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Some Observations on Recent U.S. Department of Agriculture World Crop Forecasts With Some Implications for Methods and Procedures

Jim L. Matthews, Chung Yeh and Norton Strommen*

Introduction

The U.S. Department of Agriculture has prepared and issued U.S. crop forecasts for more than a half century but only in the past 10 years has there been a concerted effort to extend this activity to include the rest of the world. Furthermore, it has only been in the last 4 years that the world crop forecastng process has been implemented so that annual forecasts are regularly updated on a monthly basis providing the opportunity to prepare a forecast track record. The World Agricultural Outlook Board (WAOB), formed in 1977, serves as a coordinating organizational unit for clearance of the Agency's crop forecasts. Members from various agencies including the Economic Research Services (ERS), Foreign Agricultural Service (FAS), Agricultural Stabilization and Conservation Service (ASCS), the Agricultural Marketing Service (AMS) and the Board's Joint Agricultural Weather Facility Staff (JAWF) meet monthly to prepare new updated crop production and use forecasts.[1/] The forecasts, by necessity, are consensus forecasts based on the composite views of the members participating. Members utilize a variety of methodologies and

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data analysis techniques. Emphasis on various methodologies and data sources vary throughout the forecast period with certain methodologies and information sources dominating early season forecasts while other methodologies become more dominant later in the season. In many cases, implementation of a set of methodologies is still very much an evolving process along with the development of data bases. For example, WAOB's Joint Agricultural Weather Facility (JAWF) provides USDA's commodity analysts with a systematic weather integration capability. The quantification of weather impacts on yields is, however, limited to the monthly lock up agenda. Because JAWF only makes yield estimates for the countries selected for review in the monthly lock up environment, it is not possible to systematically analyze the potential contributions of weather to the early season errors vs the final yield estimates. However, several trends are readily apparent when looking at the error trends for production.

Scope and Purpose

An evaluation of the most appropriate set of methodologies is much beyond the scope of this particular paper. However, a first step in such an endeavor must include some documentation of the forecasts themselves which may provide valuable clues about the best choice of techniques and procedures. This paper discusses an initial effort to document USDA's annual forecasts primarily for crop production in major producing and consuming countries. Extension to documentation of utilization forecasts is more limited but some documentation is

provided in order to gain a tentative feel for the interaction between production and use forecasts. Discussion is also limited to soybeans and coarse grains though documentation for other major crops is a part of the total endeavor.

Assumptions, Cautions and Procedural Considerations

This exercise proceeds with a number of cautions, the principal one being that the sample of forecasts used for the study is too small to make strong inferences. The period covered is limited to 1979/80 through 1982/83. Forecasts for each period are initially made in May or July preceding the crop year with monthly updates continued through the next May or July. Four years may only represent results from one cyclical phase in the world economy and may lead to biased indications of forecast performance. Furthermore, such a short time span can be unduly influenced by weather, distorting the ability to draw more general inferences. Nevertheless, a number of forecast performance measures are derived and discussed for soybeans and coarse grains and provide for some interesting tentative ideas.

The choice of performance measures and how to evaluate them is a topic meriting considerable attention on its own and a number of analysts have already done so.[2/] For this paper, basically three types of performance measures are utilized. They are: (1) root mean square errors (RMSE), (2) simple average percent errors (SAPE), and (3) Theil's U-2 statistics (U-2). RMSE statistics provide a basis for comparing variances among regions and commodities. Use of simple

average percent errors is useful in determining a bias tendency in the forecasts toward being too high or too low. Theil's U-2 statistic provides for a simple comparative evalution of a forecast.[3/] Its value ranges between zero and infinity with the lower bound (zero) being reached if and only if all forecasts are perfect. If a value of 1 is obtained, the prediction method used has a standard error of forecast equal to that obtained from a simple no-change extrapolation. If the value is larger than 1, the naive no-change forecast would have resulted in a lower standard error of forecast.

World Soybean Production Forecasts

Since 1979/80, annual production forecasts have been prepared monthly beginning in July for most major producing areas in the world, covering an estimated 90 percent of world soybean output. U.S. forecasts, of course, have a much longer history but earlier forecasts for the U.S. are not included for comparison purposes. Calculation of RMSE statistics by country and region is shown in table 1. A desirable error characteristic pattern would be to see forecast errors drop successively as they are updated monthly from new information. Monthly patterns of change are suggestive of the timing and value of new information and may suggest areas for concentrating added attention to information gathering techniques and analyses.

Table 1. Soybean Production; Root Mean Square Error

1979/80-1982/83

Region	Jul	Aug	Sep	Oct	Nov	Jan	Feb	Mar	Apr
	- - percent - -								
U.S.	10.2	4.9	4.4	4.0	3.0	1.7	1.7	1.7	1.7
Canada	14.4	8.4	6.4	6.4	6.0	1.9	1.9	1.9	1.9
E. Europe	20.1	19.4	13.0	16.7	19.9	20.1	20.1	9.2	3.9
USSR	49.8	34.5	23.4	23.4	29.3	23.2	17.4	17.4	16.2
PRC	26.1	26.1	26.1	26.4	26.4	25.4	25.0	25.0	25.0
India	32.1	32.1	32.1	36.5	21.6	21.5	21.5	21.5	21.5
Argentina	24.3	24.8	24.8	24.9	23.0	23.9	11.7	12.7	8.4
Brazil	16.6	14.8	14.5	13.1	12.5	11.9	9.6	6.7	4.1
Paraquay	39.1	39.1	39.1	34.8	26.0	26.0	13.4	13.4	28.2
Other Count.	9.5	7.0	7.5	4.5	3.0	4.5	4.0	3.1	2.7
World	7.0	4.7	4.6	3.9	3.3	2.9	2.4	2.3	2.8
World < U.S.	8.7	8.6	7.5	6.4	6.3	6.6	5.9	5.6	7.3
Maj.For.Exp.	13.7	12.5	11.4	10.3	9.8	8.6	7.5	6.5	5.1

Comments Based on RMSE

A number of countries did show a perceptible drop in forecast error variance following the first round of forecasts in July, particularly the Northern Hemisphere countries. An outstanding exception to this result is the PRC forecasts where forecast errors remained high throughout the forecast horizon. A somewhat similar result is obtained for Eastern Europe though they are a small producer. The USSR estimates demonstrate a large forecast error throughout the period though errors are substantially reduced early on in the forecast period. For the most part, forecasts for centrally planned economies were less reliable. Timeliness of reliable forecast information is the most pronounced problem noted yet for the centrally planned countries. For Southern Hemisphere countries which are also major producers and exporters of soybeans, production forecast errors show a perceptible drop by November-December and again in February-March. The decline in November-December is related more to the flow of economic information factors while the February-March declines reflect the input of weather and yield assessment analyses. On examining forecasts for Argentina and Brazil, it appears that early season information and analyses for Brazil are much better than for Argentina. When the forecast for all countries are combined excluding the U.S. the pattern of forecast errors compare favorably with those for the United States though they are higher throughout the forecast period.

Comments Based on Theil's U-2 Statistic

Based on this statistic, forecasts for most of the countries were significantly better than a naive no-change forecast. (See table 2.) The principal exceptions are the PRC, USSR, Argentina, Paraguay and India. As with the RMSE, Argentine forecasts improved noticeably in February. Early season information was less reliable than a naive no-change estimate. When all countries excluding the U.S. are added together, the aggregate forecast is again significantly better than a naive no-change in spite of obvious deficiencies in forecasts for a few countries.

Comments Based on Simple Average Percent Errors

A tendency for forecasts to be too high or too low are indicated by this statistic with results summarized in table 3. The most significant observation is the tendency for the rest of the world (ROW) estimate to be too high on average over this 4-year period. Most of the overestimation tendency is attributed to the major producer-exporters; namely, Argentina, Paraguay and Brazil. This tendency also applied to the USSR and PRC. Data and official government information sources may be a big problem for the centrally planned states but for the Southern Hemisphere producers some re-examination of basic economic factors may be in order. While the errors in these countries drop perceptibly in February-March, the tendency to overestimate persists probably because of setting early season estimates too high.

Table 2. Soybean Production; Theil U-2 Statistics

1979/80-1982/83

Region	Jul	Aug	Sep	Oct	Nov	Jan	Feb	Mar	Apr
					- - U's - -				
U.S.	0.5	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1
Canada	0.5	0.3	0.2	0.3	0.2	0.1	0.1	0.1	0.1
E. Europe	0.7	0.7	0.5	0.6	0.7	0.7	0.7	0.3	0.1
USSR	2.1	1.5	1.0	1.0	1.3	1.0	0.8	0.8	0.7
PRC	2.3	2.3	2.3	2.4	2.4	2.3	2.2	2.2	2.2
India	1.4	1.4	1.4	1.7	1.0	1.0	1.0	1.0	1.0
Argentina	1.7	1.7	1.7	1.7	1.6	1.7	0.8	0.9	0.6
Brazil	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.3	0.2
Paraquay	2.3	2.3	2.3	2.0	1.4	1.4	0.8	0.8	1.7
Other Count.	0.6	0.4	0.4	0.3	0.2	0.3	0.2	0.2	0.2
World	0.5	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2
World < U.S.	0.9	0.8	0.7	0.6	0.6	0.6	0.6	0.5	0.7
Maj.For.Exp.	0.8	0.7	0.7	0.6	0.6	0.5	0.4	0.4	0.3

Table 3. Soybean Production; Simple Average Percent Deviation 1979/80-1982/83

Region	Jul	Aug	Sep	Oct	Nov	Jan	Feb	Mar	Apr
	- - percent - -								
U.S.	0.1	0.6	1.6	1.0	1.2	1.3	1.3	1.3	1.3
Canada	-6.4	-4.4	-2.1	-2.9	-3.3	0.8	0.8	0.8	0.8
E. Europe	0.9	0.4	-3.5	-5.1	-5.8	-5.0	-5.0	-6.1	-2.0
USSR	33.1	25.3	7.7	7.7	14.4	12.8	10.1	10.1	7.4
PRC	12.0	12.0	12.0	10.6	10.6	7.6	4.6	4.6	4.6
India	-12.3	-12.3	-12.3	-7.2	6.7	5.6	5.6	5.6	5.6
Argentina	17.7	18.0	18.0	19.2	17.1	17.8	9.1	6.4	4.3
Brazil	5.1	4.2	2.7	2.0	1.1	1.4	1.8	2.6	3.2
Paraquay	27.9	27.9	27.9	23.3	18.0	18.0	10.5	10.5	21.5
Other Count.	1.0	4.6	5.8	3.2	2.2	3.3	3.1	0.1	0.5
World	2.6	3.0	3.3	2.6	2.6	2.4	1.9	1.8	2.0
World < U.S.	7.3	7.3	6.4	5.5	5.3	4.8	3.1	3.0	3.4
Maj.For.Exp.	7.8	7.2	6.0	5.4	4.7	4.8	3.3	3.4	3.9

World Soybean Use and Price Estimates

In contrast to a priori expectation there was not an obvious tendency for errors in production forecasts to be transmitted into use forecasts. This linkage is clouded because errors in use forecasts also reflect a changing demand environment introducing additional sources of error. In table 4, the simple average percent errors are examined to illustrate some of these concerns for soybeans, particularly for the United States. Examination of U.S. export data points to little or no bias in U.S. export forecasts though there is a strong tendency to overestimate production in the rest of the world. However, use was consistently overestimated as well in the ROW, clouding the implications of production forecasts for use in U.S. export forecasts. Much of this overestimation in use appeared to be centered in E. Europe and the EC-10 suggesting that errors in demand prospects are potentially troublesome for U.S. trade forecast errors. Apparently, an overestimation bias in the ROW production forecasts were largely offset by overestimation in use neutralizing the impact on U.S. export forecasts. For price forecasts, there was a definite tendency toward overestimation particularly for the early season forecast in May over this four-year period. This pattern does not appear to be closely related to production and use forecast error patterns. Further attention to nominal price forecasting appears warrranted though much of this tendency may relate to inflation expectations over this period.

Table 4. Soybean Production and Use Forecasts;
Simple Average Percent Errors
1979/80-1982/83

Region	May	Jul	Aug	Sep	Oct	Nov	Feb	Apr
	- - Percent - -							
United States								
Production	-1.0	0.1	0.6	1.6	1.0	1.2	1.3	1.3
Exports	-0.1	---	0.2	---	---	0.4	0.2	0.3
Prices	13.4	---	3.7	---	---	2.8	0.3	-1.1
Rest of World								
Production	---	7.3	7.3	6.4	5.5	5.3	3.1	3.4
Crush	---	4.2	4.1	4.4	3.2	2.6	1.7	0.4
Meal Use	---	3.3	3.9	4.1	2.5	1.8	2.1	0.1
Oil Use	---	5.3	5.4	6.4	4.6	4.1	3.1	1.7
USSR								
Production	---	33.1	25.3	7.7	7.7	14.4	10.1	7.4
Meal Use	---	-2.2	-1.3	-1.5	-5.9	-2.0	8.1	-2.0
Eastern Europe								
Production	---	0.9	0.4	-3.5	-5.1	-5.8	-5.0	-2.0
Meal Use	---	6.8	7.2	9.7	8.5	0.8	3.1	0.9
EEC-10								
Meal Use	---	1.6	3.3	3.5	2.8	2.7	1.5	-0.8
India								
Oil Use	---	18.2	21.7	31.8	38.9	26.8	27.6	10.9

Theil U Statistic Observations

Calculation of Theil's U statistics for use estimates in ROW is shown in table 5. For the most part, the results for all use categories, including soybean crush, soybean meal consumption and soybean oil use were not very good when judged by the Theil U. Not until October did the crush and meal use estimates get better than a simple naive forecast. What is most surprising is the relative performance for meal use estimates in the EEC, a market which accounts for half the U.S. exports of soybeans and meal. Not until very late in the forecast period did meal use estimates compare favorably with a naive no-change forecast. The EEC becomes an obvious candidate for higher priority attention with regard to forecasting methods and procedures.

Coarse Grain Production Forecasts

Annual coarse grain production forecasts, when examined for the July-May forecasting period, showed up quite well when compared to soybeans outside the United States. Part of this can be attributed to a larger share of coarse grain production in Northern Hemisphere countries where crop information becomes available at an earlier date. Nevertheless, there are some similarities with forecast error patterns for soybeans which are worth noting.

Table 5. Soybean Product Use Forecasts; Theil U-2 Statistics 1979/80-1982/83

Region	May	Jul	Aug	Sep	Oct	Nov	Feb	Apr
	- - U's - -							
United States								
Production	0.66	0.50	0.26	0.23	0.22	0.16	0.09	0.09
Exports	0.55	---	0.63	---	---	0.53	0.45	0.28
Prices	1.34	---	0.36	---	---	0.52	0.17	0.10
Rest of World								
Production	---	0.85	0.84	0.73	0.63	0.61	0.57	0.70
Crush	---	1.24	1.36	1.28	0.95	0.77	0.50	0.19
Meal Use	---	1.13	1.33	1.25	0.95	0.91	0.88	0.39
Oil Use	---	2.59	2.79	2.93	2.07	1.84	1.38	0.94
USSR								
Production	---	2.13	1.50	1.02	1.02	1.28	0.76	0.71
Meal Use	---	0.63	0.57	0.58	0.64	0.79	0.36	0.27
Eastern Europe								
Production	---	0.68	0.65	0.46	0.60	0.70	0.69	0.14
Meal Use	---	0.87	0.91	1.16	1.31	0.77	0.62	0.38
EEC-10								
Meal Use	---	0.84	1.17	1.20	1.18	1.19	1.08	0.45
India								
Oil Use	---	0.98	1.20	1.57	1.85	1.41	1.42	1.09

RMSE Comments

Based on RMSE statistics shown in table 6, variance in production forecasts outside the U.S. are quite low compared to U.S. coarse grains and to soybeans for ROW. Individual countries and areas have quite large RMSE's but there was much more tendency for the errors to be offsetting. The RMSE for the major exporters was quite high through January when information on crop yield prospects for Southern Hemisphere countries like Australia, Argentina and South Africa become available. Among the major exporter countries, both Argentina and South Africa stand out with quite large RMSE's and are prime candidates for more resource attention in terms of forecast methodology. For example, consider South Africa where the error terms are reduced significantly as the crop stages pass the critical reproduction phase. n the case of South African coarse grains, the RMSE statistics show significant forecast error reduction in the February, March, and April period as follows: Jan., 33.5%; Feb., 28.5%; March, 13.5%; and April, 1.14%. Similar patterns for reduced error is noted in Argentina and Brazil, but the actual magnitude of the error indications is less where yield variability is lower. South Africa shows greater changes because of its greater climate variability and susceptability to drought. Forecast errors for the USSR were initially high but showed a quite acceptable decline into November. Large early season errors, may reflect a too optimistic view about the state of crop yield technologies in the USSR particularly where substantial area expansion has occurred. Australia's pattern of errors also improved perceptibly by October.

Table 6. Coarse Grains Production; Root Mean Square Estimate 1979/80-1982/83

Region	Jul	Aug	Sep	Oct	Nov	Jan	Feb	Mar	Apr
	- - percent - -								
U.S.	13.4	6.2	4.7	3.9	2.8	1.0	1.0	1.0	1.0
Canada	10.8	9.0	4.3	3.7	3.2	1.6	1.6	1.7	1.7
W. Europe	4.5	3.2	3.6	2.1	2.4	1.4	1.2	1.3	0.9
E. Europe	8.0	8.6	8.9	6.2	5.3	4.4	4.3	3.2	1.8
USSR	19.6	13.6	12.4	9.7	5.2	5.6	4.1	4.1	4.0
PRC	3.6	3.3	3.4	3.4	4.9	5.0	5.6	5.6	5.6
India	8.2	5.4	5.1	6.2	7.1	6.7	6.7	5.1	5.1
Thailand	14.5	14.5	12.0	7.8	7.8	6.5	6.5	6.5	6.5
S. Africa	100.2	100.2	100.2	100.2	100.3	84.7	70.4	45.5	12.2
Turkey	6.6	7.3	7.3	5.1	6.3	6.3	6.3	6.3	6.3
Argentina	35.2	35.2	35.2	35.1	35.1	35.6	20.3	15.3	10.1
Brazil	13.7	13.7	13.0	13.3	13.5	14.3	13.4	13.4	12.0
Australia	41.4	32.4	23.1	7.0	6.7	7.2	7.2	7.2	2.1
Other Count.	8.1	8.2	8.6	6.3	5.7	5.4	5.2	4.2	3.3
World	3.6	1.8	1.3	1.7	2.1	1.3	1.6	1.4	1.2
World < U.S.	2.4	1.2	0.8	1.1	2.2	1.8	2.0	1.7	1.4
Maj.For.Exp.	13.9	14.1	12.3	11.2	11.5	11.4	7.4	4.9	1.9

SAPE Comments

Simple average percentage errors for coarse grains (SAPE's), shown in table 7 indicate a tendency to underestimate the U.S. coarse grain crop but no bias is indicated for ROW production. Over-estimation tendencies are indicated for the USSR, South Africa, Argentina and Australia but these are apparently offset by under-estimation for other producing areas.

Theil U Comments

Based on the Theil-U statistics in table 8, most forecasts were superior to the naive no-change with the exception of South Africa, East Europe and Turkey.

Coarse Grain Trade and Use Estimates

SAPE Comments

In contrast to soybeans, there was a tendency to significantly overestimate U.S. exports of coarse grains based on data shown in table 9. In the absence of any bias in the ROW production estimates, there is a clearer indication for coarse grains that forecast errors originating in the assessment of demand may have been a major factor contributing to errors in U.S. coarse grain export forecasts. Import forecasts for ROW were generally biased up by 3 to 5 percent from the first forecasts in May through the forecasts made in November. Examination of forecasts for the major importers indicated significant overestimation tendencies for imports and use over the 1979/80 to

Table 7. Coarse Grains Production; Simple Average Percent Deviation 1979/80-1982/83

Region	Jul	Aug	Sep	Oct	Nov	Jan	Feb	Mar	Apr
	- - percent - -								
U.S.	-6.4	-4.0	-3.2	-2.8	-2.1	-0.3	-0.3	-0.3	-0.3
Canada	-7.5	-5.6	-3.3	-2.9	-2.6	-1.2	-1.2	-1.3	-1.3
W. Europe	-1.0	-1.1	-1.0	-0.3	-0.3	-0.2	-0.4	-0.2	-0.2
E. Europe	-3.3	-4.8	-5.7	-4.1	-4.0	-3.2	-2.7	-2.0	-1.1
USSR	11.4	7.3	6.6	4.0	3.1	3.7	1.3	1.3	1.6
PRC	-1.2	-1.5	-1.6	-1.6	-2.8	-2.9	-3.3	-3.3	-3.3
India	4.0	1.2	0.3	-1.0	-3.0	-3.5	-3.5	-2.0	-2.0
Thailand	-0.8	-0.8	-2.8	-1.4	-1.4	-4.0	-4.0	-4.0	-4.0
S. Africa	38.8	38.8	38.8	38.8	38.6	33.5	28.5	13.5	1.1
Turkey	-5.6	-6.3	-6.3	-3.7	-4.4	-4.4	-4.4	-4.4	-4.4
Argentina	11.3	11.0	11.0	8.0	7.6	9.4	3.2	4.4	2.4
Brazil	-1.3	-1.3	0.3	1.4	1.5	3.9	3.3	3.1	4.2
Australia	16.4	13.9	12.0	2.7	4.7	5.3	5.3	5.3	1.2
Other Count.	0.6	0.7	0.7	-1.9	-1.7	-1.2	-1.6	-1.4	-1.4
World	-1.9	-1.3	-1.1	-1.3	-1.3	-0.4	-0.9	-0.8	-0.7
World < U.S.	0.5	0.1	0.0	-0.6	-1.0	-0.3	-1.1	-1.0	-0.9
Maj.For.Exp.	1.8	2.5	3.1	1.7	1.9	2.9	1.5	0.7	-0.5

Table 8. Coarse Grains Production; Theil U-2 Statistics

1979/80-1982/83

Region	Jul	Aug	Sep	Oct	Nov	Jan	Feb	Mar	Apr
	- - U's - -								
U.S.	0.8	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1
Canada	0.8	0.7	0.3	0.3	0.3	0.1	0.1	0.1	0.1
W. Europe	0.7	0.5	0.6	0.3	0.4	0.2	0.2	0.2	0.2
E. Europe	1.1	1.2	1.2	0.9	0.7	0.6	0.6	0.4	0.3
USSR	0.9	0.6	0.6	0.5	0.2	0.3	0.2	0.2	0.2
PRC	0.7	0.6	0.7	0.7	1.0	1.0	1.1	1.1	1.1
India	0.7	0.5	0.5	0.6	0.7	0.6	0.6	0.5	0.5
Thailand	0.7	0.7	0.6	0.4	0.4	0.3	0.3	0.3	0.3
S. Africa	1.0	1.0	1.0	1.0	1.1	0.9	0.8	0.5	0.2
Turkey	1.1	1.2	1.2	0.9	1.0	1.0	1.0	1.0	1.0
Argentina	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.3	0.2
Brazil	0.9	0.9	0.8	0.8	0.8	0.9	0.8	0.8	0.7
Australia	0.4	0.7	0.5	0.2	0.2	0.2	0.2	0.2	0.1
Other Count.	0.8	0.8	0.9	0.7	0.6	0.6	0.5	0.5	0.3
World	1.1	0.5	0.4	0.5	0.6	0.4	0.5	0.4	0.3
World < U.S.	0.5	0.3	0.2	0.3	0.5	0.4	0.4	0.4	0.3
Maj.For.Exp.	0.8	0.8	0.7	0.6	0.6	0.6	0.4	0.3	0.1

Table 9. Coarse Grains; Simple Average Percent Errors

1979/80-1982/83

Region	May	Jul	Aug	Sep	Oct	Nov	Feb	Apr
	- - percent - -							
United States								
Production	---	-6.4	-4.0	-3.2	-2.8	-2.1	-0.3	-0.3
Feed Use	-4.1	---	-2.9	---	---	-3.1	-1.6	-2.3
Exports	12.3	---	14.8	---	---	13.2	6.0	5.4
Prices	3.1	---	3.1	---	---	0.1	-1.9	-0.5
Rest of World								
Production	---	0.5	0.1	-0.03	-0.6	-1.0	-1.1	-0.9
Imports	5.4	5.2	5.0	4.9	5.1	3.3	0.4	-0.1
Major Exporters								
Production	---	1.8	2.5	3.1	1.7	1.9	1.5	-0.5
Exports	4.0	2.9	3.1	2.7	1.1	2.3	1.0	0.5
USSR								
Production	---	11.4	7.3	6.6	4.0	3.1	1.3	1.6
Feed Use	11.9	8.4	6.5	6.1	4.7	3.2	-1.0	-0.6
Imports	3.4	26.5	26.9	23.1	23.3	7.7	-2.7	-0.6
Western Europe								
Production	---	-1.0	-1.1	-1.0	-0.3	-0.3	-0.4	-0.2
Imports	21.4	15.9	19.0	16.3	14.8	14.5	11.7	10.3
Eastern Europe								
Production	---	-3.3	-4.8	-5.7	-4.1	-4.0	-2.7	-1.1
Imports	24.2	21.5	20.9	17.4	16.2	10.0	4.8	1.4

1982/83 period for the USSR, East Europe and West Europe. In the case of West Europe, the results are generally consistent with those for soybeans and soybean meal use leaving the strong suggestion that this region receive priority attention in terms of forecasting methods and applications particularly techniques emphasizing demand considerations. For the major exporter countries, there was an overestimation bias for production forecasts which is largely transmitted to an overestimation in their exports. In the case of U.S. price forecasts, there was a tendency toward overestimation in the early season forecasts though the upward bias was less than for soybeans.

Theil U Comments

Examination of Theil's U statistics for coarse grain trade and use (table 10) also indicates that import forecasts for West Europe were worse than a naive no-change during the May through August forecast period before showing gradually better relative performance. For all the major exporters of coarse grains, forecasts were significantly better than the naive no-change forecast.

Table 10. Coarse Grains, Use and Trade; Theil U-2 Statistics 1979/80-1982/83

Region	May	Jun	Jul	Aug	Oct	Nov	Jan	Feb	Mar
	- - U's - -								
Imports									
World	0.9	0.9	1.0	1.0	0.8	0.7	0.4	0.2	0.2
W. Europe	1.2	1.1	0.9	1.0	0.8	0.8	0.8	0.7	0.6
E. Europe	1.0	0.9	0.8	0.8	0.6	0.5	0.4	0.3	0.2
USSR	0.7	0.8	0.8	0.8	0.7	0.5	0.4	0.2	0.2
PRC	1.3	1.3	1.3	1.1	0.6	0.6	0.5	0.4	0.3
Japan	1.1	0.9	1.0	1.0	0.8	0.8	0.5	0.5	0.3
Exports									
Canada	0.8	0.8	0.9	0.9	0.7	0.6	0.4	0.4	0.4
Argentina	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.3	0.2
Australia	0.8	0.9	0.7	0.7	0.4	0.4	0.3	0.3	0.3
S. Africa	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.3
Maj. Exptrs.	0.5	0.5	0.6	0.5	0.4	0.4	0.3	0.3	0.2
Use									
U.S.	0.9	1.0	1.0	0.3	0.2	0.5	0.9	0.7	0.7
USSR	1.7	1.7	1.2	1.1	1.0	0.6	0.5	0.3	0.2
PRC	0.7	0.7	1.4	1.4	1.5	1.8	1.0	1.0	1.1
Others	1.0	0.9	1.0	0.9	0.5	0.5	0.4	0.3	0.3

Concluding Remarks

While a longer history of forecasts is needed to derive more definitive statements about USDA's world crop forecast performance, many of the forecasts examined reflected patterns of change that are highly desirable for a good information system. The review also notes areas of possible deficiencies and where greater resource attention might be justified. Perhaps the most obvious is the probable need to place more emphasis on use estimate techniques particularly in some key importing and consuming countries and, in particular, West Europe. Other areas that merit attention include some Southern Hemisphere producer-exporter countries, notably Argentina, where improvement in early season supply estimates for both grains and oilseeds could significantly improve forecasts for both production and exports. In the case of price forecasts, the tendency toward overestimation in early season forecasts for both coarse grains and soybeans suggest price determination processes and relationships merit added attention at this time.

FOOTNOTES

1/ The history of forecasts and a description of the current process and organizational structure is described in fuller detail in other source material. See, for example, (1), (2).

2/ For discussion of forecast performance measures, one can refer to (3), (4).

3/ A Theil's U-2 statistic is computed according to the following formula:

$$U_2 = \sqrt{\sum(P_t - A_t)^2 / \sum(A_t)^2}$$

where the P_t are predicted changes and the A_t are realized changes, defined as:

$$A_t = a_t - a_{t-1}$$
$$P_t = p_t - p_{t-1}$$

and where a_t is the realized outcome for a variable in year t and p_t is the forecast of a_t. This statistic takes on values close to zero when the forecasts are near the reported values. When a naive no change forecast is used, the statistics takes on a value of 1. Consequently, values closer to zero are desired. Values of 1 or more would suggest that the forecast procedure employed is no better or worse than the use of a naive no-change forecast.

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