

Monitoring plan and sampling protocols for testing Chlorpropham (CIPC) residues in potatoes in the context of the temporary Maximum Residue Level (tMRL)

Season 2023-2024

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1) Background and scope

A temporary MRL (tMRL) of 0,4 mg/kg for CIPC residues in potato tubers is applicable since 2 September 2021 (Reg (EU) 2021/155) following the non-renewal of the active substance (Reg (EU) 2019/989). The tMRL was reduced to 0,35 mg/kg within the storage season 2022-2023 (Regulation (EU) 2023/377). The industry continues efforts to cope with the risks of having tubers cross-contaminated during the storage period in buildings with a history of CIPC use. Storage season 2020-2021 was the first season during which CIPC could no longer be applied and the storage season 2021-2022 was the first one with the entrance into force of the tMRL of 0,4 mg/kg. In this context, the European Potato Value Chain (PVC) committed to:

- Use guidelines and promote actively the cleaning of the storage buildings each storage season since 2020/21.
- Drive European residue monitoring plans during the storage season based on proposed sampling protocols (updated annually since 2020).
- Report on the results of the monitoring and the cleaning practices in December each year, realised with the support of Arvalis.

This document is a revision of the 2022-2023 monitoring plan (issued in November 2022) and sampling protocol for tubers to be tested, taking into account the learnings of the past monitoring plan.

The sampling protocol and monitoring plan for Chlorpropham (CIPC) residues are applicable to:

- Potato lots stored in buildings with a history of CIPC usage irrespective of the number of years, type of store, term of storage, etc.
- Raw potatoes for consumption.

2) Objectives of this document

- Have **harmonized, practical** and as much as possible **representative** sampling protocols adapted to the diversity of the potato stores (types, materials, history...)¹
- These protocols should be used as the **unique** reference for determining CIPC residues in potato tuber samples (lots) for:
 - Monitoring by the PVC to periodically update the European Commission with harmonized and robust results upon which re-evaluation of the development of CIPC residues in the potato chain can take place.
 - Producers, buyers and (national) authorities checking there is no release of potato lots onto the market which are not in compliance with the temporary maximum level (tMRL).
 - Being an undisputed method between parties (liability).

¹ CIPC contamination in the fabrics of storage buildings is not distributed evenly. Moreover, the airflow that will transport the contamination is also variable. This is leading to a non-homogenous distribution of CIPC residue in a potato pile. Even after cleaning, the remaining residue found in a potato pile may vary depending on the location of sampling. The protocols set forward in this document are based on the current research and knowledge of distribution of CIPC throughout a potato pile.

3) Sampling protocols for storage season 2023-2024

3.1. Key learnings from monitoring storage season 2022-2023

The following key learnings have been considered before elaboration of the monitoring plan of season 2023-2024:

- The representativeness of the residue values was accomplished even if the 22-23 dataset is a less large than the previous one. The PVC has the ambition to maintain the precision of the results at a similarly high level for the next season.
- In parallel, the residue decline in highly contaminated stores should be monitored compared to 2022-2023 to continue this analysis consistently as started in the monitoring plans of the past seasons.
- More completed data collection of samples in the database, ensuring that data is submitted on time with all information about the store to be provided in case of need (e.g. CIPC history).
- Persistent higher CIPC residue values are found in box vs bulk storage with also a less proportion of stores under LOQ for this type of storage.
- Increasing difficulty to achieve the targets of numbers of samples in many countries.

3.2. Definition of a potato lot in storage

A quantity of tubers from the same variety stored in an undivided single storage unit (storage bin) of a store exposed to the same storage conditions for part of-or the entire storage season. *Remarks:*

- The quantity of tubers can be issued from one or more fields.
- The quantity of tubers should belong to one owner.

3.3. The main types of samples and associated sampling protocols

3.3.1. Physical limits and constraints

- Due to the potential high variability in residues in the stored tubers (possible presence of hotspots), it is obvious that a mix of tubers from different places **representing the whole pile** or at least a significant part of the pile is the best way to consider a representative sample.
 - This is not achievable when sampling a potato pile in bulk or boxes due to physical access and/or operator safety risk: only top, and sometimes front of the potato bulk pile and top of the upper boxes are easily accessible with appropriate equipment.
 - This is achievable when selecting tubers at the time of unloading from the store, either at the farm (seller's gate), at the buyer's gate or at first buyer's exit.
- We therefore need to consider 2 main types of samples:
 - Those taken "in situ" in bulk or box storage facilities: when no part of the bulk pile or none of the boxes has been removed. This will lead to a specific protocol: → Protocol n°1 (types a, b and c) "in situ".
 - Those taken during or after removal of the pile or boxes → Protocol n°2 "mix". Those "mix" samples can be taken in the potato store (during unloading) or along the downstream value chain.
- For **upfront** compliance testing, "in situ" samples (protocol n°1) are required. Although "mix" samples may lead to more representative results they cannot be used for **upfront** compliance testing. For a "mix" sample, a potato lot is sampled at the time of unloading and will likely be processed/packed and placed on the market before analytical results are available. If non-compliance is found this would disrupt the operation of the processor/packer with blocked product/recalls, or the product has already been consumed. "Mix" samples will therefore mainly be considered for research purposes within the Residue Monitoring Plan of the PVC.

3.3.2. Sample definition

- A potato sample destined to a laboratory for CIPC residue testing must:
 - Consist of minimum 12 whole tubers of the same variety,
 - Weigh a minimum of 1.5 kg,*
 - Be in a good condition with no evidence of rotting or moulds,
 - And be traceable (owner, variety, lot, bin, store of origin).
- In some countries, a sample tested for pesticides residues requires a control sample to be constituted at the same time and kept at control temperature in case high or abnormal residues are found. Such control sample must be a perfect replication of the first sample sent (meaning tubers taken from the same original sub-samples). In general, to prevent outliers due to sampling error it is advisable to resample if a second analysis is needed (e.g. cross contamination from using old gloves/contaminated materials at sampling).

*In case small tubers are stored, sample more than 12 tubers to get minimum 1.5 Kg per sample

3.3.3. Detailed sampling protocols

Reconduction of the sampling protocols of storage season 22/23:

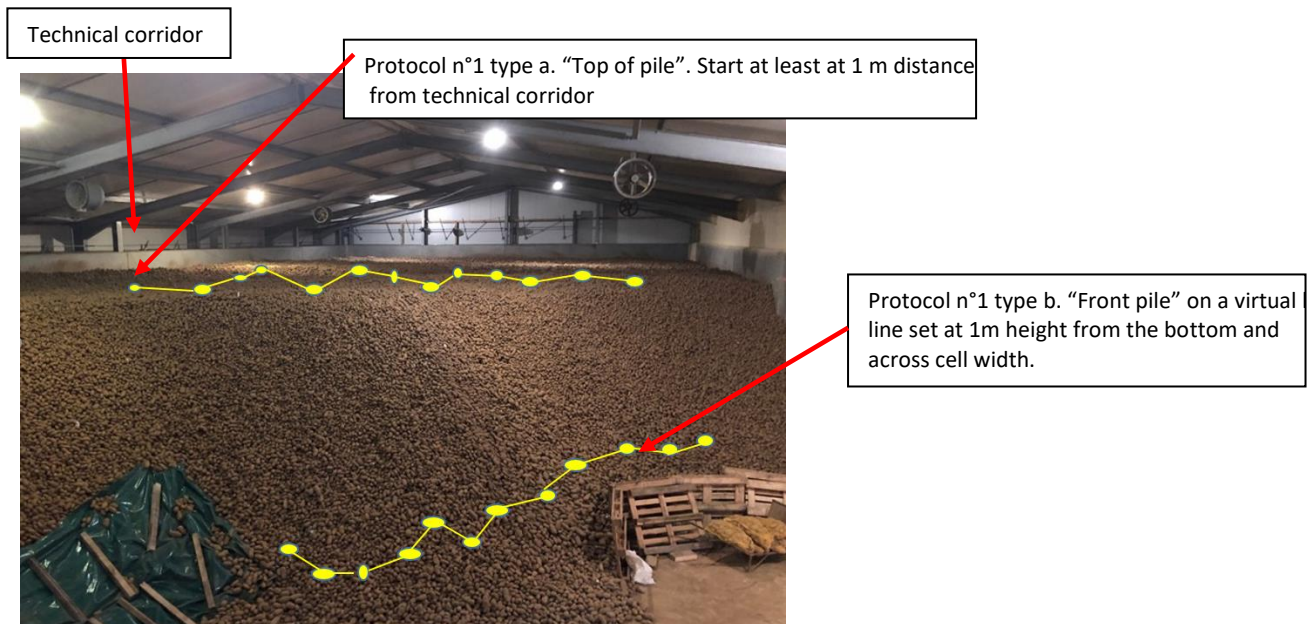
For this fourth season of monitoring the CIPC cross-contamination in stores, the PVC decided to implement the same protocols as adopted during the two last monitoring plans 21/22 and 22/23. The sampling methodology is detailed in Table 1 below for the two types of storage: box stores and bulk stores.

Table 1: Detailed definition of the different sampling protocols for crop 23 for testing CIPC residues

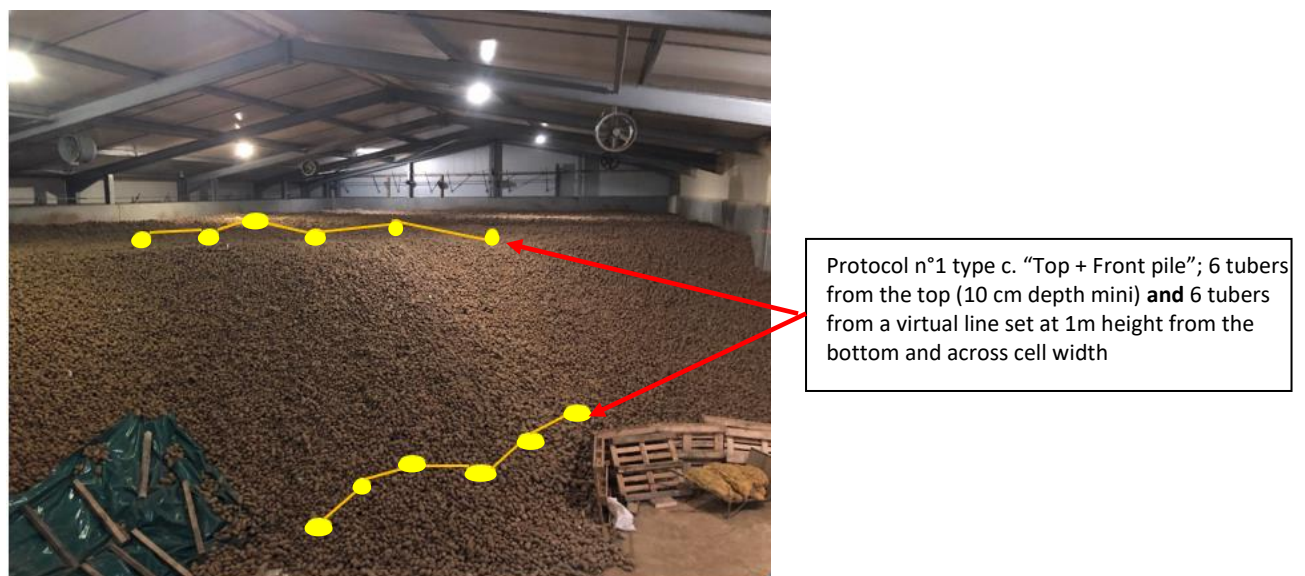
Sampling protocol number & « name »	Sampling method (How?)	When ?	Who ?	Associated remarks
n°1 type a “in situ” Top of pile	<p>Bulk store Sample minimum 12 tubers with:</p> <ul style="list-style-type: none"> ➤ Coming from the top of the pile. ➤ Avoiding the top layer of potatoes that is under constant influence of temperature variations and condensation (aim at >10cm depth). The variable conditions in this layer might influence representativeness of results. ➤ In a random zigzag design with a minimum 2 m distance from any wall. ➤ Starting from the side of the ventilation room with a minimum of 1m distance. <p>Box store Sample minimum 12 tubers from 12 different boxes:</p> <ul style="list-style-type: none"> ➤ Coming from 12 top boxes (in the diagonal of the air flow if released on top of boxes). ➤ Avoiding the top layer of potatoes that is under constant influence of temperature variations and condensation (aim at >10cm depth). The variable conditions in this layer might influence representativeness of results. ➤ If the top boxes are not (safely) accessible, randomly select from 12 of those that are accessible. 	<ul style="list-style-type: none"> ➔ Try to avoid the first 2,5 months after end store loading as the tuber residue build-up may not be representative during this period for later unloading. ➔ Minimum 8-10 days before pile unloading (when want to check compliance of a specific lot). 	<ul style="list-style-type: none"> ➔ Authorities Rep. Or ➔ 3rd party quality scheme auditor Or ➔ 3rd party company Agent mandated by authorities, or Buyer Or ➔ Buyer Agent 	<ul style="list-style-type: none"> ➔ Should be used only in stores tested previously having used this method (check possible decline) or newly tested in year 23/24 in countries having shown lowest levels of residues in the last plans (NL, DE) ➔ An “in situ” control sample may be required by legal texts (replicate) taken at the same time than the sample to be sent to the laboratory. This requires sampling double number of tubers mentioned in the method. ➔ If, for practical and/or safety reasons, it is not possible to proceed according to the described procedure, this has to be recorded, précisant where the sample has been taken (for example: Sample from 4 boxes only due to lack of access). ➔ It is highly recommended that the farmer (or lot owner) is present during the sampling phase for respecting protocol acknowledgement.

<p>n°1 type b</p> <p>“in situ”</p> <p>Front of pile</p>	<p>Bulk store with an accessible front pile section (see picture 1 below the table): Sample minimum 12 tubers:</p> <ul style="list-style-type: none"> ➤ Coming from the front pile on a virtual line set at 1m height from the bottom and across cell width, with a minimum distance of 2 m from lateral walls. ➤ In case of above or underground air ducts, 3 of the 12 tubers must be taken directly above the duct air outlet. ➤ Exclude tubers that may have rolled down from upper part of the pile. 	<p>➔ Try to avoid the first 2,5 months after end store loading as the tuber residue build-up; may not be representative during this period for later unloading.</p>	<p>➔ PVC/ assigned qualified sample takers</p>	<p>➔ Should be used only in stores sampled previously having used this method (check possible decline)</p>
<p>n°1 type c</p> <p>“in situ”</p> <p>Top + Front of pile</p>	<p>Bulk store with an accessible front pile section (see picture 2 below the table): Sample minimum 12 tubers:</p> <ul style="list-style-type: none"> ➤ 6 coming from the front pile on a virtual line set at 1m height from the bottom and across cell width, with a minimum distance of 2 m from lateral walls. In case of above or underground air ducts, 1 of the 6 tubers must be taken directly above the duct air outlet. Exclude tubers that may have rolled down from upper part of the pile. ➤ 6 coming from top of the pile, avoiding the top layer of potatoes (aim at > 10cm depth), in a random zigzag design with a minimum 2 m distance from any wall and starting from the side of the ventilation room with a minimum of 1m distance. <p>Box store Sample minimum 12 tubers from 12 different boxes:</p> <ul style="list-style-type: none"> ➤ Coming from 3 top highest layer of boxes (in the diagonal of the air flow if released on top of boxes), avoiding the top layer of potatoes (aim at > 10cm depth). ➤ Coming from 9 different boxes accessible from the front of the piles of boxes. This requires specific box handling for this. 	<p>➔ Try to avoid the first 2,5 months after end store loading as the tuber residue build-up; may not be representative during this period for later unloading.</p> <p>➔ Minimum 8-10 days before pile unloading (when want to check compliance of a specific lot).</p>	<p>➔ Idem n°1 type a including authorities rep.</p>	<p>➔ Should be used preferably in stores not tested previously in countries having shown highest levels of residues in the last plans (FR, BE, A).</p> <p>➔ An “in situ” control sample may be required by legal texts (replicate) taken at the same time than the sample to be sent to the laboratory. This requires sampling double number of tubers mentioned in the method.</p> <p>➔ If, for practical and/or safety reasons, it is not possible to proceed according to the described procedure, this must be recorded, précisant where the sample has been taken (for example: Sample from 4 boxes only due to lack of access).</p> <p>➔ It is highly recommended that the farmer (or lot owner) is present during the sampling phase for respecting protocol acknowledgement.</p>

Sampling protocol number & « name »	Sampling method (How?)	When ?	Who ?	→ Associated remarks
n°2 “Mix”	<p>→ <i>If taken at seller’s gate:</i></p> <p>At the time of store unloading: Bulk store: take 1 tuber at random from each 2 successive front loader buckets before filling the bulk hopper or the tipper, or every 5 minutes (or less) on the belt of the pile remover equipment to constitute a sample of at least 12 tubers.</p> <p>Box store: take 1 tuber at random from each or each 2 successive boxes (depending on box size) just after boxes have been loaded in the bulk hopper. If boxes are shipped straight fully to the buyer or loaded directly in a tipper without handling (grading, trimming...), just proceed as for protocol n°1 in 12 different boxes just before they are loaded.</p> <p>→ <i>If taken at buyer’s gate:</i> Pick at random at least 12 tubers coming from all sub-samples taken in the process of lot quality and/or payment assessment at delivery stage.</p>	At store (partial or full unloading) from Dec-January to end of storage season	PVC / assigned qualified sample takers	<p>→ A “Mix” sample gives the most representative view of residues of part of pile or boxes delivered.</p> <p>→ Time constraints (timing and duration) more important than for protocols n°1 for bulk stores</p> <p>→ Number of samples (frequency) to be determined by each individual buyer (grower) according to its own risk analysis assessment.</p> <p>→ It is highly recommended that both parties (Seller-Buyer) are present during the sampling phase for respecting protocol acknowledgement.</p>



Picture 1: Method for sampling protocol n°1 types a and b *"in situ"* in a bulk store with a front pile



Picture 2: Method for sampling protocol n°1 type c in a bulk store with a front pile

3.3.4. Additional remark on protocols

- It is strongly recommended that the sampler, in any store sampled, records store characteristics and cleaning protocol adopted by the owner. The grower self-assessment checklist materializes his cleaning protocol. This will give the possibility to correlate the level of residues in tubers with the store characteristics, including CIPC history and cleaning practices adopted.

- Where possible, multiple samples should be taken according to the different protocols to get a better understanding of the influence of the sampling location on the level of the residues.

3.4. General precautions for sampling

- Sampling must be carried out with appropriate consideration of the health and safety of operators, based on local regulations such as those for working at height, which may limit access to some parts of stores.
- Avoid sample cross-contamination by:
 - o Wearing **one-time use** gloves and changing them at each sample, just before new sampling; avoid touching surfaces when moving from one place to another to pick individual tubers!
 - o Using **new** paper bags and/or plastic bags. Better to consider double bagging, although not mandatory. Those bags need to have been stored in a fully CIPC free environment.
 - o Placing the paper bags in plastic bags before leaving the store (protocols 1 or 2) or other place of sampling (protocol 2)
 - o Labelling your paper/plastic bags prior to enter into the store or other sampling places (grading/packing station...)
- Adopt the proposed way of labelling depending on protocols:

Table 2: Sample labelling proposed for the diverse sample types.

Sampling protocols n°1 (types a, b and c) & n°2
Company/Organization Grower code or name Variety Storage name (and "cell" name/number) if many Type of sample ("in situ" type a, "in situ" type b, in situ type c, "mix") Date of sampling Additionally Place of sampling (if "Mix" sample or if more than one sample taken in that store/cell) Control sample (for the 2 nd sample if legally required) Additional info (in case protocol has not been followed: see 2 nd remark in protocol n°1 type a and c)

3.5. Sample management after sampling

- Maintain samples in a CIPC free environment (avoid maintain them too long in a car back and/or in contact with other samples/stuffs possibly contaminated with CIPC residues).
- Samples should be unwashed (protocols n°1 and n°2).
- Close the paper bag; close/seal the plastic bag.
- Send promptly the samples to the laboratory with a target of having them received maximum within 48 hours after store sampling.

- In case samples cannot be sent promptly or for legally required “control samples”, store them in an artificially cooled ambience.

3.6. Laboratories

- Identify 1 or 2 laboratories, ISO/IEC 17025 certified for CIPC residues analysis on potato tuber matrix at a maximal LOQ of 0.01 ppm.

4) Proposed Residue Monitoring Plan 2023-2024

4.1. Objectives of the Monitoring Plan

- Verify compliance of the raw material put on the market against the CIPC temporary MRL regulation (Reg. (EU) 2023/377).
- Feed the PVC monitoring database. These monitoring data are part of the whole CIPC tMRL process and will be a reference for the European Commission to consider the evolution (decline) of the tMRL. The PVC is committed to continue to deliver data as per the requirement in Reg. (EU) 2021/155.
- When tuber residue testing is associated to store characteristics and cleaning practices adopted, it would be possible to:
 - o Fine-tune the current “Store cleaning guidelines” if needed,
 - o Report on the cleaning practices
- Overall, the PVC wants to show its pro-activeness to the European Commission in this challenging dossier.

4.2. Proposed plan of the PVC

4.2.1. Definition and estimation of the storage building population in Europe

- The potato stores to be included in the monitoring plan are **those having had a CIPC history** (even 1 year only) and hosting consumption potatoes (table or processing), so are excluded the:
 - o Seed potato stores,
 - o So-called “Temporary stores” in which tubers are stored short-term from harvest to around end December without CIPC. Those stores are generally not suitable for mid and longer-term storage due to poor insulation/ventilation equipment.
- The average capacity of mid and long-term farm store buildings is estimated at 1000 T (surveyed by different stakeholders).
- The average estimated/measured consumption potato production of the big 4 Continental Europe producing and storing countries (DE, FR, NL, BE) was quantified at around 21.4 Million Tonnes (MT) in 2019 (source: NEPG) of which around 55% is stored in medium or long term storage capacity in the period January- up to mid-July.
- Based on the above, we can estimate the number of consumption potato stores for mid and long-term storage to be approximatively 11 800 in those 4 countries (21,4 Million Tonnes * 0.55/1000 = 11770) which represents around 550 stores per Million Ton potato produced.

We can assume that other European countries producing consumption potatoes marketed along

the year would have a similar ratio.

4.2.2. Definition of a “potato store sample” in the monitoring plan

We consider a potato store sample in the monitoring plan as:

- Being a potato sample issued from protocols n°1 or n°2 only and tested for CIPC residues,
- Being unique per grower and storage entity of origin up to 5000 tonnes (this to cover possibly the largest range of stores/cleaning situations)
- Being independent one from each other (except those coming from storing entities > 5000 tonnes)
- Taken randomly assuring a representative sampling plan. However, this revised monitoring plan includes some targeted store populations (see chapter 4.3.2)
- Having recommended detailed information on store and cleaning characteristics.

By this definition, a sample is not related to a volume/tonnage stored.

4.3. Plan for harvest 2023

4.3.1. Number of stores/samples proposed

The original monitoring plan proposed for crop 2020 was based on a statistical approach² to deliver an accuracy of 10% of the results. Around 1200 stores had to be sampled randomly for reaching this level of accuracy. This was corresponding to a sampling of around 10% of the mid and long-term storages of the four main potato countries cited above (NL, BE DE, FR).

Based on the results obtained during the first-year monitoring, the PVC considers that this number is delivering a good representativeness of the diversity of the storage situations: storage types, building features, CIPC history and cleaning practices. Within this representativity, the presence of high residue values was captured in a few cases along the different monitoring plans, with some exceedances of the tMRL. (0,40 mg/kg).

4.3.2. Proposed plan of the PVC at European level and per country, crop 2023

The key points of the proposed storage monitoring plan crop 23-are the following:

- Keep sampling the same objective of stores as proposed for crop 20 in the 2023-2024 monitoring plan in the 4 main potato- producing countries (BE, DE, FR, NL) as well as the other 3 countries that submitted data (AU, UK, PL).
- Re-sample the stores which have delivered at least one tuber sample with residues above 0,1 mg/kg during monitoring plan 2022-2023.
- Sample the remaining stores at random.

These elements are detailed below.

² The statistical approach used for crop season 2020 can be found in the previous version of this document “Monitoring plan and sampling protocol for residues 2020-2021.”

- The PVC monitoring plan for crop 23 (storage season 2023-2024) is covering again 1212 samples for the main 4 countries producing consumption potatoes in Europe. This is based on a repartition at tonnage prorata (55 stores per Million Ton produced) based on crop 19 figures, close to the 5 year average (2015-2019). The PVC considers there have not been significant changes in the tonnage produced to consider adapting this baseline.
- One target of the monitoring is to check if the residues are declining over time. Therefore, the PVC strongly recommends testing again those stores that were sampled for crop 22, which are showing residues at a residue level above 0,1 mg/kg. The variability of residues within a store could mask trends of evolution over time, which makes it more difficult to detect when starting with low residues. The PVC is also conscious that the level of CIPC residues on tubers in a given store is multi- factorial (ventilation rate depending itself on diverse factors, size of the pile (bulk), number of boxes, etc.). To limit this influence, the PVC is recommending to sample in 2023-2024 the stores already sampled in 2022-2023 (with residues >0,1 mg/kg) - and de facto also those from previous seasons- using the same type of sampling and possibly at the same period to limit the influence of these two factors. This is indicated in line B of table 3.
- The remaining number of samples after deduction of the samples in line B of table 3, can be sampled randomly across the store population that is available in the respective country. This is indicated in line C of table 3.

Note that the data collection template will facilitate the distinction of stores that were re-sampled versus the new randomly sampled stores.

Table 3: Proposed number of stores to be sampled for CIPC residues crop 23

	Approach	BE	DE	FR	NL	All 4	PL	UK	AU	All 7
A	Proposed # of stores to be sampled for crop 23 (same as crop 22)	221	440 ³	347	204	1212	137	114	21	1484
B	Proposed # of stores crop 22/23 to be re-sampled (> 0,1 ppm)	2	5	43	0	50	1	0	1	52
C	Proposed # of stores to be sampled selected randomly from crop 23 (A-B)	219	435	304	204	1162	136	114	20	1432

Please also note that:

- Responsibility is given to the potato sector of each country to organize a “national” storage-monitoring plan to be part of the European plan, suggested to be also at the relative share of the markets (Fresh, Processed), as well as the relative level of activity of operators (prorate).

³ The table potato sector in Germany has reduced the use of CIPC and focused on cool storage for many years for quality reasons and as a requirement by retail companies. Therefore, it will eventually be difficult to identify sufficient storage buildings with a significant CIPC history. The processing sector processes about 3,6 million tonnes and thus stands for about 220 samples.

- Samples from national, sectoral or company residue sampling programmes such as samples taken for food safety certification can be eligible for the PVC monitoring plan as long as the protocols and methods explained in chapter 4 of this document are taken into consideration.

4.4. Plan for harvest 2024 and beyond

The following annual monitoring plans will be adapted based on the results obtained during the third year, including the distribution of the CIPC residues, the possible occurrence of the tMRL exceedance and the standard deviation calculated, per country and overall (EU). It could be even adapted per market and per type of storage. Indeed, box stores storages are showing higher residual CIPC values with more difficulties to achieve the LOQ. However, it is recommended to continue sampling both bulk and box stores, to drive tMRL evolution on representative data from all countries. However, the size of the monitoring plan may be reviewed from crop 2024.

4.5. Reporting monitoring results in a centralized PVC database

- The PVC proposes to go on gathering the results of the tuber CIPC residues monitoring in the PVC centralized database, as implemented in storage seasons 2022-2023, 2021-2022 and 2020-2021.
- The database will host the results from protocols n°1 (types a, b and c) and n°2 with elements to explain possible outliers. Comparison of residue levels for stores tested for the 2 consecutive years will be possible.
- The data entered into the database will remain confidential to the data owners. The database will be managed independently from the 5 constitutive organizations of the PVC.
- Data entry should be facilitated by an online web application.

5) References

- *Codex Alimentarius*: Recommended methods of sampling for the determination of pesticide residues for compliance with MRLs, CAC/GL 33-1999, 18 p.
- *Commission Directive 2002/63/EC* establishing Community methods of sampling for the official control of pesticide residues in and on products of plant and animal origin, July 2002, OJEC, p30-43.
- *NEPG (North Western Europe Potato Growers)*, Final potato production numbers crop 2019 and an expected increase in acreage crop 2020, Press release Jan 21st 2020, 2 p. www.nepg.info
- *NEPG (North Western Europe Potato Growers)*, Average to good harvest in NEPG zone, but increased production costs., <http://nepg.info/wp-content/uploads/2021/11/211119-NEPG-press-release-English.pdf%E2%80%8E>
- *Mary Jo Frazier, Nora Olsen*, Best practices for CIPC residue sampling of potatoes and storage facilities, University of Idaho extension, Bul 907, 4 p.
- *Potato industry stewardship group*, Guidelines for obtaining a potato sample for CIPC residue testing, Group chairman, Dr Mike Storey, AHDB, 8p.