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COMMITTEE ON COMMODITY PROBLEMS

INTERGOVERNMENTAL GROUP ON TEA

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PRELIMINARY ANALYSIS OF THE IMPACT OF HIGH TEA PRICES ON THE WORLD TEA ECONOMY

I.   INTRODUCTION

1.   The holding of the 18th Session of the Intergovernmental Group on Tea in May 2008 coincided with the unprecedented rise in food prices, which led to the Group requesting the Secretariat to conduct a study to assess the impact of high food prices on the world tea economy. However, preliminary findings of the Secretariat indicated a limited impact of high food prices on tea. On the supply side, there was little or no reversion from tea to basic food crops in response to the rise in food prices, and, on the demand side, there was little or no substitution effect, and tea accounted for an insignificant component of the Consumer Price Index (CPI) basket of goods in most tea consuming countries. However, while carrying out this preliminary study, the Secretariat found that a more significant factor impacting the global tea economy was the rising tea prices. This document discusses the short and medium term impact of the recent increase in international tea prices, using the FAO World Tea Model.

2.   Tea prices, as measured by the FAO Tea Composite Price[1], have declined in real terms since the 1970s as supply expanded at a rapid rate, significantly greater than the growth in demand (Figure 1). Exceptional peaks occurred in periods following the oil supply shocks of the 1970s and 1980s. Given that tea is a perennial, supply response to a price increase is normally delayed, as historical evidence suggests from the previous price surges of 1976/77 and 1984/85.

3.   From 2006, world tea prices began a slow but sustained increase over the next three years, underpinned by strong demand worldwide, particularly in markets of emerging economies. The growth rate of tea prices accelerated in 2008 and 2009, firstly as a consequence of the civil disturbance in Kenya, and subsequently due to prolonged droughts in Kenya, India, and Sri

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[1] An indicator of world tea prices used by FAO in its analysis.

Lanka, which tightened supplies at the global level. Finally, after long periods of sustained growth, production actually declined, by 0.64 percent, from 2007 to 2009, while consumption grew by 0.21 percent at the global level during the same period. Consequently, from USD 1.95 per kg averaged in 2007, the FAO Tea Composite Price averaged USD 2.38 per kg in 2008 and reached a record level of USD 3.90 in November 2009, the highest price since the FAO Tea Composite Price was created in 1989. Prices retreated from their record levels in early 2010 but continued to be high by historical standards.

**Figure 1. FAO Tea Composite Price (USD per kg)**

Source: FAO
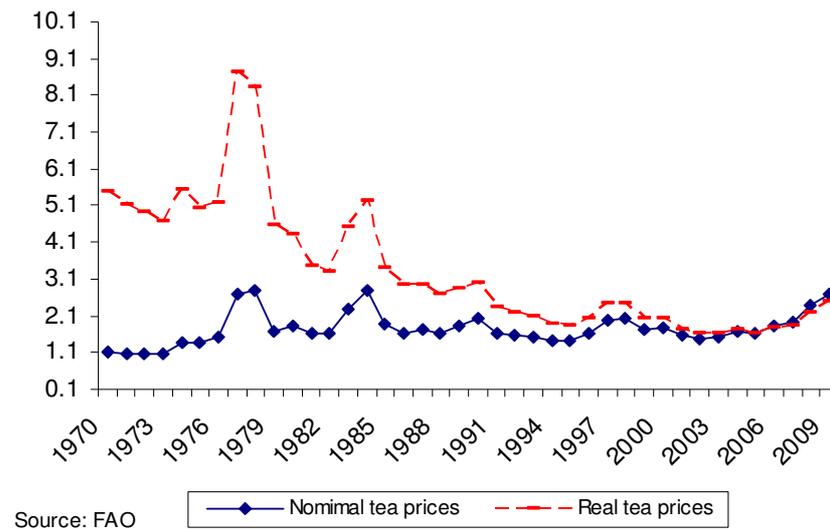
4.   Apart from the supply shocks, the upward trend in tea prices was underpinned by the growth in demand generated by the rapid growth in per capita income levels and to a lesser extent, rising population in tea consuming developing countries. These occurred against a background of unprecedented economic growth at the world level, averaging about 4.5 to 5.5 percent annually in real terms from 2003 to 2007, which supported aggregate demand not only for tea but for food and other commodities. The International Monetary Fund (IMF) commodity price index, rose by a cumulative 10 percent in 2008, following an increase of about 30 percent between December 2006 and December 2007. Economic expansion, along with inflationary trend that characterized commodity markets, were induced by an expansionary monetary policy in most OECD countries, as central banks kept interest rates at historical lows. As a result, credit to the economy grew at the expense of credit quality and contributed to rapid increases in aggregate demand for goods and services. Credit expansion had also led to growing speculation in many commodity markets and assets.

5.   The depreciation of the US dollar against currencies of major tea importing countries also helped shore up aggregate demand. In the largest tea importing country, the Russian Federation, the rouble strengthened by 19 percent from 2003 to 2008, further encouraging imports of tea. Similarly, the euro appreciated by 23.6 percent against the USD, while the Egyptian pound gained about 10.6 percent over the same period (Figure 2).

6.   From the producers' perspective, the rise in tea prices has been partially offset by the sustained increases in the cost of production, particularly labour and energy costs. Although crude oil prices have declined significantly from the record levels reached in 2008, they continue to remain high relative to historical trends over the past four decades.

**Figure 2. Currency changes of major tea importers vs the United States dollar
(2000 = 100)**
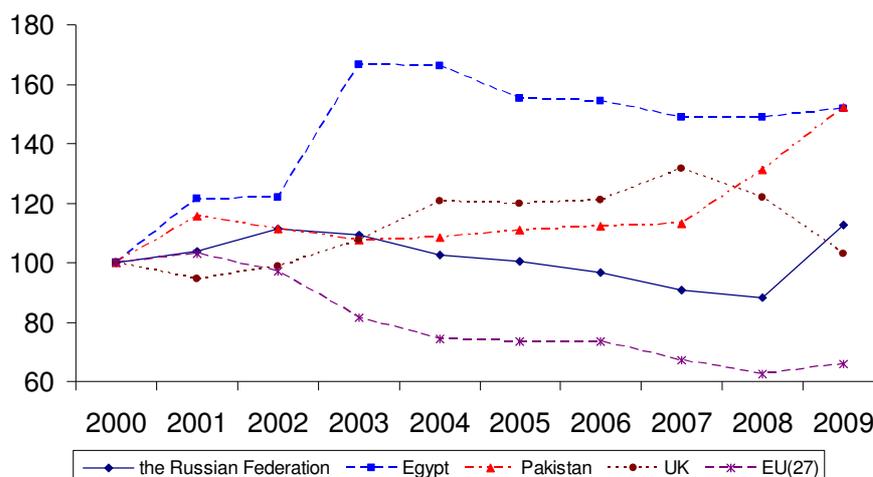
II.   IMPACT OF HIGH TEA PRICES: HISTORICAL EVIDENCE

A.   PRODUCTION

7.   Supply response to price changes for tea and other perennial crops is not immediate but delayed over time as it requires investment decisions that have long term implications. It takes at least three years from planting before plucking can be carried out economically on a tea bush, by which time prices would likely have changed significantly from the levels they were when the investment decision was made. Historical evidence shows that tea prices surge, on average, for two consecutive years before falling, in response to increased supply availabilities. Looking back at the two previous price surges of 1976/77 and 1984/85, a number of similarities can be drawn with the occurrence in 2008/09. In both cases, a tight supply position was building before prices escalated sharply, magnified by the oil price shocks. However, the capacities for countries to respond to supply shortfalls could be reduced somewhat on this occasion, largely due to:
- reduced land availability; and
- the imposition of quality standards to ensure supplies of quality teas.

B.   CONSUMPTION

8.   The effects of high international prices on tea consumption depend on the extent to which world prices are transmitted to domestic markets. Price transmission studies that were carried out by the Secretariat in response to the Group's requests at its 15th and 16th Sessions are published as documents CCP: TE03/5 and CCP: TE 05/5. In developed economies, competition in the beverages market discourages traders in the value chain from transmitting the full impact of price increases to consumers. This fact is borne out by recent events, when the FAO Tea Composite Price rose by 12.5 percent, while retail price to consumers in the United Kingdom rose by an average 6.6 percent. An unusual reaction was observed in India, where the growth in retail prices to consumers actually increased by nearly 15 percent, which was more than the increase in the international price. This could have been due to the changing consumption pattern of consumers as their income levels increased significantly, particularly in larger cities, as the economic growth rate of the country reached unprecedented highs. This was against a background of a production shortfall in the country due to prolonged drought, which contributed to tight supplies in the domestic market.

III.   METHODOLOGY AND APPROACH TO MEASURING THE PRICE IMPACT

9.   The FAO World Tea Model was used to assess the impact of high tea prices on production, consumption, and trade. The analysis was carried out on black tea only, as historical data on green tea were incomplete. The FAO World Tea Model is a partial equilibrium model consisting of equations specifying demand and supply of 50 countries/regions, including major producers and consumers of tea. Price determination is based on a market clearing price which ensures that total imports of tea matches total exports. A price transmission equation guarantees the linkage between producing/consuming countries and the world market and consists of policy variables related to border measures. Depending on the relative importance of net trade to consumption, the transmission equation sets domestic tea quotations at either export or import parity price. A consumer price equation is estimated on the basis of observed retail prices and the estimated domestic tea prices. Because demand is specified to response negatively to increases in prices while supply is specified to react positively, an equilibrium world price can be found. Estimates for supply and demand elasticities were obtained either through an econometric estimation or derived from available literature. Estimates of exogenous variables used in the baseline – mainly macroeconomic data, such as gross domestic product (GDP), CPI, exchange rates and crude oil prices – were obtained from the latest database of the FAO/OECD global commodity market model. Domestic producer tea prices were deflated by constructing a cost index on the basis of the relative importance of tradable and non-tradable inputs and energy in total tea production cost. A detailed description of the FAO World Tea Model is available in document CCP: TE 10/2, and the Secretariat will be presenting these to the Group at its Nineteenth Session.

10.   An ex-post simulation was run, wherein world tea prices were kept at their 2006 values, as they were assumed to represent price behaviour under normal conditions (i.e. without demand or supply shocks). Exogenous variables were also kept at their baseline levels[2]. Results of this simulation were compared with the baseline estimates (consumption, production, trade estimates in the presence of the price shock, i.e. the medium term outlook in document CCP: TE 10/inf.3), with the difference between observed values and actual values being attributed to the effect of the price surge. The impact on tea production would not be uniform across all regions and countries, given the difference in the extent to which they react to price changes. Some producers have greater price elasticity of supply than others. Similarly, the impact of consumption will likely differ across consuming countries and regions – the greater the price elasticity of demand, the larger the response to price changes. The model answers several specific questions, including:
- What would have been the level of consumption if *normal* conditions had prevailed, i.e., without the price shock between 2007 and 2009?
- What is the medium term impact of the price increase on tea output in major producing countries?
- What is the impact of the price increase on trade and export earnings in the short and medium term?

11.   The approach used for this analysis does not break down the aggregate impact on producers by assets or income. The bulk of the benefits from high tea prices (for higher export earnings, see section IV) may well accrue to commercial tea estates, while gains to smallholders may be limited because of preventing supply side constraints, such as access to inputs and credit. Similarly, the largest impact on consumption will likely be displayed by poorer consumers. However, in order to account for these discrepancies, an analysis of household survey data would be more appropriate, where the welfare impact is the amount of income needed to restore a household to its position prior to the income shock of high prices.

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[2] It is assumed that exogenous variables, such as GDP and exchange rates, remain unchanged from their baseline values with the imposed 2006 tea prices.

IV. MAIN RESULTS

12.   Comparative results between the baseline and simulation are annexed in Table 1. The simulation results indicate that *average consumption* at the world level was 8.2 percent higher than the baseline (Figures 3 and 4). With a comparative price change of 28.4 percent between baseline and simulation, implying that elasticity of demand at the world level was -0.3. The fact that the model assumes perfect substitutability between teas of different origins and types, such as CTC, orthodox tea and high quality teas, may have underestimated the effect on demand for specialty teas and other high quality products. As research indicates, demand for high quality teas is more price sensitive than that of bulk tea.

Figure 3. Impact of high tea prices on consumption
(percentage change – baseline vs simulation)
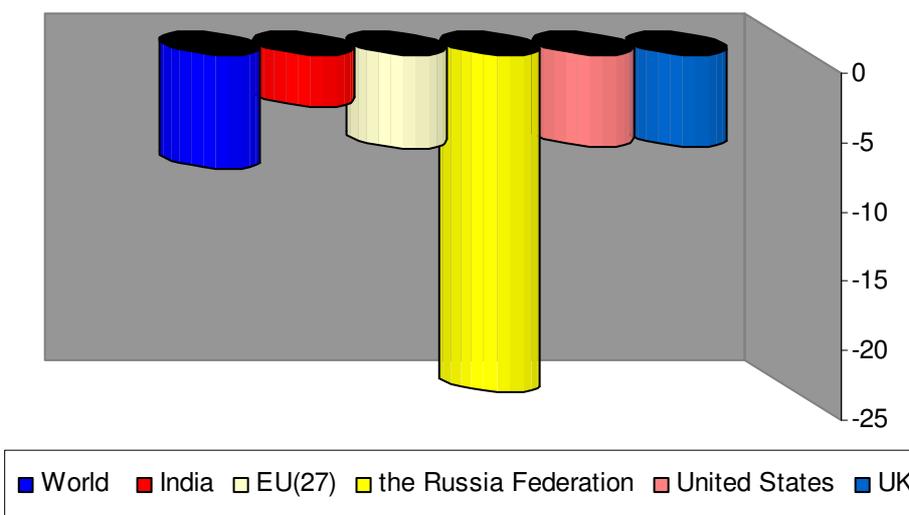
Baseline: includes price shock of 2007-2009
Simulation: removes the price shock of 2007-2009

Figure 4. Impact of high tea prices on consumption – cont
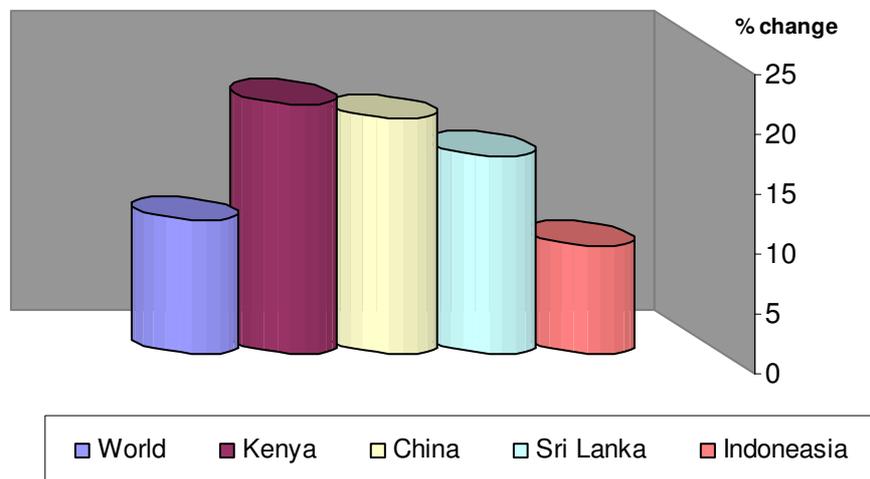**(percentage change – baseline vs simulation)**
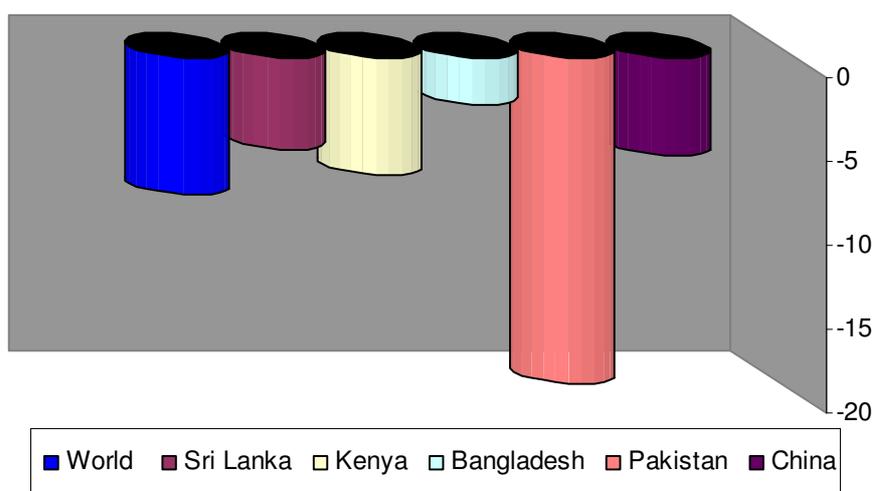
Baseline: includes price shock of 2007-2009
Simulation: removes the price shock of 2007-2009

13.   The lowest impact on consumption was estimated for Germany (-0.3 percent), while it ranged between -7 and -5 percent in traditional consuming markets of the United States and United Kingdom. Indonesia, the Russian Federation and Pakistan showed the largest drop in consumption, -30 percent, -24 percent and -19 percent, respectively. These results reflect a higher price elasticity of demand relative to other major importing countries.

14.   Figure 5 shows the changes in production between the simulation and the baseline for the period 2010-2016. It provides an indication about the size of the long-run elasticity of supply. At the global level, the long-run supply response to an average price shock of 28.4 percent translates into an estimated 11 percent rise in production, implying a long-run elasticity of 0.4. The largest supply response is expected to originate from Kenya (21 percent), which corresponds to a long-run elasticity of 0.7. Other producing countries with relatively large supply response include China (0.6) and Sri Lanka (0.6), while production in India is expected to be 8.8 percent larger because of the price shock, which corresponds to a long-run elasticity of 0.3. Finally, long-run elasticity for Indonesia and Bangladesh was evaluated at 0.3 and 0.2, respectively. These estimates of long-run elasticities were slightly higher than those estimated by Akiyama and Trivedi in 1987[3], which may reflect, among other things, improvements in productivity gains over the past two decades.

15.   As can be seen in Figure 6, word trade (measured by export) is 24 percent higher in the baseline than in the simulation. This corresponds to a world elasticity of trade of about 0.86. Black tea exports from Kenya would decline by 22 percent, and those from India, Sri Lanka and Indonesia would decline by 36 percent, 18 percent and 59 percent, respectively. On the import side, it is estimated that imports to the Russian Federation would be 24 percent higher (see Figure 7). Similarly, imports by Pakistan are estimated to increase by 19 percent, while those to the UK and the United States are estimated to be 6 percent and 6.5 percent larger, respectively. Imports to Germany are simulated to remain relatively unchanged from the baseline (-0.1 percent).

**Figure 5. Impact of high tea prices on production of selected countries
(baseline vs simulation)**

Baseline: includes price shock of 2007-2009
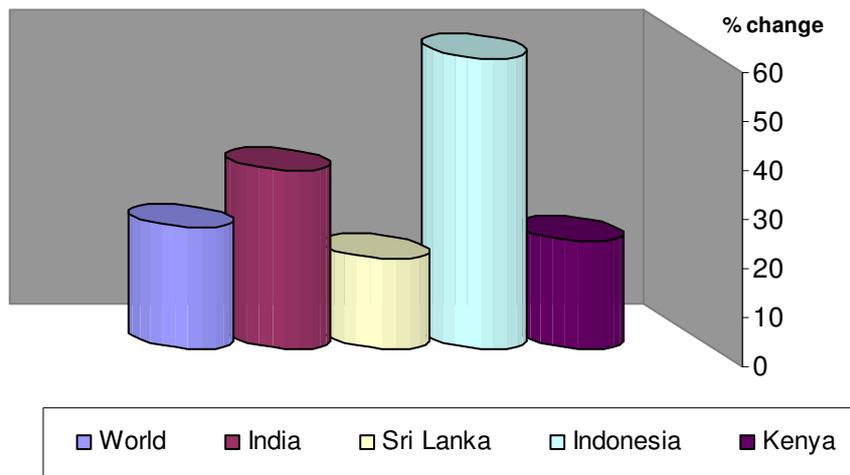Simulation: removes the price shock of 2007-2009

16.   With respect to export earnings, the analysis shows major producing countries would benefit from the increase in international tea prices. Export earnings for India are simulated to rise by 59 percent, while for Kenya, Sri Lanka and Indonesia, earnings would increase by 40 percent, 36 percent and 83 percent, respectively. Export earnings cannot provide an indication of

[3] T. Akiyama and P.K. Trivedi, *A new global tea model*, World Bank working paper, No.17, Washington, D.C., 1987.

sustainability of the tea sub-sector without taking into consideration costs of production. It is possible that the incremental increases in costs of production could be larger than those of export earnings to the point that profit actually declines.

17.   Other simulation results show that, in the long-run, tea import bills are expected to decline in the case of the Russian Federation (-12 percent) and Pakistan (-7 percent), mainly because of a reduction in total imports given higher tea prices, while the import bills for the United States and the EU(27) are projected 8 percent and 10 percent higher, respectively, than those observed under a scenario where the price shock is removed.

Figure 6. Impact of high tea prices on export of selected countries
(baseline vs simulation)

Baseline: includes price shock of 2007-2009
Simulation: removes the price shock of 2007-2009

Figure 7. Impact of high tea prices on import of selected countries
(baseline vs simulation)
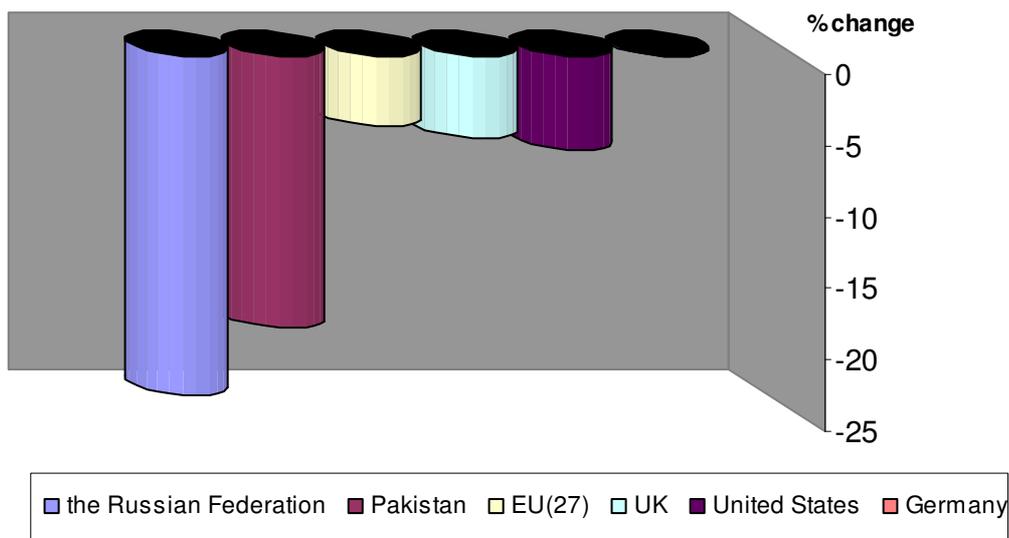
Baseline: includes price shock of 2007-2009
Simulation: removes the price shock of 2007-2009

V.   CONCLUSIONS

18.   Given the results of the Secretariat's preliminary analysis of the impact of high tea prices on the world tea economy, the following conclusions are presented for information and discussion. Some gaps have been recognized while conducting the analysis and suggestions on areas for further research are presented below. The Group is requested to consider these and recommend priorities for future research.

19.   The recent increase in world price reflected a reduction in output, initially as margins were squeezed through rising costs of production, and subsequently weather related shortfalls in major producing countries. This was in contrast with the situation spanning from 1970 to 2006, when real tea prices declined, reflecting technological progress which reduced costs and led to supply expanding at a much faster rate than demand.

20.   Although the simulation results confirm that tea consumption is responsive to price changes, particularly in importing countries, the response is muted (elasticity of 0.29). The main reason for this is the intense competition in the beverages market. Therefore, in order to maintain its market share, tea will have to remain price competitive with other beverages. The exception is in the higher quality and/or speciality market segments, where price is not the main determinant for consumption. Although the model assumed perfect substitution between teas of different origins and types, the Secretariat was able to draw this conclusion from its knowledge of the market characteristics and consumer preferences that distinguished markets that predominantly import high quality and speciality teas from those that are predominantly bulk tea importers.

21.   Given that considerable export potential exists in tea producing countries, a significant improvement in real prices could favour an increase in exports and shift the supply/demand balance at the world level, which in turn will have a moderating impact on price. Therefore, as previously recommended by the Group, it is advisable that producers do not expand output uncontrollably, particularly in terms of bringing new areas under tea, as this could lead to prices spiralling downwards just as quickly and significantly. Long run-elasticity estimates for major producing countries indicate that several countries are likely to respond to rising prices, while one in particular showed the opposite, possibly because of an articulated policy to limit area expansion.

22.   Finally in terms of trade, the analysis indicates that export earnings were positively influenced by price increases. However, in some cases this did not necessarily translate to higher profits, as recent price increases also impacted on cost of production significantly (particularly cost of farm inputs, as well as labour and energy).

23.   Some suggestions for future research include:
*   The most immediate need is to revise the Group's own estimate of demand and supply elasticities. Collaboration with IGG member countries will be needed to obtain among other things, volume, domestic and international prices for tea, cost of production and prices for competing crops for a selection of countries (up to 40 countries). In addition, information describing shifts in the market fundamentals and non-price factors should also be provided. There is a need to be confident that the results are not excessively contingent upon a particular technique or too sensitive to any of the choices and to determine to what extent they can be incorporated into the World Tea Model.
*   Future research should also specify supply equations for both estates and smallholders so as to assess smallholders' share in total supply response. On the consumption side, identify substitutes for tea and their prices.

Table 1 – Comparative results between baseline and simulation

Production	
Average % between baseline and simulation (2010-2016)	
Bangladesh	*5.9*
China	*19.7*
India	*8.78*
Indoneasia	*9.06*
Kenya	*20.9*
Sri Lanka	*16.6*
World	*11.2*

Consumption	
Average % between baseline and simulation (2007-2009)	
Bangladesh	*-2.7*
Canada	*-5.5*
China	*-5.8*
EU(27)	*-6.8*
Germany	*-0.3*
India	*-3.8*
Indonesia	*-30.1*
Kenya	*-7.0*
Pakistan	*-19.4*
Sri Lanka	*-5.4*
the Russia Federation	*-24.3*
UK	*-6.6*
United States	*-6.6*
World	*-8.2*

Export	
Average % between baseline and simulation (2010-2016)	
China	*145.7*
India	*36.00*
Indonesia	*58.94*
Kenya	*21.7*
Sri Lanka	*18.1*
World	*24.4*

Import	
Average % between baseline and simulation (2010-2016)	
EU(27)	*-5.0*
Germany	*-0.1*
Pakistan	*-19.0*
the Russian Federation	*-23.7*
UK	*-5.8*
United States	*-6.5*

Export earnings	
Average % between baseline and simulation (2010-2016)	
China	*182.0*
India	*58.9*
Indonesia	*83.1*
Kenya	*40.0*
Sri Lanka	*36.3*

Note: Simulation: the model run excludes the price increase in 2007, 2008, and 2009
   Baseline: the model run includes the price increase of 2007,2008, and 2009