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RESEARCH ARTICLE

DECADAL PROSPECTS OF GLOBAL SUGAR TRADE – AN EMPIRICAL ANALYSIS

P. Murali* and N.V. Nair

Abstract

International trade is largely defined by preferential trade agreements in which sugar producing countries get access to the higher priced domestic markets of the EU or USA. Trade under preferential agreements is very important to the sugar sectors of many developing countries. Of late, WTO regulation also paved the way to explore world markets for low cost sugar producers. These changes have impacted the global sugar trade in a sequential way. In this paper, issues concerning the major sugar producers, exporters, importers, sugar prices and consumers of this decade were analysed. The projections presented are based on the analysis of information drawn from a large number of sources. The use of a model jointly developed by the Organisation for Economic Co-operation and Development (OECD) and FAO Secretariats, based on the OECD's Aglink model and extended by FAO's Cosimo model, facilitates consistency in the analytical process. A large amount of expert judgement was applied at various stages of the projected period of the study. The empirical analysis has shown that Brazil is expected to consolidate its position as the leading global exporter and will account for over 55% of global trade and over 63% of all additional sugar exports by the close of the projection period of 2022–23. The world sugar market remains heavily distorted by government policy interventions that contribute to high price volatility. Changes in domestic support policies and border measures such as the imposition of export restrictions will have a major bearing on trade volumes and international prices.

Key words: Raw sugar, sugar price, sugar trade, Brazil, India

Introduction

International sugar trade is largely defined by preferential trade agreements in which sugar-producing countries get access to the higher priced domestic markets of the EU or USA through preferential access. Trade under preferential agreements is very important to the sugar industries of many developing countries. Sugar trade between African, Caribbean and Pacific countries (ACP), and the European Union is regulated by two agreements: the ACP/EU Sugar Protocol and the Agreement on Special Preferential Sugar (SPS). FAO studies have revealed that EU sugar policy reforms imply an erosion of preferences for the ACP countries. Hence, everything but arms initiative (EBA)[1] was introduced primarily over the medium to longer term for potential gains to the least developed countries (LDCs).

Over the last decade, there have been a number of structural changes affecting the evolution of trade patterns including consolidation of sugar trade by a smaller number of global exporters and a decline in the volume of white sugar traded internationally. The reforms on sugar policies by the European Union

P. Murali* and N.V. Nair
Sugarcane Breeding Institute, Coimbatore 641007, Tamil Nadu, India
*e-mail: muralisundar007@gmail.com

led to an abrupt decline in sugar due to progressive reduction in production quotas below the consumption levels. As a consequence, the EU has switched over from a large net exporter of white sugar to a large importer of raw sugar. New refineries in a number of countries in Africa and the Middle East have progressively come on stream and began exporting increasing quantities of white sugar to neighbouring countries and regional markets.

The world sugar market continues to experience considerable price volatility. The world indicator price for raw sugar crashed to the lowest in the decade in 2011 after soaring to a 30-year high of USD 36.08 c/lb (USD 795.4/t) in February 2010 (McConell et al 2010). Market fundamentals driving volatile prices were large global sugar deficits in the previous two seasons and adverse weather in a number of countries that reduced the expected rebounce in production resulting in higher prices. World sugar stocks dropped to the lowest level in 20 years in 2011(ISO market outlook 2011), supporting more volatile market prices. International sugar prices are expected to ease back in 2013/14, as production increased during post 2011 period around the world and the global balance is likely to move into a larger surplus that will lead to eventual stock rebuilding during 2011 - 2013.

The increase in prices of some commodities in 2010 was particularly steep because of the instability in production. In many emerging and even some of the least developed countries, economic growth has shown signs of revival. Demand for virtually all commodities including sugar has strengthened. Oil prices continued to rise and fluctuate with the sustainability of supplies becoming increasingly uncertain as political instability spread across the Middle East.

The exchange rates have also fluctuated significantly which affected the competitiveness of countries in sugar trade. The depreciation of the US dollar with respect to many currencies has increased dollar denominated prices of sugar products. Ad hoc policy measures such as trade restrictions resorted by some of the exporting countries have further curtailed the supplies and contributed to price rise in cereals, with visible impact on sugar prices as well. In addition, increased inflow of investment in commodity markets has been a persistent feature during the period, although their influence on commodity price movements remains unclear and would require further research. This paper presents the projections for sugar trade for the next 10 years based on critical analysis of available data on production and market trends and the overall economic outlook for the period.

Projections for production, consumption and trade with respect to white and raw sugar were made for a period of 10 years from 2013-14 to 2022-23.The projections were based on information drawn from a number of sources including OECD's and FAO's database.

Sources and assumptions for the macroeconomic projections

The main macroeconomic variables assumed for the projection period (2013-14 to 2022-23) were based on the December 2010 medium term projections and on the global economic prospects of the World Bank (OECD/FAO January 2011). In addition to quantities produced, consumed and traded, the baseline also includes projections for nominal prices (in local currency units) for the commodities concerned. Unless otherwise stated, prices used in the analysis were nominal terms. The data series for the projections were drawn from OECD and FAO databases, mostly from national statistical sources.

[1]Everything But Arms" arrangement (EBA) was born in 2001 to give all LDCs full duty free and quota-free access to the EU for all their exports with the exception of arms and armaments

The model provides a comprehensive dynamic, economic and policy specific representation of major sugar producing and trading countries in the world. On the basis of these discussions and updated information, a second baseline was generated. The information generated was used to prepare market assessments for sugar over the course of the projection period.

The OECD and FAO Cosimo model used indices for real GDP, exchange rate, consumer prices (PCE deflator) and producer prices (GDP deflator) which were constructed with the base year 2005 value being equal to 1. The calculation of the nominal exchange rate used the percentage growth of the ratio "country-GDP deflator/US GDP deflator".

The representation of production costs in AGLINK-COSIMO

Changes in production costs formed an important variable for farmers' decisions on crop and livestock production quantities, in addition to output returns. Supply in AGLINK-COSIMO is determined by gross returns, production costs were represented in the model in the form of a cost index used to deflate gross production revenues. In other words, supply equations in the model depended on gross returns per unit of activity (such as returns per hectare or the sugar price) relative to the overall production cost expressed by the index. Consequently, equations for harvested areas in sugarcane production quantities were depicted in the following general forms.

$$AH = f\left(\frac{RH}{CPCI}\right); \quad QP = f\left(\frac{PP}{CPCI}\right)$$

with:

AH - area harvested (crop production)
RH - returns per hectare (crop production)
CPCI - commodity production cost index
QP - production quantity (sugarcane production)
PP - producer price (sugarcane production)

Among others, energy prices includingincreased crude oil prices have fostered attention to agricultural production costs in agricultural commodity models. Energy price significantly impacted agricultural products as production costs for both crops and livestock products. Fuels for tractors and other machinery, as well as heating and other forms of energy were directly used in the production process. In addition, other inputs such as fertilisers and pesticides that have high energy content were driven to a significant extent by energy prices. It was therefore important to explicitly consider energy prices in the representation of production costs. The non-tradable sub-index was approximated by the domestic GDP deflator. Finally, the tradable sub-index was linked to global inflation (approximated by the US GDP deflator) and the country's exchange rate. This relationship was shown in the following equation:

$$\begin{aligned} CPCI &= CPCS^{NT}_{r,t} * GDPDR,T / GDPD_{r,bas} \\ &+ CPCS^{NT}_{r,t} * (XP^{OIL}_{t} * XR_{r,t}) / (XP^{oil}_{bas} * XR_{r,bas}) \\ &+ (1\text{-}CPCS^{NT1}_{r,t} - CPCS^{EN1}_{r,t}) * (XR_{r,t} * GDPD_{USA,t}) / (XR_{r,bas} * GDPD_{USA,bas}) \end{aligned}$$

with:

CPCI - commodity production cost index for sugarcane
CPCSNT - share of non-tradable input in total base commodity production costs
CPCSEN - share of energy in total base commodity production costs
GDPD - deflator for the gross domestic product
XPOIL - world crude oil price
XR - nominal exchange rate with respect to the US Dollar
r, t - region and time index, respectively
bas - base year (2005 or 2010) value

The production cost index was different for each crop products and was constructed from five sub-indices representing seed inputs, fertiliser inputs, energy inputs, other tradable inputs and non-tradable inputs, respectively.

with:

CPCSUC - commodity production cost index for crop product (sugarcane)

CPCSNT - share of non-tradable input in total base commodity production costs

$$CPCSU^{c}_{r,t} = CPCS^{NT}_{r,t} * GDPD_{R,T}/GDPD_{r,bas} + CPCS^{EN}_{r,t} * (XP^{OIL}_{t} * XR_{r,t})/(XP^{oil}_{bas} * XR_{r,bas}) + CPCS^{FT}_{r,t} * (XP^{FT}_{t} * XR_{r,t})/(XP^{FT}_{bas} * XR_{r,bas}) + CPCS^{TR}_{r,t} * (XR^{OIL}_{t} * GDPD_{USA,t})/(XRr,bas * GDPD_{USA,bas}) + CPCS^{SD}_{r,j} * PP^{SU}_{r,t}(-1)/PP^{SU}_{r,bas}$$

CPCSEN - share of energy in total base commodity production costs

CPCSFT - share of fertiliser in total base commodity production costs

CPCSTR - share of other tradable input in total base commodity production costs

CPCSSD - share of seeds input in total base commodity production costs

GDPD - deflator for the gross domestic product

XPOIL - world crude oil price

XPFT - world fertiliser price

PPSU - producer price for crop product sugarcane

XR - nominal exchange rate with respect to the US Dollar

SU - sugarcane product

r,t - region and time index, respectively

bas - base year (2008 or 2010) value

The shares of the various cost categories were country specific. They were estimated based on historic cost structures in individual countries. Shares vary depending on the development stages of the countries and regions. Developed countries have higher shares of energy, fertiliser and tradable inputs than developing nations.

The fertiliser price is constructed by FAO fertiliser analysts as following:

$$XP^{FT} = 0.2 * DAP + 0.16 * MOP + 0.02 * TSP + 0.62 * Urea$$

With:

Diammonium phosphate (DAP)

Potassium chloride (MOP)

Triple superphosphate (TSP)

Urea

And it was represented by an equation in the AGLINK-COSIMO model

$$Log(XP^{FT}_{t}) = CON + elas^{oil}_{FT} * log(XP^{OIL}_{t}) + elas^{crop}_{FT} * log(0.5 * XP^{CG}_{t-1} + 0.2 * XP^{WT}_{t-1} + 0.2 * XP^{OS}_{t-1} + 0.1 * XP^{SU}_{t-1})$$

with:

XP- OIL world crude oil price

XP- FT world fertiliser price

XP- CG world coarse grain price

XP - WT world wheat price

XP - OS world oilseed price

XPRI - world sugar price

Partial stochastic simulations with AGLINK-COSIMO model

Policy analysis was conducted by changing a set of macroeconomic variables solving the model for these new given data and comparing the new simulation output to the baseline. A number of different sets of crop yields for sugarcane and all countries studied for 10 years period (2014-2023), have been simulated by using partial stochastic model. The stochastic framework was focused on reproducing observed yield variability. The methodology developed for the present analysis did not allow price effects on yields. Yields have been assumed to follow truncated multivariate normal distributions. The deterministic benchmark projections presented was on a "normal" weather assumption.

Results and discussion

Production and use of sugar

Cultivation of sugar crops in most parts of the world was expected to expand in response to rising demand for sugar and other uses and relatively high market prices. Consequently the world sugar production is expected to increase by 38 Mt to reach over 212 Mt in 2022-23 (Fig.1), whereas the world sugar consumption is expected to grow at a lower average rate to reach 203 Mt in 2022-23.

The bulk of the additional sugar production would come from the developing countries with Brazil leading the table. Brazil has expanded the production of sugar and ethanol significantly in the past two decades, but a slowdown in investment in new mills occurred after the financial crisis of 2008 leading to deceleration in overall growth in the recent past. The recent surge in the ethanol market has improved profitability and should trigger additional investment in the sector within the decade. The raw sugar output in Brazil would be rising by around 9 Mt to nearly 45 Mt by 2022-23.

India, the second largest global producer and the world's leading consumer, is expected to boost production substantially to 33 Mt of sugar, in the coming decade, 50% higher than in 2008-10. Annual sugar output will continue to show wide swings in production as in the past (Fig. 2). Other countries of Asia, such as China and Pakistan are also expected to experience fluctuations in production though of a lesser order which can impact the import volumes. An expansion drive is underway in Thailand which is expected to increase the production to 8.7 Mt by 2022-23 consolidating its position as third largest producer in Asia.

In contrast to the expansion trends in the developing countries, the traditional sugar producing countries in the developed world are expected to witness static or lower production over the coming decade. For instance, in the European Union, quota based sugar production has declined with policy reforms and is expected to stabilise around 13.4 Mt white sugar equivalents (w.s.e). Some additional beet sugar production is expected during the period to supplement ethanol production and the chemical industry.

Production of sugar in the United States is expected to show little growth and to remain well below the 85% minimum allotment level of the 2008 food canning establishment. US producers are expected to focus on improving their sugar margins by cutting costs and essentially leaving Mexico to fill the expanding gap between stable production and higher US consumption requirements. Assured access to higher prices in the slowly growing US market is expected to encourage some further investment and growth in Mexico's sugar market in the coming decade.

The sugar industry in Australia, although devastated by floods and a cyclone in 2010, is expected to recover in coming years. However, with continuing pressure on land available for sugarcane production, sugar producers will likely focus on higher productivity based on farm consolidation and improved cane varieties and higher sugar yields to raise the sugar production to around 5 Mt by 2022-23. The sugar industry in the Russian Federation has undergone a transformation in recent years and

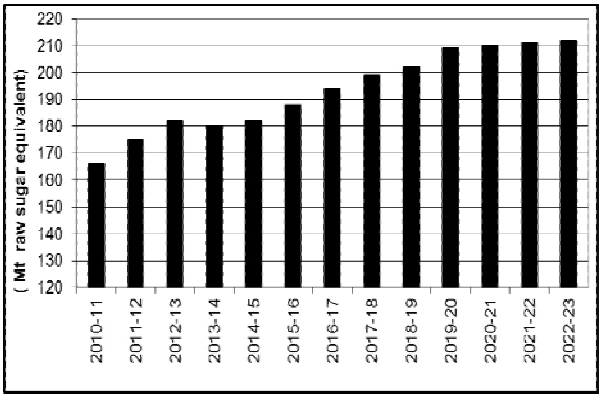

Fig. 1. World sugar production projections (2010-2023)

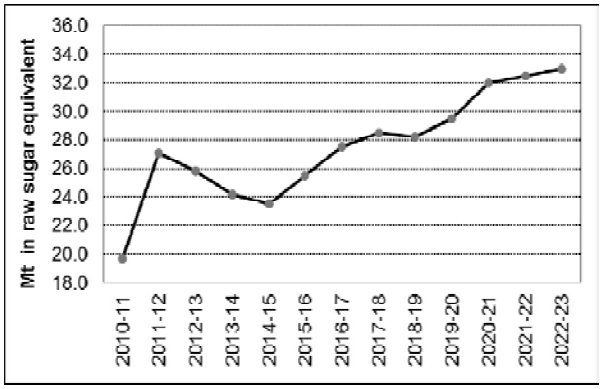

Fig. 2. Projection of raw sugar production of India at 2023

is projected to continue to expand production to reach nearly 5 Mt by 2022-23.

Global consumption is projected to grow at 2.2% p.a. up to 2022-23, down from 2.6% p.a. in the previous ten years (2001-10). The developing countries will continue to show significant growth in sugar consumption, fuelled by growing population and rising income. The sugar deficit regions of Asia and the Far East as well as Africa will witness significant growth in consumption. In contrast, sugar consumption in many developed countries, with their mature sugar markets, is expected to show little or no growth. Total consumption in these countries is expected to increase from 48Mt to nearly 52 Mt over the projected period. This reflects a possible slowdown in population growth and shifts in dietary preferences in view of the increasing health awareness and concerns.

Sugar price projection

The raw sugar price (Intercontinental Exchange No. 11 spot, fob, Caribbean ports) in nominal terms is projected at nearly USD 438/t (USD 19.1 c/lb.) in 2022-23. This is lower than the historical peak at the start of the projection period, but prices are expected to remain on a higher level over the projected period compared to the past decade. White sugar prices (Euronet, Liffe, Contract No, 407, London) follow a similar pattern and were projected to reach USD 536/t (USD 24 c/lb.) in 2022-23 (Fig. 3).

Stocks are expected to rebuild in the near term, but the stocks-to-use ratio is expected to be lower over the coming decade than in the previous 10 years (2001-10), providing support for higher prices. Brazil's sugar production, as one of the lowest cost sugar producers with considerable capacity to expand sugarcane area on a large scale, along with the projected growth in ethanol production will be a key determinant of global sugar price. Government policies that intervene in sugar markets and production cycles in major cane producing countries of Asia will continue to influence world sugar production and price volatility during the projected period.

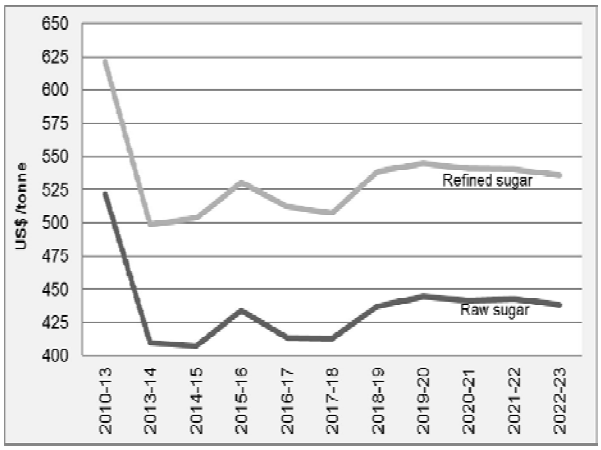

Fig. 3. Evolution of world prices in nominal terms at 2022-23

Trade

Over the last decade, there has been a number of structural changes affecting the evolution of trade patterns which will continue to influence international sugar trade in the coming period. These include consolidation of sugar trade by a smaller number of global exporters and a decline in the volume of white sugar traded internationally (Fig. 4). The reforms in the sugar regime of the European Union led to an abrupt decline in white sugar exports of 6-7 Mt, since production quotas were progressively reduced below the consumption requirements. As a consequence, the EU has switched over from a large net exporter of white sugar to a large importer of raw sugar for further refining and sale in the domestic market. The white sugar trade is expected to recover in the coming years as more refined sugar will be available for export by traditional exporters in response to the high white sugar premium during the projected period. New destination refineries in a number of countries in Africa and the Middle East are expected to come on stream and would begin to export increasing quantities of white sugar to neighbouring countries and regional markets.

Brazil is expected to consolidate its position as the leading global exporter and will account for over 55% of global trade and over 63% of all additional sugar exports by end of 2023. While the bulk of Brazil's exports will continue to be made of high quality raw sugar (VHP) which will increase to 21 Mt in 2022-23, the white sugar shipments would grow by 50% to the tune of over 14 Mt in the same period (Fig. 4).

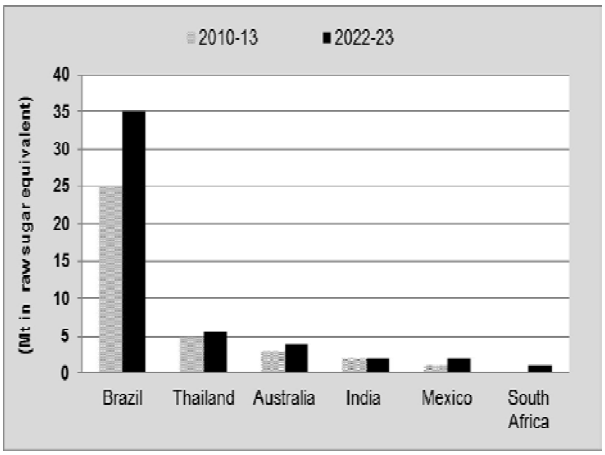

Fig. 4. Comparison of export volumes of leading exporters between 2010-13 and 2022-23

The consolidation of global sugar exports by few countries is not without risks for sugar users as world export supplies depend increasingly on the growing conditions of a few countries. In addition, the cyclicality in sugarcane production in Asia also contributes to future market volatility. However, majority of Brazil's sugarcane will continue to be used for ethanol production and many mills have the capacity to produce both sugar and ethanol. Brazil also remains the only exporter which can switch 5-10% of milling capacity between sugar and ethanol production within a year in response to changes in relative profitability between the two end uses. This flexibility should help assure sugar production and export availabilities, when relative prices periodically favour sugar over ethanol production.

In terms of other leading exporters, Thailand plays a unique role in Asia and is the only consistent producer of a large sugar surplus with a natural trade advantage, along with Australia. Exports from Thailand, which is ranked number two in the world, are projected to grow to around 5.8 Mt by 2022-23. In the case of Australia, increased production over the projected period should support exports of around 4.0 Mt by 2022-23. Strong demand for high-fructose corn syrup (HFCS) in Mexico, which is expected to grow by 75% of the total sweetener consumption and similar to the situation in the US, will substitute HFCS in beverage manufactures, releasing surplus sugar for export to the US market. Mexican exports to the preferred US market are projected to exceed 1.5 Mt by 2022-23.

Sugar importers form a broader and more diverse group of countries (Fig. 5). A significant development in 2010-11 was that China exceeded the Tariff Restricted Quota (1.95 Mt) since its entry to the WTO in 1998. Rapid economic growth and urbanisation trends are promoting the enhanced use of sugar in food industries. The low per capita sugar consumption (11kg) and tightening government controls on the production and use of artificial sweeteners are expected to lead collectively to strong growth in demand for centrifugal sugar during the projected period in China. Sugar demand is projected to grow by over 3% p.a., exceeding the expected growth in production and necessitating sugar imports to over 2 Mt by 2022-23. Indonesia would be the largest importer in Asia during the projected period (Fig. 5).

High world sugar prices at the onset of the projected period (2010) and declining internal prices consequent to sugar policy reforms have made the European Union a less attractive destination for preferential exports from LDC countries under the EBA initiative and Economic Partnership Agreements. With the world sugar prices receding since 2011, the EU will become an attractive

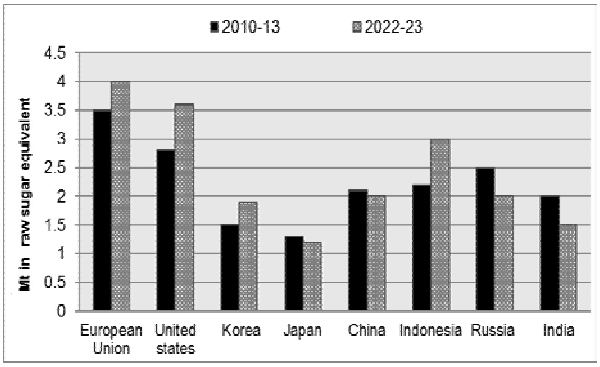

Fig. 5. Comparison of import volumes of leading exporters between 2010-13 and 2022-23

destination for many of these countries as an assured market. Nevertheless, ongoing problems with infrastructure and technology adoption could constrain some LDC countries from fully exploiting their export opportunities. The US sugar market remains heavily insulated from the world market with prohibitive tariffs and safeguard measures on imports in excess of minimum Tariff Restricted Quota (TRQ) volumes. With duty-free and unrestricted imports expected to grow from Mexico under North Atlantic Free Trade Agreement (NAFTA) over the coming decade, US imports under its WTO TRQ and other trade agreements are projected to be maintained at minimum levels. Total US imports are projected to reach 3.6 Mt in 2022-23. The Feedstock Flexibility Program (FFP) under the FCE Act for converting excess sugar supplies to ethanol in order to maintain domestic sugar prices above support levels is a remote possibility.

Finally, the Russian Federation, historically a leading destination for white sugar, had become raw sugar importers in the early 1990s for domestic processing. Imports are projected to decline to around 1 Mt in 2022-23 due to domestic production and stable consumption will lead to further import substitution.

Conclusion

The medium term sugar projections discussed constitute a conditional scenario of likely market developments based on economic, policy and normal weather assumptions. If any of these assumptions change, the resulting set of sugar projections would also be different. In the light of the relatively tight world market situation at the beginning of the projection period with stocks at 20 year low, any major production disruptions in the major sugar producing countries such as Brazil and India could radically change the market projections in the near term. It would spur further spells of high volatility and prolonging the period of low global sugar prices.

Another scenario is that the high sugar prices in 2010 and improved profitability could have prompted over investment in sugar production capacity in major sugar producing countries. This has been a feature in the past where sugar prices prevailed high. The sugarcane cropping system invariably includes a plant crop followed by two or three ratoon crops. This is the reason for short price spikes, followed by longer periods of low and depressed prices until steady consumption growth eventually erodes the production surplus.

The world sugar market has undergone a number of reforms and structural changes over the past decade. Nonetheless, it remains heavily distorted by government policy interventions which contribute to high price volatility. Changes in domestic support policies and border measures, such as the imposition of export restrictions have a major bearing on trade volumes and international prices. Other uncertainties are future policy choices for sugar in the European Union (2015) and the sugar provisions of forthcoming US Farm Bills. Changes in oil and energy prices and their implications for the share of

sugarcane diverted as a feedstock for ethanol production, particularly in Brazil, will also influence the market.

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