PROJECTIONS OF ACRES, YIELDS, AND PRODUCTION: FOUR SOUTHERN REGIONS AND THE U.S.*

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To fill domestic and foreign demand requirements in 1985, the U.S. is expected to produce 17% more wheat than it did in the 1970-72 period; also 30% more corn, 42% more sorghum, 20% more citrus, 32% more vegetables, 73% more soybeans, and 26% more cattle. These are a few of the baseline projections recently developed by ERS. The purpose of this report is to make available recent ERS projections of U.S. production and acreage needs with special emphasis on four Southern regions[1] and the part they will play in producing the expected increase.

The Economic Projections Program Area was established under a recent reorganization in ERS, USDA, and given responsibility for coordinating all ERS projections of commodity production. The program area is now preparing projections through the year 2000 in a set of publications titled "Agriculture—The Third Century." A computerized system is complemented by teams of researchers who guide the assumptions, provide input data and methodology, and review the projections. Separate but additive component models deal with commodity domestic and foreign demand, land use and availability, technological change, and price relationships. Some 23 crops and 8 livestock commodities are projected at state, regional, and national levels, under alternative scenarios involving projections of population, per capita personal disposable income, and export levels. More specific data on individual crops and individual states are available from the program area.

Domestic and foreign demand levels are estimated for each commodity. Domestic meat and grain requirements are projected by regression equations which make per capita consumption a function of personal disposable income. Feed requirements result from existing feed coefficients and projections of livestock numbers. Foreign demand levels are supplied by Economic Research Service's Foreign Demand and Competition Division.[2] The demand projections assume the relationship between commodity prices and personal incomes will be about the same in the future as in the historical period 1953-70.

U.S. PRODUCTION REQUIREMENTS TO 1985

Tables 1 and 2 summarize the level of commodity demand projected under the "baseline" scenario. This scenario includes assumptions of national population growth at the U.S. Bureau of the Census series E level (which reaches 235.7 million in 1985); personal disposable income increasing at a rate of 4.8 percent through 1975, 4.1 percent from 1976-80, and 3.8 percent beyond 1980; and a moderate export level which essentially implies a return to trends established prior to

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1 The four Southern regions include Appalachian—Virginia, West Virginia, North Carolina, Kentucky, and Tennessee; Southeast—South Carolina, Georgia, Florida, and Alabama; Delta—Mississippi, Arkansas, and Louisiana; and Southern Plains—Oklahoma and Texas.

2 For a more complete description of methodology, see [4].

1972 for the major export crops.[3] Other assumptions such as per capita consumption levels, feed, livestock relationships, etc., are discussed in detail in [1].

Table 1. COMMODITY PRODUCTION, U.S. AND FOUR SOUTHERN REGIONS, 1970-72 AVERAGE AND 1985 PROJECTIONS, BASELINE SCENARIO

Commodity	Units	Appalachian		Southeast		Delta		Southern Plains		Total South		48 States	
		1970-72	1985	1970-72	1985	1970-72	1985	1970-72	1985	1970-72	1985	1970-72	1985
		Million units											
Wheat	bu.	31.5	28.9	11.8	11.6	14.1	38.6	131.0	226.7	188	306	1,505	1,764
Rye	bu.	0.9	1.3	2.3	3.2	-	-	1.5	1.9	4.7	6.4	38.6	39.6
Rice	lbs.	-	-	-	-	4,413	6,240	2,234	2,787	6,647	9,027	8,491	11,845
Corn	bu.	234.3	222.5	127.9	147.0	13.9	10.3	44.7	16.0	421	396	5,089	6,618
Silage 1/	ton	9.4	11.6	2.5	3.4	1.6	2.3	10.4	3.8	-	21.1	-	145
Grain sorghum	bu.	8.9	5.5	3.5	0.5	16.8	19.9	343.8	537.3	373	563	795	1,132
Oats	bu.	10.9	10.2	8.5	5.4	8.6	8.3	21.7	28.1	49.7	52	831	895
Barley	bu.	12.5	15.3	1.6	2.2	0.1	0.1	18.8	32.3	33.0	50	434	550
Noncitrus fruit & nuts	ton	-	0.5	-	0.4	-	-	-	-	-	0.9	9.8	10.2
Citrus fruit	ton	-	-	-	10.5	-	-	-	0.5	-	11.0	11.8	14.2
Vegetables	cwt.	-	10.8	-	54.5	-	2.5	-	27.9	-	96	430	567
Hay	ton	7.8	7.5	2.6	2.2	3.1	2.8	7.1	8.5	20.6	21.0	128	139
Soybeans	bu.	80.8	146.5	54.1	106.4	184.2	339.5	7.7	27.5	327	620	1,193	2,061
Flaxseed	bu.	-	-	-	-	-	-	-	1.1	-	1.1	20.6	28
Peanuts	lbs.	649	1,052	1,767	2,580	12.3	1.5	644	1,137	3,073	4,771	3,091	4,813
Cotton	lbs.	303	191.0	573	338.7	1,743	1,650	1,682	1,729	4,300	3,909	5,478	5,265
Sugarcane 2/	ton	-	-	6.9	8.8	7.4	10.9	-	-	14.3	19.7	25.9	33.4
Sugarbeets	ton	-	-	-	-	-	-	-	1.0	-	1.0	27.3	33.6
Tobacco	lbs.	1,379	1,659	283.1	343.3	0.2	0.2	-	-	1,662	2,003	1,788	2,140
Irish potatoes	cwt.	7.0	5.1	7.3	10.3	0.5	0.2	3.7	5.6	18.5	21.2	313	357
Sweet potatoes	cwt.	4.9	4.6	1.2	0.7	4.4	4.4	0.9	0.6	11.4	10.3	12.5	11.9
Dry beans	lbs.	-	-	-	-	-	-	-	-	-	-	1,712	2,094
Dry peas	lbs.	-	-	-	-	-	-	-	-	-	-	312	140
Cattle & calves	lbs.	2,400	3,146	1,821	2,582	1,763	2,496	6,320	7,484	12,305	15,709	40,020	50,486
Hogs	lbs.	1,704	1,786	1,179	1,082	321.7	190.6	621.0	306.5	3,826	3,366	22,174	24,247
Sheep and lambs	lbs.	32.9	8.7	0.5	0.2	1.3	0.3	176.6	57.0	311	66.2	1,051	370
Chickens	lbs.	140.6	171.2	220.5	401.9	162.9	239.7	55.2	82.5	553	895	1,173	1,611
Broilers	lbs.	-	2,292	-	5,096	-	3,797	-	1,058	-	12,243	-	15,031
Turkeys	lbs.	288.2	383.5	96.8	113.2	152.0	257.4	201.4	248.1	738	1,002	2,299	3,299
Eggs	1000 eg:	5.1	7.2	12.4	16.4	6.8	9.0	3.2	2.9	28.5	35.5	69.4	76.2
Milk	1000 lb:	8.3	8.0	2.8	4.0	2.8	2.5	4.4	3.4	20.0	17.9	119	121

[1] Includes corn silage, sorghum silage, and sorghum forage. Assumes 1 ton forage equals 3 tons silage.
[2] Includes Hawaii in 48 states total.

The U.S. demand for only 4 of the 31 crop and livestock commodities listed (cotton, sweet potatoes, dry peas, and sheep and lambs) is projected to decline by 1985 as compared to a 1970-72 base period. Increases for the other commodities range from 2 percent for milk to 73 percent for soybeans (Tables 1 and 2).

As compared to the baseline scenario presented in Tables 1 and 2, a "high demand" [4] scenario would require 25 percent more wheat, 5 percent more rice, 18 percent more corn, 15 percent more sorghum, 6 percent more oats, barley and hay, 13 percent more soybeans, 4 percent more peanuts, 2 percent more cotton, 8 percent more cattle and calves, 4 percent more hogs, 5 percent more broilers, and 2 percent more milk. In a later section, additional acreage needs in the U.S. and the South to support these increases are discussed.

THE SOUTH'S SHARE OF U.S. PRODUCTION REQUIREMENTS

Table 1 also displays the level of production projected to 1985 for each of 4 southern regions with comparisons to a 1970-72 base period. Production shares were projected at the state level

[3] The baseline export assumptions imply [1] a policy of major importing countries to attain self sufficiency, [2] the world's production capacity will increase faster than consumption, [3] a rebuilding of grain stock with downward pressures on prices and with programs to restrict production in major exporting countries, [4] the European Community [EC-9], Eastern Europe, and USSR would approach self sufficiency in grains, [5] continued substitution of protein supplements and other nongrain feeds for grains, and [6] China [PRC] would likely import wheat and export rice, while Japan would remain the largest single import market for wheat and course grains.

[4] The "high demand" scenario assumes a series D population projection [which reaches 243.9 million by 1985]; personal disposable income increasing at 4.8 percent through 1975 and 4.5 percent thereafter; and a high export level which implies that [1] the USSR and Eastern Europe attempt to increase livestock production by importing more grain, [2] China imports more grain to improve diets, [3] the EC-9 does not pursue its self-sufficiency policy as strongly and permits continued imports of grain, [4] the livestock economics of the developing world grow faster, and [5] fishmeal production stagnates at 1969-71 levels.

Table 2. BASELINE PROJECTIONS OF COMMODITY PRODUCTION TO 1985, U.S. AND SOUTHERN REGION, COMPARISONS WITH 1970-72

Commodity	Units	1970-72 average			1985 projections			U.S. 1985 relative to 1970-72	South 1985 relative to 1970-72
		U.S.	South	S/US	U.S.	South	S/US		
		Million		Percent	Million			Percent	
Wheat	bu.	1,505	188.4	12.5	1,764	306	17	117	162
Rye	bu.	38.6	4.7	12.2	39.6	6.4	16	103	136
Rice	lbs.	8,491	6,647	78.3	11,845	9,027	76	140	135
Corn	bu.	5,089	420.8	8.3	6,618	396	6	130	94
Silage	ton	-	-	-	145	21	14	-	-
Grain sorghum	bu.	795	373.0	46.9	1,132	563	50	142	151
Oats	bu.	831	49.7	6.0	895	52	6	108	105
Barley	bu.	434	33.0	7.6	550	50	9	127	152
Noncitrus fruits & nuts	ton	9.8	-	-	10.2	.9	9	104	-
Citrus fruit	ton	11.8	-	-	14.2	11	77	120	-
Vegetables	cwt.	430	-	-	567	96	17	132	-
Hay	ton	128	20.6	16.1	139	21	15	109	102
Soybeans	bu.	1,193	326.8	27.4	2,061	620	30	173	189
Flaxseed	bu.	20.6	-	-	28	1.1	4	136	-
Peanuts	lbs.	3,091	3,073	99.4	4,813	4,771	99	156	155
Cotton	lbs.	5,478	4,300	78.5	5,265	3,909	74	96	91
Sugarcane	ton	25.9	14.3	55.2	33.4	20	60	129	140
Sugarbeets	ton	27.3	-	-	33.6	1	3	123	-
Tobacco	lbs.	1,788	1,662	93.0	2,140	2,003	94	120	121
Irish potatoes	cwt.	313	18.5	5.9	357	21	6	114	114
Sweet potatoes	cwt.	12.5	11.4	91.2	11.9	10	84	95	88
Dry beans	lbs.	1,712	-	-	2,094	-	-	122	-
Dry peas	lbs.	312	-	-	140	-	-	45	-
Cattle & calves	lbs.	40,020	12,305	30.7	50,486	15,709	31	126	128
Hogs	lbs.	22,174	3,826	17.3	24,247	3,366	14	109	88
Sheep & lambs	lbs.	1,051	311	29.6	370	66	18	35	21
Chickens	lbs.	1,173	553	47.1	1,611	895	56	137	162
Broilers	lbs.	-	-	-	15,031	12,243	81	-	-
Turkeys	lbs.	2,297	738	32.1	3,299	1,002	30	144	136
Eggs	1000 egg	69.4	28.5	41.1	76.2	36	47	110	126
Milk	1000 lbs	119	20.0	16.9	121	18	15	102	90

[1] Southern region includes the following subregions and states: Appalachian—Virginia, W. Virginia, North Carolina, Kentucky, Tennessee; Southeast—South Carolina, Georgia, Florida, Alabama; Delta—Mississippi, Arkansas, Louisiana; and Southern Plains—Oklahoma, Texas.

and then aggregated to regional levels.[5] The amount of increase or decrease in each commodity in each region is readily apparent. For example, the Appalachian and Southeast regions are projected to reduce their production of wheat slightly by 1985 as compared to their 1970-72 levels; whereas the Delta and Southern Plains regions are projected to greatly increase in their wheat production, so that the South as a whole will increase its wheat production about 63 percent. The Southeast region is projected to increase its corn production while the other 3 southern regions have declining corn production trends. The four regions as a whole are projected to reduce their corn production by 6 percent by 1985 as compared to 1970-72 levels.

Table 2 relates the projected production of the South to itself in 1970-72 and the U.S. as a whole. Figure 1 graphically displays data from Table 2. Commodities plotted above the horizontal 100 line indicate increasing production for the U.S. from 1970-72 to 1985. Those plotted to the right of the vertical 100 line indicate the same for the South. Points plotted to the right of the diagonal line indicate commodities for which production trends increase in the South relative to the U.S.

[5] Two models were used to project a state's share of U.S. production: A Cobb-Douglass function of the form $Y = aX^b$ was used for states with declining shares as determined from linear regressions of historical data; a Spillman function of the form $Y = M\text{-}AR^x$ was used for states with increasing shares, where:

Y = percent share
X = time
M = the maximum attainable percent share (the 1990 linear estimate or if the 1990 value is below an observed historical value, 110 percent of the high historical value).
a, b, A, and R = regression parameters estimated from historical data.

Historical data were transformed to logs for estimation purposes. Both functions dampen the rate of change in state production shares. State shares were summed over the 48 states and were adjusted if they did not sum to 100. Other adjustments were made using professional judgment when checks revealed a state's required acreage did not balance with its land availability.

Note that the South is projected to increase its share of soybeans, sorghum, wheat, tobacco, cattle, chickens, and eggs.

YIELD PROJECTIONS AND ACREAGE REQUIREMENTS

Table 3 indicates for the baseline scenario the projected commodity yields[6] and acreage requirements[7] to 1985 for each of the 4 southern regions, the South as a whole, and the U.S. It also indicates total cropland requirements for all crops with a breakdown into components for harvested cropland; double cropping; and failure, pasture, fallow, and idle cropland. The U.S. will require about 321 million harvested acres in 1985 under the baseline scenario, or about 9 million less than were used in 1974. The 4 southern regions combined will require about 79 million acres in 1985 (1 million less than in 1974) to meet their projected share of U.S. agricultural production (Table 3). Breaking this down to the individual regions, the Appalachian will require 3 million fewer acres; Southeast, 2.5 million less; Delta, 2.9 million more; and Southern Plains, 1.6 million more.

On a commodity basis, Table 4 indicates the 1985 projected harvested acreage requirements

Figure 1. PRODUCTION OF SPECIFIED ENTERPRISES, 1985 RELATIVE TO 1970-72, SOUTHERN REGIONS AND THE UNITED STATES

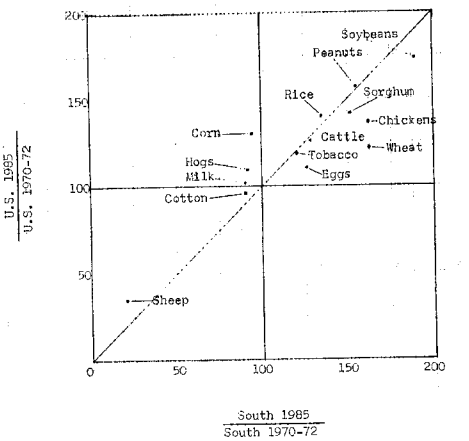

Table 3. ACREAGE HARVESTED AND YIELDS, U.S. AND 4 SOUTHERN REGIONS, 1985 PROJECTIONS, BASELINE SCENARIO

Commodity	Units	Appalachian		Southeast		Delta		Southern Plains		Total South		48 States	
		1000 acres	Yield per acre	1000 acres	Yield per acre	1000 acres	Yield per acre	1000 acres	Yield per acre	1000 acres	Yield per acre	1000 acres	Yield per acre
Wheat	bu.	647	44.6	310	37.4	990	39.0	7,628	29.7	9,575	31.9	46,591	37.9
Rye	bu.	45	28.2	106	29.8	-	-	87	22.4	238	26.8	1,317	29.9
Rice	lbs.	-	-	-	-	1,186	5,261	500	5,574	1,686	5354	2,121	5,586
Corn	bu.	2,402	92.7	2,253	65.2	193	53.2	161	99.7	5,009	79.0	57,080	116.0
Silage 1/	ton	764	15.2	253	13.5	165	14.2	531	7.1	1,713	12.3	10,869	13.4
Grain sorghum	bu.	87.1	62.9	10.4	44.5	358	55.5	8,505	63.2	8,960	62.9	16,755	67.6
Oats	bu.	180	56.9	104	52.3	120	69.4	720	39.0	1,124	46.3	14,485	61.1
Barley	bu.	259	59.0	42	51.9	3	38.1	804	40.2	1,108	45.0	10,038	54.8
Noncitrus fruit	ton	86	5.41	281	1.47	111.3	0.40	209	0.15	688	1.39	2,418	4.21
Citrus fruit	ton	-	-	916	11.4	-	-	112	4.7	1,028	10.7	1,295	11.0
Vegetables	cwt.	141	76.2	406	134.2	32	78.6	216	128.9	795	120	3,648	156
Hay	ton	3,924	1.90	947	2.36	1,378	2.03	5,146	1.66	11,395	1.85	63,449	2.20
Soybeans	bu.	4,954	29.6	3,696	28.8	12,591	27.0	898	30.6	22,139	28.0	65,539	31.5
Flaxseed	bu.	-	-	-	-	-	-	80	14.0	80	14.0	2,164	12.9
Peanuts	lbs.	288	3,655	895	2,882	1	1,140	561	2,027	1,745	2,734	1,757	2,739
Cotton	lbs.	364	525	747	453	2,508	658	5,412	319	9,031	433	10,409	506
Sugarcane	ton	-	-	253	34.8	360	30.4	-	-	612	32.2	612	32.2
Sugarbeets	ton	-	-	-	-	-	-	35	26.0	35	26.0	1,648	20.4
Tobacco	lbs.	614	2,704	135	2,555	-	-	-	-	749	2,677	820	2,610
Irish potatoes	cwt.	33.9	150	57.3	180	1.8	93	24.2	233	117	181	1,351	264
Sweet potatoes	cwt.	26.7	171	6.7	111	42.7	103	6.7	97	83	125	95	126
Dry beans	lbs.	-	-	-	-	-	-	-	-	-	-	1,372	1,526
Dry peas	lbs.	-	-	-	-	-	-	-	-	-	-	49	2,875
Subtotal		14,815		11,416		20,041		31,637		77,909		315,882	
Other crops		371		300		129		461		1,261		5,055	
Total crops harvested		15,186		11,716		20,170		32,097		79,170		320,937	
Double cropping		416		1,223		374		266		2,279		4,656	
Cropland harvested		14,770		10,493		19,796		31,832		76,891		316,281	
Failure, pasture, idle & fallow		16,083		10,112		5,275		23,037		54,507		142,050	
Total cropland		30,853		20,605		25,071		54,869		131,398		458,331	

[1] Includes corn silage, sorghum silage and sorghum forage.

[6] Crop yields were projected for most states using a Spillman function of the form $Y = M\text{-}AR^X$ where:
Y = yield
X = time
M = a maximum yield, generally the year 2020 linear estimate, and
A and R are regression coefficients using data from years 1947-70.
The effect of this function is to slightly dampen the linear yield trend. Yields of a few crops for which inadequate historical data are available were estimated by considering yields in adjoining states or by use of available surveys. When aggregated to the national level, yields for the major crops were checked with recent projections by ERS's yield projection teams and adjustments made where large discrepencies existed.

[7] Acreage requirements at regional and national levels were determined by simply dividing required production by crop yields explained in footnotes 4 and 5 above.

for the U.S. under the baseline and high demand scenarios with comparisons to 1974 for 8 major crops and the total. Should actual conditions in 1985 more closely resemble the high demand scenario, about 47 million additional harvested acres would be required for all crops as compared with the baseline scenario. Wheat, corn, and soybeans make up the bulk of the required increase. A large share of this increase could come from the 142 million acres in the category "failure, pasture, idle and fallow" (Table 3). High demand, though, implies high prices for agricultural products and therefore incentives to develop more land not now used for crops. How much land is available for development and how much of it is economically feasible for conversion to cropland?

Table 4. PROJECTIONS OF 1985 HARVESTED ACREAGE REQUIREMENTS, U.S. BASELINE AND HIGH DEMAND SCENARIOS, WITH COMPARISON TO 1974

Commodity	1985 Projections of harvested acreage: Baseline	High Demand	Indicated 1974
	Million harvested acres		
Wheat	46.6	59.3	65.5
Rice	2.1	2.2	2.57
Corn	57.1	69.5	65.2
Sorghum grain	16.8	20.4	13.9
Hay	63.4	68.4	60.5
Soybeans	65.5	74.4	52.5
Cotton	10.4	10.7	12.7
Tobacco	0.8	0.8	0.96
Total above crops	262.7	305.7	273.8
Total all crops	320.9	367.8	329.4

POTENTIAL FOR CONVERSION TO CROPLAND

It is apparent that about 264 million acres in the 48 states not now in cropland is potentially suitable for regular cultivation [1 and 2]. Table 5 shows where these acres are located and the problems that limit their use. The SCS land classification system is based on the nature and degree of physical limitation for cultivation. Class I has virtually no limitation, II some, III severe, IV very severe. Classes V through VIII are generally not suited for cultivation. The 264 million acres are classes I, II and III non-cropland. These could be considered an indication of our reservoir of potential cropland. But only about 100 million of these potential acres are considered to be physically well-adapted for conversion [2]. Much of this land is in small scattered plots, making it difficult to incorporate into crop production. Conversion of this land to crop use would also compete with grass and timber production. So, 30 million acres may be a more realistic estimate of land to be converted to crop use by 1985 [3]. Though a large potential is there, the amount converted to cropland will depend on favorable long term prospects for crops.

CONCLUSIONS

Projections to 1985 by ERS, USDA, indicate substantial increases in quantities demanded for the major crop and livestock commodities. Alternative scenarios provide a range of expected outcome. We have reported in this paper a demand projection for some 31 crop and livestock com-

Table 5. NON-CROPLAND SUITABLE FOR REGULAR CULTIVATION [1]

Region	Class I	Climate 2/ Limitations	Soil 3/ Problems	Drainage 4/ Problems	Erosion Problems 5/ Pasture range	Erosion Problems 6/ Forest and other	Total
	Million acres						
Plains	1.1	11.6	3.7	4.1	31.7	2.6	54.8
North Central	3.2	-	1.8	13.8	10.5	7.7	37.0
Florida	-	-	1.1	2.9	-	-	4.0
Miss. Delta and Gulf Coast Lowlands	.8	-	2.2	6.7	.5	.8	11.0
Coastal Plain and Piedmont	1.9	-	8.3	19.8	8.0	27.3	65.3
Atlantic Coast Lowlands	.1	-	1.2	7.4	-	.5	9.2
Texas-Oklahoma Prairies	.7	-	2.3	.6	6.7	2.0	12.3
Appalachian and Ozark Mts.	1.8	-	1.4	4.2	7.1	10.4	24.9
Northeast and Northern Great Lakes	.4	.5	3.2	13.8	1.7	12.8	32.4
Rocky Mts. and Far West	.8	1.2	3.2	2.3	3.7	2.4	13.6
U.S. (48 States)	10.8	13.3	28.4	75.6	69.9	66.5	264.5

7/ Florida, Miss. Delta and Gulf Coast Lowlands, Coastal Plain and Piedmont, Atlantic Coast Lowlands, Texas-Oklahoma Prairies, Appalachian and Ozark Mts.

[1] Land capabilities Class I-III land not classed as cropland, 1967 CNI.
[2] Class II-III C
[3] Class II-III S
[4] Class II-III W
[5] Class II-III E in pasture and range.
[6] Class II-III E in forest or "other" uses.
[7] Regions encompassed in the area in this paper referred to as the South. Part of the Plains region above is in South also.
SOURCE: [2, p. 3].

modities and indicated the proportion which is expected to be forthcoming from the South.

It appears that under normal growing conditions and continued productivity increases, the U.S. will be able to adequately meet demand requirements, even under high demand assumptions. While production of all crops listed except cotton, sweet potatoes, and dry peas, will increase by 1985, fewer acres will be required under the baseline scenario than those used in 1974. Yield increases are expected to be the major factor in reducing the threat of shortages from increasing demand requirements for U.S. agricultural products.

Though about 30 million acres may be developed for cropland use by 1985, only a fraction of it will be needed, even under the *high demand* scenario, if a reasonable amount of cropland currently idle, fallowed, or in pasture is converted to crop production.

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