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## I. INTRODUCTION

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A major achievement of the Intergovernmental Group on Tea (IGG/Tea) is its submission to, and acceptance by, CODEX Alimentarius of a list of priority chemicals detailing the correlation between field trial protocol and good laboratory practices (GLP) supervised protocol. The Working Group (WG) on Maximum Residue Levels (MRLs) produced a document explaining how the submission could facilitate the achievement of global harmonization of MRLs, including the communication plan and the Decision Tree for discussion and endorsement by the Group. Document CCP:TE 14/3 was written by the Secretariat to complement the effort of the WG by examining the implication of MRL harmonization on international trade patterns of tea.

Food safety standards have different effects on consumption and trade flows. Primarily they aim to maintain consumer safety through defined sets of limits and regulations, but these regulations could have a trade deterring effect when exporters cannot comply with the standards. As one of the food safety standards, MRLs set maximum levels of pesticide residue that can be traced in food and food products to ensure food safety. CODEX Alimentarius (2011) defines CODEX maximum limit for pesticide residues as “the maximum concentration of a pesticide residue (expressed as mg/kg), recommended by the CODEX Alimentarius Commission to be legally permitted in or on food commodities and animal feeds. MRLs are based on good agriculture practice (GAP) data, and foods derived from commodities that comply with the respective MRLs are intended to be toxicologically acceptable”.

Tea is one of the major agricultural commodities traded globally. World production in 2012 was around 4.8 million tonnes, of which 1.7 million tonnes were traded, valued at USD 5.2 billion. Kenya, China, Sri Lanka and India are major exporters, while the Russian Federation, the United Kingdom, Pakistan and the United States are major importers. There have been some incidents recently regarding excess levels of MRLs in imported food products, including tea. In 2013 the European Food Safety Authority (EFSA) reported the results of its analysis of pesticide residues found in food in the European Union (EU) which was carried out in 2010. The foods that had MRLs exceeding the acceptable EU limits were legume vegetables, spices, nuts, table and wine grapes and leafy vegetables. The highest non-compliance rate was found in legume vegetables (11.1 percent), while the lowest rates were reported for eggs (0.2 percent). According to the report, 5.1 percent of the tea, coffee and herbal infusions sampled were above the accepted maximum residue limits. After the non-compliant samples were detected, certain actions were taken, including the imposition of administrative sanctions, the European Commission’s Rapid Alert System for Food and Feed (RASFF) notifications and market withdrawals.

This document summarises current regulations and trade, and examines the MRL-trade interaction of China, a major tea exporting country. The document also addresses the welfare implications on consumers and producers.

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## II. RELATED LITERATURE ON TEA MRLs AND TRADE IMPACTS

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The trade related impacts of MRLs were mostly investigated by employing gravity type models. Chen et al. (2008) examined the impact of MRLs on China's vegetable exports employing a gravity model. They found that food safety standards imposed by importing countries had a negative and statistically significant effect on exports of agricultural products from China. In addition, food safety standards had a much larger effect on trade than import tariffs. Similarly, in 2012, Wei et al. found that MRL limits applied by importing countries significantly reduced tea exports from China. Utilizing both importer and exporter regulations in the form of similarity index, in 2012, Drogue and De Maria found that the differences between MRL regulations mattered and deterred fruit trade. Xiong and Beghin's study (2014) used a gravity model to examine the impact of MRLs on import demand of members of the Organization for Economic Cooperation and Development (OECD) and found that MRLs jointly enhanced import demand through consumer awareness of food safety by stimulating demand for products under regulation but hindered non-compliant export supply. In addition, exporters from the least developed countries (LDCs) were more constrained by MRLs than their competitors from the developed world.

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## III. FOOD SAFETY REGULATIONS AND MRLs

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The CODEX Alimentarius Commission develops harmonized international food standards, guidelines and codes of practice to protect the health of consumers and ensure fair practices in food trade. Although these guidelines are voluntary, in many cases, CODEX standards serve as a basis for national legislation. The OECD Task Force for the Safety of Novel Foods and Feeds promotes international harmonization in risk/safety assessment of novel foods and feeds by encouraging information sharing, promoting harmonized practices and common frameworks and preventing duplication among member countries (OECD, 2014). The Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement) is an international treaty of the World Trade Organization (WTO) which emphasises that measures had to be based either on scientific evidence of risk or on recognized international standards. Countries are free to set their own standards if they are based on science (WTO, 2013).

MRL regulations vary across countries, and there is no international agreement on the harmonization of regulations. MRLs of veterinary medicinal products in foodstuffs of animal origin were adopted by the EU in 1990 under Council Regulation EC-2377/90, based on CODEX guidelines. MRLs for tea were established under regulation No. 396 in 2005, and commodity and pesticide specific MRLs were laid down in Annex II of Regulation 149 in 2008 (OJEU, 1990-2014). The default values of MRLs set by the EU in 2008 were much lower than those in other countries, including CODEX guidelines (Table 1). The EU has increased the number of pesticides regulated for tea over the years, and the number currently stands at 454 pesticides.

**Table 1. A comparison of Current CODEX and Consuming Country MRLs, mg/kg**

Pesticides	CODEX	EU	USA	Canada	Australia	Japan
Paraquat	0.2	0.05*			0.5(T)	0.3
Methidathion	0.5	0.1*				1
Clothianidin	0.7	0.7	70			50
Fenpropathrin	2	2	2	2	2	25
Chlorpyrifos	2	0.1*			2	10
Deltamethrin	5	5			5	10
Propargite	5	5	10			5
Endosulfan	10	30	24		30(T)	30
Etoxazole	15	15	15			10
Permethrin	20	0.1*				20
Thiamethoxam	20	20	20			20
Cypermethrin	20 (*15)	0.5			0.5	20
Bifenthrin	30	5	30		5	25
Flubendiamide	50	0.02*				40
Dicofol	50	20	50		5	3
Hexythiazox	15	4				35
Ethion	-	3			5	0.3
Azoxystrobin	-	0.1*			20(T)	10
Propiconazole	-	0.1*		4		0.1
2,4-D	-	0.1*				
Glufosinate ammonium	-	0.1*			20(T)	0.3
Hexaconazole	-	0.05*				
L-cyhalothrin	-	1		2	1	15
Fenazaquin	-	10				
Thiacloprid	-	10				30
Acetamiprid	-	0.1 (0.05 <sup>^</sup> )	50			30
Chlorfenapyr	-	50				40
Glyphosate	-	2.0	1		2	1
Oxyfluorfen	-	0.05*				
Fenpyroximate	-	0.1*	20			10
Flufenoxuron	-	15				15
Spiromesifen	-	50	40			30

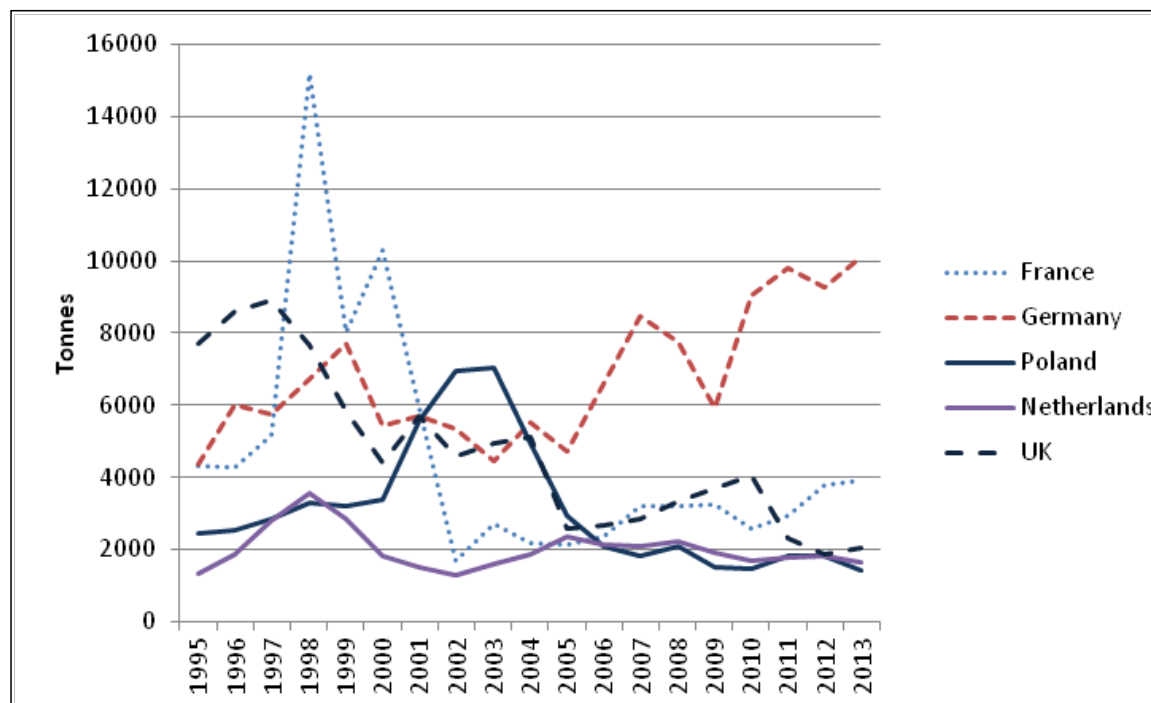
\* = Default; (T) = Temporary; <sup>^</sup> = From 25 August 2014.

Source: FAO IGG on Tea, 2014.

China's exports to major European partners decreased significantly over the last two decades, especially after 2000 (Figure 1). The reason for this decline could be attributed to the increasing number of pesticides used by tea producers which are regulated by the EU regulations, as well as lower default MRL values for the older pesticides. In addition, exports of tea from China to the Netherlands, Poland and the UK declined significantly after 2008 most likely because of the imposition of tighter regulations and lower default values. Only exports to Germany increased over the reference period, possibly because of the steady

increase of organic tea imported by the country. It is interesting to note that China's exports to Poland increased until 2003, but declined after 2004, when Poland became a member of the EU and harmonized its regulations with the Union.

Figure 1. China's Exports to the EU, 1995-2013



Source: Comtrade, 2014.

#### IV. WELFARE IMPLICATIONS

In general, food safety standards might have a deterring effect on trade if exporters could not comply with regulations. Hence, any restrictive food safety standard, such as the setting of MRLs, has similar impacts as import barriers on exporting countries. The welfare impact depends on the short and long run, the size of the importing country, elasticities and market structure. Generally speaking, any standards related restriction reduces consumer welfare in importing countries, increases domestic producer welfare (if any exist) and reduces import tariff revenues. The total impact would be welfare losses for both the importing and exporting countries. If the importing country were large enough, world prices would decline leading to less exports in the short run. If there were alternative markets, the negative impact for exporters could be reduced through re-directing exports to other markets. In the same manner, the negative impact for consumers could be reduced if new exporters were found (replacement effect). Hence, transportation costs would be the main determinant of a change in welfare. Given that tea is demand inelastic (IGG Secretariat, 2012), an MRL restriction in a particular import market would lead to an increase in price in that market and consequently, a consumer welfare loss in the short run. On the supply side, as shipment volumes decline from the offending exporting country, producer welfare would also drop in the short run.

In order to obtain some information on the implications of a disruption in supply caused by a reduction in global exports due to the imposition of tighter MRL levels, the FAO World Tea Model was utilized. The model incorporates a decrease in supply corresponding

to a 2.5 percent decline in global tea exports (the assumed 2.5 percent decline was based on informal consultations with experts in selected Tea Boards) due to production costs incurred as a result of MRL regulations, such as research and development, labelling, control and monitoring and labour costs. This was implemented by exogenizing production in countries that would be most affected by MRL restrictions, such that global export was cut by the targeted level, in comparison to the baseline. Two basic assumptions were made when running this scenario:

1. Teas of different origins and types, such as crush, tear and curl (CTC) or orthodox, were perfectly substitutable in the world market, because data reflecting the differences in consumer preferences were not available; and
2. All countries responded to world tea prices, which is a composite of average auction prices.

Assuming that all the exporters complied with the standards and that exports were not diverted to any other importer, the average world prices are projected to increase by 9 percent over a 10-year period. The price increase was high in the short-term but declined in the longer run as supply and demand adjusted over time. Hence, consumer welfare declined in importing countries, while in exporting countries, welfare depended on the trade-offs between changes in supply and gains in world prices as well as on whether price increases were transferred fully to the producers in the value chain.

It should be noted that any changes in supply would have implications for employment and gender, especially in developing countries. The female labour force participation rate was quite high in developing countries (World Bank, 2014), and most of them worked in agriculture related activities. Therefore, supply disruptions might have a negative impact on women's employment and welfare, at least in the short term.

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### III. CONCLUSIONS

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This study reviewed the current food safety regulations and trade interaction in the context of MRLs. There are no internationally harmonized regulations on tea, but there are guidelines (CODEX, OECD), regional regulations (EU), as well as national regulations. As the EFSA report highlighted, incidents related to MRLs were reported over the years, mostly on vegetable products, while MRL incidents for tea were quite low. However, as in the case of many other food safety issues, these incidents are increasingly being reported as food safety regulations become stricter and global production levels rise in line with the growth in demand. In addition, strict regulations might have deterred entry of conventional tea into the EU markets. Usually MRL related consignments are handled through administrative measures (returning to the exporter), or market withdrawals. These measures would impact negatively on exporters raising transportation and storage costs, especially when consignments were directed to new markets. Therefore, major tea exporters should control consignments in the production stage in order to prevent related incidents.

Based on available data, observations on country-specific export trends indicated that some major exporters, such as China, experienced losses in exports to conventional tea markets, particularly the EU markets. The loss occurred especially after 2000, when the EU expanded the number of pesticides regulated, and in late 2008 when EU MRL regulations with low default values, particularly for older pesticides, came into effect. According to available information, although conventional tea exports to certain EU markets decreased



over the years, organic tea exports seem to be performing well. Strict MRL standards by the EU may explain the decline in conventional tea exports from the major exporters. Therefore, restrictive regulations of the EU might have had trade deterring effects for certain countries. As the FAO Tea Model shows, any cost-related disruption in supply would lead to an increase in world prices. This could lead to increased price volatility and would reduce consumer welfare. Finally, since there is a paucity of trade data on organic tea, it is difficult to draw conclusions of the impact of MRL regulations on trade. Therefore, countries are encouraged to fill in this portion of the annual questionnaire so that a better assessment of food safety regulations could be made.

