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# WORLD BIOFUELS

## World Ethanol

The world ethanol price increased 12.5% in 2008, to \$1.74 per gallon. It decreased 8%, to \$1.6 per gallon, in 2009 because of the 37% drop in crude oil prices coupled with an almost 60% reduction in U.S. ethanol net imports. The ethanol price increases almost 9% over the projection period, mostly because of higher ethanol demand from the U.S. brought about by the renewable fuels mandates. World net trade increased 10.8% in 2008 but declined 8.2% in 2009. As world demand for ethanol increases over the projection period, net trade is expected to rise 323.2%, reaching 4.1 billion gallons by 2019.

Brazil's ethanol production totaled almost 7 billion gallons in 2009, an increase of 0.9%. This translates into 333.3 mmt of sugarcane used in ethanol production. Production of ethanol in Brazil increases 96.8% by the end of the projection period, to 13.6 billion gallons. Sugarcane used in ethanol production increases 71.8%, reaching 572.8 mmt by 2019. Brazil's ethanol consumption increased in 2009 by 7.7%, to 6.4 billion gallons. Its ethanol consumption is projected to increase 48.7% by 2019. Brazil's net ethanol exports reach 4.1 billion gallons in 2019, an increase of 338.7%, partly because of the increase in U.S. ethanol import demand.

Ethanol production in the EU increased almost 45% in 2008 and 14% in 2009. EU ethanol production is projected to reach 1.8 billion gallons in 2019, an increase of 127.4%. Consumption in the EU increased 10.3% in 2009, to 1.1 billion gallons. It is expected to reach 2.5 billion gallons in 2019, an increase of 129.2% over the decade. Total EU biofuels consumption reaches nearly 4% of transport fuels in 2019. EU net imports rise from 279 million gallons in 2009 to 655 million gallons by 2019 as consumption increases more than production.

Chinese fuel ethanol production increased 15.3% in 2008, to 516 million gallons. Production is projected to continue to increase and reach 731.4 million gallons by 2019. Ethanol consumption in China increased from 414 billion gallons in 2007 to 448 million gallons in 2008. It increases 52.7%, to 744.9 million gallons, between 2008 and 2019. Net exports, which totaled 35 million gallons in 2008, are projected to decline over the projection period. By 2018, China switches to a net importer of ethanol, with net imports of 13.4 million gallons in 2019.

In India, ethanol is produced mainly from molasses, a co-product in sugar production from sugarcane. India's ethanol production decreased 32.6%, from 443 million gallons in 2008 to 298 million gallons in 2009, because of a decline in sugarcane production. Production rises to 634.9 million gallons in 2019, an increase of 112.9%. Consumption of ethanol in India was 473 million gallons in 2009 and is projected to increase 48.3%, to 702.1 million gallons, in 2019. India's net imports increase from 53 million gallons in 2009 to 75.7 million gallons in 2019.

Japanese net imports of ethanol declined 3.2%, from 123.6 million gallons in 2007 to 119.6 million gallons in 2008. Net imports are projected to increase 103.7%, to 243.7, by the end of the decade. Ethanol net imports in South Korea totaled 60.6 million gallons in 2005. They are projected to increase to almost 202 million gallons by 2019, an increase of 147.4% from the 2005 levels.

## **World Biodiesel**

The world price of biodiesel (Central Europe FOB) increases to \$4.14 per gallon in 2010, driven by higher petroleum and vegetable oil prices. Lower exportable surpluses from Argentina as their B5 mandate is implemented and tariff barriers imposed by the EU (by far the dominant importer) on biodiesel originating from the U.S. also contribute to the price recovery. Increasing crude oil prices and the mandates in Argentina, Brazil, the EU, and the U.S. lead to price increases throughout the period. The world price reaches \$5.58 per gallon by 2019.

The EU is home to the world's largest biodiesel industry and markets. Both the implementation of antidumping and countervailing duties by the EU and the domestic consumption mandates boost demand for domestically produced biodiesel. In response to these stimuli, the local industry increases production by 5% in 2010, on top of the 36% expansion observed in the previous season. Production continues its expansion and reaches 3.5 billion gallons by 2019. Pushed by the biofuels target, consumption continues to grow during the outlook period, reaching 4.0 billion gallons in 2019. The biodiesel share of diesel in transport is, however, still only about 5.8%. Net imports grow steadily over the outlook period and reach 559 million gallons by 2019.

An export-oriented Argentine industry rapidly increased biodiesel production and exports from marginal production levels in 2006 to over 300 million gallons in 2009. This production continues its expansion path and reaches 464 million gallons by 2019. Implementation of the domestic B5 mandate in 2010, however, reduces the country's exportable surplus by 36% year on year. The ensuing growth in domestic consumption keeps net exports from expanding beyond 270 million gallons over the next decade.

Unlike in Argentina, most of the biodiesel production in Brazil has been motivated by domestic consumption mandates. This is expected to continue over the outlook period, and net exports remain at modest levels, not exceeding 80 million gallons. Consumption jumps in 2008, 2009, and 2010 because of the mandate (B2.5 by 2008, B3 and B4 by 2009, and B5 by 2010) and is expected to reach about 700 million gallons by 2019. While Brazil is striving to produce biodiesel from alternative vegetable oils, it is expected that soybean oil will remain the dominant feedstock.

The combined biodiesel production in Indonesia and Malaysia is expected to increase from about 100 million gallons in 2009 to 182 million gallons in 2019. Domestic production growth is constrained by rising palm oil prices and repeated delays in the implementation of and changes in the domestic consumption mandates in these countries. Given the uncertainty generated by these changes, no domestic consumption mandate was included in the present outlook.

## Ethanol Trade

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Net Exporters</b>	(Million Gallons)										
Brazil	945	1,124	1,324	1,430	1,553	1,736	2,089	2,599	3,118	3,660	4,148
China	35	37	23	23	17	11	7	6	0	-5	-13
Total Net Exports *	980	1,161	1,348	1,453	1,571	1,748	2,096	2,605	3,118	3,660	4,148
<b>Net Importers</b>	(U.S. Dollars per Gallon)										
Canada	171	194	220	236	253	266	277	281	290	297	308
European Union	279	315	373	407	457	491	517	546	581	613	655
India	53	91	89	89	88	87	86	80	78	75	76
Japan	137	149	162	172	183	194	204	213	223	233	244
South Korea	85	100	116	127	138	149	160	170	180	191	202
United States	180	226	291	317	333	432	715	1,168	1,606	2,077	2,470
ROW	75	85	97	107	118	128	139	149	159	170	180
Total Net Imports *	980	1,161	1,348	1,453	1,571	1,748	2,096	2,605	3,118	3,660	4,148
<b>Prices</b>	(U.S. Dollars per Gallon)										
Anhydrous Ethanol Price, Brazil †	1.60	1.61	1.46	1.53	1.52	1.54	1.57	1.67	1.69	1.74	1.74
Ethanol, FOB Omaha	1.79	1.74	1.77	1.78	1.79	1.83	1.89	1.92	1.92	1.93	1.93

Note: 1 gallon = 3.7857 liters; 1 metric ton = 1237.1644 liters.

\* Total net exports are the sum of all positive net exports.

† Represents world ethanol price.

## Biodiesel Trade

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Net Exporters</b>	(Million Gallons)										
Argentina	331	216	247	263	271	274	274	272	270	268	265
Brazil	-1	-13	23	48	63	72	76	75	72	66	58
Indonesia	21	20	22	24	26	28	32	36	41	48	58
Malaysia	58	74	85	91	95	97	98	98	99	99	99
United States	157	24	5	2	12	20	21	25	49	83	122
Total Net Exports *	566	335	382	428	467	491	500	507	531	564	602
<b>Net Importers</b>	(U.S. Dollars per Gallon)										
European Union	375	269	333	380	419	443	452	460	485	519	559
Japan	17	17	15	15	15	15	15	15	15	14	13
ROW	174	35	34	34	33	33	33	32	31	30	30
Total Net Imports *	566	335	382	428	467	491	500	507	531	564	602
<b>Prices</b>	(U.S. Dollars per Gallon)										
Central Europe FOB Price †	3.89	4.14	4.40	4.61	4.75	4.74	4.83	4.98	5.18	5.39	5.58
Biodiesel Plant	3.50	3.67	3.75	3.94	3.99	4.01	4.10	4.22	4.32	4.41	4.41

Note: 1 gallon = 3.7857 liters; 1 metric ton = 1136.36 liters.

\* Total net exports are the sum of all positive net exports.

† Represents world biodiesel price.

## U.S. Biofuels Production and Consumption

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Ethanol</b>											
	(Million Gallons)										
Production	10,699	12,304	13,295	13,648	14,042	14,627	15,293	15,827	16,274	16,763	17,307
Consumption	10,888	12,407	13,525	13,945	14,355	15,030	15,974	16,966	17,855	18,813	19,749
Net Trade	-180	-226	-291	-317	-333	-432	-715	-1,168	-1,606	-2,077	-2,470
<b>Feedstock in Ethanol Production</b>											
	(Thousand Metric Tons)										
Corn	98,283	111,773	119,932	121,954	124,249	128,149	132,603	135,782	138,144	140,451	141,832
Corn Stover	3	37	142	265	305	301	299	296	293	458	1,401
Switchgrass	0	0	0	0	0	0	0	0	0	312	1,566
<b>Biodiesel</b>											
Production	578	715	846	962	1,018	1,025	1,058	1,149	1,238	1,292	1,324
Consumption	401	660	807	945	1,000	1,002	1,027	1,119	1,203	1,242	1,245
Net Trade	157	24	5	2	12	20	21	25	49	83	122
<b>Feedstock in Biodiesel Production</b>											
Soybean Oil	913	1,143	1,461	1,687	1,763	1,761	1,915	2,147	2,286	2,383	2,444
Canola Oil	20	20	19	22	22	22	23	24	23	22	22

## Argentine Biofuels Production and Consumption

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Biodiesel</b>											
	(Million Gallons)										
Production	326	384	418	438	449	455	459	461	462	463	464
Consumption	5	168	171	175	178	182	185	189	192	196	199
Net Trade	331	216	247	263	271	274	274	272	270	268	265
<b>Feedstock in Biodiesel Production</b>											
	(Thousand Metric Tons)										
Soybean Oil	1,102	1,296	1,406	1,466	1,498	1,513	1,519	1,520	1,519	1,516	1,513

## Brazilian Biofuels Production and Consumption

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Ethanol</b>											
	(Million Gallons)										
Production	6,915	7,886	8,429	8,785	9,287	9,811	10,442	11,196	11,988	12,805	13,608
Consumption	6,365	6,646	7,015	7,389	7,739	8,079	8,362	8,608	8,877	9,151	9,461
Net Trade	945	1,124	1,324	1,430	1,553	1,736	2,089	2,599	3,118	3,660	4,148
<b>Feedstock in Ethanol Production</b>											
	(Thousand Metric Tons)										
Sugarcane	333,336	370,306	387,963	399,781	417,951	436,649	459,526	487,221	515,928	544,998	572,815
<b>Biodiesel</b>											
	(Million Gallons)										
Production	406	571	620	656	684	706	722	734	744	751	757
Consumption	396	585	597	608	621	633	646	659	672	685	699
Net Trade	-1	-13	23	48	63	72	76	75	72	66	58
<b>Feedstock in Biodiesel Production</b>											
	(Thousand Metric Tons)										
Soybean Oil	1,204	1,685	1,813	1,905	1,972	2,018	2,049	2,068	2,078	2,083	2,082

## Canadian Biofuels Production and Consumption

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Ethanol</b>	(Million Gallons)										
Production	279	302	310	323	336	351	366	388	410	433	455
Consumption	450	496	530	558	589	617	643	669	700	730	763
Net Trade	-171	-194	-220	-236	-253	-266	-277	-281	-290	-297	-308
<b>Feedstock in Ethanol Production</b>	(Thousand Metric Tons)										
Wheat	868	935	955	989	1,025	1,065	1,106	1,165	1,224	1,286	1,345
Corn	2,017	2,177	2,230	2,315	2,406	2,504	2,607	2,753	2,900	3,052	3,200

## Chinese Biofuels Production and Consumption

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Ethanol</b>	(Million Gallons)										
Production	542	563	575	594	611	630	649	671	691	712	731
Consumption	508	526	551	571	594	618	642	665	691	717	745
Net Trade	35	37	23	23	17	11	7	6	0	-5	-13
<b>Feedstock in Ethanol Production</b>	(Thousand Metric Tons)										
Wheat	1,643	1,695	1,723	1,770	1,813	1,858	1,906	1,960	2,008	2,058	2,105
Corn	3,911	4,046	4,122	4,246	4,359	4,478	4,603	4,745	4,873	5,006	5,131

## European Union Biofuels Production and Consumption

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Ethanol</b>	(Million Gallons)										
Production	803	990	1,073	1,171	1,256	1,351	1,450	1,546	1,641	1,737	1,826
Consumption	1,082	1,304	1,446	1,577	1,713	1,842	1,967	2,092	2,222	2,350	2,481
Net Trade	-279	-315	-373	-407	-457	-491	-517	-546	-581	-613	-655
<b>Feedstock in Ethanol Production</b>	(Thousand Metric Tons)										
Wheat	3,900	4,864	5,305	5,826	6,197	6,647	7,108	7,487	7,962	8,414	8,736
Corn	1,800	2,440	2,598	2,810	2,994	3,188	3,420	3,659	3,853	4,056	4,229
Barley	500	749	796	856	916	983	1,047	1,108	1,161	1,223	1,296
Sugar Beet	9,240	11,963	12,891	13,820	14,896	15,962	17,002	18,170	19,082	20,045	21,265
Other	261	261	261	261	261	261	261	261	261	261	261
<b>Biodiesel</b>	(Million Gallons)										
Production	2,477	2,612	2,840	2,888	2,940	3,002	3,082	3,151	3,265	3,371	3,471
Consumption	2,867	2,883	3,175	3,270	3,361	3,447	3,536	3,612	3,752	3,892	4,032
Net Trade	-375	-269	-333	-380	-419	-443	-452	-460	-485	-519	-559
<b>Feedstock in Biodiesel Production</b>	(Thousand Metric Tons)										
Rapeseed Oil	5,994	6,478	7,074	7,227	7,394	7,640	7,857	8,036	8,323	8,593	8,853
Soybean Oil	1,070	1,044	1,138	1,150	1,170	1,194	1,223	1,249	1,293	1,333	1,370
Sunflower Oil	311	326	354	361	367	375	385	393	409	424	438

## Indian Biofuels Production and Consumption

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Ethanol</b>	(Million Gallons)										
Production	298	419	450	476	497	519	542	568	590	614	635
Consumption	473	505	537	556	577	598	618	637	659	679	702
Net Trade	-53	-91	-89	-89	-88	-87	-86	-80	-78	-75	-76

## Indonesian Biofuels Production and Consumption

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Biodiesel</b>	(Million Gallons)										
Production	24	25	26	28	30	33	36	40	46	53	62
Consumption	3	5	4	4	4	4	4	4	4	5	5
Net Trade	21	20	22	24	26	28	32	36	41	48	58
<b>Feedstock in Biodiesel Production</b>	(Thousand Metric Tons)										
Palm Oil	84	87	92	98	105	114	126	140	159	184	217

## Japanese Biofuels Production and Consumption

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Ethanol</b>	(Million Gallons)										
Net Trade	-137	-149	-162	-172	-183	-194	-204	-213	-223	-233	-244
<b>Biodiesel</b>	(Million Gallons)										
Net Trade	-17	-17	-15	-15	-15	-15	-15	-15	-15	-14	-13

## South Korean Biofuels Production and Consumption

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Ethanol</b>	(Million Gallons)										
Net Trade	-85	-100	-116	-127	-138	-149	-160	-170	-180	-191	-202

## Malaysian Biofuels Production and Consumption

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Biodiesel</b>	(Million Gallons)										
Production	76	92	103	109	114	116	117	118	119	119	119
Consumption	18	18	18	18	18	19	19	20	20	20	20
Net Trade	58	74	85	91	95	97	98	98	99	99	99
<b>Feedstock in Biodiesel Production</b>	(Thousand Metric Tons)										
Palm Oil	265	322	359	382	397	405	409	412	414	416	417

## Rest-of-World Biofuels Production and Consumption

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Ethanol</b>	(Million Gallons)										
Net Trade	-75	-85	-97	-107	-118	-128	-139	-149	-159	-170	-180
<b>Biodiesel</b>	(Million Gallons)										
Net Trade	-174	-35	-34	-34	-33	-33	-33	-32	-31	-30	-30