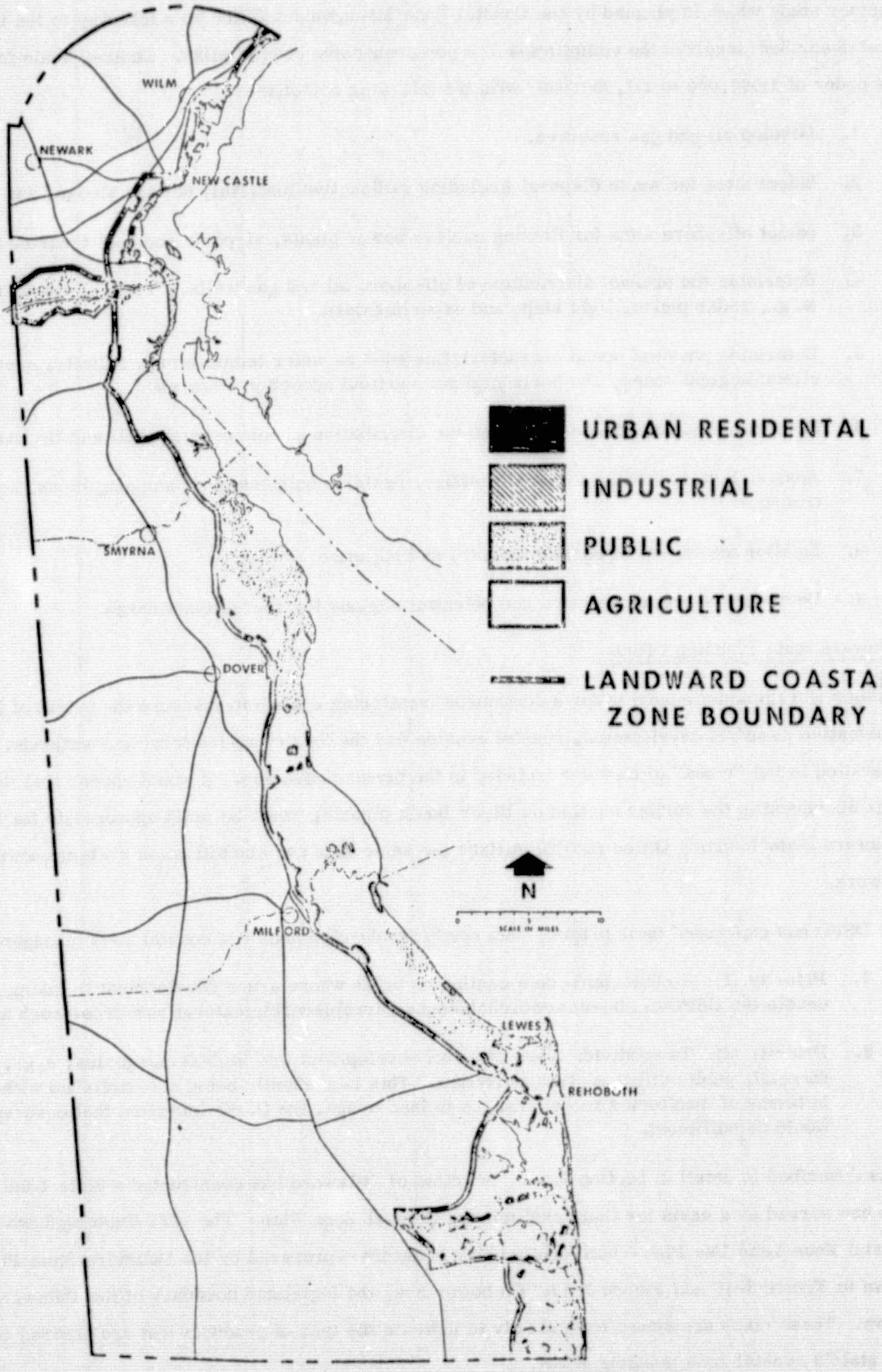



Figure 3-16. Existing Land Use 1972

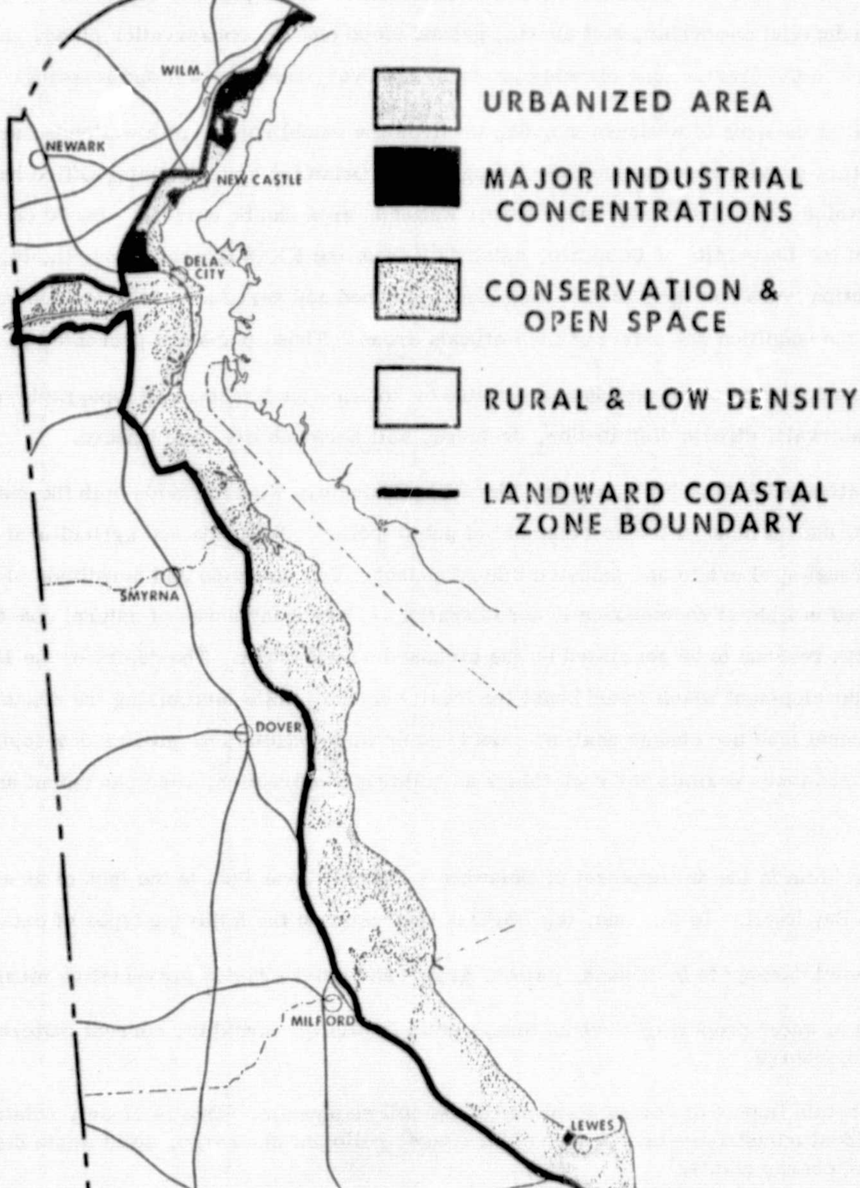



Figure 3-17. Coastal Zone Land Use Plan

There are many other charts that of necessity must be developed in the process of producing a coastal zone plan, e.g., charts of industrial ownership, soil charts, ground slope charts, conservation plans, and so forth. Of particular importance in the coastal zone planning process, however, has been wetland mapping.

The primary need in the area of wetlands mapping involves the establishment of a wetlands baseline — i.e., a set of standard parameters against which to measure change. The Delaware State Planning Office has established certain basic data from which a baseline description of their wetlands area can be derived. Based on work done by Dr. V. Klemas of the University of Delaware, using data from the ERTS aircraft underflights, they have determined that vegetation types and their distribution can be mapped and serve as a valuable and reliable indicator of soil types and of the condition and extent of the wetlands areas. These maps are presented at a scale of 1:2400.

The physical characteristics of the wetlands must also be known — such factors as topography (accurate to a 1.7 meter (5 foot) interval), stream distribution, drainage, soil permeability, and texture.

Describing the wetlands by these biological and physical parameters would provide both the mechanism to monitor wetlands changes, and an input to the development of public policy. Wetlands and agricultural lands in Delaware are being lost through real estate and industrial development. The direction and magnitude of this encroachment must be considered in light of socioeconomic considerations — how many acres of natural coast can be sacrificed for the jobs and tax revenue to be generated by the proposed development. The desire of the DSPO is to formulate a plan of logical development which would boost the local economy while minimizing the negative impact on the environment. Annual land use change analysis would enable state officials to monitor development, establish optimum zoning, and issue permits for such things as building construction, road placement and irrigation water usage.

Another major problem in the development of Delaware's Coastal Zone Plan is the lack of an established baseline for the Delaware Bay itself. To this end, the DSPO is interested in the following types of data:

1. Incremental damage to bulkheads, jetties, groins and other erosion preventative measures.
2. Changes in water properties such as temperature, salinity, turbidity, current patterns, nutrient load and stream discharge.
3. The uncertain impact of development on the coastal ecosystem. This is closely related to characteristics of individual industries — energy and water usage, pollutant discharge, solid waste disposal and distribution of discharge points.
4. Erosion and tidal characteristics of the bay-coast interface. This is particularly important for road placement and recreational land usage. For example, major highway construction in the Cape Henlopen area is now in danger of being destroyed by sea encroachment. The rate of coastal erosion was little understood when the roads were constructed several years ago.
5. Closely related to the above is the problem of sediment transport and the rate of sediment infilling of navigation channels.
6. The distribution of sediment types and shoals in the bay, closely related to commercial oyster beds and the location of fishing grounds.

Other data desired by the DSPO which is applicable to the state in general include:

1. The degree of eutrophication of ponds, lakes and other water impoundments.
2. Location and accessibility of ground water reserves; rates of recharge, etc. (desired by the Department of Natural Resources).
3. An inventory of the water impoundments, extent of irrigation and volume of water flow.
4. A method to insure that approved industry and commercial developments conform to contractural environmental restrictions.

The desired frequency of collection of coastal zone planning data is annually for the land use and character change analyses, and periodic bursts of data, perhaps seasonally, to establish the level and trend of water quality.

### 3.5.3 SUMMARY OF INFORMATION REQUIREMENTS

The information requirements for coastal zone management are summarized in Table 3-19. Whereas the requirements as derived from the Delaware State Planning Office are incorporated here, Table 3-19 includes a broader summary of the informational needs based on a report written by the Pacific Northwest River Basins Commission[1] and information provided by the NOAA Office of Coastal Management.

## 3.6 URBAN LAND USE/1980 CENSUS

This section describes the background, objectives, and requirements for an Urban Land Use/1980 Census Mission which has as its goal, the provision of field enumeration census planning imagery and land use maps for the 1980 census and the mid-decade census of population and housing being considered for 1985. This particular mission was also the subject of a concept definition study effort for an early Space Shuttle sortie flight; refer to TERSSE Final Report, Volume 6 (An Early Shuttle Palet Concept for the Earth Resources Program). Because of this additional effort, this section is able to focus on a more specific remote sensing mission than was possible for the other land resource management cases.

### 3.6.1 MISSION OVERVIEW

The land use case studies discussed so far are characteristically multi-focal in terms of diverse user community requirements and organization; when considered collectively, they necessitate a rather complex multiple missions program. A specific Space Shuttle mission to acquire and process multi-sensor data taken over the nation's urban areas will be discussed in response to the operational needs and plans of the Bureau of the Census within the Department of Commerce.

The requirements of on-going and proposed operational programs of many federal, state and local government agencies as well as private sector organizations pertaining to the high density urban corridors in the U. S. will also be met substantially in such a mission. In particular, the urban regional effort envisioned in the Land Use Data Analysis Program of the U. S. Geological Survey within the Department of the Interior would be significantly contributed to by this mission.

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[1] Columbia-North Pacific Region, Comprehensive Framework. Study of Water and Related Langs, Pacific Northwest River Basins Commission. Sept. 1972.

Table 3-19. Summary of Information Requirements for Coastal Zone Management

| Information Requirement | Parameters | Output Products |
|---|---|---|
| Land ownership | Boundaries and areas for:<br>• Federal land, by agency<br>• State land<br>• County and municipal land<br>• Private land | • Ownership maps at 1"-1 mile (larger scales used for detailed planning)<br>• Statistical summaries of acreages in each ownership class |
| Soil properties | Depth, texture, structure, presence of aggregate, wetness, reaction, slope, permeability, erosion hazard water-holding capacity, inherent fertility. | • Soils maps at 1"-2 miles or larger<br>• Statistical summaries of acreages in each capability class<br>• Reports containing soil interpretations |
| Land use and cover | Boundaries and areas for land use and cover categories<br><br>Note: Many different types of classification schemes are currently utilized. | • Land-use/cover maps at 1"-1 mile<br>• Statistical summaries showing acreages in each use/cover category |
| Mineral deposits | Type, location, areal extent, capacity | • Minerals maps at 1"-2 miles<br>• Statistical summaries of mineral production and reserves |
| Topography/landforms | Surface geometry | Topographic/landform maps at 1"-2 miles (or larger where more detail is required) |
| Geological structure | Surface geometry, attitude, orientation, deformation, weathering, maturity, strate, movement | Geological maps at 1"-2 miles |
| Evapotranspiration rate of vegetation | Water mass loss rate, insolation, plant albedo, boundary layer winds and humidity, plant geometry, standing biomass | Statistical summaries |
| Precipitation and surface water runoff | Form, distribution, rate, amount | Statistical summaries |
| Aquifers | Location, depth, size | Maps at 1"-2 miles showing location and extent of different types of aquifers |
| Wetlands | Areal extent, water quality, ecological succession stage, plant communities, mean period of inundation, zonation | • Thematic maps at 1"-200'<br>• Statistical summaries |
| Vadose water | Depth of unsaturated soil, per cent saturation, flow rate, chemical nature of water (e.g., dissolved solids, pH, algae content, bacterial content) | Statistical summaries |

Table 3-1[illegible]. Summary of Information Requirements for Coastal Zone Management (Continued)

| Information Requirement | Parameters | Output Products |
|---|---|---|
| Ground water below water table | Flow rate, direction of flow, depth of water table, water temperature, chemical nature of water (e. g., dissolved solids, pH, algae content, bacterial content) | Statistical summaries |
| Farming practices | Tillage method, use of agricultural chemicals, intensity of cultivation, extent of cultivation, irrigation, drainage, crop rotation, time of planting, time of harvest | • Thematic maps at 1"-2 miles depicting different parameters<br>• Statistical summaries |
| Soil erosion | Type, location, extent, rate of speed | Maps at 1"-2 miles (or larger depending on the specific application) |
| Crop production | Estimates of output by crop | Statistical summaries |
| Ecological succession | Time rate of change of plant species, their area and distribution | Maps at 1"-2 miles |
| Despoiled land: e.g., from strip mining, poor cultivation practices, deposition of solid wastes, fire, flood erosion, over-irrigation, etc. | • Area/extent and location<br>• Characterization of primary causal factor | Maps at 1"-2 miles (or larger where detailed information is needed) |
| Air quality | • Total content in a column, vertical distribution, concentration in the atmospheric boundary layer, sources, and sinks for:<br>- carbon dioxide<br>- carbon monoxide<br>- sulphur compounds<br>- nitrogen compounds<br>- ozone<br>- fluorocarbons<br>- other hydrocarbons (<HC>)<br>• For aerosol<br>- spatial distribution<br>- particle size spectrum<br>- optical properties as a function of (reflectivity, absorptivity, angular scattering function) | Statistical summaries |
| Benthic vegetation | Species, distribution and area, biomass, vigor | Maps at 1"-800 feet |
| Continental shelves and slopes | Bottom topography, sediment movement, sediment thickness | • Maps at 1"-2 miles<br>• Statistical summaries |

Table 3-19. Summary of Information Requirements for Coastal Zone Management (Continued)

| Information Requirement | Parameters | Output Products |
|---|---|---|
| Stratigraphy | Orientation of beds, thickness of beds, cycle of beds, attitudes, consolidation, deformation, erosional features, fossilization and organic debris, depositional features, color | • Stratigraphic maps at 1"-2 miles<br>• Stratigraphic columns |
| Lithology | Location and extent of different rock types | Lithologic maps at 1"-2 miles |
| Surface water inventory | • Areas of rivers, streams, lakes, ponds, and reservoirs<br>• Lake, pond, and reservoir levels<br>• River and stream flow<br>• Snow cover and depth<br>• Ice cover and thickness<br>• Water equivalency of snow pack<br>• Snow melt runoff<br>• Wetland zone<br>• Salt water line of rivers<br>• Area of flood plains | • Hydrologic and flood plain maps at 1"-2 miles<br>• Statistical summaries |
| Water quality | Dissolved oxygen, water temperature, pH, phenols, threshold odor number, synthetic detergents (M. B. A. S.), flourides, alkalinity, radioactivity, turbidity, fecal coliform, total dissolved solids, chlorides, hardness, toxic substances (arsenic, barium, cadmium, chromium (hexavalent), lead, mercury, zelenium, silver, zinc) | Statistical summaries |
| Evaporation rate from water surfaces and bare soil | Water temperature, soil temperature, air temperature, insolation, surface albedo, radiation balance | Statistical summaries |
| Dredging and marine construction activities | Turbidity patterns, shallow water color changes, bottom topography | Maps at 1"-800 feet |
| Beach morphology | Size and shape of beach area; intertidal zone width | Maps at 1"-800 feet |
| Near-shore bottom topography and composition | Bottom contours, sand deposits and movements, shoals, coral reefs, artificial reefs, man-made objects, bottom composition | • Maps at 1"-800 feet<br>• Statistical summaries |
| Estuarine and nearshore circulation patterns | Surface temperature patterns, coastal current, characteristic roughness patterns, effluent patterns, surface salinity patterns | • Maps at 1"-800 feet<br>• Statistical summaries |
| Coastal upwelling | Surface temperatures, surface salinity, chlorophyll concentration, nutrients | • Maps at 1"-800 feet<br>• Statistical summaries |

Table 3-19. Summary of Information Requirements for Coastal Zone Management (Continued)

| Information Requirement | Parameters | Output Products |
|---|---|---|
| Surf | Surf zone width, wavelength and amplitude of swell, wave velocity | Statistical summaries |
| Storm surges | Slope of water surface, velocity of surge, maximum inland excursion of water | Statistical summaries |
| Outfalls and river discharges | Flow rate, water temperature, dissolved gases, pH, alkalinity, pesticides, heavy metals, suspended particles, salinity, coliform bacteria, radioactivity, nutrients, sediment deposition patterns and settling rate | • Thematic maps at 1"-800 feet<br>• Statistical summaries |
| Climate | Annual mean temperature, seasonal mean temperature, annual precipitation, seasonal precipitation, prevailing winds | • Climatological maps at various scales<br>• Statistical summaries |
| Population/economic characteristics | Growth and distribution of population, urbanization, employment, personal income, education, etc. | • Maps at 1"-1 mile (or larger where detailed information is needed)<br>• Statistical summaries |

Statutory Requirements for Census Bureau Operations

The statutory requirements for the work being done at the Bureau of the Census stem from (1) the historic constitutional directive to carry out the decennial national census for continual reapportionment of the House of Representatives based on population distribution; (2) The current Federal Revenue Sharing Act and other legislation, again requiring demographic data for the various administrative units of cities, counties and states; and (3) The (still) pending National Land Use Planning Assistance bills,* with the need for the above administrative units for correlative and application data.

Current Census Procedures and Potential Impact of a Shuttle Census Mission

Since its formation as a permanent organization early in the 20th centruy, the Bureau of Census' methodology for planning and conducting the census has been based on conventional topographic procedures and field techniques for data acquisition. Data processing has been modernized through the use of digital computers in an integral fashion since the 1950 Census. The geographic data base digitization activities initiated for the 1970 Census and since enlarged have expanded the scope of automated geoprocessing application to the Census Bureau operations.

The organizational structure of the Bureau of the Census has developed in response to the procedures and practices currently in use to implement their functions. In carrying out the 1970 Decennial Census, the functional flow of data followed through the respective administrative units along the lines shown in Figure 3-18.

*USGS currently has research responsibility for remote sensing.

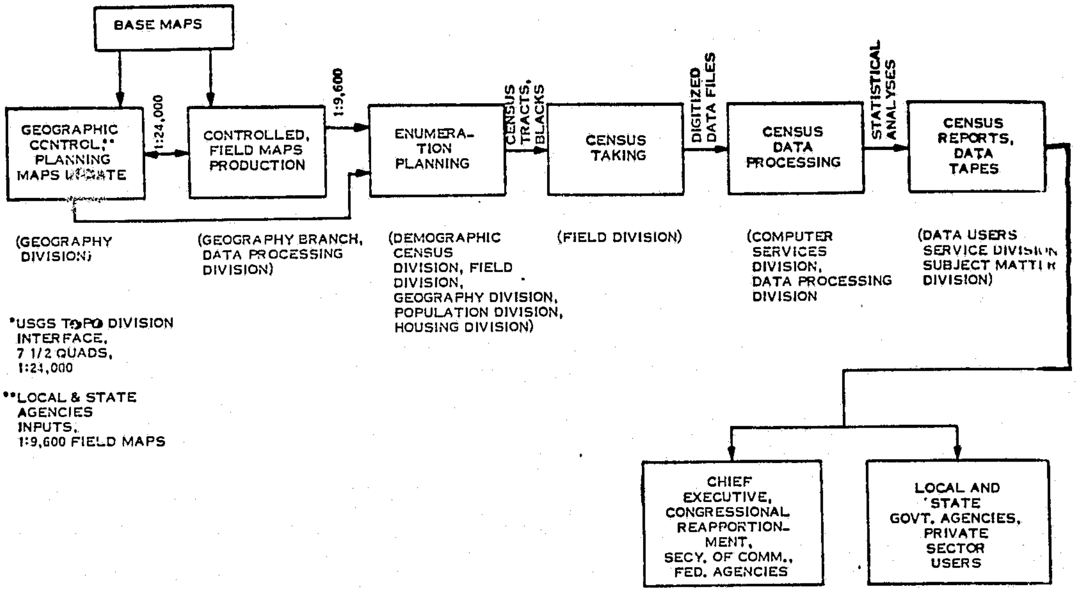


Figure 3-18. Current Functional Flow

The computerized geographic reference and demographic data processing system has expedited the post-enumeration processing. However, the Bureau will be required to release a greater amount of data than ever before in the 1980 Census Report on an even shorter time schedule than achieved in 1970.

To achieve this goal the Census Bureau has determined that a major technological advance will be necessary in the planning phase of its operation that will expedite the entire procedure. In addressing this problem, the Geography Division of the Bureau of Census has been evaluating the potential use of aircraft data on an operational basis for 1980. A major factor in this consideration is the methodology and the costs for converting acquired data into the data base format for the Bureau's use. The development of "ancillary technology" for data conversion is thus as important an item as the acquisition of reference data itself.

Table 3-20 lists the key events and their timing which will be necessary to carry out this mission.

In terms of preparedness of the Census Bureau to embark on such a project, a nominal amount of aerial imagery was acquired for the 1960 and 1970 Census. Independent of the 1970 census the USGS - Geography Applications Program's (GAP) Census Cities Project was the principal experimental effort towards a methodology development for the Bureau's assessment. NASA acquired the coverage over some 24 cities in support of the USGS Project. Photointerpretation of imagery over a number of major urban areas was carried out to arrive at delimitation of the urban area boundaries and intensive urban land use classification to levels below level 2 defined in USGS Circular 671. The orthophoto maps and theme overlays formed a base data for broad-application studies during the 1970's; the specific needs of the Census Bureau only being a partial consideration.

ERTS and Skylab data analyses by the USGS - GAP and Bureau of the Census - Geography Division have been underway to develop the necessary techniques for assessing and possibly implementing the 1980 program using multispectral analysis end photointerpretation of imagery. These studies are just beginning and are continuing in cooperation with NASA and industry.

Table 3-20. Urban Areas Land Use/ Census Planning Mission

| | |
|---|---|
| Mid 1975 - Late 1978 | Planning/Evaluation Phase |
| 1 Apr 1979 | Earliest Flight No. 1 Date |
| 1 Oct 1979 | Latest Flight No. 1 Date |
| 31 Dec 1979 | Latest fill-in flight date |
| 1 Oct 1979 - 1 Apr 1980 | Enumeration planning phase |
| 1 Apr 1980 | Census Day |
| 1 Sep 1980 | Preliminary Census data release (estimated) |
| 1 Oct 1980 | Latest Flight No. 2 Date |

Future Preparations

From discussions with researchers at each of these agencies, both human photointerpretation and machine analyses methods are beginning to be investigated using ERTS and EREP imagery and MSS scanner data. The experimental investigation and evaluation of electronic analyses techniques undertaken at the USGS with ERTS computer - compatible tapes and Skylab scanner data, including underflights, would provide the thrust for the necessary technology transfer to the Bureau of the Census - Geography Division for operational application to the 1980 Census Planning. Digitization of the reference data, namely Census Block and Track geometry, for interactive use with ERTS computer - compatible tape and analyses is an integral function in this technology assessment.

While beginning efforts are underway, it is clear that a major effort is required to develop multispectral analysis techniques and procedures which are specifically keyed to Census Bureau requirements and which make the best use both photointerpretation and machine analysis.

Thus, by 1979, the Census Bureau should be in a position to process both imagery as well as scanner data in transparency and in computer compatible tape formats. Having established the feasibility of use in these data formats, both film and scanner sensor configurations can be considered as candidates. The utility of film and tape formats is focussed primarily on the census planning and analysis functions respectively. The film format will also be useful in the field operations activity if the resolution is adequate. Both data formats are also of consider able usefulness to the U. S. G. S. in their Land Use Data Analysis program as well as to a large number of other federal, state and local governments and private users.

3.6.2 SPECIFIC MISSION REQUIREMENTS

Discussions with researchers from the Geography Division, Bureau of Census and Geography Applications Program U. S. G. S. led to a formulation of the observation, coverage and output products formats described below. The sensor configuration and processing system formulation outlined here in this report meet these requirements.

This data will permit the following: (1) 1980 Census urbanized area (UA) delineation (provided a block system has been established for the entire area of the potential UA's and preliminary steps have been completed making it possible to integrate the UA classification into the overall census system within the time limitations imposed by the other census operations and the final legally established reporting date for census results), (2) post 1980 census analysis, and (3) map revision for the mid-decade censuses of population and housing being proposed for 1985.

Observation and Coverage Requirements

Determining the coverage requirements for the observation system can begin by using one of the nationally-oriented products of the Decennial Census, Figure 3-19 showing the 1970 Census Urban and Rural Population. The Urbanized Area Concept is used to delineate these urban population concentrations. Daylight coverage of the major U. S. cities, listed on Table 3-21, in a single sortie flight is required (cloud cover conditions permitting) a fill-in flight is also possible as was indicated in Table 3-20.

Orbit selection for this mission presented a different problem from that normally associated with remote sensing. Instead of full-coverage in a given amount of time, what is desired in this instance is an orbit that passes through a finite set of ground locations a maximum number of times (and at least once for each) during the flight. The first computer program used (courtesy of MSFC) identified a family of orbits that satisfied the set of constraints which follow:

1. At least one overflight of each target city during a six-day flight.

2. A maximum cross-track (roll) angle of ±15°, to minimize the geometric distortion of the images produced but to allow for some latitude in ground trace/target centerline offset.

3. A minimum solar elevation angle of 30° to provide adequate lighting for the imaging.

4. An orbit injection date and time of June 18, 1979, 0930 GMT (It should be noted that orbit injection time is different from launch time because of the deployment of the LDEF and transfer orbit maneuvers required before commencing the Census portion of the flight)

The parameters of the selected orbit are 433.1 km (239.5 nm) altitude and 48.1 degrees inclination. Ground traces for this orbit were then produced as shown in Figure 3-20. Table 3-22 presents an observation history of the 56 largest (over 250,000 population) U. S. cities. U. S. coverage is obtained each day during three ascending and three descending passes during daylight. In general, the cities at the northern latitudes are overflown a larger number of time than those in the southern U. S. because of the 48.1 degree inclination. With regard to cloud cover, the cities which receive only one overflight are: Tucson, Arizona; Miami, Florida; Honolulu, Hawaii; New Orelcans, Louisiana; and El Paso, Texas.

Fortunately these cities fall substantially below the national average for summer cloud probability. On the other extreme, the relatively cloudy city of Seattle, Washington receive nine over flights and Minneapolis - St. Paul six. While there exists a finite probability (approximately 60-80%) that the mission could be fulfilled in a single flight because of the relatively good correlation between number of overflights and cloud cover probability, mission

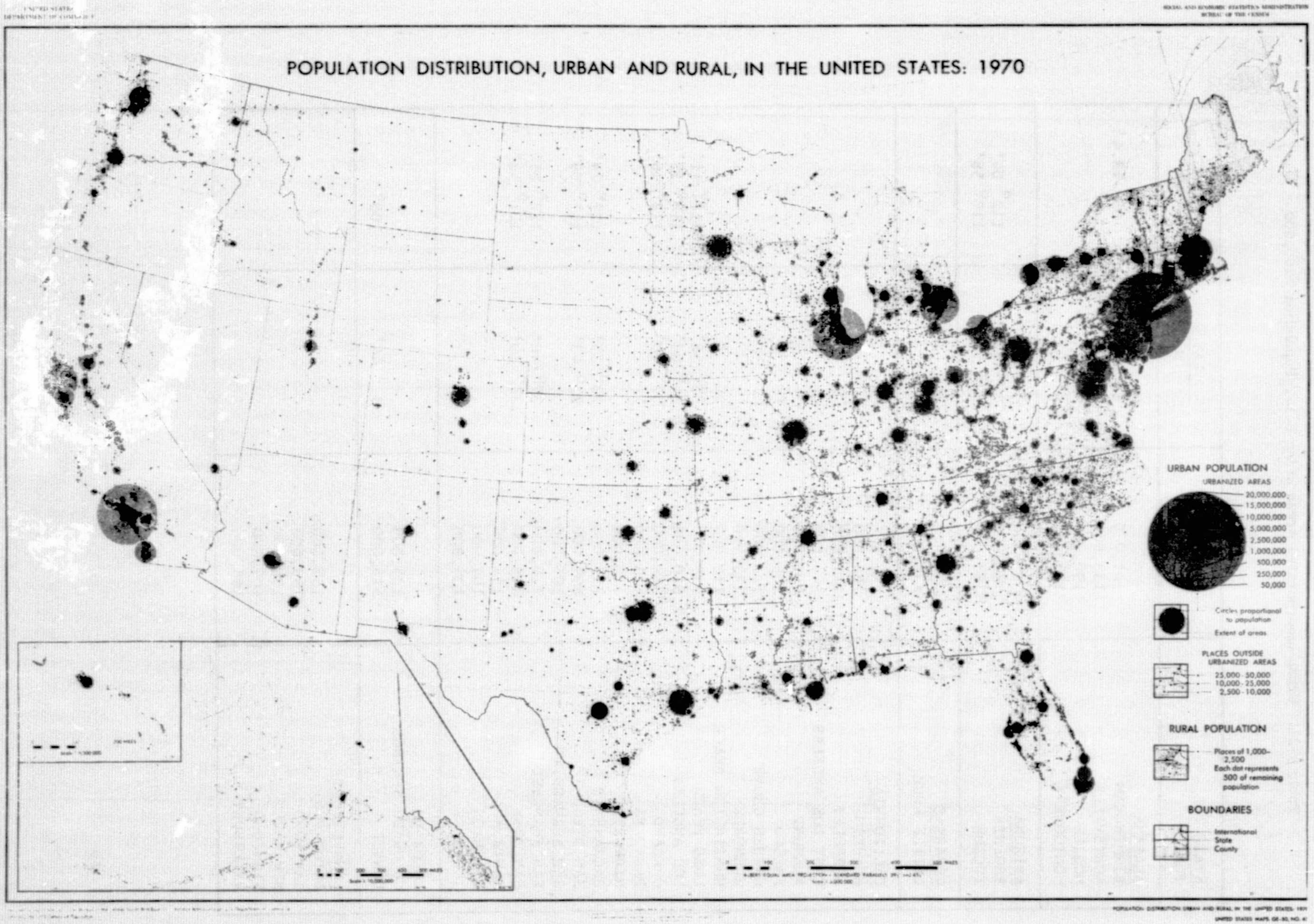


Figure 3-19. U.S. Urban and Rural Population, 1970

Table 3-21. Urban Incorporated Areas in the U.S., Population >100,000

| STATE<br>PLACE | POPULATION | LAT.<br>N | LONG.<br>W |
|---|---|---|---|
| ALABAMA | | | |
| BIRMINGHAM | 301,000 | 33° 30.7' | 86° 48.4' |
| HUNTSVILLE | 138,000 | | |
| MOBILE | 190,000 | | |
| MONTGOMERY | 133,000 | | |
| ARIZONA | | | |
| PHOENIX | 582,000 | 33° 27' | 112° 04' |
| TUCSON | 263,000 | 32° 13' | 110° 58' |
| ARKANSAS | | | |
| LITTLE ROCK | 132,000 | | |
| CALIFORNIA | | | |
| ANAHEIM | 166,000 | | |
| BERKELEY | 117,000 | | |
| EAST LOS ANGELES | 105,000 | | |
| FREMONT | 101,000 | | |
| FRESNO | 166,000 | | |
| GARDEN GROVE | 121,000 | | |
| GLENDALE | 133,000 | | |
| HUNTINGTON BEACH | 116,000 | | |
| LONG BEACH | 359,000 | 33° 46' | 118° 11' |
| LOS ANGELES | 2,810,000 | 34° 03' | 118° 15' |
| OAKLAND | 362,000 | 37° 48' | 122° 16' |
| PASADENA | 113,000 | | |
| RIVERSIDE | 140,000 | | |
| SACRAMENTO | 257,000 | 38° 35' | 121° 29' |
| SAN DIEGO | 697,000 | 32° 43' | 117° 09' |
| SAN BERNANDINE | 105,000 | | |
| SAN FRANCISCO | 716,000 | 37° 46' | 122° 25' |
| SAN JOSE | 446,000 | 37° 20' | 121° 53' |
| SANTA ANA | 157,000 | | |
| STOCKTON | 104,000 | | |
| TORRANCE | 135,000 | | |
| COLORADO | | | |
| COLORADO SPRINGS | 135,000 | | |
| DENVER | 515,000 | 39° 44' | 105° |
| CONNECTICUT | | | |
| BRIDGEPORT | 157,000 | | |
| HARTFORD | 158,000 | | |
| NEW HAVEN | 134,000 | | |
| STAMFORD | 109,000 | | |
| WATERBURY | 108,000 | | |

Table 3-21. Urban Incorporated Areas in the U. S., Population >100,000 (Continued)

| STATE<br>PLACE | POPULATION | LAT.<br>N | LONG.<br>W |
|---|---|---|---|
| DISTRICT OF COLUMBIA | | | |
| WASHINGTON | 757,000 | 38° 53' | 77° 02' |
| NORTHEAST | 184,000 | | |
| NORTHWEST | 347,000 | | |
| SOUTHEAST | 194,000 | | |
| FLORIDA | | | |
| FORT LAUDERDALE | 140,000 | | |
| HIALEAH | 102,000 | | |
| HOLLYWOOD | 107,000 | | |
| JACKSONVILLE | 529,000 | 30° 20' | 81° 39' |
| MIAMI | 335,000 | 25° 46' | 80° 11' |
| ST. PETERSBURG | 216,000 | | |
| TAMPA | 278,000 | 27° 57' | 82° 27' |
| GEORGIA | | | |
| ATLANTA | 497,000 | 33° 45' | 84° 23' |
| COLUMBUS | 155,000 | | |
| MACON | 122,000 | | |
| SAVANNAH | 118,000 | | |
| HAWAII | | | |
| HONOLULU | 325,000 | 21° 19' | 157° 52' |
| ILLINOIS | | | |
| CHICAGO | 3,369,000 | 41° 53' | 87° 37' |
| PEORIA | 127,000 | | |
| ROCKFORD | 147,000 | | |
| INDIANA | | | |
| EVANSVILLE | 139,000 | | |
| FORT WAYNE | 178,000 | | |
| GARY | 175,000 | | |
| HAMMOND | 108,000 | | |
| INDIANAPOLIS | 745,000 | 39° 46' | 86° 09' |
| SOUTH BEND | 126,000 | | |
| IOWA | | | |
| CEDAR RAPIDS | 111,000 | | |
| DES MOINES | 201,000 | | |
| KANSAS | | | |
| KANSAS CITY | 163,000 | | |
| TOPEKA | 125,000 | | |
| WICHITA | 277,000 | 37° 41' | 97° 20' |
| KENTUCKY | | | |
| LEXINGTON | 108,000 | | |
| LOUISVILLE | 362,000 | 38° 15' | 85° 46' |

Table 3-21. Urban Incorporated Areas in the U.S., Population >100,000 (Continued)

| STATE<br>PLACE | POPULATION | LAT.<br>N | LONG.<br>W |
|---|---|---|---|
| LOUISIANA | | | |
| BATON ROUGE | 166,000 | | |
| METAIRE | 136,000 | | |
| NEW ORLEANS | 593,000 | 29° 58' | 90° 04' |
| SHREVEPORT | 182,000 | | |
| MARYLAND | | | |
| BALTIMORE | 906,000 | 39° 17' | 76° 37' |
| MASSACHUSETTS | | | |
| BOSTON | 641,000 | 42° 22' | 71° 03' |
| CAMBRIDGE | 100,000 | | |
| SPRINGFIELD | 164,000 | | |
| WORCESTER | 177,000 | | |
| MICHIGAN | | | |
| DETROIT | 1,514,000 | 42° 20' | 83° 03' |
| DEARBORN | 104,000 | | |
| FLINT | 193,000 | | |
| GRAND RAPIDS | 198,000 | | |
| LANSING | 132,000 | | |
| LIVONIA | 110,000 | | |
| WARREN | 179,000 | | |
| MINNESOTA | | | |
| DULUTH | 101,000 | | |
| MINNEAPOLIS | 434,000 | 44° 59' | 93° 16' |
| ST. PAUL | 310,000 | 44° 57' | 93° 06' |
| MISSISSIPPI | | | |
| JACKSON | 154,000 | | |
| MISSOURI | | | |
| INDEPENDENCE | 112,000 | | |
| KANSAS CITY | 507,000 | 39° 06' | 94° 35' |
| ST. LOUIS | 622,000 | 38° 37' | 90° 12' |
| SPRINGFIELD | 120,000 | | |
| NEBRASKA | | | |
| LINCOLN | 150,000 | | |
| OMAHA | 347,000 | 41° 17' | 96° 00' |
| NEVADA | | | |
| LAS VEGAS | 126,000 | | |
| NEW JERSEY | | | |
| CAMDEN | 103,000 | | |
| ELIZABETH | 113,000 | | |
| JERSEY CITY | 2[illegible]1,000 | 40° 41' | 74° 04' |
| NEWARK | 382,000 | 40° 44' | 74° 10' |
| PATERSON | 145,000 | | |
| TRENTON | 105,000 | | |

Table 3-21. Urban Incorporated Areas in the U.S., Population >100,000 (Continued)

| STATE<br>PLACE | POPULATION | LAT.<br>N | LONG.<br>W |
|---|---|---|---|
| NEW MEXICO | | | |
| ALBURQUERQUE | 244,000 | | |
| NEW YORK | | | |
| ALBANY | 116,000 | | |
| BUFFALO | 463,000 | 42° 53' | 78° 52' |
| NEW YORK | 7,896,000 | 40° 42' | 74° 00' |
| BRONX | 1,472,000 | | |
| BROOKLYN | 2,602,000 | | |
| MANHATTAN | 1,539,000 | | |
| QUEENS | 1,987,000 | | |
| RICHMOND | 295,000 | | |
| ROCHESTER | 296,000 | 43° 09' | 77° 36' |
| SYRACUSE | 197,000 | | |
| YONKERS | 204,000 | | |
| NORTH CAROLINA | | | |
| CHARLOTTE | 241,000 | | |
| GREENSBORO | 144,000 | | |
| RAYLEIGH | 124,000 | | |
| WINSTON-SALEM | 135,000 | | |
| OHIO | | | |
| AKRON | 275,000 | 41° 05' | 81° 31' |
| CANTON | 110,000 | | |
| CINCINNATI | 453,000 | 39° 06' | 84° 31' |
| CLEVELAND | 751,000 | 41° 30' | 81° 42' |
| COLUMBUS | 540,000 | 39° 58' | 83° 00' |
| DAYTON | 244,000 | | |
| PARMA | 100,000 | | |
| TOLEDO | 384,000 | 41° 39' | 83° 25' |
| YOUNGSTOWN | 141,000 | | |
| OKLAHOMA | | | |
| OKLAHOMA CITY | 389,000 | 35° 30' | 97° 30' |
| TULSA | 330,000 | 36° 09' | 95° 54' |
| OREGON | | | |
| PORTLAND | 331,000 | 45° 32' | 122° 37' |
| PENNSYLVANIA | | | |
| ALLENTOWN | 110,000 | | |
| ERIE | 129,000 | | |
| PHILADELPHIA | 1,950,000 | 39° 57' | 75° 10' |
| PITTSBURGH | 520,000 | 40° 26' | 80° 00' |
| SCRANTON | 104,000 | | |
| RHODE ISLAND | | | |
| PROVIDENCE | 179,000 | | |
| SOUTH CAROLINA | | | |
| COLUMBIA | 114,000 | | |

Table 3-21. Urban Incorporated Areas in the U. S., Population >100,000 (Continued)

| STATE PLACE | POPULATION | LAT. N | LONG. W |
|---|---|---|---|
| TENNESSEE | | | |
| CHATTANOOGA | 119,000 | | |
| KNOXVILLE | 175,000 | | |
| MEMPHIS | 624,000 | 35° 07' | 90° 03' |
| NASHVILLE-DAVIDSON | 448,000 | 36° 10' | 86° 47' |
| TEXAS | | | |
| AMARILLO | 127,000 | | |
| AUSTIN | 252,000 | 30° 17' | 97° 45' |
| BEAUMONT | 118,000 | | |
| CORPUS CHRISTI | 205,000 | | |
| DALLAS | 844,000 | 32° 47' | 96° 49' |
| EL PASO | 322,000 | 31° 45' | 106° 29' |
| FORT WORTH | 393,000 | 32° 45' | 97° 18' |
| HOUSTON | 1,233,000 | 29° 46' | 95° 22' |
| LUBBOCK | 149,000 | | |
| SAN ANTONIO | 654,000 | 29° 25' | 98° 30' |
| UTAH | | | |
| SALT LAKE CITY | 176,000 | | |
| VIRGINIA | | | |
| ALEXANDRIA | 111,000 | | |
| ARLINGTON | 174,000 | | |
| HAMPTON | 121,000 | | |
| NEWPORT NEWS | 138,000 | | |
| NORFOLK | 308,000 | 36° 51' | 76° 17' |
| PORTSMOUTH | 111,000 | | |
| RICHMOND | 249,000 | | |
| VIRGINIA BEACH | 172,000 | | |
| WASHINGTON | | | |
| SEATTLE | 531,000 | 47° 36' | 122° 20' |
| SPOKANE | 171,000 | | |
| TACOMA | 155,000 | | |
| WISCONSIN | | | |
| MADISON | 172,000 | | |
| MILWAUKEE | 717,000 | 43° 02' | 87° 55' |
| NONE | | | |
| ALASKA | | | |
| DELAWARE | | | |
| IDAHO | | | |
| MAINE | | | |
| MONTANA | | | |
| NEW HAMPSHIRE | | | |
| NORTH DAKOTA | | | |
| SOUTH DAKOTA | | | |
| VERMONT | | | |
| WEST VIRGINIA | | | |
| WYOMING | | | |

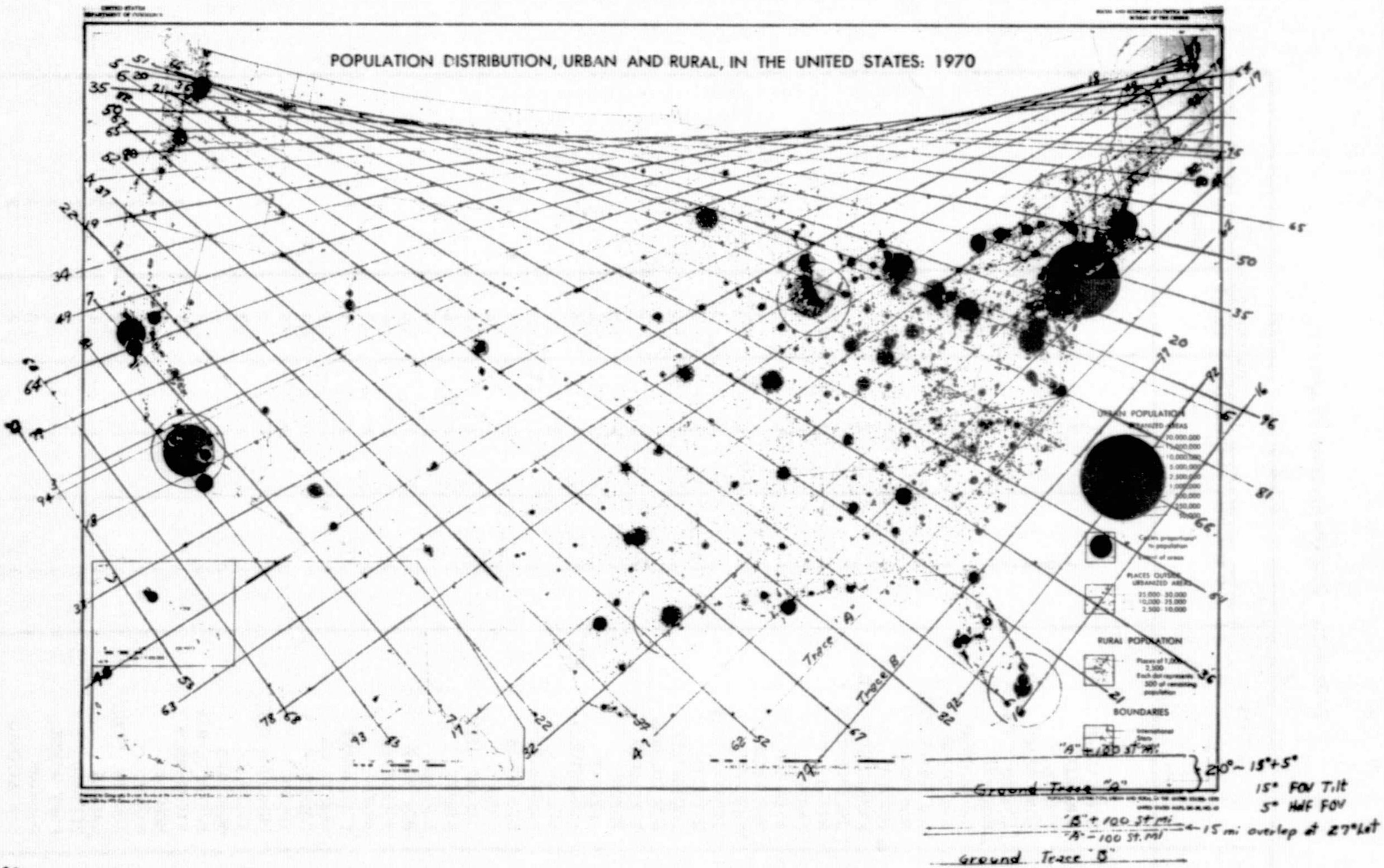


Figure 3-20. Continental U. S. Orbit Trace

Table 3-22. City Observation Frequency

| I. D. No. | City | OBSERVATIONS Ascending | Descending | Total | Additional (Sun Angle < 30°) |
|---|---|---|---|---|---|
| 1 | BIRMINGHAM | 2 | 1 | 3 | 2 |
| 2 | PHOENIX | 1 | 2 | 3 | 1 |
| 3 | TUCSON | 0 | 1 | 1 | 1 |
| 4 | LONG BEACH | 1 | 1 | 2 | 1 |
| 5 | LOS ANGELES | 1 | 1 | 2 | 1 |
| 6 | OAKLAND | 1 | 2 | 3 | |
| 7 | SACRAMENTO | 2 | 1 | 3 | |
| 8 | SAN DIEGO | 1 | 1 | 2 | 2 |
| 9 | SAN FRANCISCO | 1 | 2 | 3 | |
| 10 | SAN JOSE | 1 | 2 | 3 | |
| 11 | DENVER | 1 | 1 | 2 | |
| 12 | WASHINGTON, D.C. | 2 | 2 | 4 | 1 |
| 13 | JACKSONVILLE | 1 | 1 | 2 | 3 |
| 14 | MIAMI | 1 | 0 | 1 | 5 |
| 15 | TAMPA | 1 | 1 | 2 | 5 |
| 16 | ATLANTA | 1 | 1 | 2 | 2 |
| 17 | HONOLULU | 0 | 1 | 1 | 7 |
| 18 | CHICAGO | 1 | 1 | 2 | |
| 19 | INDIANAPOLIS | 2 | 1 | 3 | |
| 20 | WICHITA | 1 | 1 | 2 | |
| 21 | LOUISVILLE | 2 | 2 | 4 | 1 |
| 22 | NEW ORLEANS | 0 | 1 | 1 | 3 |
| 23 | BALTIMORE | 2 | 1 | 3 | |
| 24 | BOSTON | 1 | 2 | 3 | |
| 25 | DETROIT | 2 | 2 | 4 | |
| 26 | MINNEAPOLIS | 3 | 3 | 6 | |
| 27 | ST. PAUL | 3 | 3 | 6 | |
| 28 | KANSAS CITY | 1 | 2 | 3 | |
| 29 | ST. LOUIS | 1 | 2 | 3 | 1 |
| 30 | OMAHA | 2 | 2 | 4 | |
| 31 | JERSEY CITY | 2 | 2 | 4 | |
| 32 | NEWARK | 2 | 2 | 4 | |
| 33 | BUFFALO | 2 | 2 | 4 | |
| 34 | NEW YORK | 2 | 2 | 4 | |
| 35 | ROCHESTER | 2 | 2 | 4 | |
| 36 | AKRON | 1 | 2 | 3 | |
| 37 | CINCINNATI | 2 | 1 | 3 | |
| 38 | CLEVELAND | 2 | 1 | 3 | |
| 39 | COLUMBUS | 2 | 1 | 3 | |
| 40 | TOLEDO | 3 | 2 | 5 | |
| 41 | OKLAHOMA CITY | 1 | 1 | 2 | 2 |
| 42 | TULSA | 1 | 2 | 3 | |
| 43 | PORTLAND | 2 | 2 | 4 | |
| 44 | PHILADELPHIA | 2 | 1 | 3 | |
| 45 | PITTSBURGH | 1 | 2 | 3 | 2 |
| 46 | MEMPHIS | 1 | 1 | 2 | 2 |
| 47 | NASHVILLE | 2 | 1 | 3 | 2 |
| 48 | AUSTIN, TEXAS | 1 | 1 | 2 | 3 |
| 49 | DALLAS | 1 | 1 | 2 | 3 |
| 50 | EL PASO | 0 | 1 | 1 | 2 |
| 51 | FORT WORTH | 1 | 1 | 2 | 3 |
| 52 | HOUSTON | 1 | 1 | 2 | 3 |
| 53 | SAN ANTONIO | 1 | 1 | 2 | 3 |
| 54 | NORFOLK, VA. | 1 | 1 | 2 | 1 |
| 55 | SEATTLE | 5 | 4 | 9 | |
| 56 | MILWAUKEE | 2 | 2 | 4 | |

planning alternatives for cloud-covered cities include either extending the first flight in duration or scheduling the mission for a fill-in flight (e.g., Shuttle Flight No. 6) within 90 days.

The question of how complete is the access of such an orbit to the total U. S. land mass was also addressed; ancillary mission use of the sensors in non-urbanized areas (or urban areas of less than 250,000 population) is the motivation for the question. Figure 3-20 illustrates that, at the southernmost latitudes. The maximum off track distance is approximately 148 km (80nm). This figure translates to less than 20° degrees of nadir angle (15° roll +5° half FOV), a feasible value both from the point of view of hardware complexity and data processing. The mission thus may be considered to have full access to all points on the continental U. S., subject to mission scheduling and cloud cover constraints.

## Sensor Configuration Requirements

The spatial and spectral resolution requirements of the data needs of the Census Bureau for planning, field use and post-census use cover a broad range. The data format as well as analysis methods vary for each of these functional uses. The data needs of the U. S. G. S. and the other users are commensurate with the Census Bureau requirements in the urban areas. These considerations can be translated into generic sensor type and characteristics and then matched against the availability, suitability and packageability to arrive at the sensor configuration for this mission

1. Regional Contextual Overview. This can be accomplished with a panoramic camera, using black and white, true color or color infrared film giving ground resolution of 10 meters or better. Quick look, first - cut urban area delineation and outlying area analysis are the primary uses. A candidate sensor is the S163 camera.

2. Geographic Control Data Update. Here a cartographically-useful film output is desired for planning and field use. Resolution sufficient to delineate streets is necessary. A candidate sensor is the S190B camera flown on Skylab. Films used should produce a resolution of 5 to 10 meters.

3. Urban Land Use Classification. For fulfilling (or approaching the fulfillment) this functional requirement the spectral characteristics of the data and machine processing are more critical than spatial resolution and are in contrast with the previous two categories of data requirements. Ground resolution between 15m to 20m effective field of view, with spectral gray levels of between 64 to 128 levels over the spectral range are required. Five or six bands covering the spectral range of 0.42 to 1.1 $\mu$m plus 2.0 to 2.6 $\mu$m and 10.4 to 12.5 $\mu$m are the required spectral ranges for a scanner for machine-based urban land use classification.

   Both a multi-band camera and a multispectral scanner are desired sensor types for this use. In the former category, the S190A camera used on Skylab is a candidate. Selection of a suitable multispectral scanner as well as any design modifications to the camera types mentioned above is discussed in more detail in TERSSE Final Report, Volume 6.

   As mentioned earlier, the Geography Division of the Census Bureau and the Geography Applications Program at USGS have ongoing efforts to evaluate utility of the S190A and S190B as well as the ERTS MSS for their operational use.

## Data Processing Requirements

The degree to which any Earth Observations Mission can meet the operational needs of an on-going, mandatory program of a governmental agency, is determined not only by the availability of raw or base observational data but also by how far the data has been processed to be user-ready. For the Census Urbanized Areas Land Use Analysis Mission, this question of data processing to user-readiness is especially important in view of the over-riding requirement of a short turn-around for use of the data in developing selected 1980 Census Reports. Hence, even though the Census Bureau is preparing technologically to adopt whatever innovative procedures are necessary to enable them to meet their goal of an expenditious Census Report, a very careful consideration of the data processing flow depicted in Figure 3-21 will be required to provide the overall mission utility to the primary user. Therefore, the following discussion of data processing has been prepared to accompany the initial outline of the ground data processing associated with the mission.

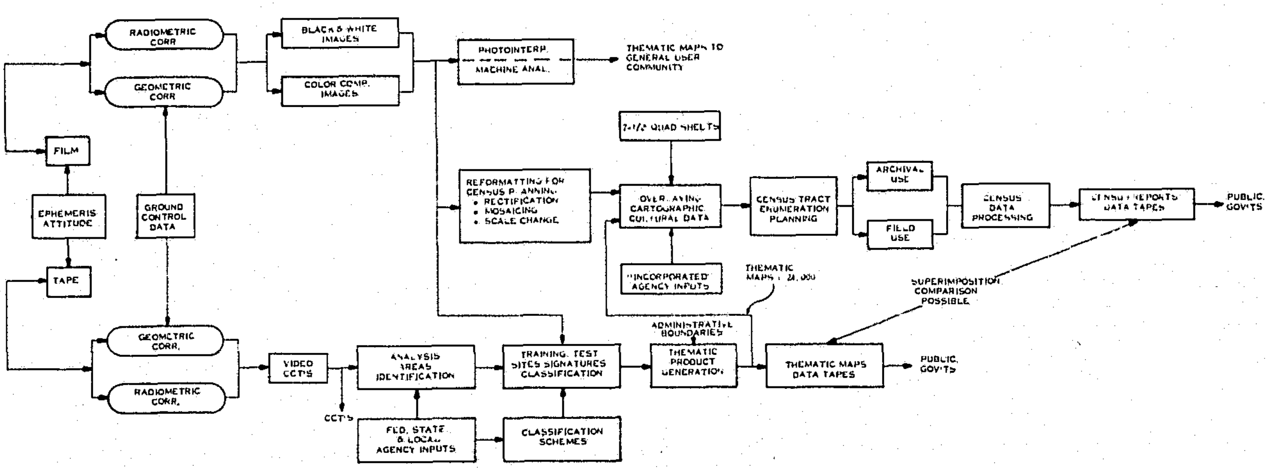


Figure 3-21. Acquisition, Processing and Distribution Flow for Bureau of Census Usage

The interaction with the user throughout the data processing flow is a feature of this mission that impacts significantly on its success. Figure 3-21 illustrates the flow of data through the ground processing system. Radiometric and geometric corrections are applied to both film and tape data. Both film and tape products are used jointly to construct thematic maps to which administrative and demographic data is added. These products then enter the enumeration planning flow and, as well, become a final output of the project. Enumeration planning involves the superposition of cultural data on the thermatic maps and photographs, from which the census tract scenarios and enumeration plans are derived. The completion of the flow includes the actual census field work and the issuance of standard census data products. Ground control data would be supplied jointly by the USGS Topographic Division and the Census Bureau's Geographic Division. The geometric corrections applied to each of the acquired data products must meet the final data use criteria, both for field enumeration as well as the national geographic data base of the Census Information System. The radiometric corrections, made in parallel, must account for the diurnal ground illumination conditions to yield the user-supplied classification accuracies regionally and nationally. The ability to routinely accomplish these corrections represent a significant technological problem which must be addressed.

The transformation of the data from the "Acquisitor's Frame of Reference" to the "User's Frames of Reference" is a very crucial one from the potential user's viewpoint. It involves the conversion of the remote sensor field of view to the ground reference frame. While there are necessarily a multiplicity of user reference frames, a consensus is emerging on the part of users in the use of the Universal Transverse Mercator Grid for geographic information systems.

The flow shown in Figure 3-21 was based on the requirements of the Bureau of Census, coordinated with those of the U. S. Geological Survey; processing downstream from this point becomes more specifically user oriented, and the data produced, can serve a multitude of users outside the Census Bureau.

<u>Output Products Requirements</u>

The mission outputs needed by the various users were generically shown in Figure 3-21. The raw or base data will be used primarily by the USGS while the Bureau of Census requires further processed outputs.

The film data must be available in the shortest time for quick-look and planning use as well as for field use with further processing. Both the film transparencies and the computer-compatible tapes are required in parallel for machine processing for land use classification to correlate with census planning as well as post-census analysis.

Current data use procedures, especially for the field enumeration purposes, require products such as maps at 1:24,000 scale and larger. Shuttle derived data can be processed to yield map overlays at 1:24,000 scale but procedures for the ultimate field extraction of desired information must yet be determined. Development of techniques to field-extract and record the reference data must be identified and addressed based on combining available output formats for non-image data and the new technology involved in the Shuttle mission products.

The in-house development of a computerized geographic data base system at the Bureau of Census make the translation of data from this mission to compatible digital formats a desired goal. The post-census (second) flight change-detection and trend evaluation in particular would require machine-processibility of the outputs from the initial (precensus) flight in this mission.

# A P P E N D I X   A

## USERS OF SRS ISSUED REPORTS

USERS OF REPORTS ISSUED BY THE STATISTICAL REPORTING SERVICE

Facts on agriculture are vital to all facets of agribusiness. An indication of the volume of service is given by the following tabulation:

| | F.Y. 1970 | F.Y. 1971 |
|---|---|---|
| Number of official reports issued, all field offices .... | 10,169 | 10,240 |
| Copies of reports distributed ........................ | 15,843,000 | 15,303,000 |
| Special requests for information answered by field offices ........................................ | 83,343 | 78,402 |
| TV, radio, and personal appearances by field office personnel ........................................ | 1,486 | 1,626 |

Newspapers, magazines, and radio and television stations are the major disseminators of SRS data. When the Crop Reporting Board in Washington, D. C. releases the monthly crop production and price reports and the major livestock reports they are covered on the spot by leading newspapers and wire services. These reports and others also get wide press coverage when issued at State level by the 44 SRS field offices which serve the 50 States. Trade publications are particularly heavy users of SRS reports. The Department frequently issues material based on SRS reports tailored specifically for use on radio and television. A set of slides and script summarizing the general crop report or other significant SRS release is sent to 60 TV stations each month. Similar material is video taped for use by 3 other TV outlets. In all, SRS prepared 24 TV features last year. The Department has three weekly radio services utilizing SRS reports. One feature is carried by some 425 stations, another goes to 240 stations. The third is a spot news service in which stations phone USDA for a short taped report. This service receives an average of 70 calls daily. In 1971, SRS contributed 67 features for radio.

Farmers and ranchers are most prominent among those who need accurate data to develop plans and to determine the best alternatives for their crop or livestock operations.

Other users include:

Congressional Members who determine agricultural legislation and also legislation affecting the general economy of the Nation.

The President and the Council of Economic Advisers who recommend policy and legislation affecting the national economy, including agriculture.

The various farmer organizations who advise their members on the course of action reflecting policy as determined by the current situation.

Department of Health, Education, and Welfare in programing agricultural vocational education, in social security and other programs affecting the agricultural population, and in administration of pure food laws.

Department of Commerce in carrying out advisory services and in executing and planning programs that pertain to businesses dependent upon farm products or sales to farm buyers, and for computing business indicators such as the GNP.

Interstate Commerce Commission in establishing or changing rates affecting transportation of agricultural products.

Department of Interior for determining programs in reclamation, land management, and conservation programs.

Department of the Treasury to plan and carry out agricultural tax programs, and to sell U.S. savings bonds in agricultural areas.

Tariff Commission for consideration in establishing appropriate import duties.

Civil Defense agencies for assessing food availability.

State governments to determine regulatory, marketing, and other programs affecting agriculture or related industries.

State agricultural colleges and extension services to advise farmers about agricultural operations in general, to provide the basis for research analyses and educational programs, and to measure the effectiveness of activities in the area of crop and livestock work.

# A P P E N D I X B

## EXAMPLES OF SURVEY FORMS

# APPENDIXES

## APPENDIX A. EXHIBITS

### Exhibit 1

C. E. 2-9693 "E" — Ill., Iowa — 34

**MARCH 1963 ACREAGE SURVEY**

REPORT FOR THE FARM YOU ARE OPERATING

| FALL AND WINTER SEEDED CROPS | Acres for harvest this year 1963 | Acres harvested last year 1962 |
|---|---|---|
| 1. Winter wheat for grain | | |
| 2. Winter rye for grain | | |
| 3. Winter barley for grain | | |
| **SPRING PLANTED CROPS** | **Acres to be planted this spring 1963** | **Acres planted last spring 1962** |
| 4. Corn for all purposes (except sweet corn) | | |
| 5. Spring wheat | | |
| 6. Oats for all purposes | | |
| 7. Spring barley | | |
| 8. Flax | | |
| 9. Sorghums for all purposes | | |
| 10. Irish potatoes | | |
| 11. Soybeans for all purposes | | |
| 12. Other spring planted crops | | |
| **HAY CROPS** | **Acres to be cut for hay in 1963** | **Acres cut for hay in 1962** |
| 13. All hay (alfalfa and alfalfa mixtures; clover, timothy and mixtures of clover and grasses; grain hay; soybean; sweetclover; lespedeza; old meadows; redtop; Sudan; orchardgrass; wild and marsh hay; etc.) | | |
| **ORCHARDS, PASTURES, ETC.** | **Acres in 1963** | **Acres in 1962** |
| 14. Land in fruit orchards and vineyards | | |
| 15. Acres in Conservation Reserve (Soil Bank) | | |
| 16. All other land, (pasture, idle, Feed Grain diversion, etc.) | | |
| 17. ACRES OF ALL LAND IN THIS FARM. (Include land rented from others) | | |

Reported by ..........

County .......... (In which farm is located) State ..........

[OVER] 16—31013-17

### Exhibit 2

C. E. 2-9738 "E" — Illinois

**JUNE 1963 ACREAGE SURVEY**

REPORT FOR THE FARM YOU ARE OPERATING

| CROP | Acres for harvest this year (1963) | Acres harvested last year (1962) |
|---|---|---|
| 1. Corn for all purposes (except sweet corn) | | |
| 2. Wheat for grain | | |
| 3. Oats for grain | | |
| 4. Barley for grain | | |
| 5. Rye for grain | | |
| 6. Popcorn | | |
| 7. Sorghums for all purposes | | |
| 8. Irish potatoes | | |
| 9. Broomcorn | | |
| 10. Soybeans for beans | | |
| 11. Soybeans for hay and other purposes | | |
| 12. Alfalfa and alfalfa mixtures for hay | | |
| 13. Clover, timothy, and mixtures of clover and grasses for hay | | |
| 14. Lespedeza for hay | | |
| 15. All other hay | | |
| 16. Vegetable crops for processing and fresh market | | |
| 17. Land in fruit orchards and vineyards | | |
| 18. Other crops (not listed above) | | |
| | **Acres in 1963** | **Acres in 1962** |
| 19. Land used for pasture only | | |
| 20. Acres in Conservation Reserve (Soil Bank) | | |
| 21. All other land not reported above (Include Wheat and Feed Grain diversion) | | |
| 22. ACRES OF ALL LAND IN THIS FARM (Include land rented from others) | | |

Name ..........

Post office .......... R. .......... (Township)

County .......... (In which farm is located) State ..........

[OVER] 16—31924-17

## Exhibit 8

### Excerpt From the Questionnaire Used for the June Enumerative Survey

(Oklahoma, Texas, New Mexico) - 2 -

Report all land in Column 1 including non-agricultural land.

## SECTION II. FIELDS AND

| Tract and Field Code | Total Acres in Field | If Irrigated CHECK | If not planted CHECK | Cotton: Planted or to be planted | Cotton: Plowed up or abandoned | Corn: Planted or to be planted for all purposes | Corn: For Grain | Wheat: Planted for all purposes | Wheat: For Combining or Threshing | Wheat: For Combining or Threshing | Oats: Planted for all purposes | Oats: For Combining or Threshing | Barley: Planted for all purposes | Barley: For Combining or Threshing |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Acres | Acres | Acres | Acres | Acres | Acres | Bushels | Acres | Acres | Acres | Acres |
| (1a) | (1) | (1b) | (1c) | (2) | (3) | (4) | (5) | (6) | (7) | [illegible] | (10) | (11) | (12) | [illegible] |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

- 3 - (Oklahoma, Texas, New Mexico)

## CROPS IN SEGMENT

In Cols. (2) through (32) account for every acre listed in Col. (1).

| Sorghums: Planted for all purposes | Sorghums: For Grain | Peanuts Alone | Crops Cut and To Be Cut For Hay: Alfalfa and Alfalfa Mixtures | Wild Hay | Grain Hay | Peanut and Other Hay | Peanut and Other Hay | Other Crops: Name of crop (soybeans, flaxseed, rye, peaches, etc.) | Utilization (grain, seed, pasture, etc.) | Planted | Pasture | Other Uses (Farmstead, woods, roads, Conservation Reserve, idle etc.) | Other Uses |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acres | Acres | Acres | Acres | Acres | Acres | Kind | Acres | Name | Use | Acres | Acres | Use | Acres |
| (17) | (18) | (23) | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

## Exhibit 9

Excerpt From the Questionnaire Used for the December Enumerative Survey

### SECTION I. FIELDS AND CROPS IN TRACT

| June Data | | | | December 1 Data | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Crops Harvested or to be Harvested by Utilization | | | |
| | | | | | | | Primary Utilization | | | |
| | | | | | | | | | Production | |
| June Field No. (1) | Total Acres in Field Acres (2) | 1961 Crop or Land Use Specify (3) | Acres Planted to Crop or in Land Use Acres (4) | 1961 Crop or Land Use Specify (5) | Acres Planted to Crop or in Land Use Acres (6) | Acres Abandoned or Plowed up Acres (7) | Utilization (Examples: Grain, Beans, Lint, Seed) (8) | Acres Harvested or to be Harvested Acres (9) | Quantity (10) | Unit (Examples: Bushel, Ton) (11) |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

Were any of these fields irrigated during 1961?

If YES ( ), /Circle irrigated crop acres in Columns (7), (9), (13) and (16) above./

If NO ( ), /Proceed to Section II on page 3./

- 2 -

| /Acres in Columns 7 + 9 + 13 + 15 must be equal to or larger than Column 6./ | | | | |
|---|---|---|---|---|
| Other Utilizations | | | | |
| | | Production | | |
| Utilization (Examples: silage, fodder, hay) (12) | Acres Harvested or to be Harvested Acres (13) | Quantity (14) | Unit (Examples: Bushel, Ton, 50 lb. Bale) (15) | Pastured or Hogged Off Acres (16) |
| | | | | |
| | | | | |

SECTION II. FALL SOWN SMALL GRAIN IN TRACT FOR HARVEST OR USE IN 1962.

Has there been (or will there be) any wheat, rye or other small grain sown this fall in any of these fields?

If YES ( ), /Complete Section II/;

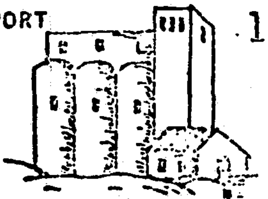
If NO ( ), /Skip to Section III/.

| Acres sown or to be sown | | | | If grain field includes more than one 1961 field (Sec. I, Col. 1) describe below. (4) |
|---|---|---|---|---|
| Winter Wheat Acres (1) | Rye Acres (2) | Other Small Grains (3) Kind | Other Small Grains (3) Acres | |
| | | | | |
| | | | | |

## Exhibit 11

**JANUARY 1 GRAIN STOCKS REPORT**

U. S. Department of Agriculture
Statistical Reporting Service
Washington, D. C.



1

To Managers of Mills, Elevators,
Warehouses, and Other Storages:

Please fill out and return this report as EARLY IN JANUARY as possible. If your firm operates plants in more than one State, separate reports should be prepared for each State. YOUR INDIVIDUAL REPORT WILL BE KEPT CONFIDENTIAL.

The enclosed envelope requires no stamp.

Respectfully,

G. D. Simpson

*Chairman, Crop Reporting Board*

COMMENTS: ______________________

12 Budget Bureau No. 40-R014.9
Approval expires Oct. 31, 1963

C.E. 2-9874 January 1, 1963

### SPECIAL INSTRUCTIONS

If you operate more than one mill, elevator, or warehouse, in a State, report the data for individual plants on the reverse side.

If no stocks are on hand, please enter "None" and return report.

Government (CCC) owned grain stored at this plant should be included as well as all other grain stored here.

| STORAGE CAPACITY | | Answer here |
|---|---|---|
| Rated BULK storage capacity | BUSHELS | |
| Has there been any change in bulk storage capacity since January 1, 1962 Yes ☐ No ☐ If yes: | | |
| How much has been added | BUSHELS | |
| How much has been discontinued | BUSHELS | |
| Rated SACKED storage capacity (Other than bulk capacity reported above) | BUSHELS | |

**STOCKS AT THIS PLANT JANUARY 1, 1963**
(Report total stocks including grain you own and grain stored for farmers, millers, processors, and the Government-Commodity Credit Corporation)

| | | |
|---|---|---|
| WHEAT (including durum) | BUSHELS | |
| RYE | BUSHELS | |
| SOYBEANS | BUSHELS | |
| FLAXSEED | BUSHELS | |
| CORN, shelled and on ear | BUSHELS | |
| OATS | BUSHELS | |
| BARLEY (grain only, exclude malt) | BUSHELS | |
| SORGHUM GRAIN | POUNDS | |

______________________
(Signature of person furnishing information)

# APPENDIX C

## <u>CROP PRODUCTION</u>, DESCRIPTION & EXAMPLE

# A P P E N D I X   C

CROP PRODUCTION, DESCRIPTION & EXAMPLE

## GENERAL CROP PRODUCTION REPORTS
(Released at 3:00 P. M.)

Crop Production by States, 1974 (unless indicated otherwise):

| | |
|---|---|
| Stocks of hay on farms as of January 1; indicated production of 1973–74 crop citrus fruits; acreage, yield per acre and production of cotton and potatoes (Winter); and prospective plantings of potatoes (Spring). Revisions for 1973 crop potatoes (Spring). | Jan. 9 |
| Annual summary of acreage, yield per acre and production for 1973 including revised data for 1972. *Note: State estimates for fruit and nuts included in Noncitrus Fruit and Nut Annual Summary.* | Jan. 16 |
| Prospective plantings for corn, spring wheat, oats, barley, all sorghums, soybeans, cotton and flaxseed (35 States). | Jan. 22 |
| Indicated production of 1973–74 crop citrus fruits; yield per acre as of February 1 and production of potatoes (Winter). | Feb. 8 |
| Indicated production of 1973–74 crop citrus fruits; acreage of potatoes (Spring); and yield per acre as of March 1 and production of potatoes (Winter). | Mar. 8 |
| Prospective plantings for corn, durum wheat, other spring wheat, oats, barley, flaxseed, cotton, rice, all sorghums, potatoes, sweet potatoes, dry edible beans, dry edible peas, soybeans, peanuts, and sugarbeets; acreage for harvest of hay and tobacco. Revised acreage for 1973 crop potatoes (Summer). | Mar. 14 |
| Condition of pastures and ranges; indicated production of 1973–74 crop citrus fruits; yield per acre as of April 1, and production of potatoes (Spring). Revisions for 1973 crop acreage, yield per acre, and production of peanuts. Also revised yield and production for 1973 crop potatoes (Summer). | Apr. 10 |
| Acreage remaining for harvest as of May 1, yield per acre and indicated production of winter wheat; percentage of winter wheat seedings harvested for grain for United States; condition of pastures and ranges; stocks of hay on farms; yield per acre and indicated production of potatoes (Spring); indicated production of 1973–74 crop citrus fruits, peaches in 9 early Southern States and almonds; preliminary production of maple sirup (1974 crop). Also revisions for 1973 cotton acreage, yield per acre, production of lint and seed; value of lint, disposition and value of cottonseed, monthly marketings of lint by farmers and 1973 tobacco acreage, yield per acre, production, price and value of production (by types and classes) and final revisions for 1972 tobacco; revision of production for almonds, bananas, papayas and taro 1973 crop; and final revision of production for 1972–73 crop citrus fruits. | May 8 |
| Acres for harvest for winter wheat, indicated yield per acre as of June 1 for winter wheat; indicated production of winter wheat, peaches, Barlett pears (Pacific coast States), cherries (Western States), apricots, nectarines, California plums, California prunes, almonds, and 1973–74 crop citrus fruits; yield per acre and production of potatoes (Spring); condition of pastures and ranges. Planted and harvested acres for mint oil. Also revisions for acreage, yield per acre, production, price and value of production of mint for oil, sugarbeets and sugarcane for 1973 (sugarbeet price and value for the United States only), production of beet and cane sugar, sugarbeet pulp, and products of cane harvested for sugar. | June 10 |

Crop Production, continued

| | |
|---|---|
| Planted **acreage** for cotton; planted **acreage** and **acreage** for harvest of all corn, white corn, winter wheat, durum wheat, other spring wheat, oats, barley, rye, flaxseed, rice sweetpotatoes, dry edible beans, dry edible peas, soybeans, peanuts, sorghum, popcorn, and sugarbeets; harvested acreage for hay, tobacco, potatoes (Summer), and sugarcane for sugar and seed. **Indicated yield** per acre and **production** as of July 1 are forecast for winter wheat, durum and other spring wheat, oats, barley, rye, and flue-cured tobacco; also potatoes (Summer). **Production**, based on average **yield** adjusted for trend, will be projected for the U. S. for corn for grain, flaxseed, rice, sugar crops, dry edible beans, dry edible peas, hay, tobacco (except flue-cured), soybeans for beans, sorghum grain and peanuts for nuts. **Indicated production** of wheat by classes (U. S.), apples (Commercial), apricots, peaches, pears, cherries (Western States), California grapes, nectarines, California plums, California prunes, almonds, walnuts and 1973–74 crop citrus fruits; condition of pastures and ranges. Revised estimates (1973 crop) of **acreage** for harvest, **yield** per acre and **production** of sweetpotatoes and popcorn, and planted acreage for popcorn. | **July 11** |
| Planted acreage for corn, soybeans, sorghum, durum wheat, other spring wheat and cotton. **Acreage for harvest, indicated yield** per acre and **indicated production** as of August 1 of corn for grain, winter wheat, durum and other spring wheat, oats, barley, rye, flaxseed, cotton, rice, hay, sorghum grain, dry edible beans, dry edible peas, soybeans for beans, peanuts harvested for nuts, potatoes (Summer), sweetpotatoes, tobacco, sugarbeets, sugarcane for sugar and seed, broomcorn, mint for oil, and hops; acreage for harvest for potatoes (Fall); **indicated production** of wheat by classes (U. S.), apples (Commercial), peaches, pears, grapes, plums and prunes (Michigan, Idaho, Washington, Oregon), walnuts; **condition** of pastures and ranges; and **index** of production by groups of crops for United States. **Revised estimates** for 1973 crop of harvested acreage, **yield** per harvested acre and **production** of broomcorn, and potatoes (Fall). | **Aug. 12** |
| **Acreage for harvest, indicated yield** per acre and **indicated production** as of September 1 of corn for grain, winter wheat, durum and other spring wheat, oats, barley, flaxseed, cotton, rice, sorghums for grain, dry edible beans, dry edible peas, soybeans for beans, peanuts harvested for nuts, potatoes (Summer), sweetpotatoes, tobacco, sugarbeets, sugarcane for sugar and seed, broomcorn, mint for oil, and hops; **indicated production** of wheat by classes (U. S.), pears, grapes, plums and prunes (Michigan, Idaho, Washington, Oregon), California prunes, walnuts, filberts, pecans, coffee **revised** 1973 crop; **condition** of pastures and ranges. **Index of production** by groups of crops for United States is also shown. | **Sept. 11** |
| **Acreage for harvest, indicated yield** per acre and **indicated production** of corn for grain, all wheat, durum and other spring wheat, flaxseed, cotton, rice, sorghums for grain, hay, dry edible beans, soybeans for beans, peanuts harvested for nuts, potatoes (Fall), sweetpotatoes, tobacco, sugarbeets, sugarcane for sugar and seed, and hops; **indicated production** of wheat by classes (U. S.), apples (Commercial), grapes, plums and prunes (Michigan, Idaho, Washington, Oregon), cranberries, filberts, pecans and 1974–75 crop citrus fruits: **condition** of pastures and ranges; and **index of production** by groups of crops for United States. Seeded winter wheat forage supplies. **Intentions** to plant 1975 crop potatoes (Winter). **Revised** acreage, yield, and production for 1974 crop potatoes (Winter). | **Oct. 10** |
| **Acreage for harvest, indicated yield** per acre and **indicated production** as of November 1, of corn for grain, cotton, rice, sorghums for grain, dry edible beans, soybeans for beans, peanuts harvested for nuts, potatoes (Fall), tobacco, sugarbeets, and sugarcane for sugar and seed. **Production** of California prunes, cranberries, filberts, and 1974–75 crop cirtus fruits; **condition** of pastures and ranges; and **index of production** [illegible] groups of crops for United States. Seeded winter wheat forage supplies. Cropping practice data for selected States -- Corn plant population, corn and soybean row-width and regular varieties. | **Nov. 8** |

Crop Production, continued

| | |
|---|---|
| Acreage, indicated yield per acre and indicated production of burley tobacco, cotton, and pecans. Indicated production of 1974–75 crop citrus fruits. Acreage, yield per acre, and production for wheat, oats, barley, rye, dry edible beans, rice, and potatoes (Fall) including revised data for preceding year except for potatoes (Fall). Also price and value for wheat, oats, barley, and rye. Production of rice by length of grain classes and dry edible beans by commercial classes. Seeded winter wheat forage supplies; condition of pastures and ranges. | Dec. 10 |
| Seeded acreage and indicated production of winter wheat, 1975 crop. | Dec. 23 |

* * *

# crop production

Release:
May 8, 1974
3:00 P. M. ET

CROP REPORT HIGHLIGHTS AS OF MAY 1, 1974

Winter wheat production is forecast at a record 1,612 million bushels, 27 percent (342 million bushels) above last year's large crop.

Citrus production is virtually unchanged from April 1 but 5 percent less than last season. Production prospects remained unchanged from April 1 for oranges, lemons, tangelos, and tangerines, but declined slightly for grapefruit and increased for temples.

Orange production is forecast at 215 million boxes unchanged from April 1 but 4 percent (9.3 million boxes) below last season's record. Harvest was approximately 68 percent complete by May 1 compared with about 62 percent at the same time last year.

Grapefruit production is expected to total 63.7 million boxes, 1 percent below last month (0.4 million boxes) and 3 percent (1.9 million boxes) below last season's revised estimates. Harvest was 82 percent complete by the first of May. Last year at the same time harvest was 80 percent complete.

Peach production in the 9 southern States is forecast at 361.1 million pounds, 21 percent less than last year and the smallest crop since 1964.

Almond prospects in California point to a record crop of 170,000 tons, 27 percent (36,000 tons) above last year.

Spring potato production of 23.0 million cwt. is estimated 2 percent above the April 1 forecast of 22.7 million cwt. and 9 percent more than 1973.

Hay stocks on farms May 1 are estimated at 25.4 million tons, 5 percent above the same date a year ago.

All cotton 1973 production totaled 13.0 million bales (12,879,900 bales of Upland and 78,100 bales of American-Pima), 5 percent above 1972.

All tobacco 1973 production totaled 1,738 million pounds, less than 1 percent smaller than the 1972 crop.

UNITED STATES DEPARTMENT OF AGRICULTURE
STATISTICAL REPORTING SERVICE CROP REPORTING BOARD
WASHINGTON, D.C. 20250
CrPr 2-2 (5-74)

## UNITED STATES CROP SUMMARY AS OF MAY 1, 1974

| Crop and unit | | Acreage (in thousands): Harvested 1973 | For harvest 1974 | Yield per acre: 1973 | Indicated 1974 | Production (in thousands) 1/: 1973 | Indicated April 1, 1974 | May 1, 1974 |
|---|---|---|---|---|---|---|---|---|
| Winter wheat | Bu. | 38,407 | 45,813 | 33.1 | 35.2 | 1,269,653 | | 1,612,106 |
| Winter wheat | Pct. 2/ | 89.0 | | | | | | |
| Potatoes, Spring | Cwt. | 98.9 | 99.9 | 214 | 231 | 21,213 | 22,670 | 23,048 |
| Maple sirup | Gal. | | | | | 857 | | 1,076 |
| Peaches 3/ | Lb. | | | | | 458.7 | | 361.1 |
| All hay stocks on farms | Ton | | | | | 24,322 | | 25,436 |
| Pasture and Range Cond. 4/ | Pct. | | | 87 | 81 | | | |

1/ Peaches in million pounds.
2/ Harvested acres as percent of seeded acres.
3/ 9 Southern States.
4/ Pasture and Range condition as of first of month. The 1963-72 average is 80 percent.

## CITRUS FRUITS, PRODUCTION 1/

| Crop | 1972-73 | Indicated 1973-74: April 1 | May 1 |
|---|---|---|---|
| | 1,000 boxes | | |
| Oranges | 224,260 | 215,000 | 215,000 |
| Grapefruit | 65,640 | 64,100 | 63,700 |
| Lemons | 22,200 | 17,400 | 17,400 |

1/ Season begins with the bloom of the first year shown and ends with the completion of harvest the following year.

## U. S. MAY 1 SUMMARY IN METRIC UNITS 1/ FOR SELECTED CROPS

| Crop | Area: Harvested 1973 | For harvest 1974 | Yield per hectare: 1973 | 1974 | Production: 1973 | Indicated April 1 1974 | May 1 1974 |
|---|---|---|---|---|---|---|---|
| | 1,000 hectares | | Quintals | | 1,000 metric tons | | |
| Winter wheat | 15,543 | 18,540 | 22.2 | 23.7 | 34,554 | | 43,874 |
| Potatoes, Spring | 40.0 | 40.4 | 241 | 259 | 962 | 1,028 | 1,045 |
| Peaches | | | | | 208.1 | | 163.8 |
| All hay stocks on farms | | | | | 22,065 | | 23,075 |

1/ 1 hectare = 2.471 acres.
1 quintal = 220.46 pounds; 3.67 bushels of wheat; 2.2046 cwt. of potatoes
1 metric ton = 2,204.62 pounds; 1.1023 short (2,000 lb.) tons.

## WINTER WHEAT

| STATE | ACREAGE | | | YIELD PER ACRE | | | PRODUCTION | | |
|---|---|---|---|---|---|---|---|---|---|
| | HARVESTED | | FOR HARVEST | | | INDICATED | | | INDICATED |
| | 1972 | 1973 | 1974 | 1972 | 1973 | 1974 | 1972 | 1973 | 1974 |
| | 1,000 ACRES | | | BUSHELS | | | 1,000 BUSHELS | | |
| ALA | 110 | 88 | 135 | 20.0 | 23.0 | 24.0 | 2,200 | 2,024 | 3,240 |
| ARIZ | 170 | 216 | 243 | 67.0 | 70.0 | 70.0 | 11,390 | 15,120 | 17,010 |
| ARK | 296 | 217 | 400 | 37.0 | 28.0 | 33.0 | 10,952 | 6,076 | 13,200 |
| CALIF | 483 | 570 | 764 | 48.0 | 54.0 | 52.0 | 23,184 | 30,780 | 39,728 |
| COLO | 2,150 | 2,400 | 2,360 | 24.0 | 24.5 | 27.0 | 51,600 | 58,800 | 63,720 |
| DEL | 25 | 26 | 32 | 33.0 | 35.0 | 39.0 | 825 | 910 | 1,248 |
| FLA | 42 | 30 | 37 | 15.0 | 22.0 | 20.0 | 630 | 660 | 740 |
| GA | 140 | 120 | 150 | 20.0 | 27.0 | 25.0 | 2,800 | 3,240 | 3,750 |
| IDAHO | 772 | 780 | 970 | 45.0 | 42.0 | 49.0 | 34,740 | 32,760 | 47,530 |
| ILL | 1,200 | 1,260 | 1,700 | 45.0 | 30.0 | 40.0 | 54,000 | 37,800 | 68,000 |
| IND | 826 | 703 | 1,400 | 48.0 | 35.0 | 45.0 | 39,648 | 24,605 | 63,000 |
| IOWA | 33 | 27 | 29 | 37.5 | 31.0 | 38.0 | 1,238 | 837 | 1,102 |
| KANS | 9,400 | 10,400 | 11,300 | 33.5 | 37.0 | 36.0 | 314,900 | 384,800 | 406,800 |
| KY | 216 | 164 | 370 | 32.5 | 33.0 | 34.0 | 7,020 | 5,412 | 12,580 |
| LA | 30 | 18 | 32 | 23.0 | 22.0 | 25.0 | 690 | 396 | 800 |
| MD | 110 | 116 | 139 | 35.0 | 34.0 | 38.0 | 3,850 | 3,944 | 5,282 |
| MICH | 535 | 568 | 900 | 40.0 | 35.0 | 40.0 | 21,400 | 19,880 | 36,000 |
| MINN | 26 | 32 | 40 | 30.0 | 37.0 | 30.0 | 780 | 1,184 | 1,200 |
| MISS | 160 | 100 | 162 | 31.0 | 27.0 | 30.0 | 4,960 | 2,700 | 4,860 |
| MO | 925 | 850 | 1,200 | 39.0 | 30.0 | 37.0 | 36,075 | 25,500 | 44,400 |
| MONT | 1,790 | 2,080 | 2,470 | 27.0 | 26.5 | 29.0 | 48,330 | 55,120 | 71,630 |
| NEBR | 2,509 | 2,680 | 2,850 | 37.0 | 35.0 | 40.0 | 92,833 | 93,800 | 114,000 |
| NEV | 7 | 8 | 10 | 75.0 | 70.0 | 70.0 | 525 | 560 | 700 |
| N J | 35 | 38 | 47 | 38.0 | 36.0 | 39.0 | 1,330 | 1,368 | 1,833 |
| N MEX | 170 | 289 | 211 | 25.5 | 29.5 | 25.0 | 4,335 | 8,526 | 5,275 |
| N Y | 140 | 140 | 205 | 37.0 | 36.0 | 39.0 | 5,180 | 5,040 | 7,995 |
| N C | 200 | 160 | 210 | 31.0 | 35.0 | 40.0 | 6,200 | 5,600 | 8,400 |
| N DAK | 66 | 73 | 116 | 33.0 | 32.0 | 31.0 | 2,178 | 2,336 | 3,596 |
| OHIO | 1,029 | 720 | 1,540 | 45.0 | 32.0 | 45.0 | 46,305 | 23,040 | 69,300 |
| OKLA | 3,900 | 5,260 | 6,200 | 23.0 | 30.0 | 28.0 | 89,700 | 157,800 | 173,600 |
| OREG | 828 | 940 | 1,080 | 42.5 | 35.0 | 44.0 | 35,190 | 32,900 | 47,520 |
| PA | 269 | 264 | 340 | 32.0 | 28.0 | 35.0 | 8,608 | 7,392 | 11,900 |
| S C | 136 | 101 | 162 | 20.0 | 25.0 | 27.0 | 2,720 | 2,525 | 4,374 |
| S DAK | 705 | 666 | 921 | 36.0 | 32.0 | 34.0 | 25,380 | 21,312 | 31,314 |
| TENN | 240 | 144 | 305 | 32.0 | 31.0 | 35.0 | 7,680 | 4,464 | 10,675 |
| TEXAS | 2,000 | 3,400 | 3,300 | 22.0 | 29.0 | 21.0 | 44,000 | 98,600 | 69,300 |
| UTAH | 205 | 207 | 238 | 26.5 | 24.0 | 27.0 | 5,433 | 4,968 | 6,426 |
| VA | 218 | 175 | 275 | 37.0 | 37.0 | 38.0 | 8,066 | 6,475 | 10,450 |
| WASH | 2,490 | 2,120 | 2,660 | 48.0 | 35.0 | 45.0 | 119,520 | 74,200 | 119,700 |
| W VA | 14 | 12 | 17 | 35.0 | 31.0 | 34.0 | 490 | 372 | 578 |
| WISC | 20 | 16 | 56 | 32.0 | 35.0 | 40.0 | 640 | 560 | 2,240 |
| WYO | 220 | 229 | 237 | 35.0 | 23.0 | 30.0 | 7,700 | 5,267 | 7,110 |
| U S | 34,840 | 38,407 | 45,813 | 34.0 | 33.1 | 35.2 | 1,185,225 | 1,269,653 | 1,612,106 |

COTTON: ACREAGE AND PRODUCTION, 1973 CROP WITH COMPARISONS

| STATE | PLANTED ACRES | | | HARVESTED ACRES | | | YIELD PER PLANTED ACRE | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1971 | 1972 | 1973 | 1971 | 1972 | 1973 | 1971 | 1972 | 1973 |
| | 1,000 ACRES | | | | | | POUNDS | | |
| UPLAND | | | | | | | | | |
| ALABAMA | 579 | 601 | 525 | 558 | 580 | 510 | 531 | 453 | 410 |
| ARIZONA | 242 | 273 | 276 | 241 | 271 | 276 | 924 | 1,059 | 1,063 |
| ARKANSAS | 1,180 | 1,470 | 1,070 | 1,140 | 1,410 | 1,000 | 504 | 468 | 467 |
| CALIFORNIA | 760 | 868 | 950 | 741 | 863 | 942 | 705 | 976 | 884 |
| FLORIDA | 11.5 | 12.5 | 12.6 | 9.3 | 11.3 | 11.5 | 486 | 517 | 477 |
| GEORGIA | 426 | 461 | 386 | 385 | 430 | 375 | 421 | 368 | 484 |
| ILLINOIS | 1.7 | 2.0 | .0 | .8 | 1.1 | .0 | 114 | 141 | 0 |
| KENTUCKY | 5.3 | 5.8 | .9 | 4.3 | 5.0 | .3 | 465 | 343 | 162 |
| LOUISIANA | 510 | 690 | 530 | 500 | 665 | 520 | 564 | 490 | 472 |
| MISSISSIPPI | 1,355 | 1,664 | 1,370 | 1,325 | 1,606 | 1,340 | 600 | 579 | 631 |
| MISSOURI | 343 | 435 | 241 | 313 | 405 | 173 | 561 | 484 | 359 |
| NEVADA | 2.3 | 2.2 | 1.9 | 2.3 | 2.1 | 1.9 | 319 | 579 | 477 |
| N. MEXICO | 135 | 141 | 131 | 130 | 131 | 127 | 474 | 540 | 499 |
| N. CAROLINA | 194 | 210 | 182 | 175 | 170 | 173 | 335 | 273 | 433 |
| OKLAHOMA | 445 | 553 | 547 | 396 | 510 | 526 | 191 | 288 | 375 |
| S. CAROLINA | 381 | 400 | 330 | 320 | 340 | 294 | 346 | 370 | 421 |
| TENNESSEE | 447 | 540 | 460 | 425 | 485 | 440 | 567 | 487 | 451 |
| TEXAS | 5,230 | 5,570 | 5,400 | 4,700 | 5,000 | 5,200 | 237 | 366 | 415 |
| VIRGINIA | 4.8 | 4.8 | 2.7 | 4.2 | 2.5 | 2.4 | 216 | 138 | 391 |
| U. S. UPLAND | 12,252.6 | 13,903.3 | 12,416.1 | 11,369.9 | 12,888.0 | 11,912.1 | 407 | 470 | 498 |
| AMER.-PIMA | | | | | | | | | |
| ARIZONA | 44.5 | 41.3 | 34.0 | 44.4 | 39.9 | 34.0 | 455 | 567 | 597 |
| N. MEXICO | 21.5 | 21.4 | 18.7 | 20.6 | 21.1 | 17.7 | 453 | 344 | 251 |
| TEXAS | 35.7 | 35.0 | 31.7 | 35.4 | 34.5 | 31.2 | 474 | 431 | 391 |
| CALIF. | .6 | .3 | .2 | .6 | .3 | .2 | 325 | 385 | 480 |
| U. S. AMER.-PIMA | 102.3 | 98.0 | 84.6 | 101.0 | 95.8 | 83.1 | 460 | 469 | 443 |
| U. S. ALL | 12,354.9 | 14,001.3 | 12,500.7 | 11,470.9 | 12,983.8 | 11,995.2 | 407 | 470 | 498 |

# crop production

## 1973 ANNUAL SUMMARY

- Acreage
- Yield
- Production

NOTE: Changes in the issuance dates for noncitrus fruit and nut statistics were announced by the U. S. Department of Agriculture in October 1973. Data on production and value for noncitrus fruits and nuts for the United States are contained in this report. Similar data by States were published in a new report entitled Noncitrus Fruits and Nuts, Annual Summary, released January 14, 1974.

Cr Pr 2-1(74) January 16, 1974 CROP REPORTING BOARD

STATISTICAL REPORTING SERVICE • U.S. DEPARTMENT OF AGRICULTURE • WASHINGTON, D.C.

## INDEX NUMBERS OF CROP PRODUCTION
## UNITED STATES, 1964-73 (1967=100) 1/

| YEAR | PRODUCTION | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ALL 2/ | FEED GRAINS | HAY AND FORAGE | FOOD GRAINS | SUGAR CROPS | COTTON | TOBACCO | OIL CROPS |
| 1964 | 93 | 76 | 93 | 84 | 113 | 206 | 113 | 75 |
| 1965 | 98 | 89 | 97 | 87 | 100 | 202 | 94 | 90 |
| 1966 | 95 | 89 | 96 | 87 | 100 | 129 | 95 | 96 |
| 1967 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1968 | 103 | 95 | 100 | 105 | 116 | 148 | 87 | 112 |
| 1969 | 104 | 99 | 100 | 97 | 120 | 135 | 91 | 115 |
| 1970 | 100 | 90 | 99 | 91 | 119 | 137 | 97 | 117 |
| 1971 | 112 | 117 | 105 | 106 | 121 | 142 | 86 | 121 |
| 1972 | 113 | 114 | 105 | 101 | 137 | 182 | 89 | 129 |
| 1973 | 119 | 117 | 109 | 111 | 120 | 173 | 90 | 156 |

1/ THE 1971 AND 1972 INDEXES REFLECT CENSUS REVISIONS. YEARS PRIOR TO 1971 ARE SUBJECT TO CHANGE AFTER REVISED DATA HAVE BEEN INCORPORATED. 2/ INCLUDES VEGETABLES, FRUITS, NUTS AND SOME OTHER CROPS NOT IN SEPARATE GROUPS SHOWN, AND FARM GARDENS.

The CROP PRODUCTION report contains State and National estimates with related information on selected agricultural commodities. These data were prepared and adopted by the Crop Reporting Board which consists of commodity statisticians from the Statistical Reporting Service's field offices and Washington headquarters.

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A P P R O V E D:

William Erwin

ACTING SECRETARY OF AGRICULTURE

OATS: Production of oats is estimated at 664 million bushels, 4 percent less than the 692 million bushels produced last year and 25 percent below the 1971 production of 881 million bushels. Acreage of oats harvested for grain totaled 14,110,000 acres, 4 percent more than the 13,525,000 harvested last year but 11 percent below acreage harvested in 1971. Acreage abandoned or used for purposes other than grain accounted for 26.5 percent of planted acreage, compared with 33.0 percent in 1972 when rains interfered with harvest and 28.2 percent in 1971.

Yield of oats per harvested acre is estimated at 47.0 bushels, compared with 51.2 bushels last year and the record of 55.9 bushels in 1971.

Wet weather slowed fall oat seeding in the South. Spring seeding moved at a slow pace except in the Northern Plains where planting progressed somewhat faster than normal. In many northern States, dry weather limited straw growth and filling of heads. Substantial acreages intended for grain in the Dakotas were not combined. Oats were harvested ahead of usual in the Northern Plains but in several other areas rains interrupted combining and contributed to yield losses.

BARLEY: Production of barley in 1973 totaled 424 million bushels, about the same as the 1972 crop of 423 million but 8 percent less than the 1971 production of 464 million bushels.

Acreage harvested for grain is estimated at 10.5 million acres, 8 percent more than the 9.7 million acres harvested in 1972. Yield per acre averaged 40.3 bushels, down 3.3 bushels from the yield of 43.6 bushels last year.

In the North Central region a 7-percent increase in acreage more than offset lower yields, resulting in a 2-percent increase in production. Spring seeding of barley started about a week ahead of normal with most of the crop seeded by the end of May. In Minnesota harvest got underway in late July and was completed by the latter part of August. In North Dakota, the leading barley State, harvest began early and progressed rapidly in the southern areas but the windup was delayed by heavy rains over the Labor Day weekend.

In the Western region reduced yields more than offset a 13-percent increase in acreage harvested for grain and production was down about 1 percent from a year earlier. Hot, dry summer weather resulted in lower yields in many areas, especially in the Northwest. In California early plantings were good due to rainfall early in the planting season. Dryland areas produced well in the southern part of the State but dry weather in the northern Sacramento Valley resulted in reduced yields and greater than normal abandonment. Lack of rainfall in late spring also limited the fill of heads in final stages of maturity.

ALL WHEAT: Production of all wheat in 1973 totaled a record high 1,711 million bushels, 11 percent above the 1972 output and 6 percent above the previous high of 1,618 million bushels in 1971. Yield per acre, at 31.8 bushels, was exceeded only by the 1972 and 1971 averages of 32.7 and 33.9 bushels, respectively. Harvested acreage, at 53.9 million, was the largest since 1968 and 14 percent above the 1972 acreage.

WINTER WHEAT: The 1973 winter wheat crop of 1,270 million bushels was record large, 7 percent above 1972 and 11 percent above 1971. The increased production was harvested from 38.4 million acres, 10 percent more than in 1972 and the largest acreage since 1968. Yield per acre of 33.1 bushels was 0.9 bushel below the 1972 yield and 2.3 bushels below the 1971 record high.

The crop entered the 1972-73 winter in generally good to excellent condition. Seeding in the Great Plains proceeded ahead of schedule except in southwest Oklahoma and in Texas where soil moisture shortages delayed progress and then wet fields further slowed completion. Cool November weather in the Plains delayed growth but the crop was in good condition on December 1. Soil moisture was in short supply in Montana and the Pacific Northwest at seeding time. November rains helped relieve short moisture conditions in Washington. Seeding in Missouri and most States east of the Mississippi River was handicapped by a wet fall. Late harvest of corn and soybeans prevented seeding some of the intended acreage of wheat and contributed to the delay in seeding of other fields.

## HARVESTED ACREAGE OF CROPS, UNITED STATES, 1964-73

| YEAR | CORN FOR GRAIN | SORGHUM FOR GRAIN | OATS | BARLEY | FEED GRAINS 1/ | WHEAT WINTER | WHEAT DURUM | WHEAT OTHER SPRING |
|---|---|---|---|---|---|---|---|---|
| | | | | 1,000 ACRES | | | | |
| 1964 | 55,369 | 11,742 | 19,759 | 10,277 | 97,147 | 38,075 | 2,467 | 9,220 |
| 1965 | 55,392 | 13,029 | 18,522 | 9,166 | 96,109 | 37,586 | 2,296 | 9,678 |
| 1966 | 57,002 | 12,813 | 17,877 | 10,250 | 97,942 | 38,616 | 2,423 | 8,574 |
| 1967 | 60,694 | 14,988 | 16,110 | 9,230 | 101,022 | 45,039 | 2,754 | 10,560 |
| 1968 | 55,980 | 13,890 | 17,708 | 9,732 | 97,310 | 41,929 | 3,621 | 9,215 |
| 1969 | 54,574 | 13,437 | 17,971 | 9,557 | 95,539 | 36,303 | 3,420 | 7,423 |
| 1970 | 57,358 | 13,568 | 18,638 | 9,725 | 99,289 | 32,702 | 2,105 | 8,757 |
| 1971 | 64,047 | 16,301 | 15,772 | 10,151 | 106,271 | 32,359 | 2,864 | 12,451 |
| 1972 | 57,421 | 13,368 | 13,525 | 9,707 | 94,021 | 34,840 | 2,550 | 9,894 |
| 1973 | 61,760 | 15,940 | 14,110 | 10,527 | 102,337 | 38,407 | 2,974 | 12,494 |

| YEAR | RICE | RYE | FOOD GRAINS 2/ | SOYBEANS FOR BEANS | FLAXSEED | CORN SILAGE | CORN FORAGE | SORGHUM SILAGE | SORGHUM FORAGE |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1,000 ACRES | | | | |
| 1964 | 1,785.6 | 1,696 | 53,244 | 30,793 | 2,825 | 8,620 | 1,399 | 1,200 | 2,809 |
| 1965 | 1,792.7 | 1,473 | 52,826 | 34,449 | 2,775 | 8,054 | 1,170 | 1,195 | 2,376 |
| 1966 | 1,967.2 | 1,276 | 52,856 | 36,546 | 2,576 | 7,934 | 931 | 1,089 | 2,064 |
| 1967 | 1,970.1 | 1,063 | 61,386 | 39,805 | 1,975 | 8,363 | 977 | 1,036 | 2,327 |
| 1968 | 2,353.4 | 996 | 58,114 | 41,391 | 2,092 | 7,879 | 746 | 908 | 2,504 |
| 1969 | 2,128.4 | 1,291 | 50,565 | 41,337 | 2,605 | 7,892 | 597 | 798 | 2,600 |
| 1970 | 1,814.7 | 1,427 | 46,806 | 42,249 | 2,848 | 8,065 | 654 | 741 | 2,167 |
| 1971 | 1,817.9 | 1,754 | 51,246 | 42,701 | 1,545 | 8,770 | 706 | 1,008 | 2,717 |
| 1972 | 1,817.9 | 1,084 | 50,186 | 45,698 | 1,151 | 8,279 | 537 | 850 | 2,510 |
| 1973 | 2,170.2 | 1,038 | 57,083 | 56,416 | 1,725 | 8,764 | 569 | 842 | 2,137 |

| YEAR | PEANUTS FOR NUTS | POPCORN | COTTON | ALL HAY | DRY BEANS | DRY PEAS |
|---|---|---|---|---|---|---|
| | | | 1,000 ACRES | | | |
| 1964 | 1,397.2 | 165.3 | 14,054.6 | 67,375 | 1,388 | 265 |
| 1965 | 1,438.3 | 205.3 | 13,612.7 | 67,496 | 1,484 | 174 |
| 1966 | 1,420.7 | 207.1 | 9,552.6 | 64,356 | 1,486 | 175 |
| 1967 | 1,403.5 | 161.9 | 7,997.3 | 63,303 | 1,205 | 176 |
| 1968 | 1,438.4 | 185.3 | 10,159.3 | 60,922 | 1,424 | 181 |
| 1969 | 1,455.7 | 182.6 | 11,051.1 | 59,716 | 1,469 | 232 |
| 1970 | 1,467.0 | 136.5 | 11,155.0 | 61,492 | 1,409 | 256.9 |
| 1971 | 1,454.5 | 173.7 | 11,470.9 | 61,405 | 1,316 | 202.7 |
| 1972 | 1,486.4 | 157.0 | 12,983.8 | 59,821 | 1,402 | 135.1 |
| 1973 | 1,499.7 | 146.3 | 11,989.0 | 62,190 | 1,390 | 136.4 |

| YEAR | PEPPERMINT | SPEARMINT |
|---|---|---|
| | 1,000 ACRES | |
| 1964 | 45.8 | 9.5 |
| 1965 | 43.7 | 10.4 |
| 1966 | 58.3 | 16.6 |
| 1967 | 64.8 | 21.1 |
| 1968 | 74.6 | 24.3 |
| 1969 | 80.4 | 33.3 |
| 1970 | 78.4 | 32.6 |
| 1971 | 64.7 | 30.9 |
| 1972 | 57.1 | 24.6 |
| 1973 | 57.9 | 24.1 |

SEE FOOTNOTES AT END OF TABLE.

## CROP PRODUCTION, UNITED STATES 1964-73

| YEAR | CORN FOR GRAIN | SORGHUM FOR GRAIN | OATS | BARLEY | FEED GRAINS 1/ | RYE |
|---|---|---|---|---|---|---|
| | 1,000 BUSHELS | | | | 1,000 TONS | 1,000 BUSHELS |
| 1964 | 3,484,253 | 489,796 | 852,257 | 386,059 | 134,174 | 32,476 |
| 1965 | 4,102,867 | 672,698 | 929,554 | 393,055 | 158,022 | 33,307 |
| 1966 | 4,167,608 | 714,992 | 803,324 | 392,108 | 158,977 | 27,791 |
| 1967 | 4,860,372 | 755,344 | 793,800 | 373,745 | 178,911 | 23,949 |
| 1968 | 4,449,542 | 731,277 | 950,689 | 426,151 | 170,502 | 22,971 |
| 1969 | 4,687,057 | 729,919 | 965,863 | 427,055 | 177,379 | 30,204 |
| 1970 | 4,151,938 | 683,571 | 917,159 | 416,139 | 160,056 | 36,840 |
| 1971 | 5,641,112 | 875,752 | 881,277 | 463,601 | 207,698 | 49,288 |
| 1972 | 5,573,320 | 809,264 | 691,973 | 423,461 | 199,947 | 29,183 |
| 1973 | 5,643,256 | 936,587 | 663,860 | 424,483 | 205,045 | 26,398 |

| YEAR | WHEAT: WINTER | WHEAT: DURUM | WHEAT: OTHER SPRING | WHEAT: ALL | RICE | FOOD GRAINS 2/ | SOYBEANS |
|---|---|---|---|---|---|---|---|
| | 1,000 BUSHELS | | | | 1,000 CWT. | 1,000 TONS | 1,000 BUSHELS |
| 1964 | 1,020,987 | 68,146 | 194,238 | 1,283,371 | 73,166 | 43,068 | 700,921 |
| 1965 | 1,017,075 | 69,866 | 228,662 | 1,315,603 | 76,281 | 44,215 | 845,608 |
| 1966 | 1,057,371 | 62,638 | 184,880 | 1,304,889 | 85,020 | 44,176 | 928,481 |
| 1967 | 1,194,119 | 66,443 | 247,036 | 1,507,598 | 89,379 | 50,368 | 976,439 |
| 1968 | 1,217,555 | 99,644 | 239,436 | 1,556,635 | 104,142 | 52,549 | 1,106,958 |
| 1969 | 1,131,439 | 108,403 | 202,837 | 1,442,679 | 91,904 | 48,721 | 1,133,120 |
| 1970 | 1,091,744 | 52,771 | 207,043 | 1,351,558 | 83,805 | 45,769 | 1,127,100 |
| 1971 | 1,144,164 | 91,805 | 381,820 | 1,617,789 | 85,768 | 54,202 | 1,175,989 |
| 1972 | 1,185,225 | 72,912 | 286,799 | 1,544,936 | 85,439 | 51,437 | 1,270,630 |
| 1973 | 1,269,653 | 84,860 | 356,887 | 1,711,400 | 92,823 | 56,722 | 1,566,518 |

| YEAR | FLAXSEED | COTTON: LINT 3/ | COTTON: SEED | ALL HAY | CORN SILAGE | SORGHUM SILAGE |
|---|---|---|---|---|---|---|
| | 1,000 BUSHELS | 1,000 BALES | 1,000 TONS | 1,000 TONS | | |
| 1964 | 24,401 | 15,144.9 | 6,237 | 118,778 | 83,551 | 11,249 |
| 1965 | 35,402 | 14,937.9 | 6,087 | 125,610 | 84,447 | 12,324 |
| 1966 | 23,390 | 9,556.8 | 3,960 | 120,930 | 89,683 | 11,851 |
| 1967 | 20,036 | 7,443.4 | 3,210 | 125,134 | 94,783 | 10,236 |
| 1968 | 26,983 | 10,925.7 | 4,640 | 124,244 | 93,652 | 9,749 |
| 1969 | 34,929 | 9,990.2 | 4,068 | 126,026 | 99,161 | 9,360 |
| 1970 | 29,548 | 10,192.1 | 4,068 | 126,971 | 93,777 | 7,206 |
| 1971 | 18,198 | 10,477.0 | 4,240 | 129,119 | 108,667 | 10,968 |
| 1972 | 13,909 | 13,702.1 | 5,440 | 128,614 | 108,520 | 10,055 |
| 1973 | 16,437 | 12,961.2 | 5,216 | 134,608 | 109,848 | 9,557 |

SEE FOOTNOTES AT END OF TABLE.

HARVESTED ACREAGE OF PRINCIPAL CROPS BY STATES 1973 WITH COMPARISON

| STATE | HARVESTED ACREAGE OF PRINCIPAL CROPS 1/ 1971 | 1972 | 1973 |
|---|---|---|---|
| | | 1,000 ACRES | |
| MAINE | 447 | 430 | 423 |
| N. H. | 112 | 111 | 108 |
| VT. | 584 | 574 | 566 |
| MASS. | 152 | 146 | 151 |
| R. I. | 18 | 18 | 17 |
| CONN. | 149 | 142 | 146 |
| N. Y. | 3,866 | 3,730 | 3,872 |
| N. J. | 380 | 360 | 390 |
| PA. | 4,394 | 4,247 | 4,330 |
| OHIO | 9,548 | 9,262 | 9,744 |
| IND. | 11,110 | 10,697 | 11,640 |
| ILL. | 20,461 | 19,946 | 22,221 |
| MICH. | 5,757 | 5,533 | 5,815 |
| WIS. | 8,972 | 8,526 | 8,843 |
| MINN. | 18,580 | 17,090 | 19,746 |
| IOWA | 21,820 | 20,916 | 23,583 |
| MO. | 12,085 | 11,486 | 12,309 |
| N. DAK. | 19,025 | 17,286 | 19,286 |
| S. DAK. | 15,110 | 13,755 | 14,918 |
| NEBR. | 16,271 | 15,415 | 17,452 |
| KANS. | 19,686 | 18,809 | 20,731 |
| DEL. | 461 | 444 | 465 |
| MD. | 1,355 | 1,332 | 1,407 |
| VA. | 2,724 | 2,661 | 2,699 |
| W.VA. | 751 | 735 | 765 |
| N. C. | 4,371 | 4,116 | 4,556 |
| S. C. | 2,561 | 2,438 | 2,600 |
| GA. | 4,283 | 4,073 | 4,544 |
| FLA. | 1,140 | 1,186 | 1,247 |
| KY. | 4,076 | 4,047 | 4,262 |
| TENN. | 4,081 | 3,991 | 4,221 |
| ALA. | 2,920 | 2,914 | 3,054 |
| MISS. | 5,246 | 5,194 | 5,223 |
| ARK. | 7,253 | 7,193 | 7,541 |
| LA. | 3,660 | 3,716 | 3,741 |
| OKLA. | 8,111 | 7,979 | 9,510 |
| TEX. | 17,623 | 17,671 | 21,946 |
| MONT. | 8,739 | 8,333 | 8,935 |
| IDAHO | 3,890 | 3,865 | 4,079 |
| WYO. | 1,761 | 1,740 | 1,755 |
| COLO. | 5,583 | 5,418 | 5,765 |
| N. MEX. | 1,063 | 1,024 | 1,193 |
| ARIZ. | 1,052 | 1,043 | 1,097 |
| UTAH | 1,061 | 1,070 | 1,114 |
| NEV. | 505 | 471 | 497 |
| WASH. | 4,212 | 4,189 | 4,423 |
| OREG. | 2,407 | 2,393 | 2,545 |
| CALIF. | 5,781 | 5,628 | 5,912 |
| HAWAII | 122 | 115 | 116 |
| U. S. | 295,319 | 283,458 | 311,503 |

1/ CROP ACREAGES INCLUDED ARE CORN, SORGHUM, OATS, BARLEY, WHEAT, RICE, RYE, SOYBEANS, FLAXSEED, PEANUTS, POPCORN, COTTON, ALL HAY, DRY BEANS, DRY PEAS, POTATOES, SWEETPOTATOES, TOBACCO, SUGARCANE, AND SUGARBEETS.

## CORN FOR GRAIN

| STATE | ACREAGE HARVESTED 1971 | 1972 | 1973 | YIELD PER ACRE 1971 | 1972 | 1973 | PRODUCTION 1971 | 1972 | 1973 |
|---|---|---|---|---|---|---|---|---|---|
| | 1,000 ACRES | | | BUSHELS | | | 1,000 BUSHELS | | |
| N Y | 349 | 270 | 360 | 87.0 | 70.0 | 77.0 | 30,363 | 18,900 | 27,720 |
| N J | 83 | 52 | 75 | 65.0 | 74.0 | 79.0 | 5,395 | 3,848 | 5,925 |
| PA | 1,036 | 900 | 1,040 | 75.0 | 72.0 | 78.0 | 77,700 | 64,800 | 81,120 |
| OHIO | 3,545 | 3,090 | 3,040 | 91.0 | 92.0 | 79.0 | 322,595 | 284,280 | 240,160 |
| IND | 5,509 | 4,884 | 5,240 | 101.0 | 104.0 | 102.0 | 556,409 | 507,936 | 534,480 |
| ILL | 10,070 | 9,225 | 9,670 | 106.0 | 110.0 | 103.0 | 1,067,420 | 1,014,750 | 996,010 |
| MICH | 1,730 | 1,722 | 1,690 | 69.0 | 83.0 | 79.0 | 119,370 | 142,926 | 133,510 |
| WISC | 2,304 | 2,143 | 2,090 | 98.0 | 95.0 | 83.0 | 225,792 | 203,585 | 173,470 |
| MINN | 5,725 | 4,899 | 5,520 | 83.0 | 93.0 | 93.0 | 475,175 | 455,607 | 513,360 |
| IOWA | 11,550 | 10,600 | 11,150 | 102.0 | 116.0 | 108.0 | 1,178,100 | 1,229,600 | 1,204,200 |
| MO | 3,092 | 2,500 | 2,600 | 88.0 | 91.0 | 88.0 | 272,096 | 227,500 | 228,800 |
| N DAK | 172 | 159 | 180 | 58.0 | 67.0 | 56.0 | 9,976 | 10,653 | 10,080 |
| S DAK | 2,626 | 2,414 | 2,630 | 46.0 | 64.0 | 54.0 | 120,796 | 154,496 | 142,020 |
| NEBR | 5,300 | 5,135 | 5,850 | 85.0 | 104.0 | 93.0 | 450,500 | 534,040 | 544,050 |
| KANS | 1,311 | 1,250 | 1,540 | 95.0 | 104.0 | 100.0 | 124,545 | 130,000 | 154,000 |
| DEL | 204 | 179 | 186 | 54.0 | 78.0 | 85.0 | 11,016 | 13,962 | 15,810 |
| MD | 516 | 443 | 500 | 72.0 | 80.0 | 85.0 | 37,152 | 35,440 | 42,500 |
| VA | 480 | 502 | 550 | 68.0 | 83.0 | 84.0 | 32,640 | 41,666 | 46,200 |
| W VA | 59 | 53 | 63 | 69.0 | 75.0 | 83.0 | 4,071 | 3,975 | 5,229 |
| N C | 1,565 | 1,280 | 1,400 | 57.0 | 80.0 | 82.0 | 89,205 | 102,400 | 114,800 |
| S C | 507 | 375 | 430 | 54.0 | 63.0 | 55.0 | 27,378 | 23,625 | 23,650 |
| GA | 1,672 | 1,490 | 1,670 | 54.0 | 52.0 | 48.0 | 90,288 | 77,480 | 80,160 |
| FLA | 314 | 307 | 340 | 49.0 | 46.0 | 43.0 | 15,386 | 14,122 | 14,620 |
| KY | 1,183 | 968 | 1,010 | 77.0 | 86.0 | 85.0 | 91,091 | 83,248 | 85,850 |
| TENN | 675 | 480 | 508 | 57.0 | 70.0 | 66.0 | 38,475 | 33,600 | 33,528 |
| ALA | 626 | 545 | 610 | 45.0 | 48.0 | 46.0 | 28,170 | 26,160 | 28,060 |
| MISS | 220 | 163 | 148 | 39.0 | 45.0 | 39.0 | 8,580 | 7,335 | 5,772 |
| ARK | 40 | 28 | 21 | 39.0 | 40.0 | 35.0 | 1,560 | 1,120 | 735 |
| LA | 108 | 86 | 65 | 45.0 | 56.0 | 42.0 | 4,860 | 4,816 | 2,730 |
| OKLA | 62 | 71 | 87 | 77.0 | 89.0 | 90.0 | 4,774 | 6,319 | 7,830 |
| TEXAS | 552 | 460 | 640 | 80.0 | 86.0 | 95.0 | 44,160 | 39,560 | 60,800 |
| MONT | 7 | 6 | 11 | 76.0 | 78.0 | 73.0 | 532 | 468 | 803 |
| IDAHO | 29 | 25 | 28 | 83.0 | 87.0 | 89.0 | 2,407 | 2,175 | 2,492 |
| WYO | 27 | 25 | 25 | 78.0 | 85.0 | 89.0 | 2,106 | 2,125 | 2,225 |
| COLO | 430 | 374 | 438 | 88.0 | 108.0 | 102.0 | 37,840 | 40,392 | 44,676 |
| N MEX | 17 | 21 | 21 | 55.0 | 75.0 | 70.0 | 935 | 1,575 | 1,470 |
| ARIZ | 16 | 15 | 9 | 32.0 | 35.0 | 32.0 | 512 | 525 | 288 |
| UTAH | 15 | 8 | 13 | 78.0 | 92.0 | 110.0 | 1,170 | 736 | 1,430 |
| WASH | 61 | 48 | 68 | 102.0 | 108.0 | 106.0 | 6,222 | 5,184 | 7,208 |
| OREG | 10 | 11 | 9 | 85.0 | 81.0 | 90.0 | 850 | 891 | 810 |
| CALIF | 250 | 215 | 235 | 94.0 | 100.0 | 105.0 | 23,500 | 21,500 | 24,675 |
| U. S. | 64,047 | 57,421 | 61,760 | 88.1 | 97.1 | 91.4 | 5,641,112 | 5,573,320 | 5,643,256 |

# APPENDIX D

## SPECIFIC CROP REPORTS

## OTHER REPORTS CONCERNING CROPS
**(Released at 3:00 P. M., except cranberries -- Aug. 20 -- 1:00 P. M.)**

| | |
|---|---|
| **Crop Values:** Season average prices and value of production of principal crops for 1973 including revised data for 1972. *Note: State estimates for fruit and nuts included in Noncitrus Fruit and Nut Annual Summary.* | **Jan. 16** |
| **Field Crops:** Production, disposition, value, 1972–73 crops, (except cotton, tobacco, sugar, potatoes and sweetpotatoes). | **May 10** |
| **Grain Stocks:** Wheat (all and durum), rye, corn, oats, barley, sorghum grain, soybeans and flaxseed stocks on farm, off-farm, and in all positions, first of month, by States: Jan. 24, Apr. 24, July 24, and Oct. 24 (Soybeans excluded in October). | **Quarterly** |
| **Soybean Stocks:** Soybean stocks on-farm, off-farm, and in all positions on September 1, by States. | **Sept. 20** |
| **Peanut Stocks and Processing:** Stocks end of previous month; millings; production and disappearance of milled products previous month, United States: Jan. 25, Feb. 25, Mar. 25, Apr. 25, May 24, June 25, July 25, Aug. 26, Sept. 26, Oct. 25, Nov. 25, Dec. 23 and seasonal report, Sept. 19. | **Monthly** |
| **Rice Stocks:** Rough and milled rice stocks by position, first of month, by States and stocks by length of grain classes (Southern Area and California): Jan. 24, Apr. 24, Aug. 26, Oct. 24 (California only, in October). | **Quarterly** |
| **Hop Stocks:** Grower, dealer and brewer stocks, Mar. 1 and Sept. 1, United States. | **Mar. 19 & Sept. 17** |
| **Popcorn:** Acreage planted and for harvest. (Also included in July Crop Production Report.) | **July 12** |
| **Potato Stocks:** Grower and local dealer storage stocks in fall crop producing areas, first of month, by States: Jan. 9, Feb. 8, Mar. 8, April 10, Dec. 10. | |
| **Potatoes and Sweetpotatoes:** Production, farm disposition, and value by States; and utilization of Irish Potatoes, U. S., 1973. | **Aug. 23** |
| **Vegetables--Fresh Market:** Quarterly prospective acreage for harvest and intentions to plant for selected crops: winter quarter, Jan. 8; spring quarter, April 8; summer quarter, July 8; fall quarter, October 8. Quarterly acreage harvested and production: winter quarter, May 8; spring quarter, August 8; summer quarter, Nov. 8; fall quarter, Jan. 8, 1975. Acreage for harvest and production of selected commercial crops: March 8, June 7, and Sept. 9. | |

**Other Reports Concerning Crops, continued**

**Vegetables--Processing:**

Intentions to plant, Mar. 29; planted acres, June 27; production forecasts, July 9, Aug. 8, Sept. 10, and annual summary, Dec. 19.

Cucumbers for Pickles Stocks and revisions; production forecast for spinach. — **Nov. 15**

**Celery:**

Monthly plantings and acreage remaining for harvest (Florida, California, Ohio, New York, and Michigan). Jan. 4, Feb. 5, Mar. 5, Apr. 4, May 6, June 4, July 5, Aug. 5, Sept. 4, Oct. 4, Nov. 5, Dec. 5. — **Monthly**

**Onion Stocks in Storage:**

Total stocks in common and cold storage, as of January 1. — **Jan. 18**

**Fruits:**

**Noncitrus Fruit and Nut Annual Summary:** Production, use, price and value, 1973 crop with comparisions. — **Jan. 14**

**Noncitrus Fruit and Nut Mid-Year Supplement:** Production, utilization, price, and value, 1973 crop with comparisions. — **July 11**

**Citrus:** Production, use and value, 1973–74 crop with comparisions. — **Oct. 1**

**Cherry Production:** Mid-June production forecast of 1974 crop and utilization previous crop (New York, Ohio, Pennsylvania, Michigan, and Wisconsin). — **June 21**

**Cranberries:** Indicated production, by States, 1974; RELEASED 1:00 P. M. — **Aug. 20**

**Apples:** By varieties. Final 1973 crop and forecast 1974 crop. — **Aug. 14**

**Cherry Utilization:** Revised production and utilization of 1974 crop. — **Oct. 7**

**Seed Crops:**

**Forecast Reports** -- Indicated acreage for harvest, yield per acre and production, by States, 1974.

| | |
|---|---|
| Crimson Clover (Southern States) | **June 20** |
| Tall Fescue (Southern States) | **July 16** |
| Crimson Clover (Oregon) | **Aug. 5** |
| Tall Fescue (Oregon) | **Aug. 15** |
| Timothy | **Aug. 22** |
| Red Clover | **Oct. 10** |
| Alfalfa | **Oct. 22** |

**Seed Crops:**

**Annual Summary:** revised acreage, yield, production, price and value; disposition, supply and disappearance of field seeds. (Includes Crimson Clover, Tall Fescue, Timothy, Red Clover, Alfalfa, Lespedeza, Orchardgrass, Bentgrass, Red and Chewings Fescue, Hairy Vetch, Ladino Clover, Ryegrass, Merion Kentucky Bluegrass and Kentucky Bluegrass other than Merion.) — **May 30**

**Other Seed Reports:**

| | |
|---|---|
| Seed Crops--Preliminary Estimates: acreage, yield, production, price and value; supply and disappearance of field seeds. | **Jan. 16** |
| Acreage and Production of Vegetable Seeds, 1974 prospective and 1973 final. | **Mar. 18** |
| Stocks of Field Seeds Held by Dealers on June 30. | **Aug. 2** |
| Stocks of Vegetable Seeds Held by Dealers on June 30. | **Aug. 16** |
| Retail Seed Prices--Relased 3:00 P. M. April 30 September 30 | |

**Flowers and Foliage Plants 23 States:**

Carnations, chrysanthemums, gladioli, roses and foliage plants. Production and sales, 1973 and intentions for 1974. — **March 27**

**Mushrooms, U. S. Totals and Selected States:**

Area in production, production, and value, July 1, 1973 – June 30, 1974 and intentions for coming year. — **Aug. 21**

**Other Reports Concerning Crops, continued**

**Export Sales:**

| | |
|---|---|
| Export Sales for U. S. wheat (by classes), wheat products, corn, barley, rye, oats, grain sorghum, rice, flaxseed, cotton (by staple length), cottonseed and soybean, oilcake and meal, linseed, cottonseed, soybeans, and the oil from the preceeding two crops; by country of destination. Released at 3:00 P. M. (Eastern time) on Friday of each week. | Weekly |

***

# grain stocks

## In All Positions

Release:
January 24, 1974
3:00 P.M. ET

### SOYBEAN STOCKS UP---MOST GRAIN STOCKS DOWN FROM A YEAR EARLIER

January 1 stocks of all grains except sorghum and soybeans were below a year earlier according to the Crop Reporting Board. Stocks of the four feed grains (corn, oats, barley and sorghum) totaled 161.1 million tons, 7 percent less than holdings on January 1, 1973.

Stocks of all wheat were down one-third from a year earlier while Durum supplies were down 27 percent. Soybean stocks were up sharply with 35 percent larger holdings than a year ago.

CORN in all storage positions on January 1, 1974 totaled 4,465 million bushels, down 8 percent from the 4,831 million bushels a year earlier and 5 percent less than January 1, 1972. Farm holdings, at 3,353 million bushels, were down 9 percent from last year while off-farm stocks at 1,112 million bushels were 3 percent below January 1, 1973.

Indicated disappearance during October-December totaled 1,887 million bushels, compared with 1,869 million used in the same quarter a year earlier.

SORGHUM GRAIN in storage January 1, 1974 totaled 648 million bushels, 4 percent above a year earlier but 9 percent below the same date in 1972. Farm stocks accounted for 221 million bushels, an increase of 1 percent from last year while off-farm stocks at 427 million bushels were up 6 percent.

January 1 stocks indicate October-December disappearance of 361 million bushels, 9 percent above the same period in 1972 and 40 percent above the comparable 1971 period.

OAT stocks on January 1, 1974 totaled 634 million bushels, 18 percent less than a year earlier and 33 percent below January 1, 1972. Farm holdings of 473 million bushels were down 15 percent from a year ago while off-farm stocks were down 27 percent. Indicated disappearance from October through December 1973 was 171 million bushels, 12 percent larger than during the comparable period in 1972.

BARLEY stored in all positions on January 1 totaled 323 million bushels, 11 percent less than a year earlier. Off-farm stocks of 114 million bushels were 1 percent below a year ago and farm stocks, at 209 million bushels, were 15 percent smaller. Disappearance during October-December was 101 million bushels, up 10 percent from the same quarter in 1972.

UNITED STATES DEPARTMENT OF AGRICULTURE
STATISTICAL REPORTING SERVICE CROP REPORTING BOARD
GrLg 11-1 (1-74) WASHINGTON, D.C. 20250

ALL WHEAT in storage on January 1, 1974 totaled 934 million bushels, 33 percent below a year earlier and 40 percent less than 2 years ago. This is the lowest January 1 all wheat stocks since 1952. On-farm stocks totaled 368 million bushels, 28 percent less than a year ago while off-farm stocks at 566 million bushels were 36 percent below the comparable quarter a year earlier. Disappearance from all storage positions from October through December 1973 is indicated at 515 million bushels, compared with 472 million a year earlier.

DURUM WHEAT stocks in all positions on January 1, 1974 totaled 72.0 million bushels, 27 percent less than a year earlier and 40 percent below 2 years ago. Current stocks are the lowest for January 1 since 1968. Farm holdings at 53.4 million bushels were 26 percent below last year and off-farm stocks were down 28 percent. Disappearance during the October-December quarter is indicated at 25.3 million bushels, compared with 18.1 million for the same quarter a year earlier.

RYE stocks in all storage positions on January 1, 1974 totaled 21.2 million bushels, down sharply from the January 1, 1973 level of 54 million bushels, and the lowest January 1 stocks since 1965. Off-farm stocks at 13.3 million bushels were only about one-third of the year earlier holdings. The 7.9 million bushels held on-farm is slightly less than half of the 1973 level. Indicated disappearance during October-December 1973 at 15.7 million bushels was nearly double the 8 million bushels in the comparable quarter a year earlier.

SOYBEANS in all storage positions on January 1, 1974 totaled a record high 1,169 million bushels, 35 percent more than a year earlier. Farm stocks at nearly 617 million bushels were up 44 percent. Off-farm stocks at 552 million bushels were 26 percent above a year earlier.

Stocks on January 1, 1974 indicated a September-December disappearance of 457 million bushels from a total supply of 1,626 million bushels (carryover of about 60 million bushels plus 1973 production of nearly 1,567 million bushels). This compares with a disappearance of 476 million bushels for the same period a year earlier. During the past 4 months, 249 million bushels were crushed and about 183 million bushels were exported.

FLAXSEED stocks on January 1, 1974 totaled 10.4 million bushels, 25 percent below a year earlier and 30 percent below stocks at the beginning of 1972. Flaxseed stored off-farms accounted for 6.4 million bushels, 35 percent below a year earlier. On-farm storage of flaxseed accounted for 4.0 million bushels, 3 percent above January 1, 1973.

Indicated disappearance during October-December 1973 was 3.6 million bushels, off sharply from the same period a year earlier. Disappearance during the 6-month period July-December 1973 was 9.5 million bushels compared with 20.2 million bushels a year earlier. Reported flaxseed crushing during July-December 1973 totaled 9.7 million bushels while exports totaled 0.3 million bushels.

A P P R O V E D:

Don Paarlberg

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## Shelled and Ear Corn - Stocks by positions, by States, January 1, 1972-74

| State | Total all positions 1972 | On farms 1973 2/ | Off farms 1/ 1973 2/ | Total all positions 1973 2/ | On farms 1974 | Off farms 1/ 1974 | Total all positions 1974 |
|---|---|---|---|---|---|---|---|
| | 1,000 bushels | | | | | | |
| Alabama | 16,071 | 13,603 | 1,851 | 15,454 | 12,908 | 2,682 | 15,590 |
| Arizona | * | 263 | 19 | 282 | 144 | 759 | 903 |
| Arkansas | 1,137 | 784 | 362 | 1,146 | 397 | 162 | 559 |
| California | 15,746 | 3,440 | 6,628 | 10,068 | 4,195 | 7,622 | 11,817 |
| Colorado | 29,432 | 22,216 | 6,975 | 29,191 | 21,444 | 11,443 | 32,887 |
| Delaware | 10,310 | 4,049 | 4,540 | 8,589 | 5,534 | 6,353 | 11,887 |
| Florida | 9,889 | 4,237 | 493 | 4,730 | 4,971 | 570 | 5,541 |
| Georgia | 65,437 | 38,740 | 7,692 | 46,432 | 44,890 | 5,912 | 50,802 |
| Idaho | 1,607 | 1,044 | 195 | 1,239 | 1,321 | 285 | 1,606 |
| Illinois | 860,855 | 547,965 | 252,373 | 800,338 | 547,806 | 240,063 | 787,869 |
| Indiana | 393,631 | 284,444 | 66,956 | 351,400 | 293,964 | 76,767 | 370,731 |
| Iowa | 1,048,294 | 946,792 | 282,731 | 1,229,523 | 794,772 | 213,895 | 1,008,667 |
| Kansas | 101,745 | 58,500 | 68,283 | 126,783 | 64,680 | 68,714 | 133,394 |
| Kentucky | 70,008 | 54,944 | 7,747 | 62,691 | 54,944 | 10,269 | 65,213 |
| Louisiana | * | 2,071 | 10,147 | 12,218 | 1,201 | 17,226 | 18,427 |
| Maryland | 23,200 | 12,758 | 11,696 | 24,454 | 17,000 | 14,650 | 31,650 |
| Michigan | 100,964 | 100,048 | 17,221 | 117,269 | 80,106 | 20,687 | 100,793 |
| Minnesota | 478,353 | 428,271 | 79,373 | 507,644 | 349,085 | 86,230 | 435,315 |
| Mississippi | 6,869 | 5,575 | 453 | 6,028 | 3,694 | 379 | 4,073 |
| Missouri | 174,198 | 122,850 | 41,609 | 164,459 | 148,720 | 37,206 | 185,926 |
| Montana | 794 | 328 | 116 | 444 | 482 | 90 | 572 |
| Nebraska | 468,948 | 395,190 | 142,043 | 537,233 | 342,752 | 122,311 | 465,063 |
| Nevada | * | | * | * | | * | * |
| New Jersey | 3,956 | 2,039 | 290 | 2,329 | 2,963 | 204 | 3,167 |
| New Mexico | 646 | 977 | 42 | 1,019 | 735 | * | * |
| New York | * | 11,718 | * | * | 18,572 | * | * |
| North Carolina | 60,910 | 40,960 | 15,515 | 56,475 | 45,920 | 15,596 | 61,516 |
| North Dakota | 7,319 | 7,990 | 1,067 | 9,057 | 6,653 | 802 | 7,455 |
| Ohio | 237,704 | 167,725 | 48,996 | 216,721 | 127,285 | 66,704 | 193,989 |
| Oklahoma | 2,158 | 1,390 | 1,107 | 2,497 | 1,331 | 1,158 | 2,489 |
| Oregon | 631 | 428 | 220 | 648 | 365 | 244 | 609 |
| Pennsylvania | 64,063 | 49,248 | 3,377 | 52,625 | 57,595 | 5,149 | 62,744 |
| South Carolina | 17,477 | 10,631 | 3,516 | 14,147 | 11,116 | 4,307 | 15,423 |
| South Dakota | 101,190 | 122,052 | 11,778 | 133,830 | 92,313 | 11,127 | 103,440 |
| Tennessee | 25,776 | 20,496 | 2,625 | 23,121 | 20,787 | 3,293 | 24,080 |
| Texas | 28,859 | 5,538 | 20,258 | 25,796 | 6,688 | 31,075 | 37,763 |
| Utah | 153 | 324 | 187 | 511 | 501 | 224 | 725 |
| Virginia | 22,759 | 25,000 | 4,998 | 29,998 | 25,410 | 5,441 | 30,851 |
| Washington | 3,221 | 3,110 | 947 | 4,057 | 2,883 | 2,531 | 5,414 |
| West Virginia | * | 2,981 | * | * | 3,294 | * | * |
| Wisconsin | 193,809 | 166,940 | 12,918 | 179,858 | 131,837 | 11,754 | 143,591 |
| Wyoming | 2,080 | 1,466 | 93 | 1,559 | 1,802 | 108 | 1,910 |
| New England | 1,025 | | 587 | 587 | | 747 | 747 |
| Unallocated* | 48,981 | | 3,431 | 18,130 | | 7,478 | 30,079 |
| United States | 4,700,205 | 3,689,125 | 1,141,455 | 4,830,580 | 3,353,060 | 1,112,217 | 4,465,277 |

* Included in unallocated to avoid disclosing individual operations.
1/ Includes stocks at mills, elevators, warehouses, terminals, processors and CCC-owned grain at bin sites.
2/ Revised.

## Off-Farm Grain Storage Capacity

Capacity of off-farm commercial grain storage in the Nation totaled 5,884 million bushels on January 1, 1974, 1 percent greater than a year earlier. Expansion of capacity occurred during the year in 31 States while 11 States recorded declines.

Kansas and Texas continued to rank 1 and 2 respectively in storage capacity and combined to account for about one-fourth of the Nation's capacity.

Illinois, Iowa, and Missouri had the largest increases during the year with 29, 16, and 16 million bushel increases respectively. The largest decline, 22 million bushels, occurred in Texas.

Capacity data, by States, include all elevators, warehouses, terminals, merchant mills, other storages and oilseed crushers which store grain, soybeans or flaxseed. Capacity data exclude CCC bins, warehouses used to store only rice or peanuts, oilseed crushers processing only cottonseed or peanuts, tobacco warehouses, seed warehouses, and storages that handle only dry beans or peas.

Capacity of Off-Farm Grain Storage Facilities, by States, January 1, 1974

| State | Rated Off-farm Storage Capacity: Revised January 1, 1973 | Rated Off-farm Storage Capacity: January 1, 1974 | State | Rated Off-Farm Storage Capacity: Revised January 1, 1973 | Rated Off-Farm Storage Capacity: January 1, 1974 |
|---|---|---|---|---|---|
| | 1,000 bushels | | | 1,000 bushels | |
| Alabama | 18,020 | 18,420 | Nevada | 300 | 300 |
| Arizona | 25,920 | 31,870 | New Jersey | 2,790 | 2,370 |
| Arkansas | 151,860 | 156,080 | New Mexico | 17,190 | 17,720 |
| California | 129,050 | 120,290 | New York | 66,920 | 67,250 |
| Colorado | 80,000 | 78,500 | North Carolina | 48,210 | 51,270 |
| Delaware | 14,430 | 16,270 | North Dakota | 144,630 | 147,600 |
| Florida | 4,290 | 4,300 | Ohio | 174,000 | 183,000 |
| Georgia | 35,000 | 36,400 | Oklahoma | 187,640 | 188,160 |
| Idaho | 49,950 | 51,470 | Oregon | 58,640 | 57,600 |
| Illinois | 572,670 | 601,370 | Pennsylvania | 27,970 | 27,200 |
| Indiana | 170,460 | 179,700 | South Carolina | 28,100 | 26,870 |
| Iowa | 486,000 | 502,000 | South Dakota | 83,960 | 85,770 |
| Kansas | 780,000 | 782,000 | Tennessee | 41,680 | 42,190 |
| Kentucky | 36,690 | 38,370 | Texas | 773,570 | 751,750 |
| Louisiana | 74,760 | 77,920 | Utah | 16,910 | 17,030 |
| Maryland | 33,400 | 33,870 | Virginia | 22,000 | 22,500 |
| Michigan | 59,770 | 61,970 | Washington | 169,410 | 168,190 |
| Minnesota | 351,940 | 352,740 | West Virginia | 290 | 300 |
| Mississippi | 56,080 | 58,580 | Wisconsin | 117,250 | 118,100 |
| Missouri | 183,290 | 199,500 | Wyoming | 4,470 | 4,370 |
| Montana | 49,860 | 48,450 | | | |
| Nebraska | 456,060 | 450,350 | New England | 4,330 | 4,450 |
| | | | | | |
| | | | United States | 5,809,760 | 5,884,410 |

APPENDIX E

SCHEDULE FOR FAS RELEASES

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREIGN AGRICULTURAL SERVICE
Washington, D. C. 20250

January 2, 1974

## RELEASE DATE OF 1974
## WORLD AGRICULTURAL PRODUCTION AND TRADE STATISTICAL REPORT
(Crop and livestock statistics)

The Foreign Agricultural Service has scheduled the following world summaries to be released during the year 1974. These reports have been scheduled to be released on the dates specified below in the Monthly Statistical Report, or Commodity Circular.

(JANUARY-JUNE)

| Release date and commodity | Contents |
|---|---|
| January 31 | |
| Beans, dry edible | Estimated production, 1973-74 |
| Beans, dry edible | International Trade 1972 |
| Fats and Oils | Review of 1973 production |
| Peas, dry edible | Estimated production, 1973-74 |
| Peas, dry edible | International Trade 1972 |
| Wheat and Rye | Estimated production, 1973-74 |
| February 28 | |
| Apples and Pears | Estimated 1973-74 production |
| Apricots, Cherries, Peaches and Plums | Estimate, 1973-74 production, No. Hemisphere |
| Cacao Beans | Estimate, 1973-74 production |
| Cotton | Estimate, 1973-74 acreage and production, 2nd |
| Figs, dried | Estimate, 1973-74 production, current stocks and trade |
| Flaxseed | Estimate, 1973-74 acreage and production |
| Raisins and Currants | Estimate, 1973-74 production |
| World Crops | Summary of 1973-74 World Crop Production |

| Release date and commodity | Contents |
|---|---|
| March 30 | |
| Almonds | Estimate, 1973 production, current stocks and trade |
| Barley and Oats | Estimate, 1973-74 acreage and production |
| Coffee | Estimate, 1973-74 total and exportable production |
| Corn | Production in Northern Hemisphere, 1973-74 preliminary, So. Hemisphere |
| Filberts | Estimate, 1973-74 production |
| Grain | Estimated stocks on Jan. 1, 1973 in major producing countries |
| Potatoes | Estimate, 1973-74 acreage and production in major producing countries |
| Prunes | Estimate, 1973-74 production |
| Soybeans | Estimate, 1973-74 production |
| Sugar | Estimated, 1973-74 stocks |
| Walnuts | Estimate, 1973 production, current stocks and trade |
| Wheat and Rye | Estimate, 1973-74 acreage and production |
| April 30 | |
| Cattle, Hogs and Sheep | Estimated number on farms, 1974 |
| Cotton | Estimated, 1973 consumption |
| Hard fibers | Estimate, 1973 production; abaca, sisal and henequen |
| Olive Oil | Estimate, 1973-74 production |
| Olives, table | Estimate, 1973-74 production; exporting countries |
| May 31 | |
| Butter and Cheese | Estimated 1973 production, selected countries |
| Cotton | Estimate, 1973-74 acreage and production, 3rd estimate |

| Release date and commodity | Contents |
|---|---|
| Cottonseed | Estimate, 1973-74 production |
| hops | Estimated, 1973-74 production |
| ilk | Estimated cows milked, milk production and utilization, principal countries, 1973 |
| eanuts | Estimate, 1973 acreage and production |
| une 29 | |
| offee | Forecast of 1974-75 production, 1st estimate |
| Corn | Estimate, 1973-74 acreage and production |
| Hides and Skins | Production for 1972-73 |
| Lard, Tallow and Greases | Production and International Trade, 1973 |
| Meat | Estimated, 1973 production, by kinds |
| Molasses | Production, 1973-74, 2nd estimate |
| Palm Oils and Kernels | Exports from producing countries, 1973 |
| Rice | Estimate, 1973-74 acreage and production |
| Sugar | Estimate, 1973-74 production |
| Tobacco | International Trade, 1973 |

Interim forecasts and preliminary estimates for individual countries will be prepared as information becomes available and will be released in the current weekly issues of Foreign Agriculture Magazine.

David L. Hume

David L. Hume, Administrator
Foreign Agriculture Service

# A P P E N D I X  F

## EXAMPLE OF FAS STATISTICAL DATA

## WORLD WHEAT PRODUCTION A RECORD IN 1973

World wheat production in 1973 is estimated at 363 million metric tons, 10 percent higher than in 1972 and 7 percent over the previous 1971 record. World wheat area was up 5 percent at 217 million hectares.

**Canada** produced 17.1 million tons of wheat in 1973, up 18 percent mainly due to increased area. The **United States** harvested a record 46.6 million-ton wheat crop, 11 percent larger than in 1972. The U.S. area rose 14 percent to 21.8 million hectares. The Mexican crop was 18 percent higher at 2 million tons.

The **South American** wheat harvest is estimated at 9 million tons, 2 percent over 1972. The Argentine crop is estimated at 5.8 million tons, 15 percent below the previous year as area was reduced by a wet planting season and an unfavorable price situation. Brazilian wheat production is estimated at a more normal 1.9 million tons, after the disastrous harvest of a year earlier.

The **West European** 1973 wheat crop, at 50.2 million tons, was within 2 percent of its 1972 high. The EC harvest at 41.1 million tons was barely below the second level of 1972. France and Italy had small declines and West Germany and the United Kingdom small gains. The Spanish crop was off 14 percent at 3.9 million tons.

**Eastern Europe** produced 31.2 million tons of wheat in 1973, up 2 percent. The Bulgarian harvest gained 16 percent and the Hungarian 10 percent, while the Polish outturn was moderately lower.

The **Soviet Union** had a record wheat crop estimated at 110 million tons, 28 percent over 1972 and 10 percent over the previous high in 1966. Soviet area was 8 percent higher at 63.1 million hectares.

The **African** wheat harvest is estimated at 8.5 million tons, down 8 percent principally because of declines from the good yield in North African countries in 1972.

**Asia**'s 1973 wheat harvest is estimated 4 percent lower for the year at 77.5 million tons. The Indian outturn of 24.9 million tons was down 6 percent. Production was moderately higher in the People's Republic of China and in Pakistan.

The **Australian** wheat crop is estimated at 10.9 million tons well above the 6.5 million-ton harvest of a year earlier. Wet weather and disease shorly before harvest took the edge off high yields and left substantial quantities of weather-damaged and light-weight wheat.

WHEAT : AREA, YIELD, AND PRODUCTION IN SPECIFIED COUNTRIES, YEAR OF HARVEST, AVERAGE 1967-71, ANNUAL 1972 AND 1973 1/

| CONTINENT AND COUNTRY | AREA 2/ AVE. 1967-71 | AREA 2/ 1972 | AREA 2/ 1973 3/ | YIELD AVE. 1967-71 | YIELD 1972 | YIELD 1973 3/ | PRODUCTION AVE. 1967-71 | PRODUCTION 1972 | PRODUCTION 1973 3/ |
|---|---|---|---|---|---|---|---|---|---|
| | THOUSAND HA | THOUSAND HA | THOUSAND HA | QU/HA | QU/HA | QU/HA | THOUSAND MT | THOUSAND MT | THOUSAND MT |
| NORTH AMERICA: | | | | | | | | | |
| CANADA | 9,421 | 8,640 | 10,021 | 16.0 | 16.8 | 17.1 | 15,106 | 14,514 | 17,112 |
| GUATEMALA | 37 | 45 | 47 | 8.8 | 9.8 | 9.4 | 32 | 44 | 44 |
| HONDURAS | | 1 | 1 | 10.0 | 10.0 | 10.0 | | 1 | 1 |
| MEXICO | 715 | 680 | 720 | 28.0 | 25.0 | 27.8 | 2,005 | 1,108 | 2,000 |
| UNITED STATES | 20,363 | 19,126 | 21,803 | 20.0 | 22.0 | 21.4 | 40,694 | 42,046 | 46,577 |
| TOTAL | 32,537 | 28,502 | 32,592 | 18.9 | 23.5 | 22.2 | 57,838 | 58,305 | 65,734 |
| SOUTH AMERICA: | | | | | | | | | |
| ARGENTINA | 4,971 | 4,690 | 4,000 | 12.3 | 14.5 | 14.5 | 6,136 | 6,800 | 5,800 |
| BRAZIL | 1,293 | 1,500 | 1,820 | 9.2 | 4.5 | 10.5 | 1,192 | 680 | 1,916 |
| BOLIVIA | 75 | 90 | 118 | 7.9 | 8.7 | 8.9 | 60 | 78 | 105 |
| CHILE | 724 | 534 | 550 | 16.6 | 14.0 | 14.0 | 1,202 | 747 | 776 |
| COLOMBIA | 67 | 57 | 45 | 11.3 | 11.4 | 11.1 | 76 | 65 | 50 |
| ECUADOR | 72 | 60 | 69 | 9.0 | 8.3 | 8.2 | 65 | 50 | 40 |
| PARAGUAY | 36 | 30 | 25 | 10.3 | 6.3 | 10.0 | 37 | 19 | 25 |
| PERU | 143 | 140 | 145 | 9.2 | 10.0 | 10.3 | 132 | 140 | 149 |
| URUGUAY | 354 | 185 | 145 | 10.1 | 10.1 | 6.9 | 358 | 180 | 100 |
| VENEZUELA | 2 | 1 | 1 | 7.5 | 10.0 | 10.0 | 1 | | 1 |
| TOTAL | 7,737 | 7,287 | [illegible] | 12.0 | 12.3 | [illegible] | 9,257 | 8,766 | [illegible] |
| EUROPE: | | | | | | | | | |
| BELGIUM | 200 | 204 | 193 | 41.5 | 44.9 | 46.3 | 832 | 916 | 894 |
| DENMARK | 104 | 135 | 119 | 46.5 | 43.9 | 43.9 | 482 | 592 | 523 |
| FRANCE | 3,955 | 3,958 | 3,946 | 36.5 | 45.8 | 45.2 | 14,427 | 18,123 | 17,844 |
| GERMANY, WEST | 1,482 | 1,626 | 1,603 | 40.4 | 39.4 | 43.2 | 5,979 | 6,410 | 6,921 |
| IRELAND | 87 | 68 | 55 | 38.6 | 36.2 | 29.8 | 335 | 246 | 164 |
| ITALY | 4,112 | 3,821 | 3,619 | 23.6 | 24.7 | 24.8 | 9,704 | 9,423 | 8,958 |
| LUXEMBOURG | 14 | 11 | 11 | 30.7 | 31.8 | 32.7 | 42 | 35 | 36 |
| NETHERLANDS | 149 | 156 | 138 | 47.0 | 43.3 | 52.2 | 701 | 676 | 720 |
| UNITED KINGDOM | 970 | 1,127 | 1,155 | 40.8 | 42.2 | 43.5 | 3,957 | 4,751 | 5,030 |
| TOTAL EC | 11,073 | 11,135 | 10,839 | 32.9 | 37.1 | 37.9 | 36,459 | 41,172 | 41,130 |
| AUSTRIA | 291 | 274 | 271 | 33.1 | 31.5 | 34.5 | 965 | 863 | 935 |
| FINLAND | 209 | 179 | 180 | 22.5 | 25.9 | 22.2 | 471 | 463 | 417 |
| GREECE | 971 | 904 | 865 | 18.6 | 21.2 | 20.1 | 1,804 | 1,919 | 1,730 |
| MALTA-GOZO | 1 | 1 | 1 | 15.0 | 20.0 | 20.0 | 2 | 2 | 2 |
| NORWAY | 4 | 3 | 4 | 31.6 | 40.0 | 30.0 | 12 | 12 | 12 |
| PORTUGAL | 599 | 511 | 479 | 10.6 | 12.0 | 10.2 | 634 | 612 | 489 |
| SPAIN | 3,827 | 3,560 | 3,140 | 13.2 | 12.8 | 12.5 | 5,054 | 4,562 | 3,932 |
| SWEDEN | 255 | 268 | 304 | 39.8 | 42.9 | 41.0 | 1,016 | 1,150 | 1,245 |
| SWITZERLAND | 100 | 89 | 87 | 39.4 | 40.9 | 41.4 | 394 | 364 | 350 |
| TOTAL WESTERN EUROPE | 17,330 | 16,895 | 16,179 | 27.0 | 30.3 | 31.0 | 46,810 | 51,129 | 50,220 |
| ALBANIA | 136 | 135 | 135 | 14.7 | 14.8 | 14.8 | 199 | 200 | 200 |
| BULGARIA | 1,038 | 960 | 975 | 27.9 | 37.1 | 37.3 | 2,900 | 3,560 | 3,637 |
| CZECHOSLOVAKIA | 1,033 | 1,192 | 1,235 | 30.9 | 33.7 | 37.7 | 3,196 | 4,016 | 4,655 |
| GERMANY, EAST | 579 | 690 | 700 | 38.0 | 39.8 | 39.5 | 2,200 | 2,744 | 2,765 |
| HUNGARY | 1,209 | 1,317 | 1,300 | 27.4 | 31.0 | 34.6 | 3,315 | 4,089 | 4,495 |
| POLAND | 1,915 | 2,048 | 1,962 | 24.2 | 25.1 | 27.0 | 4,640 | 5,147 | 5,296 |
| ROMANIA | 2,662 | 2,522 | 2,450 | 18.0 | 24.0 | 22.4 | 4,794 | 6,047 | 5,500 |
| YUGOSLAVIA | 1,934 | 1,924 | 1,696 | 24.3 | 25.2 | 27.7 | 4,691 | 4,843 | 4,703 |
| TOTAL EASTERN EUROPE | 10,506 | 10,788 | 10,453 | 24.7 | 28.4 | 29.3 | 25,933 | 30,646 | 31,251 |
| TOTAL EUROPE | 27,836 | 27,683 | 26,631 | 26.1 | 29.5 | 30.5 | 72,743 | 81,775 | 81,471 |
| U.S.S.R. (EUROPE AND ASIA) 4/ | 65,990 | 58,500 | 63,130 | 13.6 | 14.7 | 17.4 | 89,845 | 85,800 | 110,100 |
| AFRICA: | | | | | | | | | |
| ALGERIA | 2,209 | 2,200 | 2,150 | 6.2 | 6.1 | 5.1 | 1,376 | 1,350 | 1,100 |
| EGYPT | 552 | 521 | 570 | 26.9 | 31.0 | 32.2 | 1,486 | 1,616 | 1,837 |
| ETHIOPIA | 1,068 | 1,100 | 1,110 | 7.6 | 7.8 | 7.7 | 810 | 860 | 850 |
| KENYA | 152 | 104 | 100 | 13.5 | 14.4 | 14.5 | 205 | 150 | 145 |
| MOROCCO | 1,847 | 2,058 | 2,187 | 10.0 | 11.7 | 8.7 | 1,839 | 2,405 | 1,897 |
| NIGERIA | 2 | 3 | 3 | 20.0 | 20.0 | 20.0 | 5 | 6 | 6 |
| SOUTH AFRICA | 1,739 | 2,017 | 2,025 | 7.7 | 8.7 | 8.2 | 1,338 | 1,746 | 1,660 |
| SUDAN | 100 | 124 | 122 | 11.5 | 13.3 | 13.9 | 116 | 165 | 170 |
| TANZANIA | 39 | 53 | 43 | 12.1 | 12.3 | 11.6 | 48 | 65 | 50 |
| TUNISIA | 764 | 1,000 | 950 | 5.3 | 8.0 | 7.9 | 403 | 800 | 750 |
| TOTAL | 8,473 | 9,130 | 9,250 | 9.0 | 10.0 | 9.1 | 7,625 | 9,163 | 8,465 |
| ASIA: | | | | | | | | | |
| AFGHANISTAN | 2,800 | 2,513 | 3,000 | 9.0 | 11.7 | 12.3 | 2,508 | 2,952 | 3,700 |
| BANGLADESH | 24 | 120 | 127 | 9.4 | 9.4 | 7.1 | 23 | 113 | 90 |
| BURMA | 84 | 80 | 80 | 5.4 | 6.3 | 6.3 | 45 | 50 | 50 |
| CHINA, PEOPLE'S REP OF | 24,440 | 24,400 | 25,000 | 9.7 | 10.7 | 10.8 | 23,600 | 26,000 | 27,000 |
| CHINA, REP OF (TAIWAN) | 5 | 1 | 1 | 20.0 | 20.0 | 20.0 | 10 | 2 | 2 |
| CYPRUS | 56 | 55 | 15 | 13.6 | 9.1 | 6.7 | 77 | 50 | 10 |
| INDIA | 15,732 | 19,139 | 19,881 | 11.5 | 13.8 | 12.5 | 18,102 | 26,410 | 24,923 |
| IRAN | 4,280 | 4,300 | 4,300 | 9.1 | 9.1 | 9.3 | 3,880 | 3,900 | 4,000 |
| IRAQ | 1,872 | 2,100 | 2,000 | 5.7 | 7.6 | 4.0 | 1,059 | 1,600 | 800 |
| ISRAEL | 105 | 109 | 106 | 16.7 | 27.5 | 20.8 | 176 | 300 | 220 |
| JAPAN | 274 | 114 | 75 | 26.8 | 24.9 | 26.9 | 736 | 284 | 202 |
| JORDAN | 260 | 278 | 150 | 6.3 | 9.6 | 4.0 | 164 | 266 | 60 |
| KOREA, REP OF | 164 | 103 | 100 | 20.7 | 23.4 | 23.5 | 340 | 241 | 235 |
| LEBANON | 61 | 64 | 64 | 8.6 | 9.4 | 4.7 | 52 | 60 | 30 |
| NEPAL | 159 | 150 | 150 | 13.3 | 14.0 | 13.3 | 211 | 210 | 200 |
| PAKISTAN | 6,016 | 5,799 | 6,070 | 10.4 | 11.9 | 12.1 | 6,247 | 6,889 | 7,325 |
| SAUDI ARABIA | 100 | 100 | 100 | 14.6 | 15.0 | 15.0 | 146 | 150 | 150 |
| SOUTHERN YEMEN | 14 | 14 | 14 | 11.0 | 10.7 | 10.7 | 16 | 15 | 15 |
| SYRIA | 865 | 1,200 | 800 | 8.1 | 11.3 | 5.6 | 700 | 1,350 | 450 |
| TURKEY | 8,160 | 8,130 | 8,100 | 10.9 | 11.7 | 9.9 | 8,880 | 9,500 | 8,000 |
| TOTAL | 55,473 | 63,739 | 70,133 | 12.2 | 11.7 | 11.3 | 66,971 | 80,342 | 77,663 |
| OCEANIA: | | | | | | | | | |
| AUSTRALIA | 8,606 | 7,778 | 8,768 | 11.5 | 8.4 | 12.4 | 9,859 | 6,510 | 10,900 |
| NEW ZEALAND | 115 | 128 | 85 | 33.0 | 30.9 | 33.8 | 381 | 395 | 287 |
| TOTAL | 8,722 | 7,906 | 8,853 | 11.7 | 8.7 | [illegible] | 10,240 | 6,905 | [illegible] |
| WORLD TOTAL | 214,766 | 207,797 | 217,467 | 14.6 | 15.9 | 16.7 | 314,519 | 331,056 | 363,269 |

1/ Years shown refer to year of harvest in the Northern Hemisphere. Harvests of Northern Hemisphere countries are combined with those of the Southern Hemisphere which immediately follow; thus, the crop harvested in the Northern hemisphere in 1973 is combined with estimates for the Southern Hemisphere harvest which begins late in 1973 and ends early in 1974. 2/ Harvested area as far as possible. 3/ Preliminary. 4/ Production estimates for the USSR are expressed in terms of gross weight, the same as official Soviet data.

Foreign Agricultural Service. Prepared or estimated on the basis of official statistics of foreign governments, reports of U.S. Agricultural Attaches and other foreign source materials.

# A P P E N D I X G

## FAS, FOREIGN AGRICULTURE CIRCULARS

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREIGN AGRICULTURAL SERVICE
WASHINGTON, D. C. 20250

# FOREIGN AGRICULTURE CIRCULARS

The Foreign Agricultural Service issues a number of Foreign Agriculture Circulars at irregular intervals during the year on various commodities and export services for the food and agricultural trade, as well as specialized publications pertaining to individual commodities. These circulars are distributed without cost and are available to residents of the UNITED STATES.

Each circular has its own mailing list of recipients and if you wish to receive any of them, please check those in which you are interested, return this checklist, and we will send you copies of our releases as they are issued.

_____ 10003, Fats and Oils
_____ 10004, Grains (other than rice)
_____ 10005, Livestock and Meat
_____ 10006, Cotton
_____ 10007, Coffee
_____ 10008, Dried Pulses
_____ 10009, Canned Deciduous Fruits
_____ 10010, Citrus Fruits
_____ 10011, Cocoa
_____ 10012, Dairy
_____ 10013, Deciduous Fruits
_____ 10014, Dried Fruits
_____ 10015, Hops
_____ 10016, Nuts
_____ 10017, Poultry and Eggs
_____ 10018, Rice
_____ 10019, Seeds, Field and Vegetable
_____ 10020, Sugar
_____ 10021, Tea and Spices
_____ 10022, Tobacco
_____ 10023, Vegetable Fibers
_____ 10024, Wool
_____ 10025, Honey

_____ 10002, <u>World Agricultural Production and Trade Statistical Report</u>
Issued the last day of each calendar month; summarizes statistics on production and trade on the principal commodities that move in world trade.

---

To: Foreign Agricultural Service
Foreign Market Information Division
Information Services Branch, Room 5918 So.
U.S. Department of Agriculture
Washington, D. C. 20250

Please add the following name to the above checked circulars:

_______________________________________
(Name)

_______________________________________
(Organization or Firm)

_______________________________________
(Street address or P.O. Box Number)

_______________________________________
(City) (State) (ZIP CODE)

**RICE: World trade, production and stocks for 1971-72, 1972-73, and projected levels for 1973-74 1/**
**(In million metric tons)**

| Country or Region | 1971-72 | 1972-73 (preliminary) | Projected for 1973-74 as of December 10 |
|---|---|---|---|
| Production: 2/ | | | |
| Bangladesh | 15.7 | 15.4 | 18.2 |
| Burma | 8.2 | 7.4 | 8.6 |
| India | 64.0 | 58.0 | 65.5 |
| Indonesia | 19.6 | 19.0 | 20.3 |
| Japan | 13.6 | 14.9 | 15.2 |
| Pakistan | 3.3 | 3.5 | 2.9 |
| PRC | 100.0 | 98.0 | 103.0 |
| South Korea | 5.6 | 5.8 | 6.1 |
| Thailand | 12.3 | 11.8 | 13.5 |
| Sub-total | 242.3 | 233.8 | 253.3 |
| EC-9 | 1.0 | .8 | 1.1 |
| Australia | .2 | .3 | .4 |
| Argentina | .3 | .3 | .3 |
| Brazil | 5.4 | 6.2 | 6.2 |
| All Others | 46.3 | 40.2 | 41.5 |
| Total non-U.S. | 295.5 | 281.6 | 302.8 |
| USA | 3.9 | 3.9 | 4.3 |
| World Total | 299.4 | 285.5 | 307.1 |
| | 1972 | 1973 | 1974 |
| Exports: 3/ | | | |
| Burma | .5 | .1 | .6 |
| Pakistan | .2 | .8 | .4 |
| Japan | .2 | .5 | .4 |
| PRC | .8 | 1.1 | 1.3 |
| Thailand | 2.1 | .9 | 1.4 |
| Sub-total | 3.8 | 3.4 | 4.1 |
| All Others | 1.6 | 1.3 | 1.4 |
| Total non-U.S. | 5.4 | 4.7 | 5.5 |
| USA | 2.0 | 1.8 | 1.9 |
| World Total | 7.4 | 6.5 | 7.4 |
| Imports: | | | |
| EC-9 | .5 | .6 | .6 |
| Hong Kong | .4 | .4 | .4 |
| Bangladesh | .7 | .4 | .5 |
| Cambodia | — | .1 | .3 |
| Indonesia | .7 | 1.4 | 1.2 |
| South Korea | .5 | .4 | .3 |
| Philippines | .6 | .3 | .4 |
| South Vietnam | .1 | .3 | .3 |
| All Others | 3.9 | 2.6 | 3.4 |
| World Total | 7.4 | 6.5 | 7.4 |
| Stocks: | | | |
| Thailand (ending Dec. 31) | .6 | .1 | .5 |
| USA (ending July 31) | .4 | .2 | .2 |

1/ Production is on a rough basis; trade and stocks are listed as milled.
2/ The world rice harvest stretches over 6-8 months. Thus 1973-74 production, for example, represents the 1973 harvest in the Northern Hemisphere plus preliminary data for the Southern Hemisphere where harvest began late in 1973 and will end early in 1974.
3/ Trade data are on a calendar year basis.

# A P P E N D I X H

## FAS SPECIAL REPORTS

UNITED STATES DEPARTMENT OF AGRICULTURE
Washington, D.C. 20250

# FOREIGN AGRICULTURAL SERVICE

## SPECIAL REPORTS

The Foreign Agricultural Services publishes special reports on foreign agriculture, particularly relating to agricultural commodity and trade policy developments.

These reports appear in two different numbered series -- FAS-M (M iscellaneous) and FAR (Foreign Agriculture Report). The FAS-M series consists of reports on recent developments; the F A R series consists of more comprehensive reports, covering situations in greater depth.

Libraries and instructors may obtain as many as one each of 100 free publications. The Department is unable to supply them in quantity for individual textbook use. Not more than one copy each of 10 publications is allowed on other requests.

Copies of these FAS publications may be obtained by writing to the Information Services Staff, FAS, Room 5918, U.S. Department of Agriculture, Washington, D.C. 20250.

Tobacco in Australia March 1972 .............................. FAS-M-242

Italy's Changing Tobacco Industry March 1972 ................. FAS-M-243

U.S. Mint Oil in the European Market July 1972 ............... FAS-M-244

The Walnut Industries of the Mediterranean Basin
April 1972 ................................................... FAS-M-245

Review of World Rice Markets and Major Suppliers
August 1972 .................................................. FAS-M-246

The Netherlands Poultry Meat Industry August 1972 ............ FAS-M-247

West African Production and Export Prospects for Oil and
Palm Kernel Oil to 1980 September 1972 ....................... FAS-M-248

Trends in World Grain Production 1960-1972--Area,
Production, Yield February 1973 .............................. FAS-M-249

The World's Cotton: A Summary of Cotton Fiber and
Processing Test Results March 1973 ........................... FAS-M-250

Implications of European Community Enlargement for U.S.
Tobacco Exports February 1973 ................................ FAS-M-251

Knits in Western Europe--Their Impact on Cotton July 1973 .... FAS-M-252

Production and Trade Prospects for Argentine Oilseeds and
Their Products August 1973 ................................... FAS-M-253

Cotton in the Soviet Union October 1973 ...................... FAS-M-254

The Common Agricultural Policy of the European
Community November 1973 ...................................... FAS-M-255

Food and Agricultural Exhibits of the World
November 1973 ................................................ FAS-M-256

## A P P E N D I X  I

## EXAMPLE OF FOOD SITUATION REPORT

RESTRICTED - NOT FOR PUBLICATION
DISTRIBUTION RESTREINTE - NE PAS PUBLIER
DISTRIBUCION LIMITADA - NO DEBE PUBLICARSE

ESC:EWS/1974/2
20 February 1974

# EARLY WARNING SYSTEM FOR FOOD SHORTAGES
# SYSTEME D'ALERTE RAPIDE EN CAS DE PENURIES ALIMENTAIRES
# SISTEMA DE ALERTA DE LA FAO EN CASOS DE ESCASEZ DE ALIMENTOS

## MONTHLY SUMMARY OF FOOD SITUATION REPORTS
Résumé mensuel des rapports de la situation agricole
Resumen mensual sobre la situación alimentaria

SERIOUS FOOD SHORTAGES exist in:

| | | |
|---|---|---|
| CHAD* | MAURITANIA* | SENEGAL* |
| ETHIOPIA* | NIGER* | UPPER VOLTA* |
| MALI* | | |

* Emergency aid requested or international appeal issued

FOOD SHORTAGES exist in:

| | | | |
|---|---|---|---|
| BOLIVIA* | PAKISTAN* | EGYPT ARAB REP.* | DAHOMEY |
| CHILE* | | JORDAN* | NIGERIA |
| | | SYRIAN ARAB REP.* | |
| | | YEMEN ARAB REP.* | |

* FAO/WFP emergency aid in operation or requested

DANGER OF FOOD SHORTAGES reported in:

| | |
|---|---|
| INDIA | SUDAN |
| | YEMEN P.D.R. |

Further FAO/WFP emergency aid requested

WARNING OF POOR HARVESTS or uncertain crop conditions are reported for the following countries:

| | | | |
|---|---|---|---|
| GUYANA | INDONESIA | IRAQ | ALGERIA |
| | | SOMALI DEM. REP. | GUINEA |
| | | YEMEN ARAB REP. | KENYA |
| | | | TANZANIA |
| | | | ZAIRE |

| Country/Source<br>Pays Source | Date | Current 1/ crop index %<br>Récolte 1/ actuelle indice % | Crop conditions *<br>Etat des cultures * | Plantings *<br>Plantations * | Progress of harvest *<br>Progrès de la récolte * | Rainfall **<br>Pluviosité ** | Comments/Observations |
|---|---|---|---|---|---|---|---|
| Uruguay (FAO) | 30/1 | ... | A 2/ – B 3/ | B | C | 5 | Heavy January rains favoured pastures and food crops although outbreak of fungus disease expected due to high humidity. |
| Venezuela (FAO) | 4/2 | ... | B | A | B | 3 | Grain and bean shortages at the retail level caused by smaller crop due to drought in 1973 and low producer prices. Domestic supplies supplemented by imports to meet domestic demand for both food and feedgrains. |
| NORTH AMERICA | | | | | | | |
| Canada (IWC) | 30/1 | 118 | ... | ... | ... | ... | 1973 wheat crop 17.1 million tons, 18% over previous year. Reasonably good soil conditions for spring wheat plantings reported. Export estimate for 1973/74 (July-June) reduced from 14.0 million tons to 13.0 million tons due to rail strike. |
| U.S.A. (FAO) | 19/2 | ... | B | ... | ... | 3 | Continued large export demand and short supplies caused further rise in prices particularly of wheat. Import quotas on wheat and milled wheat products suspended up to 30/6/1974 to allow imports of Canadian wheat if required. For 1974 crops, U.S. farmers intend planting 19% more wheat, 5% more coarse grains than in 1973 (10% more maize but less barley and oats). Some decline in area under rice and soybeans foreseen. Condition of winter wheat satisfactory but yield prospects for all crops could be affected by fertilizer shortages. |
| FAR EAST | | | | | | | |
| Bangladesh (FAO) | 31/12 1973 | 136 | A | B | B | 3 | Cyclonic storm hit southern areas on 10 December causing considerable damage and loss of approximately 250 000 tons of paddy. Current overall crop prospect, however, remains favourable and paddy output expected to be 12.75 million tons compared to 9.44 million tons last year. Government's foodgrain procurement programme proceeding satisfactorily. |
| China (ESC) | 26/12 1973 | 104 | ... | ... | ... | ... | 1973 grain production higher than 250 million tons, the previous record in 1971/72. Despite this, grain imports during 1973/74 estimated at about 9 million tons, 40% higher than the 1972/73 level. |

1/ Main food crop in 73 (or 73/74) as % of previous year's crop / Récolte de la principale culture vivrière en 73 (ou 73/74) en pourcentage de celle de l'année précédente.

* A = Above average/early – Au-dessus de la moyenne/précoce
B = Average/normal – Moyenne/normale
C = Below average/delayed – Au-dessous de la moyenne/tardive
D = Partial failure/sharp reduction – Echec partiel/forte diminution

** Rainfall / Pluviosité
1 = Very dry / Très sec
2 = Dry / Sec
3 = Normal / Normale
4 = Wet / Humide
5 = Very wet / Très humide

2/ Pastures; 3/ Crops.

# A P P E N D I X   J

## EXAMPLES OF FAO QUESTIONAIRES

ANNUAL EXPORTS AND IMPORTS

| S.I.T.C. Revised | Corresponding BTN Heading | COMMODITY | FAO No. | Unit for quantities | Exports | | Imports | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Quantities | Value | Quantities | Value |
| | | DIVISION 04. CEREALS AND CEREAL PREPARATIONS | 040.000 | | | | | |
| 041 | 10.01 | Wheat (including spelt) and meslin, unmilled | 041.000 | | | | | |
| 042 | | Rice | | | | | | |
| 042.1 | 10.06A | Rice in the husk (paddy) | 042.101 | | | | | |
| | | Rice, husked but not further prepared | 042.102 | | | | | |
| 042.2 | 10.06B | Rice, glazed or polished, but not otherwise worked (including broken rice) | 042.200 | | | | | |
| 043 | 10.03 | Barley, unmilled | 043.000 | | | | | |
| 044 | 10.05 | Maize (corn), unmilled | 044.000 | | | | | |
| 045 | | Cereals, unmilled, other than wheat, rice, barley and maize | | | | | | |
| 045.1 | 10.02 | Rye, unmilled | 045.100 | | | | | |
| 045.2 | 10.04 | Oats, unmilled | 045.200 | | | | | |
| 045.9 | 10.07 | Cereals, unmilled, n.e.s. | 045.900 | | | | | |
| 046 | | Meal and flour of wheat or of meslin | | | | | | |
| 046.0(1) | 11.01A | Flour of wheat or of meslin | 046.010 | | | | | |
| 046.0(2) | 11.02A | Meal and groats of wheat or of meslin | 046.020 | | | | | |
| 047 | | Meal and flour of cereals, except meal and flour of wheat or of meslin | | | | | | |
| 047.0(1) | 11.01B | Cereal flours, except flour of wheat or of meslin | 047.010 | | | | | |
| 047.0(2) | 11.02B | Cereal meal and groats (except of wheat or of meslin) | 047.020 | | | | | |
| 048 | | Cereal preparations and preparations of flour and starch of | | | | | | |

Food and Agriculture Organization of the United Nations

# SPECIAL QUESTIONNAIRE ON AGRICULTURAL PRODUCTION STATISTICS FOR THE CALCULATION OF INDEX NUMBERS OF AGRICULTURAL PRODUCTION

se return two copies by AIRMAIL
e to reach Rome by 12 May 1973

Country ______________________

Address: FAO, Statistics Division
Via delle Terme di Caracalla
00100 – ROME, Italy

NOTE: If the final production data are not yet available, please report the latest estimate

| CROPS | Unit of measurement | Production data for the year 1972 or 1972/73 | Data specification [1] |
|---|---|---|---|
| Wheat | | | |
| Rye | | | |
| Barley | | | |
| Rice, paddy | | | |
| Maize | | | |
| Millet | | | |
| Sorghum | | | |
| Potatoes | | | |
| Sweet potatoes and yams | | | |
| Cassava | | | |
| Coffee | | | |
| obacco leaves (farm sales weight) | | | |
| gar – Centrifugal | | | |
| Non-centrifugal | | | |
| Cotton (lint) | | | |
| Cottonseed | | | |
| Groundnuts (in shell) | | | |
| Others | | | |
| | | | |
| | | | |

| LIVESTOCK PRODUCTS | Unit of measurement | Production data for the year 1972 or 1972/73 | Coverage of the data 2/ | Percentage of data reported to total [3] |
|---|---|---|---|---|
| Cow milk | | | | |
| Meat (Please see footnote 4) | | | | |
| – Beef and veal | | | | |
| – Mutton and lamb | | | | |
| – Goat and kid | | | | |
| – Pork | | | | |
| Hen eggs | | | | |
| Wool, greasy | | | | |
| Others (specify) | | | | |
| | | | | |

Please indicate whether data reported are "revised", "final", "3rd, 2nd, 1st estimates", "preliminary", "forecast", etc. – [2] Please state whether the data reported refer to total production or to a portion of production: e.g. commercial or inspected, sales, deliveries to marketing boards, etc. – [3] If the data reported do not cover the total production, please give an estimated percentage of the data reported to the total production. – [4] Meat production in dressed carcass weight from indigenous animals only, including, where applicable, the meat equivalent of exported live animals.

ESS SK/E 4 - D 7746 - e

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

# ANNUAL QUESTIONNAIRE ON AREA, PRODUCTION, AND UTILIZATION OF RICE – 1972

| Country |
|---|
| |
| Date of completion of questionnaire |
| |
| Unit of area ........................ |
| Unit of quantity ........................ |

*Please return in duplicate, by AIRMAIL, in time to reach Rome by 1 February 1973*
to: FAO, Statistics Division, Via delle Terme di Caracalla, 00100, ROME, Italy

## A. CURRENT SEASON'S PRODUCTION 1/

| | Area | Production |
|---|---|---|
| Preliminary estimates for 1972 or 1972/73 for rice (paddy) | | |

## B. SUPPLY AND UTILIZATION – 1970 AND 1971 1/

| | Rice | | Rice bran 2/ | |
|---|---|---|---|---|
| | ☐ 1970 or ☐ 1970/71 | ☐ 1971 or ☐ 1971/72 | ☐ 1970 or ☐ 1970/71 | ☐ 1971 or ☐ 1971/72 |
| 1. Area harvested, total 3/ | | | | |
| 2. Production (total in terms of paddy) 3/ | | | | |
| 2.1 Production marketed | | | | |
| 3. Production (total in terms of milled rice) 4/ | | | | |
| 4. Imports 5/ | | | | |
| 5. Stocks at the beginning of period 6/ | | | | |
| 6. Gross total supply (3+4+5) | | | | |
| 7. Exports 5/ | | | | |
| 8. Total domestic utilization | | | | |
| 8.1 Feed, total | | | | |
| 8.11 Direct | | | | |
| 8.12 Processed | | | | |
| 8.2 Seed | | | | |
| 8.3 Processing (not for food or feed), total | | | | |
| 8.31 For beverages, total | | | | |
| a) Beer | | | | |
| b) Alcohol and distilled spirits | | | | |
| c) Other beverages | | | | |
| 8.32 For other industrial uses | | | | |
| 8.4 Waste and losses 7/ | | | | |
| 8.5 Food, total | | | | |
| 8.51 As rice 8/ | | | | |
| 8.52 As rice products | | | | |
| 9. Stocks at the end of period 6/ | | | | |
| 10. Other by-products available from domestic processing (in terms of product weight) | | | | |
| a) Husks | | | | |
| b) Milling Offals | | | | |
| c) ........................ | | | | |

1/ REFERENCE PERIOD OF DATA: A standard reference period will have to be adopted for all the various items of the questionnai... This should the calendar year wherever possible, but countries may adopt another 12-month period suitable in the light of their crop seasons, statistical report traditions and the availability of statistics, particularly on stocks. Stock data reported in the questionnaire will then refer to the beginning and e of the reference period adopted and the data on the different flows (trade, feed, processing) will refer to this period. Production and seed should those falling within the period adopted, and the area should be that from which the reported production is harvested.
Please, give below the reference period adopted (if other than calendar year):

Countries may wish to indicate the types of utilization statistics (including trade) for which information is available also on calendar year bas

2/ Production data for rice bran should include all bran obtained from the milling of paddy (domestic and imported) during the reference period. All ... for bran should be given in terms of bran.

3/ Please give further details on area and production in table C.

4/ Please report all data referring to items 3 - 9 expressed in terms of milled rice equivalent. If this is not possible, please indicate whether data are terms of paddy or husked (brown) rice. Please give in table F appropriate factors for converting one kind of rice into the other.

5/ Please give further details on trade in table D.

6/ Please give further details on stocks in table E.

7/ Excluding harvest losses but including storage and transport losses of both rice and derived products.

8/ ... human consumption of husked rice as such, please indicate its approximate proportion to total human consumption of



9/E 1072 500

Country

C. AREA AND PRODUCTION OF RICE

| | 1970 or 1970/71 | | | | | | 1971 or 1971/72 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AREA | | | | PRODUCTION | | AREA | | | | PRODUCTION | |
| | Sown | | Harvested | | | | Sown | | Harvested | | | |
| | | 1/ | | 1/ | | 2/ | | 1/ | | 1/ | | 2/ |
| 1. Total (all rice crops) | | | | | | | | | | | | |
| 1.1 of which: Main crop | | | | | | | | | | | | |
| 1.2 Secondary crop | | | | | | | | | | | | |
| 1.3 Third crop | | | | | | | | | | | | |
| 1.a Upland rice | | | | | | | | | | | | |
| 1.b Double cropping (two or more crops of rice in the same land) | | | | | | | | | | | | |
| 1.c Irrigation (with artificial means) | | | | | | | | | | | | |
| Methods of planting: | | | | | | | | | | | | |
| 1.d Transplanted | | | | | | | | | | | | |
| 1.e Broadcast | | | | | | | | | | | | |
| 1.f Other methods | | | | | | | | | | | | |

1/ Please indicate in this column with letter N or G whether reported area figures relate to Net or Gross area. (Net area means area actually occupied by rice plants). (Gross area means total cadastral area under rice including field irrigation bunds, etc. within fields).

2/ Please indicate in this column with letter P, H or M whether reported production figures relate to Paddy, Husked (Brown) or Milled rice (including brokens).

D. TRADE BY KINDS

Please give below the trade specified by kinds. Where data differ from those provided by the customs authorities, please show also the latter.

| | Paddy | | Husked | | Milled | | Brokens | | Rice bran | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1970 or 1970/71 | 1971 or 1971/72 | 1970 or 1970/71 | 1971 or 1971/72 | 1970 or 1970/71 | 1971 or 1971/72 | 1970 or 1970/71 | 1971 or 1971/72 | 1970 or 1970/71 | 1971 or 1971/72 |
| | | | | | | | | | | |
| Customs data | | | | | | | | | | |
| Exports | | | | | | | | | | |
| Customs data | | | | | | | | | | |

E. STOCKS BY KINDS AND HOLDER

| | Paddy | | Husked | | Milled | | Brokens | | Rice bran | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1970 or 1970/71 | 1971 or 1971/72 | 1970 or 1970/71 | 1971 or 1971/72 | 1970 or 1970/71 | 1971 or 1971/72 | 1970 or 1970/71 | 1971 or 1971/72 | 1970 or 1970/71 | 1971 or 1971/72 |
| Stocks at the beginning of period | | | | | | | | | | |
| a. Government-owned | | | | | | | | | | |
| b. With mills and merchants | | | | | | | | | | |
| c. On farms | | | | | | | | | | |
| Stocks at the end of the period | | | | | | | | | | |
| a. Government-owned | | | | | | | | | | |
| b. With mills and merchants | | | | | | | | | | |
| c. On farms | | | | | | | | | | |

F. CONVERSION FACTORS
(Out-turn in percentages)

| | | To husked | | To milled | |
|---|---|---|---|---|---|
| | | 1970 or 1970/71 | 1971 or 1971/72 | 1970 or 1970/71 | 1971 or 1971/72 |
| From paddy | Total processing | | | | |
| | Commercial processing | | | | |
| | Non-commercial processing | | | | |
| From husked | Total processing | | | | |
| | Commercial processing | | | | |
| | Non-commercial processing | | | | |

G. REMARKS:

# APPENDIX K

## DESCRIPTION OF ERS SITUATION REPORTS

# AGRICULTURAL ECONOMICS

## SITUATION REPORTS

Situation Reports summarize the current situation and present economic outlook for agriculture.

**Cotton Situation, Dairy Situation, Fats and Oils Situation, Feed Situation, Fruit Situation, Livestock and Meat Situation, Poultry and Egg Situation, Rice Situation, Tobacco Situation, Vegetable Situation, Wheat Situation, Wool Situation.** These commodity reports analyze supply and demand, price, and outlook for major farm commodities. They include tables and charts presenting current data on production, market movement, stocks, consumption, prices, and foreign trade. Relevant special studies are frequently included. See calendar on page 8 for publication dates.

**Agricultural Finance Outlook,** semiannual. Provides situation and outlook for the financial condition of farmers, farm income, farm real estate, farm debts and assets, and a projected balance sheet of the farming sector. Situation and outlook are discussed for each farm production region.

**Agricultural Outlook Digest,** monthly. A newsletter that briefs the outlook and changes in commodity situations and farm trade.

**Demand and Price Situation,** quarterly. Reviews factors affecting the domestic and foreign demand for farm products. It also briefly reviews the general ·onomy, farm income, and general trends in demand, supply, and prices of major farm products and the principal farm inputs.

**Farm Cost Situation,** annual. This report gives the outlook for farm costs and analyzes the effects of changing technology on farm costs. Discusses farm labor, farm power and machinery, feed, livestock, seeds, fertilizer, petroleum, pesticides, land values and rentals, interest, taxes and insurance, and costs on different types of enterprises. Charts show changes in prices paid, quantities used, and total expenditures of selected inputs.

**Farm Income Situation,** semiannual. Estimates cash receipts from farm marketings by commodity groups and Government payments, index numbers of cash receipts and of physical volume of farm marketings, and State estimates of cash receipts from sales of crops and livestock. Each issue gives quarterly estimates of gross and net farm income, seasonally adjusted at annual rates. The report also compares farm and nonfarm incomes. An annual supplement, *Farm Income, State Estimates,* shows direct Government payments to farmers, value of home consumption, gross net farm income, farm production expense details by accounts, and cash receipts from farm marketings by States, by major individual commodities.

**Farm Real Estate Market Developments,** annual in summer, with one supplement in mid-winter and a second, as needed, in mid-spring. Summarizes trends in farmland values, volume of sales, financing of farm purchases, and factors affecting the land market. Each issue includes index numbers of estimated average value per acre by State. For farm real estate values over a period of years, see *Agricultural Statistics,* referred to on page 10.

**Fertilizer Situation,** published at the end of each year. Looks at estimated capacity to produce basic fertilizer materials in the coming year. Also looks at potential fertilizer demand in the year ahead, and analyzes U.S. fertilizer use in the year just concluding. Foreign trade in fertilizer and basic fertilizer materials is reviewed, economic aspects of foreign trade are analyzed, and historical economic and fertilizer use statistics are shown. Special reports about production, consumption, and distribution of fertilizer are prepared for each issue.

**Marketing and Transportation Situation,** quarterly. Contains analysis and statistics on the retail cost of market basket of farm foods, returns received by farmers for these products, and the spread between these returns and the retail cost. The marketing bill for farm food products and related statistics and data on costs of goods and services used by marketing firms are also published once a year. Each issue includes special articles on marketing and transportation.

**Price Spreads for Farm Foods** is a monthly release of the retail cost of a market basket of farm foods, returns received by farmers for these products, and the spread between these returns and the retail cost for the preceding month. These statistics are also summarized quarterly in the *Marketing and Transportation Situation* (see above).

**National Food Situation,** quarterly. Details per capita consumption of major foods, nutrients available for civilian consumption, indexes of the annual supply and use of farm food commodities, retail food price indexes, the Consumer Price Index, total food expenditures, and the percentage of income spent for food. It includes the outlook for food expenditures, retail prices, and consumption, and the situation and outlook for sugar and tropical products. Some issues carry special analyses on various aspects of food consumption and prices.

**World Agricultural Situation,** formerly in the FAER series, published annually through 1973; will appear at approximately 4-month intervals beginning September 1974. Appraises world agriculture for the current calendar year. Regional situation reports and data books are issued in April for these regions: Western Hemisphere, Western Europe, the Communist Areas, Far East and Oceania, Africa and West Asia. Each report gives data by country on agricultural output, use, trade, trends, and



significant policy developments, with special topics as appropriate.

See above table for the 1974 calendar of supply-demand estimates reports release dates.

# A P P E N D I X   L

## EXAMPLE FROM RICE SITUATION REPORT

## SITUATION FOR 1973/74

### Total Supplies Up Slightly But Less Long Grain

The 1973 rice crop totaled 92.8 million cwt. 9% above 1972. Initially a much larger output was expected, as allotments were raised twice and planted acreage increased around 20%. But adverse weather, particularly in the Southern States, plagued the crop from start to finish. Seeding in the South was much later than usual because of wet conditions. At harvest, tropical storm Delia reduced output in Texas and Louisiana. Consequently, yields fell 9% to 4,277 pounds per acre, the least since 1969. Texas was especially hard hit with yields averaging 3,740 pounds, the smallest in 11 years.

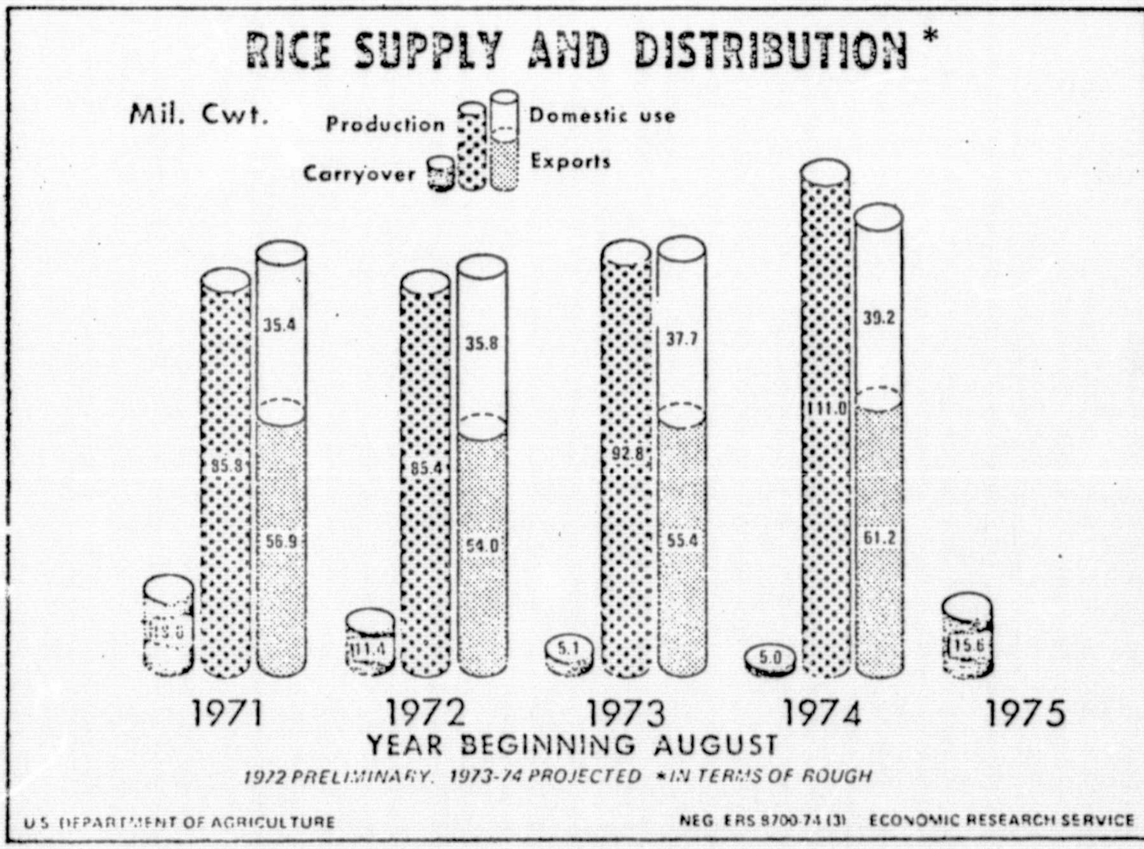
About 47% of the 1973 crop was long grain, 43% medium, and 10% short. Medium grain accounted for a higher portion of the 1973 crop than in recent years, reflecting the reduced crop in Texas, the major long grain producer.

Beginning stocks of long grain rice totaled only around 2 million cwt. and with only a marginally larger 1973 crop, 1973/74 supplies of long grain at 45.9 million cwt. were 4% below the preceding year. Medium grain stocks also fell sharply, but the larger crop resulted in total supplies climbing 6% to 40.9 million cwt. The larger short grain harvest resulted in a 7% increase in short grain supplies to 11.2 million cwt.

Imports, mainly broken rice destined for brewers, are expected to be down somewhat from the half million cwt. of last season. In total, the 1973/74 rice supply is up slightly from last year's 97.3 million cwt.

### Continued Strong Demand Another Small Carryover

Rice usage for 1973/74 will probably total a record 93.1 million cwt., with increases in both domestic use and exports. Stocks next August 1 could dip to 5 million cwt., a minimum pipeline level. Domestic use may rise 5% with all catagories increasing. Estimated food use at 26 million cwt. will be the largest since 1968/69. It now appears that per capita consumption may be picking up as high prices of other foods stimulate the demand for rice.



Brewer use continues to expand and this year's projected 8.5 million cwt. would be the largest on record. Seed use, dependent on 1974 plantings, is projected at 3.2 million cwt.

Strong world import demands accompained by relatively tight export supplies in Asia have led to a seller's market. U.S. exports for 1973/74 are estimated at around 55 million cwt., up 3% from last season. Last summer, USDA announced that PL-480 shipments for the 1973/74 crop year would be 30% below last season and half the 1971/72 total. With rice supplies in other exporting countries tight, commercial demand for U.S. rice has been unusually strong. In addition, some former PL-480 recepients have shifted to commerical purchases. U.S. rice exports for the August-January period totaled 24.4 million cwt. compared with 28.7 million a year earlier. The delayed 1973 harvest and a month's lag in new crop rice availability slowed the export pace during August-October. However, exports have since accelerated.

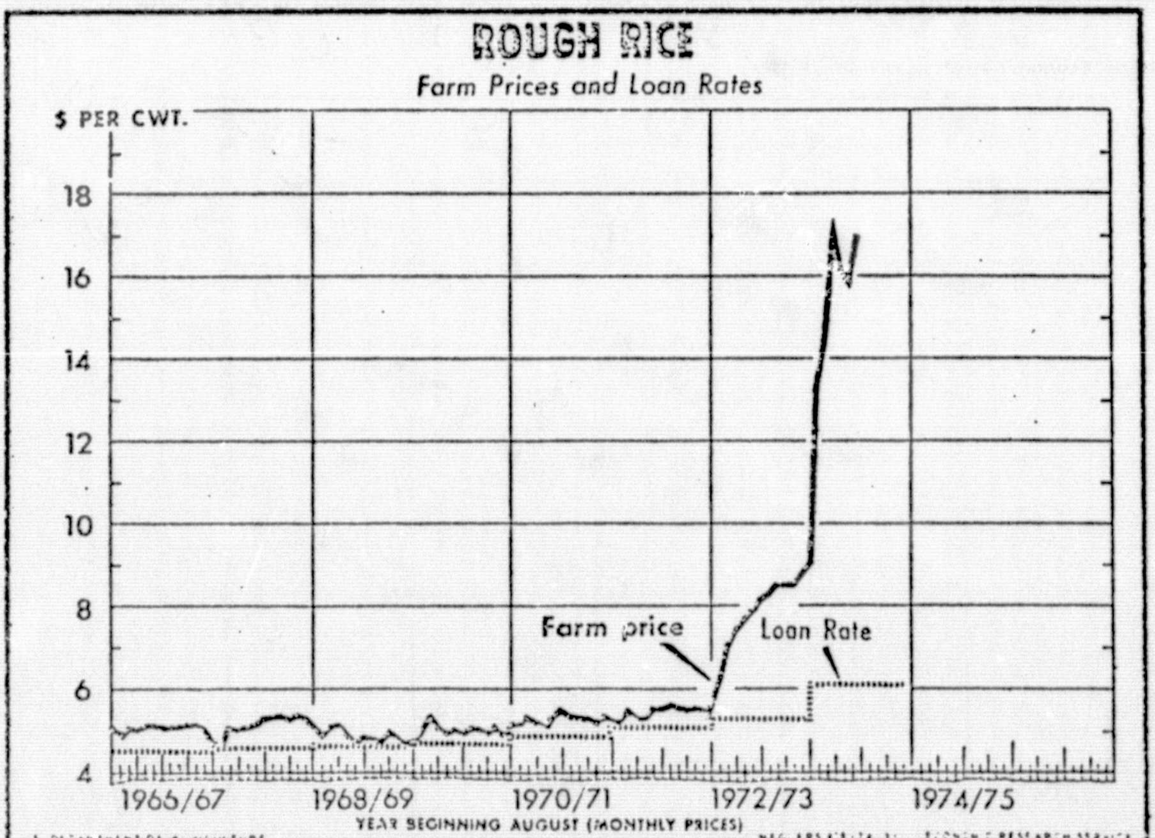
As of March 10, around 11.5 million cwt. (rough) of rice sales were reported still to be shipped. Around 26% was milled long grain, 48% other milled rice, 24% long grain brown rice, and 2% other brown rice. If these sales, along with PL-480 shipments, are consummated, only about 5 million cwt. of additional export sales would be necessary to reach the 55.4 million cwt. estimated for the year.

### Record High Farm Prices

U.S. rice prices have risen dramatically in response to a combination of tight world supplies and strong import demand for rice, wheat, and other grains. Farm prices shot up from $9 per cwt. at harvest last August to over $17 in November. Prospects for a record world crop and an improvement in export availability in Southeast Asia resulted in some weakness in December and January. But in February prices again approached season highs, as international rice prices held strong and other grain prices boomed. This strength is expected to continue, although some weakening is likely if the world food grain prospects appear favorable and the U.S. rice crop develops satisfactorily.

Rough rice: Monthly prices received by farmers, 1973/74

| Month | Arkansas | Louisiana | Texas | U.S. aver. |
|---|---|---|---|---|
| | Dollars per cwt. | | | |
| August | — | 10.50 | 11.00 | 9.00 |
| September | 13.70 | 12.00 | 13.70 | 13.20 |
| October | 15.30 | 12.90 | 14.90 | 14.70 |
| November | 16.00 | 17.40 | 16.60 | 17.10 |
| December | 16.00 | 16.00 | 15.60 | 16.10 |
| January | 16.00 | 15.50 | 15.80 | 15.80 |
| February | 18.00 | 16.40 | 16.70 | 17.00 |



### Loan Activity Down But Still Substantial

Even with record market prices this year, many growers are using the price support program in their marketing strategies. Through February, 19.1 million cwt. had been put under loan compared to 22.7 million a year earlier; net under loan was 9.9 million this year compared to 10.8 million a year ago.

### Retail Prices Up Sharply

Retail rice prices rose sharply during the last half of 1973, following the advance in farm prices and the introduction of Phase IV of the Economic and Stabilization Program which allowed cost pass-throughs on a dollar for dollar basis. During calendar year 1973, retail prices of rice at leading cities almost doubled (table 15). However, as illustrated by table 11, retail prices of other foods have also gone up sharply. Consequently, rice consumption is expected to hold its own.

Over half of the increase in rice prices to the consumer last year can be tied back to higher farm prices. Since mid-1972 the farmer's share of the retail price of long grain rice has increased from a third to just over half. Both the net farm value and the farm-retail spread registered at least a 50% increase over the July-September to October-December period.

Rice, long grain: Prices, value and farmer's share of retail price, by quarters, 1967-73

| Year | Retail price | | | | Net Farm value[1] | | | | Farm-retail spread | | | | Farmer's share | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan.-Mar. | Apr.-June | July-Sept. | Oct.-Dec. | Jan.-Mar. | Apr.-June | July-Sept. | Oct.-Dec. | Jan.-Mar. | Apr.-June | July-Sept. | Oct.-Dec. | Jan.-Mar. | Apr.-June | July-Sept. | Oct.-Dec. |
| | *Cents per lb.* | | | | *Cents per lb.* | | | | *Cents per lb.* | | | | *Percent* | | | |
| 1967 | 21.8 | 21.9 | 21.9 | 22.0 | 7.5 | 7.5 | 7.0 | 7.4 | 14.3 | 14.4 | 14.9 | 14.6 | 34 | 34 | 32 | 34 |
| 1968 | 22.0 | 22.1 | 22.1 | 22.1 | 7.7 | 7.8 | 7.4 | 7.3 | 14.3 | 14.3 | 14.7 | 14.8 | 35 | 35 | 33 | 33 |
| 1969 | 22.3 | 22.4 | 22.5 | 22.6 | 6.9 | 7.0 | 6.7 | 7.2 | 15.4 | 15.4 | 15.8 | 15.4 | 31 | 31 | 30 | 32 |
| 1970 | 22.9 | 23.2 | 23.1 | 23.3 | 7.2 | 7.3 | 7.2 | 7.4 | 15.7 | 15.9 | 15.9 | 15.9 | 31 | 31 | 31 | 32 |
| 1971 | 23.6 | 23.8 | 24.0 | 24.0 | 7.8 | 7.7 | 7.7 | 7.7 | 15.8 | 16.1 | 16.3 | 16.3 | 33 | 32 | 32 | 32 |
| 1972 | 24.1 | 24.0 | 23.9 | 24.0 | 8.1 | 8.0 | 8.2 | 10.6 | 16.0 | 16.0 | 15.7 | 13.4 | 34 | 33 | 34 | 44 |
| 1973 | 25.2 | 26.7 | 28.2 | 42.9 | 11.5 | 11.9 | 14.7 | 22.7 | 13.7 | 14.8 | 13.5 | 20.2 | 46 | 45 | 52 | 53 |

[1] Payment to farmers for equivalent quantities of rough rice (gross farm value) minus inputed value of by products obtained in processing.

Source: National Economic Analysis Division, ERS.

# APPENDIX M

## SAMPLE OF AGRICULTURAL OUTLOOK DIGEST

# AGRICULTURAL OUTLOOK DIGEST

AOD-196

FARM INPUT UPDATE

See p. 4


Approved by the Outlook and Situation Board, February 27, 1974

Economic Research Service

U.S. Department of Agriculture


## THE FARMER AND THE POCKETBOOK

Fresh from making $26 billion in 1973, by far the highest realized net farm income in history, American farmers are planning to increase crop output sharply again in 1974. If they do, and if demand for farm products remains strong through most of the year, as seems likely, their earnings may well approach those of last year and hold sharply above the prior high of $20 billion of 1972.

Their cash receipts are likely to rise by $9 billion, but that will be largely canceled out by a similar boost in production expenses. Meanwhile, government payments to farmers will be only a fraction of 1973's $2.6 billion. Overall, a $1 or $2 billion decline in realized net farm income is likely.

Through the first half of 1974, both livestock and crop prices will probably stay high because of continued strong domestic and foreign demand and tight supplies. In the second half, however, 1974's larger intended crop acreage will be harvested and there are prospects for increases in red meat and poultry production. These developments point to an easing in farm prices late in 1974.

However, the uncertainties can not be overlooked. To achieve the record output, the farmer must have fuel, fertilizer, good weather, and they must expect good demand. If widespread shortages of inputs develop, weather is not favorable or demand appears too uncertain, output would be curtailed and in the face of strong demand, net farm income could reach $30 billion. On the other hand, if the energy crisis were to generate a concerted slowdown in major foreign markets and the U.S. economy were to weaken sharply under high inflation and increasing unemployment, demand would be substantially weaker. With this weaker demand, a record farm output could result in farm income of $20 billion.

Nevertheless, farm prices for 1974 will average well above last year. And last year, you will recall, was a whopper. Although marketings of farm products slipped a little from 1972's level, farm prices were up 37 percent.

Realized net income per farm last year averaged $9,193, up from $6,856. The total 1973 personal income of farm people reached $41 billion, up $7 billion. Income from farm sources rose $5.4 billion while income from nonfarm sources increased $1.6 billion. Disposable personal income per capita of farm residents from all sources was a record $3,913, up $731. For nonfarm people, it was $4,208, up $316. Thus, the ratio of the income of farm people to nonfarm people increased to 93 percent in 1973, continuing to narrow the gap.

## FEED SUPPLIES, PRICES

Feed grain prices are nearly double those of a year earlier and will stay strong over the next few months because of tight supplies and strong demand. Prices this summer will hinge primarily on 1974 crops and foreign demand and production prospects.

January plans by farmers included planting of 78.8 million acres to corn, 10 percent above 1973. If the projected yield of 97 bushels is achieved, that acreage would produce a crop of 6.7 billion bushels, 18 percent above 1972.

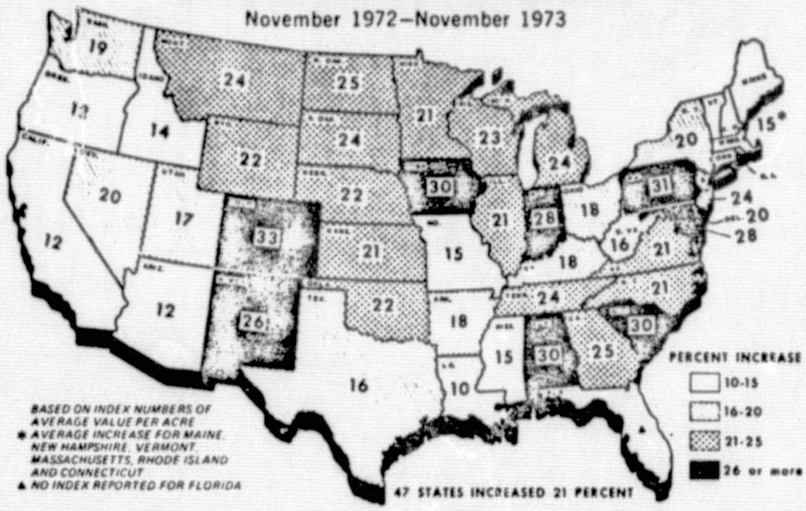
This crop increase, however, will be partly negated by a smaller carryover. Carryover on October 1 will drop to about 600 million bushels, about 15 percent less than a year earlier and the lowest since 1952.

Domestic feeding of protein feed is estimated at 20 million tons, 8 percent above 1972/73 but still only near the high marks set during 1969-71. Prices this season are lower and much more stable than last year. The large U.S. supply of soybeans is stabilizing the market as meal prices (Decatur) in recent weeks have ranged between $150 and $175 per ton. Barring new developments in export demand, meal prices likely will continue near current levels until the soybean crop outlook becomes clearer this summer.

## BOOMING FARMLAND DEMAND

### PERCENTAGE INCREASE IN AVERAGE VALUE OF FARM REAL ESTATE PER ACRE

November 1972–November 1973




The index of farm real estate values shot up 21 percent in the year ended November 1, 1973. This is the second highest 12-month increase ever recorded—trailing only the 22-percent upswing recorded on March 1, 1920. It also shows a substantial upturn from the 13 percent reported for the year ended March 1, 1973.

Colorado led all States with a 33-percent increase, followed by Pennsylvania with 31 percent, and South Carolina, Alabama, and Iowa each with 30 percent. Louisiana reported the lowest rate of increase—a substantial 10 percent. Interestingly, this "lowest" rate of increase for any State still surpassed the 7-percent average annual compound rate of increase for the United States over the past decade.

Nationwide, farmland values have increased 70 percent since March 1, 1967. Over this 6 1/2 year period, however, increases by State varied from 186 percent in Nevada to 27 percent in California.

## WHEAT: FROM LITTLE TO PLENTY

A record export pace and prospects for extremely small wheat stocks this spring dominate the 1973/74 wheat outlook.

Exports are currently estimated at a record 1.2 billion bushels, up slightly from a year ago and a record for the second consecutive year. Exports during July-December totaled a record-shattering 737 million bushels. The pace is expected to ease noticeably in January-June. Domestic use has not been quite as strong as last season. Wheat feeding has fallen off, reflecting the increased cost of wheat relative to other grains. However, food usage is expected to be up for the year as price comparisons appear to be influencing consumers to switch to wheat products. Growers will likely use around 20 percent more seed wheat.

Total disappearance for the year will exceed the 1973 crop, causing old-crop stocks on July 1 to plummet to around 180 million bushels, smallest in 27 years. Supplies of 1974-crop wheat harvested in June may help ease the pressures. In addition, some exports have been deferred and quotas on U.S. imports of wheat have been temporarily lifted.

Mid-month farm prices of wheat averaged $2.47 in July 1973, and have since risen to over $5.00 per bushel. For the season, farm prices are likely to average around $3.90 per bushel, up from $1.76 in 1972/73.

U.S. wheat growers are riding another record crop. Based on a 19-percent increase in planted acreage, the 1974 wheat crop could total around 2.1 billion bushels. If world crops return to more normal levels, demand for U.S. wheat could weaken significantly in 1974/75. U.S. exports are projected to drop around a sixth to 1 billion bushels while domestic use is expected to be about the same as in 1973/74. With demand projected to turn down and a record crop in prospect, carryover by the summer of 1975 could more than double to around 480 million bushels.

## MORE COTTON ACREAGE

Strong demand and attractive prices are spurring greater cotton planting intentions this year. Farmers say they will plant about 14 1/2 million acres of upland cotton in 1974, based on January 1 intentions. This would be slightly over 2 million acres above both 1973 plantings and the 1968-72 average. Much of the planned increased is in the Delta, which was hard hit by flooding a year ago.

With nearly a fifth more acreage planned for the 1974 upland cotton crop, production will likely rebound sharply from 1973's 12.9 million bales. Thus, output will more than likely be adequate to satisfy prospective domestic and export demand for U.S. cotton during 1974/75. Mill consumption may increase modestly to about 7 3/4 million bales, primarily reflecting moderating competition from man-made fibers because of energy-related cutbacks in production. At the same time, U.S. exports are expected to total around 5 1/2 million bales, near levels of the past 2 seasons.

Uncertainties are also part of this outlook picture. There is generally inadequate subsoil moisture on the Texas High Plains. Spot shortages of fuel and fertilizer have been reported. Indications of increasing consumer resistance to higher prices could point to a slowdown in textile purchases in 1974.

# A P P E N D I X N

## U.S. PLANTING & HARVESTING DATES

## Winter Wheat

Winter wheat is widely grown throughout the United States, with the heaviest concentration in the central and southern parts of the Great Plains. Five Great Plains States--Kansas, Oklahoma, Nebraska, Texas, and Colorado--harvested 59 percent of the winter wheat acreage in 1969. Among the States, Kansas led in wheat acreage, with 9.8 million acres harvested, 27 percent of the U. S. total. Oklahoma, with 4.2 million acres harvested, and Texas, with 2.9 million acres, were the second and third ranking winter wheat States.

Winter wheat is planted in the fall of the year. When weather conditions are favorable for early fall growth, much of the winter wheat in the Great Plains area is grazed in the fall prior to going into dormancy and again in the late winter and early spring when new growth starts. Winter wheat harvest begins in the southernmost producing areas in the late spring and quickly spreads northward. Combining usually extends well into the summer months in the northern tier of States.

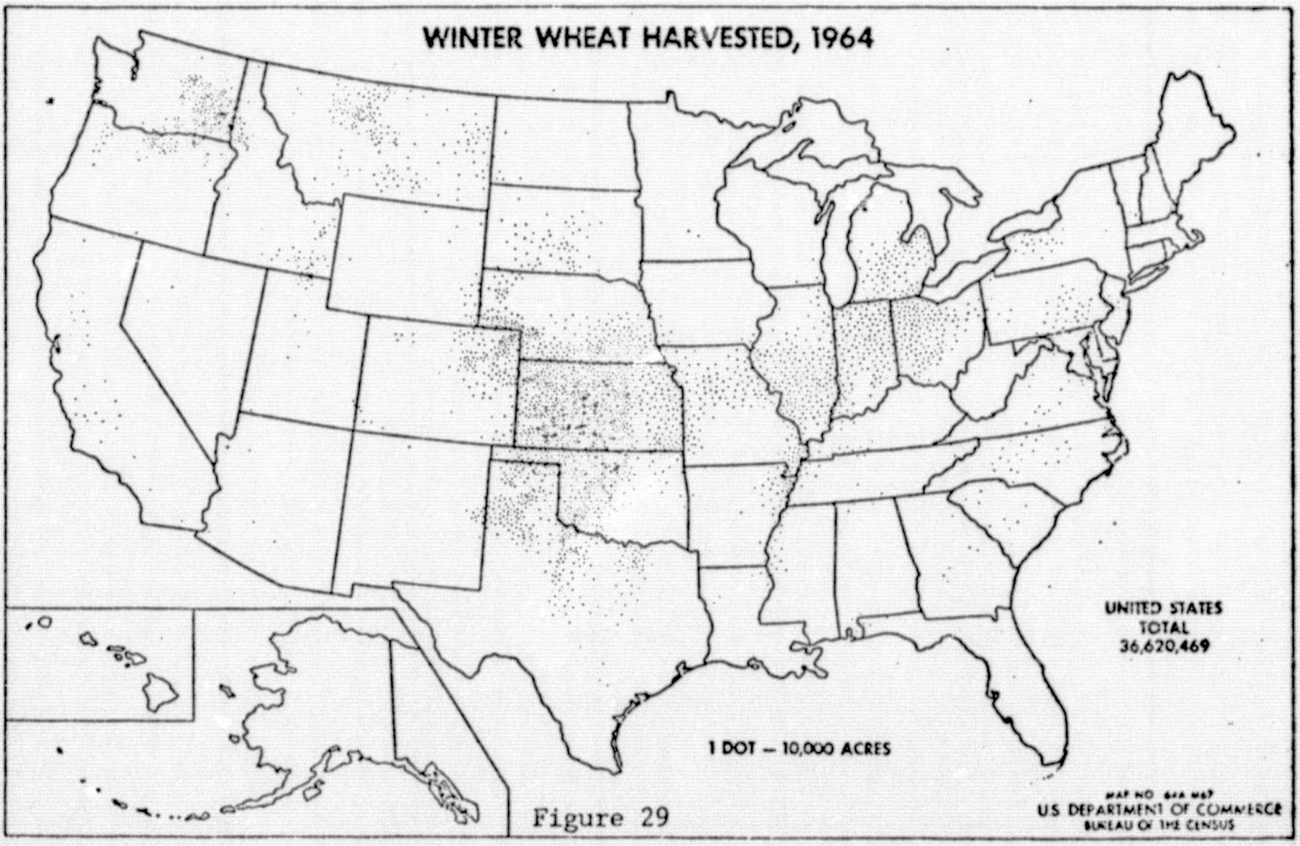



Figure 29

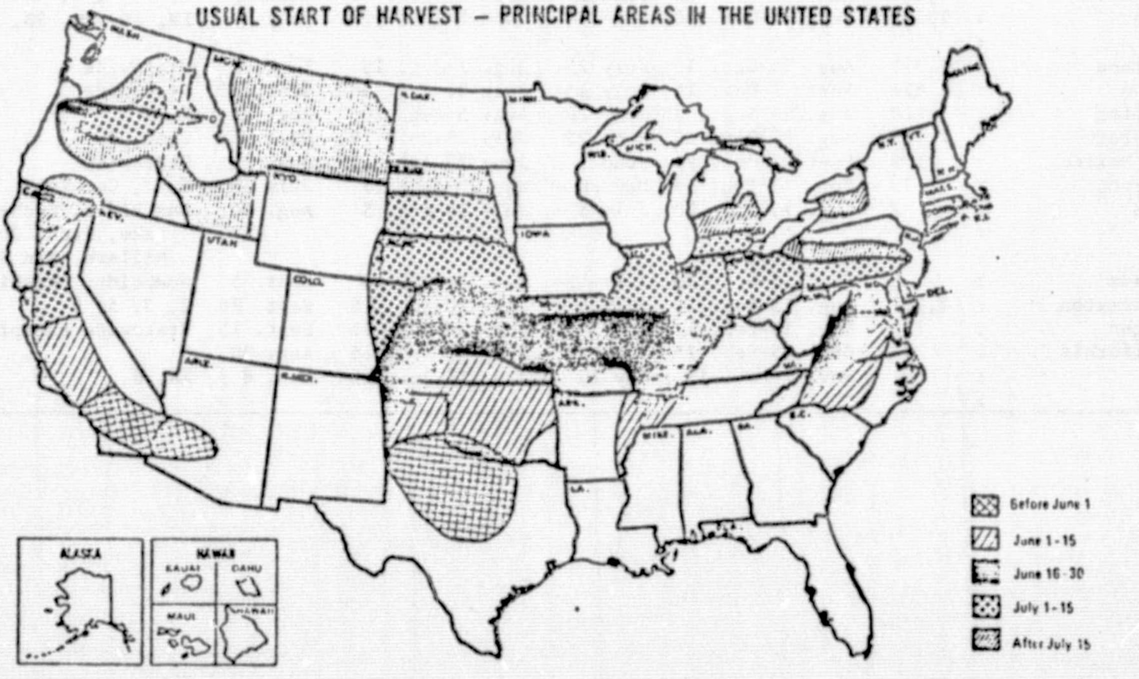
## WINTER WHEAT

### USUAL START OF PLANTING – PRINCIPAL AREAS IN THE UNITED STATES


U. S. DEPARTMENT OF AGRICULTURE — Figure 30 — NEG STATISTICAL REPORTING SERVICE 275-71(12)

## WINTER WHEAT

### USUAL START OF HARVEST – PRINCIPAL AREAS IN THE UNITED STATES




U. S. DEPARTMENT OF AGRICULTURE — Figure 31 — NEG STATISTICAL REPORTING SERVICE 276-71(12)

Table 15. Winter wheat: Usual planting and harvesting dates, by State and principal producing areas

| State | 1969 Harvested acreage (000) | Usual planting dates | Usual harvesting dates: Begin | Usual harvesting dates: Most active | Usual harvesting dates: End | Principal producing areas and counties |
|---|---|---|---|---|---|---|
| New York | 182 | Sept. 5-Oct. 10 | July 15 | July 25-Aug. 10 | Aug. 15 | 4, 5 |
| New Jersey | 34 | Sept. 20-Nov. 1 | July 5 | July 15-July 25 | Aug. 10 | Statewide |
| Pennsylvania | 327 | Sept. 1-Oct. 15 | July 1 | July 15-July 25 | Aug. 10 | 4, 5, 6, 8, 9 |
| Ohio | 1,067 | Sept. 15-Nov. 5 | July 1 | July 10-July 25 | Aug. 5 | Statewide |
| Indiana | 870 | Sept. 10-Oct. 30 | June 25 | June 30-July 20 | July 25 | Statewide |
| Illinois | 1,273 | Sept. 15-Nov. 5 | June 25 | July 1-July 15 | July 20 | 4, 4A, 5, 6, 6A, 7, 9 |
| Michigan | 628 | Sept. 15-Oct. 15 | July 10 | July 20-Aug. 1 | Aug. 10 | 5, 6, 7, 8, 9 |
| Wisconsin | 31 | Sept. 10-Oct. 10 | July 20 | July 25-Aug. 5 | Aug. 10 | Racine, Kenosha, Washington |
| Minnesota | 18 | Sept. 1-Sept. 30 | July 25 | Aug. 1-Aug. 10 | Aug. 15 | 1, 2, 4, 5, 8, 9 |
| Iowa | 40 | Sept. 10-Oct. 5 | July 10 | July 15-July 25 | Aug. 1 | Statewide |
| Missouri | 1,035 | Sept. 20-Nov. 1 | June 10 | June 15-July 1 | July 15 | Statewide |
| North Dakota | 96 | Sept. 5-Oct. 5 | Aug. 1 | Aug. 10-Aug. 15 | Aug. 20 | 1, 4, 7 |
| South Dakota | 622 | Sept. 1-Oct. 1 | July 10 | July 15-Aug. 1 | Aug. 10 | 4, 5, 7, 8 |
| Nebraska | 2,780 | Aug. 25-Oct. 5 | July 1 | July 5-July 15 | July 30 | 1, 5, 6, 7, 8, 9 |
| Kansas | 9,849 | Sept. 10-Oct. 25 | June 15 | June 20-July 5 | July 15 | Statewide |
| Delaware | 20 | Oct. 5-Nov. 15 | June 20 | June 25-July 15 | July 25 | Statewide |
| Maryland | 117 | Sept. 25-Nov. 15 | June 15 | June 20-July 15 | Aug. 1 | Statewide |
| Virginia | 157 | Sept. 20-Dec. 1 | June 10 | June 20-July 10 | July 15 | 2, 5, 6, 8, 9 |
| West Virginia | 14 | Sept. 10-Nov. 1 | July 10 | July 15-Aug. 5 | Aug. 10 | 2, Mason |
| North Carolina | 198 | Sept. 15-Nov. 5 | June 5 | June 15-July 1 | July 15 | 2, 3, 5, 6, 8, 9 |
| South Carolina | 82 | Oct. 10-Dec. 20 | June 1 | June 10-July 1 | July 10 | Statewide |
| Georgia | 86 | Sept. 10-Dec. 1 | May 20 | June 5-June 20 | June 25 | Statewide |
| Florida | 43 | Oct. 15-Dec. 15 | May 10 | May 15-May 25 | June 10 | 1 |
| Kentucky | 183 | Sept. 25-Nov. 15 | June 15 | June 20-July 5 | July 15 | 1, 2, 3, 5 |
| Tennessee | 224 | Sept. 10-Nov. 30 | June 10 | June 15-July 5 | July 15 | Statewide |
| Alabama | 85 | Sept. 20-Dec. 1 | May 15 | June 1-June 20 | July 1 | Statewide |
| Mississippi | 125 | Oct. 1-Nov. 20 | May 20 | June 5-June 15 | June 25 | 1, 2, 4, 6 |
| Arkansas | 301 | Sept. 10-Nov. 25 | June 1 | June 10-June 25 | July 5 | Statewide |
| Louisiana | 38 | Sept. 15-Nov. 15 | May 20 | June 1-June 15 | June 20 | 3, 5 |
| Oklahoma | 4,150 | Sept. 5-Oct. 25 | June 5 | June 10-June 25 | June 30 | 2, 7, 5, 1, 4 |
| Texas | 2,869 | Sept. 1-Oct. 30 | May 20 | June 5-June 20 | July 5 | 1N, 1S, 2N, 2S, 3, 4, 7 |
| Montana | 2,311 | Aug. 25-Oct. 15 | July 25 | Aug. 1-Aug. 15 | Sept. 5 | Statewide |
| Idaho | 822 | Sept. 1-Oct. 15 | July 15 | July 25-Aug. 30 | Sept. 15 | Statewide |
| Wyoming | 220 | Aug. 20-Sept. 25 | July 20 | Aug. 5-Aug. 20 | Aug. 25 | 2, 5 |
| Colorado | 2,133 | Aug. 20-Oct. 10 | June 25 | July 10-July 20 | Sept. 5 | 2, 6, 9 |
| New Mexico | 159 | Sept. 1-Oct. 20 | June 5 | June 15-July 15 | July 20 | Statewide |
| Arizona | 73 | Oct. 15-Feb. 15 | May 20 | May 25-June 10 | July 15 | 5, 7, Cochise |
| Utah | 197 | Aug. 25-Oct. 20 | July 5 | July 15-Aug. 5 | Aug. 20 | Box Elder, Cache, Salt Lake, Utah, Juab, Millard, San Juan |
| Nevada | 5 | Sept. 5-Oct. 20 | July 15 | Aug. 1-Aug. 25 | Sept. 5 | Humboldt, Pershing |
| Washington | 2,177 | Aug. 15-Nov. 20 | July 5 | July 20-Aug. 15 | Sept. 20 | 2, 3, 5, 9 |
| Oregon | 732 | Aug. 15-Feb. 1 | July 1 | July 10-Aug. 15 | Sept. 15 | Statewide except coast |
| California | 350 | Oct. 15-Feb. 15 | June 15 | July 15-Aug. 15 | Aug. 30 | 5 |
| | | Nov. 1-Feb. 15 | May 15 | June 15-July 15 | Aug. 8 | 5A, 8 |

## Spring Wheat

All spring wheat acreage harvested in 1969 amounted to 10.9 million acres and accounted for 23 percent of the total U.S. wheat acreage. North Dakota, the leading spring wheat State, had over one-half of the spring wheat harvested in 1969. South Dakota was the second leading State in spring wheat acreage, with 1.3 million acres harvested; Montana was third, with only slightly less acreage. Durum wheat, used in making macaroni and spaghetti, was harvested from 3.3 million acres, representing nearly one-third of the total spring wheat acreage. Of the total durum acreage harvested, North Dakota had 84 percent.

Spring wheat is planted in the late spring and harvested late in the summer. In the West North Central and Northwestern States, where spring wheat is primarily grown, a high proportion of the total rainfall occurs during the summer months. The favorable seasonal distribution and greater effectiveness of the precipitation make it possible to produce spring wheat with a relatively small total annual precipitation.

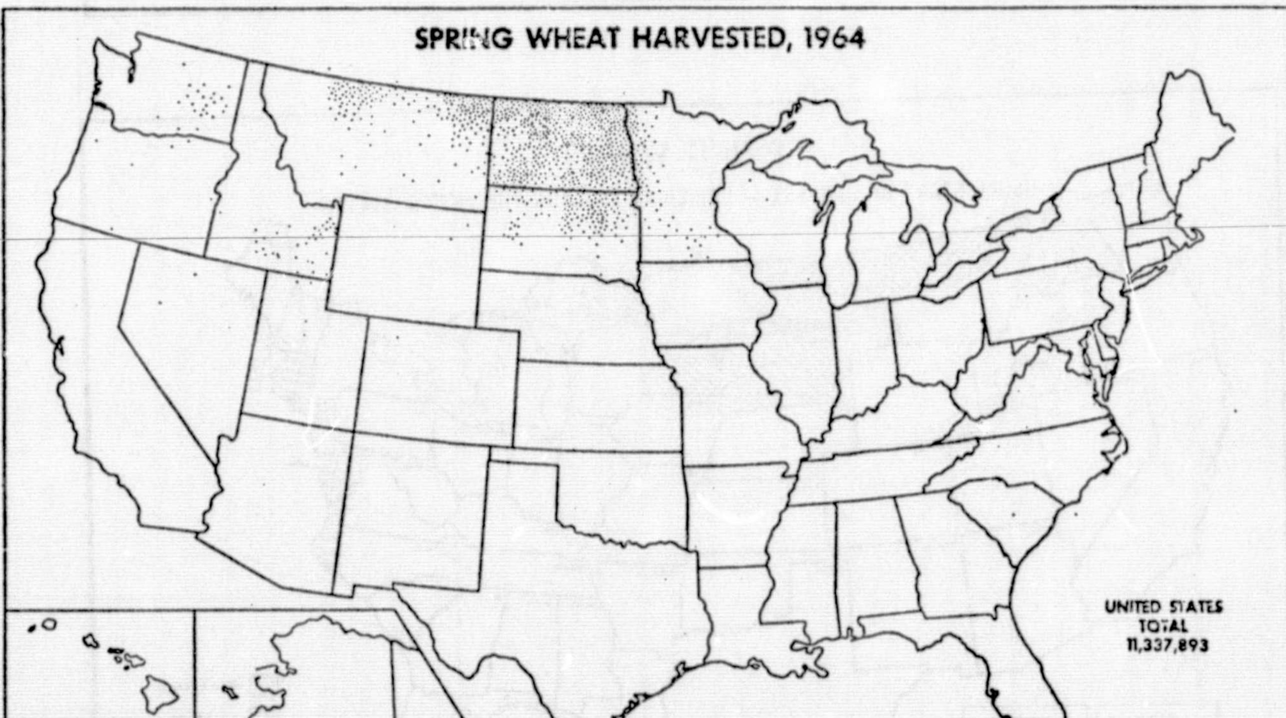
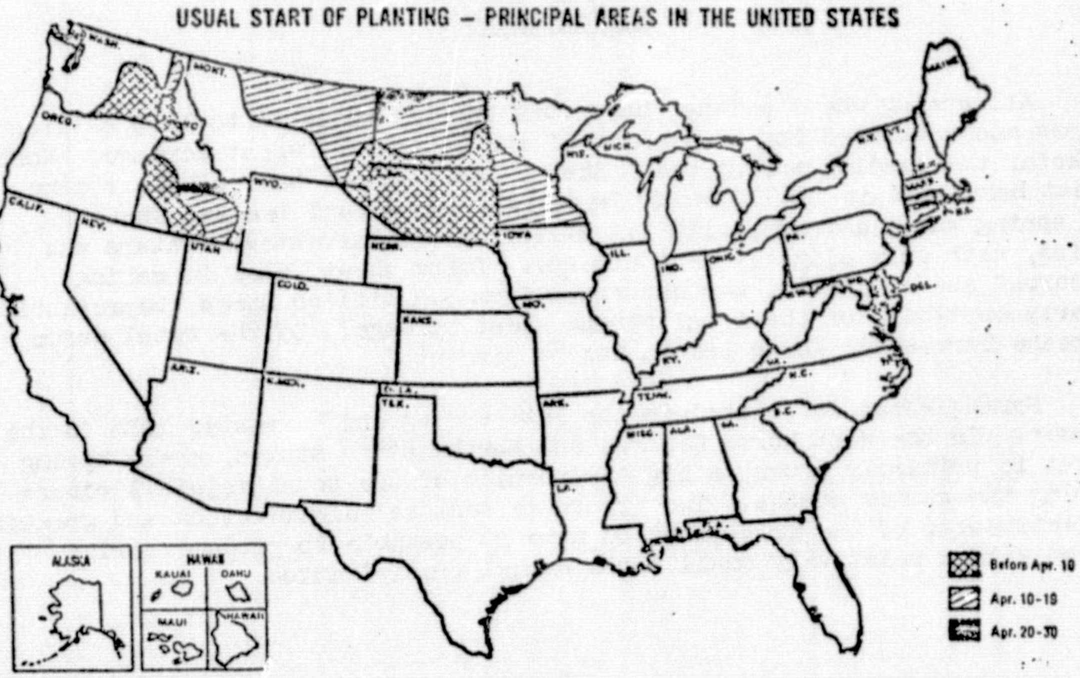


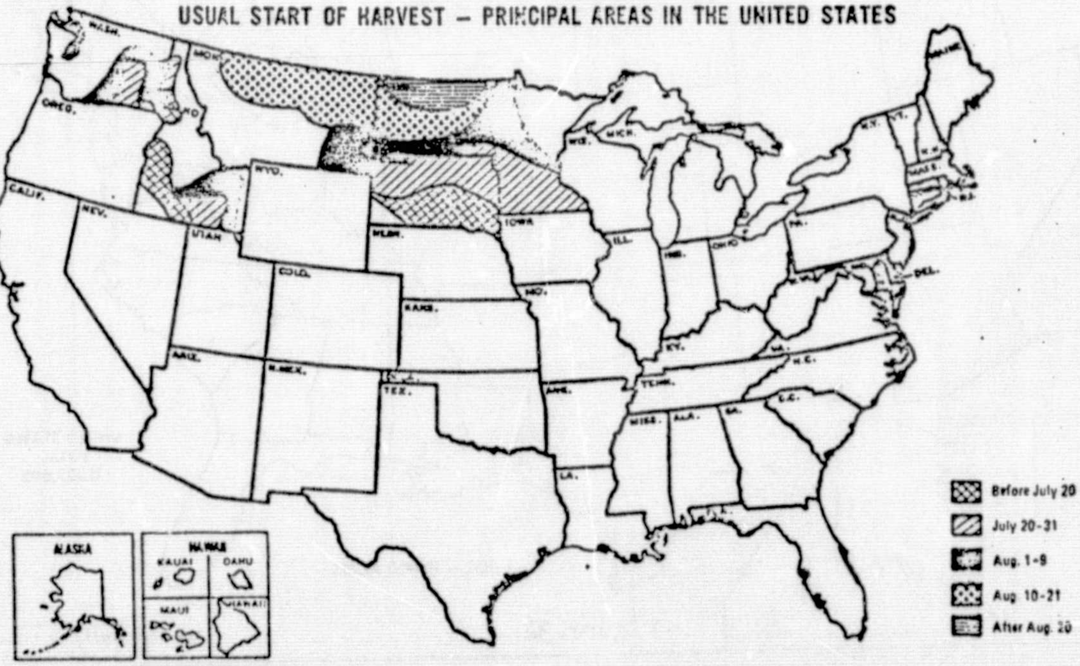

Figure 32

## SPRING WHEAT
### USUAL START OF PLANTING – PRINCIPAL AREAS IN THE UNITED STATES




U. S. DEPARTMENT OF AGRICULTURE  Figure 33  NEG STATISTICAL REPORTING SERVICE 277-71(12)

## SPRING WHEAT
### USUAL START OF HARVEST – PRINCIPAL AREAS IN THE UNITED STATES




U. S. DEPARTMENT OF AGRICULTURE  Figure 34  NEG STATISTICAL REPORTING SERVICE 278-71(12)

Table 16. Spring wheat: Usual planting and harvesting dates, by States and principal producing areas

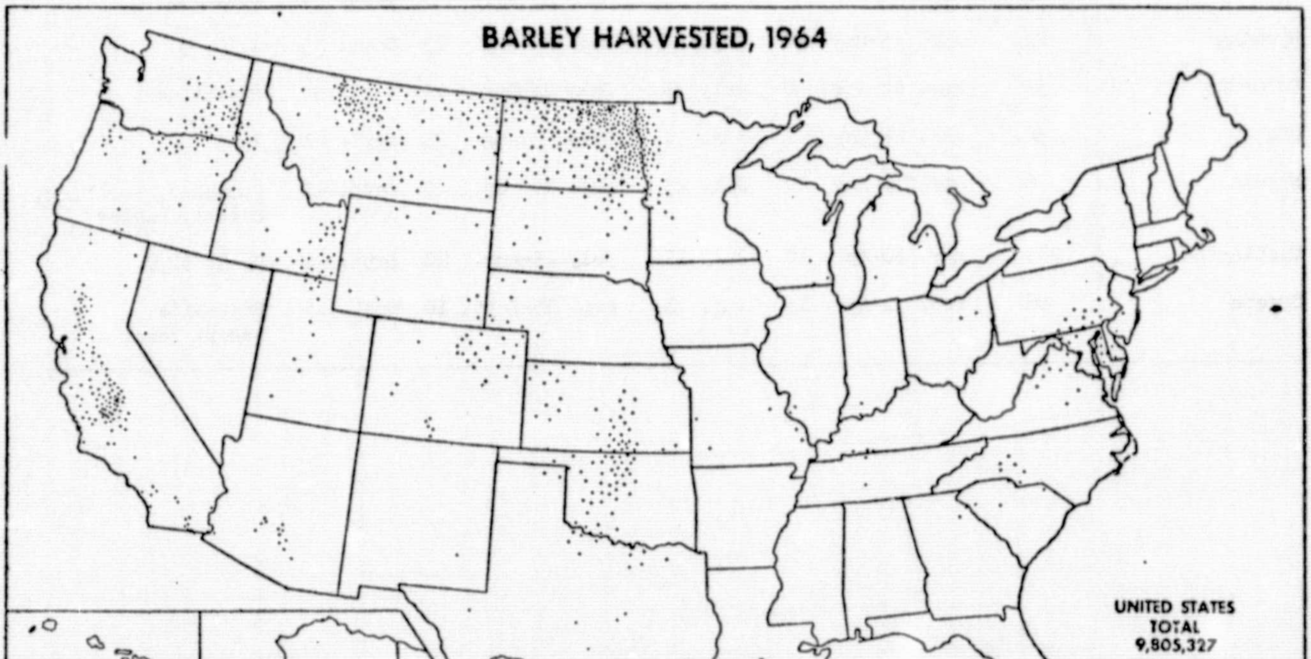
| Wheat type and State | 1959 harvested acreage (000) | Usual planting dates | Usual harvesting dates: Begin | Usual harvesting dates: Most active | Usual harvesting dates: End | Principal producing areas and counties |
|---|---|---|---|---|---|---|
| DURUM | | | | | | |
| Minnesota | 80 | Apr. 15-May 30 | July 25 | Aug. 1-Aug. 20 | Sept. 10 | 1, 4 |
| North Dakota | 2,781 | Apr. 15-June 1 | Aug. 10 | Aug. 15-Sept. 5 | Sept. 15 | 1, 2, 3, 5, 6, 9 |
| South Dakota | 234 | Apr. 1-May 5 | July 20 | July 25-Aug. 15 | Aug. 20 | 1, 2, 3, 5 |
| Montana | 230 | Apr. 10-May 25 | Aug. 5 | Aug. 10-Aug. 25 | Sept. 20 | 2, 3 |
| California | 5 | Mar. 15-May 10 | Aug. 25 | Sept. 1-Sept. 20 | Sept. 30 | Siskiyou, Modoc |
| OTHER SPRING | | | | | | |
| Wisconsin | 13 | Apr. 20-May 5 | Aug. 1 | Aug. 10-Aug. 20 | Aug. 25 | 9 |
| Minnesota | 730 | Apr. 15-May 30 | July 25 | Aug. 1-Aug. 20 | Sept. 10 | 1, 4, 5, 7, 8, 9 |
| North Dakota | 3,905 | Apr. 15-May 25 | Aug. 5 | Aug. 15-Sept. 5 | Sept. 10 | Statewide |
| South Dakota | 1,107 | Apr. 1-May 5 | July 20 | July 25-Aug. 15 | Aug. 20 | 1, 2, 3, 5 |
| Montana | 1,104 | Apr. 10-May 25 | Aug. 5 | Aug. 10-Aug. 25 | Sept. 15 | 2, 3, 9 |
| Idaho | 229 | Mar. 20-May 25 | July 15 | Aug. 10-Sept. 5 | Sept. 30 | Statewide |
| Wyoming | 22 | Apr. 5-May 20 | Aug. 1 | Aug. 10-Aug. 25 | Sept. 5 | 1, 2, 3, 5 |
| Colorado | 35 | Mar. 10-Apr. 30 | July 5 | July 15-Aug. 10 | Aug. 30 | Statewide |
| Utah | 32 | Mar. 20-May 1 | Aug. 1 | Aug. 5-Aug. 25 | Sept. 1 | 1, 5 |
| Nevada | 6 | Apr. 1-May 10 | July 25 | Aug. 10-Sept. 5 | Sept. 15 | Humboldt, Pershing, Eureka, Lander |
| Washington | 285 | Mar. 10-Apr. 10 | July 15 | July 25-Aug. 20 | Sept. 30 | 2, 3, 5, 9 |
| Oregon | 56 | Feb. 1-Apr. 15 | Aug. 1 | Aug. 15-Sept. 10 | Sept. 15 | Statewide except coast |

## CROPS

### Barley

Nearly 10 million acres of barley were harvested in 1969. While year-to-year fluctuations have occurred, acreage is still about the same as in the late twenties. Yields, however, have been steadily increasing.

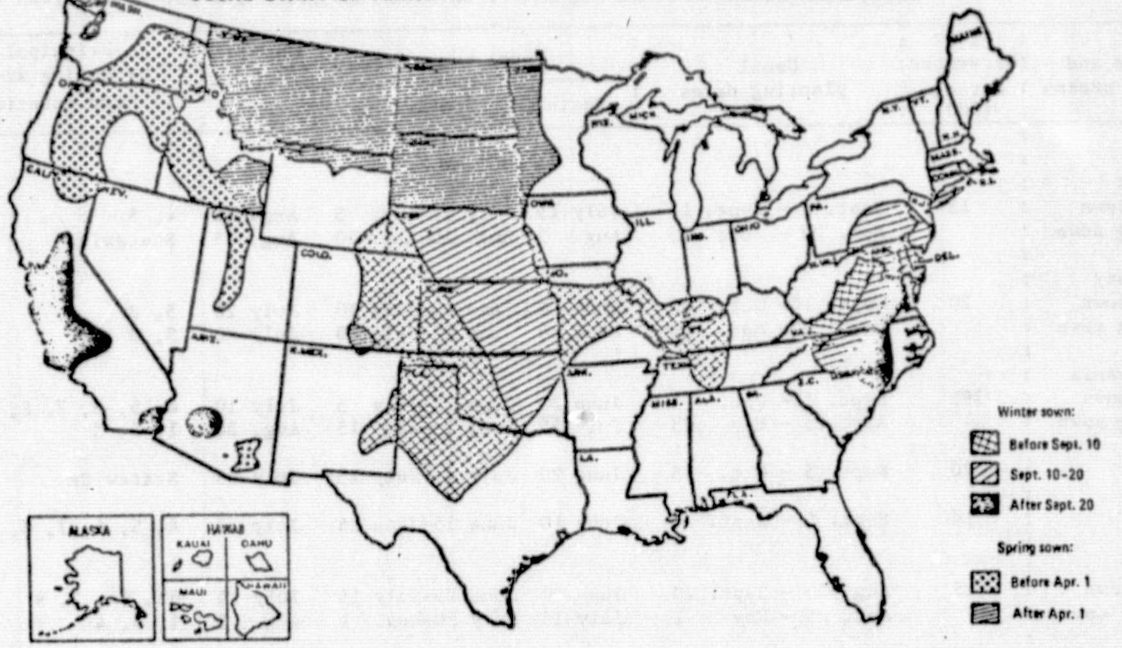
The major barley-producing State is North Dakota, where almost one-fourth of the U.S. acreage is sown. This State, with California and Montana--the second and third ranking producing States--accounts for about 50 percent of the Nation's annual acreage and production. Only minor acreages are grown in Eastern and Southern States. Most barley is fed to livestock, although over one-fourth of the crop is used for malting.




Figure

# BARLEY

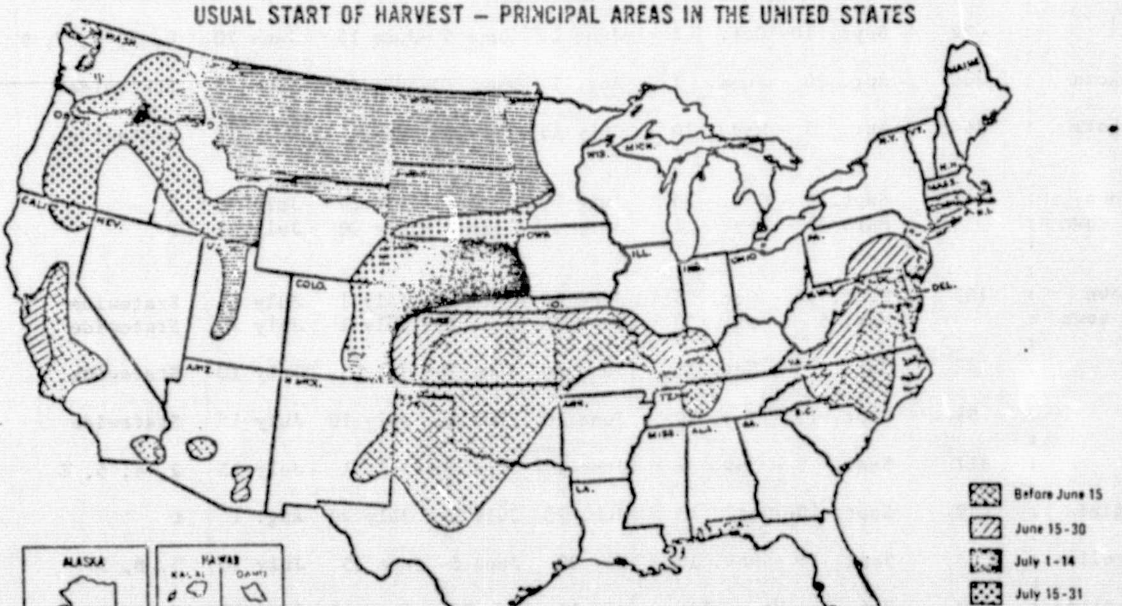
## USUAL START OF PLANTING – PRINCIPAL AREAS IN THE UNITED STATES




U.S. DEPARTMENT OF AGRICULTURE    Figure 3    NEG STATISTICAL REPORTING SERVICE 261-71(12)

# BARLEY

## USUAL START OF HARVEST – PRINCIPAL AREAS IN THE UNITED STATES




U.S. DEPARTMENT OF AGRICULTURE    Figure 4    NEG STATISTICAL REPORTING SERVICE 262-71(12)

Table 1. Barley: Usual planting and harvesting dates, by State and principal producing areas

| State and sowing season | 1969 harvested acreage (000) | Usual planting dates | Usual harvesting dates: Begin | Most active | End | Principal producing areas and counties |
|---|---|---|---|---|---|---|
| New York | | | | | | |
| Fall sown | 13 | Sept. 1 - Sept. 15 | July 15 | July 25-Aug. 5 | Aug. 10 | 4, 5 |
| Spring sown | | Apr. 20 - June 10 | Aug. 5 | Aug. 10-Aug. 20 | Aug. 25 | Statewide |
| New Jersey | | | | | | |
| Fall sown | 20 | Sept. 10- Oct. 20 | June 10 | June 20-July 10 | July 20 | 5, 8 |
| Spring sown | | Mar. 20- Apr. 20 | June 10 | June 20-July 10 | July 20 | 5, 8 |
| Pennsylvania | | | | | | |
| Fall sown | 191 | Sept. 10- Oct. 1 | June 20 | June 25-July 5 | July 10 | 4, 5, 6, 7, 8, 9 |
| Spring sown | | Apr. 25 - May 25 | July 25 | Aug. 1 - Aug. 15 | Aug. 20 | 1, 2, 3 |
| Ohio | 20 | Sept. 5 - Oct. 15 | June 20 | July 1 -July 15 | July 25 | Statewide |
| Indiana | 10 | Sept. 5 - Sept. 25 | June 10 | June 15-June 25 | July 1 | 4, 5, 6, 7, 8, 9 |
| Illinois | | | | | | |
| Fall sown | 15 | Aug. 20 - Sept. 20 | June 20 | June 25-July 15 | July 15 | 4A, 6A, 7, 9 |
| Spring sown | | Apr. 5 - May 1 | July 15 | July 20-Aug. 1 | Aug. 5 | 1, 3, 4 |
| Michigan | | | | | | |
| Fall sown | 23 | Sept. 5 - Sept. 15 | July 1 | July 5-July 20 | July 30 | 8, 9 |
| Spring sown | | Apr. 15 - May 30 | July 15 | July 15-Aug. 5 | Aug. 10 | 6, 7 |
| Wisconsin | 35 | Apr. 20 - May 1 | July 20 | July 25- Aug. 5 | Aug. 10 | 8, 9 |
| Minnesota | 685 | Apr. 15 - May 30 | July 25 | Aug. 1 - Aug.20 | Sept.10 | 1, 4 |
| Iowa | 4 | Apr. 1 - Apr. 20 | July 10 | July 15-July 25 | Aug. 1 | Statewide |
| Missouri | 22 | Sept. 10- Oct. 1 | June 1 | June 5 -June 15 | June 20 | 4, 5, 6, 7, 9 |
| North Dakota | 2,206 | Apr. 20 - June 1 | Aug. 1 | Aug. 10-Aug. 25 | Sept. 5 | Statewide |
| South Dakota | 344 | Apr. 5 - May 10 | July 15 | July 25-Aug. 10 | Aug. 15 | Statewide |
| Nebraska | | | | | | |
| Fall sown | 45 | Sept. 1 - Oct. 5 | July 1 | July 5 -July 20 | July 30 | 1 |
| Spring sown | | Mar. 25 - May 1 | July 1 | July 5 -July 20 | July 30 | 1 |
| Kansas | | | | | | |
| Fall sown | 165 | Sept. 10 - Oct. 25 | June 10 | June 15- July 1 | July 5 | Statewide |
| Spring sown | | Mar. 5 - Apr. 30 | June 20 | June 25- July 1 | July 10 | Statewide |
| Delaware | 20 | Sept. 20 - Nov. 10 | June 10 | June 20- July 5 | July 10 | Statewide |
| Maryland | 99 | Sept. 15 - Nov. 10 | June 10 | June 20- July 10 | July 15 | Statewide |
| Virginia | 117 | Sept. 5 - Nov. 1 | June 1 | June 20 -July 1 | July 15 | 2, 4, 5, 6 |
| West Virginia | 9 | Sept. 10- Oct. 15 | June 25 | July 5 - July 20 | Aug. 1 | 6 |
| North Carolina | 55 | Sept. 15 - Nov. 10 | May 20 | June 5- June 25 | July 10 | 5, 8, 9 |
| South Carolina | 19 | Oct. 1 - Dec. 1 | May 15 | May 20 - June 10 | June 15 | Statewide |
| Georgia | 5 | Sept. 10 - Dec. 1 | May 15 | June 1 - June 15 | June 25 | 3, 5, 6, 7 |
| Kentucky | 41 | Aug. 20 - Oct. 1 | June 1 | June 10-June 25 | July 5 | 2, 3 |
| Tennessee | 17 | Sept. 1 - Nov. 1 | June 1 | June 10-June 25 | July 10 | 3, 4, 5 |

Continued

Table 1. Barley: Usual planting and harvesting dates, by State and principal producing areas—Con.

| State and sowing season | 1969 harvested: acreage (000) | Usual planting dates | Usual harvesting dates: Begin | Usual harvesting dates: Most active | Usual harvesting dates: End | Principal producing areas and counties |
|---|---|---|---|---|---|---|
| Arkansas | 2 | Sept. 10-Nov. 1 | June 1 | June 10-June 25 | July 5 | Statewide |
| Oklahoma | | | | | | |
| Fall sown | 422 | Sept. 10-Oct. 30 | June 5 | June 10-June 20 | June 30 | Statewide |
| Spring sown | | Jan. 30- Mar. 15 | June 5 | June 10-June 20 | June 30 | Statewide |
| Texas | 94 | Sept. 20-Oct. 30 | May 25 | June 5-June 15 | June 20 | 1N, 2N, 2S, 3, 4, 6, 7 |
| Montana | 1,617 | Apr. 10-May 30 | Aug. 5 | Aug. 10-Aug. 25 | Sept. 15 | Statewide |
| Idaho | | | | | | |
| Fall sown | 584 | Sept. 1-Oct. 15 | July 15 | July 25-Aug. 20 | Sept. 1 | 1-9 |
| Spring sown | | Mar. 25-May 25 | July 25 | Aug. 5-Sept. 15 | Sept. 30 | Statewide |
| Wyoming | 116 | Apr. 5-May 20 | Aug. 1 | Aug. 5-Aug. 20 | Sept. 1 | 1, 2, 3, 5 |
| Colorado | | | | | | |
| Fall sown | 289 | Sept. 1-Oct. 15 | June 20 | July 1-July 20 | Aug. 5 | 2, 6, 9 |
| Spring sown | | Mar. 15-Apr. 30 | June 30 | July 5-Sept. 10 | Sept. 20 | 1, 2, 7, 8 |
| New Mexico | | | | | | |
| Fall sown | 14 | Sept. 15-Nov. 1 | June 10 | June 15-July 10 | July 20 | Statewide |
| Spring sown | | Feb. 15-Apr. 1 | June 15 | June 20-July 15 | Aug. 1 | 9 |
| Arizona | 144 | Oct. 1-Feb. 15 | May 20 | May 25-June 30 | July 10 | 5, 7, 9 |
| Utah | 128 | Mar. 20 -Apr. 25 | Aug. 1 | Aug. 20-Sept. 1 | Sept. 10 | 1, 5 |
| Nevada | | | | | | |
| Fall sown | 19 | Sept. 5-Oct. 20 | July 10 | July 15-Aug. 25 | Sept. 5 | 1 |
| Spring sown | | Apr. 5-May 10 | July 20 | July 25-Sept. 1 | Sept. 15 | 1 |
| Washington | | | | | | |
| Fall sown | 370 | Sept. 1-Nov. 10 | July 1 | July 15-Aug. 10 | Aug. 20 | 2, 3, 5, 9 |
| Spring sown | | Mar. 10-Apr. 1 | July 5 | July 20-Aug. 15 | Sept. 1 | 2, 3, 5, 9 |
| Oregon | | | | | | |
| Fall sown | 399 | Aug. 15-Feb. 1 | July 5 | July 15-Aug. 10 | Aug. 20 | 1, 2, 3, 8 |
| Spring sown | | Feb. 15-May 15 | July 25 | Aug. 5-Aug. 25 | Sept. 15 | Statewide, except Coast |
| California | | | | | | |
| Fall sown | 1,153 | Oct. 1-Apr. 15 | May 15 | June 1-July 15 | Aug. 15 | 4, 5, 5A, 8 |
| Spring sown | | Mar. 1-May 1 | Aug. 15 | Sept. 1-Sept. 20 | Sept. 30 | Modoc, Siskiyou |
| Alaska | 1.8 | May 1-July 1 | Aug. 15 | Sept. 10-Sept. 25 | Oct. 5 | Tanana & Matanuska Valleys |

## Corn

Corn is the leading crop in American agriculture both in terms of value of production and of acreage grown. In 1969, nearly 55 million acres of corn were harvested for grain, producing 4,583 million bushels. The acreage for grain comprised 86 percent of the corn grown for all purposes. More than four-fifths of the corn-for-grain acreage lies in the Corn Belt, with Illinois the leading State, and Iowa second. Corn-for-grain estimates began in 1919. The largest acreage of record, 97 million, was harvested in 1932. Acreage gradually declined, except for larger wartime plantings, and was down to 72 million acres by 1950. The downtrend continued with about 63 million acres harvested in 1957 and 1958, as allotments were in force in commercial counties for producers desiring price support. With the discontinuance of allotments in 1959, acreage returned to the 1950 level of 72 million; but declined with the start of the Feed Grain Program in 1961. During 1962-69, acreage ranged from 61 million in 1967 to 55 million in 1969. The average yield per acre has trended upward since 1940, with more rapid increases since the mid-1950's, resulting in a new record being established nearly each year in 1956-69. The 1969 yield was 83.9 bushels per acre.

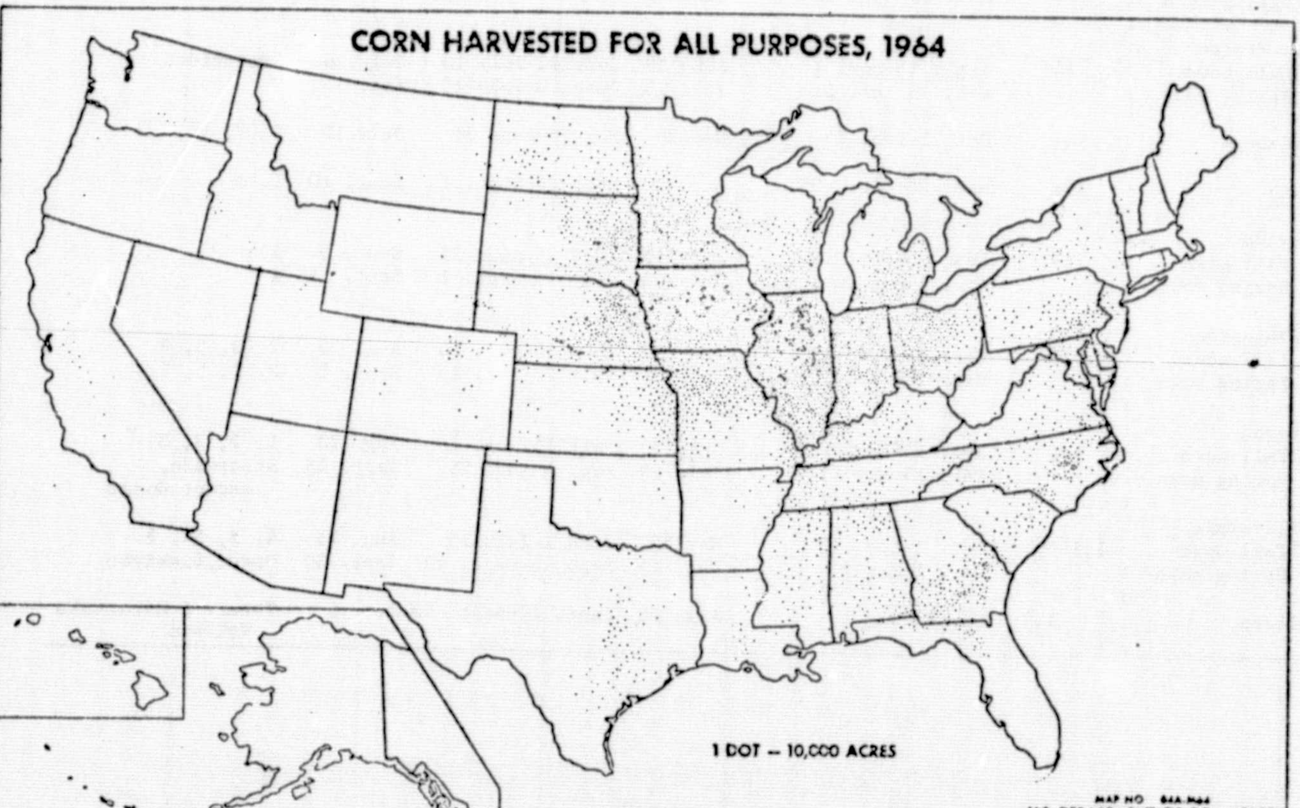



Figure 5

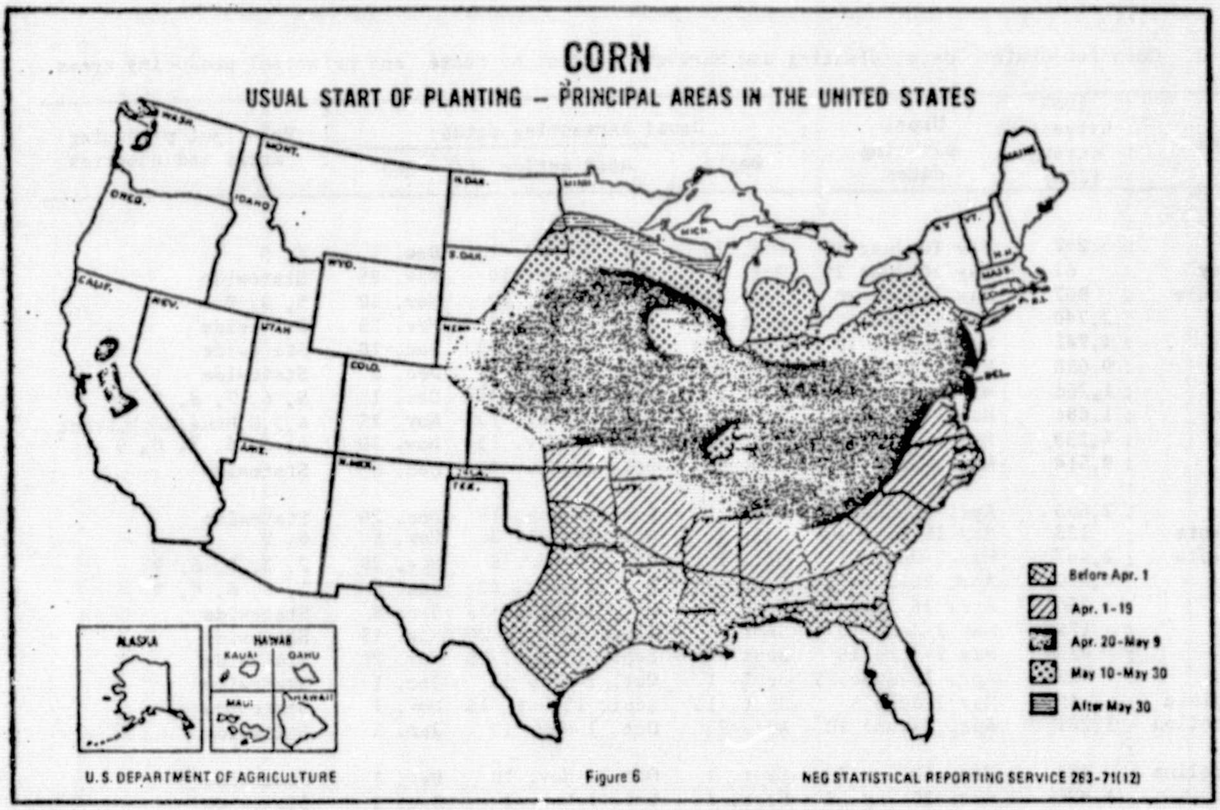



Figure 6

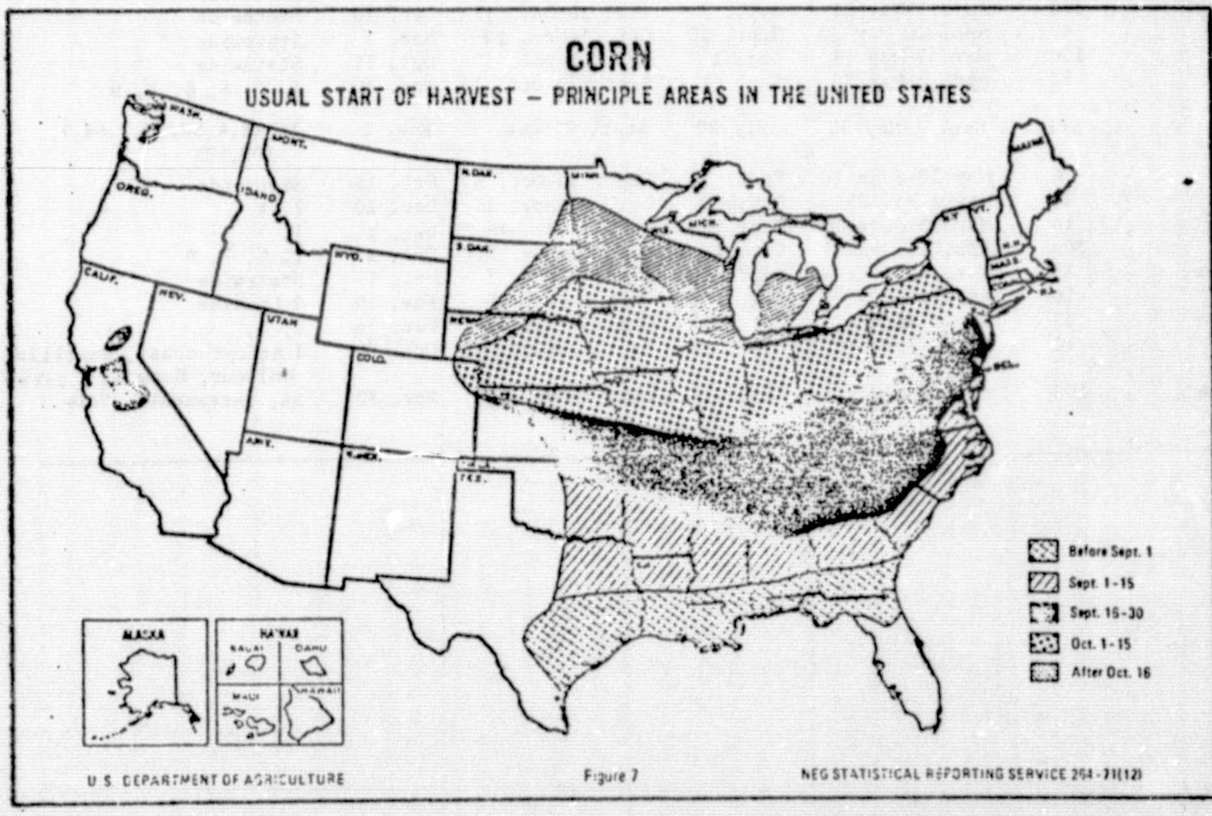



Figure 7

Table 2. Corn for Grain: Usual planting and harvesting dates, by State and principal producing areas

| State | 1969 harvested acreage (000) | Usual planting dates | Usual harvesting dates: Begin | Usual harvesting dates: Most active | Usual harvesting dates: End | Principal producing areas and counties |
|---|---|---|---|---|---|---|
| New York | 247 | May 10-June 15 | Oct. 10 | Oct. 20-Nov. 15 | Dec. 1 | 4, 5 |
| New Jersey | 61 | May 10-June 20 | Oct. 5 | Oct. 20-Nov 10 | Nov. 25 | Statewide |
| Pennsylvania | 907 | May 1-June 20 | Sept. 20 | Oct. 1-Oct. 20 | Nov. 10 | 5, 8, 9 |
| Ohio | 2,740 | May 1-June 15 | Sept. 25 | Oct. 10-Nov. 5 | Nov. 25 | Statewide |
| Indiana | 4,742 | May 1-June 10 | Sept. 30 | Oct. 10-Nov. 30 | Dec. 10 | Statewide |
| Illinois | 9,698 | May 1-June 15 | Oct. 1 | Oct. 15-Nov. 15 | Dec. 5 | Statewide |
| Michigan | 1,266 | May 1-June 15 | Oct. 1 | Oct. 15-Nov. 15 | Dec. 1 | 5, 6, 7, 8, 9 |
| Wisconsin | 1,684 | May 5-June 10 | Oct. 10 | Oct. 20-Nov. 10 | Nov. 25 | 4,7,8,Dane,Rock,Grant |
| Minnesota | 4,139 | May 1-June 15 | Oct. 5 | Oct. 20-Nov. 15 | Nov. 30 | 4, 5, 6, 7, 8, 9 |
| Iowa | 9,514 | May 1-June 1 | Oct. 5 | Oct. 25-Nov. 25 | Dec. 5 | Statewide |
| Missouri | 2,603 | Apr. 20-June 1 | Sept. 15 | Oct. 10-Nov. 15 | Dec. 20 | Statewide |
| North Dakota | 123 | May 15-June 20 | Oct. 5 | Oct. 10-Oct. 25 | Nov. 5 | 6, 9 |
| South Dakota | 2,447 | May 5-June 5 | Oct. 1 | Oct. 20-Nov. 5 | Nov. 20 | 2, 3, 5, 6, 9 |
| Nebraska | 4,620 | Apr. 25-June 5 | Sept. 25 | Oct. 15-Nov. 10 | Dec. 5 | 3, 5, 6, 8, 9 |
| Kansas | 1,236 | Apr. 15-June 10 | Sept. 15 | Oct. 10-Nov. 15 | Dec. 5 | Statewide |
| Delaware | 170 | May 1-June 15 | Sept. 5 | Sept. 15-Oct. 20 | Nov. 15 | Statewide |
| Maryland | 479 | May 1-June 15 | Sept. 1 | Sept. 15-Oct. 25 | Nov. 20 | Statewide |
| Virginia | 432 | Apr. 15-June 25 | Sept. 1 | Oct. 1-Nov. 10 | Dec. 1 | Statewide |
| West Virginia | 49 | May 1-June 5 | Sept. 10 | Sept. 15-Oct. 15 | Nov. 1 | Statewide |
| North Carolina | 1,281 | Apr. 1-June 10 | Aug. 25 | Oct. 1-Nov. 10 | Jan. 1 | Statewide |
| South Carolina | 402 | Mar. 20-May 20 | Sept. 1 | Oct. 1-Nov. 10 | Dec. 1 | Statewide |
| Georgia | 1,426 | Mar. 20-May 15 | Sept. 1 | Oct. 1-Nov. 1 | Dec. 1 | Statewide |
| Florida | 358 | Mar. 1-Apr. 30 | Aug. 15 | Sept. 1-Sept. 30 | Nov. 15 | 1, 3, 5 |
| Kentucky | 998 | Apr. 20-June 15 | Sept. 20 | Oct. 5-Nov. 5 | Nov. 25 | Statewide |
| Tennessee | 605 | Apr. 15-June 15 | Sept. 10 | Oct. 15-Nov. 5 | Dec. 5 | Statewide |
| Alabama | 619 | Mar. 20-June 5 | Aug. 20 | Sept. 15-Nov 15 | Dec. 5 | Statewide |
| Mississippi | 318 | Apr. 1-May 31 | Sept. 1 | Oct. 15-Nov. 15 | Dec. 10 | Statewide |
| Arkansas | 47 | Apr. 10-May 30 | Sept. 10 | Oct. 1-Nov. 10 | Dec. 1 | Statewide |
| Louisiana | 134 | Mar. 1-May 15 | Aug. 1 | Sept. 1-Oct. 1 | Oct. 15 | Statewide |
| Oklahoma | 58 | Apr. 5-May 25 | Sept. 1 | Sept. 10-Oct. 15 | Nov. 10 | 1, 3, 5, 6, 8, 9 |
| Texas | 571 | Mar. 1-May 30 | July 20 | Sept. 25-Oct. 10 | Nov. 1 | 1N,1S,4,5N,5S,7,8N,9, 10N,10S |
| Montana | 6 | May 10-June 10 | Sept. 15 | Sept. 20-Oct. 5 | Oct. 15 | Statewide |
| Idaho | 23 | May 1-May 25 | Oct. 10 | Oct. 25-Nov. 15 | Dec. 10 | 7, 8 |
| Wyoming | 18 | May 10-June 15 | Oct. 15 | Nov. 1-Nov. 15 | Dec. 1 | 1, 5 |
| Colorado | 302 | Apr. 25-June 1 | Oct. 1 | Oct. 10-Nov. 20 | Dec. 1 | 2, 6, 7, 9 |
| New Mexico | 17 | Apr. 15-June 8 | Sept. 10 | Oct. 10-Nov. 1 | Dec. 1 | Statewide |
| Arizona | 16 | Apr. 15-June 1 | Aug. 15 | Oct. 1-Oct. 25 | Nov. 10 | 2 Cochise |
| Washington | 33 | May 1-June 5 | Oct. 15 | Oct. 25-Nov. 20 | Dec. 15 | 2, 5, |
| Oregon | 10 | May 5-June 10 | Sept. 15 | Sept. 25-Oct. 10 | Oct. 20 | 1 except coast, Umatilla, Malheur, Douglas, Baker |
| California | 194 | Apr. 15-July 1 | Sept. 15 | Oct. 1-Nov. 10 | Nov. 30 | 3A, Sacramento, Yolo |

## Sorghum

Sorghum is well adapted to heat and tolerates limited moisture conditions. For this reason, most grain sorghums are grown in the Southern Plains States. Of the 13.5 million acres harvested for grain in 1969, 82 percent was in Texas, Kansas, and Nebraska. Acreage fluctuated considerably from year to year but trended upward to nearly 27 million acres planted in 1957. The Feed Grain Program, started in 1961, sharply reduced the acreage. With the introduction of hybrid seed in 1956, sorghum yields surged upward and by 1969 had tripled the prehybrid yield level. Sorghum grain is used primarily as a livestock feed.

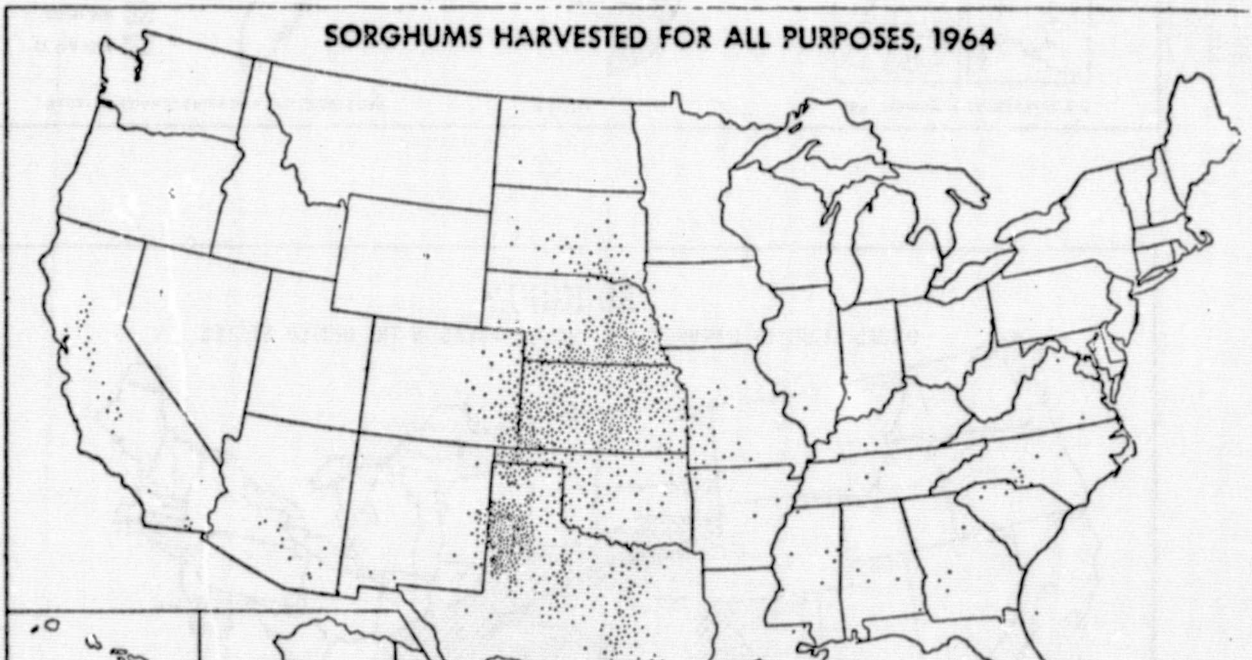



Figure 21

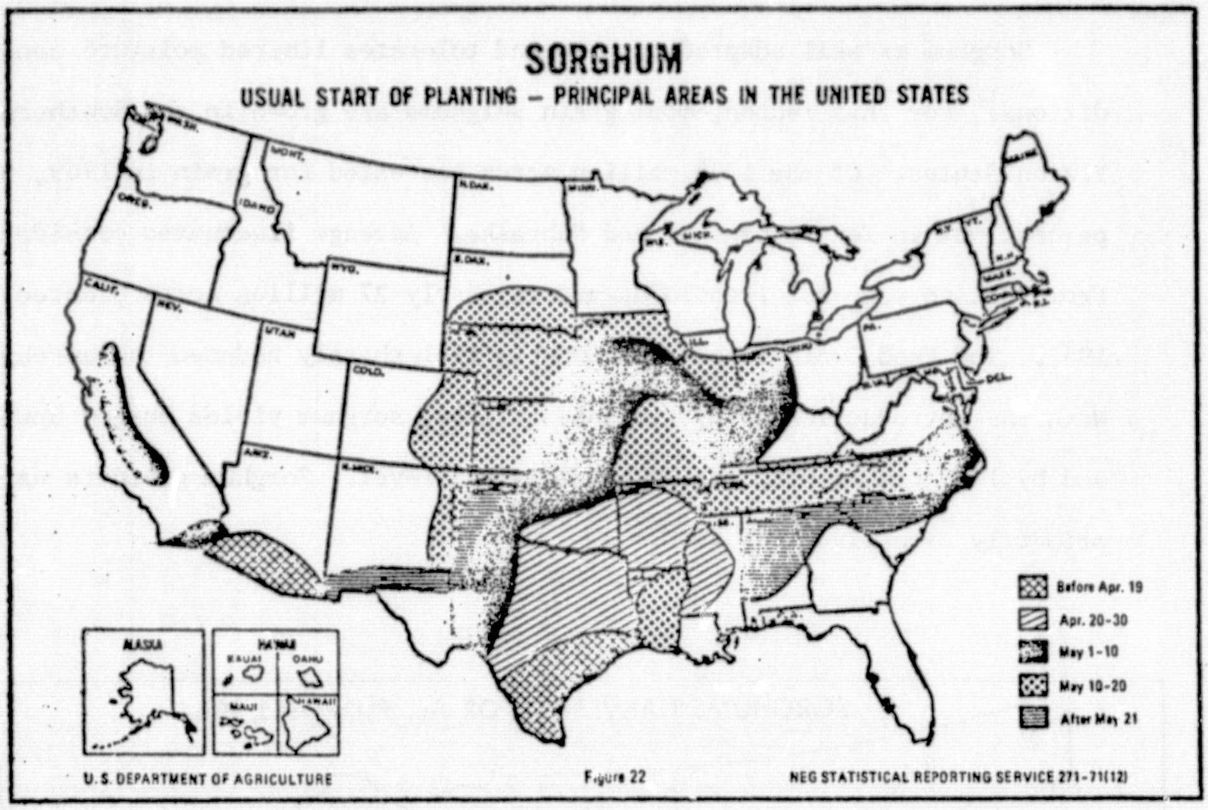



Figure 22

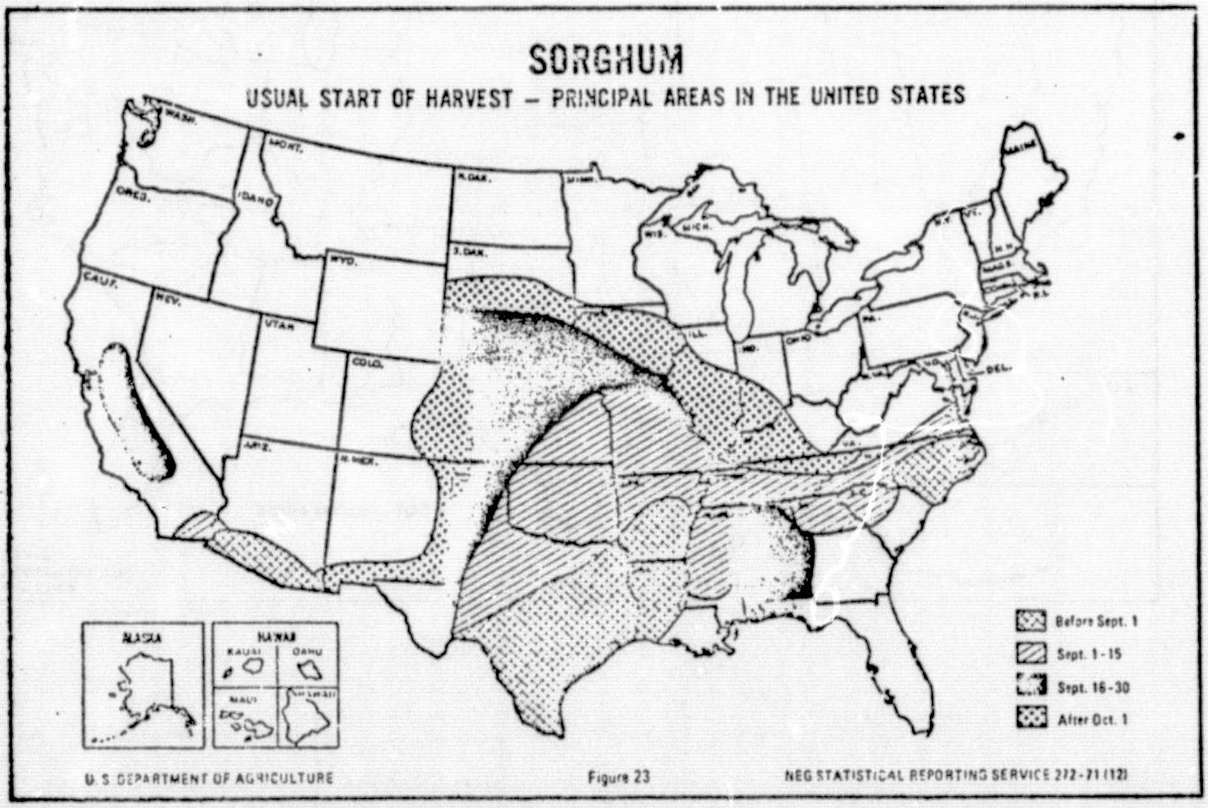
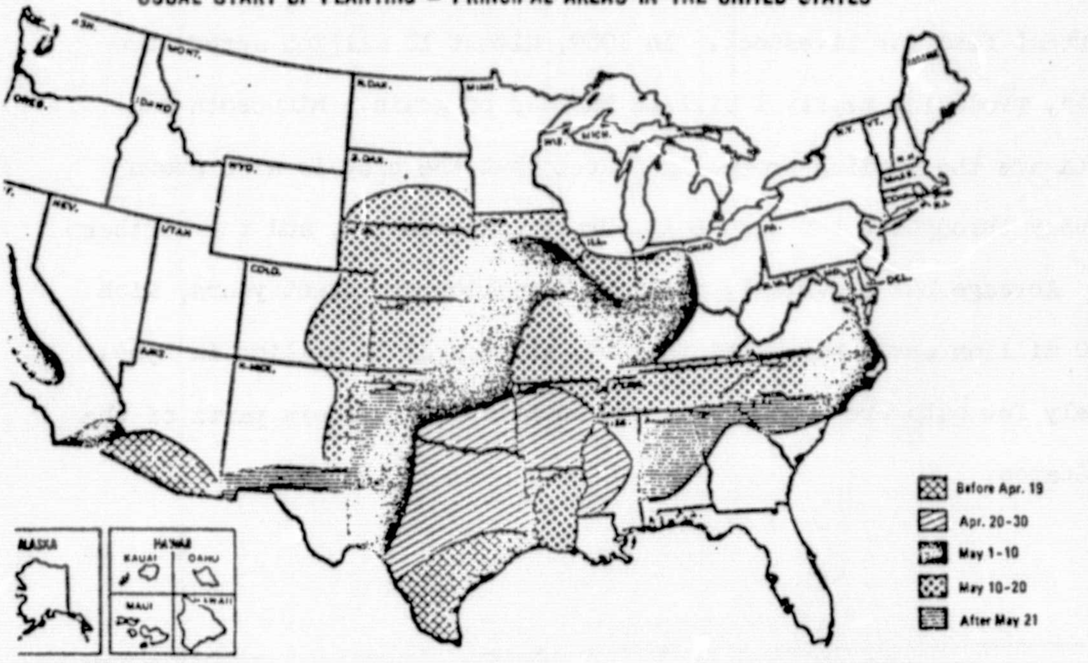



Figure 23

## SORGHUM

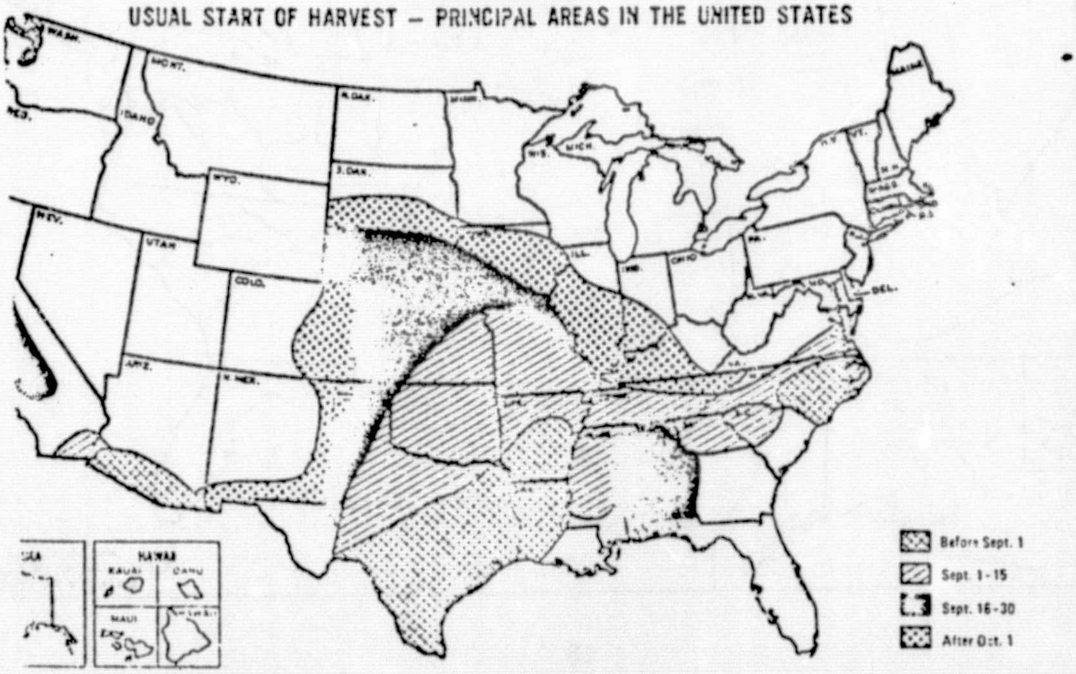
USUAL START OF PLANTING – PRINCIPAL AREAS IN THE UNITED STATES




EPARTMENT OF AGRICULTURE Figure 22 NEG STATISTICAL REPORTING SERVICE 271-71(12)

## SORGHUM

USUAL START OF HARVEST – PRINCIPAL AREAS IN THE UNITED STATES




RTMENT OF AGRICULTURE Figure 23 NEG STATISTICAL REPORTING SERVICE 272-71(12)

## Oats

Oats, the second major small grain produced in the United States is an important feed for livestock. In 1969, almost 18 million acres were harvested, producing nearly 1 billion bushels of grain. Minnesota and N. Dakota are the leading producing States; but the crop is also grown extensively throughout the Corn Belt, Great Lakes States, and the Northern Plains. Acreage has shown only a slight variation in recent years, with about 20 million acres harvested in 1964, and nearly 18 million in 1969. Relatively few oats are produced in the southern and western parts of the United States.

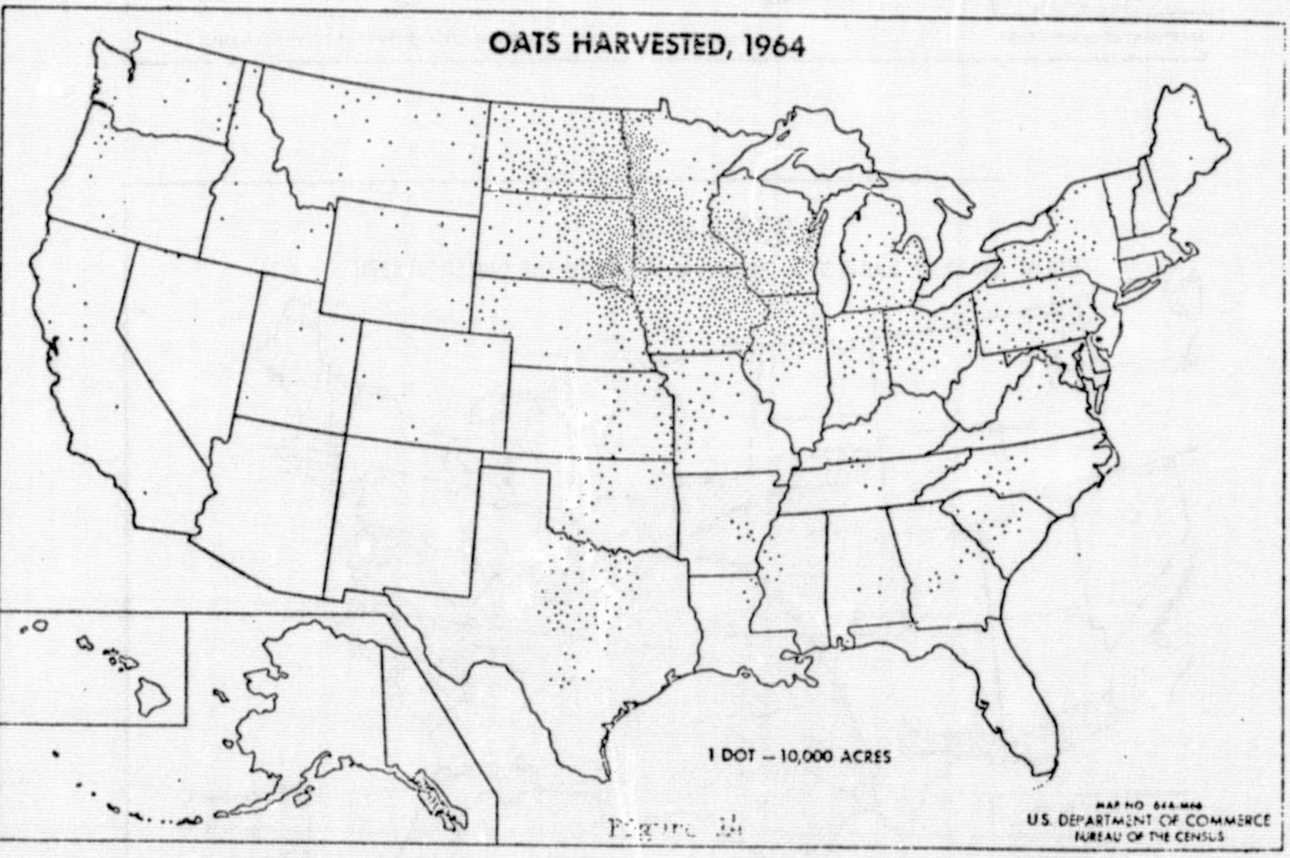
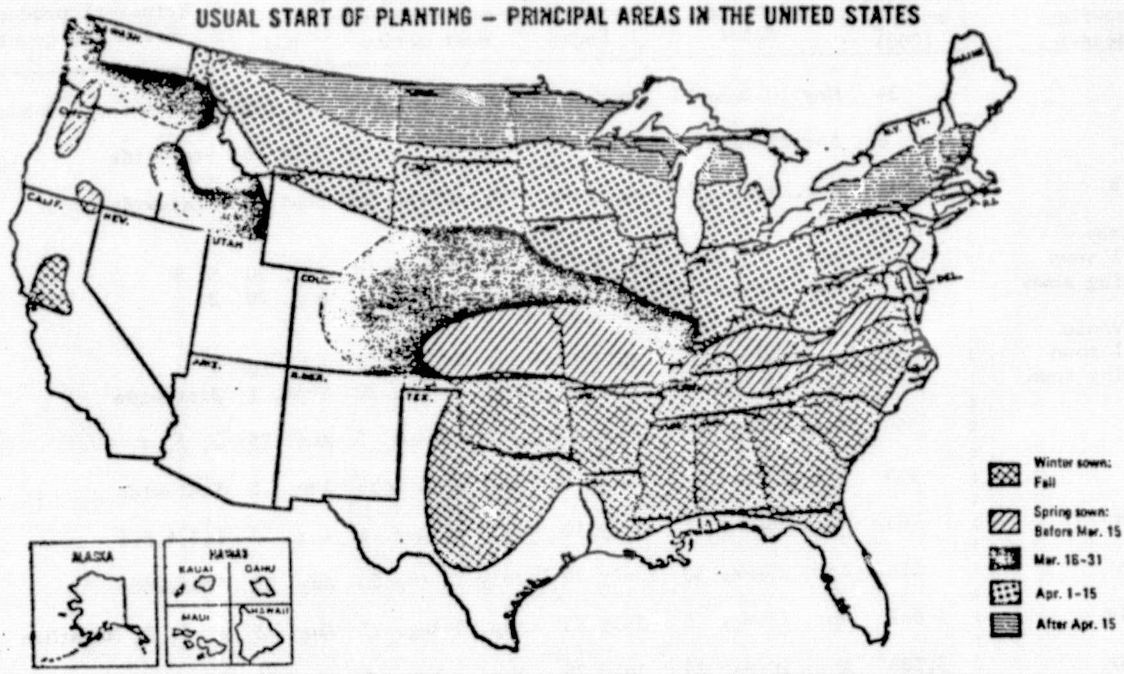



Figure 14

# OATS

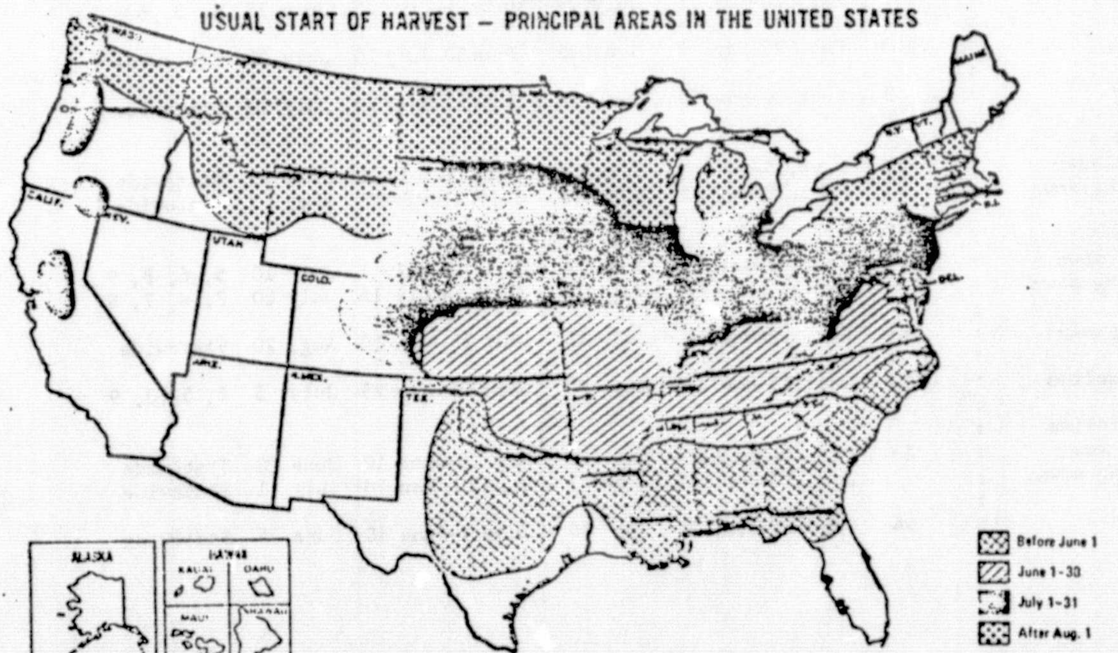
## USUAL START OF PLANTING – PRINCIPAL AREAS IN THE UNITED STATES




U. S. DEPARTMENT OF AGRICULTURE Figure 15 NEG STATISTICAL REPORTING SERVICE 267-71(12)

# OATS

## USUAL START OF HARVEST – PRINCIPAL AREAS IN THE UNITED STATES




U. S. DEPARTMENT OF AGRICULTURE Figure 16 NEG STATISTICAL REPORTING SERVICE 268-71(12)

Table 7. Oats: Usual planting and harvesting dates, by State and principal producing areas Con.

| State and sowing season | 1969 harvested acreage (000) | Usual planting dates | Usual harvesting dates | | | Principal producing areas and counties |
|---|---|---|---|---|---|---|
| | | | Begin | Most active | End | |
| Maine | 34 | May 10-June 10 | Aug. 20 | Sept. 5-Oct. 1 | Oct. 15 | Aroostook, Penobscot |
| Vermont | 6 | Apr.25-June 5 | Aug. 1 | Aug. 10-Aug.25 | Sept. 5 | Statewide |
| New York | 365 | Apr.20-May 30 | Aug. 1 | Aug. 10-Aug.25 | Sept.10 | Statewide |
| New Jersey | | | | | | |
| Fall sown | 10 | Sept.20-Oct.20 | July 15 | July 20-Aug.10 | Aug. 20 | 5, 8 |
| Spring sown | | Mar. 15-Apr.25 | July 15 | July 20-Aug.10 | Aug. 20 | 2 |
| Pennsylvania | | | | | | |
| Fall sown | 444 | Sept.1-Sept.20 | July 10 | July 20-Aug. 1 | Aug. 10 | 9 |
| Spring sown | | Apr. 10-May 25 | July 20 | Aug. 1-Aug. 20 | Sept. 1 | Statewide |
| Ohio | 560 | Apr. 1-May 10 | July 15 | July 20-Aug. 5 | Aug. 15 | 1, 2, 4 |
| Indiana | 320 | Apr. 1-Apr. 30 | July 5 | July 10-July 30 | Aug. 5 | Statewide |
| Illinois | 703 | Mar. 25-May 1 | July 10 | July 15-Aug. 1 | Aug. 15 | 1,3,4,5,6 |
| Michigan | 458 | Apr. 15-May 30 | July 20 | July 25-Aug.20 | Aug. 30 | Statewide |
| Wisconsin | 1,687 | Apr. 15-May 5 | July 25 | Aug. 5-Aug. 15 | Aug. 25 | 4, 6, 8, Marathon |
| Minnesota | 3,388 | Apr. 10-May 25 | July 25 | Aug. 1-Aug. 20 | Sept.10 | Statewide |
| Iowa | 1,840 | Apr. 5 - May 1 | July 15 | July 20-Aug. 1 | Aug. 15 | Statewide |
| Missouri | 170 | Mar. 1-Apr. 25 | June 15 | June 25-July 10 | July 20 | Statewide |
| North Dakota | 2,511 | Apr. 15-June 1 | Aug. 5 | Aug. 15-Sept.1 | Sept. 5 | Statewide |
| South Dakota | 2,357 | Apr. 5 -May 15 | July 15 | July 20-Aug.10 | Aug. 15 | 2, 3, 5, 6, 9 |
| Nebraska | 561 | Mar. 20-May 1 | July 1 | July 5-July 15 | July 25 | 1, 3, 6 |
| Kansas | 160 | Feb. 25-May 1 | June 25 | June 30-July 10 | July 20 | Statewide |
| Delaware | 3 | Sept.20-Nov.10 | June 15 | June 25-July 10 | July 20 | Statewide |
| Maryland | | | | | | |
| Fall sown | 28 | Sept.15-Nov.10 | June 15 | June 25-July 10 | July 25 | Statewide |
| Spring sown | | Mar. 20-May 1 | June 25 | July 5-July 25 | Aug. 5 | Statewide |
| Virginia | | | | | | |
| Fall sown | 49 | Sept. 5-Oct.25 | June 1 | June 10-July 1 | July 10 | 5, 6, 8, 9 |
| Spring sown | | Feb. 1-Apr. 15 | June 15 | July 1-July 15 | July 20 | 2, 4, 7, 8 |
| West Virginia | 12 | Apr. 10-May 10 | July 15 | July 15-Aug. 10 | Aug. 20 | Statewide |
| North Carolina | 120 | Sept.15-Nov. 1 | May 25 | June 10-June 25 | July 5 | 2, 5, 8, 9 |
| South Carolina | | | | | | |
| Fall sown | 83 | Oct. 1-Dec. 10 | May 20 | May 20-June 10 | June 20 | Statewide |
| Spring sown | | Jan. 10-Mar. 1 | June 1 | June 10-June 20 | July 1 | Statewide |
| Georgia | 94 | Sept.10-Dec. 1 | May 10 | June 1-June 10 | June 25 | Statewide |

Table 7. Oats: Usual planting and harvesting dates, by State and principal producing areas -- Con.

| State and sowing season | 1969 harvested acreage (000) | Usual planting dates | Usual harvesting dates: Begin | Most active | End | Principal producing areas and counties |
|---|---|---|---|---|---|---|
| Florida | 11 | Oct. 1-Nov. 30 | Apr. 15 | May 1-May 15 | May 30 | 1, 3, 5 |
| Kentucky | | | | | | |
| Fall sown | 19 | Aug. 25-Oct. 1 | June 15 | June 20-July 5 | July 15 | 1, 2, 3 |
| Spring sown | | Mar. 1 -Apr. 15 | June 25 | June 1-July 15 | July 25 | 3, 5, 6 |
| Tennessee | | | | | | |
| Fall sown | 43 | Sept.1-Nov. 1 | June 1 | June 15-July 5 | July 10 | Statewide |
| Spring sown | | Mar.15-Apr. 15 | Mostly for hay | | | 4, 5, 6 |
| Alabama | 29 | Sept. 20-Dec. 1 | May 15 | June 1-June 20 | July 1 | Statewide |
| Mississippi | | | | | | |
| Fall sown | 50 | Oct. 1-Nov. 15 | May 25 | June 5-June 15 | June 25 | 1, 4, 5 |
| Spring sown | | Feb. 15-Mar. 15 | June 1 | June 10-June 20 | June 30 | Statewide |
| Arkansas | | | | | | |
| Fall sown | 68 | Sept. 15-Nov. 15 | June 1 | June 5-June 15 | June 25 | Statewide |
| Spring sown | | Feb. 20-Mar. 20 | June 10 | June 15-July 1 | July 5 | Statewide |
| Louisiana | 28 | Sept. 15-Nov. 15 | May 10 | May 20-June 10 | June 15 | 1, 3, 5, 6, 7 |
| Oklahoma | | | | | | |
| Fall sown | 158 | Sept. 15-Oct. 30 | June 1 | June 10-June 20 | June 30 | Statewide |
| Spring sown | | Jan. 30-Mar. 25 | June 1 | June 10-June 20 | June 30 | Statewide |
| Texas | 670 | Sept. 5-Nov. 20 | May 15 | June 1-June 15 | June 20 | 2n, 2s, 3, 4, 7, 8n |
| Montana | 291 | Apr. 10-June 5 | Aug. 5 | Aug. 10-Sept. 1 | Sept. 15 | Statewide |
| Idaho | 100 | Mar. 25-May 25 | Aug. 1 | Aug. 10-Sept.20 | Oct. 10 | Statewide |
| Wyoming | 94 | Apr. 5-May 20 | Aug. 5 | Aug. 10-Aug. 25 | Sept. 1 | 1, 2, 5 |
| Colorado | 93 | Mar. 20-May 5 | July 15 | July 25-Aug. 30 | Sept.20 | Statewide |
| Utah | 22 | Mar. 20-May 15 | Aug. 1 | Aug. 10-Aug. 30 | Sept.20 | Statewide |
| Nevada | 3 | Apr. 1-May 25 | July 25 | Aug. 5-Sept. 1 | Sept.10 | Statewide |
| Washington | 80 | Mar. 10-Apr. 10 | July 15 | Aug. 1-Aug. 25 | Sept.10 | Statewide |
| Oregon | | | | | | |
| Fall sown | 113 | Oct. 1-Feb. 15 | July 10 | July 25-Aug. 15 | Sept. 1 | Statewide )except |
| Spring sown | | Feb. 15-Apr. 15 | Aug. 10 | Aug. 20-Sept.10 | Sept.20 | Statewide ) coast |
| California | | | | | | |
| Fall sown | 95 | Nov. 1-Mar. 1 | July 1 | July 15-July 30 | Aug. 15 | Sonoma, Butte, Sutter, Solano, Sacramento |
| Spring sown | | Mar. 1-May 10 | Aug. 25 | Sept. 1-Sept.20 | Sept.30 | Modoc, Siskiyou |
| Alaska | 1.5 | May 1-July 1 | Aug. 20 | Sept.10-Sept.30 | Oct. 15 | Tanana & Matanuska Valleys |

## Rice

Successful rice culture depends upon high temperatures during the growing season, a dependable fresh water supply for the irrigation period, soils that are comparatively level and underlaid with impervious subsoil, and good drainage. Areas which meet these requirements are the Coastal Prairie region of southwestern Louisiana and southeastern Texas, eastern Arkansas and northwest Mississippi, and the central valleys of California (particularly the Sacramento Valley). Production in the United States is confined mainly to these three regions.

The acreage of rice harvested in 1969 totaled 2.1 million acres, the largest of record. The peak year came in 1954, when 2.6 million acres were harvested. Record high yields per acre were set in each year from 1962 through 1967 when the U. S. yield averaged 4,537 pounds. Unfavorable conditions in the next 2 years interrupted this trend, resulting in a 1969 yield of 4,268 pounds per acre.

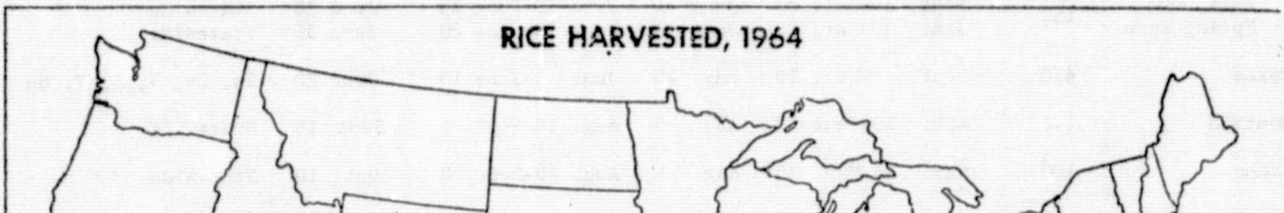



Figure 18

24

Table 9. Rice: Usual planting and harvesting dates, by State and principal producing areas

| State | 1969 harvested acreage (000) | Usual planting dates | Usual harvesting dates: Begin | Most active | End | Principal producing areas and counties |
|---|---|---|---|---|---|---|
| Missouri | 5.4 | May 1-May 20 | Oct. 1 | Oct. 5-Oct. 25 | Nov. 1 | 8, 9 |
| Mississippi | 60 | Apr.15-May 31 | Sept. 15 | Oct. 1-Oct. 15 | Nov. 15 | 1, 4 |
| Arkansas | 515 | Apr.10-May 25 | Sept. 10 | Sept.25-Oct.20 | Nov. 5 | 3, 6, 9 |
| Louisiana | 611 | Apr. 1-May 15 | Aug. 1 | Aug.15-Sept.15 | Oct. 1 | 3, 5, 7, 8 |
| Texas | 548 | Mar. 20-June 5 | July 30 | Aug. 20-Sept. 1 | Nov. 10 | 8N, 9 |
| California | 389 | Apr. 1-June 1 | Sept. 15 | Oct.10-Oct. 30 | Nov. 30 | 5, Fresno |

## Soybeans

U.S. soybean production has been increasing at a phenomenal rate, more than doubling during the past decade. Soybeans are grown primarily for beans, which are processed for oil and meal. The main soybean-producing area is in the North Central States, although the South Central and South Atlantic States are becoming increasingly important producers. Illinois is the leading State, followed by Iowa. These two States accounted for over one-third of the total U.S. production in 1969. Other top-ranking States include Indiana, Arkansas, Missouri, Minnesota, and Ohio.

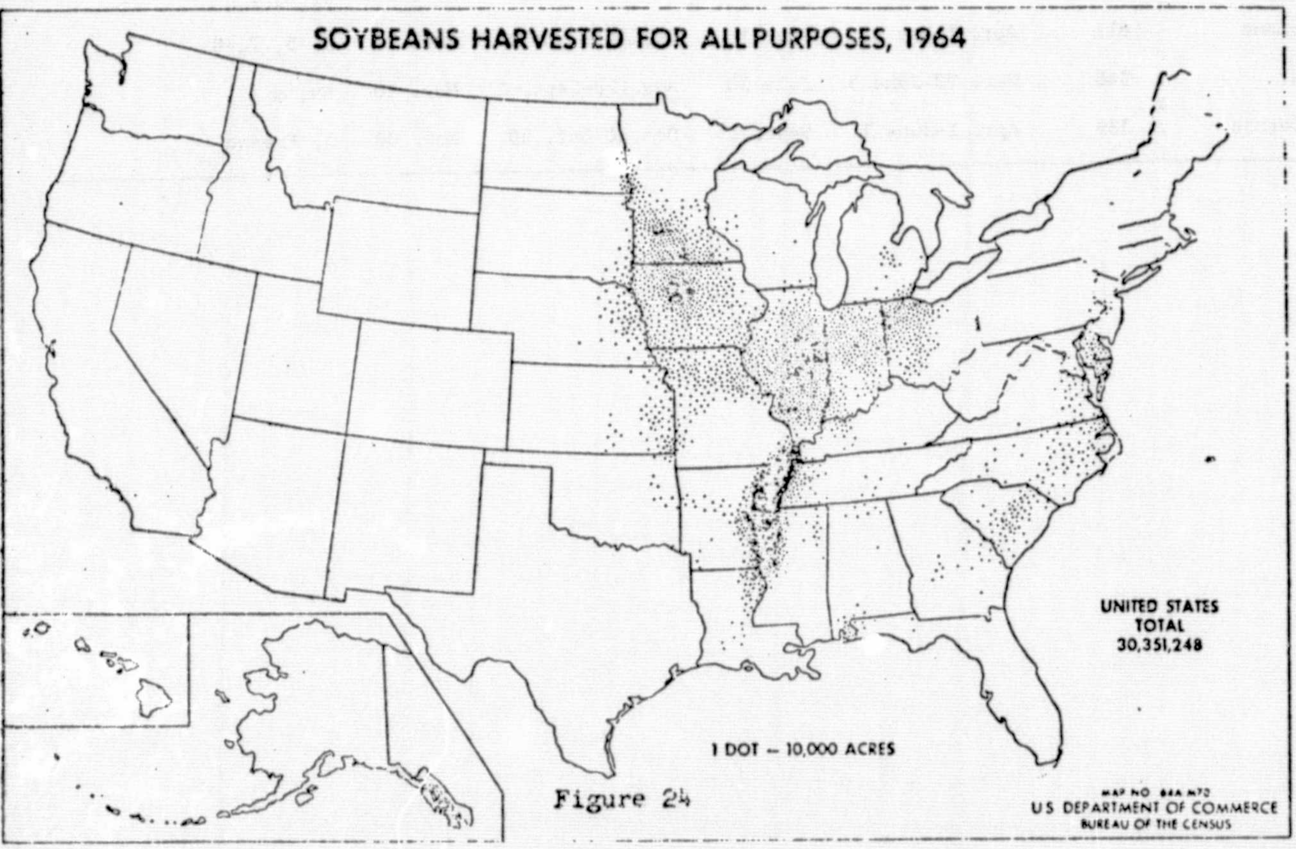
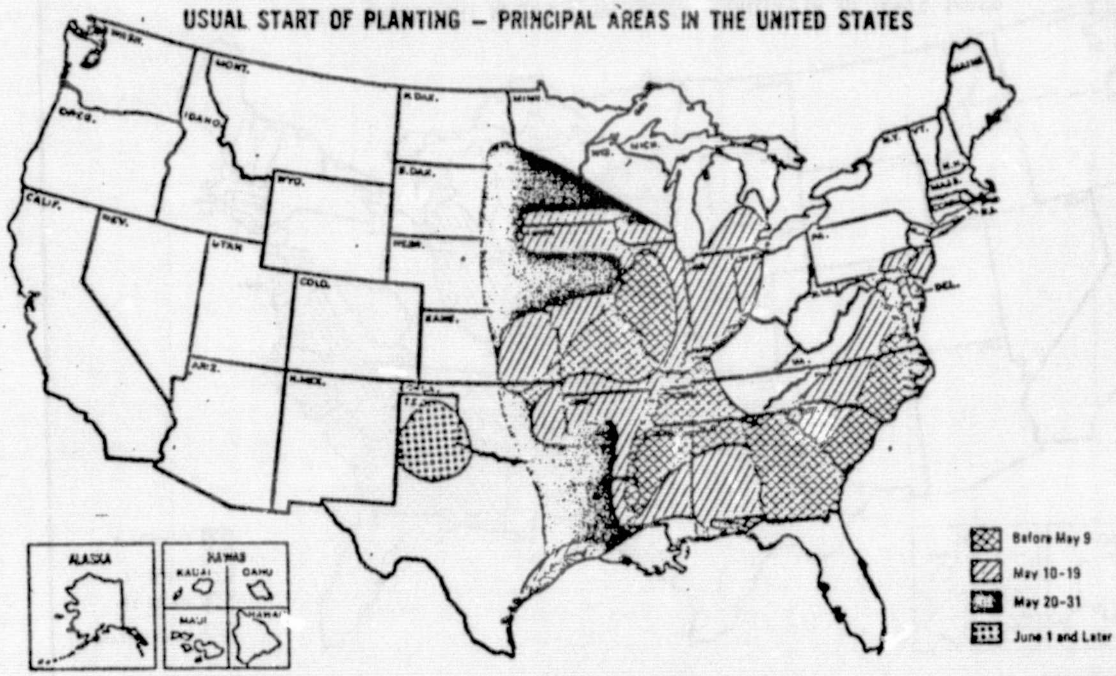



Figure 24

# SOYBEANS FOR BEANS

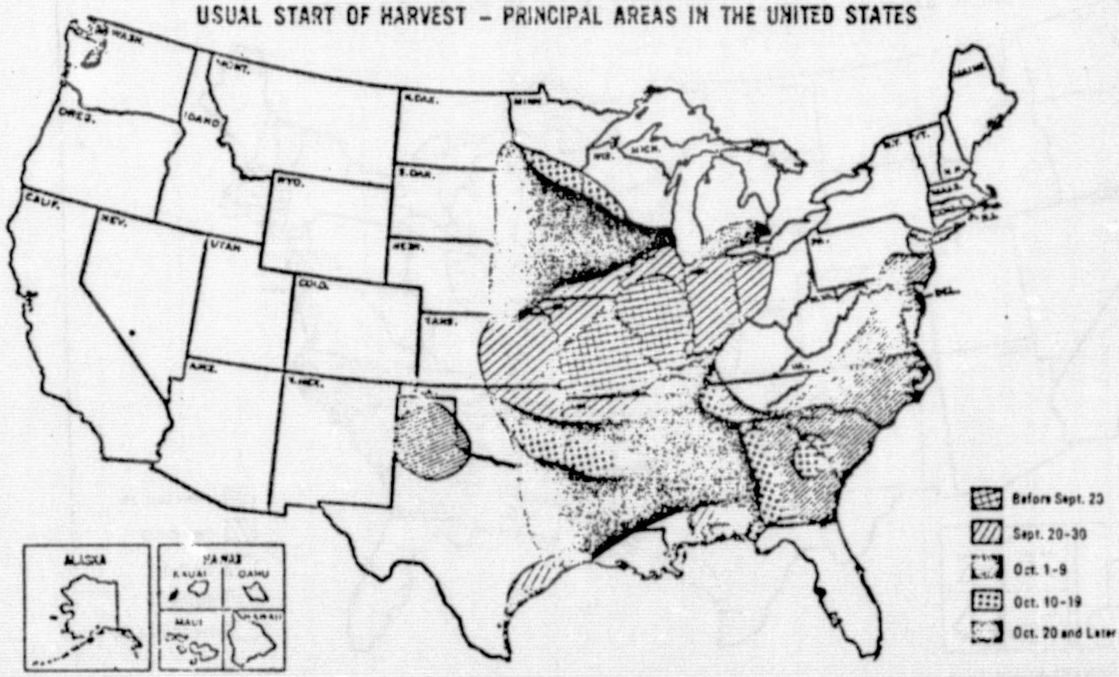
USUAL START OF PLANTING – PRINCIPAL AREAS IN THE UNITED STATES




U.S. DEPARTMENT OF AGRICULTURE | Figure 25 | NEG STATISTICAL REPORTING SERVICE 273-71(12)

# SOYBEANS FOR BEANS

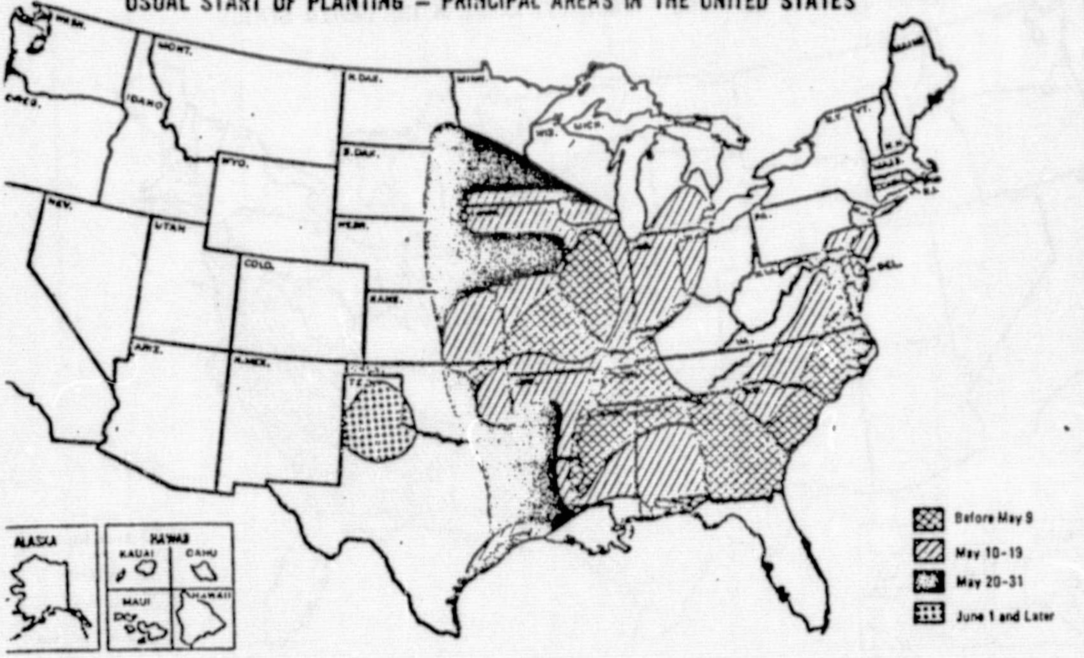
USUAL START OF HARVEST – PRINCIPAL AREAS IN THE UNITED STATES




U.S. DEPARTMENT OF AGRICULTURE | Figure 26 | NEG STATISTICAL REPORTING SERVICE 274-71(12)

# SOYBEANS FOR BEANS

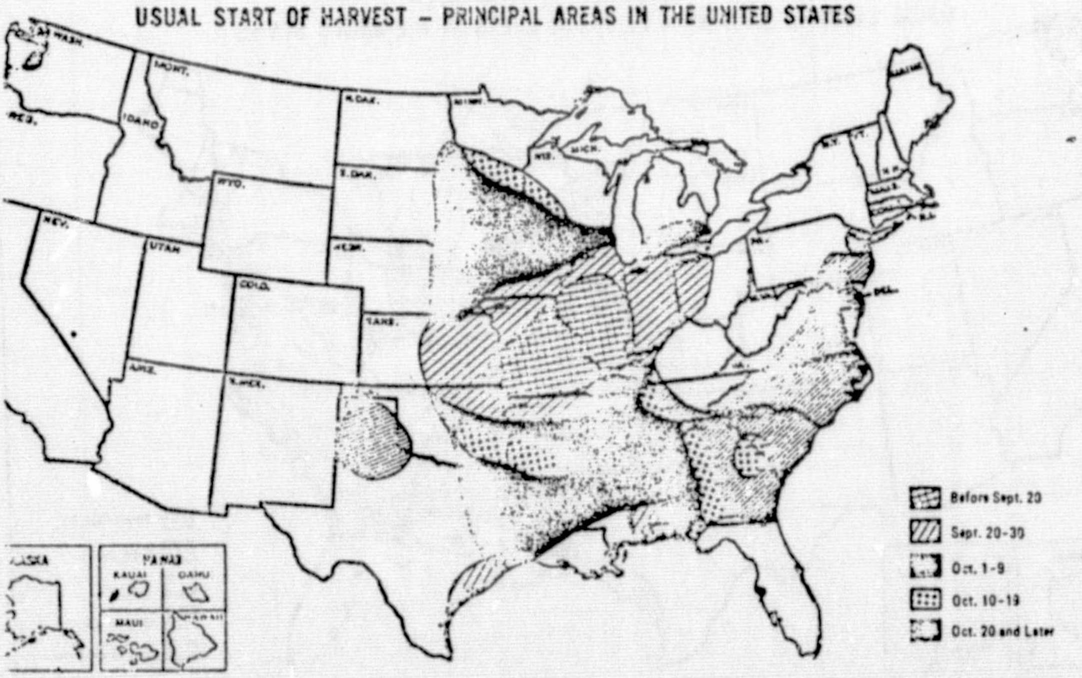
## USUAL START OF PLANTING – PRINCIPAL AREAS IN THE UNITED STATES




DEPARTMENT OF AGRICULTURE Figure 25 NEG STATISTICAL REPORTING SERVICE 273-71(12)

# SOYBEANS FOR BEANS

## USUAL START OF HARVEST – PRINCIPAL AREAS IN THE UNITED STATES




DEPARTMENT OF AGRICULTURE Figure 26 NEG STATISTICAL REPORTING SERVICE 274-71(12)

## Cotton

Cotton is grown in southern areas of the United States, mostly south of the 36th parallel. Cotton belongs to the mallow family and requires a long, frost-free season. Under tropical conditions, plants continue to grow each year and develop into trees. In the United States, cotton is grown as an annual from seed planted after soils become sufficiently warm. Planting gets underway in the Lower Valley of Texas the latter part of February and moves north across the Cotton Belt as the season advances. The bulk of the U. S. crop is planted during April, but in some late years planting is not completed until around mid-June, especially in the Plains areas of Texas. Although the first bale is ginned in June from the early-planted cotton in the Lower Valley of Texas, the bulk of the U.S. crop is harvested in October and November, except in the Plains areas of Texas. In that area, strippers are used to harvest the crop after the first freeze, with peak ginning during December in most years. Most cotton grown in the United States is upland cotton with a staple length of 1 inch or longer. Some extra-long-staple cotton (American-Pima), which has a staple of $1\frac{1}{2}$ inches or longer, is grown in Texas, New Mexico, Arizona, and California.

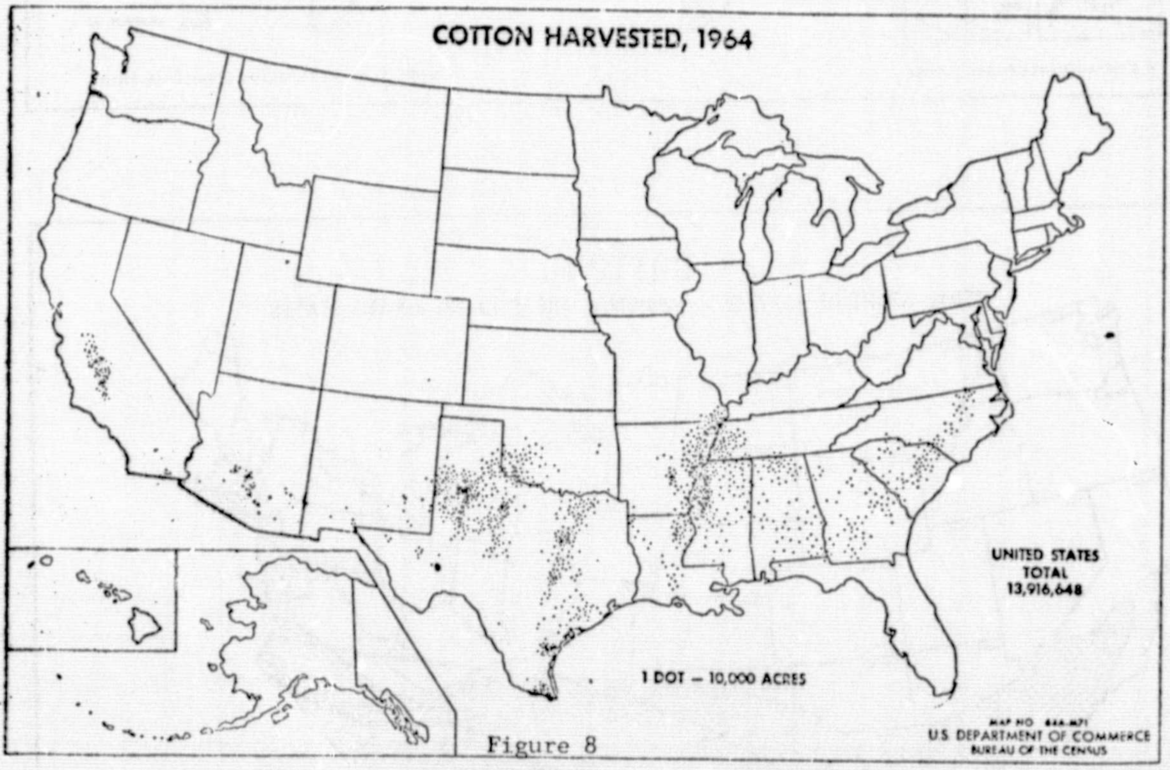
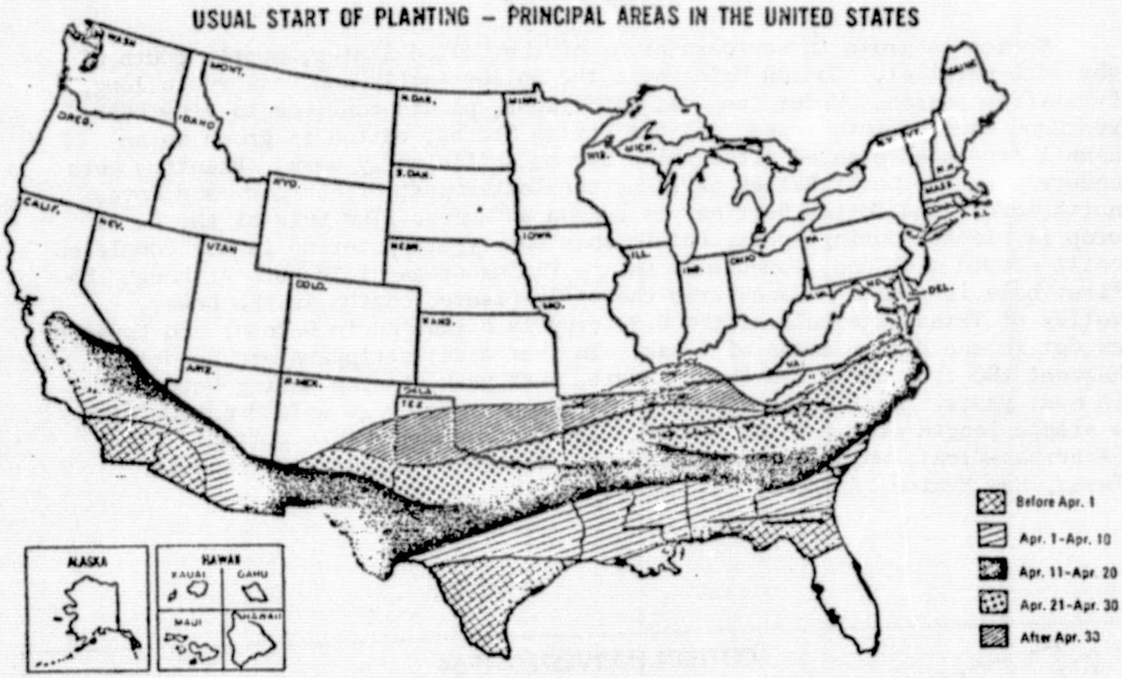



Figure 8

## COTTON

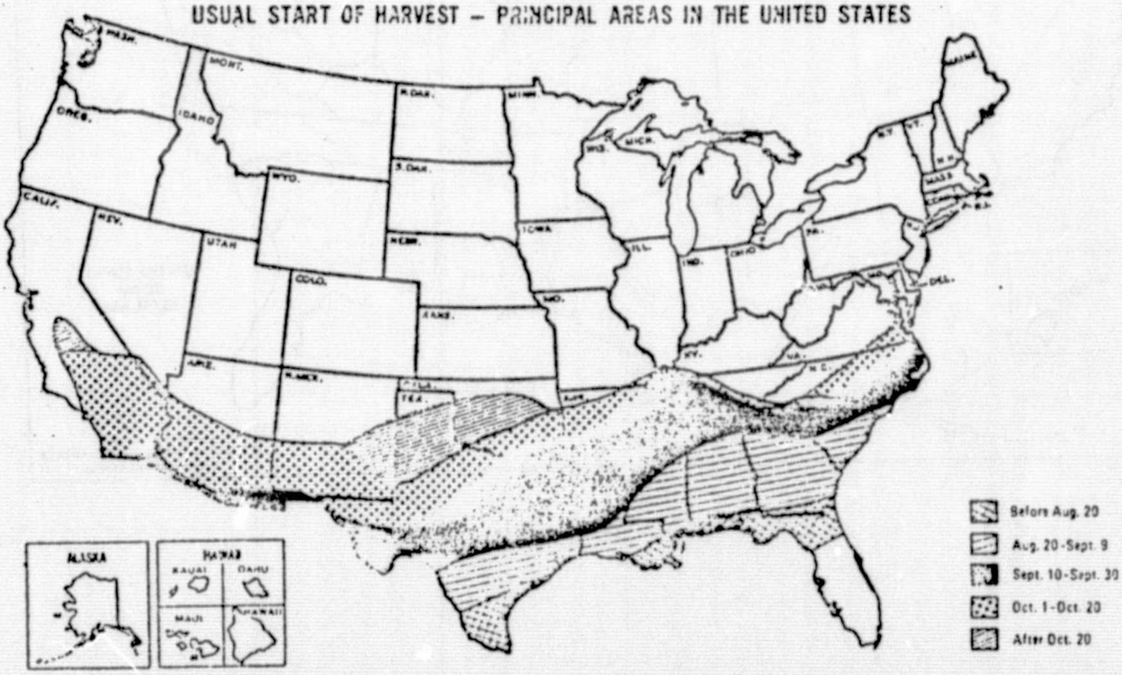
### USUAL START OF PLANTING – PRINCIPAL AREAS IN THE UNITED STATES




U. S. DEPARTMENT OF AGRICULTURE — Figure 9 — NEG STATISTICAL REPORTING SERVICE 265-71(12)

## COTTON

### USUAL START OF HARVEST – PRINCIPAL AREAS IN THE UNITED STATES




U. S. DEPARTMENT OF AGRICULTURE — Figure 10 — NEG STATISTICAL REPORTING SERVICE 266-71(12)

Table 3. Cotton: Usual planting and harvesting dates, by State and principal producing areas

| State | 1969 harvested acreage (000) | Usual planting dates | Usual harvesting dates: Begin | Most active | End | Principal producing areas and counties |
|---|---|---|---|---|---|---|
| Illinois | .4 | Apr. 20-May 15 | Sept. 15 | Sept. 30-Oct. 25 | Nov. 5 | Alexander, Pulaski |
| Missouri | 292 | Apr. 20-June 1 | Sept. 15 | Oct. 1-Nov. 1 | Dec. 15 | 9 |
| Virginia | 5.0 | Apr. 15-May 25 | Sept. 15 | Sept. 25-Nov. 1 | Dec. 1 | 9 |
| N. Carolina | 166 | Apr. 10-May 20 | Sept. 15 | Oct. 1-Nov. 15 | Dec. 10 | 2, 3, 5, 6, 8, 9 |
| S. Carolina | 287 | Apr. 1-May 20 | Sept. 1 | Sept. 20-Nov.1 | Dec. 1 | Statewide |
| Georgia | 385 | Apr. 5-May 20 | Sept. 1 | Sept. 15-Oct. 15 | Nov. 15 | Statewide |
| Florida | 12.5 | Apr. 1-May 15 | Aug. 15 | Sept. 15-Oct. 15 | Oct. 30 | 1, 3 |
| Kentucky | 5.4 | Apr. 20-May 20 | Sept. 15 | Oct. 1-Oct. 25 | Dec. 1 | Fulton, Hickman |
| Tennessee | 400 | Apr. 20-June 5 | Sept. 15 | Sept. 25-Nov. 15 | Dec. 5 | 1, 2, 3, 4, 5 |
| Alabama | 545 | Apr. 1-May 25 | Sept. 5 | Sept. 20-Dec. 1 | Dec. 20 | Statewide |
| Mississippi | 1,185 | Apr. 5-May 25 | Sept. 20 | Oct. 5-Nov. 5 | Dec. 10 | 1, 2, 4, 5 |
| Arkansas | 1,055 | Apr. 25-May 25 | Sept. 15 | Oct. 1-Nov. 10 | Dec. 15 | Statewide |
| Louisiana | 420 | Apr. 10-May 15 | Aug. 25 | Sept. 15-Nov. 15 | Dec. 1 | 1, 2, 3, 5 |
| Oklahoma | 465 | May 1-June 15 | Oct. 15 | Nov. 10-Dec. 5 | Dec. 15 | 7, 4, 5, 8, 6 |
| Texas | 4,675 | Mar. 5-June 20 | Aug. 1 | Nov. 1-Dec. 1 | Dec. 20 | Statewide |
| New Mexico | 146 | Apr. 1-May 15 | Sept. 10 | Oct. 15-Nov. 15 | Dec. 15 | 3, 7, 9 |
| Arizona | 310 | Mar. 1-May 1 | Sept. 1 | Oct. 15-Dec. 10 | Jan 15 | 5, 7, 9 |
| Nevada | 2.3 | Apr. 15-May 5 | Oct. 15 | Oct. 25-Dec. 15 | Jan. 1 | Nye |
| California | 701 | Apr. 1-May 15 | Oct. 1 | Oct. 15-Dec. 1 | Jan. 15 | Fresno, Kern, Kings, Tulare, Imperial |

Table 4. Flaxseed: Usual planting and harvesting dates, by State and principal producing areas

| State | 1969 harvested acreage (000) | Usual planting dates | Usual harvesting dates: Begin | Most active | End | Principal producing areas and counties |
|---|---|---|---|---|---|---|
| Minnesota | 388 | Apr. 25-June 15 | Aug. 15 | Aug. 25-Sept. 30 | Nov. 10 | 1, 4, 7 |
| Iowa | 1 | Apr. 10-May 1 | Aug. 1 | Aug. 5-Aug. 15 | Aug. 20 | 1, 2 |
| N. Dakota | 1,455 | May 5-June 20 | Aug. 20 | Sept 1-Sept 25 | Oct. 15 | Statewide |
| S. Dakota | 652 | Apr. 20-June 5 | Aug. 5 | Aug. 15-Sept. 1 | Sept. 5 | 2, 3, 6 |
| Texas | 100 | Nov. 5-Dec. 5 | May 1 | May 15-May 25 | June 5 | 8N, 8S, 9, 10N, 10S |
| Montana | 17 | May 5-June 10 | Aug. 20 | Sept. 5-Sept. 20 | Oct. 5 | 2, 3 |
| California | 3 | Nov.1-Jan. 15 | May 15 | June 15-July 5 | July 20 | Imperial |

# APPENDIX O

## CHINESE CROP CALANDER

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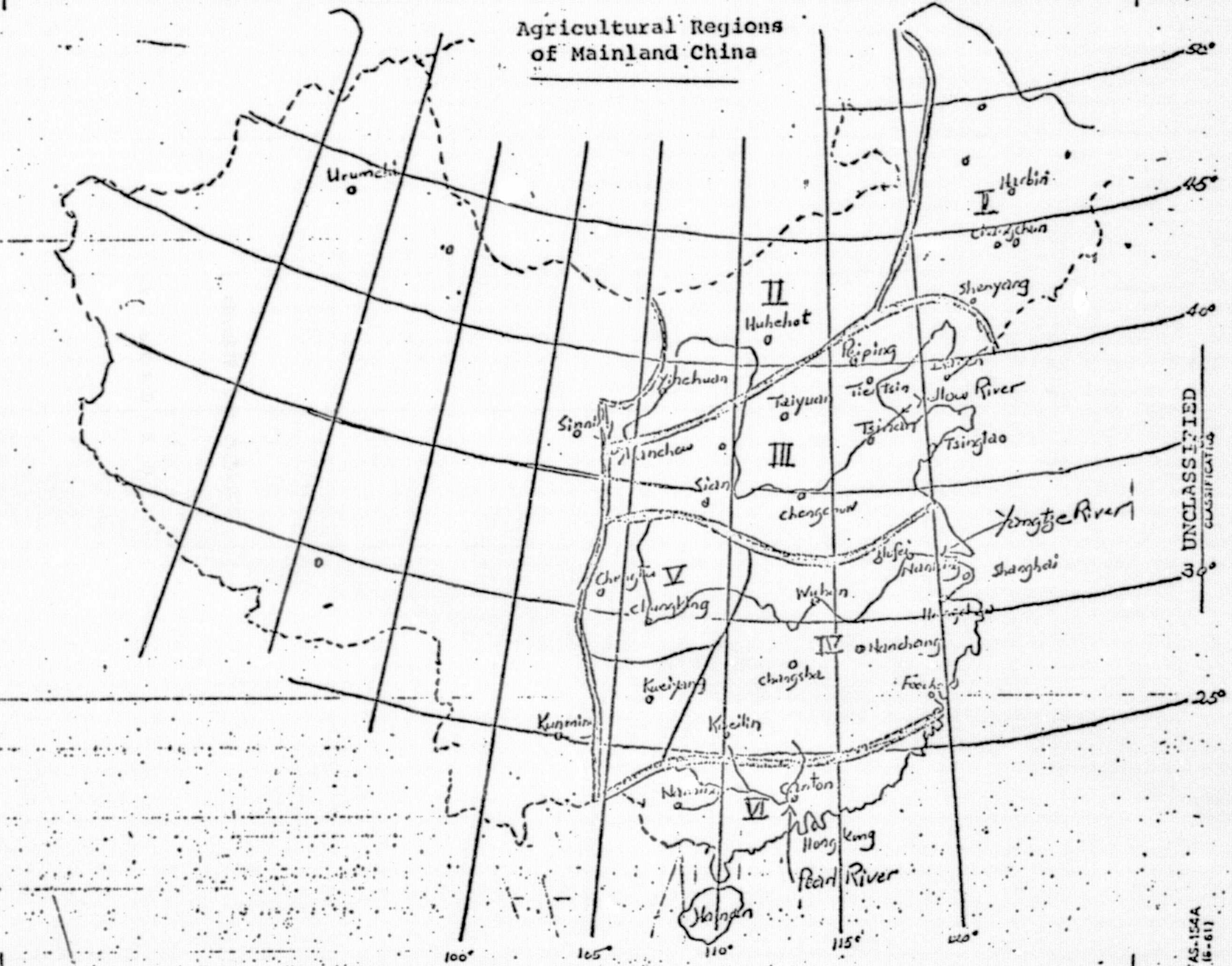
# Agricultural Regions of Mainland China




UNCLASSIFIED
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REMARKS ON FARM WORK SCHEDULE
(Summarized by S. C. Feng February 17, 1967)

1. The schedule covers only the important crops of the six areas and the major operations that are necessary in producing them.

2. Crops not included are those which account for a relatively small proportion of the total sown acreage of the region. To this category belong tobacco, sugarcane, sugar beet, the hard fibers, etc.

3. The work schedule does not mention in full the many disease and insect control operations recommended in the original almanac, for we do not believe that such recommendations are closely followed by the farmers.

4. In this abridged schedule, the terms, manuring, irrigation, watering, hoeing, cultivation, etc. are used in a loose sense of each word. The term, "top dressing", is used instead of manuring where it is believed that the additional application of fertilizer is chemical fertilizer applied to a growing crop.

5. Since the publication of the original almanac in 1959, some changes are believed to have taken place in the rotation system of crops in Areas III, IV, V, and VI. The increased double cropping practiced in these areas should bring about some changes in the work schedule. The increase in acreage in green manure crops in the south in the past few years is one example.

6. The schedule does not include the Yunnan-Kweichow plateau and Sinkiang, because, as the original almanac explains, there are not adequate data for the two areas to compile a full schedule.

# AGRICULTURAL CALENDAR FOR THE SIX MAIN AGRICULTURAL REGIONS OF MAINLAND CHINA

| Solar Term (Date) | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| | NE & INNER MONGOLIA | NORTHERN SECTIONS OF: HOPEI, SHANSI &. SHENSI; SOUTHERN INNER MONGOLIA | SHANTUNG, HONAN, S. HOPEI, S. SHANSI, CENTRAL SHENSI, & NORTHERN SECTIONS OF: BOTH ANHWEI & KIANGSU | KIANGSU, ANHWEI, CHEKIANG, HUPEH, HUNAN, KIANGSI, & NORTHERN SECTIONS OF FUKIEN | SZECHWAN & SOUTH SHENSI | KWANGTUNG, KWANGSI & SOUTH FUKIEN, |
| Spring Begins 2/4 - 18 | | Manure accumulation for cotton land | Field preparation & manuring for corn, millet, & kaoliang; manuring, plowing & irrigation of cotton land; harrowing & pressing of winter wheat land | | Top dressing, irrigation & weeding of winter wheat | |

0-4

| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Rain Water 2/19-3/5 | | Harrowing of cotton land | Manuring irrigation, & weeding of winter wheat; making seed bed for sweet potato; manuring & preparing field for Irish potato & peanuts | Preparing & manuring rice seed bed; weeding & top dressing winter wheat; top dressing rape | Preparing & manuring rice seed bed, preparing & manuring field for corn | Making & manuring rice seed bed & start of sowing; start of corn planting |
| Excited Insects 3/6-20 | Plowing, harrowing, & manuring of spring wheat land | Plowing, harrowing of spring wheat land; plowing of cotton & Irish potato land; harrowing of oats, corn & millet land | Further irrigating cotton land; culturing of sweet potato seedlings | Sowing of rice in drier areas; cultivating & manuring of winter wheat; top dressing rape; plowing & harrowing of corn land; culturing of sweet potato seedlings | Start of rice sowing; planting corn | Continuing sowing of rice, corn; preparing & manuring rice fields |

5 OF 17 Hong Kong 1 AGR-92

| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| | | | Preparing | Sowing of | Continued | Tending |



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| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Rain Water 2/19-3/5 | | Harrowing of cotton land | Manuring irrigation, & weeding of winter wheat; making seed bed for sweet potato; manuring & preparing field for Irish potato & peanuts | Preparing & manuring rice seed bed; weeding & top dressing winter wheat; top dressing rape | Preparing & manuring rice seed bed, preparing & manuring field for corn | Making & manuring rice seed bed & start of sowing; start of corn planting |
| Excited Insects 3/6-20 | Plowing, harrowing, & manuring of spring wheat land | Plowing, harrowing of spring wheat land; plowing of cotton & Irish potato land; harrowing of oats, corn & millet | Further irrigating cotton land; culturing of sweet potato seedlings | Sowing of rice in drier areas; cultivating & manuring of winter wheat; top dressing rape; plowing & harrowing of corn land; | Start of rice sowing; planting corn | Continuing sowing of rice, corn; preparing & manuring rice fields |

0-6

UNCLASSIFIED

| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Clear & Bright 4/5-19 | Preparing paddy land & rice seed bed; continued sowing of spring wheat; planting Irish potato; preparing land for planting cotton, corn, kaoliang, soybean, & millet | Preparing seed bed for rice; planting Irish potato | Rice seeding; planting of cotton & early corn; preparing land for planting of Kaoliang, millet, & sweet potato; hoeing of Irish potato fields | Continued seeding of early rice & preparing paddy fields for its transplanting preparing seed bed for inter-mediate rice sowing; seeding of interplanted late rice; planting of early corn & millet; culturing kaoliang seedlings | First top dressing for early rice; sowing of intermediate rice & preparing paddy fields (plowing under green manure, etc.) for this crop; preparing seed bed for single crop late rice; second manuring & cultivation of corn fields | Transplant-ing early rice; cultivat-ing corn fields; harvesting winter wheat; seeding of inter-mediate rice |

| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Grain | Sowing | Sowing | Preparing | Continued | Second | Tending |



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CLASSIFICATION

| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Clear & Bright 4/5-19 | Preparing paddy land & rice seed bed; continued sowing of spring wheat; planting Irish potato; preparing land for planting cotton, corn, kaoliang, soybean, & millet | Preparing seed bed for rice; planting Irish potato | Rice seeding; planting of cotton & early corn; preparing land for planting of Kaoliang, millet, & sweet potato; hoeing of Irish potato fields | Continued seeding of early rice & preparing paddy fields for its transplanting; preparing seed bed for inter-mediate rice sowing; seeding of interplanted late rice; planting of early corn & millet; culturing kaoliang seedlings | First top dressing for early rice; sowing of intermediate rice & preparing paddy fields (plowing under green manure, etc.) for this crop; preparing seed bed for single crop late rice; second manuring & cultivation of corn fields | Transplanting early rice; cultivating corn fields; harvesting winter wheat; seeding of inter-mediate rice |

| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Summer Begins 5/6-20 | Rice: direct seeding or tending seed bed, preparing & manuring paddy fields; Cotton & corn: final thinning & cultivation; Kaoliang & millet: planting, thinning; Soybeans: final thinning | Manuring rice seed bed, preparing paddy fields; transplanting or thinning of cotton; hoeing & weeding of potato oats, millet, & corn | Rice transplanting, weeding, & irrigation; final thinning of cotton & corn, & further cultivation; thinning & cultivation of kaoliang; cultivation of potatoes; planting peanuts | Early rice: weeding, manuring, irrigation, disease & insect control; Intermediate rice: transplanting, irrigation, weeding, manuring; Intermediate rice: seed bed tending; Late rice: making seed bed; Cultivating early corn, kaoliang, & millet; Transplanting sweet potato; Harvesting rapeseed | Early rice: third top dressing; Intermediate rice: transplanting; Double-crop late rice: making seed bed; Single-crop late rice; tending seed bed Harvesting wheat; Planting summer corn | Early rice; weeding; Intermediate rice: transplanting; Double-crop late rice: making seed bed |

| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Summer Begins 5/6-20 | Rice: direct seeding or tending seed bed, preparing & manuring paddy fields; Cotton & corn: final thinning & cultivation; Kaoliang & millet: planting, thinning; Soybeans: final thinning | Manuring rice seed bed, preparing paddy fields; transplanting or thinning of cotton; hoeing & weeding of potato oats, millet, & corn | Rice transplanting, weeding, & irrigation; final thinning of cotton & corn, & further cultivation; thinning & cultivation of kaoliang; cultivation of potatoes; planting peanuts | Early rice: weeding, manuring, irrigation, disease & insect control; Intermediate rice: transplanting, irrigation, weeding, manuring; Intermediate rice: seed bed tending; Late rice: making seed bed; Cultivating early corn, kaoliang, & millet; Transplanting sweet potato; Harvesting rapeseed | Early rice: third top dressing: Intermediate rice: transplanting; Double-crop late rice: making seed bed; Single-crop late rice: tending seed bed Harvesting wheat; Planting summer corn | Early rice: weeding; Intermediate rice: transplanting; Double-crop late rice: making seed bed |

| | I | II | III | IV | V | VI- |
|---|---|---|---|---|---|---|
| Grain in Ear 6/6-21 | Rice trans-planting; continued cultiva-tion of cotton, corn, kaoliang, millet, soybean & manuring of latter four crops; mounting soil around Irish potato plants | Weeding of direct seeded rice; manuring & irrigation of spring wheat; manuring, cultivat-ing, watering cotton; thinning millet; cultivat-ing Irish potato; hoeing, manuring, again hoeing of millet | Rice irrigation, weeding, & manuring winter wheat harvest-ing; irriga-tion and/or manuring, weeding of cotton, early corn, kaoliang, sweet potato, peanut, soybean, sesame; planting of late soybean | Inter-mediate rice: weeding, manuring, irriga-tion; single-crop late rice: trans-planting; double-crop late rice: tending seed bed; sowing of summer corn; cultivat-ing & manuring early millet & summer planted sweet potato | Inter-mediate rice: manuring & weeding; double-crop late rice; tending seed bed; single-crop late rice: trans-planting, irriga-tion, & manuring | Inter-mediate rice: hoeing & weeding; double-crop late rice: tending seed bed |

UNCLASSIFIED
CLASSIFICATION

| | I | II | III | IV | V | VI |
| --- | --- | --- | --- | --- | --- | --- |
| Summer Solstice 6/22-7/6 | Rice weeding & manuring; cultivating and/or irrigating & manuring corn, kaoliang, millet, & soybean | Rice manuring, cultivating; tending spring wheat; cultivating & pruning of cotton; hoeing and/or manuring of Irish potato, oats, & corn | Rice weeding & manuring; plowing under wheat stubble; topping, hoeing, & irrigation of cotton; manuring of early corn; thinning, irrigation, & cultivating of summer-planted corn; tending other misc.grains sweet potato, peanut, soy bean, & | Intermediate rice: irrigation & manuring; Summer-planted corn: Thinning & manuring Planting late soybean | Early rice harvesting; manuring double-crop rice seed bed; irrigating single-crop late rice; manuring summer-sown corn, cultivating | Early rice; slightly irrigated; intermediate rice: continued weeding & manuring |

0-12

| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Slight Heat 7/7-22 | Rice weeding & irrigation; spring wheat harvesting; manuring and/or irrigating cotton & soybean; insect & disease control for all crops | Top dressing rice, cotton, Irish potato, & corn; irrigating oats & millet; insect & disease control for all crops | Irrigating, manuring and/or cultivating rice, cotton, early & summer-sown corn, kaoliang, millet, peanut, summer-sown soybean, & sesame; further plowing of wheat land | Rice: early rice ready for harvesting; intermediate rice & singe-crop late rice irrigated; transplanting double-crop late rice; Summer-sown corn; cultivation, manuring, & irrigation | Rice: transplanting double-crop late rice; manuring single-crop late rice; irrigating intermediate rice; Corn: harvesting spring-sown crop; manuring summer-sown crop | Rice: harvesting early rice; immediately plowing paddy field for late rice; Corn: harvesting early corn; planting late corn |

| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Great Heat 7/23-8/7 | Summer plowing of spring wheat land; further irrigation of cotton & topping; irrigation of corn; disease & insect control of kaoliang, soybean, & Irish potato | Rice irrigation; harvesting spring wheat & immediate plowing & harrowing of wheat land; continued cultivation & topping & pruning of cotton; cultivating corn; control of diseases & insect pests of Irish potato, oats & millet | Rice irrigation; top dressing cotton; manuring, cultivating, & irrigating summer-sown corn; watering early millet; manuring & irrigating sweet potato | Continued harvesting of early rice; immediate manuring, hoeing, & moderate irrigation of interplanted late rice; heavy irrigation for intermediate rice; draining single-crop late rice; manuring & cultivating double-crop late rice; harvesting early corn & kaoliang; manuring and/or cultivating summer-sown corn, soybean, and sweet potato; watering millet | Intermediate rice: irrigation & then drainage; double-crop late rice manuring; single-crop late rice irrigation | Transplanting late rice |

0-14

| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Autumn Begins 8/8-22 | Continued pruning of cotton; irrigation of soybean; weeding of Irish potato | Weeding & irrigating rice; topping cotton; manuring & watering corn | Continued irrigation of rice; top dressing, pruning, & irrigating cotton; irrigation of summer-sown corn & spring-sown sweet potato; harvesting Irish potato | Continued tending of intermediate & late crops of rice; harvesting spring-sown kaoliang & immediate cultivation for regenerated crop; cultivation of soybean | Manuring, weeding & irrigation of single-crop late rice | Draining intermediate rice fields; hoeing & manuring late rice; cultivation of late corn |
| Limit of Heat 8/23-9/7 | Draining rice fields; weeding & roguing of corn, kaoliang; weeding of millet & soybean; harvesting Irish potato | Draining rice fields; irrigation of corn; partial defoliation of cotton | Preparing, manuring, & irrigating wheat land; continued pruning & irrigation of cotton; harvesting early corn, kaoliang, millet, & sesame | Draining intermediate rice fields; irrigation and/or manuring of late rice; harvesting early corn; continued cultivating of regenerated kaoliang | Harvesting intermediate rice; irrigation & weeding of late rice; harvesting summer-sown corn | Harvesting intermediate rice; repeated cultivating of late rice; final thinning of late corn & manuring |

| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| White Dew 9/8-22 | Rice harvesting; cotton picking starts; harvesting of corn, kaoliang, millet, & soybean starts; Irish potato harvesting completed | Harvesting of rice, Irish potato, & corn; further tending of cotton to improve aeration & hasten ripening | Draining paddy fields; defolia-ation & deep cultivation of cotton; harvesting of summer-sown corn; wheat sowing starts | Harvesting intermediate rice; continued irrigation of late rice; harvesting spring-sown millet; top dressing summer planted sweet potato | Irrigation of late rice | Harvesting intermediate rice; irrigating late rice; cultivating late corn |
| Autumnal Equinox 9/23-10/7 | Rice harvesting to be completed; continued picking of cotton; harvesting corn, kaoliang, millet, & soybean | Rice harvesting to be completed; plowing spring wheat & corn land; continued picking of cotton; harvesting millet & oats | Harvesting rice; continued sowing of wheat; picking of cotton; harvesting peanuts & soybean | Irrigation of late rice & roguing; irrigating soybean; top dressing sweet potato; harvesting summer-planted corn; culturing rape seedling | Draining late rice fields | Control of diseases & insects of late rice; irrigating & cultivating late corn |

UNCLASSIFIED
CLASSIFICATION

| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Cold Dew 10/8-23 | Plowing of all crop land except cotton land; cotton picking continues | Continued plowing of crop land; cotton picking continues | Continued sowing of wheat; picking cotton; harvesting of sweet potato & peanuts | Draining late rice fields; wheat sowing starts; sowing of rapeseed; harvesting kaoliang, soybean, & sweet potato | Harvesting late rice; wheat sowing | Preparing land for winter sowing |
| Hoar Frost Descends 10/24-11/7 | Plowing of cotton land | Plowing of rice, corn, oats, & millet land: plowing, harrowing, & manuring of Irish potato land: cotton picking continues | Manuring winter wheat; final picking of cotton | Harvesting late rice; wheat sowing continued harvesting of sweet potato | Harvesting late rice | Harvesting late rice |



0-17

| | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Winter Begins 11/8-22 | Slack season begins | Leveling & irrigating cotton land | Plowing cotton land | Continued harvesting of late rice; plowing paddy fields where harvesting is completed; manuring wheat: transplanting rape, manuring, & watering | Continued sowing of wheat | Wheat sowing; harvesting late corn |
| Little Snow 11/23-12/6 | Slack season continues | Slack season begins | Irrigating, manuring, hoeing wheat; plowing & irrigating cotton land | Continued plowing of paddy fields | Cultivating wheat | Weeding wheat field |
| Heavy Snow 12/7-21 | Slack season continues | Slack season continues | Slack season begins | Cultivating & manuring of wheat & rape | Manuring & irrigating wheat | Manuring, irrigating, & hoeing wheat |
| Winter Sol-stice 12/22 Little Cold 1/6 Severe Cold 1/20-2/3 | Slack season continues | Slack season continues | Slack season | Slack season | Tending winter crops | Tending winter crops |

# APPENDIX P

## HUD - BPR LAND USE CLASSIFICATION SCHEME

HUD/BPR



# Standard Land Use Coding Manual[1]

*(The following Appendix is a reproduction of the pamphlet published by the Urban Renewal Administration and the Bureau of Public Roads.)*

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## Standard Land Use Coding Manual

**A Standard System for Identifying and Coding Land Use Activities**

First Edition
January 1965

Urban Renewal Administration
Housing and Home Finance Agency
and
Bureau of Public Roads
Department of Commerce

Washington, D.C.

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C., 20402 - Price 50 cents

[1] RFF Note: See foreword of this book for relation of this appendix to whole study.

# IV The Categories and Code Numbers

## A. A STANDARD SYSTEM FOR IDENTIFYING AND CODING LAND USE ACTIVITIES—ONE- AND TWO-DIGIT LEVELS

| Code | Category | Code | Category |
|---|---|---|---|
| 1 | Residential. | 11 | Household units. |
| | | 12 | Group quarters. |
| | | 13 | Residential hotels. |
| | | 14 | Mobile home parks or courts. |
| | | 15 | Transient lodgings. |
| | | 19 | Other residential, NEC.[1] |
| 2 | Manufacturing. | 21 | Food and kindred products—manufacturing. |
| | | 22 | Textile mill products—manufacturing. |
| | | 23 | Apparel and other finished products made from fabrics, leather, and similar materials—manufacturing. |
| | | 24 | Lumber and wood products (except furniture)—manufacturing. |
| | | 25 | Furniture and fixtures—manufacturing. |

[1] NEC—Not elsewhere coded.

| Code | Category | Code | Category |
| --- | --- | --- | --- |
| 2 | Manufacturing. | 26 | Paper and allied products—manufacturing. |
| | | 27 | Printing, publishing, and allied industries. |
| | | 28 | Chemicals and allied products—manufacturing. |
| | | 29 | Petroleum refining and related industries. |
| 3 | Manufacturing (continued). | 31 | Rubber and miscellaneous plastic products—manufacturing. |
| | | 32 | Stone, clay, and glass products—manufacturing. |
| | | 33 | Primary metal industries. |
| | | 34 | Fabricated metal products—manufacturing. |
| | | 35 | Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks—manufacturing. |
| | | 39 | Miscellaneous manufacturing, NEC. |
| 4 | Transportation, communication, and utilities. | 41 | Railroad, rapid rail transit, and street railway transportation. |
| | | 42 | Motor vehicle transportation. |
| | | 43 | Aircraft transportation. |
| | | 44 | Marine craft transportation. |
| | | 45 | Highway and street right-of-way. |
| | | 46 | Automobile parking. |
| | | 47 | Communication. |
| | | 48 | Utilities. |
| | | 49 | Other transportation, communication, and utilities, NEC. |
| 5 | Trade. | 51 | Wholesale trade. |
| | | 52 | Retail trade—building materials, hardware, and farm equipment. |
| | | 53 | Retail trade—general merchandise. |
| | | 54 | Retail trade—food. |
| | | 55 | Retail trade—automotive, marine craft, aircraft, and accessories. |
| | | 56 | Retail trade—apparel and accessories. |
| | | 57 | Retail trade—furniture, home furnishings, and equipment. |
| | | 58 | Retail trade—eating and drinking. |
| | | 59 | Other retail trade, NEC. |
| 6 | Services. | 61 | Finance, insurance, and real estate services. |
| | | 62 | Personal services. |
| | | 63 | Business services. |
| | | 64 | Repair services. |
| | | 65 | Professional services. |
| | | 66 | Contract construction services. |
| | | 67 | Governmental services. |
| | | 68 | Educational services. |
| | | 69 | Miscellaneous services. |
| 7 | Cultural, entertainment, and recreational. | 71 | Cultural activities and nature exhibitions. |
| | | 72 | Public assembly. |
| | | 73 | Amusements. |
| | | 74 | Recreational activities. |
| | | 75 | Resorts and group camps. |
| | | 76 | Parks. |

| Code | Category | Code | Category |
|---|---|---|---|
| 7 | Cultural, entertainment, and recreational—Continued. | 79 | Other cultural, entertainment, and recreational, NEC. |
| 8 | Resource production and extraction. | 81 | Agriculture. |
| | | 82 | Agricultural related activities. |
| | | 83 | Forestry activities and related services. |
| | | 84 | Fishing activities and related services. |
| | | 85 | Mining activities and related services. |
| | | 89 | Other resource production and extraction, NEC. |
| 9 | Undeveloped land and water areas. | 91 | Undeveloped and unused land area (excluding noncommercial forest development). |
| | | 92 | Noncommercial forest development. |
| | | 93 | Water areas. |
| | | 94 | Vacant floor area. |
| | | 95 | Under construction. |
| | | 99 | Other undeveloped land and water areas, NEC. |

EXAMPLES OF FOUR-DIGIT

LAND-USE CLASSES

## B. A STANDARD SYSTEM FOR IDENTIFYING AND CODING LAND USE ACTIVITIES—TWO-, THREE-, AND FOUR-DIGIT LEVELS

| Code | Category | Code | Category | Code | Category | *SIC* Reference [1] |
|---|---|---|---|---|---|---|
| 11 | Household units. | 110 | Household units. | 1100 | Household units.[2] | — |
| 12 | Group quarters. | 121 | Rooming and boarding houses. | 1210 | Rooming and boarding houses.[3] | 7021 |
| | | 122 | Membership lodgings. | 1221 | Fraternity and sorority houses. | [4] Incl. 7041 |
| | | | | 1229 | Other membership lodgings, NEC.[5] | Incl. 7041 |
| | | 123 | Residence halls or dormitories. | 1231 | Nurses' homes. | — |
| | | | | 1232 | College dormitories. | — |
| | | | | 1239 | Other residence halls or dormitories, NEC. | — |
| | | 124 | Retirement homes and orphanages. | 1241 | Retirement homes. | — |
| | | | | 1242 | Orphanages. | — |
| | | 125 | Religious quarters. | 1251 | Convents. | — |
| | | | | 1252 | Monasteries. | — |
| | | | | 1253 | Rectories. | — |
| | | | | 1259 | Other religious quarters, NEC. | — |
| | | 129 | Other group quarters, NEC. | 1290 | Other group quarters, NEC. | — |
| 13 | Residential hotels. | 130 | Residential hotels. | 1300 | Residential hotels.[6] | Incl. 7011 |
| 14 | Mobile home parks or courts. | 140 | Mobile home parks or courts. | 1400 | Mobile home parks or courts. | 7031 |
| 15 | Transient lodgings. | 151 | Hotels, tourist courts, and motels. | 1510 | Hotels, tourist courts, and motels. | 7011 |
| | | 159 | Other transient lodgings, NEC. | 1590 | Other transient lodgings, NEC.[7] | — |
| 19 | Other residential, NEC. | 190 | Other residential, NEC. | 1900 | Other residential, NEC. | — |

RESIDENTIAL—1

B. A STANDARD SYSTEM FOR IDENTIFYING AND CODING LAND USE ACTIVITIES—TWO-, THREE-, AND FOUR-DIGIT LEVELS—Continued

| Code | Category | Code | Category | Code | Category | SIC Reference [1] |
|---|---|---|---|---|---|---|
| 21 | Food and kindred products—manufacturing. | 211 | Meat products—manufacturing. | 2111 | Meat packing—manufacturing. | 2011 |
| | | | | 2112 | Sausages and other prepared meat products—manufacturing. | 2013 |
| | | | | 2113 | Poultry and small game dressing and packing. | 2015 |
| | | 212 | Dairy products—manufacturing. | 2121 | Creamery butter—manufacturing. | 2021 |
| | | | | 2122 | Cheese, natural and processed. | 2022 |
| | | | | 2123 | Condensed and evaporated milk—manufacturing. | 2023 |
| | | | | 2124 | Ice cream and frozen desserts—manufacturing. | 2024 |
| | | | | 2125 | Fluid milk processing. | 2026 |
| | | 213 | Canning and preserving of fruits, vegetables, and seafoods. | 2131 | Canning and curing seafoods. | 2031 |
| | | | | 2132 | Canning specialty foods. | 2032 |
| | | | | 2133 | Canning fruits, vegetables, preserves, jams, and jellies. | 2033 |
| | | | | 2134 | Drying and dehydrating fruits and vegetables. | 2034 |
| | | | | 2135 | Pickling fruits and vegetables; vegetable sauces and seasonings; salad dressings—manufacturing. | 2035 |
| | | | | 2136 | Fresh or frozen packaged fish and seafoods. | 2036 |
| | | | | 2137 | Frozen fruits, fruit juices, vegetables, and specialties. | 2037 |
| | | 214 | Grain mill products—manufacturing. | 2141 | Flour and other grain mill products. | 2041 |
| | | | | 2142 | Preparing feeds for animals and fowls. | 2042 |
| | | | | 2143 | Cereal preparations. | 2043 |
| | | | | 2144 | Rice milling. | 2044 |

## B. A STANDARD SYSTEM FOR IDENTIFYING AND CODING LAND USE ACTIVITIES—TWO-, THREE-, AND FOUR-DIGIT LEVELS—Continued

| *Code* | *Category* | *Code* | *Category* | *Code* | *Category* | *SIC Reference* [1] |
|---|---|---|---|---|---|---|
| 32 | Stone, clay, and glass products—manufacturing—Continued | 326 | Concrete, gypsum, and plaster products—manufacturing. | 3261 | Concrete brick and block—manufacturing. | 3271 |
| | | | | 3262 | Concrete products (excluding brick and block)—manufacturing. | 3272 |
| | | | | 3263 | Concrete (ready mixed)—manufacturing. | 3273 |
| | | | | 3264 | Lime products—manufacturing. | 3274 |
| | | | | 3265 | Gypsum products—manufacturing. | 3275 |
| | | 327 | Cut stone and stone products—manufacturing. | 3270 | Cut stone and stone products—manufacturing. | 328 |
| | | 328 | Abrasive, asbestos, and miscellaneous nonmetallic mineral products—manufacturing. | 3280 | Abrasive, asbestos, and miscellaneous nonmetallic mineral products—manufacturing. | 329 |
| 33 | Primary metal industries. | 331 | Blast furnaces, steel works, and the rolling and finishing of ferrous metals. | 3311 | Blast furnaces (including coke ovens), steel works, and the rolling of ferrous metals. | 3312 |
| | | | | 3312 | Electrometallurgical products—manufacturing. | 3313 |
| | | | | 3313 | Steel wire drawing and steel nails and spikes—manufacturing. | 3315 |
| | | | | 3314 | Cold rolled sheet, strip, and bars—manufacturing. | 3316 |
| | | | | 3315 | Steel pipe and tubes—manufacturing. | 3317 |
| | | 332 | Iron and steel foundries. | 3320 | Iron and steel foundries. | 332 |
| | | 333 | Primary smelting and refining of nonferrous metals. | 3331 | Primary smelting and refining of copper. | 3331 |

| Code | Category | Code | Category | Code | Category | SIC Reference[1] |
|---|---|---|---|---|---|---|
| 41 | Railroad, rapid rail transit, and street railway transportation. | 411 | Railroad transportation. | 4111 | Railroad right-of-way (excluding switching and marshaling yards). | — |
| | | | | 4112 | Railroad switching and marshaling yards. | — |
| | | | | 4113 | Railroad terminals (passenger). | — |
| | | | | 4114 | Railroad terminals (freight). | — |
| | | | | 4115 | Railroad terminals (passenger and freight). | — |
| | | | | 4116 | Railroad equipment and maintenance. | — |
| | | | | 4119 | Other railroad transportation, NEC. | — |
| | | 412 | Rapid rail transit and street railway transportation. | 4121 | Rapid rail transit and street railway right-of-way.[2] | — |
| | | | | 4122 | Rapid rail transit and street railway passenger terminals.[3] | — |
| | | | | 4123 | Rapid rail transit and street railway equipment maintenance. | — |
| | | | | 4129 | Other rapid rail transit and street railway transportation, NEC. | — |
| 42 | Motor vehicle transportation. | 421 | Bus transportation. | 4211 | Bus passenger terminals (intercity).[4] | — |
| | | | | 4212 | Bus passenger terminals (local).[4] | — |
| | | | | 4213 | Bus passenger terminals (intercity and local).[4] | — |
| | | | | 4214 | Bus garaging and equipment maintenance. | — |
| | | | | 4219 | Other bus transportation, NEC. | — |
| | | 422 | Motor freight transportation. | 4221 | Motor freight terminals. | — |
| | | | | 4222 | Motor freight garaging and equipment maintenance. | — |
| | | | | 4229 | Other motor freight transportation, NEC. | — |

B. A STANDARD SYSTEM FOR IDENTIFYING AND CODING LAND USE ACTIVITIES—TWO-, THREE-, AND FOUR-DIGIT LEVELS—Continued

| *Code* | *Category* | *Code* | *Category* | *Code* | *Category* | *SIC Reference* [1] |
|---|---|---|---|---|---|---|
| 48 | Utilities. | 481 | Electric utility. | 4811 | Electric transmission right-of-way.[17] | — |
| | | | | 4812 | Electric generation plants. | — |
| | | | | 4813 | Electricity regulating substations. | — |
| | | | | 4819 | Other electric utility, NEC. | — |
| | | 482 | Gas utility. | 4821 | Gas pipeline right-of-way.[17] | — |
| | | | | 4822 | Gas production plants. | — |
| | | | | 4823 | Natural or manufactured gas storage and distribution points. | — |
| | | | | 4824 | Gas pressure control stations. | — |
| | | | | 4829 | Other gas utilities, NEC. | — |
| | | 483 | **Water utilities and irrigation.** | 4831 | Water pipeline right-of-way.[17] | — |
| | | | | 4832 | Water treatment plants (purification). | — |
| | | | | 4833 | Water storage.[18] | — |
| | | | | 4834 | Irrigation distribution channels. | — |
| | | | | 4835 | Water pressure control stations. | — |
| | | | | 4839 | Other water utilities and irrigation, NEC. | — |
| | | 484 | **Sewage disposal.** | 4841 | Sewage treatment plants. | — |
| | | | | 4842 | Sewage sludge drying beds. | — |
| | | | | 4843 | Sewage pressure control stations. | — |
| | | | | 4849 | Other sewage disposal, NEC. | — |
| | | 485 | **Solid waste disposal.** | 4851 | Refuse incineration. | — |
| | | | | 4852 | Central garbage grinding stations. | — |
| | | | | 4853 | Compositing plants. | — |
| | | | | 4854 | Sanitary land fills. | — |
| | | | | 4855 | Refuse disposals. | — |

## B. A STANDARD SYSTEM FOR IDENTIFYING AND CODING LAND USE ACTIVITIES—TWO-, THREE-, AND FOUR-DIGIT LEVELS—Continued

| *Code* | *Category* | *Code* | *Category* | *Code* | *Category* | *SIC Reference* [1] |
|---|---|---|---|---|---|---|
| 51 | Wholesale trade [2]—Continued | 518 | Machinery, equipment, and supplies—wholesale. | 5181 | Commercial and industrial machinery, equipment, and supplies—wholesale. | 5082 |
| | | | | 5182 | Farm machinery and equipment—wholesale. | 5083 |
| | | | | 5183 | Professional equipment and supplies—wholesale. | 5086 |
| | | | | 5184 | Equipment and supplies for service establishments—wholesale. | 5087 |
| | | | | 5185 | Transportation equipment and supplies (except motor vehicles)—wholesale. | 5088 |
| | | | | 5189 | Other machinery, equipment, and supplies wholesale, NEC. | 5089 |
| | | 519 | Other wholesale trade, NEC. | 5191 | Metals and minerals (except petroleum products and scrap)—wholesale. | 5091 |
| | | | | 5192 | Petroleum bulk stations and terminals—wholesale. | 5092 |
| | | | | 5193 | Scrap and waste materials—wholesale. | 5093 |
| | | | | 5194 | Tobacco and tobacco products—wholesale. | 5094 |
| | | | | 5195 | Beer, wine, and distilled alcoholic beverages—wholesale. | 5095 |
| | | | | 5196 | Paper and paper products—wholesale. | 5096 |
| | | | | 5197 | Furniture and homefurnishings—wholesale. | 5097 |

## B. A STANDARD SYSTEM FOR IDENTIFYING AND CODING LAND USE ACTIVITIES—TWO-, THREE-, AND FOUR-DIGIT LEVELS—Continued

independent of other functions (e.g., code 72, "Public assembly" or code 11, "Household units"). They may be indoor or outdoor pools.

[13] Code 744—"Marinas" include marine terminals and associated areas that are primarily for recreational marine craft. The sale and repair of recreational marine craft is coded 5591, "Marine craft and accessories—retail" and code 3143, "Ship and boat building and repairing," respectively.

[14] Code 7491—"Camping and picnicking areas" are separately identified if they are not a part of a larger activity (e.g., a park)

[15] Code 7511—"General resorts" have rooms for 20 or more persons and have provision for at least 2 types of recreational activities, excluding lawn games, children's playgrounds, and swimming pools.

*RFF Note: See text, pp. 127-28 for further discussion of these groups.

[16] Code 7515—"Hunting and fishing clubs" include areas on which artificially propagated game or fish are released for purposes of hunting or fishing. If there are other uses made of the property (e.g., agricultural use), these "other" uses should take priority in identifying the activity of the parcel.

[17] Code 7520—"Group or organized camps" include general camps for children, as well as Boy Scout and Girl Scout camps.

[18] Code 7610—"Parks—general recreation" may include, but are not limited to, picnic areas, bathing beaches, playfields, hiking trails, camping grounds, and other manmade recreation facilities.

[19] Code 7620—"Parks—leisure and ornamental" are largely for scenic or leisure purposes. They may contain beaches, children's play facilities, monuments, or statues.

| Code | Category | Code | Category | Code | Category | SIC Reference [1] |
|---|---|---|---|---|---|---|
| 81 | Agriculture.[2]** | 811 | Farms (predominant crop, fibers).[3] | 8111 | Farms (predominant crop, cotton). | — |
| | | | | 8119 | Farms (other type fiber crops). | — |
| | | 812 | Farms (predominant crop, cash grains).[3] | 8120 | Farms (predominant crop, cash grains). | — |
| | | 813 | Farms (field crops other than fiber or cash grain crops).[3] | 8130 | Farms (field crops other than fiber or cash grain crops). | — |
| | | 814 | Farms (predominant crop, fruits, tree nuts, or vegetables).[3] | 8141 | Farms (predominant crop, fruits). | — |
| | | | | 8142 | Farms (predominant crop, tree nuts). | — |
| | | | | 8143 | Farms (predominant crop, vegetables). | — |
| | | 815 | Farms (predominantly dairy products).[3] | 8150 | Farms (predominantly dairy products). | — |

# APPENDIX Q

## USGS "CIRCULAR 671" CLASSIFICATION SCHEME

complete or nearly complete reliance is placed on remote sensing as an inventory technique, it is not possible to obtain complete compatability with the categorization of land use employed with enumeration and observation techniques. Considerable care should be exercised in comparing land-use classifications based on data obtained by remote sensing and the definitions proposed in this report with classifications based on data obtained by enumeration and observation and category definitions written for use with those techniques. The definitions given in the concluding section of this report must be studied carefully before analyzing land-use information that has been classified in accord with the proposed classification system.

As further advances in technology are made, it may be necessary to modify the classification system for use with automatic data analysis. The ERTS-A and Skylab missions and the high-altitude aircraft program of the National Aeronautics and Space Administration offer an excellent opportunity for nationwide testing of the feasibility of using this classification system to obtain land-use information on a uniform basis.

In summary, the land-use classification system being presented in this report includes only the more generalized first and second levels of classification. The definitional structure is a first approximation, capable of further refinement on the basis of more extended and varied use. We believe, however, that it meets the principal immediate objective of providing a land-use classification system for use with major research activities in the testing of remote-sensing techniques, and that it will be possible to use this proposed system with large-scale imagery as well as with other methods of collecting land-use data such as direct enumeration and observation. Attainment of the more fundamental and long-range objective of providing a standardized system of land-use classification for national and regional studies will depend on the effective revision and improvement that should result from widespread review and use of the system. Because it is impractical to circulate unpublished manuscripts widely, this manuscript is being submitted for review and testing in the form of a U.S. Geological Survey circular.

## Land-Use Classification System for Use With Remote Sensor Data

| *Level I* | *Level II* |
|---|---|
| 01. Urban and Built-up Land. | |
| | 01. Residential. |
| | 02. Commercial and services. |
| | 03. Industrial. |
| | 04. Extractive. |
| | 05. Transportation, Communications, and Utilities. |
| | 06. Institutional. |
| | 07. Strip and Clustered Settlement. |
| | 08. Mixed. |
| | 09. Open and Other. |
| 02. Agricultural Land. | |
| | 01. Cropland and Pasture. |
| | 02. Orchards, Groves, Bush Fruits, Vineyards, and Horticultural Areas. |
| | 03. Feeding Operations. |
| | 04. Other. |
| 03. Rangeland. | |
| | 01. Grass. |
| | 02. Savannas (Palmetto Prairies). |
| | 03. Chaparral. |
| | 04. Desert Shrub. |
| 04. Forest Land. | |
| | 01. Deciduous. |
| | 02. Evergreen (Coniferous and Other). |
| | 03. Mixed. |
| 05. Water. | |
| | 01. Streams and Waterways. |
| | 02. Lakes. |
| | 03. Reservoirs. |
| | 04. Bays and Estuaries. |
| | 05. Other. |
| 06. Nonforested Wetland. | |
| | 01. Vegetated. |
| | 02. Bare. |
| 07. Barren Land. | |
| | 01. Salt Flats. |
| | 02. Beaches. |
| | 03. Sand Other Than Beaches. |
| | 04. Bare Exposed Rock. |
| | 05. Other. |
| 08. Tundra. | |
| | 01. Tundra. |
| 09. Permanent Snow and Icefields. | |
| | 01. Permanent Snow and Icefields. |

## DEFINITIONS

In the definitions presented here, an attempt has been made to include sufficient detail to provide a general understanding of what is included in each category at Levels I and II. Many of the uses described in detail will not be visible on spacecraft and high-altitude imagery. However, the detail will aid in the interpretation process, and the additional information will be useful to those who have large-scale aerial photographs and other supplemental information available.

### 01. Urban and Built-Up Land

Urban and Built-up Land comprises areas of intensive use with much of the land covered by structures. Included in this category are cities, towns, villages, strip developments along highways, transportation, power, and communications facilities, and such isolated units as mills, mines, and quarries, shopping centers, and institutions.

As development progresses, small blocks of land of less intensive or nonconforming use may be isolated in the midst of built-up areas and will generally be included in the 01-category. Agricultural, forest, or water areas on the fringe of Urban and Built-up areas will not be included except where they are part of low-density urban development. The Urban and Built-up Land category takes precedence over others when the criteria for more than one category are met. Thus, residential areas that have sufficient tree cover to meet Forest Land criteria will be placed in the Residential category.

The Level II categories of Urban and Built-up Land are: Residential; Commercial and Services; Industrial; Extractive; Transportation, Communications, and Utilities; Institutions; Strip and Clustered Settlements; Mixed; and Open and Other.

#### 01-01. RESIDENTIAL

Residential land uses range from high density, represented by the multiple-unit structures of urban cores, to low density, where houses are on lots of more than an acre, on the periphery of urban expansion. Linear residential developments along transportation routes extending outward from urban areas should be included as residential appendages to urban centers, but care must be taken to distinguish them from commercial strips in the same locality. The residential strips generally have a uniform size and spacing of structures, linear driveways, and lawn areas; the commercial strips are more likely to have buildings of different sizes and spacing, large driveways, and parking areas. Residential development along shorelines is also linear and sometimes extends back only one residential parcel from the shoreline to the first road.

Areas of sparse residential land use will be included under another category. In some places, the boundary will be clear where new housing developments abut against intensively used agricultural areas, but the boundary may be vague and difficult to discern when residential development is sporadic, or occurs in small isolated units over an extended period of time in areas of mixed or less intensive uses. A careful evaluation of density and the overall relation of the area to the total urban complex must be made.

Residential sections may also be included in other use categories where they are integral parts of the other use. Housing on military bases, at colleges and universities, living quarters for laborers near a work base, or lodging for employees of agricultural field operations or resorts are often difficult to identify and may be placed within the institutional, industrial, agricultural, or commercial categories.

#### 01-02. COMMERCIAL AND SERVICES

Commercial areas are those used predominantly for the sale of products and services. They are often abutted by residential, agricultural, or other contrasting uses which help define them. The principal components of the Commercial-use category are urban central business districts; shopping centers, usually in suburban and outlying areas; commercial strip developments along major highways and access routes to cities; and resorts. The main buildings, secondary structures, and areas supporting the basic use are all included—office buildings, warehouses, driveways, sheds, parking lots, landscaped areas, and waste-disposal areas.

Commercial areas may include some noncommercial uses too small to be separated out. Central business districts often include some institutions, such as churches and schools, and commercial strip developments may include some residential units. These are not separated out unless they exceed one-third the total commercial area. Recreational areas are not segregated as such at Level II but may cause some problems in identification. Recreational facilities that form an integral part of an institution should be included in the Institutional category. A self-contained sports area, on the other hand, such as a stadium for professional events, is Commercial. There is usually a major visible difference in the form of parking facilities, arrangements for traffic flow, and the general association of buildings and facilities. Near a resort, the intensively developed recreational areas would be included in the Commercial category, but extensive golf courses and riding areas would be included in another category, the Open and Other, if in an urban setting. Public and private golf courses, ski and toboggan areas, and other recreational facilities are also classed as Open land.

#### 01-03. INDUSTRIAL

Industrial areas include a wide array of uses from light manufacturing and industrial parks to heavy manufacturing plants. Identification of light industries—those focused on design, assembly, finishing, and packaging of products—can often be based on the type of building, parking, and shipping arrangements. Light industrial areas may be, but are not necessarily, directly in contact with urban areas; many are now found at airports or in relatively open country. Heavy industries use raw materials such as iron ore, lumber, or coal. Included are steel mills, pulp or lumber mills, electric power generating stations, oil refineries and tank farms, chemical plants and brick-making plants. Stock piles of raw materials, large power sources, and waste product disposal areas are usually visible, along with transportation facilities capable of handling heavy materials.

#### 01-04. EXTRACTIVE

Extractive Land encompasses both surface and subsurface mining operations, such as sand and gravel pits, stone quarries, oil and gas wells, and metallic and nonmetallic mines. In size, these activities range from the unmistakable giant strip or pit mines covering vast areas to the unidentifiable gas wells less than a foot square. Surface structures and equipment may range from a minimum of a loading device and trucks to extended areas with access roads, processing facilities, stockpiles, equipment sheds, and numerous vehicles. Spoil material and slag heaps are usually found within a short trucking distance of the major mine areas and may be the key indicator of underground mining operations. Uniform identification of all these diverse extractive uses is extremely difficult from remote sensor data alone.

Industrial complexes where the extracted material is refined, packaged, or further processed are included in the Industrial category even if the plant is adjacent to the mine. Areas of future reserves are included in the appropriate present-use category, Agricultural or Forest Land, regardless of the expected future use. Unused pits or quarries that have been flooded are placed in the Water category if the water body is larger than 40 acres. Areas of tailings, abandoned pits and quarries, and strip-mined areas may remain barren for decades unless steps are taken to hasten the establishment of vegetation. Until vegetative cover is established, such parcels remain in the Extractive category.

#### 01-05 TRANSPORTATION, COMMUNICATIONS, AND UTILITIES

Major transportation routes and areas greatly influence other land uses, and many land-use boundaries are outlined by them. The types and extent of transportation facilities in a locality determine the degree of access and affect both the present and potential use of the area.

Highways and railways are characterized by areas of activity connected in linear patterns. The highways include areas used for interchanges, limited access right-of-way, and service and terminal facilities. Rail facilities include stations, parking lots, roundhouses, repair and switching yards, and related areas, but overland track is not included unless six or more tracks are joined to give sufficient width for delineation at a scale of 1:250,000. Spur connections from an active line are included in the appropriate Industrial or Extractive category.

Airports, seaports, and major lakeports are isolated areas of high utilization, usually with no well defined intervening connections, although some water ports are connected by canals. Airport facilities include the runways, intervening land, terminals, service buildings, navigation aids, fuel storage, parking lots, and a limited buffer zone. The perimeter fence around airports usually makes a very sharp boundary that is visible on high-altitude imagery. Small airports, such as those on rotatable farm land, heliports, and land associated with seaplane bases are not included. Port areas include the docks, shipyards, drydocks, locks, and watercourse-control structures.

Communications and utilities areas involved in transport of water, gas, oil, electricity, and areas used for airwave communications are also included in this category. Pumping stations, electric substations, and areas used for radio, radar, or television antennas are the major types. Small facilities, or those associated with an industrial, commercial, or extractive land use, are included within the larger category with which they are associated. Long-distance gas, oil, electric, telephone, water, or other transmission facilities rarely constitute the dominant use of land over which they pass. If these uses are dominant and meet the minimum width criteria, they may be identified as transportation uses.

#### 01-06. INSTITUTIONAL

Education, religious, health, correctional, and military facilities are the main components of this subcategory. All buildings, grounds, and parking lots that compose the facility are included within the institutional unit, but areas not specifically related to the purpose of the institution should be placed in the appropriate category. Auxiliary land uses, particularly residential, commercial and services, and other supporting land uses on a military base would be included in the Institutional subcategory, but agricultural areas not specifically associated with correctional, educational, or religious institutions are placed in the appropriate agricultural category. Small institutional units, as, for example, many churches and some secondary and elementary schools, will not meet the minimum area requirements and will be included within another category, usually Residential or Commercial. Historic forts may be confused with correctional institutions because of the similarity of buildings, but the historical sites have larger parking areas and often smaller landscaped or grass areas.

#### 01-07. STRIP AND CLUSTERED SETTLEMENT

The Strip and Clustered Settlement category includes developments along transportation routes and the smaller cities, towns, and built-up areas where separate land uses may not be distinguishable. Residential, commercial, industrial, institutional, and occasionally other land uses may be included. Farmsteads intermixed with strip or cluster settlements will be included within the built-up land, but other agricultural land uses should be excluded.

#### 01-08. MIXED

This category is used for a mixture of second-level urban uses in larger cities (more than 50,000 inhabitants) where no one use predominates. In any category, as much as one-third intermixture of another use is allowed without changing the basic classification, but where the intermixture is greater, where several uses, though each is less than one-third, are included, or where individual second-level units may be too small to be separated although the aggregate of such uses may be large, the Mixed category is used.

Open land consists of golf courses, some parks, ski areas, cemeteries, and undeveloped land within an urban setting. Open land may be in very intensive use but a use that does not require structures. Other land includes the small blocks of less intensive or nonconforming uses that become isolated.

## 02. Agricultural Land

Agricultural Land may be broadly defined as land used primarily for production of farm commodities. On high-altitude imagery, the chief indications of agricultural activity will be symmetrical patterns made on the landscape by use of mechanized equipment. However, pasture and other lands where such equipment is used infrequently may not show as well-defined shapes as other areas.

Symmetrical patterns are also characteristic of Urban and Built-up Lands because of street layout and development by blocks. Distinguishing between Agricultural and Urban and Built-up Lands should ordinarily be possible on the basis of urban activity indicators and the associated concentration of population. The number of building complexes is smaller and the density of the road and highway network is much lower in Agricultural Lands than in Urban and Built-up Land. Some urban land uses, such as parks and large cemeteries, however, may be mistaken for Agricultural Land, especially when they occur on the periphery of the urban areas.

The interface of Agricultural Land with other categories of land use may sometimes be a transition zone in which there is an intermixture of land uses at first and second levels of categorization. Where farming activities are limited by wetness, the exact boundary may also be difficult to locate, and Agricultural Land may grade into swamp Forest Land, Nonforested Wetland, or Water.

The Level II categories of Agricultural Land are: Cropland and Pasture; Orchards, Groves, Vineyards, Bush Fruits, and Horticultural Areas; Feeding Operations; and Other.

### 02-01. CROPLAND AND PASTURE

The several components of Cropland and Pasture now used for agricultural statistics include: Cropland harvested; cultivated summer fallow and idle cropland; land on which crop failure occurs; cropland in soil improvement grasses and legumes, cropland used only for pasture or pasture in rotation with crops; pasture on land more or less permanently used for that purpose. From imagery alone, it is generally not possible to make a distinction between Cropland and Pasture with a high degree of accuracy and uniformity, let alone a distinction among the various components of Cropland. Moreover, some of the categories listed represent the condition of the land at the end of the growing season, and will not apply exactly to imagery taken at other times of the year. They will, however, be a guide to identification of Cropland and Pasture.

Certain factors vary throughout the United States and this variability must also be recognized; field size depends on topography, soil types, sizes of farms, kinds of crops and pastures, capital investment, labor availability and other conditions. Irrigated land in the Western States is easily recognized in contrast to Rangeland, but in the Eastern States, irrigation by use of overhead sprinklers cannot always be detected from imagery unless distinctive circular patterns are created. Drainage or water control on land used for cropland and pasture may also create a recognizable pattern that may aid in identification of the land use. In areas of quick-growing crops a field may appear to be in nonagricultural use unless the temporary nature of the inactivity is recognized.

### 02-02. ORCHARDS, GROVES, VINEYARDS, BUSH-FRUIT AND HORTICULTURAL AREAS

Orchards, groves, vineyards, and bush-fruit areas produce the various fruit, nut, and berry crops. Horticultural areas include nurseries, floricultural areas, and seed-and-sod areas used perennially for that purpose. Many of these areas may be included in another category, generally Cropland and Pasture, when identification is made by use of satellite or high-altitude imagery alone. Identification may be aided by recognition of the combination of soil qualities and climatological factors needed for these operations: water bodies in close proximity to moderate the effects of short duration temperature fluctuations; site selection for air drainage on sloping land; deep, well-drained soils on slopes moderate enough to permit use of machinery. Isolated orchards of a few acres do not constitute commercial orchards large enough to identify on high-altitude imagery, and remnants of the few acres of fruit trees on the family farm are usually not recognizable and are therefore not included.

#### 02-03. FEEDING OPERATIONS

Feeding Operations are large, specialized, livestock-production enterprises, chiefly beef cattle feedlots and large poultry farms, but also including large hog and fur-bearing animal farms. These operations have large animal populations restricted to relatively small areas. The result is a concentration of waste material that is an environmental concern. The waste-disposal problems justify a separate subcategory for these relatively small areas. Feeding Operations have a built-up appearance, chiefly composed of buildings, much fencing, access paths, and waste-disposal areas. Some are located near an urban area to take advantage of transportation facilities and proximity to processing plants.

Feeding operations in conjunction with another farm enterprise are not included. Also excluded are shipping corrals and other temporary holding facilities. Game farms and zoos do not meet the animal-population densities to be placed in this subcategory.

#### 02-04. OTHER AGRICULTURAL LAND

Inactive agricultural land is an important component of this subcategory. Such land has no physical indication of present agricultural use and no natural cover, such as brush, which would curtail its ready use for agriculture. Farmsteads, including holding areas for livestock, farm lanes and roads, ditches and canals, small farm ponds, and similar uses are generally quite small and often unrecognizable from high-altitude imagery so that these uses will generally be included with adjacent agricultural uses.

### 03. Rangeland

Rangeland may be defined as land where the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs, where natural herbivory was an important influence in its precivilization state, and that is more suitable for management by ecological rather than agronomic principles. Some rangelands have been or may be seeded to introduced or domesticated plant species. Most of the rangelands in the United States are in the Western Range, the area to the west of an irregular north-south line that cuts through the Dakotas, Nebraska, Kansas, Oklahoma, and Texas. Rangelands are also found in the Southeastern States and Alaska.

The Level II categories of Rangeland are: Grass, Savannas (Palmetto Prairies), Chaparral, and Desert Shrub.

#### 03-01. GRASS

This subcategory encompasses the tall grass (or true prairie), short grass, bunch grass or palouse grass, and desert grass regions. These grass regions generally represent a sequence of declining amounts of available moisture. Most of the tall grass region has been plowed for agriculture. The bulk of the remaining tall grass range is now in North Dakota, Nebraska, southern Kansas and Oklahoma, and the Texas Coastal Plain. Short grass rangeland occurs in a strip about 300 miles wide from the Texas Panhandle northward to the Dakotas where it widens to cover the western half of the Dakotas, the eastern three-fourths of Montana, and the eastern third of Wyoming.

#### 03-02. SAVANNAS (PALMETTO PRAIRIES)

The Palmetto Prairies in south-central Florida, north, west, and southwest of Lake

Okeechobee consist mainly of dense medium tall grasses with scattered palms and shrubs. Many areas are now in improved pasture.

#### 03-03. CHAPARRAL

This category includes California chaparral, the scrub oak or shinnery, and the mountain brush types.

#### 03-04. DESERT SHRUB

Vegetation in this zone includes the creosote bush, sagebrush, greasewood, and other desert shrubs. Bottom lands and moister flats are often characterized by dense stands of mesquite, and where alkali is high, desert saltbrush dominates wide areas.

### 04. Forest Land

Forest lands are lands that are at least 10 percent stocked by trees capable of producing timber or other wood products that exert an influence on the climate or water regime. Forest land can generally be identified rather easily from high-altitude imagery, although the boundary between it and other classes of land may be difficult to delineate precisely.

Lands from which trees have been removed to less than 10 percent stocking but which have not been developed for other use are also included. For example, lands on which there is forest rotation, involving clear-cutting and block planting, are part of Forest Land. On such lands, when trees reach marketable size, which for pulpwood in the Southeastern United States may occur in two to three decades, there will be large areas that have little or no visible forest growth. The pattern can sometimes be identified by the presence of cutting operations in the midst of a large expanse of forest. Unless there is evidence of other use, such areas of little or no forest growth should be included in the Forest Land category. Lands that meet the requirements for Forest Land and also for a higher use category should be placed in the higher category.

At Level II, Forest Land will be divided into three categories: Deciduous, Evergreen, and Mixed. To differentiate the three, sequential imagery, or at least imagery during the period when deciduous trees are bare, will be necessary.

#### 04-01. DECIDUOUS FOREST LAND

Deciduous Forest Land includes all forested areas in which the trees are predominantly those from which the leaves fall at the end of the growing period. In most parts of the United States, these would be the hardwoods, such as oak, maple, beech, ash, hickory, and aspen, and the "soft hardwoods" such as sweet gum, tupelo, cottonwood, and yellow poplar. Tropical hardwoods such as mahogany and ebony are not included as they are broad-leaved evergreens and hence are included in the Evergreen Forest Land category.

#### 04-02. EVERGREEN FOREST LAND

Evergreen Forest Land includes all forested areas in which the trees are predominantly those which remain green throughout the year. Both coniferous and tropical broad-leaved evergreens are included in this category. In most areas, the coniferous evergreens predominate, but the mangrove swamps of Florida and some of the forests of Hawaii are notable exceptions. The coniferous evergreens are commonly referred to or classified as softwoods. They include such eastern species as the longleaf, slash, shortleaf, loblolly, and other southern yellow pines; spruce and balsam fir; white and red pines; jack pine; hemlock; and cypress; and such western species as Douglas-fir, ponderosa pine, redwood, Sitka spruce, Engelmann spruce, lodgepole pine, red cedar, larch, hemlock, and white pine.

#### 04-03. MIXED FOREST LAND

Mixed Forest Land includes all forested areas where both evergreen and deciduous trees are growing and neither predominates.

### 05. Water

The Water category includes all areas within the land mass of the United States that are predominantly or persistently water covered, provided that, if linear, they are at least 1/8 mile (660 feet or 200 meters) wide and if extended cover at least 1/8 square mile or 40 acres. Water bodies smaller than these minimums are included within the land-use unit in which they are located. Sewage-treatment or water-supply facilities are a basic part of the urban pattern and should be included in the 01-Urban category even where the unit is large enough to be separately identified. Water bodies that are vegetated are placed in the 06-Wetland category, or in Forest Land if swamp forests exist.

There are five Level II categories: Streams and Waterways, Lakes, Reservoirs, Bays and Estuaries, and Other.

#### 05-01. STREAMS AND WATERWAYS

This subcategory includes rivers, creeks, canals, and other linear bodies that meet the minimum width requirement of 1/8 mile. Occasional constrictions of streams to less than 1/8 mile may be included to preserve continuity. Streams flowing through deltas will be classified as water as long as width minimums are met, but where there are many distributaries and individual streams are less than 1/8 mile wide, they will be included in the appropriate land use. Where the water course is interrupted by a control structure, the impounded area, if it exceeds 40 acres, will be placed in the Reservoirs subcategory.

The boundary between streams and lakes, reservoirs, or the ocean is the straight line across the mouth of the stream unless the mouth is more than 1 mile wide. In that case the rule given under 05-04 for bays and estuaries is followed.

#### 05-02. LAKES

Lakes are bodies of water more than 40 acres in areal extent, but excluding reservoirs. Islands within lakes that are too small to delineate will be included in the water area. The delineation of a lake will be based on the areal extent of water at the time the imagery is taken.

#### 05-03. RESERVOIRS

Reservoirs are artificial impoundments of water greater than 40 acres in areal extent, whether for irrigation, flood control, municipal water supplies, or hydroelectric power generation. Dams, levees, other water-control structures, or the excavation itself will usually be evident to aid in the identification.

#### 05-04. BAYS AND ESTUARIES

Bays and estuaries are inlets or arms of the sea that extend into the land and as such are properly classified in this system only when they are included within the land mass of the United States. In order that this land mass area be commensurate with the area of the United States used in compiling census statistics, the convention used by the Bureau of the Census in setting the outer limits of the United States will be followed. Where bays and estuaries are between 1 and 10 nautical miles in width, the outer limit of the United States will be the straight line connecting the headlands except where the indentation of the embayment is so shallow that the water area would be less than the area of a semicircle drawn with this straight line as the diameter. In that event the coastline itself would form the outer limit of the United States. Embayments less than one nautical mile in width are classed as 05-01 Streams and Waterways. Embayments or portions of embayments more than 10 nautical miles wide are not considered as included within the land mass.

#### 05-05. OTHER

Other water areas include large farm ponds that may not be identifiable as reservoirs, other water features not mentioned in the preceding categories, or combinations of water features that cannot be clearly defined.

### 06. Nonforested Wetland

Nonforested Wetlands consist of seasonally flooded basins and flats, meadows, marshes, and bogs. Wetlands are usually relatively level areas. Uniform identification is difficult because the wetland areas change as the result of such factors as long-term drought, high rainfall, seasonal fluctuations in precipitation, and diurnal tides. The observations must be correlated with tide and weather information to obtain consistent results.

Open saline- and fresh-water areas, sounds, and bays are included under 05-Water. Wetland areas with a 10 percent forest crown cover, or where recent clear cutting has occurred, are placed in 04-Forest Land.

Nonforested Wetland may be either Vegetated or Bare.

#### 06-01. VEGETATED NONFORESTED WETLAND

Vegetated Nonforested Wetland includes areas where the forest crown cover is less than 10 percent or the vegetation is nonwoody. Cattails, tules, and grasses such as Indian rice grass and saw grass occur in fresh-water marshes, and salt-tolerant grasses such as Spartina occur in the salt marshes.

#### 06-02. BARE NONFORESTED WETLAND

Tidal flats are the main component.

### 07. Barren Land

Barren land is land of limited ability to support life and little or no vegetation. In general, it appears to be an area of oily soil, sand, and rocks. Vegetation, if present, is more widely spaced and scrubby than that in the Desert Shrub subcategory of Rangeland except when unusual conditions, such as a heavy rainfall, occasionally result in growth of a short-lived more impressive plant cover.

Land may be temporarily barren owing to man's activities, but such land is usually included in another land-use category. Agricultural land may be temporarily without vegetation because of tillage practices. Sites for urban development may be stripped of cover before construction begins. Areas of extractive and industrial land have waste and tailings dumps, and exhausted sources of material supply are often evident.

Level II categories of Barren Land are: Salt Flats, Beaches, Sand Other Than Beaches, Bare Exposed Rock, and Other.

#### 07-01. SALT FLATS

Salt flats are the flat-floored bottoms of interior desert basins. For a short time after a cloudburst, they may be covered by a sheet of water, or playa lake. On vertical air photographs they appear as white scars in the desert because the soil, flatness, and color cause a diffused reflectancy much higher than the albedo of other desert features.

#### 07-02. BEACHES

Beaches are the smooth sloping accumulations of sand and gravel along shorelines. The surface is stable inland, but the shoreward part is subject to erosion by wind and water, and material is deposited in protected areas. The Beach category is not used if there is vegetative cover or another land use.

#### 07-03. SAND AND OTHER THAN BEACHES

Sand Other Than Beaches is composed primarily of dunes, accumulations of sand of aeolian origin. Dunes are most commonly found in deserts although they also occur on shore and strand lines, coastal plains, river flood plains, deltas, and in periglacial environments. They are of various shapes, the crescentic being the most elementary, and range in size from diameters of a few to several thousand meters and in height from one to several hundred meters. Isolated crescent-shaped dunes migrate freely, but longitudinal dunes tend to remain nearly fixed in position.

#### 07-04. BARE EXPOSED ROCK

The Bare Exposed Rock category includes areas of bedrock exposure, desert pavement, scarps, talus, slides, volcanic material, and other accumulations of rock without vegetative cover.

#### 07-05. OTHER

This subcategory is used for a mixture of Barren Land features or when a Barren Land subcategory cannot be positively identified.

### 08. Tundra

Tundras are cold treeless lands, primarily in Alaska, with a vegetative cover of moss and lichen, grasses, and shrubs. The tundra zone can be divided into three subzones on the basis of vegetative cover: an arctic subzone characterized by an interrupted cover of sparse moss and lichen sedges: a typical tundra subzone characterized by various types of moss and lichen sedges and rare shrubs in river valleys; and a shrub tundra subzone, characterized by birch and willow shrubs together with mosses, sedges, and grasses. Mountain tundra, along the mountain tops, extends well to the south and is enriched by alpine flora.

The interfaces of Tundra to Permanent Snow and Icefields and to Water are fairly easily determined if the imagery is taken in late summer. Between Forest Land with a light crown cover and Tundra, the boundary tends to be transitional over a wide area and is also uneven, as changes in growing conditions bring about protuberances of brushland into Tundra areas. Distinguishing between Tundra and Nonforested Wetland is difficult where there is a hummocky landscape with intervening areas of standing water. Flooded portions may vary in size owing to seasonal changes in depth of frost, amount of precipitation, and evapotranspiration potential. The ratio of flooded land to vegetation is the basis for decision. The Barren Land-Tundra interface occurs where one or more of the vegetative growing factors are deficient. The boundary will be difficult to establish.

### 09. Permanent Snow and Icefields

Permanent Snow and Icefields are those that survive summer ablation. Snow, firn, icepacks, icecaps, and glaciers are included and the underlying mass may be either land or water. An average frontal position over a period of a few years would be the most desirable border, but an expedient delineation can be made through observations at the time of maximum retreat, probably during August in the northern hemisphere. The abutting land would most probably be classed as Water, Barren Land, Tundra, or Nonforested Wetland.

## Selected References

Anderson, James R., 1971, Land use classification schemes used in selected recent geographic applications of remote sensing: Photogramm. Eng., v. 37, no. 4, p. 379-387.

Avery, T. Eugene, 1968, Interpretation of aerial photographs [2d ed.]: Minneapolis, Burgess Publishing Co., 324 p.

Barlowe, Raleigh, 1972, Land resource economics [2d ed.]: Englewood Cliffs, N.J., Prentice Hall Inc., 585 p.

Burley, Terence M., 1961, Land use or land utilization?: Prof. Geographer, v. 13, no. 6, p. 18-20.

Canada Department of Forestry, 1966, The Canada land inventory: Ottawa, Canada Dept. Forestry, 61 p.

Clawson, Marion, and Stewart, Charles L., 1965, Land use information. A critical survey of U.S. statistics including possibilities for greater uniformity: Baltimore, Md., The Johns Hopkins Press for Resources for the Future Inc., 402 p.

Cline, Marlin G., 1949, Basic principles of soil classification: Soil Sci., v. 67, p. 81-91.

Hardy, Ernest E., Belcher, Donald J., and Phillips, Elmer S., 1971, Land use classification with simulated satellite photography: U.S. Dept. Agriculture Econ. Research Service Agr. Inf. Bull. 352 p.

Marschner, F. J., 1959, Land use and its patterns in the United States: U.S. Dept. Agriculture Agr. Research Service Agr. Handb. 153, 277 p.

National Academy of Sciences, 1970, Remote sensing with special reference to agriculture and forestry: Washington, D.C., Natl. Acad. Sci.

New York State Office of Planning Coordination, 1969, Land use and natural resources inventory of New York State: Albany, New York State Office Planning Coordination, 67 p.

Society of American Foresters, 1967, Forest cover types of North America: Washington, D.C., Soc. American Foresters.

Stoddart, Laurence A., and Smith, Arthur D., 1955, Range management [2d ed.]: New York, McGraw Hill Book Co., 433 p.

U.S. Congress, 1936, The Western Range: U.S. 74th Cong., 2d sess., Senate Doc. 199.

U.S. Arctic, Desert Tropic Information Center, Research Studies Institute, 1955, Glossary of arctic and subarctic terms: Maxwell Air Force Base, Alabama, ADTIC Pub. A-105.

U.S. Department of Agriculture Conservation Needs Inventory Committee, 1966, National handbook for updating the conservation needs inventory: Washington, D.C., U.S. Dept. Agriculture Conserv. Needs Inventory Comm., 75 p.

U.S. Department of Agriculture Soil Conservation Service, 1962, Classifying rangeland for conservation and planning: U.S. Dept. Agr. Handb. 235.

U.S. Urban Renewal Administration, Housing and Home Finance Agency, and Bureau of Public Roads, 1965, Standard land use coding manual, a standard system for identifying and coding land use activities: Washington, D.C., U.S. Govt. Printing Office, 111 p.

# A P P E N D I X  R

## STATE OF DELEWARE LAND CLASSIFICATION SCHEME

# DELAWARE STATE PLANNING OFFICE FOUR-DIGIT LAND USE INVENTORY CODE AS ADAPTED FROM THE DELAWARE INTER-AGENCY PLANNING COMMITTEE STANDARD CODE

## AGRICULTURAL AND EXTRACTIVE USES

### AGRICULTURAL USES

0100 UNDIFFERENTIATED AGRICULTURE
0110 N. A.
0120 PASTURE
0130 CROPLAND
0140 ORCHARDS, NURSERIES
0150 BUILDING GROUP
0160 INDOOR CULTIVATION
0170 POULTRY
0180 LIVESTOCK
0190 AGRICULTURAL USES N. E. C.

### EXTRACTIVE USES

0200 UNDIFFERENTIATED EXTRACTIVE USES
0210 METAL MINING
0220 COAL MINING
0230 SAND AND GRAVEL
0240 STONE
0250 CHEMICAL AND FERTILIZER MINERALS
0260 PETROLEUM, NATURAL GAS
0270 CLAY, CERAMIC, REFRACTORY MINERALS
0280 N. A.
0290 EXTRACTIVE USES N. E. C.

### RESIDENTIAL USES

10-- UNDIFFERENTIATED RESIDENCE
11-- SINGLE FAMILY RESIDENCES
12-- TWO FAMILY RESIDENCES
13-- MULTIPLE FAMILY RESIDENCES
14-- GROUP QUARTERS
* INCLUDES ROOMING HOUSES, BOARDING HOUSES, ETC.
15-- TRAILER PARKS
16-- N. A.
17-- N. A.
18-- N. A.
19-- RESIDENTIAL USES N. E. C.

### BUILDING TYPE

--0- NOT REPORTED
--1- DETACHED STRUCTURES ✓
--2- SEMI-DETACHED ✓
--3- ROW (ATTACHED) STRUCTURES ✓
--4- GARDEN APARTMENTS
--5- OTHER WALK UP APARTMENTS
--6- ELEVATOR APARTMENTS
--7- TRAILERS
--8- MISCELLANEOUS ROOMING AND APARTMENT HOUSES
--9- MAKESHIFT OR N. E. C.

### OCCUPANCY / TENURE (APPLIES ONLY TO RESIDENTIAL & COMMERCIAL CODES)

---0
---1
---2 OCCUPIED UNDER CONSTRUCTION
---3
---4
---5 SEASONALLY OCCUPIED (NON-MIGRANT LABOR)
---6 OCCUPIED, TENURE UNDIFFERENTIATED
---7
---8
---9 MIGRANT LABOR OCCUPIED

NOTE: NUMBER OF DWELLING UNITS ARE NOT RECORDED AS A LAND USE.

## BUSINESS USES

### TRANSIENT LODGINGS

2106 UNDIFFERENTIATED LODGINGS
2116 HOTELS
2126 MOTELS
2136 TOURIST HOMES
2146 - 2196 N. A.

— —

C-4

RETAIL SALES EXCEPT AUTOMOTIVE

2206 UNDIFFERENTIATED RETAIL SALES
2216 FOOD AND DRUGS, EXCEPT SUPER MARKETS - INCLUDES FERTILIZER SALES
2226 SUPERMARKETS
2236 APPAREL AND ACCESSORIES
2246 FURNITURE AND HOME FURNISHINGS
2256 GENERAL MERCHANDISE, EXCEPT DEPARTMENT STORES
- INCLUDES HARDWARE, APPLIANCES, ANTIQUES, FLORIST, ETC.
2266 DEPARTMENT STORES
2276 EATING OR DRINKING
2286 PROFESSIONAL AND BUSINESS SUPPLIES
2296 RETAIL SALES N. E. C. - MAY INCLUDE GRAVESTONE & CASKET SALES

CONSUMER SERVICE USES

2306 UNDIFFERENTIATED CONSUMER SERVICES

CONSUMER SERVICE USES

2306 UNDIFFERENTIATED CONSUMER SERVICES
2316 BARBER SHOPS
2326 BEAUTY PARLORS
2336 UNDERTAKERS
2346 APPAREL REPAIR AND MAINTENANCE - INCLUDES LAUNDROMATS, ETC.
2356 HEALTH CLUBS
2366 CONSUMER GOODS REPAIR SHOPS
2376 N. A.
2386 N. A.
2396 CONSUMER SERVICES, N. E. C.

COMMERCIAL INDOOR RECREATION

2406 UNDIFFERENTIATED COMMERCIAL INDOOR RECREATION
2416 MOTION PICTURE THEATERS
2426 LEGITIMATE THEATERS
2436 NIGHT CLUBS AND DANCE HALLS
2446 BOWLING ALLEYS
2456 POOL HALLS
2466 AMUSEMENT ARCADES
2476 ICE SKATING OR ROLLER RINKS
2486 SPORTS ARENA
2496 COMMERCIAL INDOOR RECREATION N. E. C.

AUTOMOTIVE SALES AND SERVICES

2506 UNDIFFERENTIATED AUTOMOTIVE SALES AND SERVICES
2516 AUTOMOTIVE AND TRUCK SALES, NOW - INCLUDES TRAILERS
2526 AUTOMOTIVE AND TRUCK SALES, USED - INCLUDES TRAILERS
2536 FARM EQUIPMENT SALES
2546 TRAILER SALES
2556 GASOLINE STATIONS
2566 REPAIR GARAGES
2576 BODY AND PAINT SHOPS
2586 CAR WASH
2596 OTHER N. E. C. - INCLUDES AUTO PARTS & SUPPLY STORES

COMMERCIAL AND PROFESSIONAL SERVICES

2606 UNDIFFERENTIATED COMMERCIAL AND PROFESSIONAL SEWVICES
2616 REAL ESTATE OFFICES
2626 BANKS AND OTHER FINANCIAL INSTITUTIONS
2636 PROFESSIONAL OFFICES OTHER THAN MEDICAL
- INCLUDES LAWYERS, PHOTOGRAPHERS, ETC.
2646 MEDICAL OFFICES - INCLUDES DENTISTS
2656 INSURANCE OFFICES
2666 SERVICES TO BUSINESS AND PROFESSIONS, INCLUDING REPAIR
2676 GENERAL OFFICES
2686 VETERINARIANS
2696 COMMERCIAL AND PROFESSIONAL SERVICES N. E. C. - MAY INCLUDE (NEWSPAPER OFFICES) WITHOUT ON-SITE PRINTING, ETC.

2706 ADMINISTRATION AND MANAGEMENT
- INCLUDES OFFICE BUILDINGS OF SEPARATELY INDUSTRIAL FIRMS LOCATED IN C. B. D.

COMMERCIAL OUTDOOR RECREATION

2806 UNDIFFERENTIATED COMMERCIAL OUTDOOR RECREATION
2816 MINIATURE GOLF
2826 DRIVING RANGE
2836 OUTDOOR THEATER
2846 SPORTSFIELD

2856 FAIRGROUNDS
2866 AMUSEMENTS
2876 RACING
2886 N. A.
2829 OTHER N. E. C.

2906 BUSINESS USES N. E. C. - INCLUDES WHOLESALE SALES WITHOUT STOCK STORAGE

WHOLESALE, STORAGE DISTRIBUTING AND CONTRACTING USES

31-- WHOLESALING WITH STOCK - INCLUDES DISTRIBUTORS
32-- BUILDING TRADES AND CONSTRUCTION CONTRACTORS - EXCLUDES LUMBER YARDS
33-- INDOOR STORAGE, EXCEPT SCRAP - INCLUDES OIL TANKS, ETC.
34-- OUTDOOR STORAGE, EXCEPT SCRAP
35-- COMBINED INDOOR AND OUTDOOR STORAGE, EXCEPT SCRAP - LUMBER YARDS, ETC.
36-- SCRAP, WASTE, JUNK, SALVAGE, STORAGE OR SALES
37-- N. A.
38-- N. A.
39-- OTHER N. E. C.

MANUFACTURING USES

41-- PRIMARY PROCESSING
42-- FABRICATION AND ASSEMBLY
43-- RESEARCH, TESTING
44-- N. A.
45-- N. A.
46-- N. A.
47-- N. A.
48-- N. A.
49-- FUNCTION N. E. C.

STANDARD INDUSTRIAL (MANUFACTURING) CODE: (FOR USE WITH STORAVE AND MANUFACTURING LAND USE CODE)

--19 ORDINANCE AND ACCESSORIES
--20 FOOD AND KINDRED PRODUCTS
--21 TOBACCO MANUFACTURES
--22 TEXTILE MILL PRODUCTS
--23 APPAREL AND OTHER FINISHED PRODUCTS MADE FROM FABRICS AND SIMILAR MATERIALS
--24 LUMBER AND WOOD PRODUCTS, EXCEPT FURNITURE
--25 FURNITURE AND FIXTURES
--26 PAPER AND ALLIED PRODUCTS
--27 PRINTING, PUBLISHING, AND ALLIED INDUSTRIES
--28 CHEMICALS AND ALLIED PRODUCTS
--29 PETROLEUM REFINING AND RELATED INDUSTRIES
--30 RUBBER AND MISCELLANEOUS PLASTICS PRODUCTS
--31 LEATHER AND LEATHER PRODUCTS
--32 STONE, CLAY AND GLASS PRODUCTS
--33 PRIMARY METAL INDUSTRIES
--34 FABRICATED METAL PRODUCTS, EXCEPT ORDINANCE, MACHINERY, AND TRANSPORTATION EQUIPMENT
--35 MACHINERY, EXCEPT ELECTRICAL
--36 ELECTRICAL MACHINERY, EQUIPMENT, AND SUPPLIES
--37 TRANSPORTATION EQUIPMENT
--38 PROFESSIONAL, SCIENTIFIC, AND CONTROLLING INSTRUMENTS; PHOTOGRAPHIC AND OPTICAL GOODS; WATCHES AND CLOCKS
--39 MISCELLANEOUS MANUFACTURING INDUSTRIES

COMMUNITY SERVICE USES

GOVERNMENT

5100 UNDIFFERENTIATED GOVERNMENTAL USE
5110 POSTAL
5120 GENERAL GOVERNMENT
5130 POLICE
5140 FIRE
5150 DEFENSE
5160 PENAL AND CORRECTIONAL
5170 JUDICIAL
5180 RESTROOMS, PAVILION, PUBLIC BATHS, ETC.
5190 GOVERNMENTAL USE N. E. C. - INSPECTION LANE

EDUCATION

5200 UNDIFFERENTIATED EDUCATIONAL ESTABLISHMENT
5210 COLLEGES OR UNIVERSITIES
5220 JUNIOR COLLEGES
5230 HIGH SCHOOLS
5240 JUNIOR HIGH SCHOOLS
5250 ELEMENTARY SCHOOLS
5260 PRESCHOOL, NURSERY SCHOOLS
5270 VOCATIONAL, TECHNICAL SCHOOLS
5280 PROFESSIONAL, BUSINESS, AND NURSING SCHOOLS
5290 EDUCATIONAL USES N. E. C.

RELIGIOUS USES

5300 UNDIFFERENTIATED RELIGIONS
5310 PLACE OF WORSHIP
5320 PARISH HOUSE, SUNDAY SCHOOL, ETC.
5330 RELIGIOUS COMPLEX
5340 - 5390 N. A.

HEALTH ESTABLISHMENTS (EXCEPT PRACTITIONERS OFFICES)

5400 UNDIFFERENTIATED HEALTH ESTABLISHMENTS
5410 GENERAL MEDICAL HOSPITALS
5420 CLINICS
5430 CONVALESCENT HOMES
5440 HOMES FOR AGED - INCLUDES NURSING HOMES
5450 MENTAL HOSPITALS OR INSTITUTIONS
5460 SPECIAL HOSPITALS
5470 N. A.
5480 N. A.
5490 HEALTH ESTABLISHMENTS N. E. C.

5500 POLITICAL, LABOR, BUSINESS ASSOCIATIONS, AND FRATERNAL ORDERS
5600 CULTURAL USES (LIBRARIES, MUSEUMS)
5700 NON-COMMERCIAL INDOOR SOCIAL AND RECREATIONAL USES
5800 CHARITABLE AND WELFARE ORGANIZATIONS
5900 OTHER COMMUNITY SERVICES N. E. C.

TRANSPORTATION USES

RIGHTS OF WAY

6100 UNDIFFERENTIATED RIGHTS OF WAY
6110 STREETS AND HIGHWAYS EXCEPT LIMITED ACCESS
6120 LIMITED ACCESS HIGHWAYS
6130 RAIL RIGHTS OF WAY
6140 AVIATION RIGHTS OF WAY
6150 MARINE RIGHTS OF WAY
6160 PEDESTRIAN RIGHTS OF WAY
6170 UTILITY EASEMENTS
6180 N. A.
6190 RIGHTS OF WAY N. E. C.

MOTOR VEHICLE FACILITIES EXCEPT RIGHTS OF WAY

6200 UNDIFFERENTIATED MOTOR VEHICLE FACILITIES
6210 OPEN AUTOMOBILE PARKING
6220 PARKING GARAGES
6230 TAXI STANDS
6240 TRUCK LOADING AND PARKING AREAS
6250 TRUCKING TERMINAL
6260 N. A.
6270 N. A.
6280 N. A.
6290 MOTOR VEHICLE FACILITIES N. E. C.

MASS TRANSIT FACILITIES

6300 UNDIFFERENTIATED MASS TRANSIT FACILITIES
6310 BUS TERMINAL
6320 BUS MAINTENANCE AND REPAIR
6330 BUS STORAGE AND PARKING
6340 TRAIN TERMINAL
6350 TRAIN MAINTENANCE AND REPAIR
6360 TRAIN STORAGE AREA
6370 N. A.
6380 N. A.
6390 MASS TRANSIT FACILITIES N. E. C.

AVIATION FACILITIES

6400 UNDIFFERENTIATED AVIATION FACILITIES
6410 AIR TERMINAL
6420 HANGARS AND STORAGE
6430 REPAIR AND MAINTENANCE
6440 N. A.
6450 N. A.
6460 N. A.
6470 N. A.
6480 N. A.
6490 AVIATION FACILITIES, N. E. C.

MARINE FACILITIES

6500 UNDIFFERENTIATED MARINE FACILITIES
6510 MARINE TERMINAL
6520 DOCKS OR WHARFS (WET STORAGE)
6530 DRY STORAGE
6540 INDOOR MAINTENANCE AND REPAIR

6550 OUTDOOR MAINTENANCE AND REPAIR
6560 GASOLINE AND OTHER SERVICE
6570 NAVIGATION AIDES
6580 BOAT RAMPS
6590 MARINE FACILITIES, N. E. C.
6600 NOT ASSIGNED
6700 NOT ASSIGNED
6800 NOT ASSIGNED
6900 TRANSPORTATION FACILITIES, N. E. C.

UTILITY USES

WATER SUPPLY FACILITIES

7100 UNDIFFERENTIATED WATER SUPPLY FACILITIES
7110 STORAGE
7120 TREATMENT
7130 DISTRIBUTION EXCEPT PUMPING
7140 PUMPING
7150 N. A.
7160 N. A.
7170 N. A.
7180 N. A.
7190 WATER SUPPLY FACILITIES, N. E. C.

SEWERAGE FACILITIES

7200 UNDIFFERENTIATED SEWERAGE FACILITIES
7210 COLLECTION SYSTEM
7220 TREATMENT
7230 PUMPUNG
7240 STORAGE
7250 N. A.
7260 N. A.
7270 N. A.
7280 N. A.
7290 SEWERAGE FACILITIES, N. E. C.

ELECTRICAL FACILITIES

7300 UNDIFFERENTIATED ELECTRICAL FACILITIES
7310 GENERATION
7320 TRANSMISSION
7330 SUBSTATION
7340 N. A.
7350 N. A.
7360 N. A.
7370 N. A.
7380 N. A.
7390 GAS FACILITIES, N. E. C.

WASTE AND REFUSE (EXCEPT SEWAGE)

7500 UNDIFFERENATIATED WASTE AND REFUSE FACILITIES
7510 STORAGE
7520 DISPOSAL
7530 TREATMENT OR PROCESSING
7540 N. A.
7550 N. A.
7560 N. A.
7570 N. A.
7580 N. A.
7590 WASTE AND REFUSE FACILITIES, N. E. C.

COMMUNICATION USES

7600 UNDIFFERENTIATED COMMUNICATION FACILITIES
7610 TELEPHONE FACILITIES
7620 TELEGRAPH FACILITIES
7630 RADIO BROADCASTING
7640 RADIO TRANSMISSION
7650 TELEVISION BROADCASTING
7660 TELEVISION TRANSMISSION
7670 N. A.
7680 N. A.
7690 COMMUNICATIONS FACILITIES, N. E. C.
7700-7900 N. A.

OPEN LAND USES

LAND-BASED RECREATION

8100 UNDIFFENENTIATED LAND-BASED RECREATION
8110 HIGH DENSITY RECREATION - INCLUDES ATHLETIC FIELDS, TOTLOTS, PLAYFIELDS, SMALL MUNICIPAL PARKS, ETC.
8120 GENERAL RECREATION - INCLUDES LARGE MUNICIPLE AND COUNTY PARKS, GOLF COURSES, ETC.
8130 NATURAL ENVIRONMENT AREAS - INCLUDES LARGE STATE OR NATIONAL PARK OR FOREST AREAS REMOTE FROM POPULATION CENTERS.
8140 OUTSTANDING NATURAL AREAS - INCLUDES SIGNIFICANT NATURAL FEATURES, PHENOMENA, AND AREAS OF SPECIAL BEAUTY.
8150 PRIMITIVE AREAS - INCLUDES EXTENSIVE NATURAL UNDEVELOPED AREAS AVAILABLE FOR PUBLIC OBSERVATION, ETC.
8160 GOLF COURSES
8170 N. A.
8180 N. A.
8190 N. E. C.

WATER BASED RECREATION

8200 UNDIFFERENTIATED
8210 SWIM CLUBS
8220 MARINAS
8230 BATHING BEACHES
8240 FISHING PIERS
8250-8290 N. A.

8300 COMBINED LAND & WATER BASED RECREATION

8400 CEMETARIES

8500-8900 N. A.

OWNERSHIP

---0 OWNERSHIP NOT REPORTED
---1 PRIVATELY OWNED
---2 QUASI-PUBLIC
---3 MUNICIPAL
---4 COUNTY
---5 STATE
---6 FEDERAL
---7 N. A.
---8 N. A.
---9 N. E. C.

UNUSED SPACE

9100 WATER AREA
- INCLUDES SWAMP, MARSH

9200 MARGINAL LAND (POTENTIALLY USABLE)
- INCLUDES WOODS ~~WND~~ A MEADOWLANDS

9300 DERELICT LAND
- INCLUDES ABANDONED EXCAVATIONS, ETC.

9400 UNOCCUPIED BUT USABLE OPEN LAND

9500 UNUSED LAND WITH VACANT BUILDING UNDIFFERENTIATED

9510 WITH UNUSED RESIDENCE
9520 WITH UNUSED COMMERCIAL FACILITY
9530 WITH UNUSED STORAGE FACILITY
9540 WITH UNUSED INDUSTRIAL FACILITY
9550 WITH UNUSED COMMUNITY SERVICE FACILITY
9560 WITH UNUSED TRANSPORTATION FACILITY
9570 WITH UNUSED UTILITY FACILITY
9580 N. A.
9590 WITH VACANT BUILDING N. E. C.

9600 N. A.

9700 N. A.

9800 N. A.

9900 UNUSED BUT USABLE, N. E. C.

APPENDIX TABLE I

LAND USE COMPOSITION OF INCORPORATED PLACES

NEW CASTLE COUNTY, DELAWARE, 1964

| Land Use | Bellefonte | Delaware City | Elsmere | Middletown | Newark |
|---|---|---|---|---|---|
| | Percent of Urban Land | | | | |
| Residential | 73.1 | 21.4 | 57.5 | 52.0 | 31.0 |
| Commercial | 4.4 | .8 | 2.6 | 10.1 | 2.9 |
| Wholesale, Storage & Contracting | - | .1 | 5.2 | 2.3 | .1 |
| Manufacturing | - | 58.5 | .6 | .9 | 13.0 |
| Community Services | 1.1 | 2.0 | 3.9 | 11.7 | 28.3 |
| Transportation | 21.4 | 16.7 | 27.5 | 21.8 | 18.3 |
| Utilities | - | .1 | 1.4 | .5 | .4 |
| Recreation & Open Uses | - | .3 | 1.4 | .6 | 6.0 |
| Urban Land* | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| | Acres | | | | |
| Urban Land | 103 | 509 | 454 | 263 | 2,529 |
| Nonurban Land | 1 | 453 | 160 | 131 | 1,237 |
| Total Land Area | 104 | 962 | 614 | 394 | 3,766 |

*Columns may not total to 100.0% due to rounding.

# A P P E N D I X   S

## HUD-BPR SCHEME AS ADOPTED BY THE DELEWARE VALLEY REGIONAL PLANNING COMMISSION (DURPC)

## 1110 DETACHED SINGLE FAMILY UNITS

DESCRIPTION: Single residential buildings. Included are vacant and seasonal dwellings and farm homes

PHOTO INTERPRETATIONS: Single dwellings on separate land parcels.

CHARACTERISTICS: Individual walkways or driveways and usually a single chimney.

## 1120 SEMI-DETACHED UNITS - SINGLE FAMILY

DESCRIPTION: Duplexes or twin homes, structures designed for 2 family occupancies.

PHOTO INTERPRETATIONS: 2 family residential buildings.

CHARACTERISTICS: Twin homes side by side with individual front doors and pathways and/or driveways: Duplexes, 2 story homes. Shadow is indication for height of building.

## 1130 ATTACHED UNITS (ROWHOMES) - SINGLE FAMILY

DESCRIPTION: Residential buildings attached in a continuous stretch. Each unit houses a single family and has a direct access from the outside.

PHOTO INTERPRETATIONS: A string of 3 or more attached homes.

CHARACTERISTICS: Individual pathway and a visible line of attachment protruding on the roof. Where backyards exist divisions are also visible.

## 1140 APARTMENTS - MULTI-FAMILY

DESCRIPTION: Large buildings with multiple separate living units not owner occupied or medium sized buildings (Garden Apartments) in a layout.

PHOTO INTERPRETATIONS:

CHARACTERISTICS: Adjacent auto parking for large buildings walkway directly in front of living unit in the Garden Apartment type.

## 1200 GROUP QUARTERS

DESCRIPTION: Group quarters include rooming and boarding houses membership lodgings, residence halls and dormitories retirement homes and orphanages, and religous quarters.

PHOTO INTERPRETATIONS: These buildings are usually distinguishable from apartments by the landscape, architecture, and the related buildings near-by.

CHARACTERISTICS:

## 1400 MOBILE HOMES

DESCRIPTION: Mobile homes in trailer parks or courts (excluding lots devoted to sales only)

PHOTO INTERPRETATIONS: Mobile homes are distinguishable from sales and rentals by the spacing for direct access and the parked cars in front of the mobile homes. Also there is the absence of a small building (office) which is on a sales lot.

CHARACTERISTS: Spacing of mobile homes, parked cars and absence of dealer office.

## 1500 TRANSIENT LODGING

DESCRIPTION: Hotels and Motels occupied by permanent guests. It also includes such establishments as the YMCA, YWCA and YMHA.

PHOTO INTERPRETATIONS: Building or buildings with numerous lodgings.

CHARACTERISTS: Large swimming pool, parking lot and direct access to a major thoroughfare are indications of transient lodgings. Also the shape of the buildings is a factor. Motels usually have a small office building at the entrance.

## 2100 FOOD AND KINDERED PRODUCTS - MANUFACTURING

DESCRIPTION: Plants where products are made (as opposed to storage sale and distributing activities) included in these categories are:

- Meat Products - Manufacturing (Packing)
- Dairy Products - Manufacturing
- Canneries
- Grain Mill Products - Manufacturing
- Bakery Products - Manufacturing
- Sugar - Manufacturing
- Confectionery Andrelated Products - Manufacturing
- Beverage - Manufacturing
- Other food preparations and kindred products

PHOTO INTERPRETATIONS: Almost all of these categories present a problem. However, some can be identified by certain characteristics.

CHARACTERISTICS: Canneries are usually located near bodies of water and conveyor belts that lead into the cannery are good indications. Also in the grain mill products the identification piece could be the tall round building (Silo) or grain elevators.

## 2200 TEXTILE MILL PRODUCTS - MANUFACTURING

DESCRIPTION: The manufacturing of cloth and cloth products. Also includes tire cord fabric, artificial leather, and dyeing and finishing of textiles.

CHARACTERISTICS: Manufacture usually has a few buildings which are round in shape and smokestacks. Also water basins or storage.

## 2300 APPAREL PRODUCTS

DESCRIPTION: The manufacturing of clothing. Included are handbags, luggage, and footwear (except rubber).

## 2400 LUMBER AND WOOD PRODUCTS

ESCRIPTION: The production and processing of lumber and wood materials including logging camps, saw mills and planing mills, wooden containers, and lumber yards.

PHOTO INTERPRETATIONS: Lumber stacked up in open storage or under long rectangular overhead roof for weather protection.

## 2500 FURNITURE AND FIXTURES

DESCRIPTION: Manufacturing of household, office and public building and related furniture and such fixtures as shelvings and partitions.

## 2600 PAPER AND ALLIED PRODUCTS

DESCRIPTION: Manufacturing of pulp and paper and cardboards, bags, boxes and envelopes, and sanitary paper products.

PHOTO INTERPRETATIONS: Discharge of light colored industrial waste, a settling basin and high smokestacks and usually located near water bodies.

## 2700 PRINTING, PUBLISHING, AND ALLIED PRODUCTS

DESCRIPTION: Newspaper, periodicals, books and business forms manufacturing, and printing.

## 2800 CHEMICALS AND ALLIED PRODUCTS

ESCRIPTION: Industrial chemicals, plastics, paint, soap and detergents, cosmetics, argicultural chemicals, printing ink, and other related chemical manufacturing.

PHOTO INTERPRETATIONS: Chemical plants contain storage tanks, power plant, and processing and fabrication buildings

CHARACTERISTICS: Chemical plants usually have a settling basin, and storage tanks which are conical or round in shape.

## 2900 PETROLEUM REFINING AND RELATED INDUSTRIES

DESCRIPTION: Petroleum refining, and paving and roofing material production (excluding tank farms for the sole purpose of storage and not connected to a refinery).

PHOTO INTERPRETATIONS: These industries are typified by many closed or tall tanks, gas holders, pipelines, and much large, outdoor processing equipmen

CHARACTERISTICS: Large round tanks near a number of small buildings, smokestacks and furnace buildings.

## 3100 RUBBER AND PLASTIC PRODUCTS

DESCRIPTION: Manufacturing of tires, innertubes, rubber footwear, reclaiming rubber and plastic products.

PHOTO INTERPRETATIONS: Again this type ~~of~~ manufacturing is typified by many closed or tall tanks, gasholders, pipeline, and much large, outdoor processing equipment, also air vents on roofs, and proximity to railroads.

## 3100 RUBBER AND PLASTIC PRODUCTS (Continued)

CHARACTERISTICS: Storage tanks, processing building, power plant and coal piles, settling basin and multi-fabrication buildings, and air vents on the roofs are indications of rubber and plastic products.

## 3200 STONE, CLAY AND GLASS PRODUCTS

DESCRIPTION: Manufacturing of glass, cement, brick, porcelain, pottery and vitreous products, concrete, gypsum, cut stone, and asbestos.

PHOTO INTERPRETATIONS: This type of manufacturing is composed of large chimneys or many stacks, large quanities of fuel, and the presence of kilns. Als conveyor (Blower) belts are included.

CHARACTERISTICS: Railroad tracks for delivery of raw materials are usually visibl along with waste materials site and the presence of kilns and smokestacks, conveyor belts and finished product may also be visible.

## 3300 PRIMARY METAL INDUSTRIES

DESCRIPTION: The manufacturing facilities engaged in the production of iron and steel and non-ferrous metals including activities such as blast furnaces, iron and steel foundries, steel pipe and tubes, primary smelting and refining of non-ferrous metals (copper, lead & zinc), secondary smelting and refining of non-ferrous metals and alloys and rolling, drawing and extruding of non-ferrous meta

PHOTO INTERPRETATIONS: Steel plants are typified by heavy steel-frame, one story buildin storage yards with heavy lifting equipment, and rail lines entering buildings.

CHARACTERISTICS: Lots of smokestacks, long and large one-story buildings and frequently the raw material or the finished product can be seen in open storage. Also a large number of railroad tracks leading to and fro the plants are an indication along with the other factors.

## 3400 FABRICATED METAL PRODUCTS

DESCRIPTION: Fabrication products are the result or output of processing plants assembled products. These range from machinery (Industrial and office), household appliances, transportation equipment and parts to metal cans, cutlery, bolts, nuts, screws, rivets, metal stamping, and other fabricated metal products.

PHOTO INTERPRETATIONS: These plants are most difficult to identify because most of these activities are hidden from view. There is however some outdoor equipment in evidence.

CHARACTERISTICS: Sometimes cranes, bulk materials and again railroads leading to the plant are visible.

## 3500 PROFESSIONAL, SCIENTIFIC AND CONTROL INSTRUMENTS

DESCRIPTION: The production and assembly of instruments and equipment for such purposes as engineering, mechanical measuring, optical and surgical equipment, photographic and time pieces.

PHOTO INTERPRETATIONS: These plants are not identifiable by P.I. because most of these activities are hidden from view.

## 3900 MISCELLANEOUS MANUFACTURING

DESCRIPTION: The manufacturing of such items as jewelry,musical instruments, toys, office and artist materials, tobacco production, motion picture production and other miscellaneous manufacturing.

PHOTO INTERPRETATIONS: Again these manufacturing plants are difficult to identify because of hidden clues. However, such plants as tobacco production and motion picture production have some visible identification factors.

CHARACTERISTICS: Tobacco production can be identified by a main plant and several small warehouses where tobacco is left to dry. The motion picture productions have sets which would give the clue for their identification.

## 4101 PASSENGER RAIL TRANSPORTATION

DESCRIPTION: Railroad and mass transit terminals including passenger stations.

PHOTO INTERPRETATIONS: 2 sets of railroads with stations along the lines.

CHARACTERISTICS: Wire supports along the electrified lines also the level grading and the smooth curves of the beds, and station platforms.

## 4102 FREIGHT RAIL TRANSPORTATION

DESCRIPTION: Railroad terminals for freight, railroad equipment and maintenance including rapid rail transit and street railway equipment maintenance.

PHOTO INTERPRETATIONS: A mechanical plant with several sets of rails which spur from a single or double set of tracks.

CHARACTERISTICS: Usually there is a railroad turntable and locotives on the tracks and a building for repairs and maintenance or for freight (absence of turntable).

## 4103 RAIL AND RAPID TRANSIT RIGHT-OF-WAY

DESCRIPTION: Along with the right-of-way of rapid rail transit, street railway, and railroad is included the railroad switching and marshaling yards.

PHOTO INTERPRETATIONS: Level grading and smooth curves of the beds and several railroads close together.

CHARACTERISTICS: Rails are most of the time noticable on the right-of-way and rail yards are a cluster of rails side by side.

## 4201 BUS TRANSPORTATION

DESCRIPTION: In this category there are bus terminals (intercity and local) bus garaging and equipment maintenance, and taxecab garages.

PHOTO INTERPRETATION: These terminals are usually located near rail transit and railroad terminals.

CHARACTERISTICS: Presence of lots of buses lined up at a depot is a good indication.

## 4202 MOTOR VEHICLE FREIGHT TRANSPORTATION

DESCRIPTION: Motor freight terminals and motor freight garaging and equipment maintenance.

PHOTO INTERPRETATION: Presence of a large building surrounded by trucks.

CHARACTERISTICS: Most of the time there are trailers for the motor trucks for an indication.

## 4301 AIR PASSENGER TERMINALS

DESCRIPTION: Airports and flying fields and terminals including heliports.

PHOTO INTERPRETATION: Landing strips and runways are the main sites of airports and flying fields.

CHARACTERISTICS: Passenger terminal buildings are serviced by conveniently accessible roadways. Along with this there are several low structures and airtowers.

## 44 MARINE TERMINALS

DESCRIPTION: This includes both passenger and fright and it also includes commercial fishing and ferry terminals.

PHOTO INTERPRETATION: Marine terminals are usually located on larger bodies of water or lakes of a good size.

CHARACTERISTICS: Pier along the coastline and sights of vessels or boat on the water is an indication.

## 45 HIGHWAY AND STREET LAND

DESCRIPTION: Freeways and expressways (Divided highways) classified to right-of-way width. For all other streets and roads classification limited to travel surface (cartway).

PHOTO INTERPRETATION: Wide extended strip of improved land (black or white on photo) used for movement of vehicles.

CHARACTERISTICS: For freeways and expressway lanes are noticeable and possible presence of vehicles. Also interchanges are a clear indication. All other roads are identified by their corridor shape and at times curves or road bends also indicate their identification.

## 46 AUTOMOBILE PARKING

DESCRIPTION: Automobile parking includes non-residential off-street parking that is 5,000 square feet or greater (or approximately 17 parking spaces). This code includes parking on open lots, parking within parking structures, and the parking area at shopping centers. Parking areas of less than 5,000 square feet are not identified as a separate activity.

PHOTO INTERPRETATIONS: Areas with cars (more than 17 cars) excluding off-street areas, vacant lots are also included if cars are parked on it.

CHARACTERISTICS: Cars parked in a parking pattern side by side. Some have painted parking spaces. A small building with lots of cars on the lot indicates a used car lot.

## 47 COMMUNICATIONS

DESCRIPTION: Telegraph, Radio and Television stations, and relay towers

PHOTO INTERPRETATIONS: Relays and transmission facilities are readily identified by the towers.

CHARACTERISTICS: Very tall towers which have a large base and extend upward to form an apex.

## 481 ELECTRIC UTILITIES

DESCRIPTION: Electric generating plants and substations.

PHOTO INTERPRETATIONS: Electric plants and substations usually surrounded by wire fence and transformers are readily seen.

CHARACTERISTICS: Round spiral cylinders and a small structure indicate that it is an electric plant or substation.

## 482 GAS UTILITIES

DESCRIPTION: Gas production plants and natural or manufactured gas storage and distribution points.

PHOTO INTERPRETATIONS: Compressed gas cylinders are usually stacked up around the station. Also proximity to water.

CHARACTERISTICS: Gas storage can be detected by the depression at the top of the tanks and by long cylindrical tanks.

## 483 WATER SUPPLY

DESCRIPTION: Water storage, water treatment plants (Filtration plants) and water pressure control stations. Also irrigation distribution channels are included in this code.

PHOTO INTERPRETATIONS: Water tank and towers indicate water supply and treatment plants are usually located near bodies of water (E.G. River).

CHARACTERISTICS: Round tanks on top of towers or cylindrical tanks on the ground. Also ditches with water running over an extended area and usually on agricultural land (Furrows) are irrigation distribution channels.

## 484 SEWAGE DISPOSAL

DISCRIPTION: Sewage treatment plants, sewage sludge drying beds and pressure control stations.

PHOTO INTERPRETATIONS: Usually located at a good distance fron residential sectors and evidence of discharge of effluent into a stream or river.

CHARACTERISTICS: Sludge digesters (round shape), drying beds and a trickling filter tank. Also presence of sedimentation tanks and chlorine contact tank with baffles.

## 485 SOLID WASTE DISPOSAL

DESCRIPTION: Refuse incinirators and disposals, central garbage grinding stations, compositing plants and sanitary land fill are all included under this code.

PHOTO INTERPRETATIONS: Refuse incinirators have a tall smoke stack standing next to a small building and land fills have mounds of earth.

CHARACTERISTICS: Land texture surrounding incinirators is usually scoured also the presence of a dumptruck assess ramp which is higher than the surrounding terrain. Land fills have undisturbed mounds of earth present.

## 49 OTHER TRANSPORTATION, COMMUNICATION AND UTILITY

DESCRIPTION: Freight forwarding services, transportation ticket offices (only when they are a separate and distinct activity not located within one of the transportation terminals), packing and crating services, and travel arranging services.

PHOTO INTERPRETATIONS: There is little or no outdoor equipment in evidence to identify these activities.

## 51 WHOLESALE TRADE

DESCRIPTION: Automotive equipment, drugs, chemicals and allied products, dry goods and apparel, groceries and related products, farm products, electrical goods, hardware, plumbing and heating equipment and supplies, machine equipment and supplies, petroleum bulk stations lumber and construction materials are all under this code.

PHOTO INTERPRETATIONS: Some wholesale trade can be identified by their structures or by open storage.

CHARACTERISTICS: Petroleum tanks are large and round and at times the oil company's name is printed on top of them. Also proximity to railroad. Also stock piles of lumber and construction materials in open storage. Also junk yards. Other wholesale trade is difficult to detect because they are hidden from view by well-constructed buildings.

## 52 RETAIL TRADE - BUILDING MATERIALS, HARDWARE, FARM EQUIPMENT

DESCRIPTION: These materials and equipments include heating and plumbing, paint, glass and wallpaper - retail, electrical supplies-retail, and lumber yards.

PHOTO INTERPRETATIONS: Lumber yards and farm equipment may be identified by open storage and the rest are hard to identify because they are hidden from view.

CHARACTERISTICS: Piles of lumber stacked up or farm machinery and equipment in an enclosure. Also, easy access to a major road.

## 53 RETAIL TRADE - GENERAL MERCHANDISE

DESCRIPTION: Department and variety stores.

PHOTO INTERPRETATIONS: Difficult to identify because activity is well hidden from view by the structures.

## 54 RETAIL TRADE - FOOD

DESCRIPTION: Groceries, meats, candy, dairy products, and bakeries are in this category.

PHOTO INTERPRETATIONS: Classification is difficult because it is hidden from view.

## 55 RETAIL TRADE - AUTOMOTIVE, AIRCRAFT, AND MARINE CRAFT

DESCRIPTION: Retail trade of motor vehicles and accessories, gasoline service stations, marine craft and accessories, aircraft and accessories, and mobile homes.

55 RETAIL TRADE - AUTOMOTIVE, AIRCRAFT, AND MARINE CRAFT (Continued)

PHOTO INTERPRETATIONS: Lots filled with motor vehicles, marine craft, aircraft and mobile homes and gasoline stations which are almost alway at a street corner.

CHARACTERISTICS: Lots filled with motor vehicles, marinecraft, aircraft and mobile homes usually have a small low building (showroom) on the lot. Also the spacing is unlike that of a parking lot or trailer park. Gasoline pumps are usually noticable for gasoline stations.

56 RETAIL TRADE - APPAREL AND ACCESSORIES

DESCRIPTION: Clothing stores, shoes, custom tailoring, furriers and fur apparel are in this category.

PHOTO INTERPRETATIONS: Difficult to identify because trade or materials are hidden from view.

57 RETAIL TRADE - FURNITURE, HOME FURNISHINGS

DESCRIPTION: Items in this category are: Furniture, household appliances, home furnishings, radios, televisions and music supplies.

PHOTO INTERPRETATIONS: Items of this retail trade are difficult to identify because they are hidden from view.

58 EATING AND DRINKING

DESCRIPTION: Places of drinking and eating including restraurants, diners bars, taverns and clubs.

PHOTO INTERPRETATIONS: Usually located on the town strip or near recreational activities.

CHARACTERISTICS: Drive-in restraurants and diners are usually located at street corners with a good size parking lot in front or beside it. Sometimes shape and size of building its an indication.

59 OTHER RETAIL TRADE

DESCRIPTION: This includes such trades as drug and proprietary, florists, liquor, antiques, books and stationery, sporting goods and bicycles, farm and garden supplies, jewelry, fuel, fuel oil and ice and bottled gas.

PHOTO INTERPRETATIONS: Almost all these trades are difficult to detect because they are hidden from view.

## 61 FINANCE, INSURANCE, REAL ESTATE SERVICES

DESCRIPTION: Banking services, security and commodity brokerages, insurance brokerages, and real estate and related services.

PHOTO INTERPRETATIONS: Services are difficult to identify because they are hidden from view by well enclosed structures.

## 6201 PERSONAL SERVICES (EXCEPT CEMETERIES)

DESCRIPTION: Beauty and barber services, laundry and dry cleaning services, photographic services, apparel repairs, and funeral homes.

## 6242 CEMETERIES

DESCRIPTION: Includes memorial grounds, grave yards, and crematorials.

PHOTO INTERPRETATIONS: Open lot with gravestones, or circular or grid shaped configuration of walkways are an indication.

## 6301 BUSINESS SERVICES

DESCRIPTION: Advertising, consumer and collect on services, duplicating, mailing and steno services, dwelling and other building services, news syndicate services and employment services are amoung this category.

## 637 WAREHOUSING AND STORAGE

DESCRIPTION: Includes open storage, stockyards, and foodlockers.

PHOTO INTERPRETATIONS: Long rectangular buildings usually low (one storey) and sometimes aluminum covered.

## 641 AUTOMOBILE REPAIR AND SERVICES

DESCRIPTION: Automobile repair and wash services (not including gasoline service stations)

PHOTO INTERPRETATIONS: Presence of junked cars at rear and repaired cars neatly parked.

## 649 OTHER REPAIR SERVICES

DESCRIPTION: Electrical, raido and T.V., Watch, Jewelry, Upholstery and furniture, and armature reqinding services.

## 6513 HEALTH SERVICES

DESCRIPTION: Hospitals and health centers, and it also includes old age homes, convalescent homes, medical and dental laboratories.

PHOTO INTERPRETATIONS: Hospitals are usually cross shaped buildings and have an easy access to the main road. Convalescent or old age homes usually have an impressive or sophisticated landscape feature.

CHARATERISTICS: Most hospitals have a half circle road in front of the main door. They are mostly cross shaped or H shaped buildings.

## 6501 PROFESSIONAL SERVICES

DESCRIPTION: Engineering and architectural services, legal services, medical services, accounting services and urban planning services.

## 66 CONTRACT CONSTRUCTION

DESCRIPTION: Building construction, general contractor services, plumbing, painting, masonry, carpentry, roofing, concrete services, and water well drilling services.

PHOTO INTERPRETATIONS: Some have an indication by the raw materials and equipment in open storage.

## 67 GOVERNMENTAL SERVICES

DESCRIPTION: Court houses, police and fire stations, military installations, postal services, prisons, and other correctional institutions.

PHOTO INTERPRETATIONS: Court houses usually have pillars or have a distinct shape and correctional institutes have look out towers, and military installations have a barracks area. A firing area and probably a landing strip and docks for naval base.

CHARATERISTICS: Court houses are usually round or square in shape and correctional institutions are wheel shaped without the rim and have round and high look-out tower or more, and military installations usually have administration building, ammo storage area (storage cells covered with earth), tanks, control tower, and a runway as indications to identify.

## 6811 PRIMARY, NURSERY EDUCATION

DESCRIPTION: Grammar schools and nursery schools including kindergarden schools

PHOTO INTERPRETATIONS: These schools usually have a distinct shape and play area.

CHARACTERISTICS: Unique architecture and there is usually a baseball diamond.

## 6813 SECONDARY EDUCATION

DESCRIPTION: Grades 7 through 12 popularly known as Junior and senior high school.

PHOTO INTERPRETATIONS: Usually larger than elementary schools, also the play area is larger

CHARACTERISTICS: Football field or a track field.

## 682 UNIVERSITY, COLLEGE EDUCATION

DESCRIPTION: Universities and colleges also included are junior colleges, professional schools.

PHOTO INTERPRETATIONS: Usually made up of a number of buildings with a track field and or baseball diamond.

CHARACTERISTICS: A campus area, architecture of buildings and walkways leading to buildings and parking area.

## 683 VOCATIONAL, SPECIAL, OTHER EDUCATION

DESCRIPTION Vocational or trade schools, business and stenographic schools barber and beauty schools, art and music schools, dancing schools, and correspondence schools all fit in this classification.

PHOTO INTERPRETATIONS: Religious centers can be identified by the shape of the building.

CHARACTERISTICS: Cross-shaped building most of the time and sometimes long rectangular building. Also a steeple or spiral, or a bell tower. Some modern buildings are round in shape.

## 71 CULTURAL ACTIVITIES AND NATURE EXIBITIONS

DESCRIPTIONS: Libraries, museums, art galleries, planeteria, aquariums, botanical gardens,and arboretums, zoos, and historic monuments and sites are in this classification.

PHOTO INTERPRETATIONS: Some of these are identifiable by their out in view parts.

CHARACTERISTICS: Botanical gardens and arboretums by the presence of trees and plants laid out in an orderly pattern, and greenhouses. Historic monuments are usually visible on a right-of-way. Library usually has hallway shape with a large rectangular or square shape on the roof and a parking lot. Museums have an outstanding entranceway.

## 72 PUBLIC ASSEMBLY

DESCRIPTION: Amphitheathres, motion picture theatres, drive-in movies, stadiums (individual sports), arenas and field houses, race tracks, auditoriums and exhibition halls.

## 72 PUBLIC ASSEMBLY (Continued)

PHOTO INTERPRETATIONS: Most are pretty obvious by their shape and the extensive external parking facilities. Exhibition halls are similar to warehouses except that they are a single building and located near a recreational area near school and have easy access to arterials.

CHARACTERISTICS: Round or oval shapes with grandstands and an open space inside and a toteboard. Theatres have an arcade in front.

## 73 AMUSEMENTS

DESCRIPTION: Fairgrounds and amusement parks, penny arcades, miniature golf, golf, driving ranges, and go-kart tracks are all amusement classifications.

PHOTO INTERPRETATIONS: Ferris wheels or roller coaster tracks identify amusement parks, miniature golf areas are narrow and long (rectangular shape) and usually along a major roadway. Driving ranges can be identified by an overhead roof board and a long open field. Go-kart tracks are small in size and may appear odd in shape.

## 74 RECREATIONAL ACTIVITIES

DESCRIPTION: Sports Activities Included:

- Golf Courses (with or without country club)
- Tennis courts
- Skating and roller rinks
- Riding Stables
- Bowling Alleys
- Skiing and Tobogganing slopes or trails

Playgrounds and Athletic areas include:

- Tot lots and playgrounds
- Playfields or Athletic fields

General recreation centers include:
(These are not limited to a gym)

- Gymnasiums and athletic clubs
- swimming areas
- Marinas - Yatching clubs - Boat rentals and Boat access sites.
- Camping and picnicing areas (not part of a larger activity)

PHOTO INTERPRETATIONS: Most of these sites are easily identified by certain characteristics of the play area.

CHARACTERISTICS: Golf courses are identified by the greens, sandtraps and the club house. Usually contains one or more lakes. Tennis courts are identified by the 4 square configuration on the ground. Skating and roller rinks a most of the time indoor and the T or I shaped building is an indication. Playgrounds are distinguished by their size and athletic fields on them. Marinas are identified by small piers and a Yatch Club, also small boats are an indication. Camping and picnicing areas are usually in among a forest area. Also tables, benches, tents can be detected.

## 75 RESORTS AND GROUP CAMPS

DESCRIPTION: General resorts (rooms for 20 or more persons and have provisions for at least 2 types of recreational activities excluding lawn games, children's playgrounds and swimming pools) Dude Ranches, Ski Resorts, Hunting and Fishing Clubs, and group or organized camps.(Girl Scout and Boy Scout)

## 76 PARKS

DESCRIPTION: Parks - General Recreation, Individual recreation activities ocurring within a park are not separately coded.
Leisure and Ornamental - Largely for scenic or leisure purposes. They may contain beaches, children's play facilities, and monuments or statues.

PHOTO INTERPRETATIONS: Large parks with recreational activities, and state parks.

CHARACTERISTICS: Visible park activities by layout, baseball diamonds, football fields, picnic areas, swimming areas and hiking trails.

## 81 AGRICULTURE

DESCRIPTION: Farmland in current use including,orchards, dairy farms, ranches, pasture land, nurseries, apiaries, poultry farms, and horse raising farms.

PHOTO INTERPRETATIONS: Tilled land, and products of farm lands.

CHARACTERISTICS: Furrows and land texture are proofs of current use of farmland. Also corrals, and chicken coops are an indication of the type of farms.

## 82 AGRICULTURAL RELATED ACTIVITIES

DESCRIPTION: Preliminary agricultural processing and animal husbandry services- Vet Services, Animal Hospital, Poultry Hatcheries.

PHOTO INTERPRETATIONS: Usually hard to detect because activities are mostly hidden from view.

## 83 FORESTRY ACTIVITIES

DESCRIPTION Commercial Forestry Production-Forested areas not on farms, ranches, or parks set aside for industrial wood (pulp and paper, veneer, gum extraction, and bark) Forest Nurseries.

PHOTO INTERPRETATIONS: Forest areas aside from parks, farms, ranches and undeveloped areas.

## 84 FISHING ACTIVITIES

DESCRIPTION: Finfish and shellfish hatcheries, other fisheries and marine products.

PHOTO INTERPRETATIONS: Marine Terminals.

CHARACTERISTICS: Fishing vessels and possibility of canneries near-by.

## 85 MINING ACTIVITIES

DESCRIPTION: Mining metal ores, coal, crude petroleum, natural gas, and mining and quarrying of non-metallic minerals. Also mining services.

PHOTO INTERPRETATIONS: Presence of scarred land and mining equipment.

CHARACTERISTICS: Open pit mining and strip mining have power shovels, dredges, and drilling rigs.

## 91 UNUSED, UNDEVELOPED LAND

DESCRIPTION: This identifies those parcels of land that appear to be undeveloped or if previously developed are presently vacant or not in use. Vacant buildings are not included.

PHOTO INTERPRETATIONS: Empty land area.

## 92 FOREST AREAS

DESCRIPTION: Forest (non-commercial) reserve. That is forested areas having a tree crown density of 10 per cent or more. Areas of lower tree stocking, including windbreaks and timbered strips less that 100 feet wide may be classified as idle or unused land.

PHOTO INTERPRETATIONS: Forested land - Wilderness area

## 931 RIVERS, STREAMS AND CREEKS

DESCRIPTION: All running water bodies

PHOTO INTERPRETATIONS: Bodies of water running in a channel in a meandering form.

CHARACTERISTICS: Light-toned or dark-toned areas which are usually narrow and meandering in form.

## 932 OTHER WATER BODIES

DESCRIPTION: Lakes, bays and lagoons, oceans and seas are all part of this code.

PHOTO INTERPRETATIONS: Bodies of standing water except impounding basins.

## 95 UNDER CONSTRUCTION

DESCRIPTION: Residential - If construction has not reached the point where all exterior windows and doors are installed and the usable floors are in place.

Non-Residential - Only if there is no means of identifying the activity or activities that will occupy the structure when it is completed.

Non-Structural - Highways, Bridges, and other N.E.C.

PHOTO INTERPRETATIONS: Foundations and half way up erections.

CHARACTERISTICS: Concrete foundations in structures and unsurfaced highway (bridges and overpasses usually completed prior to road surfacing). For bridges or overpasses support foundations (usually T shaped) are visible.

## 96 WETLANDS

DESCRIPTION: Swamps and marshes are under this code.

PHOTO INTERPRETATIONS: Any land area with visible signs of water or wet appearance.

Also 911 ABANDONED BLDGS.

A P P E N D I X  T

BIBLIOGRAPHY

WORLD CROP SURVEY

Agriculture - Environmental and Consumer Protection Appropriations for 1973, Subcommittee Hearings of the Committee on Appropriations, House of Representatives 92 Congress, 2nd Session.

Weekly Weather and Crop Bulletin, NOAA and SRS, Vol. 60. No. 10, March 5, 1973, Washington, D. C.

Grain Stocks, USDA - SRS Crop Reporting Board GrLg 11-1 (4 - 74), Washington, D. C.

Periodicals, ERS - SRS; USDA; February 1974, Washington, D. C.

Crop Production, USDA - SRS Crop Reporting Board CrPr 2-1 (74) January 16, 1974, Washington, D.C.

Crop Production, USDA - SRS Crop Reporting Board CrPr 2-2 (5-74), May 8, 1974, Washington, D. C.

Crop Reporting Board Reports, USDA - SRS crop Reporting Board, 1974 Issuance Dates and Contents, Dec. 1973, Washington, D. C.

An Analysis of the Benefits and Costs of An Improved Crop Acreage Forecasting System Utilization Earth Resources Satellite or Aircraft Information, USGS contract No. 14-08-001-13519; Earth Satellite Corporation Nov. 16, 1973, Washington, D. C.

Crop and Livestock Estimates, USDA - SRS, May 1967.

Major Statistical Series of the USDA, Vol. 8. Crop and Livestock Estimates. Agricultural Handbook No. 365, May 1971, Washington, D. C.

Statistical Reporting Service of the U.S.D.A., USDA - SRS, Misc. Pub. No. 967, December 1964, Washington, D. C.

What is the Foreign Agriculture Service? USDA - FAS July 1970, Washington, D. C.

"Agricultural Intelligence", in the 1962 Yearbook of Agriculture. USDA-GPO, 1962, Washington, D.C.

"Our Agricultural Attaches", in the 1964 Yearbook of Agriculture. USDA-GPO, 1964, Washington, D. C.

Foreign Agriculture, USDA - FAS, Vol. XII, No. 8, February 25, 1974, Washington, D. C.

Foreign Agricultural Service Spacial Reports, U.S.D.A., Washington, D.C.

Release Date of 1974 World Agricultural Production and Trade Statistical Report, USDA - FAS, Jan. 2, 1974 Washington, D.C.

Foreign Agriculture Circular, USDA - FAS. FG. 15-73 December 14, 1973, Washington, D.C.

Production Yearbook 1971, Food and Agriculture Organization of the U.N., Rome, Vol.25, 1971.

Report on the 1960 World Census of Agriculture, Vol. 2, "Analysis and International Comparison of Census Results"; FAO, Rome 1971

Report on the 1960 World Census of Agriculture, Vol. 2, "Program, Concepts, and Scope"; FAO, Rome 1969.

Program for the 1970 World Census of Agriculture, FAO, Rome 1965.

The State of Food and Agriculture 1972, FAO Rome 1972.

Periodicals, USDA-SRS-ERS, Feb. 1974, Washington, D. C.

Agricultural Outlook Digest, USDA-ERS, AOD-196 February 27, 1974.

Rice Situation, USDA-ERS, March 1974, Washington, D. C.

## LAND RESOURCES MANAGEMENT


Noone, James A., 1972: "Resources Report?Senate House Differ on Approaches to Reform of Nation's Land Use Laws, National Journal.

U.S.D.I., Office of Land Use and Water Planning, 1973: "Background Materials on the Proposed Land Use Policy and Planning Assistance Act.

U.S.D.I., Geological Survey, 1973: "Resource and Land Information (RALI) Program," March 2, 1973.

Marston, L. and Curlin, J. W., 1973: "Implications for Federal Land Use and Natural Resources Information Systems," presented at the National Symposium on Resource and Land Information, Reston, Virginia, November 7-9.

Morton, Rogers C. B., 1973: "Land Use - The National Environmental Strategy," State Government, Volume XLVI, Number 3, Pages 148-151.

Marden, Robert H., 1973: "The Management Challenge of Land and Water Resources Planning," Ibid.

McCall, T., 1973: "Oregon: Come Visit but Don't Stay," Ibid.

C.E.Q., 1973: Environmental Quality, Third Annual Report.




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