CANADA GRAINS COUNCIL

Estimating Food Loss and Waste due to Missing/ Default MRLs: Case Study and Lessons Learned

Gord Kurbis, Vice President, Trade Policy & Crop Protection Canada Grains Council

Growth in volume, complexity of global agricultural trade

"Since 1995, international trade in food and agriculture **more than doubled** in real terms to amount to USD 1.5 trillion in 2018."

"Emerging economies and developing countries are increasingly participating in global agricultural and food markets; **their exports have grown to more than one-third** of the world total."

> *The State of Agricultural of Commodity Markets*, FAO, 2020

As of 1 march 2022, 354 regional trade agreements (FTAs) were in force

World Trade Organization, WTO.org



Chatham House (2018), 'resourcetrade.earth', http://resourcetrade.earth/



Increasing complexity of technology-related standards and requirements



Figure 1.7. Population, food production and agricultural land use in the long run

Source: Population data from Maddison's historical statistics for 1820-1940; UN Population Division for 1950-2010; 1800 and 1810 extrapolated from Maddison. Agricultural (crops and pasture) land data for 1800-2010 from th History Database of the Global Environment (HYDE 3.2), Klein Goldewijk et al. (2017). Global agricultural production data for 1960-2010 from FAOSTAT (Net Agricultural Production Index), data for 2020 from OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

From OECD-FAO Agricultural Outlook 2020-2029



Two international grower/trade coalitions

- International Grain Trade Coalition: more global use of international standards (Codex MRLs)
- International Agri-Food Network: support for an improved system of setting Codex MRLs

Data projects

- Food Waste/Loss
- Global noncompliance data to demonstrate trade impacts and advocate for trade-enabling solutions
- Current project on EU emergency use authorizations



Data Project Example #1: What effect on noncompliances if Codex MRLs were used? Noncompliances on APEC agri-food exports, 2018-2020



Green: the shipment was compliant with Codex <u>and the noncompliance</u> <u>would not have occurred</u> if importing country used Codex MRLs

25+ countries globally have national MRL lists but defer to Codex MRLs if national MRL missing

Examples: New Zealand, Singapore, Chile, Israel, South Africa

■ Violation ■ No Violation

• **Source:** non-compliance for reporting countries. Reporting countries include: Hong Kong, China; South Korea; United States; Australia; Japan; European Union; Chinese Taipei

Data project example #2: example of using data for advocacy in engagement with WTO SPS Committee Chair

	Number of global MRL	Number resulting
Country	noncompliances reported	from missing MRLs,
Country	on agri-food products	or the application of
	from origin country	0.01 ppm MRLs

Cambodia	2	1
Sri Lanka	52	20
India	535	303
China	731	385
Indonesia	55	20
Malaysia	27	9
Philippines	30	9

- Updated global noncompliance data
- New ability to determine which noncompliances would disappear if Codex MRLs used
- Ability to determine how many OECD and APEC countries had MRLs in place for noncompliances resulting from missing MRLs
- Country- and region-specific charts and queries to drive advocacy

Noncompliance for reporting countries excluding Canada, January 1 2019 – Sept. 30, 2020. US data only available starting Q3 2019.

Data Project example #3: Tracking EU Emergency Use Authorizations

Provisional Results: EU Emergency Use Authorizations for Arable Crops for Human Consumption, 1980 - 2021



Source: European Commission and Strategic Vision Consulting Ltd

Food Waste/Loss Data Project: lessons learned; data gaps encountered

Estimating the amount of food waste from noncompliance data where there was a missing MRL (and where the use of the Codex MRL would have prevented food waste)

- The analysis began as an effort to meaningfully estimate food waste resulting from missing MRLs.
- As it evolved, serious data gaps were encountered (number of economies reporting, shipment size, fate of shipments).

<u>A decision was made to shift the analysis to a</u> <u>case study format that would</u>:

- 1. Identify specific data gaps
- 2. Provide recommendations for further research, data collection required for robust quantification
- 3. Proceed with an approximation of food waste as expressed in a wide range
- 4. Make methodology and assumptions transparent



The Context: Quotes on Global Food Loss/Waste Estimates

- "In 2011, FAO presented the estimate that around 1/3 of the world's food was lost or wasted every year."
- "FAO's 2011 estimate is in the process of being replaced by two separate indices: the Food Loss Index (FLI) and the Food Waste Index (FWI)."
- "When converted into calories, global food loss and waste amounts to approximately 24 percent of all food produced."
- "1.4 billion hectares of land 28 percent of the world's agricultural area - is used annually to produce food that is lost or wasted."

Sources: FAO, World Resources Institute

http://www.fao.org/news/story/en/item/196402/icode/ http://www.fao.org/3/ca6030en/ca6030en.pdf http://www.fao.org/food-loss-and-food-waste/flw-data) https://files.wri.org/d8/s3fs-public/reducing food loss and waste.pdf



Source: WRI analysis based on FAO. 2011. Global food losses and food waste-extent, causes and prevention. Rome: UN FAO. Source: Lipinski et al., 2013. "Reducing Food Loss and Waste" World Resources Institute.

Determining the subset of MRL violations as potential food waste (Aug 2014 – March 2021)

9442 —	→ 2010 —	→ 1600 —	→ 1358
<section-header>WRL violation samples in dataset from reporting economies:AustraliaEUHong Kong, China JapanKoreaChinese Taipei</section-header>	Samples that would be "No violation" if Codex had been used	Not the proper to the prope	ZERO TOLERANCE IMPACT: Shipments would have been "No violation" if Codex had been used instead of : • Missing MRL • Default MRL • LOD/LOQ • 0.01 ppm

Determining the subset of MRL violations as potential food waste (Aug 2014 – March 2021)

9442 —	→ 2010 —	→ 1600 —	→ 1358
<section-header>WRL violation samples in dataset from reporting economies:AustraliaEUHong Kong, ChinaJapanKoreaChinese Taipei</section-header>	Samples that would be "No violation" if Codex had been used	 Shipments that would have been "No violation" if Codex had been used 	 64-68% of total were compliant with av'g Shipments would APEC and been "No violati OECD MRLs Codex had been used instead of : Missing MRL Default MRL LOD/LOQ 0.01 mm

How would this have changed if APEC or OECD* MRLs were used instead of Codex?

*excluding OECD members in the EU

Violation Result using APEC Calculated Average MRL



Source: Non-compliance for reporting countries, 2014-2020. APEC reference MRL based on a Calculated Average MRL (Excluding Defaults and EU Deferrals for Chile and Peru).

Violation Result using OECD Calculated Average MRL



Source: Non-compliance for reporting countries, 2014-2020. OECD reference MRL based on a Calculated Average MRL (Excluding Defaults, Swiss and Turkish MRLs Equal to EU MRLs, Chile's EU Deferrals, and EU MRLs).



For shipments that were either returned or returned or destroyed (not specified), we have set up a perishability index to determine the probability of those shipments being re-directed to other jurisdictions versus the probability of the goods perishing before they can be re-directed.

Using this perishability index, we can estimate food waste across a range of Low – Medium – High probability that non-compliant shipments were re-directed to other markets.

Perishability Index			
LOW PERISHABILITY	MODERATE PERISHABILITY	HIGH PERISHABILITY	
Food products that have a long shelf like that can most likely be re- dispatched to other markets. For the purposes of this study, these foods have a low probability of being food waste.	Food products that have a shelf life beyond one week that can likely be redirected to other markets For the purposes of this study, these foods have a moderate probability of being food waste.	Food products that have a short shelf life and likely perish before being directed to food markets. For the purposes of this study, these foods have a high probability of being food waste.	
Examples:	Examples:	Examples:	
Grains Dry Beans Dried Fruit (e.g. raisins, dates) Frozen fruits and vegetables	Citrus Apples Onions Potatoes	Peppers, cucumbers, tomatoes Lettuce and leafy greens Fresh herbs Fresh berries	



Data Gap on Size of Each Shipment: Method to Estimate

- Estimated minimum consignment size (via industry contacts and trade databases).
- Serious data limitation; adapted the case study by expressing results in a (very) wide range of potential food waste outcomes.
- Estimated volumes below are approximations. We expect that these can be improved through dialogue with industry colleagues.
- Convert consignment weight to kcal for each commodity (via FAO Food Balance Sheets).

Minimum Consignment Size Estimates

Examples:	Examples:	Examples:
Grains 25 Tonnes Dry Beans 24 Tonnes Dried Fruit (e.g. dates) 10 Tonnes	Citrus 24 Tonnes Apples 5 Tonnes Onions 20 Tonnes Potatoes 24 Tonnes	Peppers 5 Tonnes Spinach 1 Tonnes Raspberries 1 Tonnes Peaches 8 Tonnes

Estimating Food Loss/Waste: From rejected shipments that were compliant with Codex MRLs



625 shipments of food that

*Based on 5 of 6 importing economies that report publicly (Australia, EU, Japan, Korea, and Chinese Taipei) from Aug 2014 – 2021. U.S. data excluded due to limitations on reported residue levels.

Estimated MRL-related global food waste/loss, 2014-2021*

(* Food shipments that were compliant with Codex MRLs, but zero tolerance principle was applied because importing country MRL was missing.)

- High probability that between 140,000 4,765,555 days of food was wasted (i.e. food to feed one person for one day).
- Small proportion of global food waste but it is needless and therefore significant in absolute terms
- Moderate probability that up to an additional 6 million days of food was wasted

<u>Next Step: pass on to academics to further develop, address</u> <u>data gaps – expectation of peer reviewed journal article</u>

Text slides on methodology and assumptions appended

Category	LOW estimate*	HIGH estimate*
Food that was destroyed/seized or did not specify returned or destroyed, but was highly perishable	315,060,000 kcal	10,722,500,000 kcal
Food that did not specify whether it was returned or destroyed and was moderately perishable	1,462,000,000 kcal	14,620,000,000 kcal

Summary of messages

- 1. Farmers increasingly face a complex global patchwork of MRLs.
- 2. Impacts on farmers, trade and food security are expected to grow.
- 3. Food waste/loss is only one category of impact.
- 4. Of just under the 10,000 publicly-reported MRL noncompliances from 2014-2021, approx. 15% of these food shipments would have not been rejected* if Codex MRLs had been used.
- 5. Of the 15%, approx. half are estimated to have resulted in food waste/loss.
- 6. Because of significant data gaps, results are expressed in a wide range and approach/assumptions made transparent.

Next steps: <u>collaboration underway with academia</u> on further research leading toward a peer-reviewed publication. To help with this project by providing additional industry intelligence about consignment volume, fate of shipments, please contact Gord Kurbis or Carol Hannam.

gord@canadagrainscouncil.ca carol@synthesis.ag



*Another 5,000+ of the 10,000 rejected/noncompliant shipments did not have a Codex Wike in place but were compliant with the relevant MRLs in OECD and APEC countries, indicating a need for more Codex MRLs.

Data assumptions and sources

The goal of this case study is to summarize data gaps and lessons learned when estimating the amount of food wasted; specifically, in cases where shipments in question were compliant with Codex MRLs, and where deferral to Codex MRLs would therefore have prevented food waste

Methods Used:

BCI database of non-compliances from Aug 2014 – March 2021 for reporting economies: Australia; EU; Hong Kong, China; Japan; Chinese Taipei; Korea

Selected shipments that were deemed non-compliant based on a missing or default MRL level (which includes the following categories: *No MRL, Default MRL, 0.01 ppm, LOD/LOQ MRL*)

From this subset of non-compliances based on missing or default MRLs, it was determined which samples would have been compliant if the relevant Codex MRL had been used, instead of the missing/default MRL

The goal of this case study is to summarize data gaps and lessons learned when estimating the amount of food wasted; specifically, in cases where shipments in question were compliant with Codex MRLs, and where deferral to Codex MRLs would therefore have prevented food waste

Data Assumptions:

Samples versus shipments: Samples non-compliance data were further analysed to determine unique shipments versus individual samples. Sometimes one shipment can have non-compliance data entered for more than one active ingredient.

For EU data, sample IDs are linked to shipments via the Violation ID, so it is easy to distinguish which samples arose from the same shipments. Multiple samples were removed so each shipment was only counted once.

For all other cases (e.g. Australia, Japan, Korea, Chinese Taipei), samples are not linked to shipments and data were analysed to determine which samples likely arose from one shipment. Using a combination of sampling date, reporting date, manufacturer and importer identity, multiple samples were identified and removed so each presumed shipment was only counted once.

For non-compliances that would have been compliant if CODEX was used instead of (a) a default, (b) 0.01, or (c) an unknown or missing MRL: when there were multiple active ingredient noncompliances and even one active ingredient was non-compliant based on a domestically-set MRL, then the whole shipment and all related samples were removed from the dataset.

Data Assumptions:

Fate of shipments: Each reporting economy uses different language and different levels of detail to indicate the fate of non-compliant shipments. In some cases, the specific action taken is identified (e.g. *Destroyed, Re-dispatch to country of origin, etc.*), whereas in the majority of cases, the action taken is less defined (e.g. *"The goods that did not meet the requirements in the case were returned or destroyed in accordance with the regulations."*) We have separated the fate of shipments into 3 categories of action taken:

Category of Shipment	This category includes the actions taken:
Destroyed	Destruction Seized
Returned	Return to consignor Redispatch to origin
Returned or destroyed (not specified)	Detained by operator Directed abandonment or return of the cargo Import not authorized The goods were returned or destroyed in accordance with the regulations. Official detention Placed under customs seals Withdrawal from the recipients Withdrawal from the market Not reported
Datasets not included in this study:	Already sold or consumed Press release or recall No action taken No stock left

Estimating weight and calories of food waste

Data Assumptions:

- FAO Food Balance Sheets were used to determine the calories per 100g of each commodity
- The LOW estimate of consignment size weight was calculated using the average MOQ (minimum order quantity) on food trade websites.
- The HIGH estimate of consignment size weight was calculated as 10X the LOW estimate of consignment size.
- Assumed average consumption for one person is 2250 kcal/day
- Removed herbs, spices, tea from dataset (as per World Resources Institute food waste analysis methods)

	LOW estimate	HIGH estimate
Food that was destroyed/seized or did not specify returned or destroyed, but was highly perishable	315,060,000 kcal	10,722,500,000 kcal
Food that did not specify whether it was returned or destroyed and was moderately perishable	1,462,000,000 kcal	14,620,000,000 kcal