

Overview of the 2008 U.S. and World Outlook

The Macroeconomic Environment

Macroeconomic projections used in the 2007 FAPRI baseline were obtained from Global Insight. Although recent market turbulence and high crude-oil prices have clouded prospects, the 10-year outlook for the global economy continues to be strong, with a 3.3% average annual rate of real GDP growth. The refiner acquisition cost of crude oil rises first to nearly U.S. \$81 per barrel in 2008 and ends at U.S. \$67 per barrel in 2017.

Downside risk in the outlook centers within the U.S. economy. Rising energy and food prices coupled with recent difficulties in the financial and real estate markets keep growth in 2008 at only 1.90%. But a continued decline in the U.S. dollar and solid growth in trading countries expand exports and, together with business investments, fuel recovery, pushing the decade average up to 2.47%. Problems in the U.S. economy affect the other NAFTA economies, but strong domestic demand keeps growth in Canada at or above 2.23%. Mexico's economy grows at 3.73%. Despite high energy and food prices, inflation is expected to remain moderate during the outlook period, at between 1.6% and 1.9% per year in Canada and the U.S. and at 3.3% to 4.6% in Mexico.

Trade linkages and remittances from migrant workers in the U.S. expose Latin American economies to spillovers from the weakness in North America. But past positive macroeconomic reforms cushion erosion of investor and consumer confidence. Argentina's real GDP is expected to grow at 5.4% annually for the next 10 years. Brazil's economy in the coming decade grows 4.0% per year. Price inflation is expected to be significant in Argentina at 8.6%, while in Brazil it is less so at 3.8%.

The brightest spot in the outlook is the strong and accelerating exports and investments in Asian economies, resulting in an exceptionally solid growth outlook. The projected average annual real growth rate in Asia is 4.5%, with highest growth rates (7.4% to 8.2%) expected for China, Vietnam, and India for the decade. Japan's outlook continues to be positive, with projected real growth of 1.3% annually for the outlook period. Inflation remains low in most of Asia.

The economic growth convergence between old

Europe and the New Member States (NMS) continues; the former grew 2.7% and the latter 6.0% in 2007. Contagion effects from U.S. economic woes taper growth for both in the short to medium term. But catch-up spending on production capacity and productivity improvements sustain growth in the NMS. Most EU members experience real currency appreciation against the U.S. dollar. Inflation remains low.

Strong commodity prices and continuing productivity improvements drive sustained growth in the CIS. Russia and Ukraine grow by 5.0% to 5.5% annually in the next decade. The ruble in Russia and hryvnia in Ukraine strengthen in real terms against the U.S. dollar. Price inflation is projected to be high.

Favorable external markets, sound policy reforms, rising capital inflows, and prudent fiscal policy sustain a strong outlook in Africa, with growth of 5.7%. Oil exporting countries such as Angola and Nigeria benefit from high prices. Most currencies in the region depreciate relative to the U.S. dollar, and price inflation remains high.

The growth outlook in the Middle East is good, with strong domestic demand supported by high crude-oil prices and diversification initiatives that expand investments in the non-oil sector. Currencies are stable in the Middle East and price inflation is modest.

Agricultural and Trade Policy Assumptions

New bioenergy mandates are the main drivers in the current outlook. Major energy policies included in the baseline are the U.S. Energy Independence and Security Act (EISA) of 2007, the 2003 Renewable Fuels Directive of the EU, and fuel mandates and regulations for Argentina's biodiesel (mandating a 5% blend by 2010) and Brazil's biodiesel fuel research program (mandating a 2% biodiesel blend by 2008, a 5% blend by 2010, and tax incentives for biodiesel production). The baseline also includes biofuel policies such as the producer incentives in Canada.

Congress is currently considering a new farm bill. For this baseline, provisions in the Farm Security and Rural Investment Act (the 2002 farm bill) are extended through 2017/18, including the loan rates, target prices, and direct payment rates. Likewise, the biofuel tax credits and tariffs are extended.

Continuing implementation of the 2003 CAP reforms completes target rate of decoupling this year and will take the form of a Single Farm Payment. The accession of Bulgaria and Romania to the European Union is included in the 2007 outlook.

The sugar reforms of the EU CMO were adopted in 2006. The reforms cover a transitional period from 2006/07 to 2009/10. To ease the possible oversupply of sugar in the market in the first years of the reform, the European Commission implemented a 2.5 mmt one-year cut in the quota in 2006/07. A sufficient amount of quota sugar (1.5 mmt) was surrendered in 2006/07 at a one-time payment of €730/ton. However, the second year of the sugar reform saw only about 0.7 mmt of quota renounced, much less than the 6 mmt anticipated by the Commission. Consequently, in February 2007, the Commission introduced another compulsory but temporary market withdrawal of about 2 mmt of sugar for the 2007/08 year. The two quota withdrawals have been accounted for in the baseline.

The European Commission is set to increase the milk quota by 2% beginning April 1, 2008. The increase, a total of 2.84 mmt, would apply on an equal basis to the 27 member states and would be on top of the 0.5% quota increase already scheduled for most of the EU-15 member states.

The outlook assumes recovery from the SPS shocks and trade restrictions in meat markets associated with BSE in North America, FMD in Latin America, especially Argentina, and AI in Europe and Asia.

The 2007 outlook includes policy tables covering border tariffs and TRQs, export subsidies, and domestic policy interventions used in the FAPRI model. An extended policy database is available on our Web site and is updated once a year in the spring (www.fapri.iastate.edu/tools/).

The Outlook for U.S. Agriculture

Expanding biofuel production, a weak dollar, world economic growth, and the weather have all contributed to sharp increases in U.S. grain and oilseed prices. Higher crop prices have caused shifts in crop production, reduced the taxpayer cost of certain farm programs, and increased production expenses for livestock producers. New energy legislation and high petroleum prices are expected to contribute to continued strong growth in biofuel production. Biofuel and

export demand growth may keep nominal crop prices well above pre-2007 levels over the next 10 years. The livestock sector must adjust to higher production costs; thus, growth in meat and milk production is expected to slow.

Crops

Ethanol production continues to expand at a phenomenal pace, so the amount of corn used to produce ethanol now exceeds U.S. corn exports. Rising corn prices resulted in a 15-million-acre increase in corn acreage in 2007. In spite of record production, average corn prices in 2007/08 are roughly double what they were two years ago. Renewed competition from soybeans and other crops may cut into corn acreage in 2008, but corn production needs to increase in subsequent years to meet growing demand for fuel, feed, and food.

EISA, signed into law in December 2007, requires minimum levels of use of various classes of biofuels. EISA ethanol use mandates are likely to be exceeded in 2008 and 2009 but are more likely to prove binding in later years unless petroleum prices are higher than assumed in these projections.

Acreage shifts sharply reduced 2007 U.S. soybean production, contributing to lower stocks and much higher soybean prices. Demand for U.S. soybeans is expected to remain strong, in spite of competition from South America, because of income-driven demand growth in China and the rest of Asia and global demand for vegetable oil to make biodiesel. U.S. soybean acreage is expected to rebound in 2008, but stocks remain tight and prices high.

Wheat prices increased dramatically between the summer of 2007 and early 2008, in part because poor weather has limited production in Australia, Canada, and Europe. With an assumed return to more normal yields for these competing exporters, projected wheat prices decline slightly but continue to be supported by high prices for corn and other grains.

The sharp increase in producer returns for competing crops led to a sharp reduction in cotton acreage in 2007. Although cotton prices have increased in 2007/08, cotton returns have not kept pace with returns for other crops. As a result, cotton acreage could contract again in 2008. Reduced production and increasing cotton exports should eventually reduce large cotton inventories.

Livestock, Poultry, and Dairy

In 2007, feed costs faced by livestock producers increased sharply, and another large increase is expected in 2008. For production to remain profitable, livestock, poultry, and milk prices must increase. In 2007, milk prices increased because of strong international demand for dairy products. Poultry prices increased as well, primarily because of slower production growth. Hog and cattle producers are expected to face tight or even negative margins in 2008, but eventually production will adjust.

The cattle prices experienced in recent years would normally be expected to lead to an expansion of the cow herd. However, dry weather and high forage costs have discouraged expansion, and projected weak or negative returns to cow-calf operators mean cow numbers are unlikely to increase. A slow recovery in beef exports and limited growth in beef production keep projected fed cattle prices near or above 2007 levels over the next 10 years.

High corn and soybean meal prices have sharply increased, yet pork production is also expected to increase in 2008. The resulting lower hog prices and negative margins result in slower growth in pork production. As with beef, slower production growth and rising export demand support pork prices. Barrow and gilt prices average more than \$50 per cwt after 2010, and producer net returns are positive in most years.

A slowdown in U.S. chicken production in late 2006 and 2007 facilitated a recovery in chicken prices. Poultry consumption and exports grow over the next 10 years at a moderate pace, at least as compared to chicken demand growth prior to 2005. Projected wholesale broiler prices remain near the 2007 level.

Drought in Australia and demand growth in Asia contributed to a sharp increase in world and U.S. dairy product prices in 2007. A strong U.S. supply response to high 2007 milk prices and returns is expected to result in lower milk prices in 2008 while at the same time production costs continue to increase. Projected milk prices remain well above pre-2007 levels as the rate of growth in milk production slows after 2008.

Farm Income and Other Aggregate Indicators

Higher crop prices and receipts are the main factors behind a sharp increase in net farm income in 2007. Further increases in crop receipts in 2008 may

result in record net farm income (in nominal terms) in spite of another year of significantly higher costs for feed, fertilizer, and fuel. After 2008, cash receipts and production expenses grow at a similar pace, resulting in relatively stable projections of net farm income.

Government farm program outlays by the CCC declined sharply in FY 2007, as higher prices for corn and other commodities translated into reduced expenditures under the marketing loan and CCP programs. CCC outlays remain low over the next 10 years. In contrast, average crop insurance program costs increase, as premium subsidies and company reimbursements increase with commodity prices.

Consumer food prices increased by about 4% in 2007, and 2008 food price inflation is again expected to exceed the general rate of inflation in the U.S. economy. Higher producer prices for grain, vegetable oil, and other farm commodities account for part of the increase, and higher fuel prices and other factors contribute to rising food processing and distribution costs.

Alternative Baseline Projections

The figures reported in this publication are based on a single set of assumptions about the weather, the economy, and other factors that affect commodity supply and demand. FAPRI also has developed a stochastic baseline of U.S. agricultural and biofuel markets that estimates market outcomes under a wider range of assumptions. In essence, FAPRI develops 500 related baselines that share some assumptions, such as a continuation of current government policies, but that differ in their assumptions about crop yields, production costs, petroleum prices, export demand conditions, and other factors.

Results of the stochastic baseline analysis are summarized in the *FAPRI 2008 U.S. Briefing Book* available at www.fapri.missouri.edu. That publication provides average results from the 500 related baselines. For most variables, those average results from the stochastic analysis are very similar to the estimates reported in this publication. There are exceptions to this general rule, however. For example, average ethanol production is slightly greater in the stochastic analysis than it is in the figures reported here. Ethanol production capacity can grow more rapidly when ethanol producer returns are above average, but capacity only dissipates slowly if returns are below normal.

(continued on page 8)

Box 1. Biofuel Mandates and Outlook

Energy Independence and Security Act (EISA)

The Energy Independence and Security Act (EISA) was signed into law in December 2007. EISA includes a number of provisions to encourage or require the use of biofuels, and these are incorporated in the baseline projections.

EISA mandates minimum levels of domestic use of various classes of biofuels. The overall renewable fuel standard (RFS) requires that 9 billion gallons of biofuels be utilized in calendar year 2008, growing to 24 billion gallons by 2017 and more in later years. Of this total, a rising portion is to be met by “advanced biofuels,” which include biodiesel, cellulosic ethanol, and other biofuels not made from corn starch that meet certain environmental criteria, such as minimum net levels of greenhouse gas reduction.

The overall advanced biofuel mandate increases from 600 million gallons in 2009 to 9 billion gallons in 2017. Thus, no more than 15 billion gallons of corn starch-based ethanol can count toward the RFS in 2017—the 24 billion gallon RFS minus the 9 billion gallon advanced biofuel mandate. Of the advanced biofuel mandate, at least 1 billion gallons must be met by biodiesel by 2012. In addition, EISA also calls for increases in the use of cellulosic ethanol, with a 5.5-billion-gallon target by 2017.

The Energy Policy Act of 2005 established a system that provides some flexibility to entities required to incorporate biofuels in the fuels they sell. If it is cheaper to use more than the mandate in one region than it is to meet the mandate in another, then entities in the two regions are likely to trade. If an entity incorporates more than the required amount of biofuels, it can meet up to a certain portion of the mandate in the subsequent period using credits carried forward. When a mandate is binding, the credit trading system would provide an incentive to bid up the price of that particular class of biofuel until adequate supplies are available to meet the mandate. Costs associated with the higher prices paid for biofuels when mandates are binding would eventually be passed on to final consumers of blended fuels.

Regulations to implement EISA are yet to be written, so the analysis relies on a series of assumptions about how provisions of the law would be carried out, based on a reading of the law, existing regulations, and discussions with federal agency personnel. At the time the baseline

was prepared in January 2008, there was much uncertainty surrounding even the most important assumptions. For example, the law provides the authority to waive some or all of the mandates under various circumstances that will need to be clarified in regulation and program administration. We assume in this baseline that only the authority to waive the cellulosic ethanol mandate will actually be utilized. When the cellulosic mandate is waived, our reading of the law suggests that cellulosic ethanol producers would be provided with credits valued at the greater of \$0.25 per gallon or \$3.00 minus the wholesale price of gasoline. A waiver of one part of the broader mandates for biofuel use results in corresponding reductions in those higher-order mandates. Thus, the shortfall in cellulosic ethanol use relative to the mandate does not lead to greater mandates for use of other biofuels.

A number of other implementation assumptions are also potentially important:

- We assume that up to 10% of the mandate in one year can be met by credits rolled over from the previous year. In 2008 and 2009, actual biofuel use is projected to exceed the RFS. As a result, actual biofuel use in some later years may be less than the EISA levels, even when none of the mandates is waived.

- In current regulations, one gallon of biodiesel is treated as if it were the equivalent of 1.5 gallons of biofuels. This suggests that if biodiesel use exactly equals the 1-billion-gallon biodiesel mandate in 2012, this would count as 1.5 billion gallons for purposes of the advanced biofuel mandate and the total RFS. All forms of ethanol are treated as equivalent in this sense.

- EISA provisions suggest that sugar-based ethanol imports could contribute to satisfaction of the advanced biofuel mandate. Given limited projected supplies of other biofuels that meet the established criteria, ethanol imports could play an important role in meeting the advanced biofuel mandate. We assume that 75% of the small amount of ethanol made from wheat and sorghum would also be counted as advanced.

- We do not allow any deficit. Provisions of previous energy policy indicate an allowance for deficits, provided they are made good the following year.

EISA does not alter existing law regarding biofuel tax credits and tariffs. Under laws in place in January 2008, a \$0.51-per-gallon ethanol tax credit is due to

expire at the end of 2010. A \$0.54 per gallon tariff on non-preferential imports of ethanol and a \$1.00-per-gallon tax credit for biodiesel made with pre-consumer oils and fats are due to expire at the end of 2008. This baseline assumes that these provisions are extended when they are currently due to expire. The *FAPRI U.S. Baseline Briefing Book* available at www.fapri.missouri.edu examines a scenario in which the credits and tariff expire as scheduled.

Biodiesel Outlook

Biodiesel has recently experienced a major surge worldwide, with production increasing from roughly 874 million gallons in 2005 to 2.1 billion gallons in 2007. The rapid expansion in production capacity and production is being observed both in developed and developing countries. While only the EU produced significant amounts less than five years ago, several countries, including the U.S., Brazil, Argentina, Indonesia, and Malaysia, are emerging as major players in this market. The U.S. and these Latin American countries use soybean oil as a feedstock for most of their production, while palm oil and rapeseed oil are the primary feedstocks for producers in Southeast Asia and the EU, respectively. The current FAPRI outlook covers the countries mentioned here, as well as the net trade position of Japan.

Owing to new mandates like the 2007 EISA in the U.S., the biodiesel sector has recently experienced a major surge worldwide, with production increasing from roughly 874 million gallons in 2005 to 2.1 billion gallons in 2007.

Expansion of production and consumption of the biofuel has been fostered by government mandates and financial incentives in combination with high crude-oil prices. Justification for government intervention and support usually involves the pursuance of environmental (mainly reductions in greenhouse gas emissions), rural development, and energy security goals. While financial incentives, including subsidies, tax credits, and exemptions, drove the growth in production and consumption in the past, countries are increasingly relying on consumption mandates to enhance demand and thus provide some market security for producers to increase production.

The move might be largely attributed to the large public outlays that would be required to keep increasing biodiesel consumption through tax exemptions or subsidies. All the major players have policies in place that mandate the inclusion of a minimum amount of biodiesel.

The EU is moving from the indicative targets proposed under directive 2003/30/EC toward a mandatory biofuel usage of 10% of the energy used for transport by 2020. Both Brazil and Argentina require that all the diesel fuel sold in the countries contain a minimum of 5% biodiesel (B5) by 2010. A B2 mandate is already in effect as of this year for Brazil. On the U.S. side, as previously described, the recently passed EISA also mandates minimum levels of biodiesel consumption, starting at 500 million gallons in 2009 and increasing to 1 billion gallons by 2012. These are significant increases from a domestic consumption level estimated at less than 400 million gallons in 2007.

The FAPRI outlook indicates that the production and consumption of biodiesel will increase significantly in the next decade, driven mainly by the mandates implemented by the EU, the U.S., Argentina, and Brazil, combined with sustained high crude-oil prices. The price of biodiesel reaches \$6 per gallon by the end of the period (a 70% increase). However, under the assumptions of the outlook, the EU target to replace 10% of its motor fuel consumption with biofuel by 2020 will be a challenging one. The biodiesel share of diesel in EU transport fuels is projected to be 4.3% by the end of the period as compared to 3.2% in 2007. Trade of biodiesel has only recently commenced in significant volumes with the appearance of the new market participants, in particular, Argentina, Indonesia, Malaysia, and the U.S. acting as net exporters. Net exports of biodiesel are projected to double to 600 million gallons by 2017, with Argentina emerging as the main exporter beyond 2012, followed by the U.S. The EU emerges as the main importer and remains in this position throughout the period, with imports increasing more than threefold (from 119 to 429 million gallons) between 2007 and 2017. Overall, production, consumption, and trade of biodiesel are projected to grow over the next decade.

Because of the safety net aspects of current U.S. farm programs, government payments and net farm income are also higher on average in the stochastic baseline than reported here.

The Outlook for World Agriculture

The rest of the world also faces higher prices of food and feed grains, and oilseed and products. Their livestock and dairy sectors adjust to the higher cost of production primarily driven by the historic high levels of feed grains and oil meal prices. But in the longer run, sustained economic growth with moderate general price inflation and continuing increases in population expand demand for food, feed, and fuel.

Wheat

The Gulf FOB wheat price increased by more than 50%, to \$313.6 per mt, in 2007/08. The wheat price is projected to decrease to \$251.3 per mt the following year with the recovery in production of major exporters such as Australia, the EU, Canada, and Ukraine. The world wheat price reaches \$264.1 per mt in 2017/18 as growth in world demand puts pressure on world markets. In 2008/09, world wheat area is projected to increase because of increases in Australian, EU, and U.S. wheat areas, among others. Area expansion combined with yield growth increases world wheat production to 648.5 mmt in 2008/09. In the later years, production increases come primarily from yield growth.

Population growth increases world wheat demand for food use. By 2017/18, food and industrial use reaches 574 mmt while feed use reaches 112.6 mmt. Consumption grows 1.1% annually on average, with the main source of the demand increase coming from Asian, African, and Middle Eastern countries. In 2007/08, world wheat net trade decreased because of a lower supply of wheat that was the result of lower beginning stocks. It increases to 89 mmt in 2008/09 because of higher production, which lowers the wheat price. Net trade grows 2.7% annually on average, reaching 107.4 mmt in 2017/18. The U.S. market share increased to 35.9% in 2007/08 with the growth in U.S. production and lower supplies in other exporting countries. It decreases in 2008/09 with the recovery in production of other major exporters.

Wheat area and yields in Australia are projected to recover in 2008/09, increasing production to 22.3 mmt and net exports to 14.7 mmt. As production grows

more than consumption, net exports reach 19.2 mmt in 2017/18. Canadian wheat production reaches 25.3 mmt in 2017/18 while consumption reaches 11.7 mmt, driven by growth in feed use and demand by the ethanol sector. Net exports are fairly stable, reaching only 13.5 mmt in 2017/18 because of the high growth rate of domestic consumption. In 2007/08, weather conditions adversely affected wheat production in the EU. In 2008/09, yield and area are projected to increase, causing production to increase to 135.1 mmt. Food and industrial use grows 0.6% annually on average, reflecting rising demand from the ethanol industry. By 2017/18, it reaches 69.6 mmt while feed use reaches 61.2 mmt. Net exports end the period at 13.4 mmt.

In Argentina, production growth comes from yield growth and an area increase over the next 10 years. Production reaches 20.1 mmt in 2017/18. Consumption grows 0.6% on average annually, reaching 5.2 mmt in 2017/18. Aided by the production growth and a meager consumption increase, Argentine net exports reach 14.9 mmt by the end of the projection period.

Net imports of Asian countries increase by 9.5 mmt over the next 10 years, owing to the increase in food use. African and Middle Eastern countries increase their net imports by 12.9 mmt over the next 10 years. Latin American countries' net imports decrease by 0.6 mmt by 2017/18, since production growth exceeds consumption growth.

Coarse Grains

The world coarse grain area is projected to increase further in 2008/09, by 2.6 mha, to reach 257.9 mha. The main source of this increase is corn area, which is responding to higher ethanol demand, particularly in the U.S. Coarse grain area reaches 261.7 mha in 2017/18. Corn area increases the most, especially in the U.S. and Latin America, followed by the sorghum area. Coarse grain production reaches 1,114.3 mmt in 2017/18. Net trade in coarse grains grows 1.8% annually on average, reaching 131.4 mmt in 2017/18.

In 2007/08, corn demand increased in the world, particularly in the U.S., increasing the world price by more than 27%, to \$198.2 per mt. The corn price decreases slightly in 2008/09 as production increases. It stays relatively stable after that. The stocks-to-use ratio decreased to 13.3% in 2007/08 as consumption increased, mainly because of a demand increase from the

ethanol sector. It ends at 13% in 2017/18. In 2007/08, world corn area increased to 157.1 mha. It continues to increase in the projection period, reaching 163.2 mha by 2017/18 because of the higher corn demand. Production reaches 895.9 mmt in 2017/18 because of growth in area and yields. Consumption increases further in 2008/09, to 789.9 mmt, mainly because of the increase in food and industrial use; it reaches 895.6 mmt in 2017/18.

In 2007/08, corn net trade increased with the growth in consumption and production. In 2008/09, corn net trade decreases as U.S. net exports decline, and the increase in exports of other countries cannot meet the increase in demand. Over the next 10 years, corn net trade is projected to increase, reaching 107.2 mmt in 2017/18 because of demand growth in major importing regions such as Asia and Latin America. The U.S. recaptures its market, and its share recovers to 71.9% in 2017/18.

In the next decade, the main U.S. competitors in the corn market increase their production to meet the rising world demand. Argentina increases its production by 7 mmt over the next 10 years. Brazilian production grows by 8.7 mmt over the projection period. South African production increases by 0.7 mmt by 2017/18.

The largest demand increase for corn comes from Asian countries because of growth in their livestock industries and therefore in feed demand. Asian net imports increase by 10.1 mmt over the next decade. African net imports decrease slightly with the increase in production. Among Latin American countries, Mexico maintains its role as a major importer, with imports reaching 14.3 mmt in 2017/18. Mexico also increases its imports of U.S. dried distillers grains. Middle Eastern corn net imports reach 11.1 mmt in 2017/18.

The world sorghum price decreases in 2008/09 to \$172.6 per mt as import demand in the world declines to 6.1 mmt. World sorghum net trade reaches 6.3 mmt by 2017/18 with growth in demand. Japanese net imports are stable, reaching 1.3 mmt in 2017/18. Mexico's sorghum net imports decrease until 2010/11 and then increase, following the pattern of feed use and livestock numbers. Mexican net imports reach 1.8 mmt by 2017/18. The U.S. market share, which generally follows the path of Mexican sorghum net imports, reaches 76.1% by 2017/18.

The world barley price decreases in 2008/09 to \$146 per mt with the recovery in production of major exporters. Net trade reaches 17.9 mmt in 2017/18, fueled by the growth in Asian demand. EU net exports of barley reach 4.7 mmt in 2017/18. Australian net exports recover in 2008/09 and reach 4.7 mmt by 2017/18. Canadian net exports are 1.5 mmt in 2017/18. Ukrainian and Russian net exports reach only 3.5 mmt and 1.8 mmt, respectively, by 2017/18.

Rice

International rice prices spiked in 2007/08 because of tightened exportable supplies, as India, Egypt, and Vietnam restricted their exports to control rising domestic prices. Driven by strong consumption and trade, and appreciation of the Thai baht, the export price continues to trend upward, reaching \$450 per mt by 2017/18. Population-driven consumption growth, coupled with efforts by China and India to maintain low stocks, keeps the rice stocks-to-use ratio declining steadily, to end at 15% in 2017/18. World rice area in 2007/08 increased by 0.45% as area gains in China, Indonesia, and Nigeria more than offset declines in Bangladesh, the U.S., Japan, and Australia. Continued higher prices in 2007/08 are expected to increase global rice area in 2008/09 by 700,000 ha.

While global rice use steadily increases because of population growth, average per capita consumption continues to decline, driven by urbanization, income growth, aging populations, and diet diversification in a number of Asian countries.

On average, world total rice trade is projected to grow at 1.8% annually, reaching 34.4 million tons by 2017/18. Despite the growth, rice trade as a share of world rice consumption remains low relative to other grains, at 7.4% in 2017/18.

Thailand, Vietnam, India, and Pakistan account for 81% of volume growth in world rice exports over the next decade, as these countries experience increased yields and declines in per capita consumption. Growth in U.S. production outpaces that of domestic consumption, enabling rice exports to grow at 1.1% per year. Despite projected steady contraction in rice area over the baseline, China is expected to remain a net exporter as yields improve and per capita consumption declines. Uruguay and Argentina are also expected to expand exports, as area expands and yields

improve, causing domestic output to substantially exceed domestic use.

With strong growth in population and rice consumption per capita, import demand for rice in Africa and the Middle East continues to increase substantially, accounting for 35% of the total growth in world rice imports over the next decade. Mexico's strong growth in per capita consumption of rice and Turkey's growth in population and income are expected to cause continued expansion in rice imports of these two countries. Likewise, the Philippines, Indonesia, the EU, and Bangladesh are projected to remain major rice shipment destinations over the baseline.

Oilseeds

World oilseed prices increase in 2007/08 as a result of stagnating supply and strong world demand. Sunflower seed and rapeseed prices drop next season as area expands. The soybean price remains strong in 2008/09 because of shrinking stocks. Despite area expansions and yield improvements, oilseed prices are not expected to return to their historical levels for the remainder of the projection period.

World oilseed area stagnated in 2007/08 because of strong competition from coarse grains. Driven by record high prices, world oilseed area rebounds next season and is projected to reach 202 mha through the end of the outlook period. Soybean area expansion in South America accounts for 41% of the total oilseed area growth. Palm kernel area expansion of 28% is primarily concentrated in Indonesia and Malaysia. Rapeseed area grows 13% over the next decade as the CIS and EU expand the harvest area for the EU's biodiesel industry. The expansion of oilseed area is driven by increased worldwide demand for protein meals and vegetable oils.

Because of corn area expansion in 2007/08, U.S. soybean production shrank by 19% and pulled the world soybean output down by 6%. World production is expected to recover by 10% in 2008/09 as the U.S. and Brazil respond to the record high price. Encouraged by expected price increases, Brazil's soybean area expansion is expected to post an average growth of 3% annually; Brazil outpaces the United States to become the leading producer in 2016/17. World production reaches 297 mmt at the end of the outlook period and is concentrated in Argentina, Brazil, and the

United States. By 2017/18, Brazil holds a 31% share while the United States contributes 30% of production.

China remains the world's leading soybean importer because of its stagnant production, policies favoring domestic crush, and growing demand for protein and fats. Chinese soybean net imports rise to 52 mmt in 2017/18, accounting for 55% of world net imports. The European Union's net import share continues to decrease during the outlook period, as it imports processed products rather than beans. Brazil dominates the net exports market; its net export share increases to 59% over the next decade. Meanwhile, Paraguay's share of net exports is projected to grow to 8%. World rapeseed net trade increases 31% over the outlook period, primarily driven by biodiesel demand in the European Union. Canada remains the leading net exporter, although its share of world net exports declines from 72% to 62% over the next decade. The CIS is an emerging net exporter, accounting for 31% of world net exports by 2017/18.

Driven by expansion in the world livestock sector, oilseed meal consumption reaches 266 mmt by the end of the projection period. Almost 80% of this increase results from growth in soybean meal consumption. China increases its consumption by 3.4% annually because of strong expansion in its livestock sector. U.S. domestic consumption expands by 19% over the next decade whereas the U.S. share of world consumption falls slightly. Soybean meal also accounts for the majority of the growth in oilseed meal trade. The volume of net trade in the soybean meal market increases by 32% throughout the baseline. Argentina, the leading soybean meal net exporter, ships 98% of its production to the world market because of its differential export tax. Argentina exports 40 mmt by 2017/18 and its market share grows to 52%. The EU remains the top net importer, accounting for 38% of world net imports.

Increasing incomes and population in developing countries, combined with emerging biodiesel industries in various countries, stimulate an additional 36 mmt of world vegetable oil consumption by 2017/18. World vegetable oil food consumption per capita is expected to increase to 16 kg annually over the baseline. World palm oil consumption increases by 46% while soybean oil consumption grows by 30% over the next 10 years. Rapeseed oil consumption reaches 23

mmt during the baseline because of biodiesel production in the EU. China's soybean oil food consumption per capita reaches 10 kg annually and its soybean oil net imports increase 51% by 2017/18. Despite the domestic biodiesel mandate, Argentina still dominates the world soybean oil exports, holding a 72% share of the world market. Palm oil remains the most traded vegetable oil in the world for the next decade. Chinese palm oil net imports expand to 10.8 mmt in 2017/18, accounting for more than a quarter of world net imports. Indonesia, the dominant palm oil exporter, increases its palm oil net exports to 22 mmt as the world price remains strong for the next 10 years.

Cotton

Gains in cotton yield since 2004/05 have been substantial worldwide. U.S. yields have "stair-stepped" to over 900 kg/ha. Yields grow towards 1,000 kg/ha but vary with changes in regional acreage. With the introduction of Bt cotton in India, yields are increasing at a rapid pace; they were 400 kg/ha in 2003/04, have reached 573 kg/ha in 2007/08, and continue to grow for the rest of the decade. These quickly growing yields reach 746 kg/ha in 2017/18. India draws in additional acreage and reaches 10.45 mha by the end of the projection period.

Recent growth in world cotton production has been driven by strong yields and above-average cotton acreage. Higher prices for grains and oilseeds due to biofuels production constrain acreage growth in many locations over the projection period. Biofuels-driven acreage competition is expected to reduce U.S. planted cotton acreage to under 4.0 mha on average over the projection period and to reduce acreage in other coarse-grain-producing countries such as Argentina. Other regions, with fewer alternative crops or a comparative advantage in cotton production, are likely to hold or increase acreage to take advantage of improved prices.

Prices, as measured by the Cotlook NE A-Index, are expected to rise to \$1,619 per mt in 2007/08 and grow to \$1,730 per mt in 2008/09 before moderating slightly for the rest of the projection period. Supply constraints, through competition for acreage from grains and oilseeds, contribute to the improved outlook for prices, but continued world demand, despite higher prices, plays a supportive role as well. World cotton consumption is expected to reach a record 27.8 mmt

in 2007/08 and to grow modestly above population growth, reaching 33.2 mmt by 2017/18. World cotton spinning continues to concentrate in a small number of countries. China, India, Pakistan, and Turkey account for 73% of world mill use in 2007/08 and expand to 80% of world mill use by 2017/18. While some of this gain in mill use has come from declines in the United States and Europe, developing countries are expected to continue to see their growth in mill use slow or even decline. The United States must increasingly rely on export markets for the majority of demand.

Sugar

World sugar production, consumption, and net trade in raw sugar equivalence increase by 15.5%, 24.8%, and 17.7%, respectively, between 2007/08 and 2017/18. World sugar stocks declined for three consecutive years before increasing by 33.9% in 2006/07 and 11.9% in 2007/08. After two years of tight markets, the sugar price declined in 2006/07 by 26.1% as supply rose. The sugar price increases by 2.2% in 2007/08, to almost 12¢ per pound. By 2017/18, the price increases to about 13¢ per pound, an increase of 8.5%, as demand increases, production declines in the European Union, and more sugarcane is diverted to ethanol production, particularly in Brazil.

Brazil remains the dominant world supplier, given continued record sugar production and the country's potential for expansion. Brazilian net exports reach 26.5 mmt by 2017/18. Because of adverse weather, Australian sugar production declines for the third consecutive year in 2007/08, by 2.5%. With government financial support and favorable sugar prices, both sugar production and net exports in Australia are projected to increase by over 19% between 2007/08 and 2017/18. Thailand's sugar production continues to recover, increasing by 39% in 2006/07 and by 7.1% in 2007/08. Thai sugar production and net exports are projected to increase by 12.5% and 3%, respectively, between 2007/08 and 2017/18. The implementation of the EU sugar reforms resulted in a significant reduction in EU sugar beet production and a trade reversal in the European Union from a major sugar exporter to a net importer; net imports total 4 mmt by the end of the projection period.

Russia and Ukraine are projected to lower their combined sugar imports in the coming decade, as do-

mestic production increases by 25% while consumption increases by about 4% by 2017/18. In India, sugar production continues to increase, by 44.9% in 2006/07 and by 3.7%, to almost 32 mmt, in 2007/08. India is expected to continue to export sugar during the projection period, with net exports reaching nearly 3 mmt.

Ethanol and Biodiesel

Given the growing interest in biofuels as an alternative fuel source, many countries are promoting ethanol use through mandates and/or directives. In the world ethanol market, the current major players are Brazil and the United States, with China and India emerging as significant producers. With the decline in U.S. net imports in 2007, the world ethanol price declined 12.6%, to \$1.7 per gallon. The price declines further in 2008, by almost 16%, as ethanol supplies increase. As countries continue to increase their production of ethanol, the ethanol price continues its downward trend; it drops to \$1.25 per gallon in 2012, after which it begins to increase. This increase is a result of EISA provisions in the United States that require increased use of “advanced biofuels,” a category which includes imported sugar-based ethanol. The world ethanol price reaches \$1.52 per gallon by 2017. As demand for ethanol increases over the projection period, net trade is expected to increase 235% and reach nearly 3.6 billion gallons by 2017.

Brazilian production of ethanol increased to 5.2 billion gallons in 2007, and production is projected to increase by 96.7%, to 10.3 billion gallons, by the end of the projection period. Ethanol consumption increased in 2007 by 15.4%, to 4.3 billion gallons, and is projected to increase 56.8% by 2017. Brazil’s net exports reach 3.6 billion gallons in 2017, a 315% increase. In the European Union, ethanol production decreased by 2.2% because of higher feedstock prices. EU production is projected to reach 2.1 billion gallons in 2017, an increase of 72%. Consumption increased by 9.1% in 2007, to 1.2 billion gallons. Consumption reaches 2.4 billion gallons in 2017. EU net imports rise from 33 million gallons in 2007 to 329 million gallons by 2017, as consumption grows faster than production.

Fuel ethanol production in China increased by less than 1% in 2007, to nearly 423 million gallons. Production is projected to increase 34.5%, to reach 576.4 million gallons, while ethanol consumption

increases 158%, to 553 million gallons, by 2017. As China moves toward implementation of alternative fuel sources, its net exports decline steadily over the decade. Indian ethanol production increased to 594 million gallons in 2007 and is projected to increase to 748 million gallons in 2017, up by 26%. Ethanol consumption is projected to increase 98.2%, to 950 million gallons, by 2017. Consequently, net imports reach 214 million gallons. As support for the use of ethanol in fuel continues in Japan and South Korea, their net imports are expected to increase 62.9% and 78.4%, respectively, by the end of the projection period.

Biodiesel is another emerging renewable energy source adopted in a growing number of countries. The world price of biodiesel (Central Europe FOB) increases to \$4.82 per gallon in 2008, driven by high demand as EU countries attempt to achieve their biofuel targets and because of high crude-oil prices. Expanded production in Argentina and Brazil leads to a temporary price decline, to \$4.40, in 2009 and to a sharp increase in exports before the start of the countries’ B5 mandates. However, the world price increases to \$6.00 per gallon by 2017, driven by higher demand from the EU. World net trade doubles to 607 million gallons over the next decade, driven mainly by strong EU demand.

Currently, the EU has the world’s most developed biodiesel industry. Production increased 15% in 2007, and it reaches 2.5 billion gallons by 2017. Pushed by the biofuel target, domestic consumption continues to grow during the outlook period, reaching 3.0 billion gallons by 2017. The biodiesel share of diesel in transport is, however, still only 4.3%. Net imports increase rapidly between 2007 and 2009 as a sizeable volume of biodiesel is delivered from Argentina and Brazil. However, net imports slow down when these two countries’ B5 mandates are executed in 2010. Net imports are expected to hit 429 million gallons at the end of the decade.

Encouraged by their biodiesel mandates and the world market, Argentina and Brazil’s biodiesel industries make significant expansions over the projection period. Argentina’s biodiesel production expands from 73 to 468 million gallons between 2007 and 2017. Domestic consumption jumps significantly in 2010 as the B5 mandate is exercised. Consumption reaches 217 million gallons while net exports grow to 251 million

gallons by 2017. Similar to the outlook in Argentina, Brazil's biodiesel production increases to 718 million gallons by the end of the decade. Consumption jumps in 2008 and 2010 because of the mandate (B5 by 2008 and B10 by 2010). Domestic use is projected to reach 634 million gallons by 2017. Brazil's net exports supply 84 million gallons to the world market over the next decade.

Livestock and Poultry

SPS and food safety concerns continued in 2007, but world meat trade recovered from the 1.1% decline in 2006. Driven by sustained income and population growth, per capita meat consumption rises by 5.1 kg over the baseline, reaching a level of 57.6 kg per person per year by 2017. Meat production capacity continues to expand. Structural transformation and new investment has improved productivity and efficiency. World meat production rises by 17.1% over the next decade, and reaches 248.51 in 2017.

Rising meat demand fuels world trade. Income and population growth as well as various production constraints enable consumption to grow faster than production in many countries, prompting these countries to import more to satisfy their excess demand. World meat trade rises 28.7%, reaching 20.9 mmt at the end of the decade.

Demand recovery coupled with strong grain prices pushes all meat prices to historically high levels. Strategic production investment has improved Brazil's competitiveness relative to other exporting countries, and currency devaluation in the projection period partly compensates earlier appreciation of the real. Brazil gains an additional 2.5 to 14.7 percentage points of export market share. The United States also benefits from currency devaluation and gains an additional 13.1 percentage points of export share in pork markets.

Beef

After a decline of 1.3% in 2006, world beef trade recovered in 2007 and is projected to continue to grow throughout the decade. It is projected to grow by an average rate of 2.7%, ending at 7.6 mmt in 2017. The beef price reaches \$91.85/cwt in 2007 and remains strong for the rest of the decade, returning to near \$90/cwt in 2017 after a decline from 2008 to 2014. Responding to the recovery in trade and the growth of the world price, beef production increases at an annual rate

of 1.4% over the decade, reaching 63.3 mmt in 2017.

A couple of factors boost world beef trade. First is the recovery of demand from BSE concerns, such as those in Japan and South Korea. Second is the income and population growth in many developing countries, such as in Egypt, the Philippines, and Mexico. Third is the increasing demand from trade reversals; for example, China and the European Union have changed from exporters to importers.

A weak economy and a crisis in consumer confidence because of BSE reduced Japan's imports of beef in 2002 and 2004. Imports are recovering from BSE concerns. A continued decline in production, at 0.6%, and a 1.6% growth in consumption fuel expansion of net imports. Imports grow at 3.1% and reach 0.9 mmt in 2017.

China traditionally has been a net exporter of beef, with declining exports but small imports. Poor animal genetics and limited available pasture land restrict its production expansion. Because of continued economic growth, China becomes a beef importer, and its net imports reach 666 tmt in 2017.

Slow recovery in cattle numbers, coupled with economic and population growth, causes Mexico to import more beef. Its beef imports continue to grow at 10.7% over the next decade, and reach 736 tmt in 2017.

Russia's net imports peak in 2008 at 1.2 mmt to meet a shortfall in its domestic production. Then the recovery in production slightly softens its import levels for the rest of the decade, with imports ending at 1.1 mmt in 2017.

AI in the EU poultry sector temporarily arrested the decline in per capita beef consumption in the European Union in 2006. Thereafter, consumption reverts to its long-term declining trend at a rate of 0.2% annually. With maximum decoupling of support in the beef sector beginning in 2007 and shrinking dairy animal numbers, EU beef production declines at a rate of 0.2% annually, ending at 7.9 mmt in 2017. The European Union became a net importer in 2003 and continues in this position for the rest of the decade, importing 529 tmt in 2017.

With restoration of live cattle trade with the United States, Canada's cattle exports grow 2.3% annually, reaching 1.55 million head in 2017. As a result, beef

trade is weak in the short to medium term. Canada's beef net exports grow by 59.6% annually in the second half of the decade, reaching 331 tmt in 2017.

Producers in Oceania and South America benefited from the ban of North American beef in many importing countries. Australia expanded its supply share in the Asian market when North American suppliers faced SPS challenges. Even with re-entry of U.S. beef in many markets, Australia posts a 1.1% growth rate in its net exports in the next decade, as other major players' exports remain weak in the short run. Export of live animals in 2007 was only 79% of the peak in 2002. However, exports grow by 7.7% annually, reaching 1.35 million head in 2017. Despite its strengthening currency, New Zealand benefited from the compromised SPS status of other beef exporters as well as from the growth in its dairy sector. New Zealand's exports continue to grow over the rest of the decade at 3.6% annually, reaching 685 tmt in 2017.

After two successive years of strong export growth, export controls to reign in domestic inflation reduced Argentina's net exports by 27.0% in 2006, and by another 4.9% in 2007. Moreover, export controls together with herd rebuilding soften medium-term exports. But rising cattle numbers coupled with currency depreciation throughout the next decade allow Argentina to expand its net exports in the outer years. Net exports in 2017 reach 691 tmt.

Pork

In 2007, pork trade remained at the same level as in 2006, at 4.1 mmt. Over the next decade, pork trade grows strongly at 2.8% (1.17 mmt), reaching 5.31 mmt in 2017. Pork production increases in the next decade at a rate of 1.8% (16.64 mmt), reaching 111.25 mmt in 2017. From a peak in 2004 of \$52.50/cwt, the pork price cycles throughout the decade. The pork price peaks again in 2012 at \$53.31/cwt and ends at \$51.34/cwt in 2017.

Recovery in the beef and poultry sectors from BSE and AI affects Japan's pork sector. Consumption drops at 0.2% over the next decade, and production also declines at 0.2% because of higher feed costs. As a result, net imports are nearly stable, with a slight rise of 0.2% per year, and they reach 1.2 mmt in 2017.

Constrained by environmental pressures and high feed costs, Taiwan's production increases only slightly,

at 1%, which boosts its net imports by 33.3% per year. China's exports declined 38.6% in 2007 because of the outbreak of blue ear disease. Exports continue to decline over the decade, and China becomes a net importer in 2015. South Korea's consumption growth is supplied mostly by additional imports; imports grow at 3.3% over the decade.

Improved disposable income and population growth induce Mexico's pork consumption to rise at 2.7%. Despite some industry integration, high feed costs limit production expansion; production grows at 1.8%. As a result, pork imports rise at 5.7% over the outlook period, reaching 573 tmt in 2017.

Despite its pork TRQ with an in-quota rate of 15% and an out-quota rate of 80%, Russia's net imports grow at 1% over the decade, reaching 943 tmt in 2017. Both its production and consumption rise, at an annual rate of 2.0% and 1.7%, respectively.

The hog inventory in Canada has declined since 2006. It will begin to turn around in 2011. As a result, pork production declines next year by 5.3%. Over the rest of the decade, production grows at 2.7% annually. Canada's export of live hogs to the United States continues to grow, at 1.4%, reaching 11.55 million head in 2017. Canada's pork exports decline in the short run but grow at 4.7% over the rest of the decade.

The European Union's per capita consumption jumped 1.2% in 2007 because of AI in poultry. It continues to grow over the rest of the decade by 0.3% as incomes rise in the NMS. Net exports rise until 2009 but decline after that and end at 1.1 mmt in 2017. Strict environmental regulations and animal welfare requirements limit the European Union's long-term capability. Production grows at 2.4% in the projection period, compared to the 3.2% growth in consumption.

Poultry

After a decline of 6.1% in 2006 due to AI, broiler trade started to grow from 2007 at a rate of 3.0% annually. Total broiler trade increases by 1.85 mmt, reaching 7.94 mmt in 2017. Total broiler production increases by 1.9% (12.0 mmt), reaching 73.97 mmt in 2017.

China's net imports of broiler reach 692 tmt in 2017. After losing 59.4% of its exports because of AI, Thailand regains 0.6 point of market share in the next decade. Productivity improvements, product innovation, and a shift to higher-valued products enable

Thailand to overcome SPS concerns and its higher cost of production. Thailand's net exports increase by 5.4% annually, reaching 485 tmt in 2017. However, with small- and medium-sized operations exiting the industry and the continuing threat of AI, Thailand falls short of its long-term trend.

Continuing recovery from AI allows Japan's net imports to grow by 1.5% for the rest of the decade. Also, economic growth raises combined broiler net imports in South Korea, Indonesia, and the Philippines from 60 to 129 tmt. The high cost of production in Saudi Arabia fuels import growth of 4.7%; imports reach 633 tmt in 2017.

Taiwan removed its broiler import quota and replaced it with a "tariff-only regime" in 2005. As a result, imports are projected to increase 12.5% annually, reaching 108 tmt in 2017. A shift to differentiated local breeds sustains domestic production at a growth rate of 1.4% per year.

Russia's imports dropped by 10.5% in 2003 and by another 6.0% in 2004 as new import rules were clarified. Imports recovered by 20.0% in 2005, continue above the 1.13 mmt TRQ through 2012, and remain at the TRQ level over the rest of the period. Over the outlook period domestic production is encouraged and grows by 3.2%, exceeding the 1.5% growth in consumption.

Under NAFTA, Mexico's TRQ for chicken leg quarters is removed in 2008. Strong domestic demand drives net imports to grow 5.6% annually, and they reach 646 tmt in 2017.

Brazil's net exports increased 16% in 2007, and they continue to grow in the next decade. Exports grow 3.1%, reaching 3.79 mmt in 2017. Reduction in AI concerns and aggressive promotional efforts in overseas markets encourage Brazilian poultry exports. Fiscal incentives and subsidies from local government encourage large new investments in broiler production.

The United States loses 3.1 percentage points of market share. Strict animal welfare and environmental regulations limit the European Union's production expansion, and it loses 0.2 point of market share.

Dairy

Over the decade, world milk production increases 20.1%, with most of the growth generated by gains

in productivity per cow. Of the 102.9 mmt increase in milk production, 32.9% occurs in the Americas, primarily in the United States and Brazil, and 44.6% occurs in Asia, mainly in China and India. Total butter production increases 34.9% over the baseline, with India accounting for over 88.9% of the growth. Total cheese production grows 22.3%, with the United States and the European Union accounting for over 64%. NFD production rises 21.7%, with the greatest gains occurring in the United States, which comprises almost half of the growth. Excluding the European Union, WMP production grows in most countries, increasing a total of 19.7%. Despite a rising availability of milk in many importing countries, dairy product trade expands substantially over the decade.

Australian milk production is adversely affected by the lack of an irrigation water supply in the near term. With an assumption of improved weather, Australian milk production starts to recover in 2011 and reaches the pre-drought level at the end of the baseline. Consequently, Australian butter, cheese, NFD, and WMP production increase over the long run. New Zealand milk production increases 1.2% annually, which enables butter, cheese, NFD, and WMP production to increase 9.7%, 27.7%, 17.3%, and 10.9%, respectively, over the projection period. As leading exporters in world dairy markets, Australia and New Zealand enjoy continued export growth in long run. Stimulated by strong import demand, especially from Asia, Australian and New Zealand NFD and WMP exports increase steadily over the decade, accounting for 38.2% and 58.8%, respectively, of total world trade.

Because of an increase in milk quotas, EU milk production increases to reflect the new quota level. EU milk production averages 142.6 mmt during the projection period. Because of restricted milk supply and higher returns from cheese production, more milk is diverted from butter and NFD into cheese production. Cheese production rises 16.6% over the baseline, while butter and NFD production decreases. The steady growth in domestic cheese consumption absorbs the bulk of the increase in cheese production, limiting the growth in cheese exports throughout the baseline. Both butter and NFD prices remain above the intervention prices but with a decreasing trend. Butter, NFD, and WMP exports stagnate as both production and consumption decline.

North American milk production increases 13.3% over the decade, with roughly 90% of the growth occurring in the United States. While EU NFD export languishes, U.S. NFD exports increase 69.4% and account for about one-third of total world exports at the end of the baseline. Mexican milk production increases 10.7%, entirely through the growth of productivity. Growth in Mexico's dairy product output cannot catch up with domestic demand growth, and Mexican dairy product imports increase over the baseline.

As Argentina's economy recovers and world prices stay strong, the Argentine dairy sector expands over the baseline. Its butter, cheese, NFD, and WMP production increase 2.7%, 3.9%, 4.9%, and 4.8% annually, respectively. Attracted by strong world prices, Argentine dairy exports increase, especially cheese and WMP. Argentine cheese exports increase 90.9% and WMP exports increase 48.6%. Improved domestic economic conditions and favorable government policies boost Brazilian dairy production. Milk production increases 4.6% annually, mostly generated by higher productivity per cow. A more abundant supply of milk enables butter, cheese, NFD, and WMP production to increase 16.3%, 47.7%, 50.3%, and 36.9%, respectively, in Brazil during the projection period. Consequently, there are more exportable surpluses of dairy products, allowing Brazil to become a rising exporter in the world markets, especially of cheese and milk powder.

Russian milk output increases 1.6% annually over the baseline. The additional supply of milk accommodates growth in fluid milk consumption as well as increased output of all four major dairy products. Income growth stimulates growth in all dairy consumption. The growth in production cannot catch up the growth in consumption, and consequently all Russian dairy imports increase throughout the baseline. With strong demand and high world prices, Ukraine starts to expand its exports after being negatively affected by the import ban in Russia.

With sustained economic growth, population growth, and changing diets, Asian dairy consumption expands steadily. To meet strong domestic demands for dairy products, China and India significantly increase milk production. In response to efforts by the Chinese government to encourage milk production through better genetics and herd management, Chinese cow yields

increase 2.6 % annually. With limited land, water, feed, and energy sources, starting from mid-term, the pace of growth in the Chinese cow inventory slows down. Rising yields combined with a steady expansion of China's dairy herd result in a 3.9% annual increase in Chinese milk production. The expansion of milk production not only facilitates the growth of fluid milk consumption but also helps boost the production of dairy products, especially of milk powder. Domestic WMP has become more abundant and consumers have begun to substitute fluid consumption for milk powder. Thus, China started to export WMP in 2007, and it continues to trade as an exporter over the projection period. Strong demand drives Chinese butter, cheese, and NFD imports to increase steadily over the decade.

As one of the biggest milk producers in the world, India continues to expand its milk production, with a 1.4% annual growth in cow milk production and a 3.3% annual growth in buffalo milk production. Driven by rapidly growing domestic demand and strong world prices, Indian butter production increases 71.9%. Butter exports reach a record at the midterm of the baseline and then decrease as more production is absorbed by domestic markets. As a by-product, India's NFD production grows 49%, creating excess supplies that allow NFD exports to rise. Indian NFD exports increase 62% over the baseline.

Southeast Asia (Indonesia, Malaysia, the Philippines, Thailand, and Vietnam) depends heavily on imports to meet domestic demand. It increases its share of total NFD imports from 36.6% in 2007 to 40.8% in 2017. China and Japan together account for about 7% of the NFD import market by the end of the baseline. While China switched from a WMP importer to a WMP exporter, Southeast Asia increases its imports 4.5% annually. Steady growth also occurs in Asian cheese and butter imports. As a leading cheese importing country, Japan's cheese imports increase 1.1% annually, accounting for roughly 18% of total world imports by 2017. China, Southeast Asia, and South Korea increase their combined cheese imports 5.6% annually. Total butter imports to China, Japan, South Korea, and Southeast Asia increase 62% over the baseline.