



Review of pesticide residues in cocoa in relation to deshelled and unshelled beans from an industry perspective

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Harmonized Legislation For Food Safety. Kuala Lumpur, 26 Jan 2011**

ECA & CAOBISCO

ECA (European Cocoa Association): trade association representing the EU cocoa sector and regrouping the major companies involved in the cocoa bean trade and processing, in warehousing and related logistical activities. Together, ECA Members represent two-thirds of Europe's cocoa beans grinding, half of Europe's industrial chocolate production and 40 % of the world production of cocoa liquor, butter and powder.

CAOBISCO: EU Trade Association for chocolate, biscuits and confectionery industries. Through its National Associations it represents over 2000 companies in Europe.

Some opening questions

- What is stated in some national regulations on reference material used for testing pesticide residue levels ?
- Can deshelling of the cocoabean bring salvation to mitigate pesticide residues in cocoa ?
- Has the cocoa industry the tools (regulatory and technical) to remove pesticide residues from its cocoa products ?
- Does the expression “Prevention is always better than the cure” still stands or has it lost its meaning ? Can cocoa processing industry handle pesticide residues in cocoa products on its own ?

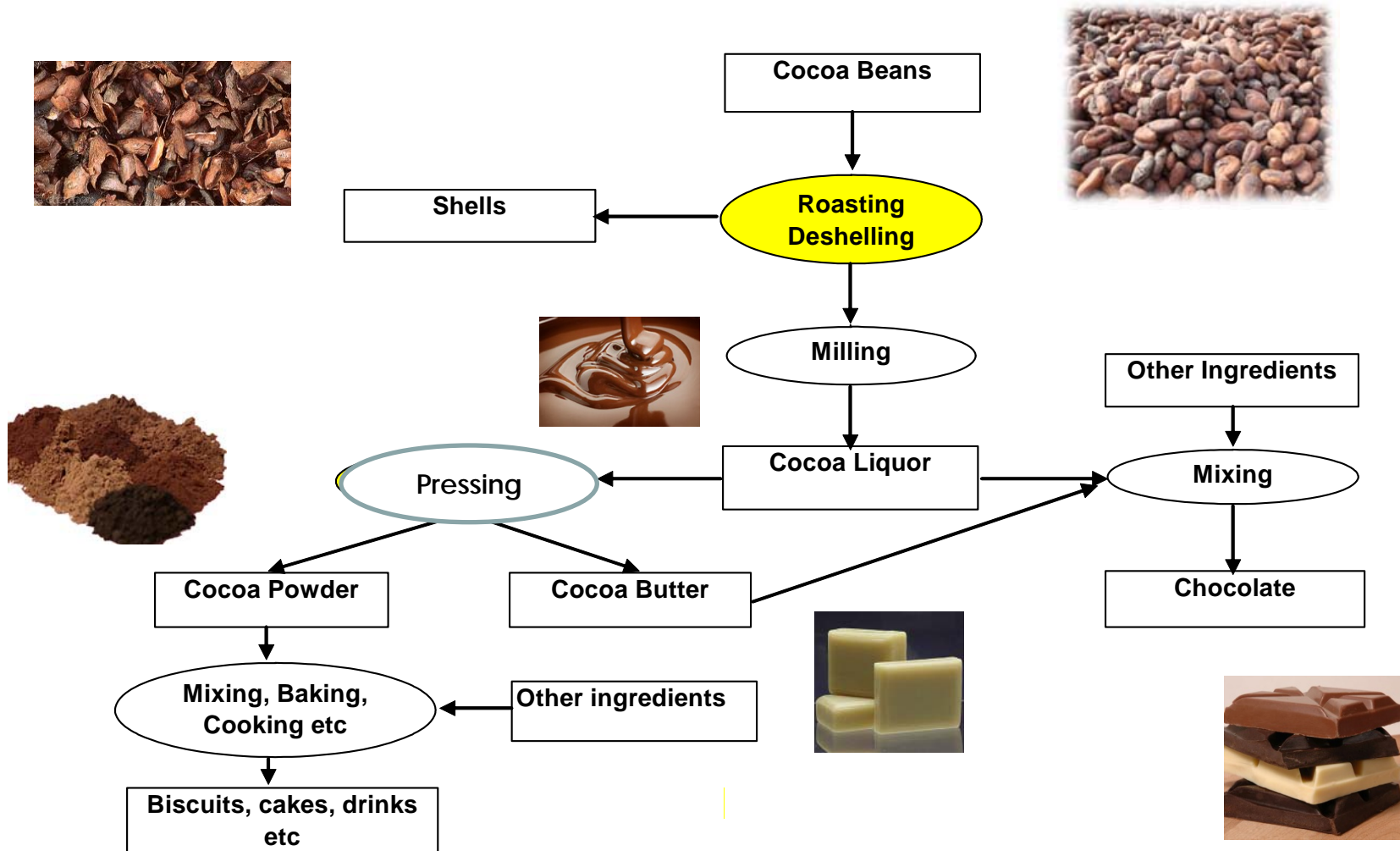
State of play of some national legislations on reference material used for testing MRLs

- EU: applicable to 'beans after removal of shells' (« the edible part ») as defined in Commission Regulation (EC) N° 178/2006
- USA: FDA tolerance to apply on deshelled cocoa beans
- Japan: applicable to whole cocoa beans as defined by Positive List System, 29 May 2006 (MHLW)
- Australia: applicable to whole cocoa beans as defined in Standard 1.4.2 of the Food Standards Code

State of play of Codex International Standard on reference material used for testing MRLs

- In absence of national legislation, Codex Standards can be used as a reference for international trade
- Codex Standard CAC/GL N° 41 of 1993, section 2.1, group 21 of Volume 2 A states :
Portion of commodity to which the Codex MRL applies :
=> cocoa beans : 'whole commodity'.

Cocoa beans are raw materials which are further processed to yield cocoa products



Process of deshelling (on laboratory scale)

- There are several ways to deshell on laboratory scale :
 - Manually
 - beans totally deshelled
 - Mechanically
 - small quantity of (*preheated*) beans pass through breaker and winnower
 - some shell possibly remains in nib, as under real process conditions



The Cocoa Bean Breaker

In operation, cocoa beans are fed into the inlet hopper of the Breaker and pass to an internal rotating roller. The specially engineered roller and stainless steel adjustable breaking blocks 'shear' the beans to avoid unnecessary crushing. The broken shells and nibs fall into any convenient reception tray.

The Winnower

The broken mixture is then fed carefully into the Winnower, where an adjustable air current separates the broken shell from the nib. The closed-circuit construction of the Winnower means that there is no need to make provision for exhaust air. The two separated products are delivered gently below the outlet spouts. Any necessary cleaning is easily carried out.

Both machines can be supplied with electric motors to suit either 110 volt or 220-240 volt single-phase supplies, which should be stated at the time of order.



Process of deshelling (industrial scale)

- Winnowers will separate the nib (cotyledon) from the shell :
 - broken beans are passed over a series of vibrating sieves
 - the shells being removed by pneumatic suction
- Complete separation is virtually impossible; a tolerance is allowed in food standards



Source : Buhler



Source : Buhler

Provisions for shell content in cocoa products in national & international standards

- EU: no provision in legislation
 - Cocoa & Chocolate Directive 2000/36/EC does not set any maximum level of shell content in cocoa products
- USA: max 1.75 % in cocoa nib
 - Code of Federal Regulations 21 CFR 163.110 states for cacao nib : the cacao shell content in cacao nib is not more than 1.75 percent by weight on an alkali free basis
- Codex: max 1.75 % in cocoa mass/nib
 - Codex Stan 141-1983, Rev. 1-2001, Codex Standard for Cocoa (Cacao) Mass (Cocoa/Chocolate Liquor) and Cocoa Cake has included provisions for maximum shell content in some cocoa products :
 - cocoa mass : max 1.75 %
 - cocoa cake : max. 4.50 %

Can deshelling be seen as the cure to get rid of pesticide residues from cocoa beans ?

- To a certain extent, BUT ...
- Systemic pesticides - applied in the field - will migrate via the vascular system into all parts of the cocoa bean : both cotyledon and shell
- Contact insecticides – used for post harvest treatment (in containers, warehouses, ...) – might possibly migrate from outer layer into the cotyledon, the core of the cocoa beans
=> hot and humid climatic conditions – prevailing in cocoa producing countries – can favour this migration process

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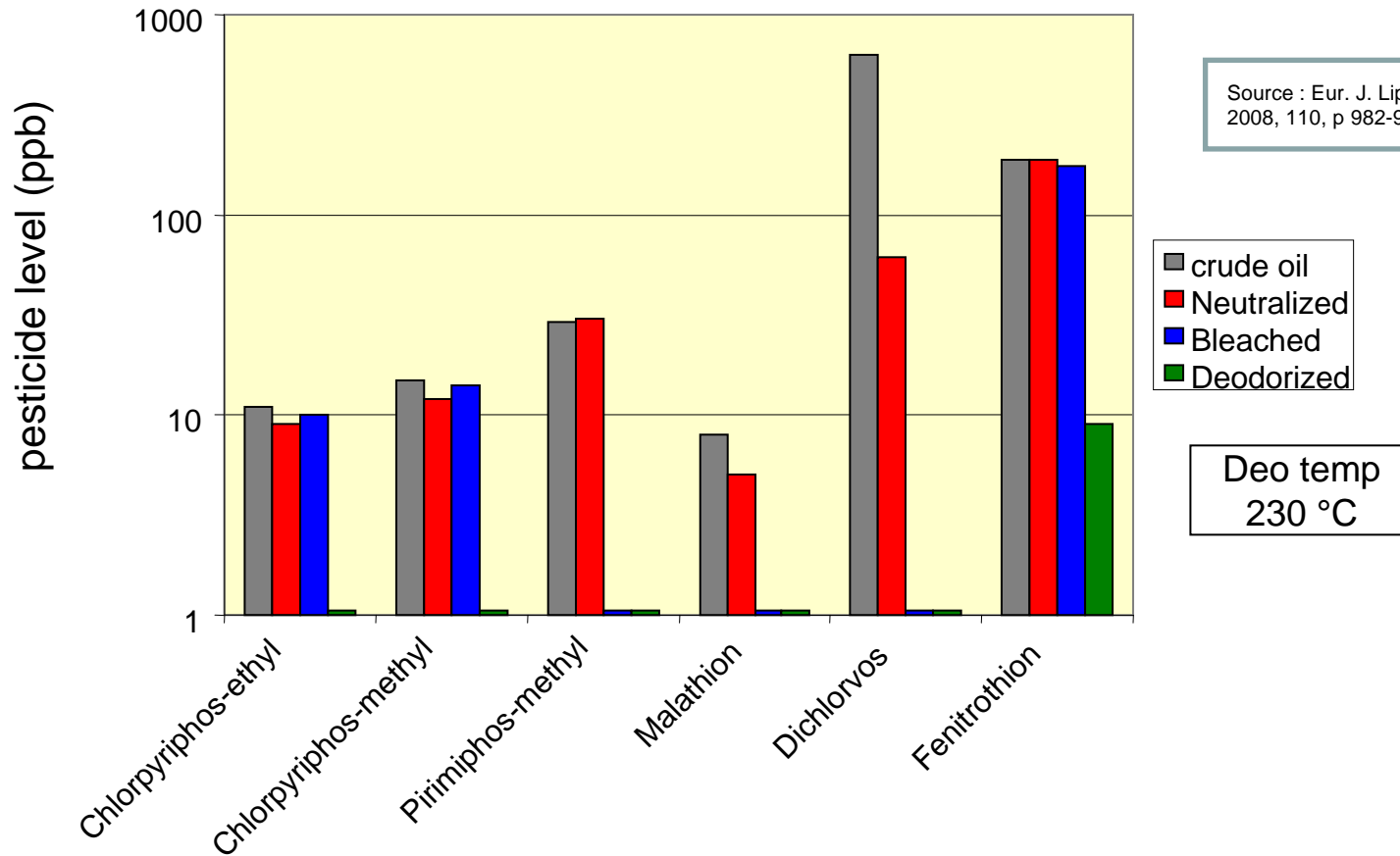
=> Deshelling will not remove all pesticide residues from cocoa beans

Can the cocoa industry mend fences and solve a pesticide issue in its products ? (1)

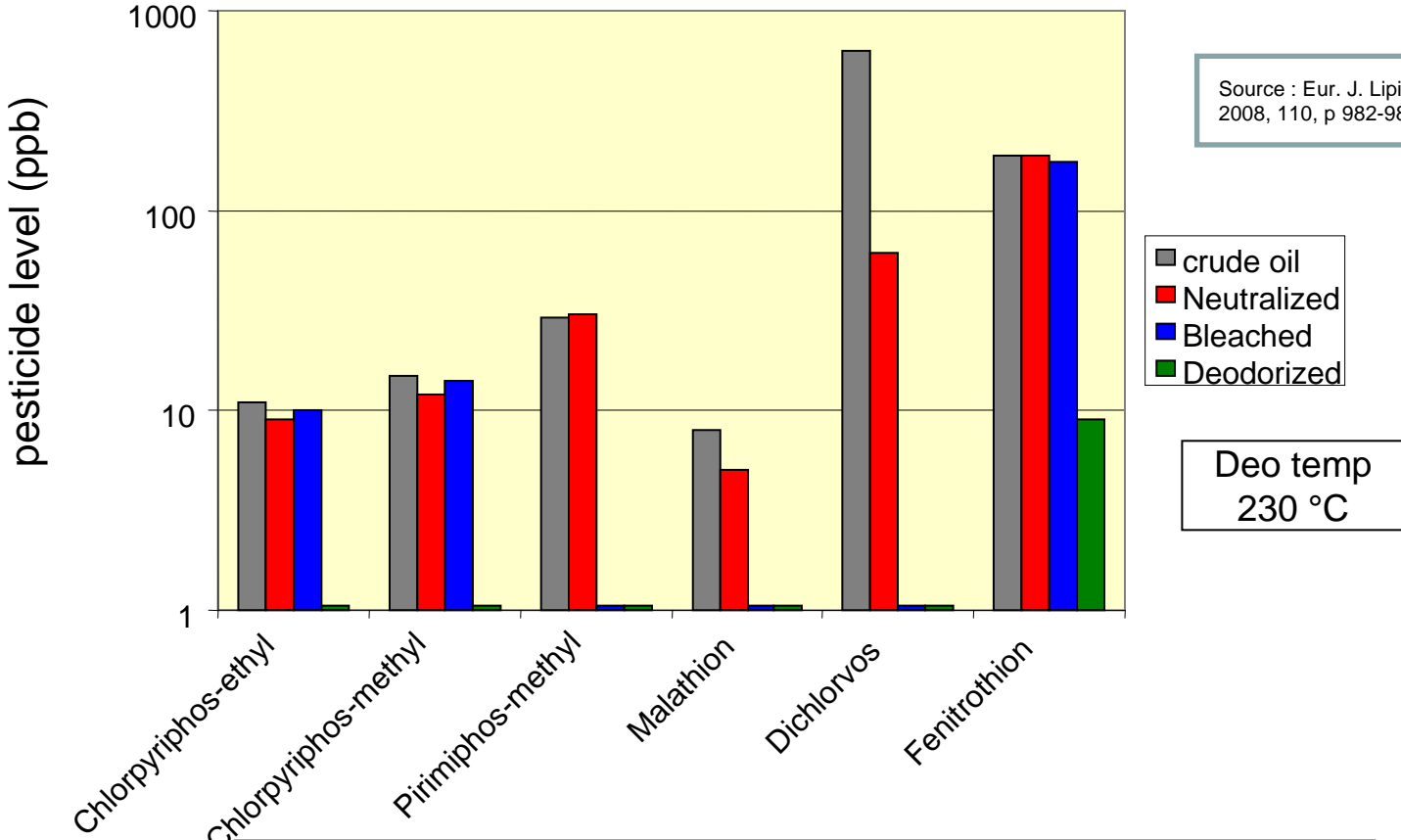
There is a technical constraint :

- Fatsoluble pesticides are mainly removed by deodorization ($T > 180\text{ }^{\circ}\text{C}$) (e.g. endosulfan, pirimiphos-methyl, chlorpyrifos)

Example of pesticide removal in crude oil business: results production trial on sunflower oil



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Unfortunately above removal techniques not possible to implement on most cocoa products

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- Fatsoluble pesticides are mainly removed by deodorization ($T > 180\text{ °C}$) (e.g. endosulfan, pirimiphos-methyl, chlorpyrifos)
 - During the roasting process, cocoa beans are heated to **100-130 °C** for 45-70 min., the conditions varying according to the type of roaster and the requirements of the final product
 - Using higher temperatures ($>130\text{ °C}$), cocoa products would have a burned taste, disqualifying the products for further processing or use
- ⇒ Cocoa industry does not have the technical possibility to remediate (only cocoabutter can possibly undergo e.g. a deodorization treatment)

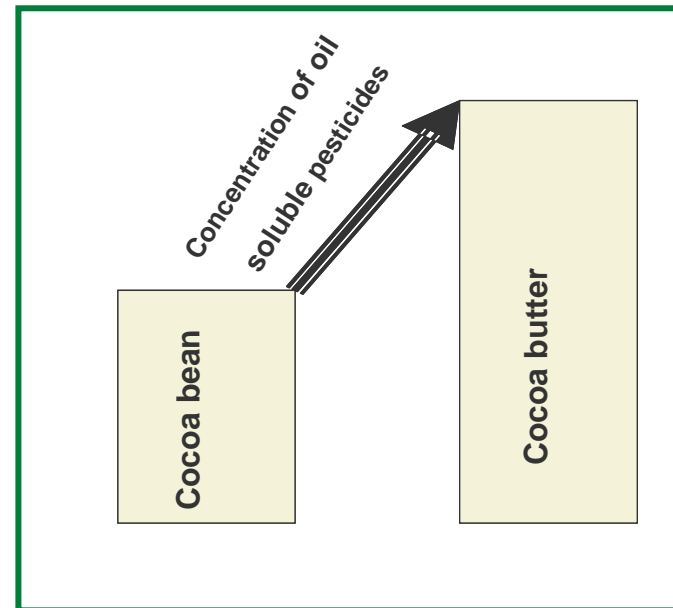
Can EU cocoa industry mend fences and solve a pesticide issue in its products ? (2)

There is a legislative constraint :

- Cocoa beans brought to the European market have to meet limits set, as stipulated in Commission Regulation (EC) N° 396/2005
- Processing, and/or mixing for dilution purposes with the same or other products is prohibited when residues are above the applicable MRL

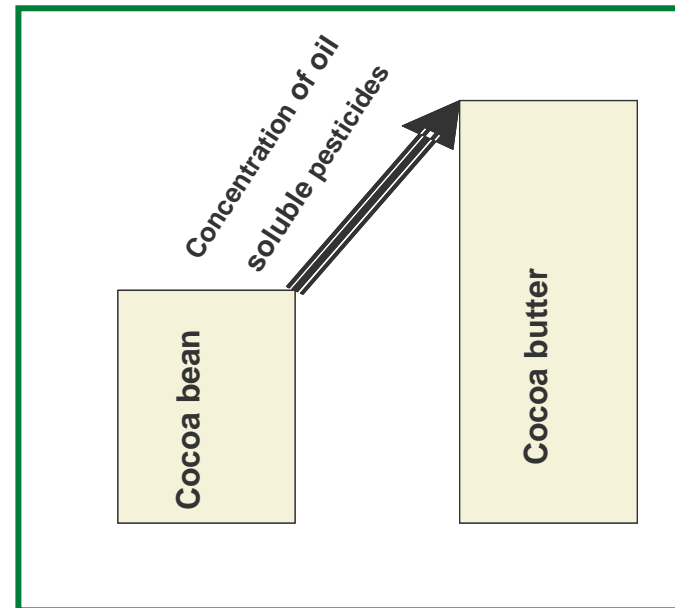
Processing factors: another legislative constraint

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- If processing factors stay unresolved, cocoa industry can run into odd situations during transformation of 'MRL compliant' raw commodity =>

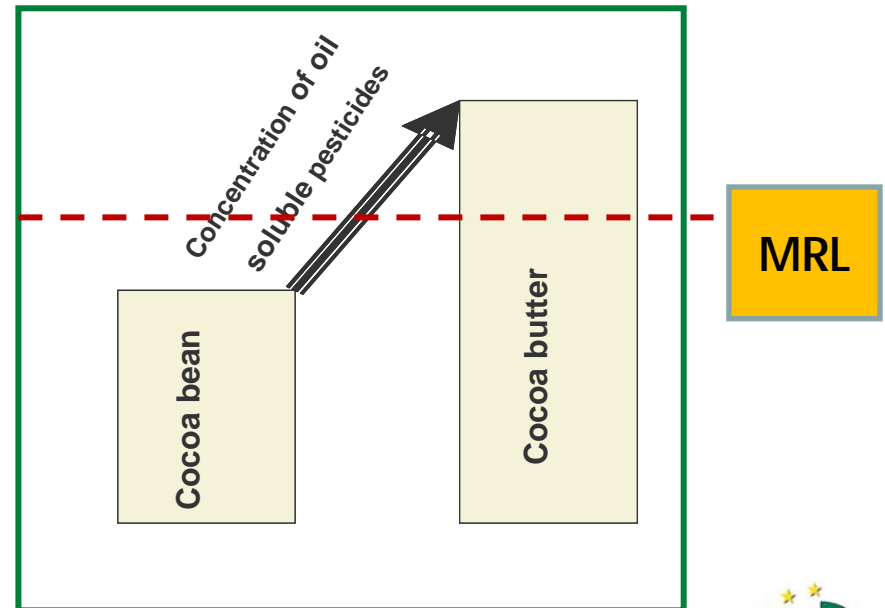


MRL

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?????



Processing factors : not (yet) harmonised

- EU : Annex 6 to Regulation (EC) N° 396/2005 scheduled to set processing factors => Current status : under construction
- Some countries take same MRL for processed products as for raw commodity, irrespective of concentration/dilution caused by processing
- Other countries apply a uniform MRL (e.g. 10 ppb) for products, irrespective of MRL on raw commodity; some put the limit at LOD ...
- Codex discussion on MRLs for processed foods:
The JMPR frequently estimates maximum residue levels for important processed foods and feeds in international trade when residues concentrate in these products at levels higher than in the raw agricultural commodities from which they are derived (e.g. oil, bran, peel, etc.)

CONCLUSIONS (1)

- Harmonisation of legislations regarding reference material to be used for testing MRLs would be highly welcomed
- Alignment on the processing factors would equally be appreciated
- Cocoa processing industry has little or no room to manoeuvre to mitigate pesticide residue levels in its cocoa products : deshelling and other processing steps cannot really bring relief
- Solution for not exceeding pesticide MRLs :

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- Solution for not exceeding pesticide MRLs :

Integrated Pest Management (IPM)

- Rationale Pesticide Use (RPU)

CONCLUSIONS (2)

- Integrated Pest Management (IPM) is paramount
- Cocoa Producing Countries are key stakeholders to promote, implement and ensure this IPM
- Industry welcomes the ICCO project of re-enforcing SPS capacity building in Cocoa Producing Countries (farm school training, ...)
- The EU cocoa industry is committed to high standards of safety and quality,
 - not only to guarantee the food safety of the consumer,
 - but evenso to ensure the occupational health and safety of the cocoa farmer
 - by promoting a safe & rationale use of pesticides.



Photo Cargill

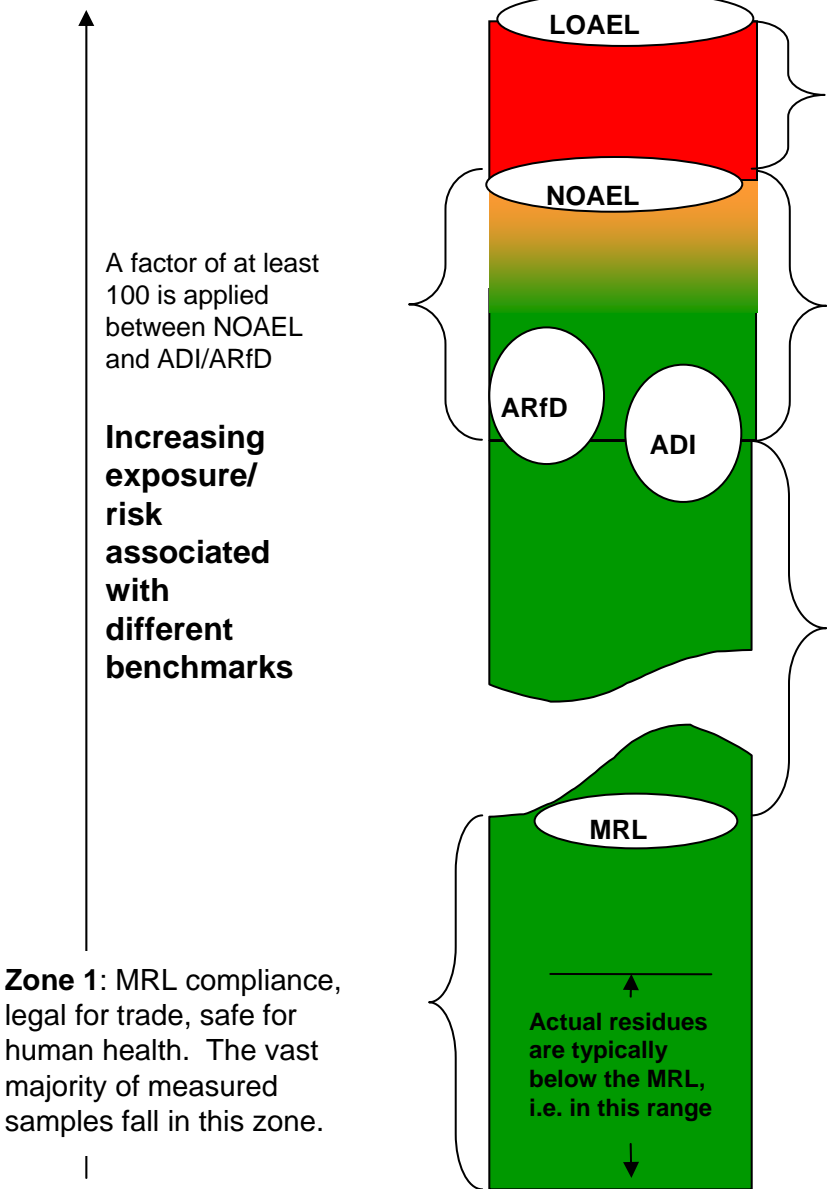


Thank you for your attention
Terima kasih



Photo Roy Bateman

Simplified Schematic Showing the Wide Safety Margins Used in the MRL Setting Process



Zone 4: NOAEL is exceeded, meaning there is a human health concern. Immediate steps to prevent the sale of the crop/commodity have to be taken.

Zone 3: ADI and/or ARfD are significantly exceeded, meaning there may be a human health concern. Given the safety margins incorporated into the ADI and ARfD, case-by-case assessment is appropriate, and if necessary steps to prevent the sale of the crop/commodity should be taken.

Zone 2: MRL exceedance, not legal for trade but safe for human health. Case-by-case analysis and appropriate steps to ensure future compliance with MRLs should be undertaken.

Explanations:

- MRL: Maximum Residue Level (Maximum contents of a pesticide residue to be legally permitted in or on food commodities)
- ADI: Acceptable Daily Intake (Estimate of the amount of a substance in food, which can be ingested daily over a lifetime by humans without appreciable health risk)
- ARfD: Acute Reference Dose (Estimate of the amount of a substance in food, which can be ingested in a single meal by humans without appreciable health risk)
- NOAEL: No Observable Adverse Effect Level (The greatest concentration of an agent, that causes no detectable adverse alteration of morphology, functional capacity, growth, development or lifespan of the target.)
- LOAEL: Lowest Observable Adverse Effect Level (similar to NOAEL, but where an effect is seen)