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This report was prepared by Jarrett Whistance (jwxbb@mail.missouri.edu) and Wyatt Thompson (thompsonw@missouri.edu) at FAPRI-MU.

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Executive Summary

This report takes a closer look at the biofuels portion of the U.S. Agricultural and Biofuels Baseline released by the Food and Agricultural Policy Research Institute at the University of Missouri (FAPRI-MU). The FAPRI-MU baseline is a ten-year projection of market prices and quantities using information available in January 2013. The relevant markets in this report include those for ethanol, biodiesel, Renewable Identification Numbers (RINs), and biofuel feedstocks such as corn and soybeans.

As evidenced by sharply higher conventional RIN prices, the results indicate the blend wall quickly becomes a major issue that persists throughout the projection period. Although several factors contribute to the result, chief among them appears to be declining motor gasoline consumption as oil prices rise and cars become more fuel efficient over time. Less overall fuel use means less ethanol can be used in fuel with 10% ethanol (E10). In order to meet the increasing Renewable Fuel Standard (RFS2) requirements, more ethanol must be consumed in mid- and high-level ethanol blended fuels (i.e. E15 and E85). Ethanol prices fall dramatically relative to gasoline in order to encourage infrastructure development and consumer adoption for those fuels.

Cellulosic ethanol production is projected to grow at a modest rate but continues to remain well below the levels intended by RFS2. The baseline assumes the Environmental Protection Agency (EPA) continues to reduce the RFS2 requirement for cellulosic biofuels to the level of production, but also reduces the broader advanced and overall RFS2 requirements beginning in 2014. The implication is that the EPA reduces the overall biofuel requirement by up to the same amount as the cellulosic shortfall, whereas the EPA could opt to leave the broader mandates unchanged so that the cellulosic shortfall must be made up by greater use of other biofuels.

Two-way ethanol trade with Brazil continues throughout the projection period. Imported sugarcane ethanol from Brazil remains the primary way to meet the RFS2 requirement for advanced biofuels. As the mandate grows, ethanol imports rise accordingly. Higher imports of sugarcane ethanol leave open the possibility for greater exports of corn ethanol.

Biodiesel production is projected to expand beyond the RFS2 requirements, which are assumed to remain steady at the 2013 level of 1.28 billion gallons. In the baseline, biodiesel competes with sugarcane ethanol imports from Brazil to help fill the RFS2 mandate for advanced biofuels as shown by the convergence of biodiesel and advanced RIN prices over the course of the projection period. The results also reflect a shift in the composition of biodiesel feedstocks slightly away from soybean oil and toward other oils, including corn oil. Non-food grade corn oil becomes increasingly available for both biodiesel and feed uses as more dry-mill ethanol producers extract corn oil from distillers grains.

Baseline results presented in this report are averages of many possible market outcomes given uncertainty about petroleum prices, crop yields, and other factors. The underlying ranges of some quantities and prices, including RIN prices, are found to be sensitive to market conditions.

Overview

Recently, the Food and Agricultural Policy Research Institute at the University of Missouri (FAPRI-MU) released its annual baseline projections for agricultural and biofuel markets.¹ The baseline was prepared in January 2013 according to available market information at the time. Policy assumptions generally follow those of the Congressional Budget Office (CBO) its baseline projections, namely that current policy continues over the 10-year projection period. The retroactive and one-year extension of the \$1.00/gallon biodiesel blender credit and the one-year extension of the \$1.01/gallon second-generation biofuel producer credit were both accounted for in the baseline. The baseline assumes both of those tax credits expire, as legislated, at the end of 2013. Macroeconomic assumptions are based on projections by IHS Global Insight in January 2013. As in the earlier report, the results presented here are the average of 500 alternative outcomes based on different assumptions regarding weather, oil prices and other factors. Prices, quantities and values in any individual outcome may be much higher or lower than the averages that are presented.

The purpose of this report is to provide a more in-depth look at the biofuel market results. In addition to the biofuel results in the previous release, this report covers a detailed look at how we assume the Environmental Protection Agency (EPA) uses its authority to reduce the cellulosic and, by extension, the advanced and overall Renewable Fuel Standard (RFS2) requirements. This report also includes estimates of Renewable Identification Number (RIN) availability, RIN values, and overall RFS2 compliance costs.

Some of the key highlights include:

- 1) **The results depend, in large part, on our waiver implementation assumption.** Each year of RFS2 so far, the EPA has waived, or reduced, the cellulosic RFS2 requirement from the legislated level to a level the EPA estimates to be obtainable. At the same time, the EPA has left the broader advanced and overall RFS2 requirements unchanged. The baseline assumes a pace of cellulosic biofuel technology growth that falls short of the RFS2 targets, and that the EPA continues to waive the cellulosic mandate to the level of actual production. However, we assume the EPA begins waiving the advanced and overall mandates in 2014. The biomass-based diesel requirement remains unaffected, and we assume it is held steady at 1.28 billion gallons in the years beyond 2013.

¹ See www.fapri.missouri.edu. Note: Differences occur between this report and FAPRI-MU #01-13 as we have discovered, and corrected, an error in our handling of E15 use and its implications for the potential E10 market. The effects of this correction on market prices and quantities are small.

- 2) **The “blend wall” appears more pressing than in previous baselines.** Declining motor gasoline consumption in the medium term makes it more difficult to meet the overall RFS2 requirement by further limiting the amount of ethanol that can be consumed in low-level (E10) ethanol blends. Assuming the RFS2 continues to be enforced, more ethanol must be consumed in mid-level (E15) and high-level (E85) blends to overcome the blend wall.
- 3) **The effective retail price of ethanol falls well below the energy equivalent price relative to unleaded gasoline.** Ethanol prices below energy equivalence, an ethanol-gasoline price ratio of about two-thirds, encourage wider adoption of mid- and high-level blends. A key uncertainty is the length of time such low retail ethanol prices would need to persist. In these projections, the prices remain low to stimulate additional E15 and E85 use each year.
- 4) **RIN prices rise sharply before holding steady through the projection period as the blend wall becomes more pressing and RFS2 requirements become harder to meet.** Conventional RINs rise to around \$0.80 per RIN. Biodiesel and advanced RINs converge around \$1.40 per RIN. Their behavior indicates that biodiesel is competitive with sugarcane ethanol imports from Brazil as a way of meeting the RFS2 mandate for advanced biofuels. The overall cost of complying with the RFS2 rises along with RIN prices, and those costs are assumed to be passed on to all motor fuel consumers. In light of recent market developments, our conventional RIN price projections for 2012/13 are likely to be too low, but concerns about the blend wall are playing out in the market much as we would anticipate.
- 5) **Biodiesel use expands beyond RFS2 requirements and might compete in the broader advanced requirement.** Soybean oil is the largest feedstock for biodiesel production throughout the projection period. Corn oil becomes much more popular than in the past as more dry-mill ethanol producers extract corn oil and increase its availability as a biodiesel feedstock. The first small levels of cellulosic diesel production appear in this baseline, but all of it is used to meet the cellulosic biofuel requirement rather than the biomass-based diesel requirement.
- 6) **RIN prices and other variables are sensitive to conditions.** All the data presented here are averages of the 500 simulations. Each simulation is distinguished by its own assumption about petroleum price, crop yield variations, and other factors. The RIN price ranges are wide in this baseline, with many outcomes represented, including biodiesel use exceeding its mandate to help meet the broader advanced mandate, sugarcane ethanol competing with corn ethanol for the overall mandate, and the overall mandate not binding with conventional RIN prices falling to zero in some instances.

Ethanol supply and use

September-August year	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23
Petroleum fuel prices											
	(Dollars per barrel)										
Petroleum, W. Texas interm.	91.15	87.39	83.15	84.93	89.46	93.90	98.26	101.83	105.16	108.50	110.33
Petroleum, refiners' acquis.	94.48	87.21	82.27	83.77	87.83	91.61	95.37	98.51	101.36	104.19	105.83
	(Dollars per gallon)										
Unl. gasoline, FOB Omaha	2.85	2.62	2.50	2.54	2.64	2.74	2.83	2.91	2.98	3.05	3.10
Unleaded gasoline, retail	3.43	3.24	3.15	3.18	3.29	3.41	3.52	3.61	3.69	3.77	3.83
	(Million gallons)										
Motor gasoline use*	133,756	134,452	136,062	137,279	137,417	136,824	135,664	134,142	132,447	130,645	128,852
Ethanol supply and use											
Production	12,631	14,622	15,436	15,669	15,954	16,443	16,847	17,270	17,665	17,961	18,343
From corn	12,407	14,388	15,108	15,247	15,272	15,371	15,341	15,384	15,433	15,397	15,348
Other conventional	215	214	229	248	261	270	275	283	290	295	300
Cellulosic	9	21	98	173	421	803	1,231	1,603	1,942	2,269	2,695
Imports	705	353	783	794	974	1,248	1,587	1,618	1,488	1,664	1,674
Domestic disappearance	12,972	14,235	15,617	15,991	16,411	17,071	17,783	18,256	18,521	18,977	19,391
In 10% and lower blends	12,785	12,848	12,440	12,433	12,360	12,101	11,792	11,506	11,244	10,932	10,615
In mid level blends	58	693	1,962	2,178	2,261	2,572	2,796	2,925	3,011	3,136	3,293
In higher level blends	130	695	1,215	1,380	1,790	2,398	3,195	3,825	4,267	4,909	5,483
Exports	491	619	558	462	502	596	630	610	610	631	606
Ending stocks	686	807	851	861	876	901	922	943	965	982	1,002
Ethanol prices											
	(Dollars per gallon)										
Conventional rack, Omaha	2.33	2.04	2.02	2.08	2.11	2.13	2.15	2.19	2.20	2.19	2.21
AMS spot plant price, Iowa	2.21	1.94	1.92	1.97	2.00	2.02	2.04	2.07	2.08	2.07	2.09
Cellulosic rack	3.92	3.19	3.31	3.43	3.53	3.63	3.69	3.68	3.69	3.72	3.74
Other advanced rack	2.63	2.46	2.51	2.49	2.57	2.68	2.75	2.77	2.77	2.79	2.79
Effective retail	2.80	1.97	1.87	2.00	2.02	2.02	2.05	2.08	2.12	2.12	2.13
Ethanol/gasoline retail	82%	61%	60%	63%	61%	59%	58%	58%	58%	56%	56%
RIN values											
Conventional ethanol	0.12	0.69	0.80	0.73	0.74	0.78	0.79	0.81	0.78	0.78	0.81
Advanced ethanol	0.41	1.11	1.28	1.14	1.20	1.34	1.39	1.39	1.35	1.38	1.39
Cellulosic ethanol	0.69	1.50	2.08	2.08	2.17	2.28	2.33	2.30	2.28	2.31	2.34

*includes fuel ethanol

Biofuel policies

Calendar year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Renewable Fuel Standard											
	(Million gallons)										
(as applied with waivers)	15,200	16,550	16,742	18,135	18,425	19,045	20,003	20,806	21,060	21,733	23,042
Advanced biofuels	2,000	2,750	2,342	3,135	3,425	4,045	5,003	5,806	6,060	6,733	8,042
Cellulosic biofuel	9	35	80	167	304	601	1,003	1,417	1,782	2,122	2,486
Biodiesel	1,000	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280
Tax credits and tariffs											
	(Dollars per gallon)										
Conventional ethanol credit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biodiesel credit	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ethanol specific duty	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cellulosic producers credit	1.01	1.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(Percent)										
Ethanol ad-valorem tariff	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

Corn processing

September-August year	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23
Corn food and industrial use											
	(Million bushels)										
Ethanol and coproducts	4,571	5,288	5,542	5,583	5,582	5,608	5,588	5,594	5,601	5,578	5,551
HFCS	483	516	528	530	533	535	537	538	539	541	541
Glucose and dextrose	280	299	302	302	303	304	304	305	306	307	308
Starch	240	255	261	263	265	267	270	272	275	277	280
Beverage alcohol	135	143	145	147	148	149	150	151	152	154	155
Cereals and other	202	213	218	219	221	223	224	226	228	230	232
Total	5,911	6,715	6,996	7,045	7,052	7,086	7,072	7,086	7,101	7,087	7,067
Corn dry milling											
Corn dry milled for ethanol	4,035	4,716	4,958	5,015	5,027	5,061	5,050	5,065	5,083	5,075	5,060
(Share de-oiling DDGS)	31.2%	49.2%	66.6%	75.9%	81.3%	84.7%	87.2%	89.1%	90.8%	92.2%	93.5%
Yields per bushel of corn											
	(Units per bushel)										
Ethanol (gallons)	2.73	2.74	2.74	2.75	2.75	2.76	2.76	2.77	2.77	2.78	2.78
Distillers grains (pounds)	16.86	16.69	16.52	16.44	16.40	16.37	16.36	16.35	16.34	16.34	16.33
Costs and returns											
	(Dollars per gallon)										
Ethanol value	2.33	2.04	2.02	2.08	2.11	2.13	2.15	2.19	2.20	2.19	2.21
Distillers grains value	0.84	0.57	0.53	0.53	0.54	0.55	0.56	0.56	0.56	0.56	0.56
Corn oil value	0.06	0.07	0.07	0.07	0.08	0.09	0.09	0.09	0.08	0.08	0.08
Corn cost	-2.59	-1.89	-1.71	-1.72	-1.74	-1.75	-1.77	-1.77	-1.76	-1.74	-1.73
Fuel and electricity cost	-0.19	-0.23	-0.24	-0.22	-0.21	-0.21	-0.22	-0.23	-0.24	-0.25	-0.29
Other operating costs	-0.34	-0.34	-0.34	-0.34	-0.35	-0.35	-0.35	-0.35	-0.36	-0.36	-0.36
Net operating return	0.11	0.23	0.33	0.40	0.43	0.45	0.45	0.48	0.48	0.47	0.46
Corn wet milling											
	(Million bushels)										
Corn wet milled for ethanol	537	573	584	569	555	547	537	529	518	503	491
Other corn wet milling	1,003	1,070	1,091	1,096	1,101	1,106	1,111	1,115	1,120	1,125	1,129
Total corn wet milling	1,539	1,643	1,675	1,664	1,656	1,654	1,648	1,644	1,638	1,628	1,620
Yields per bushel of corn											
	(Units per bushel)										
Ethanol (gallons)	2.69	2.69	2.70	2.70	2.70	2.70	2.71	2.71	2.71	2.71	2.72
Gluten feed (pounds)	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40
Gluten meal (pounds)	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Corn oil (pounds)	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53
Costs and returns											
	(Dollars per gallon)										
Ethanol value	2.33	2.04	2.02	2.08	2.11	2.13	2.15	2.19	2.20	2.19	2.21
Gluten feed value	0.40	0.30	0.28	0.28	0.28	0.29	0.29	0.29	0.29	0.29	0.29
Gluten meal value	0.32	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.25	0.25	0.25
Corn oil value	0.32	0.33	0.32	0.31	0.31	0.32	0.32	0.31	0.31	0.31	0.31
Corn cost	-2.63	-1.92	-1.74	-1.75	-1.77	-1.79	-1.80	-1.80	-1.80	-1.78	-1.77
Fuel and electricity cost	-0.15	-0.18	-0.19	-0.17	-0.17	-0.17	-0.18	-0.18	-0.19	-0.20	-0.23
Other operating costs	-0.53	-0.54	-0.54	-0.54	-0.55	-0.55	-0.56	-0.56	-0.57	-0.57	-0.58
Net operating return	0.07	0.26	0.38	0.43	0.45	0.46	0.46	0.49	0.49	0.49	0.48

Biodiesel sector

October-September year	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23
Biodiesel supply and use											
	(Million gallons)										
Production	1,198	1,335	1,417	1,432	1,473	1,563	1,605	1,633	1,668	1,714	1,767
From soybean oil	689	754	790	780	783	808	801	787	778	773	776
From corn oil	91	127	163	195	231	276	317	357	399	442	486
From other fats and oils	405	435	436	427	425	441	447	447	445	449	452
From cellulosic diesel	13	20	28	31	34	37	40	43	46	49	52
Net exports	78	66	58	56	56	57	58	59	59	60	61
Domestic disappearance	1,120	1,270	1,359	1,376	1,417	1,506	1,547	1,574	1,609	1,654	1,706
Fuel prices and tax credit											
	(Dollars per gallon)										
Biodiesel, rack	4.57	4.78	4.69	4.56	4.60	4.72	4.77	4.76	4.76	4.79	4.81
#2 Diesel, refiner sales	2.83	2.62	2.50	2.56	2.66	2.75	2.85	2.93	3.00	3.08	3.12
#2 Diesel, retail	3.66	3.47	3.35	3.41	3.52	3.62	3.72	3.80	3.88	3.96	3.99
Biodiesel tax credit	1.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RIN values											
Per RIN gallon	0.51	1.33	1.54	1.41	1.38	1.44	1.47	1.46	1.44	1.44	1.44
Per physical gallon	0.77	2.00	2.31	2.12	2.08	2.15	2.21	2.19	2.16	2.15	2.16
Costs and returns											
Biodiesel value	4.57	4.78	4.69	4.56	4.60	4.72	4.77	4.76	4.76	4.79	4.81
Glycerin value	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Soyoil cost	-3.97	-4.13	-4.02	-3.88	-3.90	-3.99	-4.02	-3.99	-3.95	-3.95	-3.93
Other operating costs	-0.57	-0.57	-0.58	-0.58	-0.58	-0.59	-0.59	-0.60	-0.60	-0.61	-0.61
Net operating return	0.07	0.11	0.13	0.13	0.14	0.17	0.19	0.21	0.23	0.26	0.29

Soybean oil supply and use

October-September year	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23
Supply											
	(Million pounds)										
Beginning stocks	2,540	1,504	1,592	1,680	1,785	1,814	1,782	1,812	1,864	1,910	1,955
Production	18,737	19,771	19,882	20,176	20,439	20,682	20,920	21,152	21,378	21,642	21,868
Imports	350	150	150	150	150	150	150	150	150	150	150
Domestic use											
Biodiesel	5,302	5,805	6,081	6,004	6,028	6,219	6,168	6,056	5,989	5,955	5,979
Food and other	12,809	12,256	12,233	12,390	12,536	12,624	12,683	12,833	12,976	13,105	13,236
Exports											
	2,012	1,772	1,630	1,828	1,995	2,021	2,188	2,361	2,516	2,688	2,763
Total use											
	20,123	19,833	19,944	20,222	20,560	20,864	21,039	21,250	21,481	21,748	21,977
Ending stocks											
	1,504	1,592	1,680	1,785	1,814	1,782	1,812	1,864	1,910	1,955	1,996
Price											
	(Cents per pound)										
Decatur	51.59	53.67	52.14	50.39	50.70	51.82	52.15	51.77	51.36	51.32	51.08

Biofuel RIN supply and Utilization: Crop Year

September-August year	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23
	(Million gallons)										
Renewable Fuel Standard	16,100	16,819	17,885	18,235	18,805	19,692	20,625	21,167	21,511	22,176	22,773
Advanced biofuels	2,500	2,619	3,085	3,235	3,805	4,692	5,625	6,167	6,511	7,176	7,773
Cellulosic ethanol (waived)	28	50	140	220	471	859	1,291	1,667	2,011	2,343	2,773
Biodiesel	1,187	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280
Biodiesel RFS RINs											
Production	1,107	1,250	1,331	1,345	1,384	1,469	1,507	1,531	1,563	1,605	1,654
Carry In	149	70	11	2	7	5	2	1	1	3	3
Use for biodiesel compliance	1,187	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280
Unused for this mandate	70	40	61	67	110	194	230	252	285	328	377
of which, carry out	70	11	2	7	5	2	1	1	3	3	2
of which, demoted	0	29	59	61	105	192	229	251	282	325	375
Advanced RFS RINs											
Production	2,454	2,386	3,086	3,263	3,827	4,704	5,630	6,170	6,526	7,187	7,784
Biodiesel (in ethanol gallon)	1,661	1,875	1,996	2,018	2,075	2,203	2,261	2,297	2,345	2,407	2,481
Cellulosic	28	50	140	220	471	859	1,291	1,667	2,011	2,343	2,773
Other Advanced	765	461	950	1,026	1,280	1,642	2,078	2,207	2,169	2,436	2,530
Carry In	309	263	16	4	11	9	4	1	2	4	5
Use for advanced compliance	2,500	2,619	3,085	3,235	3,805	4,692	5,625	6,167	6,511	7,176	7,773
Unused for this mandate	263	30	17	32	33	21	9	5	16	14	15
of which, carry out	263	16	4	11	9	4	1	2	4	5	4
of which, demoted	0	14	13	21	24	17	8	3	12	10	12
Total RFS RINs											
Production	14,712	16,247	17,821	18,286	18,843	19,723	20,594	21,206	21,617	22,230	22,805
Biodiesel (in ethanol gallon)	1,661	1,875	1,996	2,018	2,075	2,203	2,261	2,297	2,345	2,407	2,481
Cellulosic	28	50	140	220	471	859	1,291	1,667	2,011	2,343	2,773
Other Advanced	765	461	950	1,026	1,280	1,642	2,078	2,207	2,169	2,436	2,530
Conventional	12,258	13,861	14,735	15,023	15,016	15,019	14,964	15,036	15,091	15,044	15,022
Carry In	2,217	829	257	193	245	281	311	277	312	405	445
Use for total compliance	16,100	16,819	17,885	18,235	18,805	19,692	20,625	21,167	21,511	22,176	22,773
Unused for this mandate	829	257	193	245	283	312	280	316	418	459	478
of which, carry out	829	257	193	245	281	311	277	312	405	445	468
of which, expired	0	0	0	0	2	1	3	4	13	14	10
RIN value	(Dollars per RIN-gallon)										
Biodiesel RIN	0.51	1.33	1.54	1.41	1.38	1.44	1.47	1.46	1.44	1.44	1.44
Cellulosic RIN allowance v.	0.69	1.50	2.08	2.08	2.17	2.28	2.33	2.30	2.28	2.31	2.34
Advanced RIN	0.41	1.11	1.28	1.14	1.20	1.34	1.39	1.39	1.35	1.38	1.39
Conventional RIN	0.12	0.69	0.80	0.73	0.74	0.78	0.79	0.81	0.78	0.78	0.81
RIN compliance expend.	(Million dollars)										
Total	2,592	12,496	16,070	15,120	16,311	18,803	20,828	21,999	22,243	23,657	25,425

Corn supply and use

September-August year	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23
Area	(Million acres)										
Planted area	97.2	96.9	92.5	91.0	91.1	91.5	91.6	91.3	91.0	90.7	90.2
Harvested area	87.4	88.8	84.8	83.4	83.4	83.8	83.9	83.6	83.4	83.1	82.6
Yield	(Bushels per harvested acre)										
	123.4	161.8	164.3	166.3	168.6	170.8	172.6	174.8	176.9	178.7	180.7
Supply	(Million bushels)										
Beginning stocks	11,869	14,995	15,595	15,680	15,855	16,115	16,315	16,466	16,628	16,758	16,873
Production	989	604	1,639	1,774	1,767	1,765	1,797	1,824	1,846	1,881	1,924
Imports	10,780	14,366	13,932	13,880	14,063	14,324	14,492	14,617	14,757	14,852	14,924
	100	25	25	25	25	25	25	25	25	25	25
Domestic use	10,324	11,707	12,019	12,036	12,087	12,166	12,189	12,221	12,260	12,264	12,256
Feed and residual	4,389	4,969	4,999	4,969	5,012	5,057	5,094	5,112	5,135	5,154	5,166
Ethanol and coproducts	4,571	5,288	5,542	5,583	5,582	5,608	5,588	5,594	5,601	5,578	5,551
HFCS	483	516	528	530	533	535	537	538	539	541	541
Seed	24	23	23	23	23	23	23	23	23	23	23
Food and other	857	910	926	931	937	942	948	954	961	968	975
Exports	941	1,649	1,802	1,876	2,002	2,152	2,301	2,399	2,487	2,570	2,656
Total use	11,265	13,357	13,821	13,913	14,090	14,317	14,490	14,620	14,747	14,834	14,912
Ending stocks	604	1,639	1,774	1,767	1,765	1,797	1,824	1,846	1,881	1,924	1,961
Farm price	(Dollars per bushel)										
	7.08	5.18	4.69	4.73	4.79	4.83	4.88	4.88	4.87	4.84	4.82
Market net return/a.	(Dollars)										
	524.99	470.87	398.14	414.50	434.34	447.08	456.41	458.69	457.93	452.20	449.18

Soybean supply and use

September-August year	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23
Area	(Million acres)										
Planted area	77.2	78.5	76.4	77.2	77.3	77.3	77.5	77.7	77.5	77.5	77.6
Harvested area	76.1	77.4	75.4	76.1	76.2	76.2	76.4	76.6	76.4	76.5	76.5
Yield	(Bushels per harvested acre)										
	39.6	43.5	44.1	44.6	45.1	45.6	46.0	46.6	47.0	47.5	47.9
Supply	(Million bushels)										
Beginning stocks	3,204	3,517	3,528	3,604	3,653	3,689	3,729	3,772	3,803	3,840	3,878
Production	169	134	191	195	200	198	195	190	193	195	197
Imports	3,015	3,368	3,322	3,394	3,438	3,475	3,519	3,566	3,595	3,630	3,666
	20	15	15	15	15	15	15	15	15	15	15
Domestic use	1,726	1,837	1,849	1,879	1,902	1,924	1,946	1,968	1,990	2,015	2,036
Crush	1,608	1,709	1,719	1,744	1,767	1,788	1,808	1,829	1,848	1,871	1,890
Seed and residual	118	128	130	135	135	136	138	140	142	144	146
Exports	1,345	1,490	1,485	1,524	1,552	1,569	1,593	1,610	1,618	1,628	1,642
Total use	3,070	3,326	3,333	3,403	3,455	3,494	3,539	3,579	3,608	3,642	3,678
Ending stocks	134	191	195	200	198	195	190	193	195	197	200
CCC inventory	0	0	0	0	0	0	0	0	0	0	0
Under loan	2	11	13	15	15	14	14	14	14	15	16
Other stocks	132	180	182	185	184	181	177	179	180	182	185
Farm price	(Dollars per bushel)										
	14.20	11.49	11.26	10.99	11.23	11.49	11.69	11.66	11.71	11.71	11.70
Market net return/a.	(Dollars)										
	417.39	346.08	340.71	335.28	350.54	366.17	375.88	377.46	380.90	382.63	383.46

Selected stochastic distributions

Marketing year	12/13			17/18			22/23		
Percentile	10	50	90	10	50	90	10	50	90
Supply and Use									
	(Million gallons)								
Motor gasoline use*	133,738	133,758	133,771	122,910	138,167	149,650	108,460	131,044	145,905
Ethanol production	12,521	12,642	12,726	15,405	16,341	17,689	16,031	18,234	20,849
Low-level blend use	12,741	12,791	12,822	10,585	12,302	13,428	8,580	10,922	12,202
Mid-level blend use	54	58	61	2,343	2,564	2,820	2,891	3,311	3,679
High-level blend use	129	130	131	1,524	2,269	3,437	3,879	5,409	7,096
Biodiesel production	1,179	1,185	1,190	1,321	1,472	1,831	1,331	1,680	2,163
Biodiesel domestic use	1,115	1,120	1,124	1,317	1,451	1,805	1,332	1,674	2,143
Prices									
	(Dollars per barrel)								
Petroleum price, Refiners' acq.	94.48	94.48	94.48	52.90	83.58	144.41	60.34	95.33	172.88
	(Dollars per gallon)								
Unleaded gasoline, retail	3.43	3.43	3.44	2.54	3.24	4.55	2.81	3.65	5.14
Conventional ethanol, Omaha rack	2.29	2.33	2.39	1.81	2.12	2.50	1.86	2.19	2.58
Ethanol, effective retail	2.76	2.80	2.85	1.52	1.96	2.61	1.55	2.07	2.80
Biodiesel, rack	4.54	4.57	4.62	4.11	4.67	5.34	4.13	4.79	5.50
	(Dollars per RIN)								
Biodiesel RINs	0.49	0.51	0.54	1.03	1.41	1.93	1.02	1.40	1.89
Cellulosic RINs	0.65	0.70	0.72	1.39	2.29	3.25	1.39	2.28	3.55
Advanced RINs	0.37	0.42	0.44	1.03	1.36	1.63	1.02	1.38	1.80
Conventional RINs	0.11	0.12	0.12	0.35	0.74	1.29	0.27	0.80	1.42
	(Million dollars)								
Total RIN compliance expend.	2,504	2,578	2,691	9,690	18,321	29,604	9,937	23,539	46,717
	(Dollars per bushel)								
Corn price, farm level	6.86	7.04	7.32	3.54	4.70	6.17	3.51	4.67	6.13
Soybean price, farm level	13.84	14.18	14.60	8.33	11.14	14.68	8.50	11.52	15.23
	(Cents per pound)								
Soybean oil price, Decatur	51.06	51.56	52.18	43.41	51.40	60.65	41.83	50.73	60.31
Corn oil price, Chicago	55.90	56.40	57.04	47.58	55.50	64.71	46.16	54.93	64.56

* includes fuel ethanol