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Soybeans

1989

1989-90 SOYBEAN OUTLOOK

Uhrig, J. William

1989-90 soybean outlook

6780

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INTRODUCTION

1989
It's a pleasure and a challenge to participate in the AAEA Outlook program. The challenge comes from trying to forecast soybean production and prices at a time when there is much uncertainty about the planted acreage, the potential impact of weather on yields during the next month, and even the demand for soybeans and soybean products for the year ahead. Any data I estimate will become obsolete by the time the USDA issues the August 1 crop report on August 10th. Once the USDA data becomes available, all analysts and members of the grain trade use it (even if only as a basis for making changes in their own estimates).

RECAP OF 1988-89

1692
Soybeans
A year ago, the major soybean producing states experienced the worst drought since the 1930's. June rainfall was the smallest in over 100 years. The major difference from previous droughts is that it arrived early -- starting in February instead of late in the growing season. June rainfall was the smallest in over 100 years. All grain futures prices rose sharply during June. Much of the Midwest experienced 100 degree temperatures in early July--and the 30 day forecast was for continued dry weather and hot temperatures.

The weather patterns changed in July---and the grain markets topped out July 5th, based on the forecast of rain. The major soybean producing areas received above normal July rainfall. Most soybean producers fared pretty well, as the higher prices received helped to offset the reductions

Presented at the AAEA Annual Meeting, Baton Rouge, Louisiana, July 31, 1989.

experienced in yields as a result of the early drought. State and national yields turned out to be much better than was generally expected during the growing season. In retrospect, the Midwest was within a few days of a serious crop disaster.

Each USDA crop report and subsequent Grain Stocks report indicated larger production and stocks of soybeans than was anticipated. Larger soybean stocks normally indicate sluggish utilization or an underestimation of the soybean crop. The final 1988 crop estimate will be revised in January 1990.

1988 CROP CONDITIONS

Hope springs eternal in Agriculture. Past studies by the National Weather Bureau indicate that the Midwest has not previously experienced back-to-back droughts. In the eastern cornbelt, (states east of the Mississippi River) the subsoil moisture is normally replenished over the winter and early spring. Part of the eastern cornbelt (particularly eastern Indiana and Ohio) experienced too much rainfall this past spring-- and over a million acres intended for corn was apparently switched to soybeans or alternate government programs options such as 0-92.

By contrast, large portions of the western cornbelt have received only 2/3 to 3/4 of normal rainfall for the first half of the year. The subsoil moisture has not been recharged. The Palmer Drought Index indicates that parts of Iowa, Nebraska, Minnesota, and Northern Illinois need 8 to 12 inches of rain to fully recharge the subsoil moisture. This problem has been generally recognized for several months. Spring rainfall was adequate to get the crops started and the subsequent rains have come just in time to prevent damage. With continued timely rains, it is possible to produce a soybean crop that is very good, but most likely will be below trend yield. The uncertainty surrounding potential 1989 production helped support soybean prices this spring.

August temperature and rainfall are important variables in determining soybean yields. Weather during the next month is crucial to achieving top soybean yields. The type of weather received during August could make over 200 million bushel difference in U.S. soybeans production during the year ahead. With these caveats, I'll provide my best judgment as to the supply-demand situation at the present time.

SOYBEAN ACREAGE

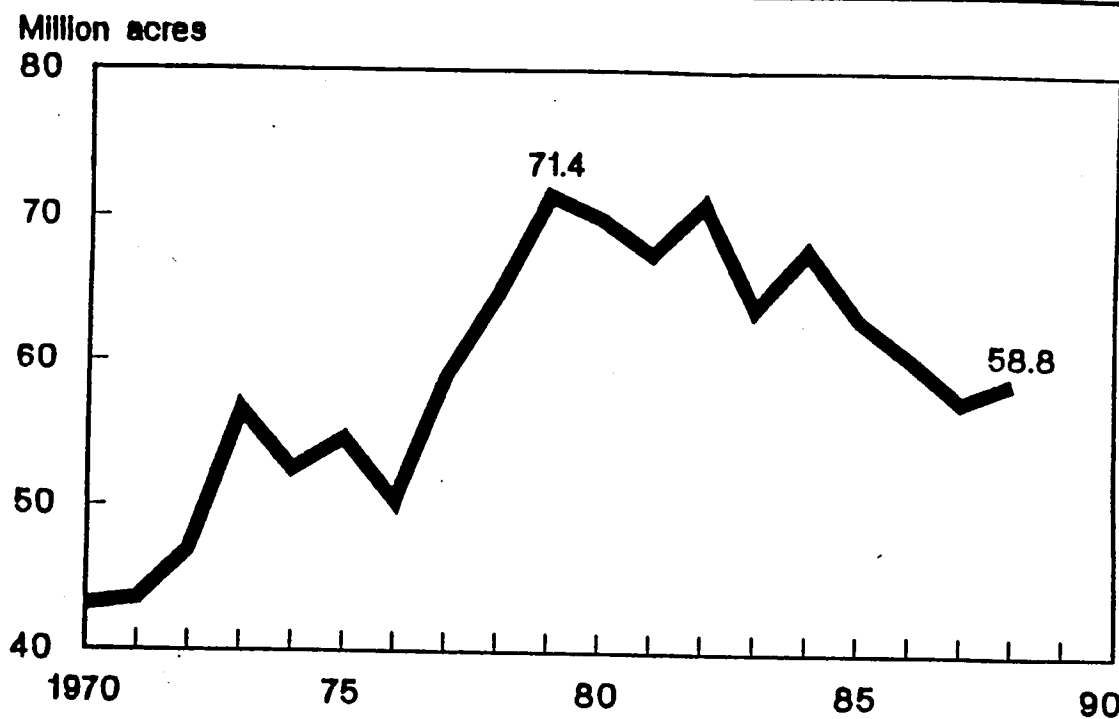
U.S. soybean acreage has generally declined for the past decade. Since the peak of 71.4 million acres in 1979, acreage fell to 58 million (nearly 20 percent decline) in 1987, and was only slightly higher at 58.9 million acres in 1988. The policy provisions of the 1985 Agricultural Adjustment Act made it more profitable for producers to grow crops that have relatively high target prices and deficiency payments. Soybeans compete with corn for acreage in the cornbelt and cotton in the Southern states. Annual program provisions of government wheat program have an important indirect impact on double cropping of wheat-soybeans. See figures 1 and 2.

In March, soybean producers indicated they would plant 61.7 million acres to soybean. This was 5 percent larger than the 58.9 million acres planted in 1988. On July 12th the USDA acreage survey indicated the soybean planted acreage would be 61.325 million and harvested acreage would be 60.193 million acres. The data for this report was collected in early June, and apparently does not fully reflect the wet conditions in eastern Indiana and Ohio. It also does not account for the soybeans and/or other crops planted on about 2 million acres of abandoned wheat land in Kansas. Offsetting these increases will be 500,000 acres of more that was not planted due to excessive rainfall in the Delta.

Westcott^{1/} found that "An increase in winter wheat plantings of 1 million acres would be expected to raise soybean double cropping by nearly

Figure 1

U.S. Soybean Plantings

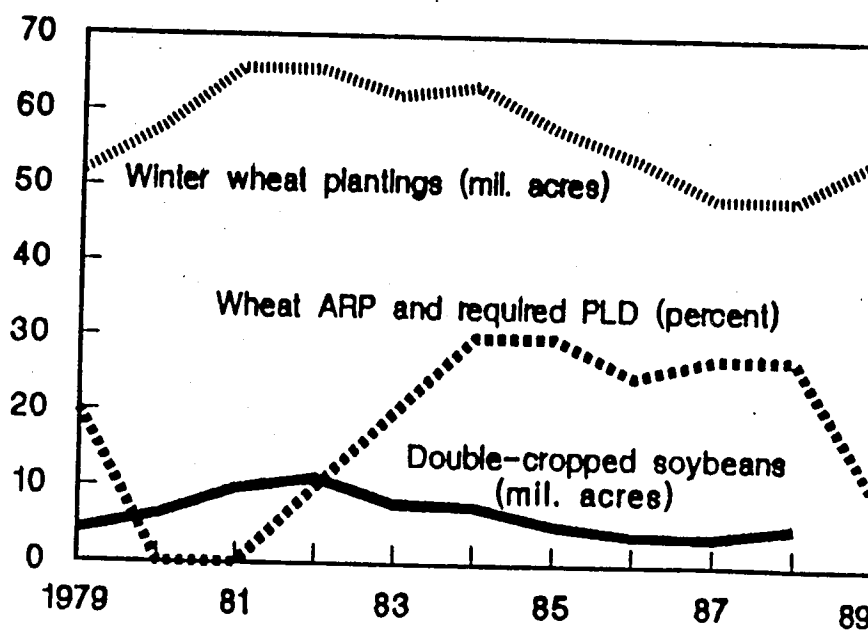


SOURCE: USDA ERS

Economic Research Service

Figure 2

Wheat Program, Winter Wheat Acreage, and Soybean Double Cropping



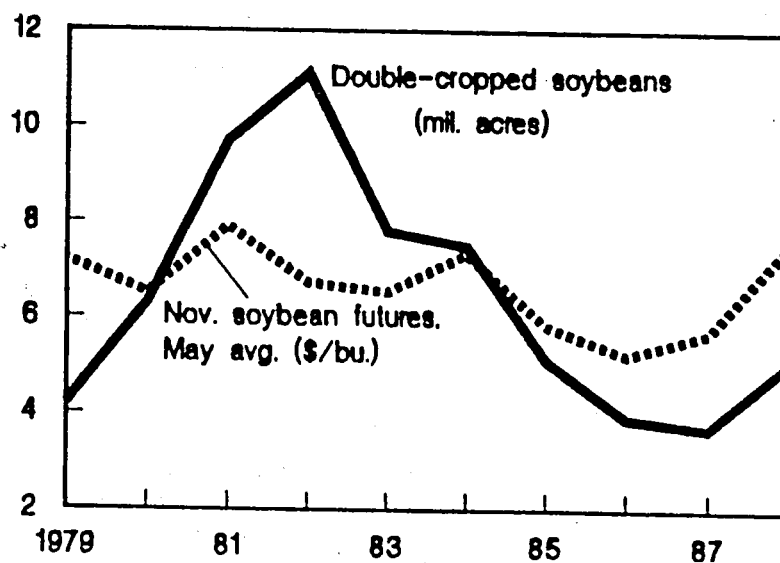
SOURCE: USDA ERS

300,000 acres. An increase in soft red winter wheat plantings of 1 million acres would be expected to boost soybean double cropping by about 800,000 acres. Also, a \$1 increase in soybean price expectations would be expected to raise soybean double cropping by 800,000 acres (i.e., farmers expectations of harvest time soybean prices in May as indicated by the November futures contract). See Figure 3. Changes in the 1989 Government wheat program and the larger 1989 wheat acreage, indicate that double crop soybean acreage would likely increase about 1 to 2 million acres compared to last year's 5.1 million acres.

U.S. SOYBEAN POTENTIAL PRODUCTION

During the past decade, the low U.S. average soybean yield has been 26.2 bushels per acre; the record yield was 34.1 bushels per acre in 1985--a year of ideal weather during the growing season. Thus, the range of potential yields is from 26 to 34 bushels per acre, with a more realistic range of from 30 to 33 bushels per acre. (see table 1)

Figure 3
Soybean Double Cropping and Futures Prices



1/ Paul C. Westcott, "Winter Wheat Plantings and Soybean Double Cropping", Oil Crops, USDA, ERS, January 1989.

Table 1. U.S. Soybean Acreage, Yield and Production.

Year	Planted -----million acres-----	Harvested	Yield (Bu./acre)	Production (million bu.)
1950	15.6	13.8	21.7	299.2
1951	15.7	13.6	20.8	283.8
1952	16.4	14.4	20.7	298.8
1953	16.7	14.8	18.2	269.2
1954	18.9	17.0	20.0	341.1
1955	20.0	18.6	20.1	373.7
1956	22.0	20.6	21.8	449.3
1957	22.2	20.9	23.2	483.4
1958	25.3	24.0	24.2	580.3
1959	23.6	22.6	23.5	532.9
1960	24.6	23.7	23.5	555.1
1961	28.0	27.0	25.1	678.6
1962	28.6	27.6	24.2	669.2
1963	29.6	28.6	24.4	699.2
1964	31.7	30.8	22.8	700.9
1965	35.2	34.4	24.5	845.6
1966	37.3	36.5	25.4	928.5
1967	40.8	39.8	24.5	976.4
1968	42.3	41.4	26.7	1,107.0
1969	42.5	41.3	27.4	1,133.1
1970	43.1	42.2	26.7	1,127.1
1971	43.5	42.7	27.5	1,176.1
1972	46.9	45.7	27.8	1,270.6
1973	56.5	55.7	27.8	1,547.5
1974	52.5	51.3	23.7	1,216.3
1975	54.6	53.6	28.9	1,548.3
1976	50.3	49.4	26.1	1,288.6
1977	59.0	57.8	30.6	1,767.3
1978	64.7	63.7	29.4	1,868.8
1979	71.4	70.3	32.1	2,260.7
1980	69.9	67.8	26.5	1,797.5
1981	67.5	66.2	30.1	1,989.1
1982	70.9	69.4	31.5	2,190.3
1983	63.8	62.5	26.2	1,636.0
1984	67.8	66.1	28.1	1,861.0
1985	63.1	61.6	34.1	2,099.0
1986	60.4	58.3	33.3	1,940.0
1987	58.0	57.0	33.7	1,923.0
1988	58.9	57.4	26.8	1,539.0

Table 2 represents my current thinking about the potential production of the 1989 soybean crop. The range in production is 250 million bushels-- from 1.8 billion to 2.05 billion bushels. A difference in supplies of this magnitude could make \$1.50 per bushel difference in the U.S. annual soybean price.

TABLE 2. Soybean Production Possibilities

YIELD, BU/ACRE	HARVESTED ACREAGE (MIL)		
	60	61	62
	million bushels		
30	1,800	1,830	1,860
31.5	1,890	1,920	1,950
33	1,980	2,010	2,050

	YEAR	AMOUNT
Record Prdtn	1979	2,190 Million Bushel
Record Yield	1985	34.1 BU/Acre

TABLE 3. Harvested Area of Soybeans by Country.

Marketing Year	United States	Brazil	China	Argentina	Paraguay	Other	World Total
			(1,000 Acres)				
1967/68	39,805	1,784	20,213	49	35	6,983	68,869
1968/69	41,392	2,239	19,768	69	69	6,842	70,379
1969/70	41,337	3,259	19,768	64	99	7,304	71,832
1970/71	42,249	4,240	19,768	89	133	7,341	73,821
1971/72	42,704	7,018	20,509	168	188	7,549	78,135
1972/73	45,684	8,933	22,486	388	200	8,004	85,694
1973/74	55,667	12,708	22,486	850	314	8,760	100,785
1974/75	51,340	14,391	21,745	880	373	8,856	97,585
1975/76	53,616	15,856	22,486	1,072	427	8,308	101,766
1976/77	49,400	17,470	16,531	1,631	566	8,295	93,893
1977/78	57,829	19,229	16,926	3,089	672	9,036	106,782
1978/79	63,663	20,401	17,653	3,954	890	9,842	116,401
1979/80	70,342	21,681	17,907	5,016	988	10,660	126,594
1980/81	67,812	21,006	17,855	4,300	988	10,257	122,218
1981/82	66,163	20,267	19,827	4,907	988	11,226	123,380
1982/83	69,440	20,104	20,791	5,636	865	12,313	129,149
1983/84	62,524	23,279	18,698	7,191	1,038	11,846	124,575
1984/85	66,112	25,088	18,014	8,078	1,359	14,520	133,170
1985/86	61,582	23,351	19,076	8,278	1,359	14,851	128,492
1986/87	58,291	22,906	20,485	8,673	1,310	15,444	127,108
1987/88	56,981	25,970	20,880	10,526	1,532	17,297	133,137
1988/89	57,377	28,416	20,509	12,355	1,705	18,335	138,697

Table 3 shows the harvested acreage of soybeans by country. The decline in U.S. soybean acreage has more than been offset by increases in other countries--particularly Brazil and Argentina.

TABLE 4. USDA World Supply/Demand Report: Soybeans 7/12 in MMT.

	Beg Stk	Prod	Imprts	Crush	Dom Use	Exports	End Stocks
<u>89-90</u>							
July 12	15.19	109.06	25.75	88.40	105.56	26.48	17.95
US	3.40	53.07	0	30.35	32.93	16.33	7.21
Foreign	11.78	55.99	25.75	58.05	72.63	10.15	10.74
Argentina	2.93	10.50	0	7.00	7.60	2.50	3.33
Brazil	6.27	21.00	0.03	16.30	17.73	4.50	5.07
EC	0.64	1.80	12.00	11.97	13.62	0.25	0.57
Japan	0.82	0.28	4.65	3.84	5.09	0	0.66
<u>88-89</u>							
July 12	19.84	93.47	24.44	32.07	99.06	23.51	15.18
US	8.22	41.88	0	29.12	31.72	14.97	3.40
Foreign	11.62	51.60	24.44	52.95	67.33	8.54	11.78
Argentina	3.86	6.60	0	6.23	6.77	0.75	2.93
Brazil	4.52	22.00	0.06	14.40	15.81	4.50	6.27
EC	0.90	1.65	11.02	10.94	12.66	0.28	0.64
Japan	0.98	0.28	4.50	3.70	4.94	0	0.82

World production of soybeans is projected to increase 19 percent in 1989 (15.6 MMT) from 1988 levels, based on the USDA crop Report and projections. U.S. production increased 27 percent (11.2 MMT) while foreign production is projected to increase 8.5 percent (4.4 MMT). This estimate is based on Argentina's production of 10.5 MMT and Brazilian production of 21 MMT based on trend in yield and harvested acreage--which means a potential increase of 3 MMT or over 100 million bushels increase for the Southern

Hemisphere. The South American crops will come to market starting in March 1990.

World utilization is projected to expand 7.7 percent (9.47 MMT) during the year ahead. U.S. usage is expected to increase 5.5 percent (2.57 MMT) over last years poor usage, while foreign usage is projected to expand over 9 percent (6.91 MMT). The increase in foreign usage is 2.7 times larger than the increase in U.S. usage.

SUPPLY-DEMAND PROSPECTS

All estimates of supply and demand made in July must be considered as tentative and subject to revision. After several attempts of developing my own supply-demand estimates, I found they did not differ significantly from those published by USDA on July 12. An overall picture is provided by Table 5, which shows the percentage change from the previous marketing year.

TABLE 5. Percent Change in Supply-Demand of Soybeans, Oil, and Meal

	Supply	Domestic Use	Exports	Total Utilization	Carryover Stocks
Soybeans	+ 13	+ 4	+ 9	+ 6	+ 212
Oil	+ 3 1/2	+ 5	- 2	+ 4	+ 1
Meal	+ 6	+ 8	0	+ 6	0

What emerges is a rapid rebuilding of U.S. supplies and stocks, due largely to increases in world production, and a very competitive environment for exports. A 13 percent increase from the prior year's level is a historically high year/year increase. It far exceeds the post drought year increases of 107 and 103 percent in 1981 and 1984 respectively.

Producer sales in Argentina and Brazil were small during May and June due to an expected devaluation of their currency, which would boost their soybean price. The currency adjustments have occurred, and sales are

expected to resume, being heavily concentrated in July-September -- before the U.S. crop comes to market.

When the U.S. and South American supplies are combined, supplies on September 1 are estimated to be about 15 percent larger than last year. This will limit upside potential for prices, without weather problems in the U.S. in August and/or the coming South American growing season.

World trade in soybeans is estimated to be 23 million tons during the year ahead compared to 19.85 million last year. This is an increase of 16 percent. The 1988 drought apparently cut world trade by 20 percent. Lower price levels relative to last year and the rebuilding of depleted foreign pipeline stocks are the main stimulants. The major problem is that U.S. will not likely share proportionately in the increases due to foreign competition. Soybean oil exports are expected to decline due to increased supplies of competing oils. The prospect of a recession in the U.S. and other countries may temper the outlook for exports.

U.S. soybean exports are estimated to increase 11 percent to 600 million bushels compared with 550 million for 1988/89. Soybean meal exports are estimated at 5.5 million tons, the same as last year. Soybean oil exports are projected to decline 25 million pounds, but because of reduced imports will represent a net increase in trade. U.S. soybean oil exports are dependent upon government GS102 and PL480 programs. Large Export Enhancement Initiatives are not expected for soybean oil.

Domestic soybean meal usage is projected to increase 8 percent to 21 million tons. This reflects lower meal prices and improved livestock feeding margins.

Domestic use of soybean oil is projected to increase 5 percent, at 11 billion pounds. This is in line with past post-drought recoveries. Domestic soybean oil consumption will benefit from lower prices, and smaller cottonseed oil supplies.

Based on the current supply-demand balance tables, U.S. ending stocks of soybeans as of August 31, 1990 are projected to be 265 million bushels, compared with 125 million on September 1, 1989. Ending stocks/use ratio would increase to 14.6 compared to 7.3 -- doubling from a year earlier.

TABLE 6. U.S. Soybean Supply/Usage Balance September-August

	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
	----- Million Bushels -----					
Beginning Stocks	176	316	536	436	302	125
Production	1,861	2,099	1,940	1,923	1,539	1,950
Supply	2,037	2,415	2,476	2,359	1,841	2,075
Crush	1,031	1,052	1,179	1,173	1,070	1,115
Exports	598	740	752	803	550	600
Feed, Seed	61	60	82	56	60	60
Residual	31	26	27	25	36	35
Total Usage	1,721	1,878	2,040	2,057	1,716	1,810
Ending Stocks	316	536	436	302	125	265
End Stk as Pct. of Total Usage	18.5	28.5	21.3	14.7	7.3	14.6
U.S. Average Pr	\$5.84	\$5.05	\$4.78	\$5.88	\$7.35	\$4.75-6.25

TABLE 7. U.S. Soybean Meal Supply/Usage Balance October-September

	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89 ¹	1989-90 ¹
	- - - - - thousand tons - - - - -						
Beginning Stocks	474	255	387	212	240	153	300
Production	22,758	24,529	24,951	27,759	28,060	25,147	26,500
Supply	23,232	24,784	25,338	27,791	28,300	25,300	26,800
Domestic Use	17,618	19,480	19,090	20,402	21,268	19,500	21,000
Exports	5,359	4,915	6,036	7,328	6,878	5,500	5,500
Total Use	22,977	24,397	25,126	27,730	28,146	25,000	26,500
Ending Stocks	255	387	212	240	153	300	300
Soybean Crush	963	1,041	1,055	1,179	1,175	1,070	1,115
Meal Yield lbs. Per Bushels	47.3	47.1	47.3	47.2	47.8	47.0	47.5
dollars/ton ²	\$188.21	\$125.46	\$154.88	\$163.61	\$221.90	\$230.00 ³	\$140-180 ³

¹ USDA estimate 7-12-89

² Wholesale price 44% protein Decator

³ USDA estimate July 12

TABLE 8. U.S. Soybean Oil Supply/Usage Balance October-September

	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89 ¹	1989-90 ¹
	million pounds						
Beginning Stocks	1,261	721	632	947	1,725	2,092	2,085
Production	10,872	11,468	11,617	12,786	12,974	12,270	12,385
Imports	0	20	8	0	194	352	30
Supply	12,133	12,209	12,257	13,733	14,893	14,010	14,500
Exports	1,823	1,660	1,257	1,186	1,873	1,425	1,400
Domestic	9,589	9,916	10,053	10,821	10,928	10,500	11,000
Total Usage	11,412	11,577	11,310	12,007	12,801	11,925	12,400
Ending Stocks	721	632	947	1,726	2,092	2,085	2,100
Oil Yields lbs. Per Bushels	11.3	11.0	11.0	10.85	11.0	11.5	11.1
Soybean Crush Ml. Bushels	963	1,041	1,054	1,179	1,175	1,070	1,115
Ending Stks/Usage	6.3	5.5	8.4	14.4	16.3	17.5	16.9
Oil & Prod Value	43.6	52.0	34.8	30.0	31.0	30.0	31.0 ²
Cents/lb. ³	30.55	29.52	18.02	15.36	22.92	21.50	19.50-23.5

¹ USDA estimate July 12

² JWU estimate

SUMMARY

- 1) When analyzing oilseeds, the world supply-demand situation is important. An analysis of the soybean situation must include two marketing years.
 - a. September-August in the U.S.
 - b. March-February in South America
- 2) South America is becoming an increasingly important factor in soybean production--and has a big impact on the volume of U.S. exports and the resultant prices.
- 3) There is some evidence that both the 1988 U.S. and the 1989 Brazilian Soybean Crop may have been underestimated.
- 4) We still face the potential for weather stress in the U.S. on soybeans during August and weather problems in South America in 1989-90.
- 5) Many companies locked in supplies last June at what turned out to be high prices. This year, they will have to be convinced of a widespread drought before becoming aggressive buyers.

- 6) Synthetic lysine is a new factor cutting into the demand for soybean meal. In hog rations three pounds of lysine and 97 pounds of corn can substitute for up to 25 percent of the required protein--if the price is right. Feed manufacturers using least-cost ration formulation are keenly aware of this.
- 7) Trade inventories are low - as companies buy hand-to-mouth. Increased usage and rebuilding of pipeline supplies will help boost prices after harvest.
- 8) The current lack of carrying charges in the futures markets does not encourage commercial hedging and storage. The spreads between the futures contracts and the basis will have to widen to encourage commercial hedging and storage.
- 9) Board crushing margins have deteriorated in recent months.
- 10) U.S. is likely to produce at least 100 million bushels more soybeans than will be used in the 1989-90 marketing year.
- 11) The 1989 soybean loan--which will not be announced until after the August Crop Report is likely to be \$4.55 per bushel.
- 12) USDA World Board estimates the U.S. average farm price in a range of \$4.75-\$6.25 for 1989-90. The midpoint is \$5.50 per bushel.

CONCLUSION

Soybeans face tough world competition during the year ahead. Much uncertainty centers around both potential production and demand. Hot and dry weather during August can provide price rallies. The U.S. average price for soybeans during the 1989-90 marketing year is expected to be \$6.00 per bushel or slightly less---unless widespread weather problems develop in August--or the 1990 South American crop experiences production problems.

Use any rally to sell soybeans for harvest delivery for \$6.00 or better. The lowest price is expected to be at harvest. A harvest price of \$6.00 is equal to @ \$6.50 for early 1990 sales.

Modest recovery in prices is expected after harvest. From harvest lows, storage into early 1990 will be profitable. Cash prices could trade in a range of \$5.00 to \$6.50 during the year ahead.

Without storage, consider selling at harvest and purchasing a Call Option.

TABLE 9.

SOYBEAN: YIELD, 1965 TO DATE, U. S.
COMPARISON OF FORECAST AND FINAL ESTIMATES

YEAR	YIELD FORECAST AND FINAL ESTIMATES						DEVIATIONS FROM FINAL ESTIMATE					
	AUG 1	SEP 1	OCT 1	NOV 1	ANN SUM	FINAL	AUG 1	SEP 1	OCT 1	NOV 1	ANN SUM	
BUSHEL												
1965	24.9	25.0	24.9	24.6	24.5	24.5	.4	.5	.4	.1		
1966	23.3	25.1	25.1	25.2	25.4	25.4	-2.1	-.3	-.3	-.2		
1967	24.9	25.0	24.8	24.6	24.5	24.5	.4	.5	.3	.1		
1968	26.0	26.4	26.0	26.4	26.7	26.7	-.7	-.3	-.7	-.3		
1969	25.5	25.3	25.7	26.3	27.4	27.4	-1.9	-2.1	-1.7	-1.1		
1970	26.8	27.2	27.3	27.3	26.8	26.7	.1	.5	.6	.6	.1	
1971	28.8	27.7	27.4	28.0	27.6	27.5	1.3	.2	-.1	.5	.1	
1972	27.7	28.1	28.7	29.5	27.9	27.8	-.1	.3	.9	1.7	.1	
1973	27.4	28.3	28.3	28.0	27.8	27.8	-.4	.5	.5	.2		
1974	25.1	25.1	24.0	23.7	23.5	23.7	1.4	1.4	.3		-.2	
1975	27.2	26.9	27.5	28.4	28.4	28.9	-1.7	-2.0	-1.4	-.5	-.5	
1976	27.2	25.8	25.3	25.3	25.6	26.1	1.1	-.3	-.8	-.8	-.5	
1977	27.5	28.3	28.3	28.9	29.6	30.6	-3.1	-2.3	-2.3	-1.7	-1.0	
1978	27.9	28.0	28.3	28.6	29.2	29.4	-1.5	-1.4	-1.1	-.8	-.2	
1979	30.3	30.9	31.5	31.8	32.2	32.1	-1.8	-1.2	-.6	-.3	.1	
1980	27.4	27.0	26.1	26.5	26.8	26.5	.9	.5	-.4		.3	
1981	30.2	31.2	31.5	31.0	30.4	30.1	.1	1.1	1.4	.9	.3	
1982	32.3	32.6	32.4	32.4	32.2	31.5	.8	1.1	.9	.9	.7	
1983	29.7	24.9	24.7	25.0	25.7	26.2	3.5	-1.3	-1.5	-1.2	-.5	
1984	30.5	30.3	29.5	28.5	28.2	28.1	2.4	2.2	1.4	.4	.1	
1985	31.5	33.2	33.9	34.2	34.1	34.1	-2.6	-.9	-.2	.1		
1986	32.9	33.1	33.3	33.8	33.8	33.3	-.4	-.2		.5	.5	
1987	34.7	34.0	34.2	34.1	33.7	33.7	1	.3	.5	.4		
1988	26.0	25.9	26.4	26.6	26.8		-.8	-.9	-.4	-.2		

SOURCE: USDA NASS

TABLE 10.

**SOYBEAN: PRODUCTION, 1965 TO DATE, U. S.
COMPARISON OF FORECAST AND FINAL ESTIMATES**

	PRODUCTION FORECAST AND FINAL ESTIMATES					DEVIATIONS FROM FINAL ESTIMATE				
YEAR	AUG 1	SEP 1	OCT 1	NOV 1	FINAL	AUG 1	SEP 1	OCT 1	NOV 1	
	MILLION BUSHELS									
1965	864	867	862	853	846	18	21	16	7	
1966	860	926	927	929	928	-68	-2	-1	1	
1967	999	1,003	994	985	976	23	27	18	9	
1968	1,064	1,080	1,066	1,079	1,107	-43	-27	-41	-28	
1969	1,061	1,055	1,070	1,094	1,133	-72	-78	-63	-39	
1970	1,114	1,133	1,135	1,134	1,127	-13	6	8	7	
1971	1,235	1,186	1,175	1,200	1,176	59	10	-1	24	
1972	1,270	1,286	1,317	1,351	1,271	-1	15	46	80	
1973	1,540	1,599	1,588	1,575	1,548	-8	51	40	27	
1974	1,314	1,316	1,262	1,244	1,216	98	100	46	28	
1975	1,458	1,442	1,474	1,520	1,548	-90	-106	-74	-28	
1976	1,344	1,274	1,250	1,252	1,289	55	-15	-39	-37	
1977	1,602	1,644	1,647	1,683	1,767	-165	-123	-120	-84	
1978	1,765	1,772	1,792	1,810	1,869	-104	-97	-77	-59	
1979	2,129	2,174	2,213	2,236	2,261	-132	-87	-48	-25	
1980	1,880	1,831	1,757	1,775	1,798	82	33	-41	-23	
1981	2,017	2,089	2,107	2,077	1,989	28	100	118	88	
1982	2,293	2,314	2,300	2,299	2,190	103	124	110	109	
1983	1,843	1,535	1,517	1,537	1,567	276	-32	-50	-30	
1984	2,035	2,028	1,912	1,902	1,867	168	161	45	35	
1985	1,959	2,063	2,108	2,129	2,099	-140	-36	9	30	
1986	1,979	1,980	1,992	2,009	1,940	39	40	52	69	
1987	2,000	1,957	1,968	1,960	1,923	77	34	45	37	
1988	1,474	1,472	1,501	1,512	1,539	-65	-67	-38	-27	

SOURCE: USDA NASS

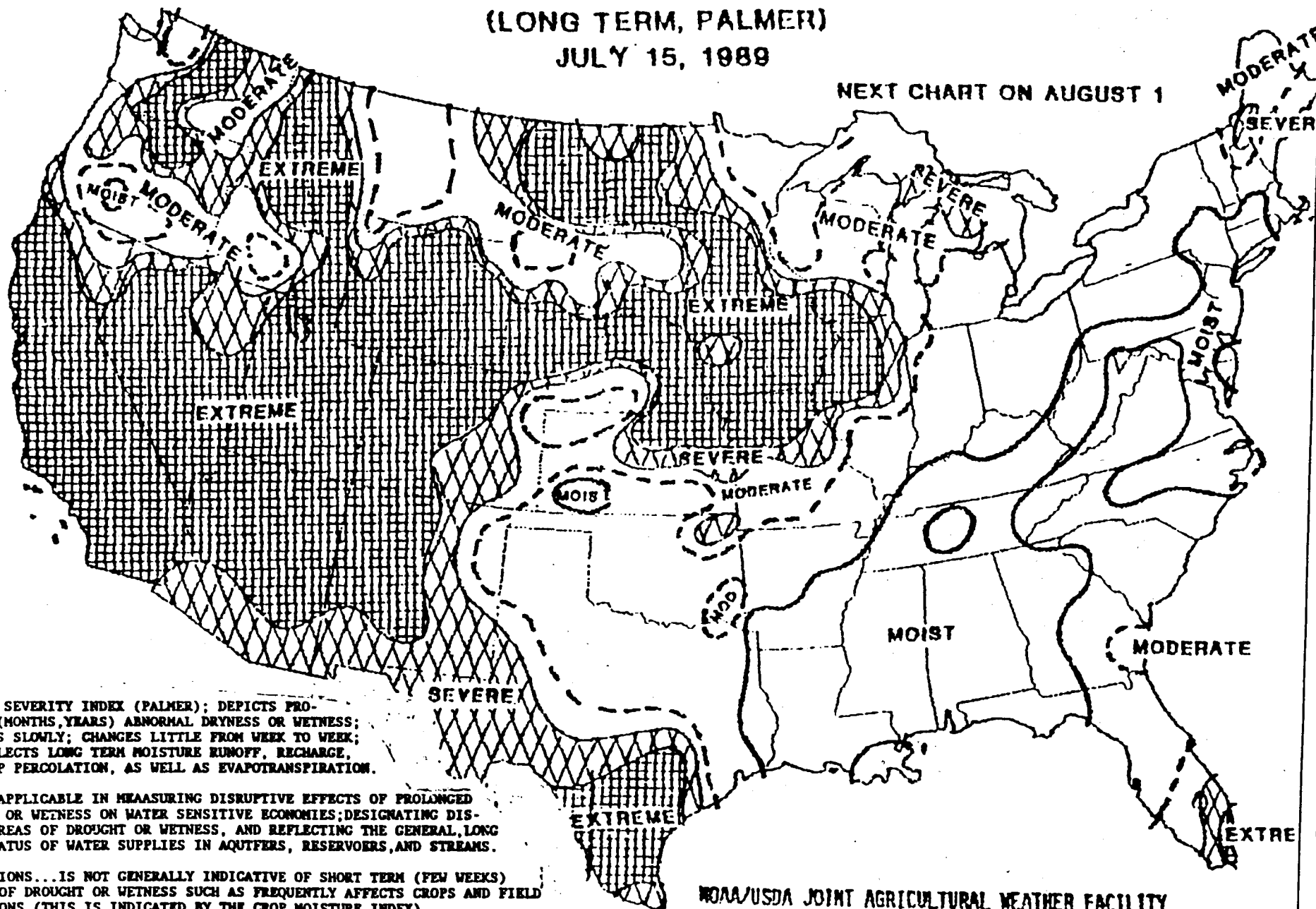
Figure 4.

DROUGHT SEVERITY

(LONG TERM, PALMER)

JULY 15, 1989

NEXT CHART ON AUGUST 1



DROUGHT SEVERITY INDEX (PALMER); DEPICTS PROLONGED (MONTHS, YEARS) ABNORMAL DRYNESS OR WETNESS; RESPONDS SLOWLY; CHANGES LITTLE FROM WEEK TO WEEK; AND REFLECTS LONG TERM MOISTURE RUNOFF, RECHARGE, AND DEEP PERCOLATION, AS WELL AS EVAPOTRANSPIRATION.

USES...APPLICABLE IN MEASURING DISRUPTIVE EFFECTS OF PROLONGED DRYNESS OR WETNESS ON WATER SENSITIVE ECONOMIES; DESIGNATING DISASTER AREAS OF DROUGHT OR WETNESS, AND REFLECTING THE GENERAL, LONG TERM STATUS OF WATER SUPPLIES IN AQUIFERS, RESERVOIRS, AND STREAMS.

LIMITATIONS...IS NOT GENERALLY INDICATIVE OF SHORT TERM (FEW WEEKS) STATUS OF DROUGHT OR WETNESS SUCH AS FREQUENTLY AFFECTS CROPS AND FIELD OPERATIONS (THIS IS INDICATED BY THE CROP MOISTURE INDEX).

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Based on preliminary

Figure 5.

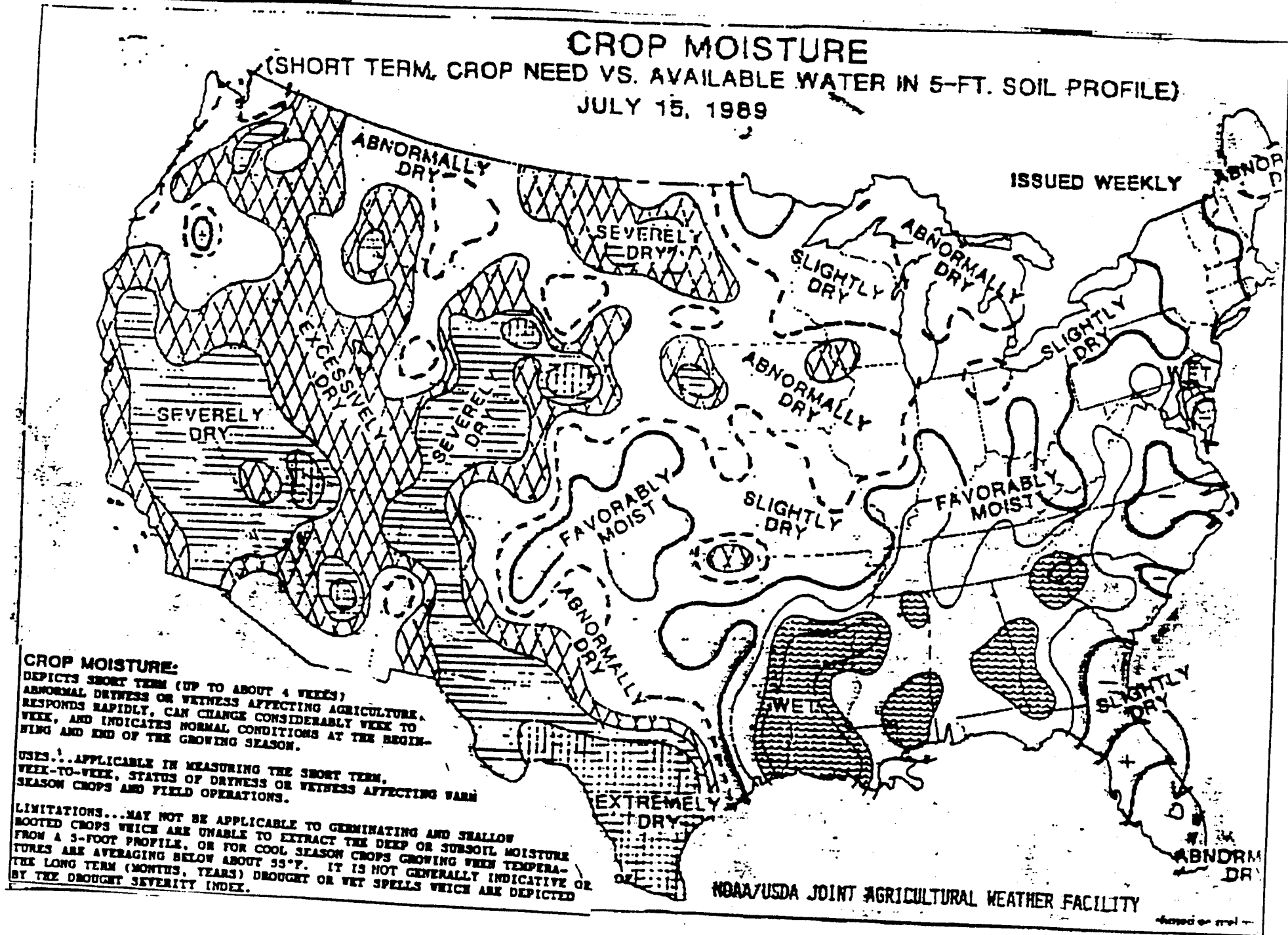


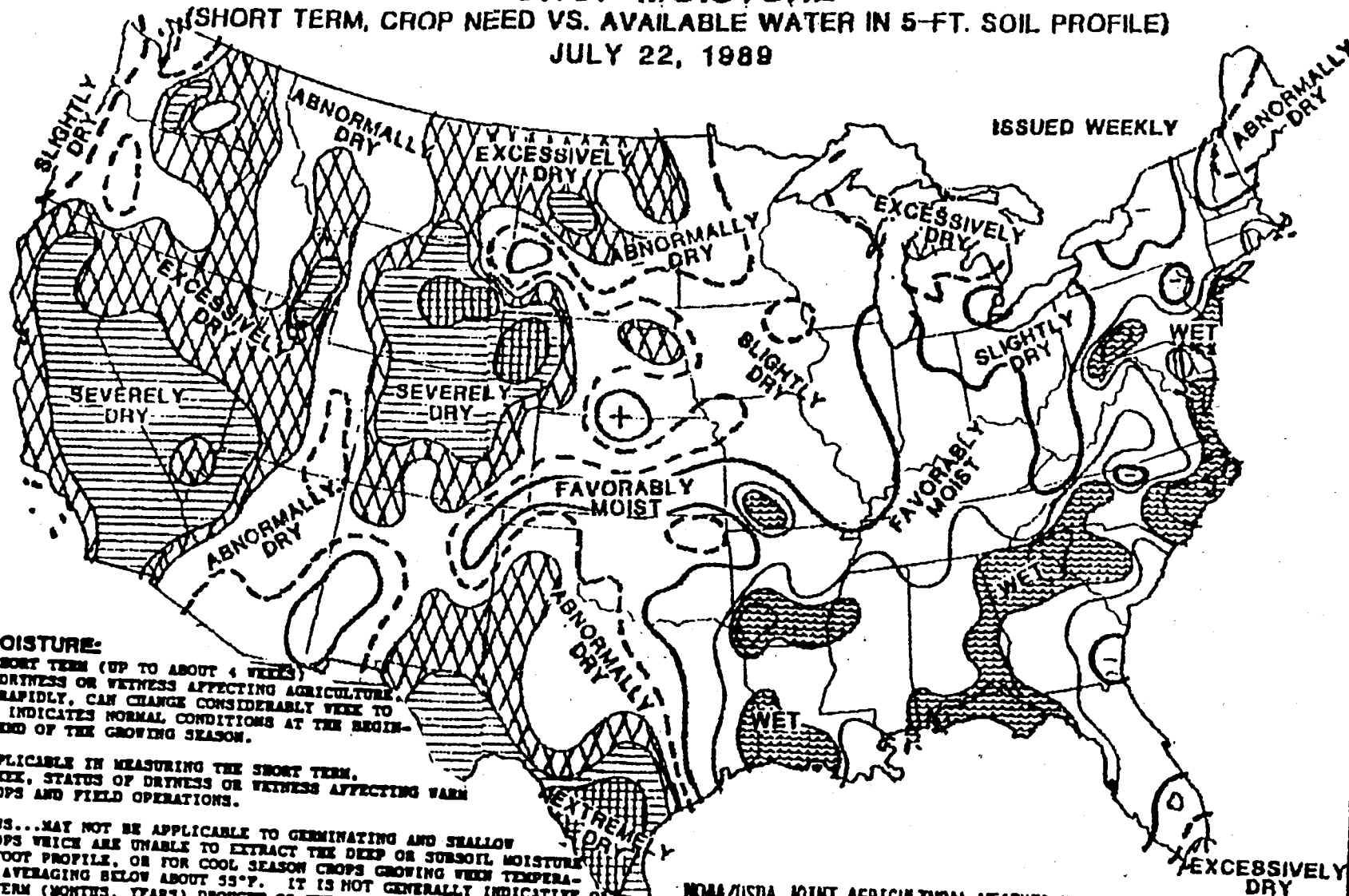
Figure 6.

CROP MOISTURE

(SHORT TERM, CROP NEED VS. AVAILABLE WATER IN 5-FT. SOIL PROFILE)

JULY 22, 1989

ISSUED WEEKLY



CROP MOISTURE:

DEPICTS SHORT TERM (UP TO ABOUT 4 WEEKS) ABNORMAL DRYNESS OR WETNESS AFFECTING AGRICULTURE. RESPONDS RAPIDLY, CAN CHANGE CONSIDERABLY WEEK TO WEEK, AND INDICATES NORMAL CONDITIONS AT THE BEGINNING AND END OF THE GROWING SEASON.

USES...APPLICABLE IN MEASURING THE SHORT TERM, WEEK-TO-WEEK, STATUS OF DRYNESS OR WETNESS AFFECTING WARM SEASON CROPS AND FIELD OPERATIONS.

LIMITATIONS...MAY NOT BE APPLICABLE TO GERMINATING AND SHALLOW ROOTED CROPS WHICH ARE UNABLE TO EXTRACT THE DEEP OR SUBSOIL MOISTURE FROM A 5-FOOT PROFILE, OR FOR COOL SEASON CROPS GROWING WHEN TEMPERATURES ARE AVERAGING BELOW ABOUT 55°F. IT IS NOT GENERALLY INDICATIVE OF THE LONG TERM (MONTHS, YEARS) DROUGHT OR WET SPELLS WHICH ARE DEPICTED BY THE DROUGHT SEVERITY INDEX.

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Based on preliminary reports