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SELECTION OF THE ARGENTINE INDICATOR REGION

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This report describes the Argentine Indicator Region selection activities of the Inventory Technology Development project of the AgRISTARS program.

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PREFACE

The Agriculture and Resources Inventory Surveys Through Aerospace Remote Sensing is a multiyear program of research, development, evaluation, and application of aerospace remote sensing for agricultural resources, which began in fiscal year 1980. This program is a cooperative effort of the U.S. Department of Agriculture, the National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration (U.S. Department of Commerce), the Agency for International Development (U.S. Department of State), and the U.S. Department of the Interior.

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A portion of the Laboratory for Applications of Remote Sensing (LARS) Contract Report 112878 is reproduced in appendix A.

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ABBREVIATIONS

AgRISTARS	Agriculture and Resources Inventory Surveys Through Aerospace Remote Sensing
ERIM	Environmental Research Institute of Michigan
FAS	Foreign Agriculture Service
FSR	foreign similarity region
IR	indicator region
ITD	Inventory Technology Development
LACIE	Large Area Crop Inventory Experiment
LARS	Laboratory for Applications of Remote Sensing
NASA	National Aeronautics and Space Administration
UCB	University of California at Berkeley
USDA	U.S. Department of Agriculture
USGP	U.S. Great Plains

1. INTRODUCTION

The Inventory Technology Development (ITD) project is one of eight major projects within the Agriculture and Resources Inventory Surveys Through Aerospace Remote Sensing (AgRISTARS) program (ref. 1). An objective of the ITD project is to develop advanced technology for estimating crop area. This report documents the region selected for study in Argentina and describes characteristics which influence the performance of crop information systems.

1.1 INDICATOR REGION (IR) CONCEPT

The design of the ITD project of the AgRISTARS program requires the identification of foreign areas of interest for developing advanced technology that supports area estimation systems. A full foreign country production or area estimation is not within the scope of the experiment; therefore, indicator regions (IR's) that are representative of important production areas are needed. After the selection of an IR, Foreign Similarity Regions (FSR's) in the United States will be chosen based on the similarity of conditions to the foreign IR.[1] The conditions considered important are:

1. Highest amounts of production for crops of interest.
2. Representative crop varieties and cropping practices encountered throughout the IR.
3. Agronomic trends affecting national production.

The FSR will be used as a testing region for development of techniques which permit evaluation of error in area estimation. These techniques will support accuracy assessment for the IR during developmental tests. Other uses of the FSR may be to support development of area estimation procedures, sensitivity studies for both the segment level and aggregated area estimation performance, and simulation modeling of state-of-the-art crop inventory systems. The information in this report describes the ITD project IR selected for Argentina and will be used in selecting an appropriate FSR in the United States.

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[1] Similar regions in the United States are needed because of the available or potentially available ground observations and other data resources.

1.2 ARGENTINE WHEAT, CORN, AND SOYBEAN IR

The Argentine wheat, corn, and soybeans IR (fig. 1-1) has been selected in support of the exploratory experiments to be conducted within the ITD project of the AgRISTARS program. The IR was selected primarily on the basis of production statistics for the provinces in Argentina. Each province in Argentina was examined for the availability of Landsat data; area, yield and production statistics; crop calendars; and other ancillary data. The IR was reviewed according to agrophysical conditions that could influence labeling and classification accuracies. In addition to the IR review, these conditions were identified in connection with the highest producing provinces as determined from available Argentine crop statistics (table 1-1).

The production of wheat, corn, and soybeans is concentrated mainly in the Pampa region in the provinces of Cordoba, Santa Fe, Entre Rios, La Pampa, Buenos Aires, San Luis, Santiago del Estero, Chaco, and Corrientes (fig. 1-2). From crop statistical data and agricultural publications, it was determined that the heaviest concentrations of the three crops of interest (wheat, corn, and soybeans) occur in four provinces: Cordoba, Santa Fe, Entre Rios, and Buenos Aires. These four provinces were selected as the Argentine IR and account for 86.3 percent of the wheat area planted, 93.6 percent of the corn area planted, and 99.9 percent of the soybeans area planted in 1977 (table 1-1).

The ITD project has prepared a statistical data base containing available statistics for 1976-78. In general, obtaining agricultural statistical data for Argentina is unpredictable because of political conditions. From the year 1888 to the year 1974, only eleven censuses were conducted in Argentina (ref. 2).

TABLE 1-i.- ARGENTINE CROP STATISTICS FOR 1977-78

(a) 1977 area used for planting/percentage of Argentine land used for planting

Provinces in Indicator Region	Argentine area planted in wheat		Argentine area planted in corn		Argentine area planted in soybeans	
	Hectares	%	Hectares	%	Hectares	%
Santa Fe	960 000	13.50	470 000	18.49	429 000	72.22
Cordoba	1 044 000	14.68	543 000	21.36	140 000	17.50
Entre Rios	251 000	3.53	160 000	6.29	9 000	1.51
Buenos Aires	3 883 610	54.62	1 206 350	47.46	52 000	8.75
Total	6 138 610	86.33	2 379 350	93.60	630 000	99.98

(b) 1977 production harvested/percentage of Argentine production

Provinces in Indicator Region	Wheat production		Corn production		Soybean production	
	Metric tons	Total, %	Metric tons	Total, %	Metric tons	Total, %
Santa Fe	879 000	13.89	441 400	20.51	398 500	73.15
Cordoba	893 000	14.11	532 500	24.75	90 500	16.61
Entre Rios	227 000	3.58	149 000	6.92	8 700	1.59
Buenos Aires	3 527 640	55.76	959 350	44.59	47 000	8.62
Total	5 526 640	87.34	2 082 250	96.77	544 700	99.97

Table 1-1.- Concluded.

(c) 1978 area planted/percentage of Argentine land used for planting

Provinces in Indicator Region	Argentine area planted in wheat		Argentine area planted in corn		Argentine area planted in soybeans	
	Hectares	%	Hectares	%	Hectares	%
Santa Fe	710 100	15.85	470 000	17.21	714 000	71.77
Cordoba	660 000	14.73	560 000	20.51	132 000	13.26
Entre Rios	130 000	2.90	136 000	4.98	15 800	1.58
Buenos Aires	2 469 730	55.12	1 332 460	48.80	132 750	13.34
Total	3 969 830	88.60	2 498 460	91.50	994 550	99.95

(d) 1978 production harvested/percentage of Argentine production

Provinces in Indicator Region	Wheat production		Corn production		Soybean production	
	Metric tons	Total, %	Metric tons	Total, %	Metric tons	Total, %
Santa Fe	640 000	16.77	450 000	19.28	680 000	71.18
Cordoba	500 000	13.10	550 000	23.57	130 000	13.60
Entre Rios	115 000	3.01	118 000	5.05	15 300	1.60
Buenos Aires	2 209 750	57.92	1 098 600	47.08	129 801	13.58
Total	3 464 750	90.80	2 216 600	94.98	955 101	99.96

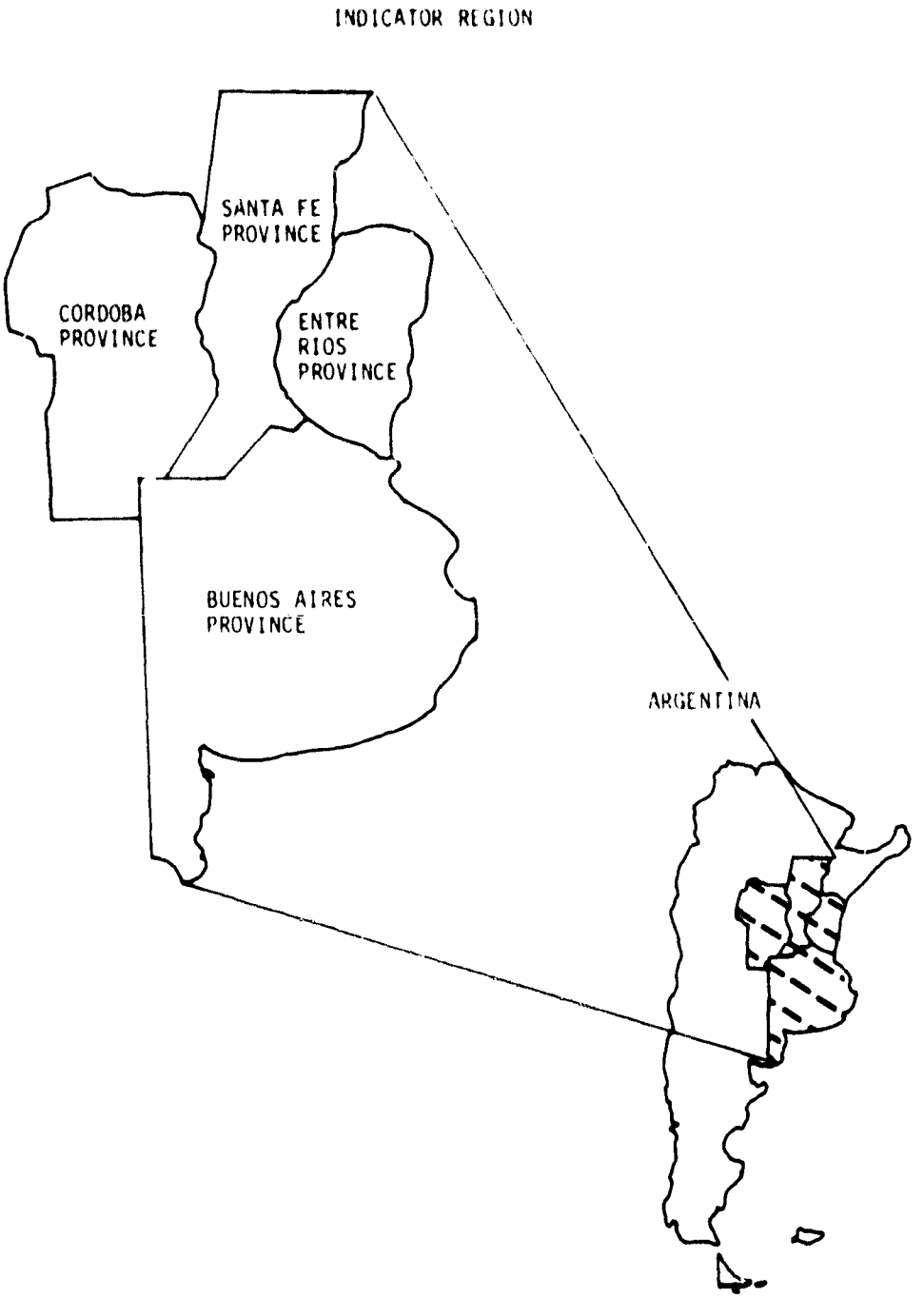

Figure 1-1.- The wheat, corn, and soybean IR for Argentina.

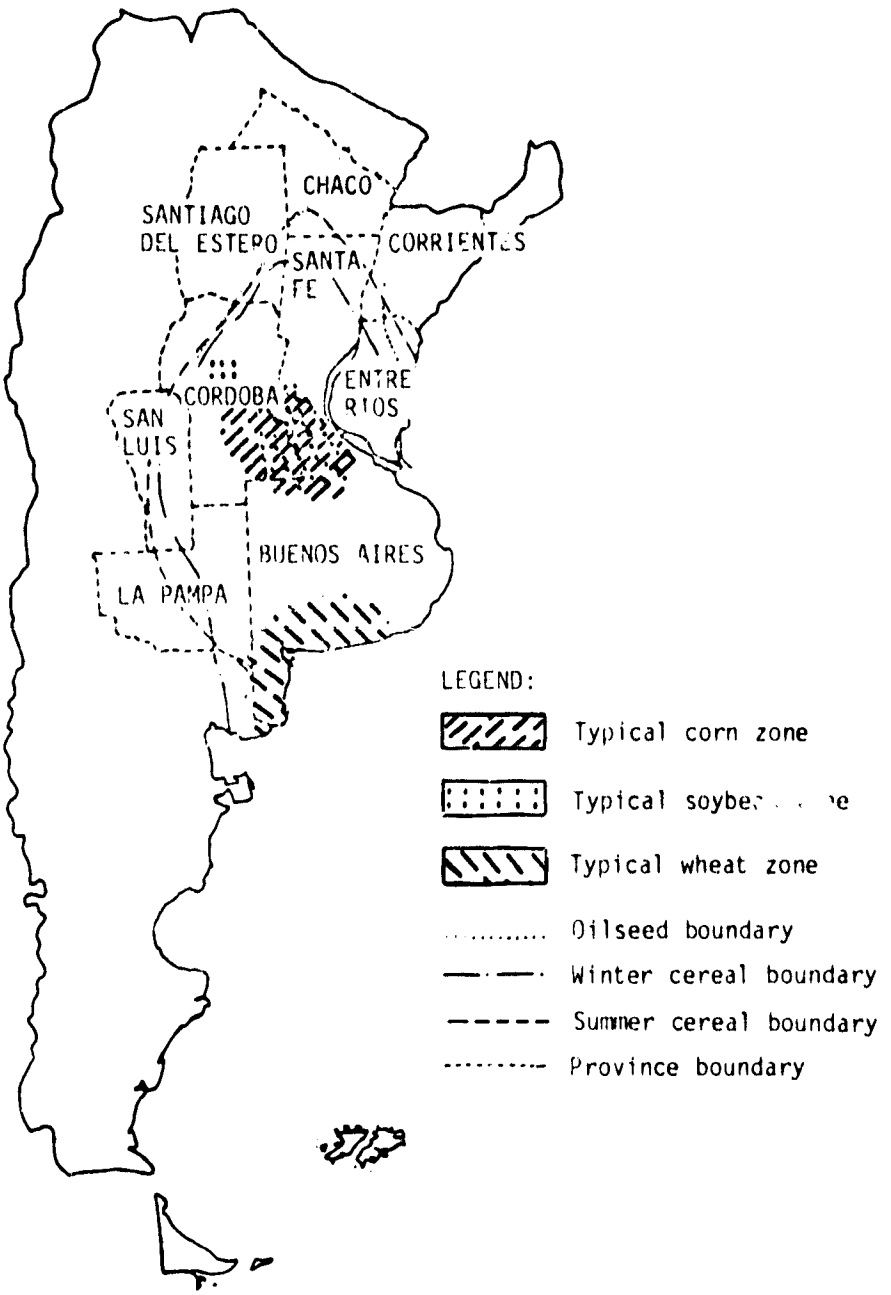

Figure 1-2.- The Pampa region of Argentina indicating corn, wheat, and soybean zones. (Secretaria de Estado de Agricultura y Ganaderia, Servicio Nacional de Economia y Sociologia Rural Campaña Agricola 1978-79, Buenos Aires, Argentina)

2. SUMMARY

The IR is chosen to be representative of crop production in the foreign country. The Argentine IR, located in the provinces of Buenos Aires, Cordoba, Entre Rios, and Santa Fe, was chosen to represent those conditions such as the amount of production for crops of interest and cropping practices encountered and to portray agronomic trends affecting national production. These four provinces will represent the Argentina wheat, corn, and soybean IR that supports the development of technology for Argentina. These provinces produced 90.8 percent of the wheat, 95.0 percent of the corn, and 100.0 percent of the soybeans in Argentina in 1978.

Limited ground-observations data on Argentina are available at this time as a result of work done by the Environmental Research Institute of Michigan (ERIM) at Ann Arbor and the University of California at Berkeley (UCB) in February 1981, under contract to the National Aeronautics and Space Administration (NASA). Subsequently, the FSR in the United States with available or potentially available ground observations will be selected, based on the similarity of conditions to the IR. The FSR will be used for the following: (a) error characterization, (b) segment level and aggregated area estimation performance, (c) improvement of area estimation procedures, (d) sensitivity studies, and (e) simulation modeling of state-of-the-art crop inventory systems. Table 2-1 summarizes the characteristics studied in the Argentine IR.

TABLE 2-1.- SUMMARY OF CHARACTERISTICS STUDIED IN THE ARGENTINE INDICATOR REGION

Item	Description
General characterization (p. 3-3)	The IR l in the physical division known as the Pampas, (p. 3-3), with most of the IR in the wetter area known as the Humid Pampa. In the Humid Pampa, grazing is important with 40 to 80 percent of the land in pastures. Four major agricultural divisions of the Humid Pampa are: 1. Pastoral district (p. 3-5) a. Located in the southeast, this district is between Mar del Plata and Tandil. b. Eighty percent of the land is in livestock ranching without agriculture. 2. The grain farming area (p. 3-5) a. In the 1960's, alfalfa was the chief crop in the number of acres cultivated, but the most important commercial crop was wheat. b. Wheat production and cattle raising are found in the southern coastal area. 3. The mixed livestock and crop farming (maize) district (p. 3-7) a. Located in the vicinity of Rosario, this area produces maize, wheat, flax, and soybeans, with maize more important than wheat. b. Since the 1970's, soybeans have become an important crop. 4. Around the city of Buenos Aires (p. 3-7) a. Located around the city of Buenos Aires is an area of intensive farming, with good soil, abundant rainfall, mild climate, and access to a ready market.
Crop calendars (p. 4-1)	Only province level or subregional level is available at this time, no departamento- or partido-level data. Only planting and harvesting ranges are available at the province level. At the subregional level, intermediary stages are available for wheat, corn, and many other crops except soybeans. Generalized crop calendar observations (February 1981) made for wheat, corn, and soybeans (provided by ERIM) are available.

TABLE 2-1.- Continued.

Item	Description
Confusion crops (p. 4-17)	Potential confusion crops for corn and soybeans are sorghum and sunflowers; millet could also possibly be a confusion crop. For wheat, the potential confusion crops are flax, barley, oats, and rye. Sorghum also could be a confusion crop because of its wide variability in planting time.
Cropping practices (p. 4-18)	Crop rotations: approximately 10 percent of the corn producers who farm over 60 hectares practice crop rotation with leguminous plants such as Vicia sativa (common vetch). Pasture is usually in rotation with wheat. Varieties: No recent data are available at this time. The most recent data available were obtained during the 1960's. Varieties used in the United States and foreign countries change rapidly; therefore, it is questionable that the varieties grown in Argentina during the 1960's are currently being used.
Irrigation (p. 4-20)	Irrigation in the Pampa is almost nonexistent.
Diseases and pests (p. 4-20)	Diseases of wheat are stem rust, septoria, "take-all," wheat smut, and black spot. Diseases of sunflowers are rust international race No. 1, No. 2, No. 3, and the black plague. Common pests are aphids (green bugs), soil insects, grubs, plant lice, and weeds; herbicide usage is mostly confined to corn production. Wild oats are a problem in areas of cereal monoculture.
Soils (p. 4-21)	Alluvial: valleys of the Parana River and Uruguay River. Prairie and chernozem: the remaining area encompassed by the four provinces.
Climate (p. 4-22)	Temperatures tend to be moderate throughout the year; all the provinces are classified as humid-temperate with no dry season. This is the same general classification assigned to the southeastern United States. Precipitation is greatest during the summer months (southern hemisphere) of December through February. The annual range is from 12 inches to 44 inches in the IR.

TABLE 2-1.- Concluded.

Item	Description
Climate (p. 4-22)	The growing season is approximately 300 days in the Parana area to 140 days south of latitude 40° (southern tip of Buenos Aires Province).
Landsat data (p. 4-24)	Original Large Area Crop Inventory Experiment (LACIE) allocation was for 164 segments (145 in the IR). It appears that only a partial number of segments from the original allocation were collected.
	1976-77: Seventeen segments are available, with sparse acquisition histories (not a full crop year).
	1977-78: Acquisitions are available for 150 segments, with sparse acquisition histories.
	1980-81, 1981-82: Argentina Technology Development: fifty segments allocated in 41 partidos in the four IR provinces; twenty-five of these segments are in the same location as the original LACIE allocation.
Ground observations in Argentina	Ground observations were collected by ERIM/UCB from February 16 to 30, 1981.

Buenos Aires Province, segment no.	Cordoba Province, segment no.	Santa Fe Province, segment no.	Entre Rios Province,
511	604	677	No data were collected
520	611		
527	616		
556	692		
561			
570			
578			
624			
649			
681			
682			
685			

3. DESCRIPTION OF THE SELECTED ARGENTINE IR

3.1 ARGENTINE PHYSICAL DIVISIONS

The Argentine national territory includes a wide variety of land features which can be divided into four major physical divisions,[2] each with numerous subdivisions (refs. 3 and 4). Shown in figure 3-1, these divisions are:

1. The Northern Lowlands

   This area includes the Chaco, a vast alluvial plain with a tropical scrub woodland vegetation, as well as the Argentina Mesopotamia, the land between the Parana and Uruguay Rivers, composed of floodplains and gently rolling, well-drained interfluves. Also included in this division is the arm of Argentine territory that extends onto the Parana Plateau.

2. The Andes

   The Andes Mountains form the western border of Argentina, except in the far south. This region includes the Cordilleras, a system of parallel mountain chains, in the dry north, and the ice-covered glaciated mountains in Patagonia to the south. Also included in this physical division are the dry section of the Bolivian high plateau and the dry lower mountain and bolson desert west of Cordoba and south of Tucuman. The string of oasis settlements in the eastern piedmont of the Andes Mountains may also be included.

3. The Pampas

   The Argentine IR lies in this physical division. The Pampas is a broad, fertile plain lying south of the Chaco (the Northern Lowlands) and to the east of the Andean piedmont. Before man changed the landscape, most of the plain was covered with a vegetation type known as monte - low scrub trees, shrubs, and grasses. The monte is xerophytic in nature. Toward the southeast cool summers prevail and rainfall is heavier; tall prairie

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[2]The descriptions of the physical features are based on the work Latin America (ref. 4).

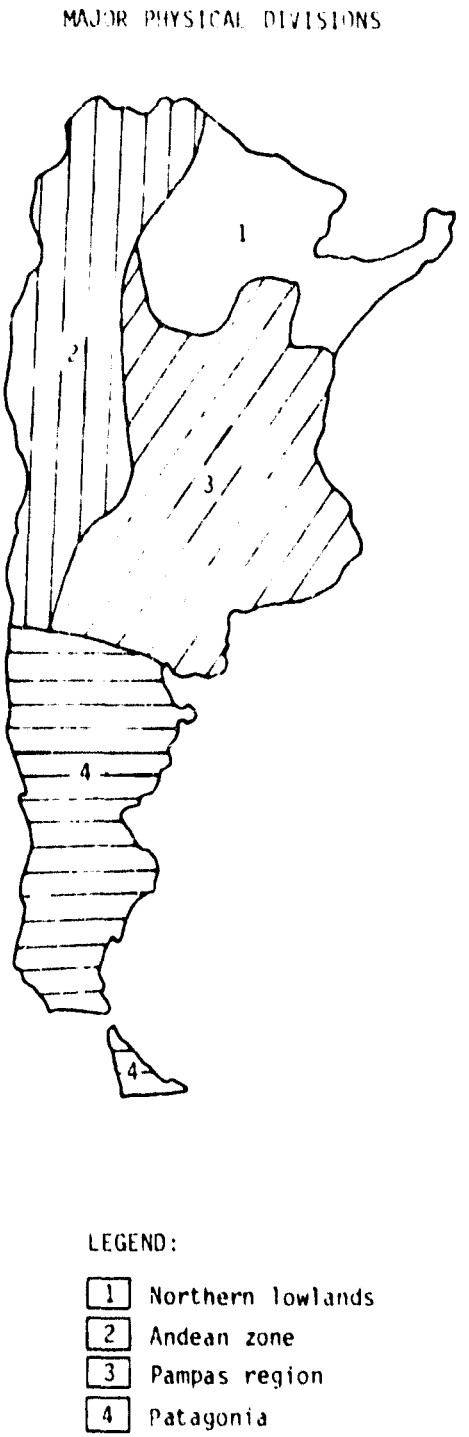


Figure 3-1.- The four major physical divisions of Argentina (ref. 3).

grasses were more abundant than the monte in the land's original state. The Pampas is usually divided into the humid eastern section, known as the Humid Pampa, and the dry outer reaches of the plain to the west, known as the Dry Pampa.

4. Patagonia

This area includes the region south of the Rio Colorado (Colorado River), an arid, windy plateau region with greener valleys. The far southern portion of Patagonia is continuously cool with stormy weather. It has virtually no summer, but winters are not so severe as its extreme southern latitude (near the South Pole) would suggest

In this report, the Pampas is discussed because the Argentine IR is located in this physical division.

3.2 THE PAMPAS

The IR provinces of Buenos Aires, Cordoba, Entre Rios, and Santa Fe lie in the region known as the Pampas; the wetter eastern region of the Pampas, called the Humid Pampa (fig. 3-2, ref. 4), contains most of the IR. Most of Argentina's productive capacity, capital, and population are in the four provinces described above.

The boundary between the Humid Pampa and the Dry Pampa came into being with grain farming. The western boundary and the various subdivisions within it became a conspicious feature at this time. The subdivisions of the Humid Pampa are shown in figure 3-2.

The surface of the Humid Pampa is nearly level. The noticeably higher mountains or hilly areas that rise above the plain are the Sierra de la Ventana (4200 ft), the Sierra del Tandil (1600 ft), the Sierra de Cordoba, and the gently sloping alluvial fans at the base of these hills. Along the Rio de la Plata (Plata River) there are shallow mud flats bordered by a steep bank; this steep bank is the Barranca, an abrupt (100 ft) rise above the Rio de la Plata. The surface slopes slightly southwestward above the Barranca; this is the area known as the Northeast Pampa Rim. Along the Parana and Plata Rivers are small

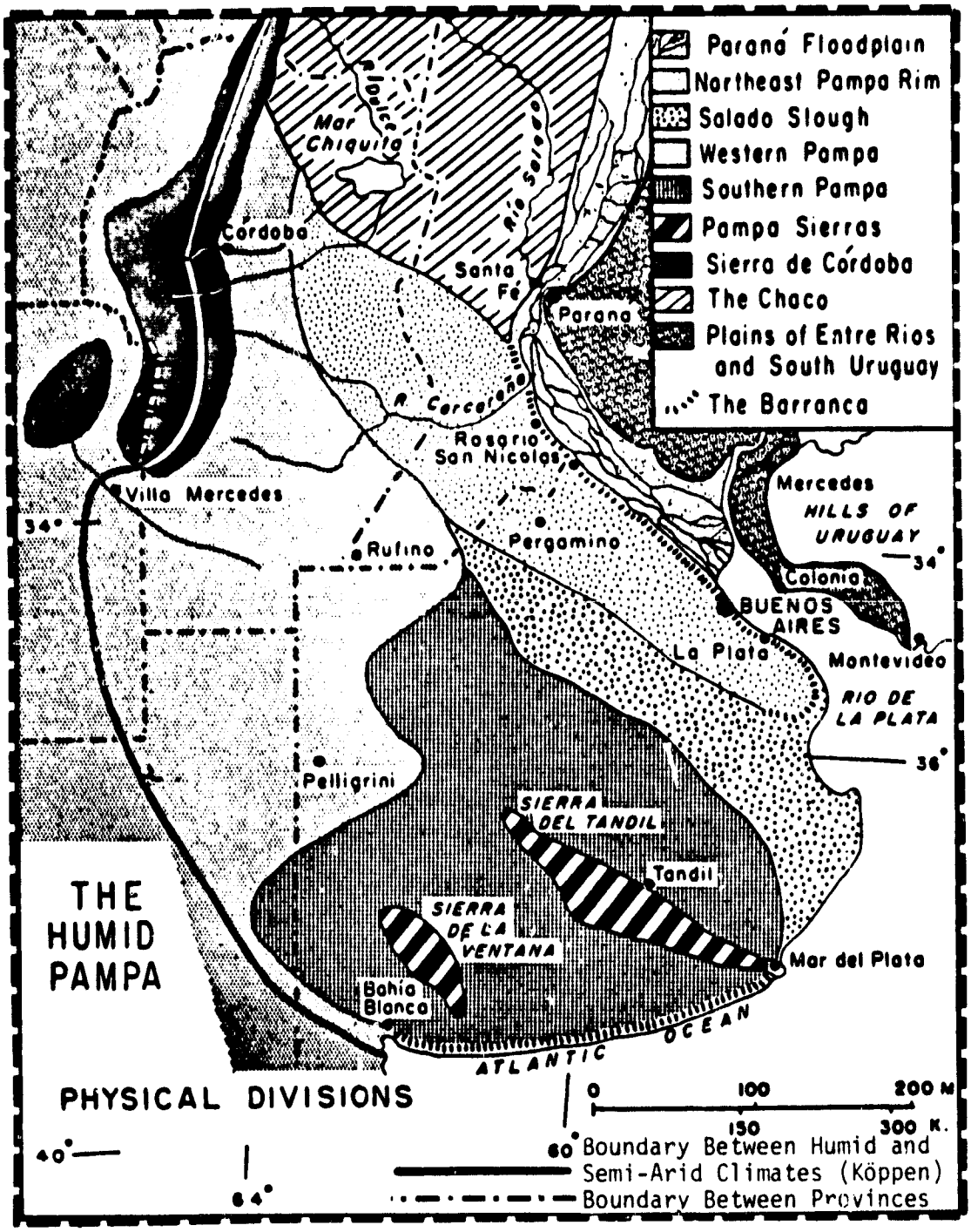


Figure 3-2.- The Humid Pampa of Argentina (ref. 4).

flat-bottomed ravines formed from the erosion of the Barranca. Beyond these ravines the area is relatively flat. The Salado Slough is a marshland area where, for much of the year, the Rio Salado is lost within the marshes; however, during the wetter times of the year, the water table rises and reed-filled lakes are formed, south and southwest of the Salado Slough is the southern Pampas, an area interspersed with shallow, marshy depressions and small areas of slightly higher ground. This area also has a few sand dunes. The soil, formed by windblown material from the Dry Pampa, is a sandy soil known as loess. Throughout the western Pampas the water table is very near the surface.

3.3 DESCRIPTION OF THE AGRICULTURAL REGIONS WITHIN THE SELECTED ARGENTINE IR

The Pampas is a great plain south of the Chaco and east of the Andean piedmont, most of which was originally covered with monte.

3.3.1 FOUR MAJOR AGRICULTURAL DIVISIONS

Four major agricultural divisions[3] (fig. 3-3, ref. 4) of the Humid Pampa are:

1. The pastoral district

   In this southeastern portion of Buenos Aires Province (between Mar del Plata and Tandil), 80 percent of the land is used for livestock ranching without agriculture.

2. The alfalfa-wheat district (grain farming area)

   Although wheat is the most important commercial crop, the most acreage is in alfalfa except in the southern coastal area where wheat becomes more dense. In the southern coastal area, grass pastures are common and grain crops may be used for green chop (silage).

[3]These descriptions are based on data from the 1950's and 1960's contained in reference 4.

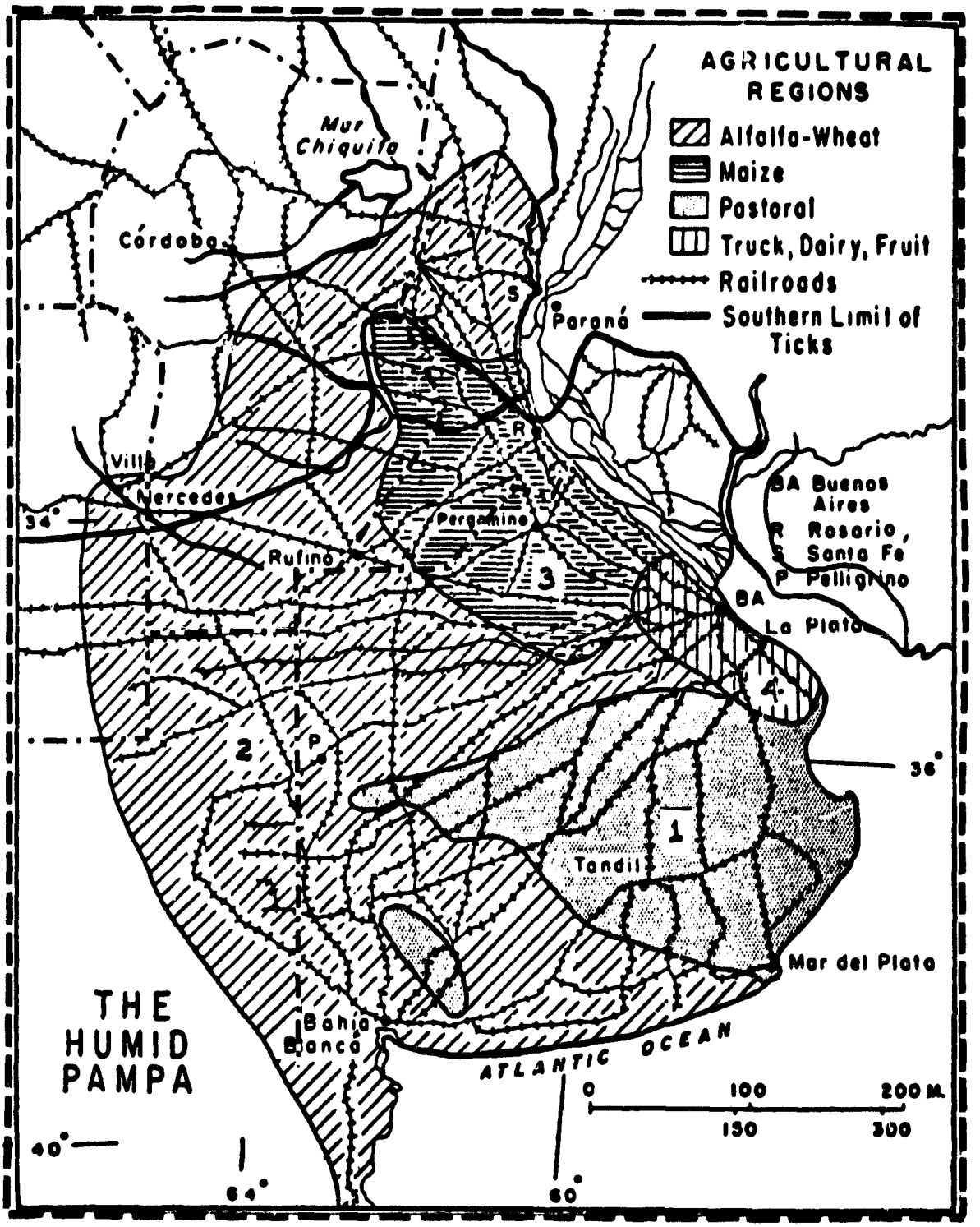


Figure 3-3.- The four major agricultural divisions of the Humid Pampa in Argentina (ref. 4).

3. The maize district (mixed livestock and crop farming)

   The district surrounding Rosario forms the main corn belt region of Argentina. In this area maize (or corn) is more important than wheat.

4. Intensive truck, dairy, and fruit farming district

   This area is around the city of Buenos Aires.

Pasture is a very important land use in the Humid Pampa. In the 1950's at least 40 per cent of the land was in pasture (ref. 4). At the edge of the Humid Pampa and to the northern and western regions of Argentina, more than 80 percent of the land in the 1950's and 1960's was used for grazing.

The pastoral district is located in Buenos Aires Province along the coast, south of the city of Buenos Aires, extending inland to the vicinity of Azul. Here, sheep raising for high-grade mutton and wool is concentrated. Additionally, it is a leading area in beef cattle breeding and the chief source of yearling steers.

The grain farming area is located in the following provinces: southeast Cordoba, southern Santa Fe, and a 200-mile-wide, north-south band occupying most of the eastern part of Buenos Aires. The chief cash crop in the grain farming district is wheat, but the raising of high-grade animals is of chief importance. In this district, sharp differences can be noted in pasture and cropland from year to year, depending upon the market. Wheat yield varies considerably in this district; the highest yields are located in north-central Buenos Aires Province and southeast Santa Fe Province.

In the third district, the one in the area of Rosario, mixed livestock and farming dominate the landscape. Corn has its highest yield adjacent to the Parana River between Buenos Aires and Rosario, extending westward for about 100 miles. Beyond this area, corn is still grown, but it diminishes in importance because of an unfavorable combination of soil, rainfall, and temperature. In this third district, two other crops, flax and wheat, are important. The flax-growing area of the IR is north of the Parana River in

Entre Rios Province. Heavy wheat yields can be found in the southern Santa Fe and northern Buenos Aires Provinces. Interspersed throughout this district, livestock grazing remains a distinct enterprise. It is in this third district that soybeans have become an important crop since the 1970's (fig. 3-3; also fig. 1-2 in section 1).

The district surrounding Buenos Aires is one of intensive truck, dairy, and fruit farming, and it supplies the metropolitan area of Buenos Aires. This district is ideally suited for intensive farming: good soil, abundant rainfall, mild climate, and access to a ready market (ref. 4).

3.3.2 ARGENTINA'S AGRICULTURAL DEVELOPMENT PLAN

Argentina is now trying to recover the important world position it held in agriculture in the 1940's. It has tremendous production potential but has stagnated economically. The government has adopted a national plan for agricultural recovery in three phases, with irrigation included in the last of these phases. This plan (ref. 5) follows:

1. Short-term production goal of 37.7 million tons of grain. The expanding soybean production is part of this plan.
2. Advanced middle technology phase, including the application of fertilizers and chemicals. Part of this phase is a goal of 67.7 million tons of grain to be produced by the year 1990.
3. Advanced technology phase to be attained by the year 2000. This phase includes a greater application of spray irrigation and a goal of 102.5 million tons of grain to be produced, with 80 percent of that to be exported.

Most of this development is within the AgRISTARS Argentine IR. Corn, sorghum, and oil-bearing seeds, respectively, are the main grain exports.

3.4 GENERAL CHARACTERIZATION OF WHEAT, CORN, AND SOYBEANS IN THE IR

3.4.1 WHEAT

Argentina is among the world's top producers in wheat production. Seed varieties, as well as mechanization, are steadily improving, and yield per hectare is relatively high. Because most of the wheat farmers do not use herbicides or insecticides and virtually none irrigate their fields, losses from pest damage and drought are potential hazards. Most of the wheat crops produced in the Argentine IR are winter wheat varieties; very little spring wheat is grown. In southern Buenos Aires, a durum wheat variety is grown for export to the Italian pasta market, but this acccounts for only a small amount of the Argentina wheat production. Even in the areas where wheat is the dominant commercial crop, much of the land is still used for grazing (refs. 3, 4, and 6). Typically, the wheat is grown in areas that are not being used for pasture. Later, this cultivated land will be turned over to pasture, and pasture land will be used as a wheat area. The amount of land devoted to wheat will also reflect the market price of wheat, which may vary from season to season.

In the IR, the average farm size is somewhat less than 300 hectares, but more than half the farms are between 25 to 200 hectares. Many of these farms are operated by tenants, but there are some landowners of small farms. The farms tend to be diversified, with wheat occupying about 54 hectares and other crops and pasture occupying the remaining hectarage.

Wheat production per hectare has been slowly increasing since the 1950's. This increase can be attributed to two factors: (a) the cultivation of better land and (b) improved farming practices. For example, more productive wheat varieties are being used, and chemicals to control weeds and insect pests are being applied.

Overall, the profit motive appears to be the dominant factor controlling the wheat industry. Associated with and influencing the profit motive are government policy and the weather. Specifically, fluctuating weather and government

policy determine prices which, in turn, determine the Argentine farmer's production decisions. Generally, support prices are announced prior to planting in order to influence the area harvested. In terms of profit, the wheat industry's biggest competitor is the cattle industry. When the price of beef is high relative to wheat, the hectarage devoted to wheat will decrease. Conversely, when wheat is bringing a high price on the world market, the area planted in wheat will increase.

Other important crops competing with wheat in the IR are sunflowers in Buenos Aires Province; flax in Entre Rios Province; and corn in Buenos Aires, Santa Fe, and Cordoba Provinces. Unquestionably, the Argentine IR is a major grain producer comparable to areas in the United States Great Plains (USGP).

3.4.2 CORN

In Argentina, accurate, reliable, and timely crop development data, as well as agro-economic data, are exceedingly difficult to obtain. Even when these data are available, the weather is so variable that an accurate seasonal outlook is virtually impossible (ref. 7). Argentina's corn yield is indicative of the impact of the wide weather fluctuations which are typical of the major corn-producing countries.

Corn producers have adopted many of the production practices common in the United States, but yields per unit are comparatively low and have increased slowly. The highly variable weather of the Pampas is often cited as the major reason for this. Three more reasons for the low yields, as reported in reference 7, are:

1. Argentine corn producers use virtually no fertilizers, as they are cost prohibitive relative to the market price of corn. Fertilizer usage can provide a substantial increase in yield per hectare; however, adverse weather conditions can negate any monetary gains. Almost all of Argentina's fertilizer is imported.
2. With favorable weather, the Pampas soil is still fertile without the use of fertilizer, except where it has been cultivated for many years.

3. The current flint corn varieties have been developed primarily to withstand the semiarid climate of the Pampas. To date, research has not produced varieties adaptable to the climate and, at the same time, responsive to fertilizer application.

Corn was Argentina's leading grain export before World War II, but it has fluctuated since that time. In the early 1970's, Argentina ranked fourth in the world's corn-producing countries. Although many Argentine farmers use modern agricultural methods, about half still do not use up-to-date cultivation practices. Even today, fertilized and cultivated corn fields are not the norm.

3.4.3 SOYBEANS

In the 1970's, there was a sharp expansion in the soybean area due to changes in Argentine government policy. Under the new policy, export taxes were cut and direct exports of soybeans were permitted. The previous policy required that all oilseeds be processed locally, and only oil and meal exports were permitted (refs. 7 and 8).

Soybean production has been heavily concentrated in Santa Fe and Cordoba Provinces. In 1977, production in these two provinces amounted to over 1.1 million tons, or 70 percent of the Argentine crop and 4 percent of foreign soybean output (ref. 9).

The soybean crop provides most of its own nitrogen from the soil, a real cost advantage in fertilizer-deficient countries. In certain locations, soybeans can be planted immediately following the wheat harvest to produce another crop in the same year. Year-to-year variations in soybean production can be influenced by several factors which are given below (ref. 9).

1. A change in price relative to alternative crops will cause a shift in the area planted.
2. A change in growing conditions (e.g., availability of moisture during the growing months) or abnormal temperatures can delay planting or prevent maturation of the crop.

3. Technological improvements in chemicals, equipment, and management can improve production.

4. A change in the varieties planted may have various results.

Because of the limited area available, the future rate of expansion for soybean production will depend heavily on the corn-soybean price relationship.

4. GENERAL CHARACTERIZATION OF OTHER ITEMS OF INTEREST PERTAINING TO AGRICULTURE IN THE IR

The following items are discussed in this section as they relate to agriculture or the collection of data on agriculture in the IR:

- Crop calendars
- Confusion crops
- Cropping practices
- Soil
- Climate
- Landsat data
- Ground observations
- Potential problems anticipated in proportion estimates and accuracy assessment

4.1 CROP CALENDARS

In 1975 for the Large Area Crop Inventory Experiment (LACIE), historical crop calendars were developed at a subregional level for the four provinces of interest. They were developed from U.S. Department of Agriculture, Foreign Agriculture Service (USDA/FAS) information, with the crop growth-stage data interpolated from planting and harvest dates by an agronomist (ref. 10). The subregions and the related crop calendars are listed in table 4-1; the subregions and related crops are listed in table 4-2. Figure 4-1 is a map showing the subregion and province boundaries; figures 4-2 through 4-7 are the crop calendars. The soybean, a relatively new crop to Argentina, is shown only on the crop calendar in table 4-3.

Planting and harvesting ranges (table 4-3) are now available from the government of Argentina through Marvin Bauer of the Laboratory for Applications of Remote Sensing (LARS), Purdue University, West Lafayette, Indiana. These crop calendars are at the province level and do include soybeans as well as many other crops (ref. 11). See figure 1-1 in section 1 for the wheat, corn, and soybean Argentina IR. Generalized crop calendar observations on soybeans, wheat, and corn for Argentina are available from ERIM.

TABLE 4-1.- SUBREGIONS AND CROP CALENDARS FOR PROVINCES OF INTEREST

[From ref. 6]

Subregion	Related figures/crop-calendars	Province covered
I	4-2	Northern Santa Fe
II-N	4-3	Southern Santa Fe
II-S	4-4	Northern Buenos Aires
III	4-5	Entre Rios
IV	4-6	Southern Buenos Aires
V-N	4-7	Cordoba

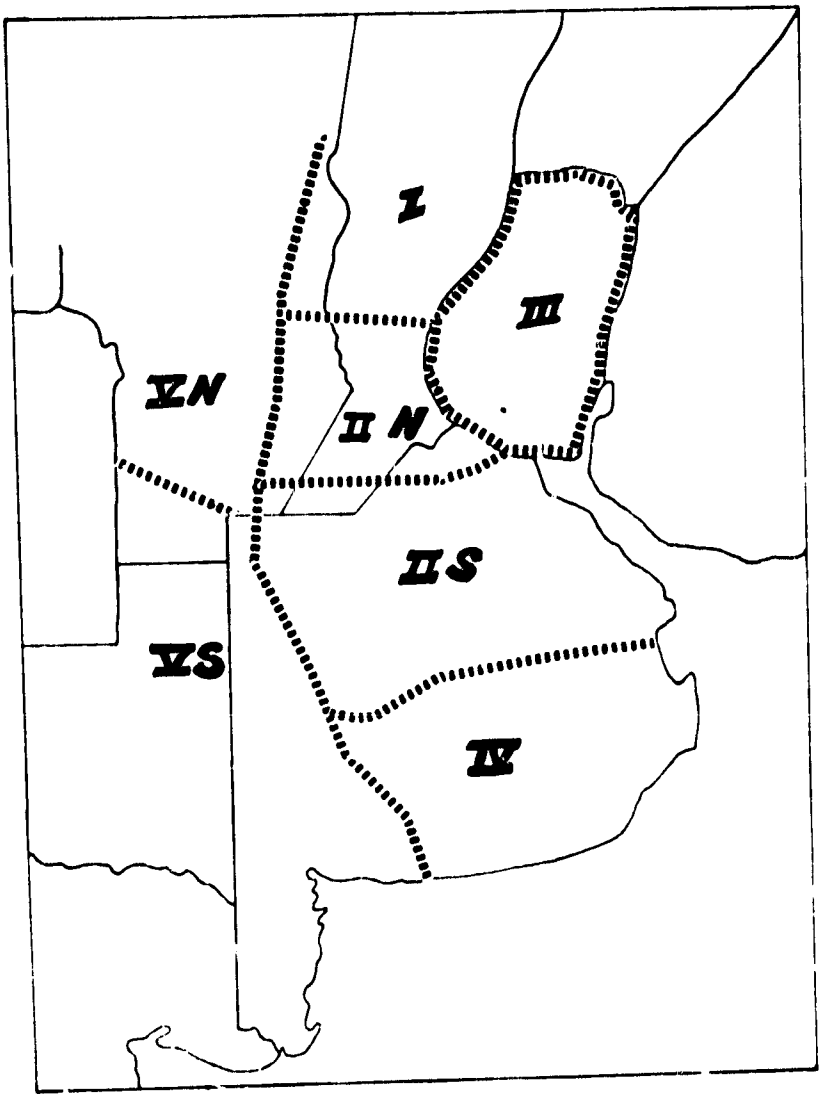
TABLE 4-2.- CROPS AND SUBREGIONS INCLUDED IN HISTORICAL CROP CALENDARS

Crop	Subregions applicable
Wheat	I, II-N, II-S, III, IV, V-N
Spring wheat	I, II-N
Corn	I, II-N, II-S, III, IV, V-N
Grain sorghum	I, II-N, II S, III, IV, V-N
Barley (grain)	I, II-N, II-S, III, IV, V-N
Barley (forage)	I, II-N, II-S, III, IV, V-N
Sunflower	I, II-N, II-S, III, IV, V-N
Rye	I, II-N, II-S, III, IV, V-N
Rice	I, III
Oats	I, II-S, III, IV, V-N
Peanuts	I, III
Potato	II-N, II-S, III, IV, V-N
Durum wheat	IV
Flaxseed	I, II-N, II-S, III, IV, V-N
Alfalfa hay	I, II-N, II-S, III, IV, V-N
Millet	I, II-N, II-S, III, IV, V-N
Cotton	I, III, V-N

TABLE 4-3.- CROP CALENDAR, DATES OF PLANTING AND HARVESTING

[From Argentina through LARS, Purdue University]

Crop	Provinces in the IR	Date of planting		Date of harvest	
		Start	End	Start	End
Wheat	Buenos Aires	May	September	December	January
	Cordoba	May	July	November	December
	Entre Rios	May	July	November	December
	Santa Fe	April	August	October	December
Maize (corn)	Buenos Aires	September	December	March	July
	Cordoba	August	December	April	July
	Entre Rios	August	October	February	April
	Santa Fe	August	October	March	June
Soybeans (oil)	Buenos Aires	November	January	April	June
	Cordoba	October	December	March	June
	Entre Rios	September	October	March	May
	Santa Fe	October	December	March	June
Sunflowers	Buenos Aires	September	January	February	June
	Cordoba	September	January	March	June
	Santa Fe	September	December	December	May
Flax (oil)	Buenos Aires	June	October	December	February
	Cordoba	May	July	November	December
	Entre Rios	June	September	November	December
	Santa Fe	May	August	November	December
Peanuts	Cordoba	October	December	March	June
Millet	Buenos Aires	October	January	January	April
	Cordoba	November	January	January	April
	Santa Fe	November	January	February	March
Sorghum	Buenos Aires	October	January	March	June
	Cordoba	October	December	March	July
	Entre Rios	October	November	March	May
	Santa Fe	September	December	January	May
Oats	Buenos Aires	February	August	November	January
	Cordoba	March	July	November	December
	Entre Rios	March	July	November	December
	Santa Fe	March	July	November	December
Barley (for beer)	Buenos Aires	June	August	November	January
	Cordoba	June	August	November	January
	Santa Fe	June	August	November	December
Barley (fodder)	Buenos Aires	March	August	November	January
	Santa Fe	April	July	November	December
Rye	Buenos Aires	March	August	November	January
	Cordoba	March	July	November	December
	Santa Fe	April	July	November	December



LEGEND:

I	Northern Santa Fe
II N	Soutnern Santa Fe
II S	Northern Buenos Aires
III	Entre Rios
IV	Southern Buenos Aires
V N	Cordoba
V S	La Pampa (outside of the IR)

Figure 4-1.- Subregions of the provinces in the Argentine IR (ref. 6).

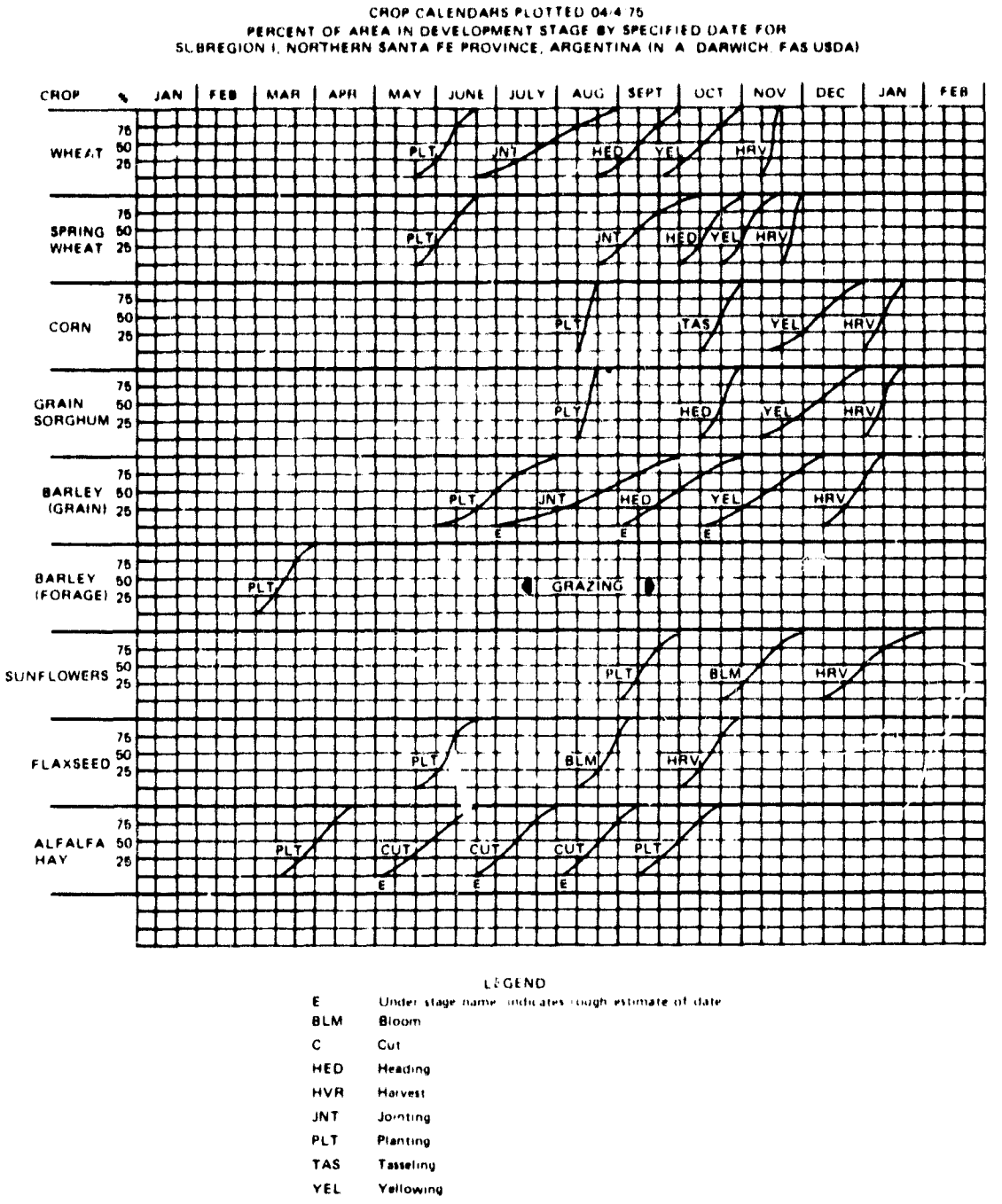
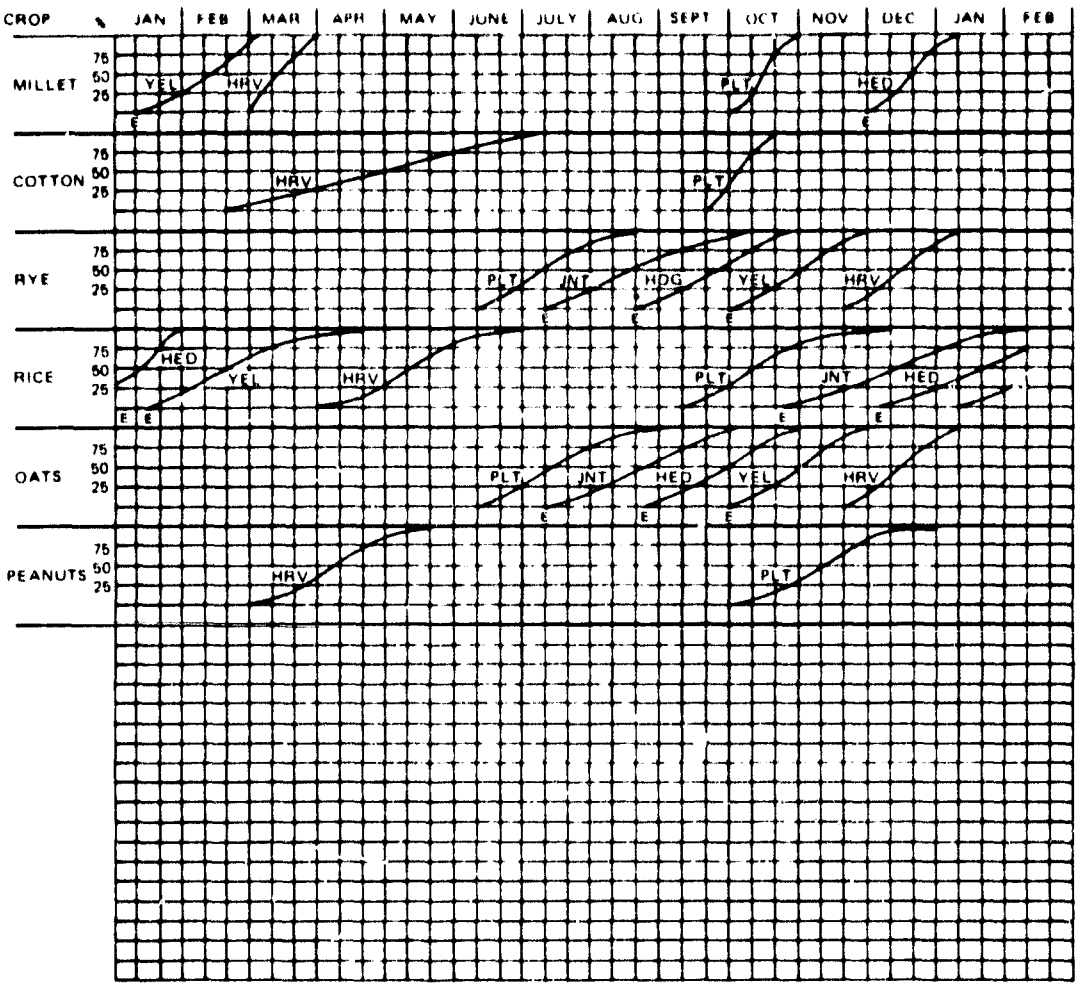


Figure 4-2.- Crop calendar for northern Santa Fe Province, subregion I.

CROP CALENDARS PLOTTED 04/4/78
PERCENT OF AREA IN DEVELOPMENT STAGE BY SPECIFIED DATE FOR
SUBREGION I, NORTHERN SANTA FE PROVINCE ARGENTINA (N. A. DARWICH, FAS USDA)



LEGEND

BLM	Bloom
C	Cut
E	Under stage name, indicates rough estimate of date
HED	Heading
HVR	Harvest
JNT	Jointing
PLT	Planting
TAS	Tasseling
YFL	Yellowing

Figure 4-2.- Concluded.

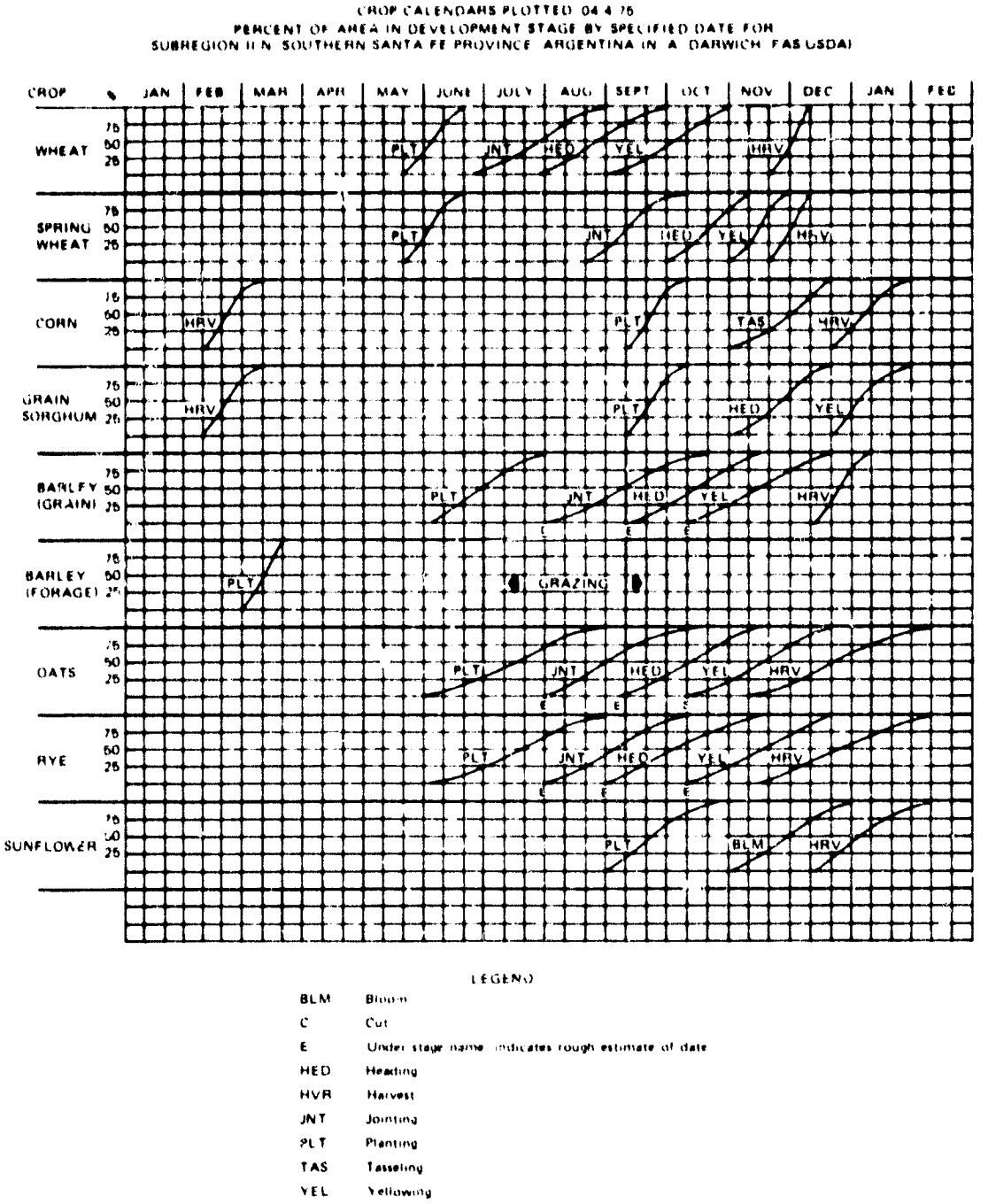
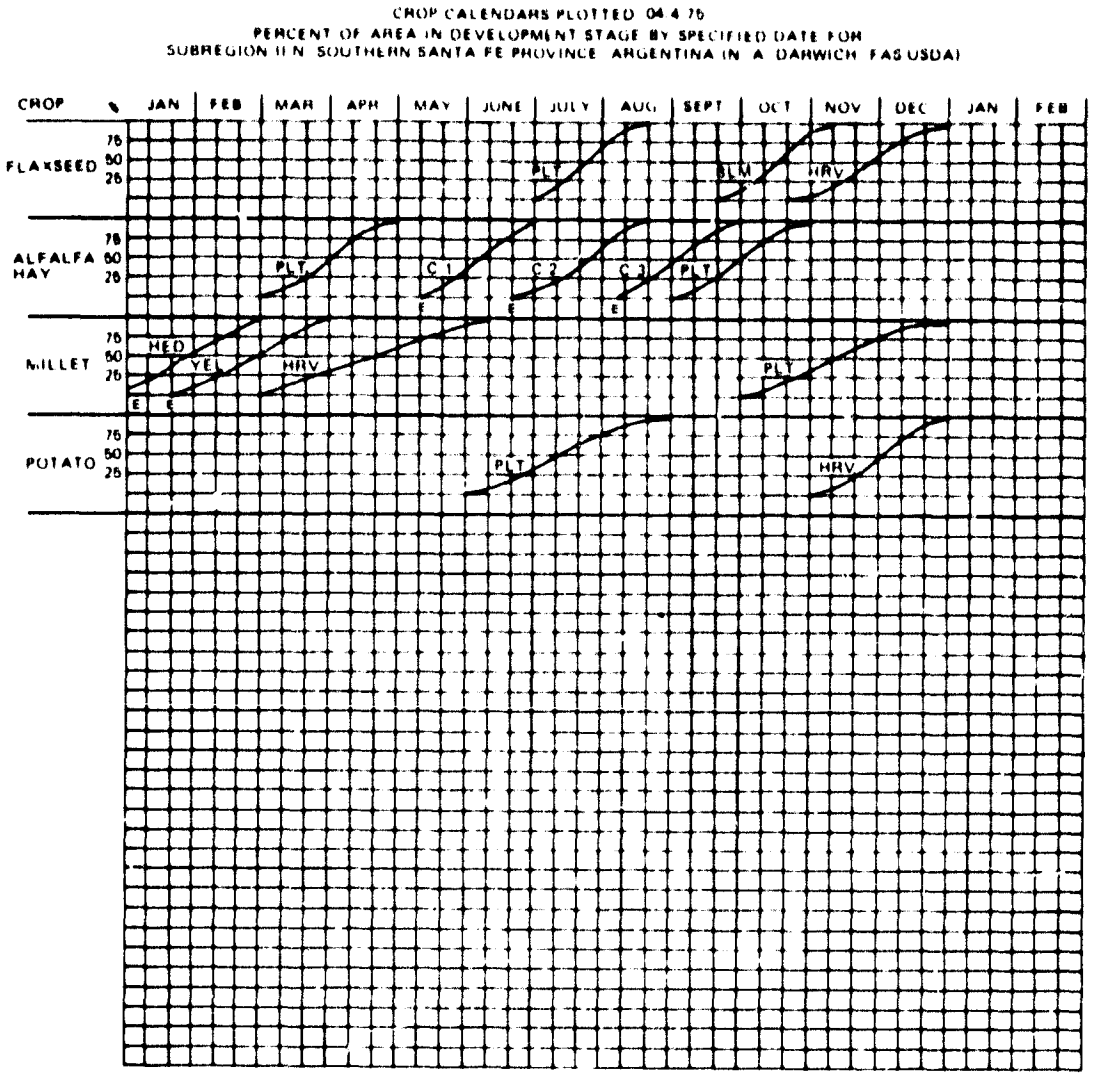


Figure 4-3.- Crop calendar for southern Santa Fe Province, subregion II-N.



LEGEND

BLM	Bloom
C	Cut
E	Under stage name, indicates root, estimate of date
HED	Heading
HVR	Harvest
JNT	Jointing
PLT	Planting
TAS	Tasseling
YEL	Yellowing

Figure 4-3.- Concluded.

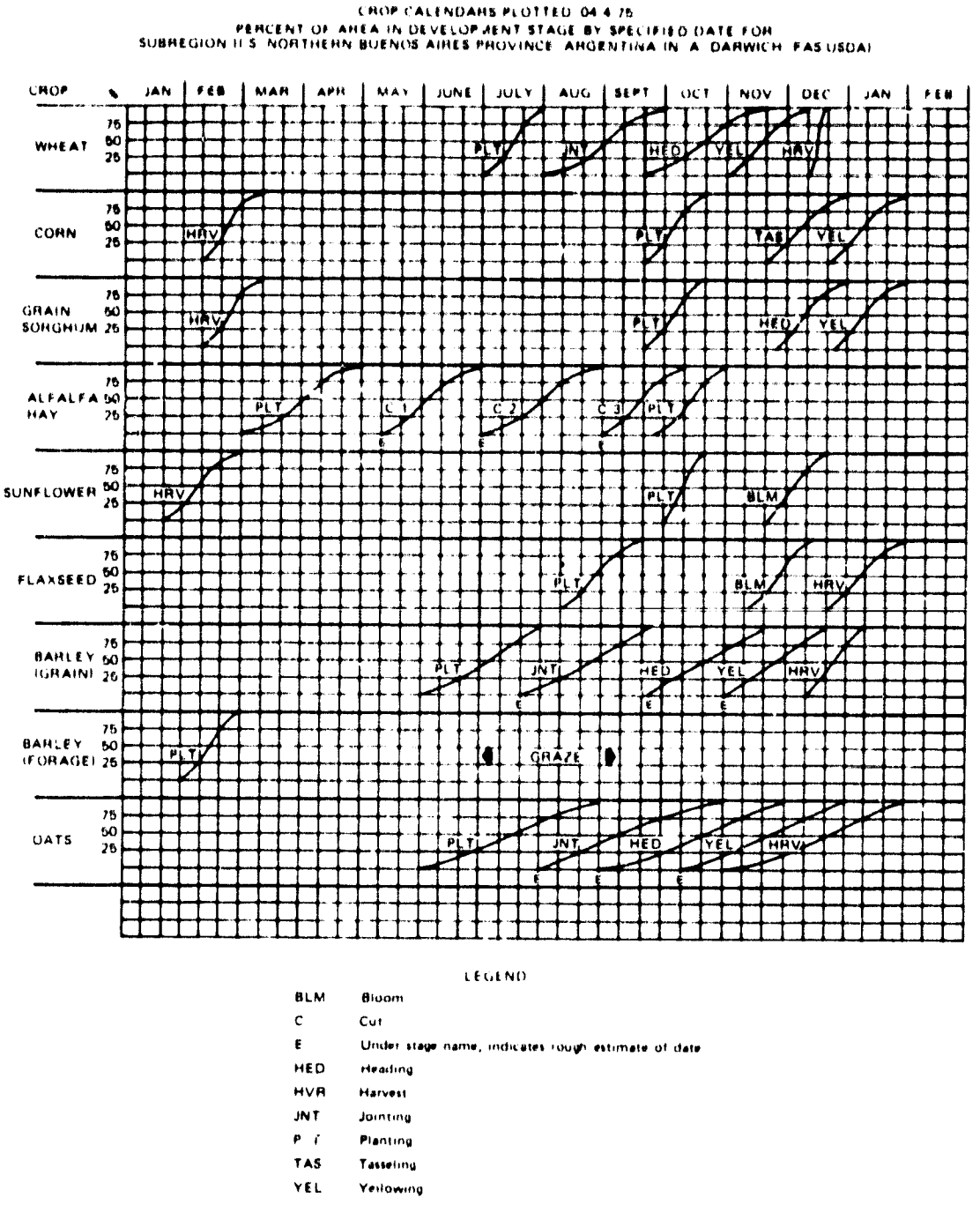
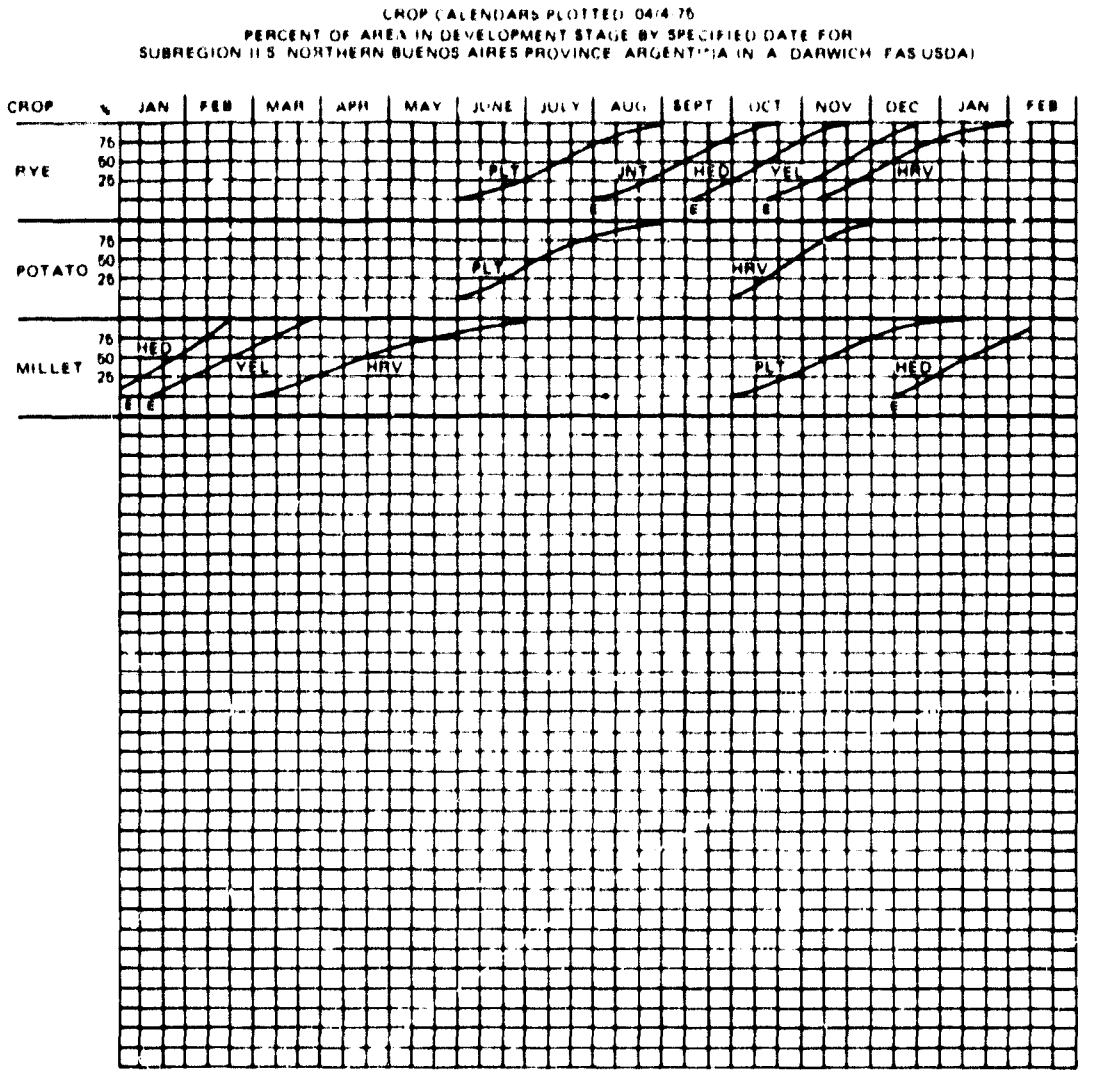


Figure 4-4.- Crop calendar for northern Buenos Aires Province, subregion II-S.



LEGEND

BLM	Bloom
C	Cut
E	Under stage name, indicates rough estimate of date
HED	Heading
HVR	Harvest
JNT	Jointing
PLT	Planting
TAS	Tasseling
YEL	Yellowing

Figure 4-4.- Concluded.

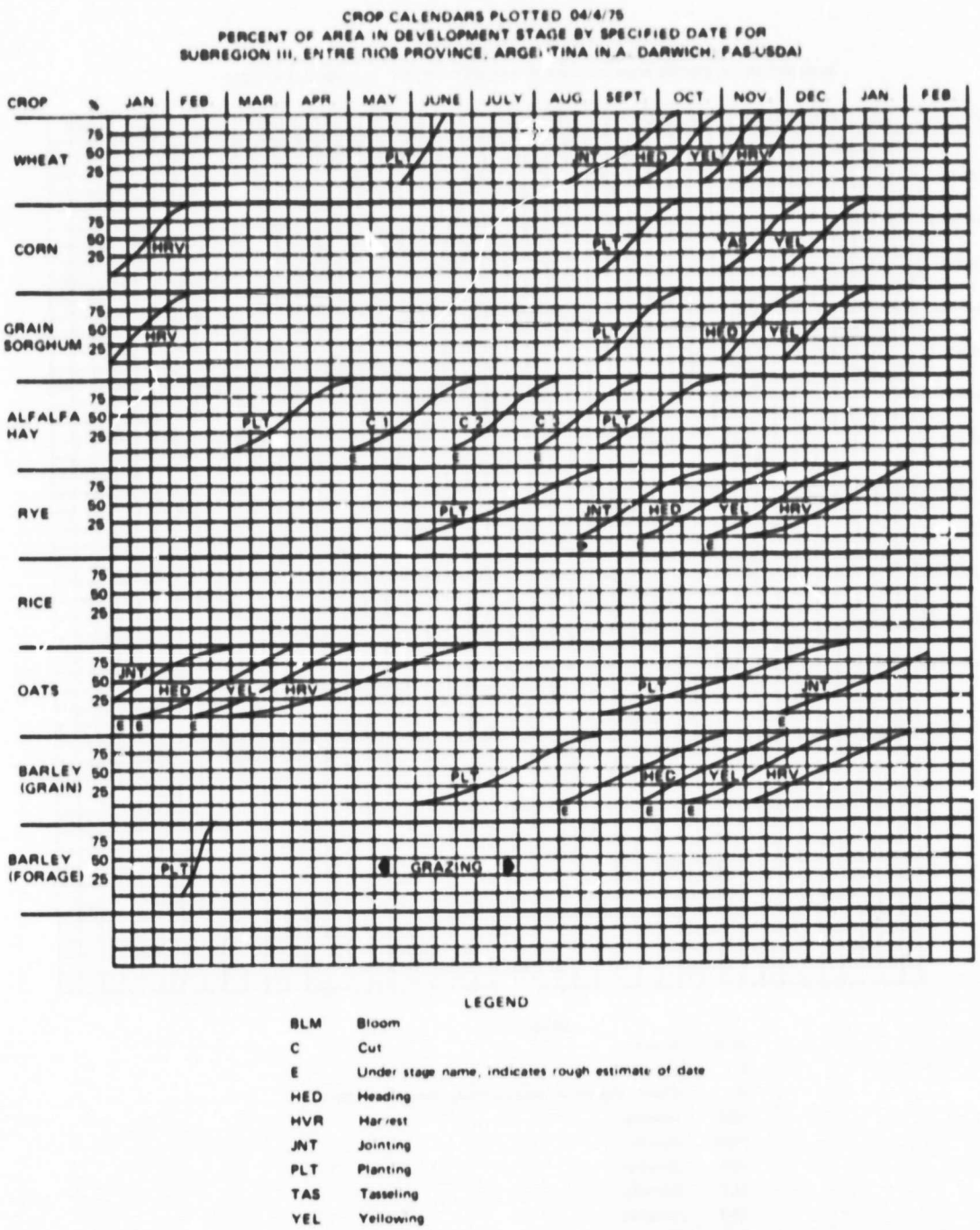
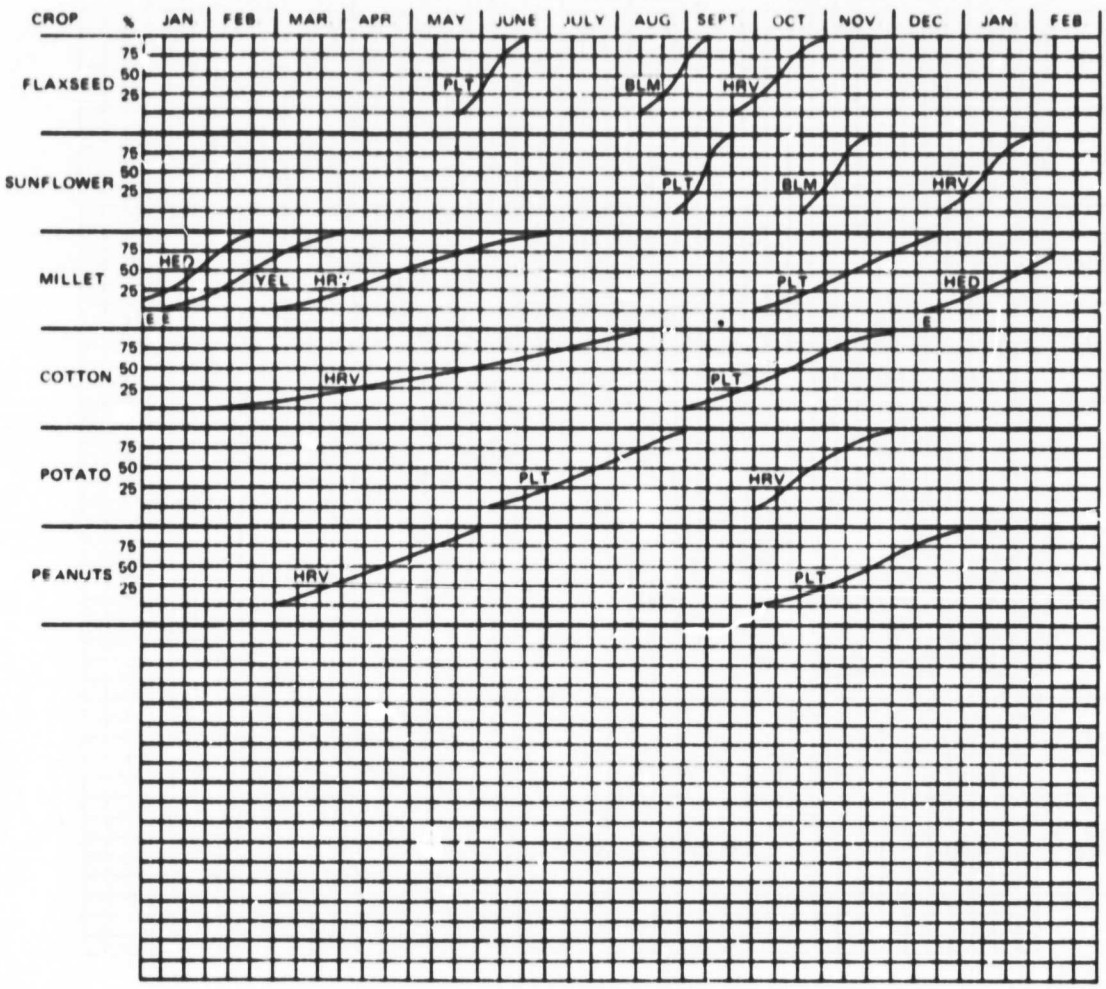


Figure 4-5.- Crop calendar for Entre Rios Province, subregion III.

CROP CALENDARS PLOTTED 04/4/75
PERCENT OF AREA IN DEVELOPMENT STAGE BY SPECIFIED DATE FOR
SUBREGION III, ENTRE RIOS PROVINCE, ARGENTINA (N.A. DARWICH, FAS-USDA)

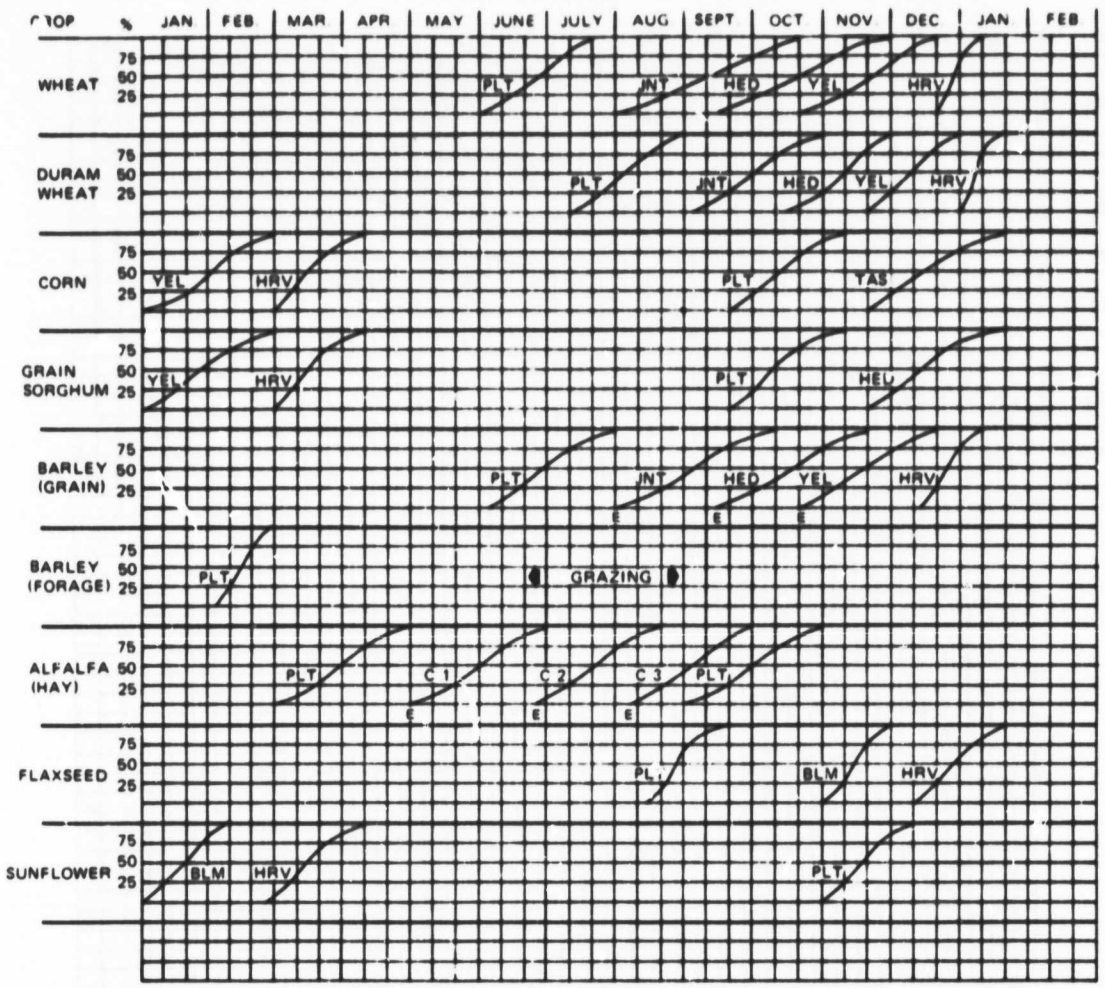


LEGEND

BLM	Bloom
C	Cut
E	Under stage name, indicates rough estimate of date
HED	Heading
HVR	Harvest
JNT	Jointing
PLT	Planting
TAS	Tasseling
YEL	Yellowing

Figure 4-5.- Concluded.

CRC ' CALENDARS PLOTTED 04/4/75
PERCENT OF AREA IN DEVELOPMENT STAGE BY SPECIFIED DATE FOR
SUBREGION IV, SOUTHERN BUENOS AIRES PROVINCE, ARGENTINA (N.A. DARWICH; FAS-USDA)

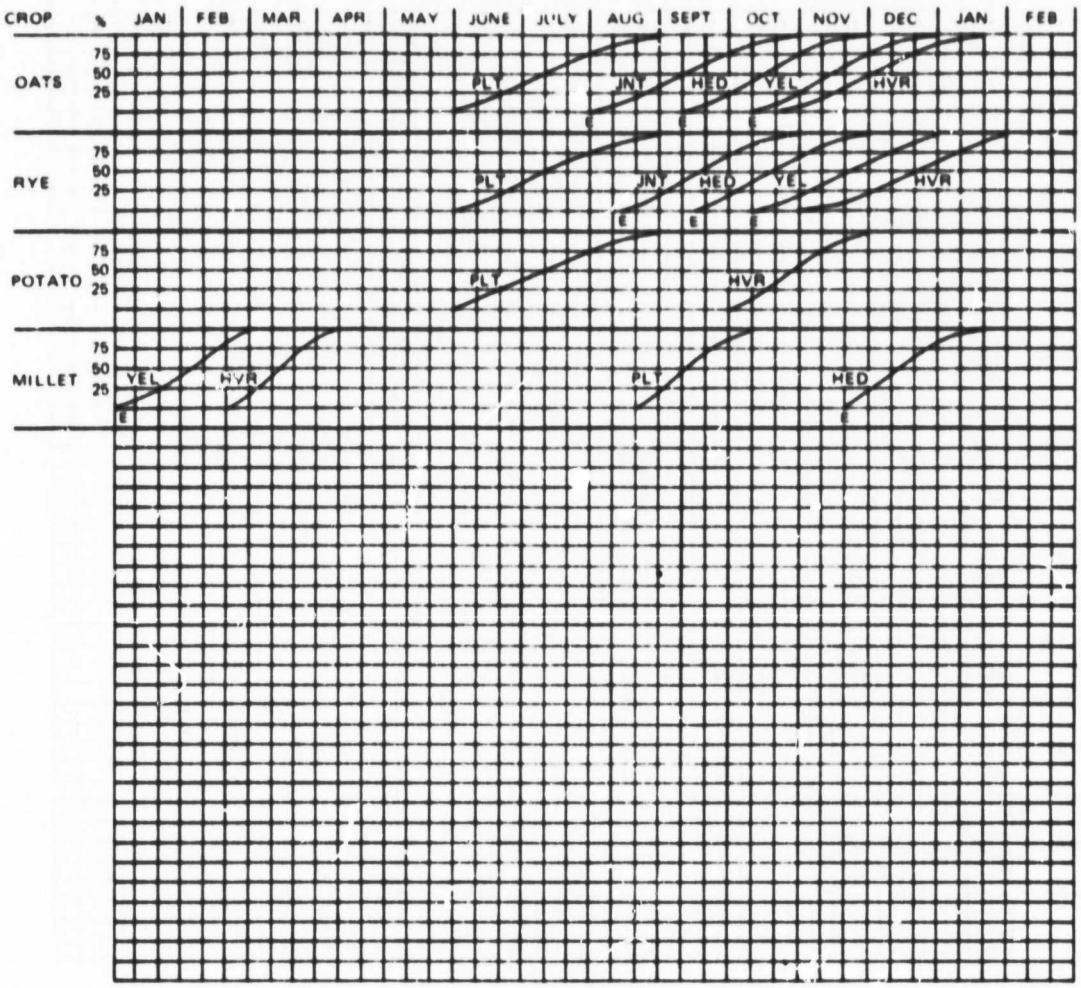


LEGEND

BLM	Bloom
C	Cut
E	Under stage name, indicates rough estimate of date
HED	Heading
HVR	Harvest
JNT	Jointing
PLT	Planting
TAS	Tasseling
YEL	Yellowing

Figure 4-6.- Crop calendar for southern Buenos Aires Province, subregion IV.

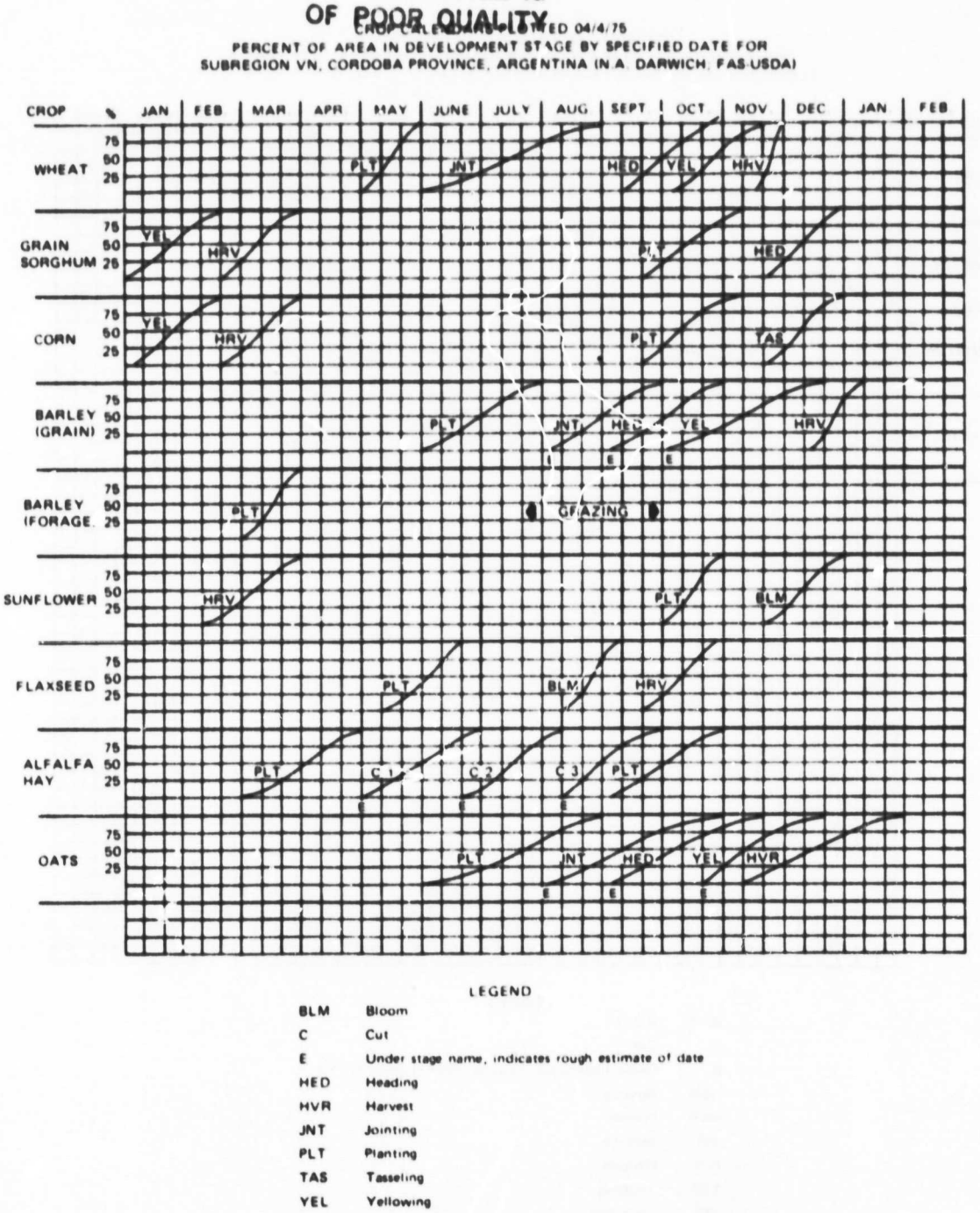
CROP CALENDARS PLOTTED 04/4/75
PERCENT OF AREA IN DEVELOPMENT STAGE BY SPECIFIED DATE FOR
SUBREGION IV, SOUTHERN BUENOS AIRES PROVINCE, ARGENTINA (N.A. DIV. (WICH, FAS-USDA)



LEGEND

BLM	Bloom
C	Cut
E	Under stage name, indicates rough estimate of date
HED	Heading
HVR	Harvest
JNT	Jointing
PLT	Planting
TAS	Tasseling
YEL	Yellowing

Figure 4-6.- Concluded.

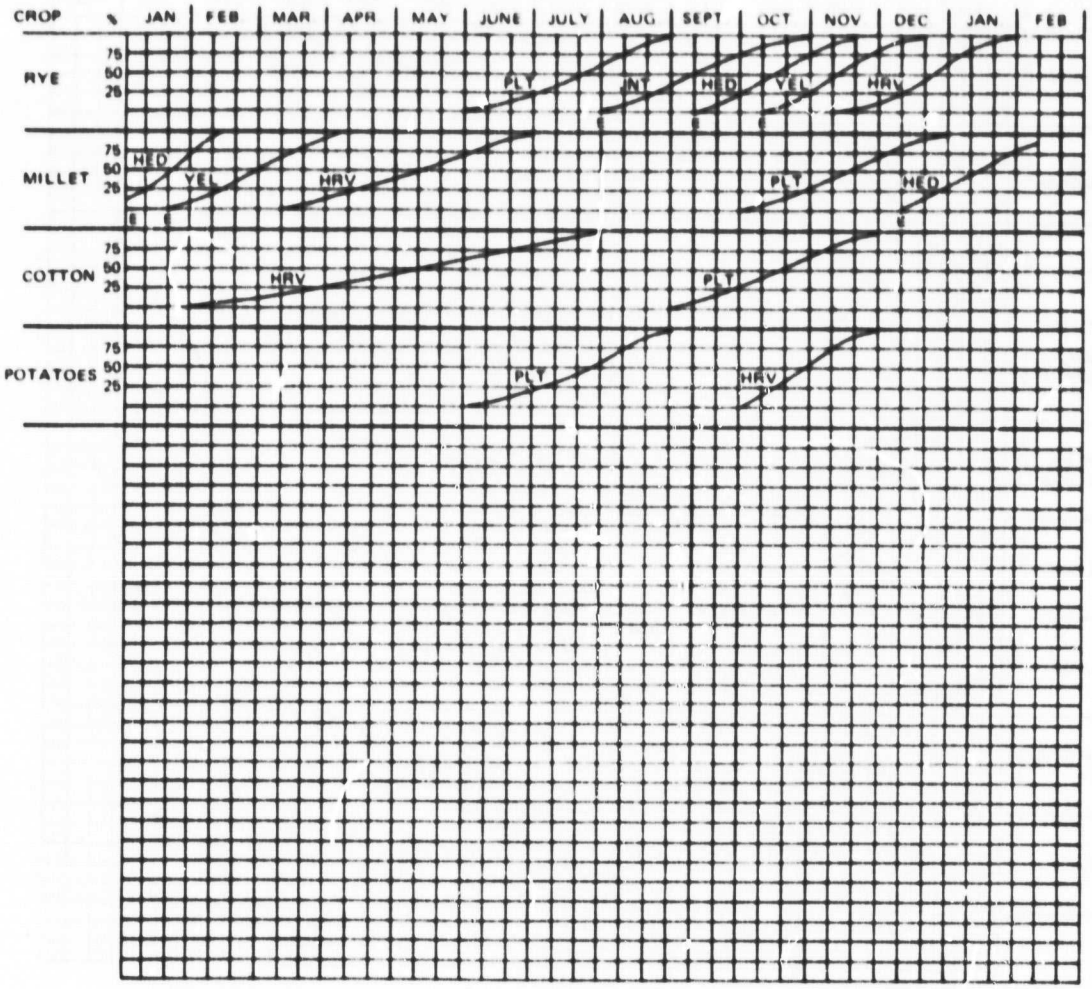


LEGEND

BLM	Bloom
C	Cut
E	Under stage name, indicates rough estimate of date
HED	Heading
HVR	Harvest
JNT	Jointing
PLT	Planting
TAS	Tasseling
YEL	Yellowing

Figure 4-7.- Crop calendar for Cordoba Province, subregion V-N.

CROP CALENDARS PLOTTED 04/4/75
PERCENT OF AREA IN DEVELOPMENT STAGE BY SPECIFIED DATE FOR
SUBREGION VN, CORDOBA PROVINCE, ARGENTINA (N A DARWICH, FAS USDA)



LEGEND

BLM	Bloom
C	Cut
E	Under stage name, indicates rough estimate of date
HED	Heading
HVR	Harvest
JNT	Jointing
PLT	Planting
TAS	Tasseling
YEL	Yellowing

Figure 4-7.- Concluded.

4.2 CONFUSION CROPS

In Argentina, the most common potential confusion crops with corn and soybeans are sorghum and sunflowers because they have a similar growth cycle. For wheat, the potential confusion crops are flax, barley, oats, and rye (refs. 10 and 11).

4.2.1 SUNFLOWERS

For the sunflower, as for other crops, an important production factor is the market price relative to other agricultural products. When the price of wheat drops, farmers tend to shift temporarily to more profitable crops. In southern Buenos Aires Province, the shift has been from wheat to sunflowers. Argentina has been trying to become self-sufficient in oilseed production for domestic use. The sunflower with its high oil content and adaptability to an extensive area, including most of the Pampa region and vast areas of the northeast and northwest regions of Argentina, was considered to be a good choice for domestic oilseed production. The peak harvest time of sunflowers is March and April, which is also a harvest period for corn and soybeans. Cultivation of sunflowers is lucrative for the farmer in that (a) it is relatively easy, requiring no particular implementation except for a special attachment during harvest, (b) it is resistant to undergrowth, (c) it can be produced on poorer land than many other crops, (d) it can be given less attention than cereal crops, (e) it can be planted in wheat stubble after wheat has been harvested, (f) it requires very little fertilizer, and (g) it has the shortest growing cycle of all oilseeds.

4.2.2 SORGHUM

Sorghum has become a very important crop in Argentina, particularly in the IR. Argentina produces about 7 percent of the world's sorghum. The most dense area of sorghum cultivation and the most dense area of corn and soybean cultivation overlap in the IR in the provinces of Cordoba and Santa Fe. Eighty percent of the sorghum in Argentina is harvested in the IR area. The sorghum area varies with the availability of seed and the cattle market, but sorghum is the third largest export crop after wheat and corn.

4.2.3 FLAX

The most dense area of flax cultivation overlaps with the most dense wheat and oats cultivation in Buenos Aires Province. The other area of dense flax production is the entire province of Entre Rios.

4.3 CROPPING PRACTICES

4.3.1 CROP ROTATION PATTERNS FOR WHEAT

Table 4-4 shows the crop rotation patterns relating to wheat for the regions of interest (ref. 6).

4.3.2 CROP ROTATION IN THE CORN REGION OF THE PAMPAS (ref. 12)

Crop rotation using leguminous plants was not widespread by 1971 (ref. 12). About 10 to 12 percent of the corn producers with 60 to 70 hectares are practicing this type of crop rotation. The proportion of large corn producers (70 to 120 and 500 hectares or more) who practice a leguminous crop rotation is also small.

The most common leguminous plants used in crop rotation with corn are *vicia sativa* (common vetch); varieties are red trebol, white trebol, melilotus biannual, and lato corniculado. They are planted along with wheat the year before or after the corn harvest. The following methods are used:

1. The leguminous plants are left in the field until February and then the 5 months of growth is buried like green manure for the following corn crop. The leguminous plants may be left another year in pasture or left for seed production and then buried for green manure. In this way, the corn crop is alternated with the wheat crop/leguminous plants every year or two. However, with use of leguminous plants, one can plant corn every year or alternate with the leguminous crop for seeds.
2. Farmers harvest wheat at the end of November and quickly prepare the soil and plant sunflowers in December. Then, around the end of January or beginning of February, plant *vicia*.

TABLE 4-4.- CROP ROTATION FOR WHEAT IN REGIONS OF INTEREST

[From ref. 6]

Region	Crop rotation pattern
I	Pasture, wheat, millet, ... Pasture, sunflowers, wheat, ...
II	
Corn belt area south of Santa Fe	Pasture (alfalfa) for 5-10 years, flax, wheat, wheat plus alfalfa, ...
Eastern Cordoba	Alfalfa, sorghum, or millet, wheat (5-10 years), ...
South	Pasture, flax, wheat, ...
III	Pasture, flax, wheat, ...
IV	Pasture, flax, wheat, oats, pasture, potatoes, wheat, oats, ...
V	Pasture, wheat, pasture, wheat, wheat, oats, ...

3. After the wheat is harvested, the stubble is left for pasture or plowed into the soil. The fields are left through the summer months; at the end of February or the beginning of March, the *vicia* is planted as green manure for the following corn crop.

4. Some farmers produce the vetch for an early harvest (plant in July and harvest at the beginning of November), incorporate the stubble, and then plant sunflowers at the end of November or beginning of December. The sunflowers are harvested at the end of March. *Vicia* is planted in April in the sunflower stubble as a green manure crop for the following corn crop.

Using leguminous crops in crop rotation with corn improves the level of organic matter, fertility, and productivity of the soil. This permits good yields of maize to be obtained year after year, thus providing regularity in the production of maize.

4.3.3 VARIETIES OF WHEAT, CORN, AND SOYBEANS

There are no recent data available at this time with respect to varietal information on wheat, corn, and soybeans or their confusion crops. The most recent available data were obtained during the 1960's and are in reference 4. Varieties used in the United States and foreign countries change rapidly as new strains and hybrids are introduced; therefore, it is questionable that the varieties used in the 1960's are still being used.

4.3.4 IRRIGATION

Irrigation in the Pampas is almost nonexistent (ref. 6). In Santa Fe Province, cotton, corn, oats, wheat, and barley were grown without irrigation (ref. 13).

4.3.5 USAGE OF INSECTICIDE AND HERBICIDE FOR DISEASE AND PEST CONTROL

Insecticides are very rarely used. Generally, insect and fungus diseases are not a serious problem because new disease-resistant varieties of crops have been developed and accepted for use. Diseases of wheat common to Argentina are stem rust, septoria "take all," wheat smut, and black spot (ref. 6).

Diseases of sunflowers are rust international race nos. 1, 2, or 3 and the black plague (ref. 14). Common pests are aphids (green bugs), soil insects, grubs, and plant lice.

Herbicide usage is confined mostly to corn production. A problem with weeds exists and may limit yields. "Wild oats" are also a problem in areas where a monoculture of cereals has existed (refs. 6 and 15).

4.4 SOIL

The valleys of the Parana River to the west and the Uruguay River to the east contain extensive accumulations of rich alluvial soil. On a map this alluvial buildup appears "U-shaped," with the bottom of the U located where these rivers discharge into the Rio de la Plata. Other than this relatively narrow "U-shaped" alluvial belt, the remaining area encompassed by the four provinces consists of prairie and chernozem soils (ref. 16).

The four provinces in the IR cover an oval area about 900 miles north to south and 600 miles east to west and occupy an area consisting primarily of a level, unbroken, fertile plain.

In these provinces, immense quantities of sediment rest on a basement complex of older igneous and metamorphic rocks. The detritus overlaying the bedrock is mainly alluvial and aeolian in origin and varies greatly in thickness. For example, in the Buenos Aires area, the bedrock is approximately 1000 feet below these sedimentry deposits. In addition to the water and wind-blown deposits, there are indications that some of the deposits are of marine origin. Except near the Cordoba Hills and the Pampa Sierras to the extreme west, the soil covering the provinces is free of material larger than sand (refs. 15 and 16).

Wheat and other small grains do exceptionally well in these prairie and chernozem soils. These soils are formed in those areas having fairly moist conditions and natural grass (prairie grass) cover. Prairie grasses contribute to the humus content and the fertility of the soil. While the soil loses

some of its fertility after the grasses are removed and the land is planted with wheat, fertilizers and selective nutrient-rich crop rotation have made farming highly profitable (refs. 16 and 17).

The importance of wheat production diminishes as the soil changes from the prairie and chernozem soils to the reddish chestnut and brown soils in the northwest, the red-yellow podzolic-latosolic soils in the north, and the desert soils in the west (ref. 16).

4.5 CLIMATE

Precipitation is greater during the summer months of December through February, but rainfall can be expected during the nonsummer months also. Because the IR falls approximately between latitude 30° S. and 40° S., temperatures tend to be moderate throughout the year. Under the Koppen-Geiger climatic classification, all the provinces in this study are classified as humid-temperate with no dry season. This is the same general classification assigned to the southeastern half of the United States, excluding the southernmost tip of Florida. As in the southeast United States, the weather in the four provinces can be uncomfortably hot or cold and humid. In Entre Rios Province, for example, humidity at times reaches 90 percent during the winter, thus intensifying the chilling effects of the season.

In general terms, the four provinces lie in an area of relatively mild winters and hot summers. The growing season, which occurs between frosts, spans a period of approximately 300 days in the Parana area and spans a period of approximately 140 days south of latitude 40° (refs. 3 and 4).

In the IR, the mean annual precipitation varies from a low of about 12 inches in southwestern Buenos Aires Province and increases northward and eastward to approximately 44 inches in the northeastern part of Entre Rios Province (ref. 6). See figure 4-8 for precipitation isohyets in the IR.

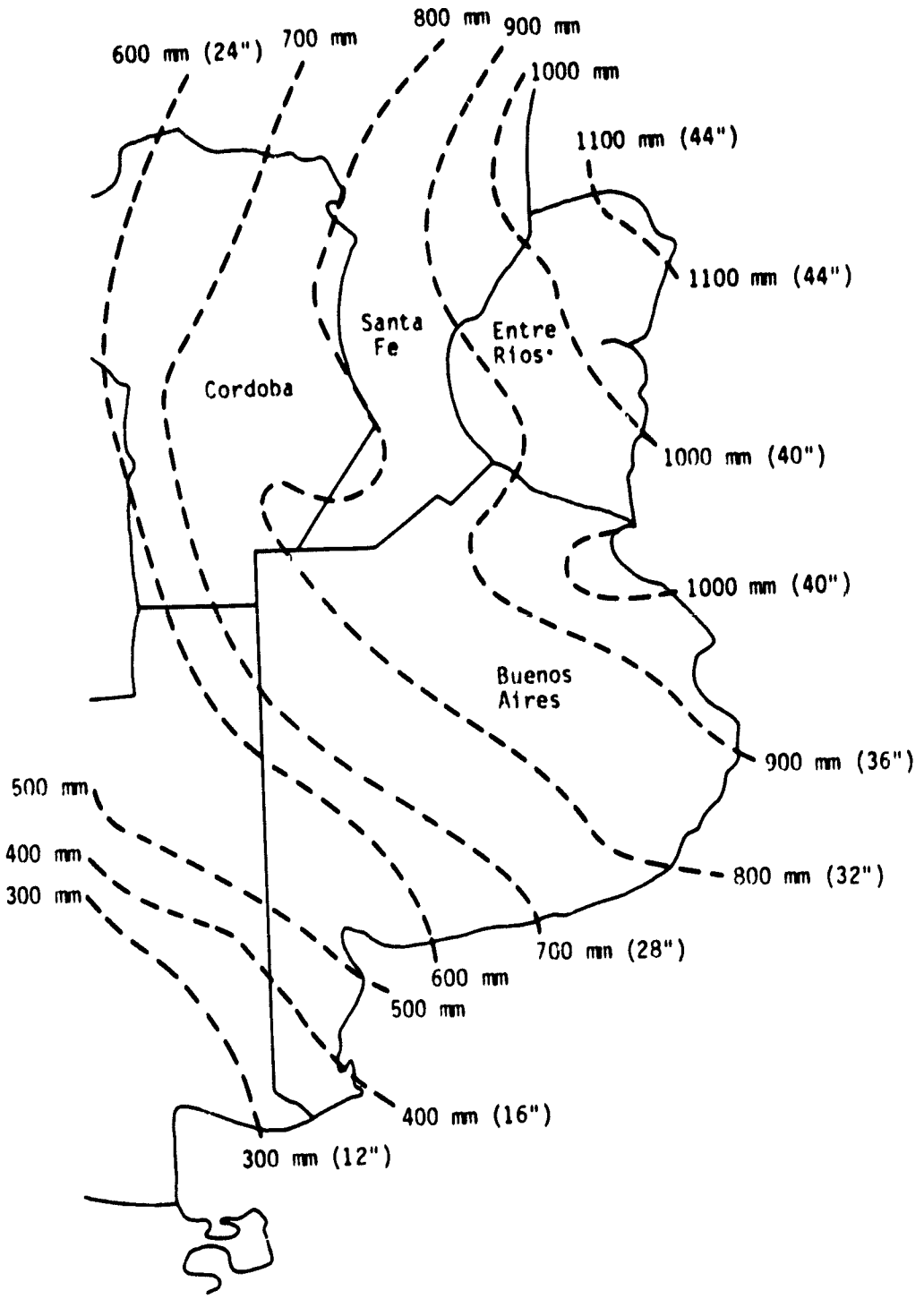


Figure 4-8.- Precipitation isohyets in the IR.

4.6 LANDSAT DATA

For the 1976-77 crop year, segment data are available for 17 sites. These data are sparse; e.g., four of the seventeen sites have only one acquisition. For the most part, the imagery consists only of data that include the following stages: (a) preplanting to planting for wheat, (b) harvest to post harvest for wheat, (c) preplanting for corn, and (d) tasseling to yellow for corn.

For Argentina, the original segment allocation in the 1977-78 crop year was as follows:

- 78 segments in Buenos Aires Province
- 24 segments in Cordoba Province
- 13 segments in Entre Rios Province
- 19 segments in La Pampa Province (outside of IR)
- 30 segments in Santa Fe Province

This is an overall total of 164 segments. Acquisitions are available for 150 sites; however, the same problems exist as mentioned for the 1976-77 data set. It appears that only a partial number of segments from the original allocation were collected.

The segments that have an available acquisition history are listed in table 4-5. For the 1980-81 crop year, the 51 allocated segments in the IR are given in table 4-6. A list of full-frame data for Argentina as of July 1980 is available (ref. 18).

For the Argentina technology development, a sample selection for wheat, corn, and soybeans has been done. This new allocation is for 51 segments in the four IR provinces and are located in 41 partidos. Twenty-five of these segments are in the same location as the original LACIE allocation (ref. 19).

TABLE 4-5.- AVAILABLE LANDSAT ACQUISITIONS IN THE IR

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
500	Buenos Aires	Adolfo Alsina	37°19'	62°42'	77135
500	Buenos Aires	Adolfo Alsina	37°19'	62°42'	77136
500	Buenos Aires	Adolfo Alsina	37°19'	62°42'	77172
500	Buenos Aires	Adolfo Alsina	37°19'	62°42'	77189
500	Buenos Aires	Adolfo Alsina	37°19'	62°42'	77243
500	Buenos Aires	Adolfo Alsina	37°19'	62°42'	77261
500	Buenos Aires	Adolfo Alsina	37°19'	62°42'	77315
500	Buenos Aires	Adolfo Alsina	37°19'	62°42'	77316
500	Buenos Aires	Adolfo Alsina	37°19'	62°42'	78004
501	Buenos Aires	Adolfo Alsina	37°28'	62°58'	77189
501	Buenos Aires	Adolfo Alsina	37°28'	62°58'	77190
501	Buenos Aires	Adolfo Alsina	37°28'	62°58'	77315
501	Buenos Aires	Adolfo Alsina	37°28'	62°58'	78004
501	Buenos Aires	Adolfo Alsina	37°28'	62°58'	78005
502	Buenos Aires	Adolfo Alsina	37°34'	62°35'	76267
502	Buenos Aires	Adolfo Alsina	37°34'	62°35'	76285
502	Buenos Aires	Adolfo Alsina	37°34'	62°35'	76339
502	Buenos Aires	Adolfo Alsina	37°34'	62°35'	77189
502	Buenos Aires	Adolfo Alsina	37°34'	62°35'	77261
502	Buenos Aires	Adolfo Alsina	37°34'	62°35'	78004
503	Buenos Aires	Ayacucho	37°13'	58°26'	76193
503	Buenos Aires	Ayacucho	37°13'	58°26'	76318
503	Buenos Aires	Ayacucho	37°13'	58°26'	76337
503	Buenos Aires	Ayacucho	37°13'	58°26'	77151
503	Buenos Aires	Ayacucho	37°13'	58°26'	77187
503	Buenos Aires	Ayacucho	37°13'	58°26'	77348
504	Buenos Aires	Azul	37°05'	59°56'	77169
505	Buenos Aires	Bahia Blanca	38°35'	61°50'	77134
505	Buenos Aires	Bahia Blanca	38°35'	61°50'	77170
505	Buenos Aires	Bahia Blanca	38°35'	61°50'	77189
505	Buenos Aires	Bahia Blanca	38°35'	61°50'	77242
505	Buenos Aires	Bahia Blanca	38°35'	61°50'	77243
505	Buenos Aires	Bahia Blanca	38°35'	61°50'	77260
505	Buenos Aires	Bahia Blanca	38°35'	61°50'	77278
505	Buenos Aires	Bahia Blanca	38°35'	61°50'	77314
505	Buenos Aires	Bahia Blanca	38°35'	61°50'	78003

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
506	Buenos Aires	Balcarce	37°33'	58°25'	77151
506	Buenos Aires	Balcarce	37°33'	58°25'	77187
507	Buenos Aires	Balcarce	37°43'	58°09'	77294
508	Buenos Aires	Baradero	34°03'	59°36'	77152
508	Buenos Aires	Baradero	34°03'	59°36'	77188
508	Buenos Aires	Baradero	34°03'	59°36'	77314
508	Buenos Aires	Baradero	34°03'	59°36'	77350
508	Buenos Aires	Baradero	34°03'	59°36'	78003
509	Buenos Aires	Bolivar	36°14'	60°48'	77134
509	Buenos Aires	Bolivar	36°14'	60°48'	77135
509	Buenos Aires	Bolivar	36°14'	60°48'	77152
509	Buenos Aires	Bolivar	36°14'	60°48'	77188
509	Buenos Aires	Bolivar	36°14'	60°48'	77189
509	Buenos Aires	Bolivar	36°14'	60°48'	77242
509	Buenos Aires	Bolivar	36°14'	60°48'	77350
509	Buenos Aires	Bolivar	36°14'	60°48'	78003
510	Buenos Aires	Bolivar	35°59'	61°04'	77134
510	Buenos Aires	Bolivar	35°59'	61°04'	77135
510	Buenos Aires	Bolivar	35°59'	61°04'	77152
510	Buenos Aires	Bolivar	35°59'	61°04'	77153
510	Buenos Aires	Bolivar	35°59'	61°04'	77188
510	Buenos Aires	Bolivar	35°59'	61°04'	77189
510	Buenos Aires	Bolivar	35°59'	61°04'	77242
510	Buenos Aires	Bolivar	35°59'	61°04'	77243
510	Buenos Aires	Bolivar	35°59'	61°04'	77261
519	Buenos Aires	Coronel Pringles			0
521	Buenos Aires	Coronel Suarez	37°44'	61°57'	76285
521	Buenos Aires	Coronel Suarez	37°44'	61°57'	76302
521	Buenos Aires	Coronel Suarez	37°44'	61°57'	76339
525	Buenos Aires	Chivilcoy	34°54'	60°05'	77188
525	Buenos Aires	Chivilcoy	34°54'	60°05'	77278
525	Buenos Aires	Chivilcoy	34°54'	60°05'	77314
525	Buenos Aires	Chivilcoy	34°54'	60°05'	77350
525	Buenos Aires	Chivilcoy	34°54'	60°05'	78003

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
526	Buenos Aires	General Alvear	36°09'	60°11'	77278
526	Buenos Aires	General Alvear	36°09'	60°11'	78003
527	Buenos Aires	General Arenales	34°14'	61°03'	77135
527	Buenos Aires	General Arenales	34°14'	61°03'	77153
527	Buenos Aires	General Arenales	34°14'	61°03'	77243
527	Buenos Aires	General Arenales	34°14'	61°03'	77261
527	Buenos Aires	General Arenales	34°14'	61°03'	77315
528	Buenos Aires	General La Madrid	37°34'	61°19'	77152
528	Buenos Aires	General La Madrid	37°34	61°19'	77188
528	Buenos Aires	General La Madrid	37°34	61°19'	77189
528	Buenos Aires	General La Madrid	37°34	61°19'	77242
528	Buenos Aires	General La Madrid	37°34'	61°19'	77243
528	Buenos Aires	General La Madrid	37°34'	61°19'	77260
528	Buenos Aires	General La Madrid	37°34'	61°19'	77261
528	Buenos Aires	General La Madrid	37°34'	61°19'	77314
528	Buenos Aires	General La Madrid	37°34'	61°19'	78003
529	Buenos Aires	General Villegas	34°58'	62°38'	77244
529	Buenos Aires	General Villegas	34°58'	62°38'	77316
529	Buenos Aires	General Villegas	34°58'	62°38'	78005
530	Buenos Aires	General Viamonte	35°14'	61°03'	76213
530	Buenos Aires	General Viamonte	35°14'	61°03'	76266
530	Buenos Aires	General Viamonte	35°14'	61°03'	76267
530	Buenos Aires	General Viamonte	35°14'	61°03'	76285
530	Buenos Aires	General Viamonte	35°14'	61°03'	76338
530	Buenos Aires	General Viamonte	35°14'	61°03'	76339
530	Buenos Aires	General Viamonte	35°14'	61°03'	77135
530	Buenos Aires	General Viamonte	35°14'	61°03'	77153
530	Buenos Aires	General Viamonte	35°14'	61°03'	77243
530	Buenos Aires	General Viamonte	35°14'	61°03'	77261
530	Buenos Aires	General Viamonte	35°14'	61°03'	77314
530	Buenos Aires	General Viamonte	35°14'	61°03'	77315
530	Buenos Aires	General Viamonte	35°14'	61°03'	77350
530	Buenos Aires	General Viamonte	35°14'	61°03'	78003
531	Buenos Aires	General Villegas	34°47'	63° 0'	76196
531	Buenos Aires	General Villegas	34°47'	63° 0'	76268
531	Buenos Aires	General Villegas	34°47'	63° 0'	77244
531	Buenos Aires	General Villegas	34°47'	63° 0'	77316
531	Buenos Aires	General Villegas	34°47'	63° 0'	78005

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
532	Buenos Aires	General Pinto	34°38'	62°38'	77244
532	Buenos Aires	General Pinto	34°38'	62°38'	77316
532	Buenos Aires	General Pinto	34°38'	62°38'	77334
532	Buenos Aires	General Pinto	34°38'	62°38'	78005
533	Buenos Aires	Gonzales Chaves	37°55'	60°41'	77152
533	Buenos Aires	Gonzales Chaves	37°55'	60°41'	77188
533	Buenos Aires	Gonzales Chaves	37°55'	60°41'	77260
533	Buenos Aires	Gonzales Chaves	37°55'	60°41'	77314
533	Buenos Aires	Gonzales Chaves	37°55'	60°41'	78003
534	Buenos Aires	Gonzales Chaves	37°54'	59°56'	77133
534	Buenos Aires	Gonzales Chaves	37°54'	59°56'	77152
534	Buenos Aires	Gonzales Chaves	37°54'	59°56'	77169
534	Buenos Aires	Gonzales Chaves	37°54'	59°56'	77187
534	Buenos Aires	Gonzales Chaves	37°54'	59°56'	77188
534	Buenos Aires	Gonzales Chaves	37°54'	59°56'	77242
534	Buenos Aires	Gonzales Chaves	37°54'	59°56'	77260
534	Buenos Aires	Gonzales Chaves	37°54'	59°56'	77313
534	Buenos Aires	Gonzales Chaves	37°54'	59°56'	77349
534	Buenos Aires	Gonzales Chaves	37°54'	59°56'	78002
535	Buenos Aires	Guamini	36°54'	62°49'	77135
535	Buenos Aires	Guamini	36°54'	62°49'	77136
535	Buenos Aires	Guamini	36°54'	62°49'	77189
535	Buenos Aires	Guamini	36°54'	62°49'	77190
535	Buenos Aires	Guamini	36°54'	62°49'	77243
535	Buenos Aires	Guamini	36°54'	62°49'	77261
535	Buenos Aires	Guamini	36°54'	62°49'	77315
535	Buenos Aires	Guamini	36°54'	62°49'	77316
535	Buenos Aires	Guamini	36°54'	62°49'	77334
535	Buenos Aires	Guamini	36°54'	62°49'	78004
535	Buenos Aires	Guamini	36°54'	62°49'	78005
536	Buenos Aires	Guamini	36°59'	62°12'	77135
536	Buenos Aires	Guamini	36°59'	62°12'	77153
536	Buenos Aires	Guamini	36°59'	62°12'	77189
536	Buenos Aires	Guamini	36°59'	62°12'	77243
536	Buenos Aires	Guamini	36°59'	62°12'	77261
536	Buenos Aires	Guamini	36°59'	62°12'	77315
536	Buenos Aires	Guamini	36°59'	62°12'	78004

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
537	Buenos Aires	Hipolito Yrigoyen	36°24'	61°56'	77135
537	Buenos Aires	Hipolito Yrigoyen	36°24'	61°56'	77153
537	Buenos Aires	Hipolito Yrigoyen	36°24'	61°56'	77189
537	Buenos Aires	Hipolito Yrigoyen	36°24'	61°56'	77243
537	Buenos Aires	Hipolito Yrigoyen	36°24'	61°56'	77261
538	Buenos Aires	Juarez	37°29'	59°33'	77169
538	Buenos Aires	Juarez	37°29'	59°33'	77187
538	Buenos Aires	Juarez	37°29'	59°33'	77313
538	Buenos Aires	Juarez	37°29'	59°33'	78002
539	Buenos Aires	Junin	34°44'	61°03'	77135
539	Buenos Aires	Junin	34°44'	61°03'	77153
539	Buenos Aires	Junin	34°44'	61°03'	77243
539	Buenos Aires	Junin	34°44'	61°03'	77261
539	Buenos Aires	Junin	34°44'	61°03'	77315
540	Buenos Aires	La Prida	37°35'	60°41'	77152
540	Buenos Aires	La Prida	37°35'	60°41'	77188
540	Buenos Aires	La Prida	37°35'	60°41'	77242
540	Buenos Aires	La Prida	37°35'	60°41'	77260
540	Buenos Aires	La Prida	37°35'	60°41'	77314
540	Buenos Aires	La Prida	37°35'	60°41'	78003
542	Buenos Aires	Lincoln	35°24'	61°40'	77135
542	Buenos Aires	Lincoln	35°24'	61°40'	77153
542	Buenos Aires	Lincoln	35°24'	61°40'	77189
542	Buenos Aires	Lincoln	35°24'	61°40'	77243
542	Buenos Aires	Lincoln	35°24'	61°40'	77261
542	Buenos Aires	Lincoln	35°24'	61°40'	77333
542	Buenos Aires	Lincoln	35°24'	61°40'	78004
544	Buenos Aires	Loberia	38°18'	58°23'	77258
544	Buenos Aires	Loberia	38°18'	58°23'	77294
545	Buenos Aires	Necochea	37°59'	59°02'	77169
545	Buenos Aires	Necochea	37°59'	59°02'	77187
545	Buenos Aires	Necochea	37°59'	59°02'	77294
545	Buenos Aires	Necochea	37°59'	59°02'	77313
545	Buenos Aires	Necochea	37°59'	59°02'	77348
545	Buenos Aires	Necochea	37°59'	59°02'	78002

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
546	Buenos Aires	Necochea	38°37'	58°53'	77132
546	Buenos Aires	Necochea	38°37'	58°53'	77169
546	Buenos Aires	Necochea	38°37'	58°53'	77186
546	Buenos Aires	Necochea	38°37'	58°53'	77187
546	Buenos Aires	Necochea	38°37'	58°53'	77258
546	Buenos Aires	Necochea	38°37'	58°53'	77294
546	Buenos Aires	Necochea	38°37'	58°53'	77295
546	Buenos Aires	Necochea	38°37'	58°53'	77348
547	Buenos Aires	9 de Julio	35°29'	60°42'	76213
547	Buenos Aires	9 de Julio	35°29'	60°42'	76230
547	Buenos Aires	9 de Julio	35°29'	60°42'	76266
547	Buenos Aires	9 de Julio	35°29'	60°42'	76338
547	Buenos Aires	9 de Julio	35°29'	60°42'	77134
547	Buenos Aires	9 de Julio	35°29'	60°42'	77135
547	Buenos Aires	9 de Julio	35°29'	60°42'	77152
547	Buenos Aires	9 de Julio	35°29'	60°42'	77188
547	Buenos Aires	9 de Julio	35°29'	60°42'	77189
547	Buenos Aires	9 de Julio	35°29'	60°42'	77243
547	Buenos Aires	9 de Julio	35°29'	60°42'	77260
547	Buenos Aires	9 de Julio	35°29'	60°42'	77261
547	Buenos Aires	9 de Julio	35°29'	60°42'	77315
547	Buenos Aires	9 de Julio	35°29'	60°42'	77350
547	Buenos Aires	9 de Julio	35°29'	60°42'	78003
548	Buenos Aires	Olavarria	36°39'	60°26'	77134
548	Buenos Aires	Olavarria	36°39'	60°26'	77152
548	Buenos Aires	Olavarria	36°39'	60°26'	77242
549	Buenos Aires	Patagones	40°29'	62°24'	77170
549	Buenos Aires	Patagones	40°29'	62°24'	77188
549	Buenos Aires	Patagones	40°29'	62°24'	77278
549	Buenos Aires	Patagones	40°29'	62°24'	77351
549	Buenos Aires	Patagones	40°29'	62°24'	78003
549	Buenos Aires	Patagones	40°29'	62°24'	78004
550	Buenos Aires	Patagones	40°09'	62°23'	76140
550	Buenos Aires	Patagones	40°09'	62°23'	76141
550	Buenos Aires	Patagones	40°09'	62°23'	76177
550	Buenos Aires	Patagones	40°09'	62°23'	76194
550	Buenos Aires	Patagones	40°09'	62°23'	76230
550	Buenos Aires	Patagones	40°09'	62°23'	76266
550	Buenos Aires	Patagones	40°09'	62°23'	76267

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
550	Buenos Aires	Patagones	40°09'	62°23'	76302
550	Buenos Aires	Patagones	40°09'	62°23'	76339
550	Buenos Aires	Patagones	40°09'	62°23'	77134
550	Buenos Aires	Patagones	40°09'	62°23'	77135
550	Buenos Aires	Patagones	40°09'	62°23'	77170
550	Buenos Aires	Patagones	40°09'	62°23'	77260
550	Buenos Aires	Patagones	40°09'	62°23'	77314
550	Buenos Aires	Patagones	40°09'	62°23'	77333
550	Buenos Aires	Patagones	40°09'	62°23'	78003
550	Buenos Aires	Patagones	40°09'	62°23'	78004
551	Buenos Aires	Patagones	39°54'	62°38'	76141
551	Buenos Aires	Patagones	39°54'	62°38'	76177
551	Buenos Aires	Patagones	39°54'	62°38'	76248
551	Buenos Aires	Patagones	39°54'	62°38'	76266
551	Buenos Aires	Patagones	39°54'	62°38'	76302
551	Buenos Aires	Patagones	39°54'	62°38'	76339
551	Buenos Aires	Patagones	39°54'	62°38'	77135
551	Buenos Aires	Patagones	39°54'	62°38'	77261
551	Buenos Aires	Patagones	39°54'	62°38'	77314
551	Buenos Aires	Patagones	39°54'	62°38'	77333
551	Buenos Aires	Patagones	39°54'	62°38'	77351
551	Buenos Aires	Patagones	39°54'	62°38'	78003
551	Buenos Aires	Patagones	39°54'	62°38'	78004
552	Buenos Aires	Patagones	40°44'	62°31'	77170
552	Buenos Aires	Patagones	40°44'	62°31'	77188
552	Buenos Aires	Patagones	40°44'	62°31'	77278
552	Buenos Aires	Patagones	40°44'	62°31'	77333
552	Buenos Aires	Patagones	40°44'	62°31'	77351
552	Buenos Aires	Patagones	40°44'	62°31'	78003
552	Buenos Aires	Patagones	40°44'	62°31'	78004
553	Buenos Aires	Patagones	40°44'	62°54	77278
553	Buenos Aires	Patagones	40°44'	62°54'	77351
553	Buenos Aires	Patagones	40°44'	62°54'	78003
553	Buenos Aires	Patagones	40°44'	62°54'	78004
554	Buenos Aires	Pehuajo	35°53'	62°10'	77135
554	Buenos Aires	Pehuajo	35°53'	62°10'	77136
554	Buenos Aires	Pehuajo	35°53'	62°10'	77153
554	Buenos Aires	Pehuajo	35°53'	62°10'	77189
554	Buenos Aires	Pehuajo	35°53'	62°10'	77243

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
554	Buenos Aires	Pehuajo	35°53'	62°10'	77261
554	Buenos Aires	Pehuajo	35°53'	62°10'	77315
554	Buenos Aires	Pehuajo	35°53'	62°10'	78004
555	Buenos Aires	Pergamino	33°44'	60°20'	77135
555	Buenos Aires	Pergamino	33°44'	60°20'	77153
555	Buenos Aires	Pergamino	33°44'	60°20'	77188
555	Buenos Aires	Pergamino	33°44'	60°20'	77243
555	Buenos Aires	Pergamino	33°44'	60°20'	77261
555	Buenos Aires	Pergamino	33°44'	60°20'	77315
555	Buenos Aires	Pergamino	33°44'	60°20'	78003
556	Buenos Aires	Puan	38°08'	63°21'	77136
556	Buenos Aires	Puan	38°08'	62°21'	77154
556	Buenos Aires	Puan	38°08'	62°21'	77172
556	Buenos Aires	Puan	38°08'	62°21'	77243
556	Buenos Aires	Puan	38°08'	63°21'	77261
556	Buenos Aires	Puan	38°08'	63°21'	77315
556	Buenos Aires	Puan	38°08'	63°21'	77316
556	Buenos Aires	Puan	38°08'	63°21'	78004
556	Buenos Aires	Puan	38°08'	63°21'	78005
557	Buenos Aires	Puan	38°29'	63°06'	77172
557	Buenos Aires	Puan	38°29'	63°06'	77189
557	Buenos Aires	Puan	38°29'	63°06'	77190
557	Buenos Aires	Puan	38°29'	63°06'	77243
557	Buenos Aires	Puan	38°29'	63°06'	77244
557	Buenos Aires	Puan	38°29'	63°06'	77261
557	Buenos Aires	Puan	38°29'	63°06'	77316
557	Buenos Aires	Puan	38°29'	63°06'	77333
557	Buenos Aires	Puan	38°29'	63°06'	78004
558	Buenos Aires	Puan	37°49'	62°58'	77172
558	Buenos Aires	Puan	37°49'	62°58'	77189
558	Buenos Aires	Puan	37°49'	62°58'	78004
558	Buenos Aires	Puan	37°49'	62°58'	78005
560	Buenos Aires	Rivadavia	35°23'	63°08'	77244
560	Buenos Aires	Rivadavia	35°23'	63°08'	77334
560	Buenos Aires	Rivadavia	35°23'	63°08'	78005
561	Buenos Aires	Rojas	34°14'	60°42'	76303
561	Buenos Aires	Rojas	34°14'	60°42'	76338

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
561	Buenos Aires	Rojas	34°14'	60°42'	76339
561	Buenos Aires	Rojas	34°14'	60°42'	77135
561	Buenos Aires	Rojas	34°14'	60°42'	77153
561	Buenos Aires	Rojas	34°14'	60°42'	77243
561	Buenos Aires	Rojas	34°14'	60°42'	77261
561	Buenos Aires	Rojas	34°14'	60°42'	77315
562	Buenos Aires	Saavedra	38°04'	62°28'	77189
562	Buenos Aires	Saavedra	38°04'	62°28'	77315
562	Buenos Aires	Saavedra	38°04'	62°28'	78004
563	Buenos Aires	Saavedra	37°49'	62°27'	77189
563	Buenos Aires	Saavedra	37°49'	62°27'	77315
563	Buenos Aires	Saavedra	37°49'	62°27'	78004
564	Buenos Aires	Saladillo	35°33'	59°42'	77152
564	Buenos Aires	Saladillo	35°33'	59°42'	77188
566	Buenos Aires	San Cayetano	38°23'	59°17'	77133
566	Buenos Aires	San Cayetano	38°23'	59°17'	77169
566	Buenos Aires	San Cayetano	38°23'	59°17'	77187
566	Buenos Aires	San Cayetano	38°23'	59°17'	77295
566	Buenos Aires	San Cayetano	38°23'	59°17'	77313
566	Buenos Aires	San Cayetano	38°23'	59°17'	77348
566	Buenos Aires	San Cayetano	38°23'	59°17'	77349
566	Buenos Aires	San Cayetano	38°23'	59°17'	78002
567	Buenos Aires	Tandil	37°14'	59°10'	77151
567	Buenos Aires	Tandil	37°14'	59°10'	77187
567	Buenos Aires	Tandil	37°14'	59°10'	77313
567	Buenos Aires	Tandil	37°14'	59°10'	78002
568	Buenos Aires	Tapalquen	36°09'	59°40'	77134
568	Buenos Aires	Tapalquen	36°09'	59°40'	77152
568	Buenos Aires	Tapalquen	36°09'	59°40'	77187
568	Buenos Aires	Tapalquen	36°09'	59°40'	77188
568	Buenos Aires	Tapalquen	36°09'	59°40'	77241
568	Buenos Aires	Tapalquen	36°09'	59°40'	77242
568	Buenos Aires	Tapalquen	36°09'	59°40'	77313
568	Buenos Aires	Tapalquen	36°09'	59°40'	77349
568	Buenos Aires	Tapalquen	36°09'	59°40'	78002
568	Buenos Aires	Tapalquen	36°09'	59°40'	78003

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
569	Buenos Aires	Tornquist	38°34'	62°51'	77189
569	Buenos Aires	Tornquist	38°34'	62°51'	77243
569	Buenos Aires	Tornquist	38°34'	62°51'	77261
570	Buenos Aires	Tornquist	38°24'	62°12'	77135
570	Buenos Aires	Tornquist	38°24'	62°12'	77189
570	Buenos Aires	Tornquist	38°24'	62°12'	77243
570	Buenos Aires	Tornquist	38°24'	62°12'	77261
570	Buenos Aires	Tornquist	38°24'	62°12'	78003
570	Buenos Aires	Tornquist	38°24'	62°12'	78004
571	Buenos Aires	Trenque Lauquen	35°58'	62°32'	77135
571	Buenos Aires	Trenque Lauquen	35°58'	62°32'	77136
571	Buenos Aires	Trenque Lauquen	35°58'	62°32'	77153
571	Buenos Aires	Trenque Lauquen	35°58'	62°32'	77172
571	Buenos Aires	Trenque Lauquen	35°58'	62°32'	77189
571	Buenos Aires	Trenque Lauquen	35°58'	62°32'	77243
571	Buenos Aires	Trenque Lauquen	35°58'	62°32'	77244
571	Buenos Aires	Trenque Lauquen	35°58'	62°32'	77316
571	Buenos Aires	Trenque Lauquen	35°58'	62°32'	77334
571	Buenos Aires	Trenque Lauquen	35°58'	62°32'	78004
571	Buenos Aires	Trenque Lauquen	35°58'	62°32'	78005
572	Buenos Aires	San Cayetano	38°25'	59°40'	77133
572	Buenos Aires	San Cayetano	38°25'	59°40'	77169
572	Buenos Aires	San Cayetano	38°25'	59°40'	77295
572	Buenos Aires	San Cayetano	38°25'	59°40'	77313
572	Buenos Aires	San Cayetano	38°25'	59°40'	78002
573	Buenos Aires	Tres Arroyos			
574	Buenos Aires	Tres Arroyos	38°15'	60°18'	77134
574	Buenos Aires	Tres Arroyos	38°15'	60°18'	77152
574	Buenos Aires	Tres Arroyos	38°15'	60°18'	77169
574	Buenos Aires	Tres Arroyos	38°15'	60°18'	77188
574	Buenos Aires	Tres Arroyos	38°15'	60°18'	77242
574	Buenos Aires	Tres Arroyos	38°15'	60°18'	77260
574	Buenos Aires	Tres Arroyos	38°15'	60°18'	77278
574	Buenos Aires	Tres Arroyos	38°15'	60°18'	77295
574	Buenos Aires	Tres Arroyos	38°15'	60°18'	77313
574	Buenos Aires	Tres Arroyos	38°15'	60°18'	77314
574	Buenos Aires	Tres Arroyos	38°15'	60°18'	78002
574	Buenos Aires	Tres Arroyos	38°15'	60°18'	78003

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
575	Buenos Aires	25 de Mayo	35°19'	59°43'	77134
575	Buenos Aires	25 de Mayo	35°19'	59°43'	77188
575	Buenos Aires	25 de Mayo	35°19'	59°43'	77314
575	Buenos Aires	25 de Mayo	35°19'	59°43'	77349
575	Buenos Aires	25 de Mayo	35°19'	59°43'	77350
575	Buenos Aires	25 de Mayo	35°19'	59°43'	78002
575	Buenos Aires	25 de Mayo	35°19'	59°43'	78003
576	Buenos Aires	Villarino	38°53'	63°15'	77136
576	Buenos Aires	Villarino	38°53'	63°15'	77153
576	Buenos Aires	Villarino	38°53'	63°15'	77189
576	Buenos Aires	Villarino	38°53'	63°15'	77190
576	Buenos Aires	Villarino	38°53'	63°15'	77243
576	Buenos Aires	Villarino	38°53'	63°15'	77244
576	Buenos Aires	Villarino	38°53'	63°15'	77261
576	Buenos Aires	Villarino	38°53'	63°15'	77316
576	Buenos Aires	Villarino	38°53'	63°15'	78004
577	Buenos Aires	Colonel de Marina Leonardo Rosales	39°05'	62°32'	77189
577	Buenos Aires	Colonel de Marina Leonardo Rosales	39°05'	62°32'	78004
578	Buenos Aires	Villarino	38°59'	63° 0'	77243
578	Buenos Aires	Villarino	38°59'	63° 0'	77261
578	Buenos Aires	Villarino	38°59'	63° 0'	78004
579	Buenos Aires	Villarino	38°49'	62°29'	77189
579	Buenos Aires	Villarino	38°49'	62°29'	77243
579	Buenos Aires	Villarino	38°49'	62°29'	78004
580	La Pampa	Atreuco	36°57'	63°56'	77136
580	La Pampa	Atreuco	36°57'	63°56'	77334
580	La Pampa	Atreuco	36°57'	63°56'	78005
581	La Pampa	Hucal	38°18'	63°37'	77136
581	La Pampa	Hucal	38°18'	63°37'	77154
581	La Pampa	Hucal	38°18'	63°37'	77172
581	La Pampa	Hucal	38°18'	63°37'	77244
581	La Pampa	Hucal	38°18'	63°37'	77316
581	La Pampa	Hucal	38°18'	63°37'	78004
581	La Pampa	Hucal	38°18'	63°37'	78005

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
582	La Pampa	Capital	36°26'	64°10'	77136
582	La Pampa	Capital	36°26'	64°10'	77244
582	La Pampa	Capital	36°26'	64°10'	77245
582	La Pampa	Capital	36°26'	64°10'	77263
582	La Pampa	Capital	36°26'	64°10'	77316
582	La Pampa	Capital	36°26'	64°10'	77317
582	La Pampa	Capital	36°26'	64°10'	77335
582	La Pampa	Capital	36°26'	64°10'	78005
582	La Pampa	Capital	36°26'	64°10'	78006
583	La Pampa	Catrilo	36°32'	63°48'	77136
583	La Pampa	Catrilo	36°32'	63°48'	77137
583	La Pampa	Catrilo	36°32'	63°48'	77172
583	La Pampa	Catrilo	36°32'	63°48'	77244
583	La Pampa	Catrilo	36°32'	63°48'	77263
583	La Pampa	Catrilo	36°32'	63°48'	77316
583	La Pampa	Catrilo	36°32'	63°48'	78005
584	La Pampa	Conhello	36° 0'	64°46'	77137
584	La Pampa	Conhello	36° 0'	64°46'	77173
584	La Pampa	Conhello	36° 0'	64°46'	77245
584	La Pampa	Conhello	36° 0'	64°46'	77263
584	La Pampa	Conhello	36° 0'	64°46'	77317
585	La Pampa	Toay	36°21'	64°32'	77137
585	La Pampa	Toay	36°21'	64°32'	77173
585	La Pampa	Toay	36°21'	64°32'	77245
585	La Pampa	Toay	36°21'	64°32'	77317
585	La Pampa	Toay	36°21'	64°32'	77335
586	La Pampa	Chapaleufu	35°12'	63°30'	77136
586	La Pampa	Chapaleufu	35°12'	63°30'	77137
586	La Pampa	Chapaleufu	35°12'	63°30'	77244
586	La Pampa	Chapaleufu	35°12'	63°30'	77245
586	La Pampa	Chapaleufu	35°12'	63°30'	77263
586	La Pampa	Chapaleufu	35°12'	63°30'	77316
586	La Pampa	Chapaleufu	35°12'	63°30'	77317
586	La Pampa	Chapaleufu	35°12'	63°30'	77334
587	La Pampa	Guatrache	37°32'	64°05'	77136
587	La Pampa	Guatrache	37°32'	64°05'	78005

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
588	La Pampa	Guatrache	37°43'	63°43'	77136
588	La Pampa	Guatrache	37°43'	63°43'	77154
588	La Pampa	Guatrache	37°43'	63°43'	77172
588	La Pampa	Guatrache	37°43'	63°43'	77334
588	La Pampa	Guatrache	37°43'	63°43'	78005
589	La Pampa	Hucal	38°07'	63°52'	77136
589	La Pampa	Hucal	38°07'	63°52'	77172
589	La Pampa	Hucal	38°07'	63°52'	77244
589	La Pampa	Hucal	38°07'	63°52'	77316
590	La Pampa	Hucal	37°48'	63°28'	77136
590	La Pampa	Hucal	37°48'	63°28'	77154
590	La Pampa	Hucal	37°48'	63°28'	77190
590	La Pampa	Hucal	37°48'	63°28'	77334
590	La Pampa	Hucal	37°48'	63°28'	78005
591	La Pampa	Maraco	35°42'	63°38'	77136
591	La Pampa	Maraco	35°42'	63°38'	77137
591	La Pampa	Maraco	35°42'	63°38'	77155
591	La Pampa	Maraco	35°42'	63°38'	77244
591	La Pampa	Maraco	35°42'	63°38'	77245
591	La Pampa	Maraco	35°42'	63°38'	77263
591	La Pampa	Maraco	35°42'	63°38'	77316
591	La Pampa	Maraco	35°42'	63°38'	77334
591	La Pampa	Maraco	35°42'	63°38'	78005
592	La Pampa	Quemu Quemu	36°01'	63°56'	76142
592	La Pampa	Quemu Quemu	36°01'	63°56'	76143
592	La Pampa	Quemu Quemu	36°01'	63°56'	76179
592	La Pampa	Quemu Quemu	36°01'	63°56'	76196
592	La Pampa	Quemu Quemu	36°01'	63°56'	76232
592	La Pampa	Quemu Quemu	36°01'	63°56'	76233
592	La Pampa	Quemu Quemu	36°01'	63°56'	76250
592	La Pampa	Quemu Quemu	36°01'	63°56'	76268
592	La Pampa	Quemu Quemu	36°01'	63°56'	77136
592	La Pampa	Quemu Quemu	36°01'	63°56'	77137
592	La Pampa	Quemu Quemu	36°01'	63°56'	77154
592	La Pampa	Quemu Quemu	36°01'	63°56'	77244
592	La Pampa	Quemu Quemu	36°01'	63°56'	77245
592	La Pampa	Quemu Quemu	36°01'	63°56'	77263
592	La Pampa	Quemu Quemu	36°01'	63°56'	77317
592	La Pampa	Quemu Quemu	36°01'	63°56'	77334
592	La Pampa	Quemu Quemu	36°01'	63°56'	78006

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
593	La Pampa	Rancul	35°50'	65°01'	77137
593	La Pampa	Rancul	35°50'	65°01'	77138
593	La Pampa	Rancul	35°50'	65°01'	77173
593	La Pampa	Rancul	35°50'	65°01'	77245
593	La Pampa	Rancul	35°50'	65°01'	77263
594	La Pampa	Realico	35°05'	64°29'	77155
594	La Pampa	Realico	35°05'	64°29'	77173
594	La Pampa	Realico	35°05'	64°29'	77245
594	La Pampa	Realico	35°05'	64°29'	77263
595	La Pampa	Toay	36°46'	64°34'	77173
595	La Pampa	Toay	36°46'	64°34'	77245
595	La Pampa	Toay	36°46'	64°34'	77263
595	La Pampa	Toay	36°46'	64°34'	77317
595	La Pampa	Toay	36°46'	64°34'	77334
595	La Pampa	Toay	36°46'	64°34'	77335
595	La Pampa	Toay	36°46'	64°34'	78006
596	La Pampa	Conhello	35°56'	64°09'	77137
596	La Pampa	Conhello	35°56'	64°09'	77173
596	La Pampa	Conhello	35°56'	64°09'	77245
596	La Pampa	Conhello	35°56'	64°09'	77263
596	La Pampa	Conhello	35°56'	64°09'	77335
596	La Pampa	Conhello	35°56'	64°09'	78005
596	La Pampa	Conhello	35°56'	64°09'	78006
597	La Pampa	Utracan	37°12'	64°20'	77136
597	La Pampa	Utracan	37°12'	64°20'	77154
597	La Pampa	Utracan	37°12'	64°20'	77172
597	La Pampa	Utracan	37°12'	64°20'	77173
597	La Pampa	Utracan	37°12'	64°20'	77245
597	La Pampa	Utracan	37°12'	64°20'	77263
597	La Pampa	Utracan	37°12'	64°20'	77317
597	La Pampa	Utracan	37°12'	64°20'	78005
597	La Pampa	Utracan	37°12'	64°20'	78006
598	La Pampa	Utracan	37°31'	64°28'	77136
598	La Pampa	Utracan	37°31'	64°28'	77154
598	La Pampa	Utracan	37°31'	64°28'	77245
598	La Pampa	Utracan	37°31'	64°28'	77317
598	La Pampa	Utracan	37°31'	64°28'	77353
598	La Pampa	Utracan	37°31'	64°28'	78005

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, South	Longitude, West	Julian calendar acquisition dates
600	Cordoba	Calamuchita	31°59'	64°20'	77138
600	Cordoba	Calamuchita	31°59'	64°20'	77246
600	Cordoba	Calamuchita	31°59'	64°20'	77264
600	Cordoba	Calamuchita	31°59'	64°20'	77300
600	Cordoba	Calamuchita	31°59'	64°20'	77317
600	Cordoba	Calamuchita	31°59'	64°20'	78025
601	Cordoba	General Roca	34°44	65°04'	76162
601	Cordoba	General Roca	34°44	65°04'	76179
601	Cordoba	General Roca	34°44	65°04'	76180
601	Cordoba	General Roca	34°44	65°04'	76306
601	Cordoba	General Roca	34°44	65°04'	77137
601	Cordoba	General Roca	34°44	65°04'	77245
601	Cordoba	General Roca	34°44	65°04'	77263
601	Cordoba	General Roca	34°44	65°04'	77300
601	Cordoba	General Roca	34°44	65°04'	78007
601	Cordoba	General Roca	34°44	65°04'	78025
602	Cordoba	General Roca	34°26'	63°58'	77137
602	Cordoba	General Roca	34°26'	63°58'	77155
602	Cordoba	General Roca	34°26'	63°58'	77245
603	Cordoba	Juarez Celman	33°01'	63°25'	77245
603	Cordoba	Juarez Celman	33°01'	63°25'	77317
603	Cordoba	Juarez Celman	33°01'	63°25'	78006
604	Cordoba	Juarez Celman	33°01'	63°55'	77137
604	Cordoba	Juarez Celman	33°01'	63°55'	77173
604	Cordoba	Juarez Celman	33°01'	63°55'	77245
604	Cordoba	Juarez Celman	33°01'	63°55'	77317
604	Cordoba	Juarez Celman	33°01'	63°55'	78006
605	Cordoba	Marcos Juarez	33°03'	62°07'	77136
605	Cordoba	Marcos Juarez	33°03'	62°07'	77154
605	Cordoba	Marcos Juarez	33°03'	62°07'	77244
605	Cordoba	Marcos Juarez	33°03'	62°07'	77334
605	Cordoba	Marcos Juarez	33°03'	62°07'	78005
606	Cordoba	Marcos Juarez	32°28'	62°07'	77136
606	Cordoba	Marcos Juarez	32°28'	62°07'	77244
606	Cordoba	Marcos Juarez	32°28'	62°07'	77262
606	Cordoba	Marcos Juarez	32°28'	62°07'	77334
606	Cordoba	Marcos Juarez	32°28'	62°07'	78005

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
607	Cordoba	Marcos Juarez	33°18'	62°15'	77136
607	Cordoba	Marcos Juarez	33°18'	62°15'	77262
607	Cordoba	Marcos Juarez	33°18'	62°15'	77334
607	Cordoba	Marcos Juarez	33°18'	62°15'	78005
608	Cordoba	Marcos Juarez	33°38'	62°22'	77244
608	Cordoba	Marcos Juarez	33°38'	62°22'	77262
608	Cordoba	Marcos Juarez	33°38'	62°22'	77334
608	Cordoba	Marcos Juarez	33°38'	62°22'	78005
609	Cordoba	Presidente Roque Saenz Pena	34°01'	63°28'	77137
609	Cordoba	Presidente Roque Saenz Pena	34°01'	63°28'	77245
609	Cordoba	Presidente Roque Saenz Pena	34°01'	63°28'	77263
609	Cordoba	Presidente Roque Saenz Pena	34°01'	63°28'	77317
609	Cordoba	Presidente Roque Saenz Pena	34°01'	63°28'	77334
609	Cordoba	Presidente Roque Saenz Pena	34°01'	63°28'	78005
610	Cordoba	Presidente Roque Saenz Pena	34°11'	63°50'	77137
610	Cordoba	Presidente Roque Saenz Pena	34°11'	63°50'	77245
610	Cordoba	Presidente Roque Saenz Pena	34°11'	63°50'	77263
610	Cordoba	Presidente Roque Saenz Pena	34°11'	63°50'	77317
611	Cordoba	Rio Cuarto	33°10'	64°16'	76233
611	Cordoba	Rio Curato	33°10'	64°16'	76341
611	Cordoba	Rio Curato	33°10'	64°16'	77245
611	Cordoba	Rio Curato	33°10'	64°16'	77299
611	Cordoba	Rio Curato	33°10'	64°16'	77300
612	Cordoba	Rio Cuarto	32°49'	64°44'	77138
612	Cordoba	Rio Curato	32°49'	64°44'	77300
612	Cordoba	Rio Curato	32°49'	64°44'	77318
612	Cordoba	Rio Curato	32°49'	64°44'	78025
613	Cordoba	Rio Cuarto			

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
614	Cordoba	Rio Primero	30°54'	63°02'	77137
614	Cordoba	Rio Primero	30°54'	63°02'	77245
615	Cordoba	Rio Segundo	31°46'	63°24'	77137
615	Cordoba	Rio Segundo	31°46'	63°24'	77245
615	Cordoba	Rio Segundo	31°46'	63°24'	77263
615	Cordoba	Rio Segundo	31°46'	63°24'	77317
616	Cordoba	San Justo	30°59'	62°48'	76179
616	Cordoba	San Justo	30°59'	62°48'	77137
616	Cordoba	San Justo	30°59'	62°48'	77245
617	Cordoba	San Justo	31°30'	62°13'	77136
617	Cordoba	San Justo	31°30'	62°13'	77154
617	Cordoba	San Justo	31°30'	62°13'	77244
617	Cordoba	San Justo	31°30'	62°13'	77262
617	Cordoba	San Justo	31°30'	62°13'	77334
617	Cordoba	San Justo	31°30'	62°13'	78005
618	Cordoba	San Justo	30°45'	61°59'	77154
618	Cordoba	San Justo	30°45'	61°59'	77244
618	Cordoba	San Justo	30°45'	61°59'	77262
619	Cordoba	Tercero Arriba	32°00'	63°59'	77137
619	Cordoba	Tercero Arriba	32°00'	63°59'	77138
619	Cordoba	Tercero Arriba	32°00'	63°59'	77245
619	Cordoba	Tercero Arriba	32°00'	63°59'	77246
619	Cordoba	Tercero Arriba	32°00'	63°59'	77264
619	Cordoba	Tercero Arriba	32°00'	63°59'	77317
620	Cordoba	Union	32°27'	62°42'	76160
620	Cordoba	Union	32°27'	62°42'	76178
620	Cordoba	Union	32°27'	62°42'	76179
620	Cordoba	Union	32°27'	62°42'	76232
620	Cordoba	Union	32°27'	62°42'	77136
620	Cordoba	Union	32°27'	62°42'	77244
620	Cordoba	Union	32°27'	62°42'	77245
620	Cordoba	Union	32°27'	62°42'	77262
620	Cordoba	Union	32°27'	62°42'	77317
620	Cordoba	Union	32°37'	62°42'	77334
620	Cordoba	Union	32°27'	62°42'	78005

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
621	Cordoba	Juarez Celman	33°47'	63°13'	77137
621	Cordoba	Juarez Celman	33°47'	63°13'	77244
621	Cordoba	Juarez Celman	33°47'	63°13'	77245
621	Cordoba	Juarez Celman	33°47'	63°13'	77317
621	Cordoba	Juarez Celman	33°47'	63°13'	77334
621	Cordoba	Juarez Celman	33°47'	63°13'	78005
621	Cordoba	Juarez Celman	33°47'	63°13'	78006
622	Cordoba	Union	33°02'	62°43'	77136
622	Cordoba	Union	33°02'	62°43'	77244
622	Cordoba	Union	33°02'	62°43'	77262
622	Cordoba	Union	33°02'	62°43'	77334
622	Cordoba	Union	33°02'	62°43'	78005
623	Cordoba	Union	32°42'	62°50'	77136
623	Cordoba	Union	32°42'	62°50'	77244
623	Cordoba	Union	32°42'	62°50'	77245
623	Cordoba	Union	32°42'	62°50'	77262
623	Cordoba	Union	32°42'	62°50'	77317
623	Cordoba	Union	32°42'	62°50'	77334
623	Cordoba	Union	32°42'	62°50'	78005
623	Cordoba	Union	32°42'	62°50'	78006
625	Entre Rios	Colon	32°12'	58°20'	77134
625	Entre Rios	Colon	32°12'	58°20'	77170
625	Entre Rios	Colon	32°12'	58°20'	77241
625	Entre Rios	Colon	32°12'	58°20'	77242
625	Entre Rios	Colon	32°12'	58°20'	77277
625	Entre Rios	Colon	32°12'	58°20'	77295
625	Entre Rios	Colon	32°12'	58°20'	77313
625	Entre Rios	Colon	32°12'	58°20'	77331
626	Entre Rios	Concordia	31°14'	58°28'	77152
626	Entre Rios	Concordia	31°14'	58°28'	77170
627	Entre Rios	Diamante	32°03'	60°35'	77153
627	Entre Rios	Diamante	32°03'	60°35'	78004
628	Entre Rios	Gualeguay	32°55'	59°45'	77134
628	Entre Rios	Gualeguay	32°55'	59°45'	77152
628	Entre Rios	Gualeguay	32°55'	59°45'	77188
628	Entre Rios	Gualeguay	32°55'	59°45'	77314
628	Entre Rios	Gualeguay	32°55'	59°45'	78003

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
629	Entre Rios	Gualeguaychu	32°38'	59°09'	77242
629	Entre Rios	Gualeguaychu	32°38'	59°09'	77314
629	Entre Rios	Gualeguaychu	32°38'	59°09'	78003
630	Entre Rios	Gualeguaychu	32°53'	58°55'	77242
630	Entre Rios	Gualeguaychu	32°53'	58°55'	77314
630	Entre Rios	Gualeguaychu	32°53'	58°55'	78002
630	Entre Rios	Gualeguaychu	32°53'	58°55'	78003
631	Entre Rios	La Paz	31°20'	59°45'	77242
631	Entre Rios	La Paz	31°20'	59°45'	77261
631	Entre Rios	La Paz	31°20'	59°45'	77314
631	Entre Rios	La Paz	31°20'	59°45'	77315
631	Entre Rios	La Paz	31°20'	59°45'	78003
631	Entre Rios	La Paz	31°20'	59°45'	78004
632	Entre Rios	Parana	31°58'	59°59'	77314
632	Entre Rios	Parana	31°58'	59°59'	78003
632	Entre Rios	Parana	31°58'	59°59'	78004
633	Entre Rios	Parana	31°35'	59°45'	77134
633	Entre Rios	Parana	31°35'	59°45'	77152
633	Entre Rios	Parana	31°35'	59°45'	77170
633	Entre Rios	Parana	31°35'	59°45'	77242
633	Entre Rios	Parana	31°35'	59°45'	77261
633	Entre Rios	Parana	31°35'	59°45'	77315
633	Entre Rios	Parana	31°35'	59°45'	78003
633	Entre Rios	Parana	31°35'	59°45'	78004
634	Entre Rios	Nogoya	32°03'	59°24'	77134
634	Entre Rios	Nogoya	32°03'	59°24'	77152
634	Entre Rios	Nogoya	32°03'	59°24'	77170
634	Entre Rios	Nogoya	32°03'	59°24'	77242
634	Entre Rios	Nogoya	32°03'	59°24'	78003
635	Entre Rios	Uruguay	32°23'	58°48'	77134
635	Entre Rios	Uruguay	32°23'	58°48'	77152
635	Entre Rios	Uruguay	32°23'	58°48'	77242
635	Entre Rios	Uruguay	32°23'	58°48'	77278
635	Entre Rios	Uruguay	32°23'	58°48'	77331
635	Entre Rios	Uruguay	32°23'	58°48'	78002
635	Entre Rios	Uruguay	32°23'	58°48'	78003

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
636	Entre Rios	Victoria	32°33'	60°20'	77153
636	Entre Rios	Victoria	32°33'	60°20'	78004
637	Entre Rios	Villaguay	31°45'	58°47'	76194
637	Entre Rios	Villaguay	31°45'	58°47'	76266
637	Entre Rios	Villaguay	31°45'	58°47'	76284
637	Entre Rios	Villaguay	31°45'	58°47'	76302
637	Entre Rios	Villaguay	31°45'	58°47'	76320
637	Entre Rios	Villaguay	31°45'	58°47'	77134
637	Entre Rios	Villaguay	31°45'	58°47'	77152
637	Entre Rios	Villaguay	31°45'	58°47'	77242
637	Entre Rios	Villaguay	31°45'	58°47'	78003
650	Santa Fe	San Martin	32°18'	61°45'	77136
650	Santa Fe	San Martin	32°18'	61°45'	77244
650	Santa Fe	San Martin	32°18'	61°45'	77262
650	Santa Fe	San Martin	32°18'	61°45'	77334
650	Santa Fe	San Martin	32°18'	61°45'	78005
651	Santa Fe	Caseros	33°18'	61°17'	77135
651	Santa Fe	Caseros	33°18'	61°17'	77153
651	Santa Fe	Caseros	33°18'	61°17'	77243
651	Santa Fe	Caseros	33°18'	61°17'	77261
652	Santa Fe	Caseros	33°13'	61°54'	77136
652	Santa Fe	Caseros	33°13'	61°54'	77244
652	Santa Fe	Caseros	33°13'	61°54'	77262
652	Santa Fe	Caseros	33°13'	61°54'	78005
653	Santa Fe	Castellanos	31°25'	61°45'	77136
653	Santa Fe	Castellanos	31°25'	61°45'	77154
653	Santa Fe	Castellanos	31°25'	61°45'	77262
653	Santa Fe	Castellanos	31°25'	61°45'	77334
654	Santa Fe	San Cristobal	30°40'	61°31'	77244
654	Santa Fe	San Cristobal	30°40'	61°31'	77262
654	Santa Fe	San Cristobal	30°40'	61°31'	77334
655	Santa Fe	Rosario	33°24'	60°48'	77153
655	Santa Fe	Rosario	33°24'	60°48'	77243
655	Santa Fe	Rosario	33°24'	60°48'	77261
655	Santa Fe	Rosario	33°24'	60°48'	77315

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
656	Santa Fe	General Lopez	33°54'	61°46'	77135
656	Santa Fe	General Lopez	33°54'	61°46'	77153
656	Santa Fe	General Lopez	33°54'	61°46'	77243
656	Santa Fe	General Lopez	33°54'	61°46'	77244
656	Santa Fe	General Lopez	33°54'	61°46'	77261
656	Santa Fe	General Lopez	33°54'	61°46'	77262
656	Santa Fe	General Lopez	33°54'	61°46'	77333
656	Santa Fe	General Lopez	33°54'	61°46'	78005
657	Santa Fe	Caseros	33°28'	61°47'	77135
657	Santa Fe	Caseros	33°28'	61°47'	77153
657	Santa Fe	Caseros	33°28'	61°47'	77243
657	Santa Fe	Caseros	33°28'	61°47'	77244
657	Santa Fe	Caseros	33°28'	61°47'	77261
657	Santa Fe	Caseros	33°28'	61°47'	77262
657	Santa Fe	Caseros	33°28'	61°47'	77315
657	Santa Fe	Caseros	33°28'	61°47'	77333
657	Santa Fe	Caseros	33°28'	61°47'	77334
657	Santa Fe	Caseros	33°28'	61°47'	78005
658	Santa Fe	General Lopez	33°58'	62°30'	77244
658	Santa Fe	General Lopez	33°58'	62°30'	77334
658	Santa Fe	General Lopez	33°58'	62°30'	78005
659	Santa Fe	General Lopez	34°23'	62°15'	77244
659	Santa Fe	General Lopez	34°23'	62°15'	77316
659	Santa Fe	General Lopez	34°23'	62°15'	77334
659	Santa Fe	General Lopez	34°23'	62°15'	78005
661	Santa Fe	Belgrano	32°39'	61°24'	77136
661	Santa Fe	Belgrano	32°39'	61°24'	77153
661	Santa Fe	Belgrano	32°39'	61°24'	78004
661	Santa Fe	Belgrano	32°39'	61°24'	78005
662	Santa Fe	La Capital	31°21'	60°48'	77315
662	Santa Fe	La Capital	31°21'	60°48'	78004
663	Santa Fe	Las Colonias	31°15'	61°03'	77136
663	Santa Fe	Las Colonias	31°15'	61°03'	77154
663	Santa Fe	Las Colonias	31°15'	61°03'	77244
663	Santa Fe	Las Colonias	31°15'	61°03'	77261
663	Santa Fe	Las Colonias	31°15'	61°03'	77262
663	Santa Fe	Las Colonias	31°15'	61°03'	77315

TABLE 4-5.- (Continued).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
663	Santa Fe	Las Colonias	31°15'	61°03'	77334
663	Santa Fe	Las Colonias	31°15'	61°03'	78004
664	Santa Fe	Las Colonias	30°50'	61°17'	77244
664	Santa Fe	Las Colonias	30°50'	61°17'	77262
664	Santa Fe	Las Colonias	30°50'	61°17'	77334
664	Santa Fe	Las Colonias	30°50'	61°17'	78005
665	Santa Fe	9 de Julio	28°40'	61°36'	77137
665	Santa Fe	9 de Julio	28°40'	61°36'	77154
665	Santa Fe	9 de Julio	28°40'	61°36'	77173
665	Santa Fe	9 de Julio	28°40'	61°36'	77316
665	Santa Fe	9 de Julio	28°40'	61°36'	77334
666	Santa Fe	9 de Julio	28°50'	61°09'	76250
666	Santa Fe	9 de Julio	28°50'	61°09'	77154
666	Santa Fe	9 de Julio	28°50'	61°09'	77244
667	Santa Fe	Rosario			
668	Santa Fe	San Cristobal	30°26'	61°24'	77154
668	Santa Fe	San Cristobal	30°26'	61°24'	77244
668	Santa Fe	San Cristobal	30°26'	61°24'	77262
668	Santa Fe	San Cristobal	30°25'	61°24'	77316
668	Santa Fe	San Cristobal	30°25'	61°24'	77334
669	Santa Fe	San Cristobal	30°10'	61°03'	77154
669	Santa Fe	San Cristobal	30°10'	61°03'	77244
669	Santa Fe	San Cristobal	30°10'	61°03'	77316
669	Santa Fe	San Cristobal	30°10'	61°03'	78005
670	Santa Fe	San Cristobal	29°45'	61°30'	77154
670	Santa Fe	San Cristobal	29°45'	61°30'	77244
670	Santa Fe	San Cristobal	29°45'	61°30'	77262
670	Santa Fe	San Cristobal	29°45'	61°30'	77316
670	Santa Fe	San Cristobal	29°45'	61°30'	77334
671	Santa Fe	San Javier			
672	Santa Fe	San Jeronimo			
673	Santa Fe	San Justo			

TABLE 4-5.- (Concluded).

Segment	Province	Partido	Latitude, south	Longitude, west	Julian calendar acquisition dates
674	Santa Fe	San Justo	30°50'	60°42'	77154
674	Santa Fe	San Justo	30°50'	60°42'	77262
675	Santa Fe	Iriondo	32°39'	60°56'	77153
675	Santa Fe	Iriondo	32°39'	60°56'	77315
675	Santa Fe	Iriondo	32°39'	60°56'	78004
676	Santa Fe	Castellanos	31°43'	61°59'	77136
676	Santa Fe	Castellanos	31°43'	61°59'	77244
676	Santa Fe	Castellanos	31°43'	61°59'	77262
676	Santa Fe	Castellanos	31°43'	61°59'	77334
677	Santa Fe	Las Colonias	31°53'	61°24'	77136
677	Santa Fe	Las Colonias	31°53'	61°24'	77244
677	Santa Fe	Las Colonias	31°53'	61°24'	77262
677	Santa Fe	Las Colonias	31°53'	61°24'	77334
677	Santa Fe	Las Colonias	31°53'	61°24'	78004
677	Santa Fe	Las Colonias	31°53'	61°24'	78005
678	Santa Fe	Vera	29°55'	60°15'	77333
678	Santa Fe	Vera	29°55'	60°15'	78004
679	Santa Fe	Vera	29°35'	60°56'	77154
679	Santa Fe	Vera	29°35'	60°56'	77244
679	Santa Fe	Vera	29°35'	60°56'	77316

TABLE 4-6.- LANDSAT DATA ORDER FOR ARGENTINA IN 1980-81

Segment number	Province	Partido	Latitude	Longitude
649	Buenos Aires	Puan	37°35'	62°40'
555	Buenos Aires	Pergamino	33°34'	60°20'
680	Buenos Aires	9 de Julio	35°37'	60°49'
681	Buenos Aires	Tandil	34°34'	60°46'
682	Buenos Aires	Salto	34°18'	60°10'
561	Buenos Aires	Rojas	34°14'	60°42'
683	Buenos Aires	25 de Mayo	35°39'	60°08'
684	Buenos Aires	Chacabuco	34°35'	60°23'
685	Buenos Aires	San Pedro	33°57'	59°50'
527	Buenos Aires	General Arenales	34°14'	61°03'
686	Buenos Aires	Baradero	34°00'	59°35'
687	Buenos Aires	San Antonio de Areco	34°19'	59°34'
688	Buenos Aires	Bartolome Mitre	34°00'	60°03'
689	Buenos Aires	Colon	34°02'	61°10'
511	Buenos Aires	Bragado	35°04'	60°41'
690	Buenos Aires	Chivilcoy	34°49'	60°03'
691	Buenos Aires	Ramallo	33°41'	60°06'
578	Buenos Aires	Villarino	38°59'	63°00'
520	Buenos Aires	Coronel Suarez	37°39'	61°56'
500	Buenos Aires	Adolfo Alsina	39°19'	62°42'
535	Buenos Aires	Guamini	36°54'	62°49'
570	Buenos Aires	Tornquist	38°24'	62°12'
554	Buenos Aires	Pehuajo	35°53'	62°10'
531	Buenos Aires	General Villegas	34°47'	63°00'
633	Entre Rios	Parana	31°35'	59°45'
656	Santa Fe	General Lopez	33°54'	61°46'
624	Buenos Aires	General Arenales	34°18'	61°18'
638	Santa Fe	General Lopez	33°15'	61°23'
651	Santa Fe	Caseros	33°18'	61°17'
639	Santa Fe	Caseros	34°10'	61°40'
655	Santa Fe	Constitucion	33°24'	60°48'
640	Santa Fe	Constitucion	33°24'	60°28'
661	Santa Fe	Iriondo	33°39'	61°24'
641	Santa Fe	Iriondo	32°53'	61°20'
642	Santa Fe	San Lorenzo	32°47'	60°55'
643	Santa Fe	San Lorenzo	32°55'	60°57'
644	Santa Fe	Belgrano	32°30'	61°38'
645	Santa Fe	Rosario	33°07'	60°50'
677	Santa Fe	San Martin	31°53'	61°24'
646	Santa Fe	San Jeronimo	32°24'	61°04'
605	Cordoba	Marcos Juarez	31°03'	62°07'
606	Cordoba	Marcos Juarez	32°28'	62°07'
622	Cordoba	Union	33°02'	62°43'
623	Cordoba	Union	32°42'	62°50'
611	Cordoba	Rio Cuarto	33°10'	64°16'
647	Cordoba	Rio Cuarto	32°41'	64°23'
604	Cordoba	Juarez Celman	33°01'	63°55'
648	Cordoba	Tercero Arriba	32°23'	63°46'
616	Cordoba	San Justo	30°59'	62°48'
556	Buenos Aires	Puan	38°08'	63°21'
692	Cordoba	San Justo	31°03'	62°45'

4.7 GROUND OBSERVATIONS IN ARGENTINA

Ground observations were collected on the following segments by ERIM and UCB from February 16 to 30, 1981 (fig. 4-9).

- Segments in Buenos Aires Province: 511, 520, 527, 556, 561, 570, 578, 624, 649, 681, 682 and 685.
- Segments in Cordoba Province: 604, 611, 616, and 692.
- Segment in Santa Fe Province: 677.

4.8 POTENTIAL PROBLEMS ANTICIPATED FOR PROPORTION ESTIMATION AND LABELING ACCURACY.

To determine which data are required for crop separation, it is necessary to have accurate crop growth-stage data. The accuracy of the current crop calendar data has not been tested at this time.

The growth-stage data for Argentina do not correspond to the growth stages used for corn and soybean procedures in the United States. At this time, the United States is the only area in which procedures for corn and soybeans have been implemented. So far, these differences have not been examined to determine the extent of the problem.

A minimum number of acquisitions are presently required for processing and for separating corn and soybeans from other summer crops and from each other. The Landsat acquisition histories (table 4-5) show that in the past each segment acquired very few acquisitions. This could be a problem if the acquired acquisitions do not fall in critical time periods.

Very little current agricultural information is available at this time to aid the analyst in developing and testing procedures to be used in Argentina.

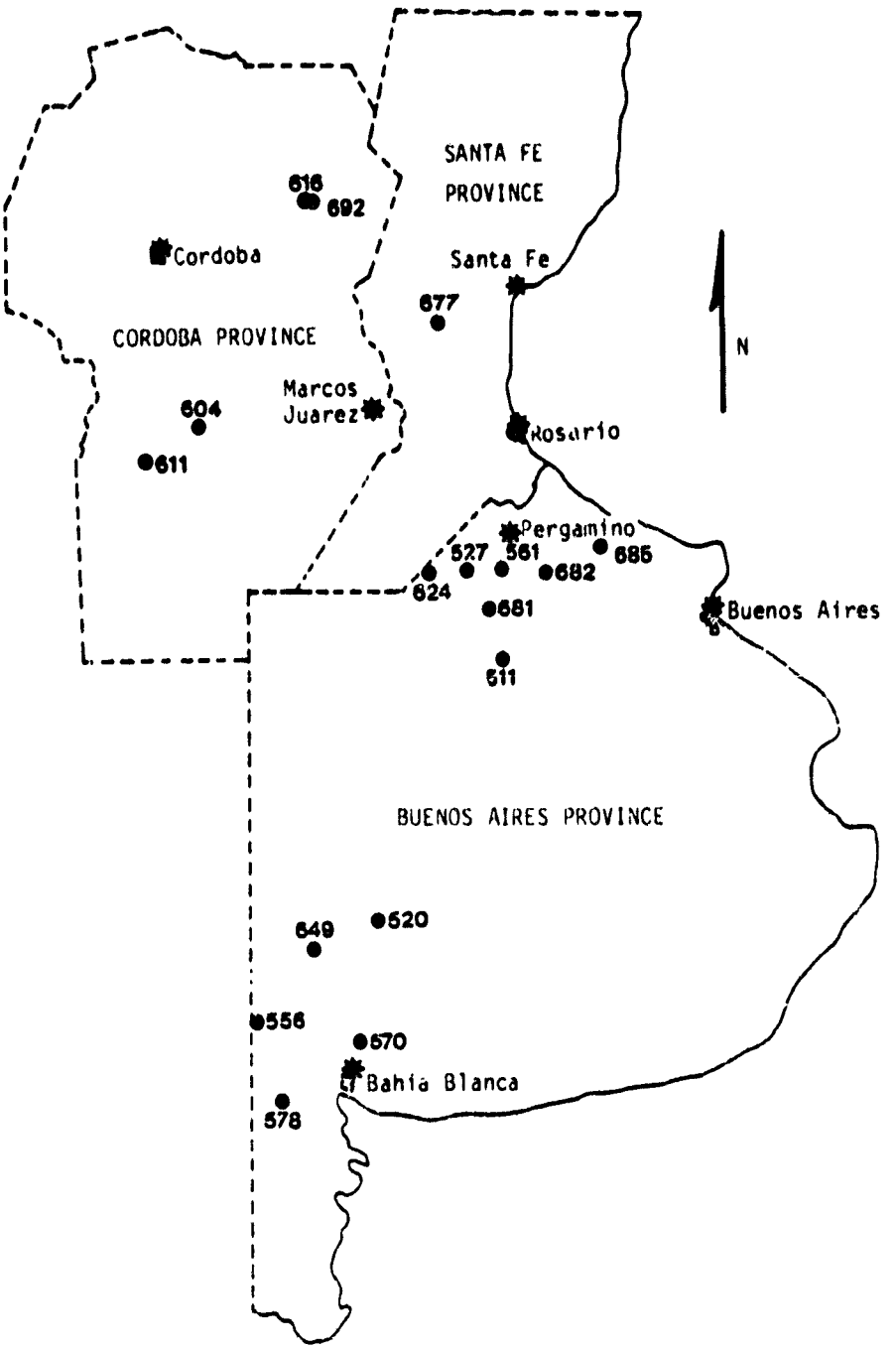


Figure 4-9.- ERIM/UCB ground observations taken in Argentina on February 16 to 30, 1981.

5. CONCLUDING REMARKS

The IR was chosen to represent important country conditions. These conditions are:

a. The IR must be located in an area of high production for the crops of interest.

b. The area selected must be representative of crop varieties and cropping practices encountered throughout the country.

c. The area must reflect the agronomic trends affecting national production.

Each province in the IR was evaluated for the availability of Landsat data; area, yield and production statistics; crop calendars; and other ancillary data. The IR was reviewed according to agrophysical conditions that could influence labeling and classification accuracies. The provinces of Buenos Aires, Cordoba, Entre Rios, and Santa Fe were chosen as the Argentine IR.

The following major variables are discussed in this document in relation to how they may affect labeling accuracy and proportion estimation.

a. Climate

b. Confusion crops

c. Crop calendars

d. Cropping practices

   1. Varieties
   2. Irrigation
   3. Diseases and pests
   4. Crop rotations
   5. Soils

e. Landsat acquisition histories

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APPENDIX A

WHEAT STATISTICS METHODOLOGY IN ARGENTINA

[From LARS Contract Report 112878: Final Report, Vol. IV, Assessment of Methods Acquiring, Analyzing, and Reporting Crop Production Statistics, November 1978, Laboratory for Applications of Remote Sensing, Purdue University, West Lafayette, Indiana.]

CHAPTER 3

WHEAT STATISTICS METHODOLOGY IN ARGENTINA

3.1 Agricultural Statistics in Argentina

3.1.1 Organization and Responsibilities of Statistical Agencies. There are three branches responsible for agricultural statistics within the Agriculture and Livestock Secretariat in Argentina. These three are the Methodology, Crop Statistics and Livestock Statistics Sections under the administration of the National Department of Economics and Rural Sociology (1).

The Crops Statistics Section makes the final recommendations concerning area and production statistics to the Subsecretary of Agricultural Economics who issues the national crop reports. The present Methodology Section has operated for ten years and is responsible for establishing sample surveys in several provinces to estimate livestock numbers and production. Provincial inspectors are employed by the Secretary of the Interior, but their reports are sent to the Crop Statistics Section.

3.1.2 Current Methods of Collecting Crop Statistics. The current federal system of acquiring agricultural statistics consists of traditional subjective methods combined with limited use of area probability surveys. These traditional methods rely to a great extent on the reports of 43 federal inspectors assigned to the 22 provinces in Argentina with nearly half of the inspectors concentrated in the high density wheat area (Figure 3.1). In Buenos Aires Province there are 22 inspectors alone. The major wheat growing region in Argentina may be subdivided according to season, growing conditions and varieties (Figure 3.2). Statistics related to growing season, area, yield and production have been compiled for each of the wheat regions (Table 3.1). There are significant differences among regions in the soils, climate and other growing conditions.

Crop data are collected by an inspector from farmers within his assigned region. Inspectors submit their reports to the Department of Estimation twice a month. These reports include statistics on harvested areas, precipitation and temperature data, and comments on growing conditions and crop status. Other sources of information obtained by the inspectors include bankers, officials of cooperatives, seed merchants, agricultural chemical dealers and others.

Agricultural census data are also used as a basis for crop statistics. Since 1888 eleven censuses have been conducted in Argentina, the two most recent in 1969 and 1974. Results are usually published two years following data collection. Overall, except for the provinces of Buenos Aires and Santa Fe, base maps for census operations are inadequate and may result in overlapping census districts within departments of each province.

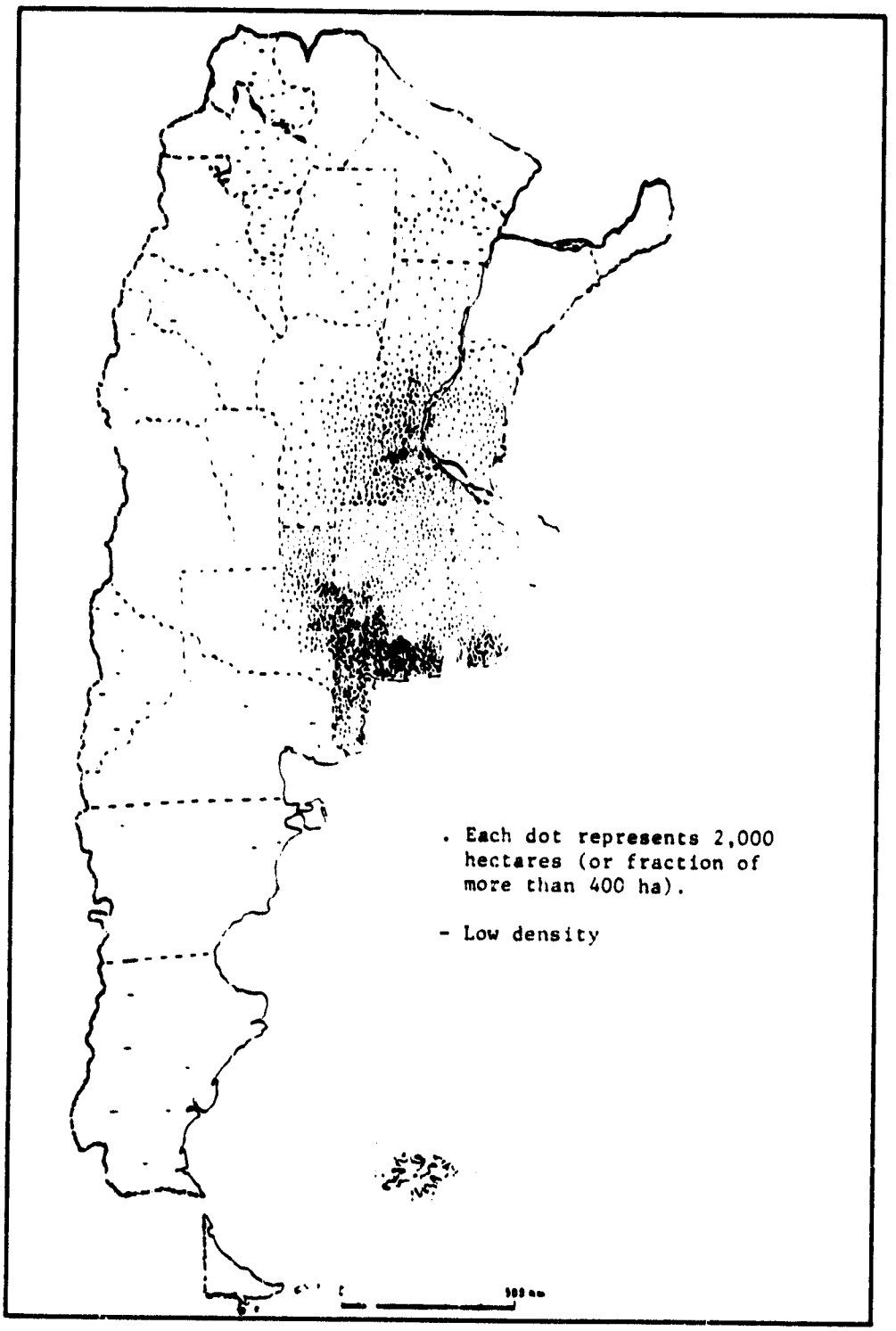

Figure 3.1 Density of area sown to wheat in Argentina, 1971-72 (2). (Total area in wheat: 4,986,000 ha)

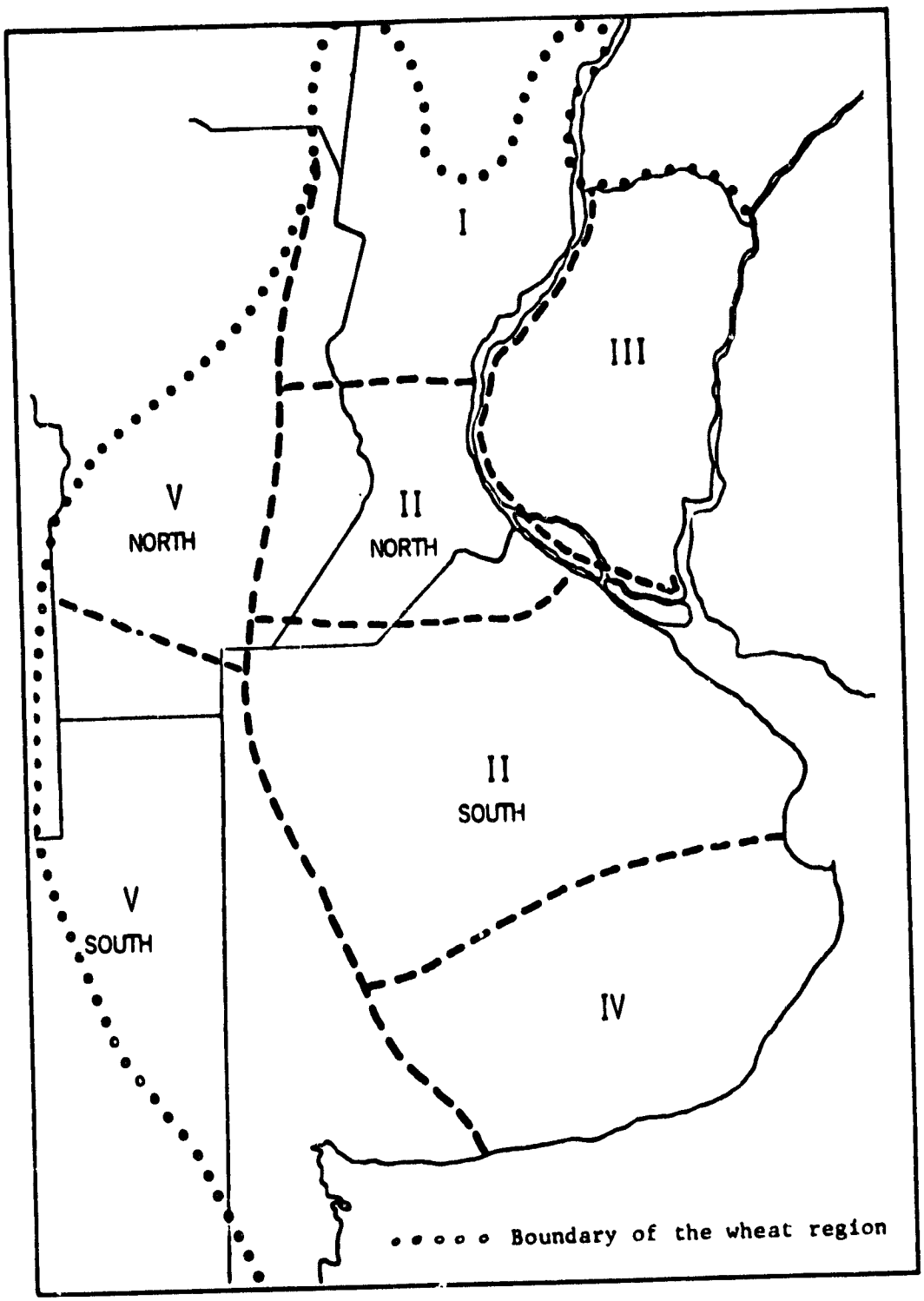

Figure 3.2 Subdivisions within the major wheat-growing region of Argentina (4).

Table 3.1 Wheat regions of Argentina (4).

Region	I	IIN*	IIS*	III	IV	VN*	VS*
Stages of Growth							
Planted	May-Jun	Jun-mid Jul	end May/ mid Jul	mid May/ mid Jul	end May/ mid Jul	May-Jun	mid May/ mid Jul
Booted	1-20 Sep	early Oct	20 Oct	20 Oct	10 Nov	10 Oct	mid Oct/ early Nov
Ripened	Oct	10-20 Nov	end Nov	end Nov	10 Dec	10-20 Nov	20 Nov/ mid Dec
Harvested	early Nov	end Nov/ first Dec	10-20 Dec	10-20 Dec	end Dec/ early Jan	end Nov/ first Dec	early Jan
Area	6.3%	15.5%	15.0%	5.5%	13.9%	5.0%	38.8%
Yield (kg/ha)	1500	2000	1700	1500	1800	1300	1400
Production	4.5%	17.7%	17.5%	4.0%	17.2%	2.7%	36.4%

*N = North

*S = South

3.1.3 Probability Sampling in Buenos Aires Province. In 1972 the province of Buenos Aires was stratified and sample units were selected following a two stage sampling scheme. The purpose of this stratification was to obtain improved livestock estimates and enumerate cultivated areas in wheat, grain sorghum, flax and corn within sample units. Sample surveys based upon this stratification were conducted in 1972, 1973 and 1976.

In Buenos Aires Province there are about 120,000 farms covering an area of approximately 30 million hectares. Of these, 3,150 farms (7.9% of the total land area) were surveyed. The list frame used to identify farms within sample units was obtained from the 1969 agriculture census.

a. *Stratification.* Census districts (similar to townships in the U.S.) were defined as the primary units within a stratum. There are an average of 15 census districts in each department (similar to a county in the U.S.), and Buenos Aires Province contains 120 departments. The greater metropolitan area of the city of Buenos Aires covers twenty of these departments. These were excluded from the survey. The Province was stratified geographically (Figure 3.3) according to the predominant agricultural characteristic (Table 3.2).

Table 3.2 Predominant agricultural characteristics in strata of Buenos Aires Province (3).

Stratum	Characteristic
I	livestock, mixed
II	cattle
III	corn
IV	grain sorghum
V	sunflower
VI	flax
VII	wheat

b. *Sampling plan.* One hundred fifty farms were selected with probability equal to 1.0. These farms accounted for five percent of the cultivated land in the Province of Buenos Aires. The remaining 3000 farms were selected according to a probability plan described below. Within each stratum census districts were the primary units. Two segments (the secondary units) were selected within the primary units and were defined such that there was an average of five farms per segment. Thus, 300 primary units were selected for a total of 3000 farms. For each stratum there was a constant overall sampling fraction for each selected segment.

Primary units were selected with unequal probabilities to reduce variance. To determine the probability of selection for these units, data from the 1969 Agricultural Census and 16 different linear combinations (Table 3.3) of probabilities for each agricultural characteristic (including number of cattle and sheep, areas of corn, wheat and sunflowers) were considered for each stratum. For each stratum each pertinent probability combination was examined to determine the number of primary units required for a specified

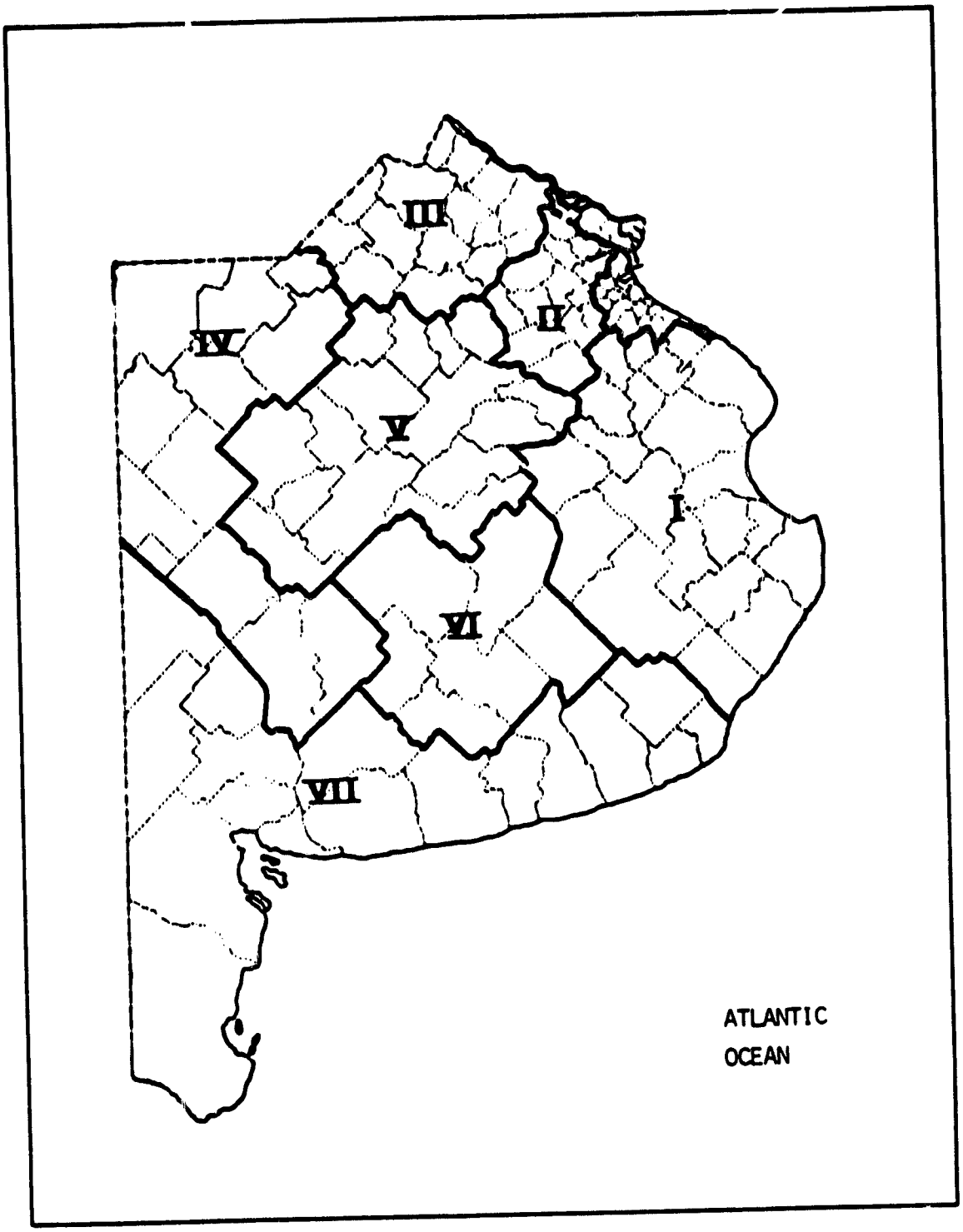

Figure 3.3 Boundaries of strata in the Province of Buenos Aires (3).

Table 3.3 Sixteen probability combinations considered (3).

$$P_1 = \frac{P(cattle) + P(sheep)}{2}$$

$$P_2 = \frac{P(cattle) + P(sheep) + P(wheat)}{3}$$

$$P_3 = \frac{P(cattle) + P(wheat)}{2}$$

$$P_4 = \frac{P(cattle) + P(wheat) + P(cultivated\ land)}{3}$$

$$P_5 = \frac{P(cattle) + P(cultivated\ land)}{2}$$

$$P_6 = \frac{P(cattle) + 2*P(cultivated\ land)}{3}$$

$$P_7 = \frac{2*P(cattle) + P(corn) + P(cultivated\ land)}{4}$$

$$P_8 = \frac{P(cattle) + P(corn) + P(cultivated\ land)}{3}$$

$$P_9 = \frac{P(cattle) + P(sunflower)}{2}$$

$$P_{10} = \frac{P(cattle) + P(sunflower) + P(cultivated\ land)}{3}$$

$$P_{11} = \frac{2*P(cattle) + P(cultivated\ land)}{3}$$

$$P_{12} = \frac{P(cattle) + P(cultivated\ land) + P(sheep)}{3}$$

$$P_{13} = \frac{P(cattle) + P(sunflower) + P(corn) + P(wheat)}{4}$$

$$P_{14} = \frac{2*P(cattle) + P(sunflower) + P(corn) + P(wheat)}{5}$$

$$P_{15} = \frac{P(cattle) + P(cultivated\ land) + P(sunflower) + P(corn) + P(wheat)}{5}$$

$$P_{16} = \frac{P(cattle) + 2*P(cultivated\ land) + P(sheep)}{4}$$

coefficient of variation. Results of each probability combination were evaluated for each stratum using a minimum variance criterion, and probability combinations were selected for each stratum (Table 3.4).

Secondary units, segments, were selected so as to have a constant sampling fraction within the stratum. For example, if f_{h1} is the sampling fraction for the primary units, then f_{h2} is chosen such that $f_{h1} \times f_{h2} = f_h$, the sampling fraction for h.

c. *Allocation.* Since only 300 primary units were to be selected, a study was conducted to compare an optimal allocation procedure with allocation based on a coefficient of variation of 10%. Prior measure of variation was available from the 1969 census. Results of both allocation procedures were compared for each stratum and variable (both livestock and crops) to be estimated. The allocation of sample units was then determined in a subjective manner such that the total number of primary units would be 300.

d. *Estimation and results.* Both direct expansion and ratio estimates were claculated for bread wheat and macaroni wheat (Table 3.5). Note that there is a complete enumeration of 150 which account for 5% of the cultivated area in Buenos Aires Province and that this enumerated figure is added to the estimated value.

This survey was originally designed for the purpose of obtaining livestock estimates. Less attention was given to methods of collecting crop statistics. Lack of field supervision of enumerators and bias introduced by reports from individual farmers of planting intentions rather than actual planted areas resulted in inaccurate estimates for crops. In addition, the survey was conducted at a time which was optimal for enumerating cattle but not necessarily for all crops.

3.2 Area Estimates

The previous section has described two different procedures for estimating crop areas in Argentina--the traditional inspector method and the probability sampling method. In all except strata II and VII the area estimates by inspectors are considerably lower than the estimates by probability sampling, the differences ranging from approximately 20% to 38% (Table 3.6). For stratum II the inspector area estimate was approximately 20% higher than the probability sampling estimates; for stratum VII the inspector estimate was 35% higher than the probability sampling estimates. Since more than 40% of the area planted to wheat in Buenos Aires Province is in this stratum, this discrepancy poses serious questions.

Although probability surveys have been used to estimate the wheat areas in Buenos Aires Province, the use of this method of surveying has not been accepted for determining the national area estimates.

3.3 Yield Estimates

Argentina does not employ objective methods for determining yield estimates. National estimates are based on the biweekly reports of the

Table 3.4 Selected probability combination for each stratum(3).

Stratum	Selected Probabilities
I - (cattle & sheep)	$P_1 = \frac{P(\text{cattle}) + P(\text{sheep})}{2}$
II - (cattle)	$P_5 = \frac{P(\text{cattle}) + P(\text{cultivated crops})}{2}$
III - (corn)	$P_8 = \frac{P(\text{cattle}) + P(\text{cultivated crops}) + P(\text{corn})}{3}$
IV - (grain sorghum)	$P_{16} = \frac{P(\text{cattle}) + 2*P(\text{cultivated crops}) + P(\text{sheep})}{4}$
V - (sunflower)	$P_{10} = \frac{P(\text{cattle}) + P(\text{sunflower}) + P(\text{cultivated crops})}{3}$
VI - (flax)	$P_{12} = \frac{P(\text{cattle}) + P(\text{cultivated crops}) + P(\text{sheep})}{3}$
VII - (wheat)	$P_2 = \frac{P(\text{cattle}) + P(\text{sheep}) + P(\text{wheat})}{3}$

Table 3.5 1976 estimate of hectares planted in wheat in Buenos Aires Province (3).

Estimator	Bread Wheat: Estimation and Estimated Standard Error	Bread Wheat: Estimation of the Coefficient of Variation	Macaroni Wheat: Estimation and Estimated Standard Error	Macaroni Wheat: Estimation of the Coefficient of Variation
$X'_T = X_{IF} + \sum_{h=I}^{VII} x_h \cdot \frac{1}{f_h}$	$X'_T = 3{,}128{,}360$ $\hat{\sigma}_{x'_T} = 148{,}374$	$\hat{CV}_{x'_T} = 4.68\%$	$X'_T = 305{,}854$ $\hat{\sigma}_{x'_T} = 64{,}012$	$\hat{CV}_{x'_T} = 16.25\%$
$X'''_T = X_{IF} + \sum_{h=I}^{VII} \frac{x'_h}{y'_h} \cdot Y_h$	$X'''_T = 3{,}426{,}204$ $\hat{\sigma}_{x'''_T} = 204{,}560$	$\hat{CV}_{x'''_T} = 5.97\%$	$X'''_T = 307{,}997$ $\hat{\sigma}_{x'''_T} = 68{,}115$	$\hat{CV}_{x'''_T} = 22.12\%$

Notation:

X'_T = direct expansion estimate of total area planted

X'''_T = ratio estimate of total area planted

X_{IF} = total area planted on farms selected with probability = 1

x_h = area planted in stratum h

$x'_h = x_h \cdot \frac{1}{f_h}$

f_h = sampling fraction for stratum h

Y_h = actual area in stratum h

$y'_h = y_h \cdot \frac{1}{f_h}$ = estimated area in stratum h

y_h = total area sampled in stratum h

Table 3.6 Sampling and inspector estimates for wheat areas in Buenos Aires Province.*

Stratum	Estimate	Bread Wheat (hectares)	Macaroni Wheat (hectares)
I	Probability Sample		
	Direct Expansion	73,988	8,974
	Ratio	73,999	8,975
	Inspector	59,010	7,800
II	Probability Sample		
	Direct Expansion	23,182	5,510
	Ratio	23,989	5,703
	Inspector	29,400	-
III	Probability Sample		
	Direct Expansion	349,314	2,025
	Ratio	364,774	2,116
	Inspector	224,400	-
IV	Probability Sample		
	Direct Expansion	782,997	4,649
	Ratio	793,177	4,716
	Inspector	618,000	-
V	Probability Sample		
	Direct Expansion	548,119	1,420
	Ratio	545,945	1,414
	Inspector	372,500	-
VI	Probability Sample		
	Direct Expansion	317,202	31,956
	Ratio	301,694	30,349
	Inspector	245,300	46,700
VII	Probability Sample		
	Direct Expansion	1,300,904	251,320
	Ratio	1,303,357	251,793
	Inspector	2,005,000	275,500
TOTAL	Probability Sample		
	Direct Expansion	3,395,706	305,854
	Ratio	3,406,935	305,066
	Inspector	3,553,610	330,000

*Personal communication with Mr. Osvaldo Stepancich.

inspectors. In addition to interviewing farmers and grain merchants in their districts, inspectors obtain information from harvest equipment operators for current harvest conditions and expected yields.

3.4 Crop Reports

All official crop reports are based on subjective estimates of area planted, crop conditions and expected yield by federal inspectors. A forecast of area to be planted in wheat is issued in June. This report is based on planting intentions. Other estimates of area planted in wheat are reported in July and September. Production and derived yield estimates are reported in December, January and March. In Argentina the wheat harvest is generally completed by mid-February.

3.5 Comments

Lack of trained field personnel and operational funds have greatly limited the development of a comprehensive crop survey program in Argentina. This may account, at least in part, for the increasing interest in that country to use satellite scanner data for making crop estimates. The idea is attractive in a country where the fields are generally large (50 hectares and larger) and the agricultural scene is relatively simple. That is, only a few crops are grown commercially over large areas.

Although the use of remote sensing technology seems to have great merit for conducting crop surveys in Argentina, it is important that a sound probability sampling procedure be designed and implemented so that survey techniques using satellite data can be statistically evaluated. Reflectance data from satellite scanners contains valuable information about the agricultural scene, but interpretation of the data for crop estimation purposes may be seriously questioned if there is no scientific ground sampling method to corroborate the results.

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APPENDIX B

NONSTATISTICAL DATA COLLECTION

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NONSTATISTICAL DATA COLLECTION

Nonstatistical agricultural data were obtained through a search, using the agriculture on-line access (AGRICOLA) data base at the National Agricultural Library in Beltsville, Maryland. The AGRICOLA data base contains data on world agriculture. Access to the information contained in this data base was obtained through the Technical Library at the National Aeronautics and Space Administration (NASA), Lyndon B. Johnson Space Center (JSC), Houston, Texas. Data obtained through this search were requested on interlibrary loan through the National Agricultural Library, Texas A&M University, and the University of Texas at Austin.

The Benson Latin American collection at the University of Texas at Austin provided most of the requested information. Most of the data were in Spanish, requiring pertinent parts to be translated. After translation, little agricultural information of use was obtained. Other information used in the IR selection was provided from textbooks and from data related to the Large Area Crop Inventory Experiment (LACIE).[1]

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[1]Environmental Research Institute of Michigan (ERIM), Ann Arbor, Michigan, collected agricultural information, maps, and ground observations and made contacts with the Argentine government during February 1981; data were used from these sources.

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