



Statistical
Reporting
Service

U.S. Department
of Agriculture

Washington, D.C.
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December 22, 1976

SUBJECT: Several New Characteristics of Probability Crop Acreage Data Collected by the Statistical Reporting Service in Illinois in 1975

TO: Robert Freie, Chief, Methods Staff, ED

THROUGH: William H. Wigton, Head, New Techniques Section, RD

Additional crop acreage data was collected in Illinois in 1975 to be used in concert with LANDSAT data for research purposes. Several new characteristics of the probability data for Illinois were: (1) a time series of direct expansion estimates at four time intervals during the crop season, (2) the follow-up of farmers intentions to plant a crop on a field-by-field basis during the crop season, (3) a measure of acres in field from current aerial photographs (digitized acreage) other than acres reported by the farmer, and (4) the retention of average field sizes by crop type. Information concerning these new characteristics will be presented in this memorandum.

I. Time Series of Direct Expansions

The table of time series of direct expansions is in a memorandum dated April 26, 1976 to Rich Allen of which you received a copy. Major crop results are included in Appendix I.

II. Digitized Acreage

A new source of data collected during the crop season in Illinois was low altitude color infrared aerial photography for a subsample of segments. The photography was developed at a scale approximately five inches to a mile. This current aerial photography provided an accurate high resolution picture of the crops and land uses in late summer for a subsample of 202 segments. Extensive software has been developed by personnel at CAC (Center for Advanced Computation) at the University of Illinois for getting accurate acreage figures for each field in a segment from the photographs. This is accomplished using graphics data tablet digitizing equipment connected to interactive DEC PDP-10 computers in Boston.

The aerial photograph and 7½ minute USGS quadrangle map are placed on the tablet concurrently. A transformation is established from the photograph to the map by digitizing common points. Then all tract and fields boundaries are digitized from the photo and transformed to the latitude-longitude coordinate system of the map. A highly accurate acreage calculation algorithm is then applied to the polygon shaped fields and the acreages are stored on disk files. The original ground file using farmers reported acreage throughout the growing season is also stored on the same storage system. Thus using both files a comparison of expanded acreages using both sources of data is possible. To date, such a comparison has been made for the twenty-nine counties wholly contained in the August 4 LANDSAT Pass in Western Illinois.

Digitized vs. Reported Acreage
As Of August 4, 1975

	Digitized	C.V.	Reported	C.V.
Corn	4,189,587	3.31	4,110,150	3.36
Soybeans	1,578,607	7.76	1,539,212	7.65

The distribution of the difference was not studied on a segment or field basis. When the data for the entire state is available perhaps such an analysis will be performed. If any group is interested in further analysis of this data, the tapes would be available. At the present time, any further analysis is not planned by the New Techniques Section other than the comparison of the two totals after all data for the state is available.

III. Follow-Up of Farmers' Intentions

An added benefit of retaining field level identification was the ability to follow-up farmers' intentions field-by-field. At the request of the Illinois SSO an emphasis was given to soybean intentions and double cropped soybeans after winter wheat.

There were 522 fields on the JES recorded as soybean intentions. Of those 522 fields, 486 actually were planted to soybeans. However, eighty fields that were not recorded as soybean intentions on the JES actually went to soybeans. Thus, a net of 44 fields more went to soybeans than expected. Using the average soybean field size and intensive agriculture expansion factor, this amounts to about 200,000 acres or 2% of the soybean estimate.

It is also of interest to note that of the eighty fields that unexpectedly went to soybeans, 42 of the fields were double cropped soybeans after winter wheat which were not recorded as double cropping on the JES.

Included in Appendix III (pages 1-9) is the history of winter wheat fields throughout the crop season and also the history of all fields.

IV. Average Field Sizes

In utilizing LANDSAT data as an auxiliary variable one of the major factors involved is average field size by crop and land use type. There are two major factors involved in the success of estimating a crop once good quality LANDSAT data is obtained. One of these factors is spectral separability of the crop. The other factor is the average field size or amount of data available for estimating mean vectors and covariance matrices of the spectral responses for a crop type. LANDSAT pixels that fall on field boundaries are generally not included in calculating the mean vectors and covariance matrices. Thus crop types with small average field sizes may not have sufficient data for estimation of the multivariate parameters needed for classification.

Using the field level record from the ground surveys it was possible to calculate average field sizes. Appendix II summarizes the average field sizes and also the measure of success in using LANDSAT data described in footnote 1. The segments were treated as a simple random sample in the calculation of average field size.

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APPENDIX I

TIME SERIES OF CROP ACREAGES

ILLINOIS 1975

CROP	JES	LS-JUNE	JULY UPDATE	LS-JULY	LS-AUGUST	LS-SEPTEMBER
CORN UNHARVESTED	11,408	11,414	11,470	11,431	11,678	11,183
SOYBEANS UNHARVESTED	8,569 <u>1/</u> (8,239) <u>2/</u>	8,231 <u>2/</u>	8,668 <u>1/</u>	8,703 <u>1/</u>	8,831 <u>1/</u>	8,164 <u>1/</u>
WINTER WHEAT UNHARVESTED	2,120	2,134	2,129	155	-	-
ALFALFA	664	720	690	736	850	850
OATS UNHARVESTED	496	516	468	438	16	24

JULY UPDATE FIGURES ARE PLANTED ACRES FOR CROPS.

ALL LS-SUPPLEMENT FIGURES INCLUDE ONLY CROP ACRES THAT ARE PLANTED BUT NOT YET HARVESTED. ALFALFA INCLUDES ALL ACRES SEEDING.

1/ INCLUDES DOUBLE CROPPED SOYBEANS

2/ EXCLUDES DOUBLE CROPPED SOYBEANS

APPENDIX II

CROP OR LAND USE	NUMBER JES FIELDS	AVERAGE FIELD ACREAGE	AVERAGE CROP ACREAGE ^{2/}	r^2 ^{1/}
WASTE, ROADS FARMSTEADS	2,212	7.13	7.12	(.78)
WOODS	831	21.12	21.08	(.24)
WATER	51	7.02	6.71	(.89)
CORN	2,166	29.08	28.74	(.75)
OATS	193	14.18	14.04	(.14)
WINTER WHEAT	629	17.93	17.51	-
SORGHUM	23	14.57	14.46	-
SOYBEANS	1,679	28.86	26.51	(.71)
ALFALFA	329	11.44	11.18	(.13)
CLOVER	311	12.01	11.79	-
PERMANENT PASTURE	754	16.98	16.65	(.35)

^{1/} SAMPLE COEFFICIENT OF DETERMINATION BETWEEN FARMERS REPORTED ACREAGE
AND LANDSAT CLASSIFIED PIXELS FOR THE WESTERN LANDSAT PASS IN ILLINOIS.

^{2/} BY FIELD

All Wheat Fields ON JES

STATISTICAL ANALYSIS SYSTEM

JUNE JNCROPTP	JULY JLCROPTP	# Fields FREQUENCY	% PERCENT
540	530	4	0.636
540	540	49	7.790
540	541	342	54.372
540	600	86 ⁴⁴	13.672
540	553	6	0.954
540	554	129	20.509
540	800	10	1.590
540	845	1	0.159
540	848	1	0.159
540	856	1	0.159
TOTALS		629	100.000

44 OF THE 86 FIELDS THAT WENT FROM WINTER WHEAT TO SOYBEANS ONLY 44 (OF THOSE) FIELDS WERE RECORDED ON THE JES AS INTENTIONS.

All WHEAT FIELDS ON JES

STATISTICAL ANALYSIS SYSTEM

JUNE INCROPTP	AUGUST AIIICROPTP	# FIELDS FREQUENCY	% PERCENT
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540	530	4	0.636
540	541	285	45.310
540	600	97 ^{44 a/}	15.421
540	653	10	1.590
540	654	174	27.663
540	800	55	8.744
540	845	1	0.159
540	848	1	0.159
540	856	1	0.159
540	857	1	0.159
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TOTALS		629	100.000

a/ OF THE 97 FIELDS THAT WENT FROM WINTER WHEAT TO SOYBEANS (JUNE-AUGUST) ONLY 44 OF THOSE FIELDS WERE LISTED AS INTENTIONS ON THE JES.

All Wheat Fields ON JES

STATISTICAL ANALYSIS SYSTEM

JUNE INCROPTP	SEPTEMBER SPCROPTP	# Fields FREQUENCY	% PERCENT
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540	530	4	0.636
540	540	4	0.636
540	541	228	36.248
540	547	1	0.159
540	600	96 ^{44 3/4}	15.262
540	653	12	1.908
540	654	162	25.755
540	800	113	17.965
540	842	2	0.318
540	845	1	0.159
540	848	1	0.159
540	856	1	0.159
540	857	4	0.636
-----		-----	-----
TOTALS		629	100.000

3/ SAME NOTE AS AUGUST.

Field History (JUNE-JULY)

T.

STATISTICAL ANALYSIS SYSTEM

JUNE CROP TYPE JNCROPTP	JULY CROP TYPE JLCROPTP	# FIELDS FREQUENCY	% PERCENT
0	0	63	0.662
0	5	1	0.011
0	533	1	0.011
0	541	2	0.021
0	600	15	0.158
0	653	2	0.021
0	654	3	0.032
0	800	2	0.021
0	857	2	0.021
5	5	2211	23.220
5	6	1	0.011
6	6	830	8.717
6	800	1	0.011
7	7	51	0.536
60	60	2	0.021
100	100	1	0.011
530	530	2165	22.737
530	857	1	0.011
533	533	156	1.638
533	534	27	0.284
533	600	1	0.011
533	653	1	0.011
533	654	8	0.084
535	536	1	0.011
540	530	4	0.042
540	540	49	0.515
540	541	342	3.592
540	600	86	0.903
540	653	6	0.063
540	654	129	1.355
540	800	10	0.105
540	845	1	0.011
540	848	1	0.011
540	856	1	0.011
547	547	8	0.084
547	548	4	0.042
550	550	11	0.116
570	570	23	0.242
573	573	11	0.116
574	574	2	0.021
577	577	11	0.116
590	590	20	0.210
600	600	1679	17.633
651	651	2	0.021
653	573	1	0.011
653	600	2	0.021
653	653	324	3.403
653	654	2	0.021
654	530	3	0.032
654	600	9	0.095
654	653	1	0.011
654	654	295	3.098

CREATED
AFTER JES

NOTE: SEE NEXT PAGE
FOR CODES.

(JUNE-JULY)
Turned

654	800	1	0.011
654	842	2	0.021
680	680	4	0.042
681	681	6	0.063
682	682	6	0.063
800	800	2	0.021
842	654	1	0.011
842	842	744	7.813
845	600	1	0.011
845	800	1	0.011
845	845	93	0.977
848	848	15	0.159
856	654	1	0.011
856	856	2	0.021
857	857	58	0.609
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TOTALS		9522	100.000

<u>Code</u>	<u>Description</u>	<u>Code</u>	<u>Description</u>
005	Waste, roads, farmsteads	577	Other vegetables
006	Woods	590	Cover unknown
007	Water	600	Soybeans
530	Corn	601	Soybean stubble
531	Corn stubble	607	Dry beans
533	Oats	651	Wild hay
534	Oats stubble	653	Alfalfa
535	Barley	654	Other hay
536	Barley stubble	680	Other fruit
540	Winter wheat	681	Apples
541	Wheat stubble	682	Peaches
546	Mixed grains	800	Plowed or worked land
547	Rye	842	Perm. pasture
548	Rye stubble	845	Crop pasture
550	Spring wheat	847	Summer fallow
570	Sorghum	848	Other crops
571	Sorghum stubble	856	Soil improvement
572	Sweet corn stubble	857	Idle cropland
573	Sweet corn		
574	Tomatoes		

JNCROPTP

AUCROPTP

FREQUENCY

PERCENT

Field
History
(JUNE - AUGUST)

JNCROPTP	AUCROPTP	FREQUENCY	PERCENT
0	0	41	0.431
0	5	1	0.011
0	530	1	0.011
0	541	2	0.021
0	547	2	0.021
0	577	4	0.042
0	600	15	0.158
0	653	4	0.042
0	654	9	0.095
0	800	8	0.084
0	842	2	0.021
0	857	2	0.021
5	5	2210	23.209
5	6	2	0.021
6	6	830	8.717
6	800	1	0.011
7	7	51	0.536
60	60	2	0.021
100	100	1	0.011
530	5	1	0.011
530	530	2164	22.726
530	857	1	0.011
533	533	12	0.126
533	534	110	1.155
533	600	1	0.011
533	653	29	0.305
533	654	33	0.347
533	800	8	0.084
535	653	1	0.011
540	530	4	0.042
540	541	285	2.993
540	600	97	1.019
540	653	10	0.105
540	654	174	1.827
540	800	55	0.578
540	845	1	0.011
540	848	1	0.011
540	856	1	0.011
540	857	1	0.011
547	547	3	0.032
547	548	7	0.074
547	654	1	0.011
547	800	1	0.011
550	541	8	0.084
550	550	1	0.011
550	654	1	0.011
550	800	1	0.011
570	570	23	0.242
573	572	9	0.095
573	573	2	0.021
574	574	2	0.021
577	577	8	0.084

(JUNE - AUGUST)
continued

577	800	3	0.032
590	590	20	0.210
600	600	1676	17.601
600	800	2	0.021
600	857	1	0.011
651	651	2	0.021
653	573	1	0.011
653	600	3	0.032
653	653	322	3.382
653	654	3	0.032
654	530	3	0.032
654	600	9	0.095
654	653	1	0.011
654	654	290	3.046
654	800	5	0.053
654	842	2	0.021
654	857	1	0.011
680	680	4	0.042
681	681	6	0.063
682	682	6	0.063
800	600	1	0.011
800	800	1	0.011
842	654	2	0.021
842	800	4	0.042
842	842	739	7.761
845	600	1	0.011
845	800	1	0.011
845	845	93	0.977
848	848	15	0.158
856	654	1	0.011
856	800	1	0.011
856	856	1	0.011
857	845	1	0.011
857	857	57	0.599

TOTALS

9522

100.000

Field History (JUNE - SEPTEMBER)

8.

STATISTICAL ANALYSIS SYSTEM

INCRPTP	SPCROPTP	FREQUENCY	PERCENT
0	0	1	0.011
0	5	2	0.021
0	530	6	0.063
0	531	14	0.147
0	540	2	0.021
0	541	4	0.042
0	547	2	0.021
0	577	2	0.021
0	600	16	0.168
0	601	2	0.021
0	653	4	0.042
0	654	10	0.105
0	800	17	0.179
0	842	3	0.032
0	857	6	0.063
5	5	2208	23.188
5	6	1	0.011
5	800	2	0.021
5	842	1	0.011
6	5	1	0.011
6	6	828	8.696
6	800	2	0.021
7	7	51	0.536
60	60	2	0.021
100	100	1	0.011
530	530	2087	21.918
530	531	70	0.735
530	800	7	0.074
530	845	1	0.011
530	857	1	0.011
533	533	11	0.116
533	534	100	1.050
533	600	1	0.011
533	653	29	0.305
533	654	36	0.378
533	800	15	0.158
533	845	1	0.011
535	653	1	0.011
540	530	4	0.042
540	540	4	0.042
540	541	228	2.394
540	547	1	0.011
540	600	96	1.008
540	653	12	0.126
540	654	162	1.701
540	800	113	1.187
540	842	2	0.021
540	845	1	0.011
540	848	1	0.011
540	856	1	0.011
540	857	4	0.042
547	547	3	0.032

(JUNE-SEPT.)
continued

547	548	7	0.074	7
547	654	1	0.011	
547	800	1	0.011	
550	541	8	0.084	
550	654	2	0.021	
550	800	1	0.011	
570	570	23	0.242	
573	572	8	0.084	
573	573	1	0.011	
573	800	2	0.021	
574	574	1	0.011	
574	800	1	0.011	
577	577	7	0.074	
577	800	4	0.042	
590	590	20	0.210	
600	20	1	0.011	
600	540	3	0.032	
600	600	1540	16.173	
600	601	104	1.092	
600	654	1	0.011	
600	800	29	0.305	
600	857	1	0.011	
651	651	2	0.021	
653	573	1	0.011	
653	600	3	0.032	
653	653	317	3.329	
653	654	3	0.032	
653	800	1	0.011	
653	845	4	0.042	
654	530	3	0.032	
654	547	1	0.011	
654	600	9	0.095	
654	650	1	0.011	
654	653	1	0.011	
654	654	275	2.888	
654	800	18	0.189	
654	842	2	0.021	
654	857	1	0.011	
680	680	4	0.042	
681	681	6	0.063	
682	682	6	0.063	
800	540	1	0.011	
800	600	1	0.011	
842	654	1	0.011	
842	800	4	0.042	
842	842	739	7.761	
842	857	1	0.011	
845	540	3	0.032	
845	600	1	0.011	
845	800	1	0.011	
845	842	2	0.021	
845	845	88	0.924	
848	842	1	0.011	
848	848	14	0.147	
856	654	1	0.011	
856	800	1	0.011	
856	856	1	0.011	
857	800	4	0.042	
857	848	1	0.011	
857	857	53	0.557	100%

9522