

Container Management

How to Increase Collection Rates of Empty Packaging from
Plant Protection Products

Country Analysis, Results and Recommendation



Summary

The crop protection industry continuously improves the performance of container management systems (CMS) established in countries over the last 30 years to ensure collection and sound recovery of plant protection product (PPP) packaging. These dedicated packaging collection and treatment systems ensure end-of-life control and thereby reduce risks to human health and the environment.

In some countries, collection rates of pesticide packaging stall at lower levels and the reasons for this stagnation are not always well understood. The purpose of this report is to list the prominent factors that impact collection rates, both positively and negatively, and the options to close performance gaps.

This report is the result of a study conducted in 2020 for CropLife International (CLI). CMS data from the CLI database were analyzed and partners from a representative range of CMS programs were interviewed to gain insight into positive and negative factors impacting collection rates. To complete the picture, a comparison with other packaging sectors was added. Identified factors, ranked by importance, include the following:

- Legal obligations tend to foster higher collection rates. Countries without legal obligation can also achieve high collection rates, but the study found that countries with legally mandated systems, such as under Extended Producer Responsibility (EPR), and legal targets tend to be significantly higher (overall 79 percent collection rate) than in countries with purely voluntary schemes (35 percent). Voluntary schemes have to rely on other factors, such as unconditional commitment from companies and other stakeholders, partnerships with agri-certification schemes and others to achieve equally high collection rates.
- Collection rates tend to be higher in countries where empty, rinsed PPP containers are classified as “non-hazardous.” In some cases though, CMS programs claimed a “hazardous” classification as a factor for high collection rates because even “dirty” and non-rinseable packaging can be collected.
- CMS with lower collection rates share one common feature: they all lack sufficient funding. The study demonstrated that adequate funding to maximize collection rates can reduce the per kilogram collection costs through economy of scale, process optimization and others. Aggregated cost data from the regions (e.g., Europe and Latin America) shows that over the last 15 years, it has been possible to more than double the number of collection schemes, the quantity collected and the collection rate without increasing the total cost for the industry.
- Data concerning farm size and type of agriculture (big versus small farms, export versus subsistence farming, etc.) were not benchmarked in this study. Yet, experience from CMS managers strongly suggests that waste collection tends to be easier on bigger farms. Nonetheless, small-scale farmers should not be forgotten. While collecting the first 30 percent of packaging mass is the easiest part for a collection system, the biggest impact in terms of risk mitigation is achieved through the collection of the last 30 percent.

- The density of collection points on the territory, distances to farms, opening hours and operating mode are other influencing factors identified in this study. Findings suggest that the easier it is for users to return their waste, the higher the chances that they do.
- The collection of other waste (flexible, seed or fertilizer packaging, etc.) and offering farmers an “all-waste-solution” are seen as a promising way to attract more farmers to the collection systems and by doing so, raise collection rates.
- Communication with all stakeholders and a genuine interest in farmers’ needs turn out to be key for success. Language and terminology are important to induce the right attitude to return waste as a duty, rather than a choice.

The most important recommendations from this study are to:

- **Adopt a business approach to CMS.** Farmers should be provided with solutions. The entire value chain should see the benefits of container management, which can also be used as a sales pitch. Closed-loop recycling solutions should be considered for big markets to allow CMS programs to stay independent from the recyclates and virgin plastic markets.
- **Provide CMS with appropriate funding** Experience in Europe and Latin America has shown that sufficient investment in CMS pays off through improved cost efficiency (collecting more at a decreasing cost per ton).
- **Advocate a supportive legal framework and enforcement of legal obligations.** This includes calling for a “non-hazardous” classification of rinsed containers and the establishment of EPR with clearly shared responsibilities.
- **Collaborate with certification schemes, agricultural organizations and agri-food retailers.** When certification provides a license to operate or export, the risk of losing it becomes a strong behavioral change element.
- **Position CMS as a solution, not a chore.** Sufficient budget should also be foreseen for communication with all stakeholders. The message must be repeated to turn a habit into culture.

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Introduction

The plant protection industry is committed to taking care of the end of life of their products by promoting responsible and sound management of packaging waste in all markets for all professional users. The industry has gained unique experience and expertise by establishing and running - directly or in partnership with other stakeholders - collection and recovery programs for one-way primary packaging in over 60 countries. Some have been operating for more than 20 years. Since 2005, CropLife International (CLI) has monitored the development and performance of these systems by collecting and assessing on an annual basis a series of performance data from container management systems (CMS) around the world. The industry looks at continuously improving the performance of these CMS programs and has set a goal to collect 50 percent of all primary packaging containers shipped globally by 2020 (CLI roadmap, 2015).

However, in 2018, the quantity collected and managed in a safe and controlled manner by the monitored CMS programs covered only 28 percent of the estimated 350 thousand tons of pesticide packaging shipped yearly on the global market. The annual 250,000 tons of packaging waste that is not collected by dedicated programs are presumably collected by municipal schemes, by local collectors and recyclers, sent to landfills or incinerated in approved facilities. It might also accumulate on farms, be reused or disposed of in farms' backyards, abandoned in the environment, or collected and reused for counterfeit products. No matter the collection and treatment modes, without a dedicated CMS in place, there is no control on the end of life of PPP packaging and this is a serious risk for the industry, human health and the environment.

The journey to reach sound and controlled container management in all markets is still a long way to go and the industry has a direct responsibility but also the capacity and the competence to reach it. A big challenge will be to establish new CMS programs in all markets not yet covered and launch several new pilot programs every year. Guidelines to support countries with the design and implementation of new CMS have been published by the plant protection industry¹ as well as international institutions.² At the same time, there is potential for improvement in countries with established CMS and the industry aims at reducing this gap, too. This study is a contribution to that goal.

The primary goals of a sound CMS should be to maximize the collection and safe recovery of empty packaging in order to minimize the risks of container accumulation and mismanagement on farms, illegal disposal in the environment and, overall, to human health and the environment. Thus, the

¹ *Roadmap for Establishing a Container Management Program for Collection and Disposal of EPesticide Containers* (CropLife International, Brussels, 2015); *Container Management Guidelines: Building Effective and Integrated Strategies for Packaging Reduction, Design, Rinsing and Recovery* (CropLife Europe, Brussels, 2005).

² *International Code of Conduct on the Distribution and Use of Pesticides: Guidelines on Management Options for Empty Pesticide Containers* (World Health Organization and Food and Agriculture Organization of the United Nations, Rome, 2015)

collection rate for primary packaging is probably the best indicator to assess performance of a CMS program.

The purpose of this study was to understand key blocking and fostering factors and to propose guidance for CMS programs and the industry with practical recommendations on how collection rates can be enhanced in programs and globally.

This study is based on a detailed review of countries' performance indicators provided by the CLI CMS database and research in various countries to understand how they run their CMS. In parallel, an examination was carried out to extract transferable examples and good practices from waste streams from other sectors as well as ways they increase collection performance.

This publication is a short version of a detailed internal study conducted in 2020. An important outcome of this study is a “toolbox” of hands-on suggestions for country managers who are interested in improving the collection performance of their CMS. This toolbox is available upon request at CLI and can be used by countries to identify the most appropriate and resource efficiency measures.

Strategy & Methodology

CMS Data and Country Selection

Since 2005, CLI has recorded performance indicators from over 40 CMS established by the plant protection industry. The data are collected directly from the CMS programs or via national crop protection associations, then they are controlled and aggregated as regional or global annual performance reports. This CLI CMS database monitors the development and performance of these programs and highlights areas for improvement at national and global levels. For the first time, CLI has provided access to country data to have a close look at the collection performance of CMS programs and to investigate reasons for low rate and good practices that can help countries increase the collection of pesticide packaging.

A review of the data reveals that the quality of information provided by the programs is not harmonized and, unfortunately, incomplete or unreliable for some regions and countries. Of the 63 countries in the CLI CMS database, 55 provided data on a regular basis for at least the last 3-4 years though only 38 collected the necessary data. The database also has numerous gaps, which point to misleading trends for national and regional figures. Data from some regions (e.g., Asia) are almost entirely missing. Other programs could only provide data about the quantity collected (e.g., in Africa) and a majority of programs only provide data for rigid plastic containers, not other primary packaging. Consequently, it is difficult to assess and compare the performance of the CMS programs. Some manage plastic packaging from other products (e.g., fertilizers) as well and they do not segregate the data; it is estimate that this packaging represents 5-20 percent of the quantity collected. Thus, collection data provided by CLI and CMS programs for this study should be taken as approximations or best available data and be used with caution when benchmarking countries. However, the database is very useful to track progress and trends in each country.

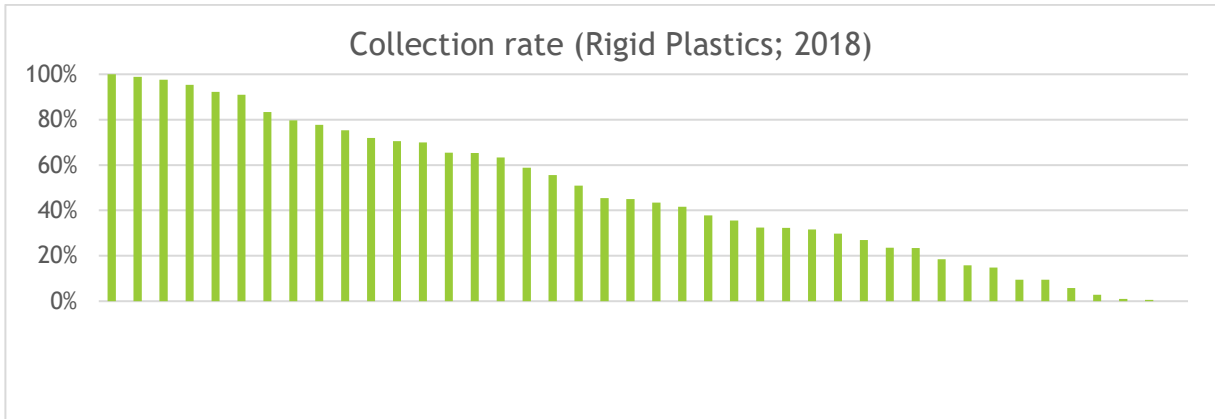
The collection performance and good practices from countries and other sectors should be understood within their national specific contexts and program setups. For this reason, the authors discussed with the coordinators of CMS programs in 14 countries, representing a variety of conditions and CMS set-ups, to review the factors that have positively or negatively impacted their development. The aims were to understand how key elements of CMS set-up such as market sizes, types of agriculture, waste classification regimes, legal status of the programs, mode of collection, etc. can impact collection performance and which best practices have proven to be efficient.

In conclusion, collection rates are well-suited to monitoring the status and progress in countries and benchmarking CMS performance. However, this data is only as valuable as its underlying quality and the method used to calculate it. Thus, comparing countries based on collection rate should be done with caution because of their inconsistency in measures. Also, CMS benchmarking is currently based on the collection rate of rigid plastic containers only because they are the most important packaging fraction in most countries and they are recyclable. However, other primary packaging is at least as

important in terms of risk reduction and stewardship principles therefore the “true” collection rate should include all primary packaging.

The following figure shows the wide range of collection rates across regions. As highlighted above, of the 62 countries registered in the CLI CMS database, only 39 provide collection rates:

Figure 1. Collection rate of rigid plastic containers in 42 countries



Comparison to Other Sectors

A comparison with collection programs from other sectors was conducted to draw parallels and extract best practices. It includes CMS for household industrial and other types of professional packaging and details some of the regulatory tools used by these systems (typical EPR, deposit refund systems, “pay-as-you-throw” and combination systems, coupons, other incentives, etc.).

Elements Affecting Collection Rate

The CMS survey identified and studied several factors that are likely to affect the collection rate of empty pesticide containers.

- **Legal framework:** Legally mandated schemes versus voluntary schemes; legal collection targets; waste classification
- **National agricultural and farming profile:** Geographical coverage of CMS programs; type of agriculture and average size of farm holdings; packaging portfolio; organizations of agricultural activities (cooperatives, agri-certification schemes, etc.)
- **CMS set-up:** Mode of collection; density of collection networks; collection of other agri-plastics; recycling programs; incentives; collection target and mandate to maximize collection rate; funding capacity
- **Outreach programs:** Strategy; communication budget; involvement of company sales forces

This report provides a summary of the findings. Key takeaways are:

- Direct comparisons between CMS programs and countries, such as on collection rate, without considering national and local differences are “risky” and may prevent a true comparative performance assessment.
- Any recommendation emerging from this study is only useful with due consideration of national conditions and set-up of a CMS.
- There is not one single factor that can lead to the success (or sub-optimal performance) of a collection scheme.
- A positive factor that contributes to an increased collection rates in one country will not necessarily have the same positive effect in every country.

With these caveats in mind, this study identifies and analyses several factors that can block or boost collection rates in countries and provides practical recommendations for the industry and CMS coordinators to increase collection rates in their countries and globally.

Legal Framework

There is a set of legal obligations that can enable the successful implementation and management of CMS programs when they are correctly designed and enforced.

Enabling Regulation for Successful CMS

- Clear and proportionate regulations based on the **shared responsibility** of all concerned stakeholders
- Regulation that creates a **level playing field** among producers and importers on their responsibility for product end-of-life (e.g., EPR)
- Mandatory minimum collection and/or recycling **targets**
- **Take-back requirement** for retailers and distributors
- **Rinsing and return requirement** for product users
- **Non-hazardous classification** for rinsed pesticide containers

Legal Obligation on Manufacturers for Post-consumer Management of Packaging Waste

- “**Extended Producer Responsibility**” (EPR) puts the financial or operational responsibility for compliant waste management on the producers of packaged products. It is the most common approach in Europe and other regions as it is strongly recommended as effective environmental policy by global institutions such as the Organization for Economic Co-operation and Development (OECD). New EPR obligations for pesticide packaging are foreseen in the near future in New Zealand and Kenya among other countries.
- “**Shared responsibility**” usually defines clear roles and responsibilities for all key stakeholders involved in the supply of pesticide products - from producers and importers to users - including responsibility for products’ end of life. It often calls for explicit return of empty containers by users.
- The “**take-back obligation**” requires producers, distributors and/or retailers to take back empty packaging from users (e.g., in Portugal, Poland, Serbia).

EPR, shared responsibility and take-back obligation usually boost collection rates by:

Establishing a level playing field among all producers and importers that facilitate the set-up and sustainable development of CMS programs.

Setting minimum quantitative targets in terms of collection, recovery and/or recycling.

Providing a funding mechanism to reach legal targets and cover the net costs of recovery schemes when recycling revenues are not sufficient to cover all expenses.

- **Requiring awareness-raising** campaigns about CMS to reach a maximum of waste holders.

Setting a minimal requirement for packaging design, such as full recyclability.

Mandatory Versus Voluntary

CropLife International’s CMS “roadmap”³ differentiates countries with voluntary or legally mandated schemes. It notes that “*a legally mandated scheme ensures that all groups contribute to the scheme (financially or by an obligation to return properly rinsed containers to a collection point, etc. However, it runs the risk that it will lack the drive for efficiency that voluntary schemes may have.*” In purely

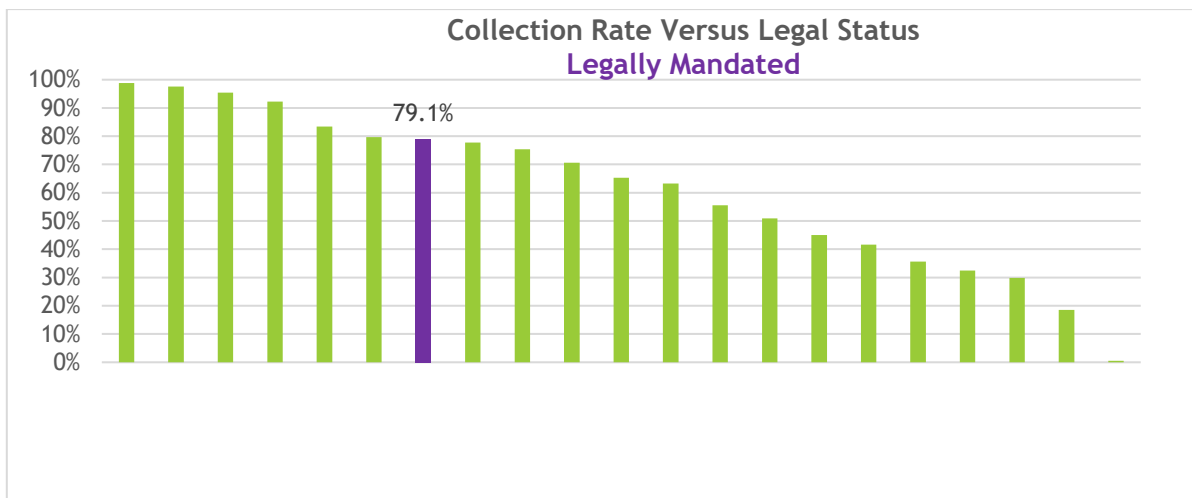
³ Roadmap for establishing a container management program for collection and disposal of empty pesticide containers, CropLife International, Brussels, 2015

voluntary initiatives, stakeholders are free to participate in the various activities related to sound empty packaging management.

The study reviewed the sometimes thin difference between voluntary and mandatory schemes. For instance, in Europe, producers or importers of packed products have a legal EPR obligation. They join producer responsibility organizations (PRO) to collectively fulfill this obligation. However, it has not been possible to establish compliance PRO for pesticide packaging in all EU Member States and the industry pro-actively decided to establish voluntary CMS programs to ensure pesticide containers are safely collected and treated. In such case, there is a legal obligation on producers, but the CMS program is voluntary (and pesticide producers pay for it and the PRO).

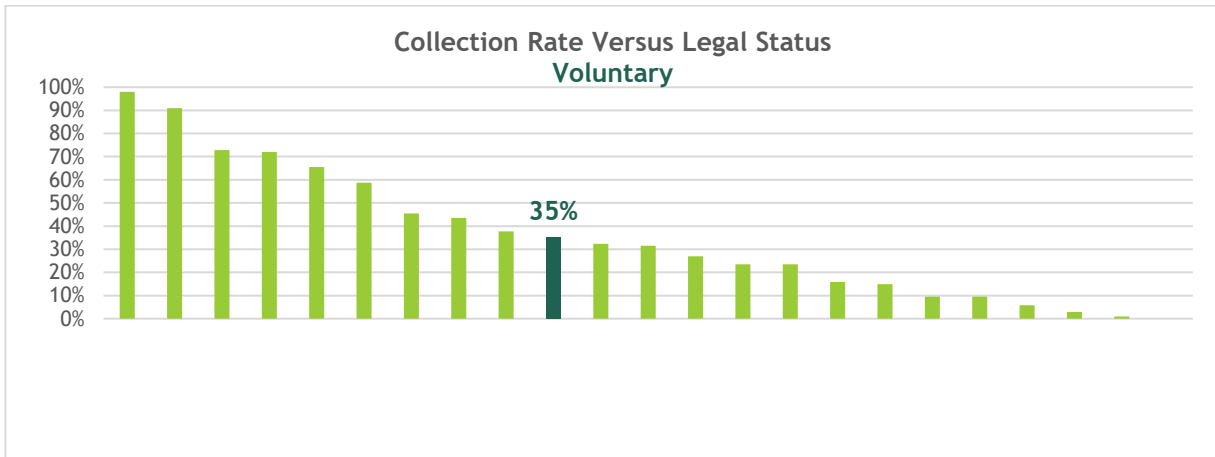
Of the 43 CMS programs benchmarked in the CLI CMS database, 21 are legally mandated schemes and 14 have a collection rate for plastic containers above 50 percent.

Figure 2. Collection Rates in Countries with Legally Mandated CMS Programs (2018)



* Plastic container data only Similarly, the graphic below shows that only six of the 22 of voluntary programs have a collection rate above 50 percent.

Figure 3. Collection Rates in Countries with Voluntary CMS Programs (2018)



* Plastic container data only. While the collection figures are affected by various parameters and depict both very performant and under-performant collection programs, the graphs suggest that overall, collection rates are higher in countries with a legal obligation on producers (79%) compared to countries without such legal obligation (35%). The discussion with countries also confirmed that legally binding targets reinforce the legal obligations on producers and importers by setting a minimum performance level as well as a timeframe to reach targets.

However, it is worthwhile to highlight that some fully voluntary schemes are very successful (e.g., in Bulgaria, Canada, South Africa). This is possible with a genuine commitment by industry to pro-actively act and maximize collection performance (often through internal collection targets).

Findings also suggest that the way EPR is covered in regulations can be problematic:

- It can lead to a patchwork of regional EPR conditions in federal states when regions have a significant legislative autonomy on waste policy.
- EPR regulations often favor large or even monopolistic EPR organizations or impose the allocation of EPR contributions for the separate collection of household packaging by municipalities with no place for compliance PRO for packaging waste from specific sectors and with specific needs (e.g., from agriculture).
- Rules to increase competition among collection programs for similar wastes can distort the situation in a country and cause a race to the bottom, cherry-picking the most productive and accessible areas and intensifying problems with free riders. In the case of pesticide packaging and agricultural plastics, experience shows that one unique system would be the preferred option in most cases.

For countries with an unfavorable legal framework, a recommendation could be to work with authorities to integrate a specific EPR requirement (eventually combined with a take-back obligation for retailers) for agricultural packaging within related regulation. The national ministry of environment could approve this approach if the same guiding principle (e.g., EPR minimal requirements) and targets apply to pesticide packaging as for normal packaging. This has been an effective approach in Portugal, Spain and Greece.

Overall, the study shows that a pro-active and committed industry has led to successful and performant CMS programs in many countries. It has also prevented unnecessary legislation (e.g., in France) or been

involved in the design of smart regulation (e.g., INPEV in Brazil) that has been used as a legislative model for other countries (e.g., INPEV model in Peru) or sectors (e.g., for agricultural plastics in France or New Zealand).

Waste Classification

Primary PPPs can be divided into two types of packaging: rigid containers (generally plastic for liquid products) and flexible packaging (often multilayered composite sachets or pouches for granular products).

Liquid formulations and rigid containers are designed to maximize the efficiency of pouring and rinsing with water to reach a 99.99 percent product removal efficiency. As a result, rinsed containers are classified as “non-hazardous” waste in many countries. The Food and Agriculture Organization of the United Nations (FAO) and World Health Organization (WHO) recommend that “countries classify rinsed containers that have been inspected as non-hazardous.”⁴

Classification of packaging waste in countries generally follows one of the following approaches:

- Packaging waste of dangerous goods (pesticides in general) are classified as “hazardous.”
- Countries follow the FAO/WHO recommendation and properly classify rinsed containers as “non-hazardous” waste.
- Regulation provides criteria for classifying waste based, in general, on concentration limits for classified substances.

While many countries still classify pesticide packaging waste as hazardous, there are several CMS programs that have voluntarily opted for a “hazardous” classification for practical reasons. The motivation is that it is “easier” for farmers, making it more convenient to collect all packaging (non-rinseable or poorly rinsed containers, etc.). Other reasons are if the burden of proof for non-hazardous classification is too complex or expensive to pursue, or because waste management operators are reluctant to collect and manage non-hazardous packaging.

Nonetheless, a non-hazardous classification offers the adequate conditions to increase collection rates and operate CMS at lower costs. The rationales are more and cheaper options for collection, transport and treatment; no special and costly permit requirements at all stages of the waste stream; lower residues in waste; lower risks and easier recycling. However, it requires stringent rules for the preparation and collection of packaging waste (in particular, proper rinsing by product users) and an efficient monitoring of the waste stream to ensure rules are enforced. Consequentially, lower costs per kilogram collected means that more resources are available to collect more waste.

The review of the CLI CMS database shows that CMS can operate poorly or very well with both classification regimes. Nonetheless, the finding of this study is that the overall collection rate of programs with a non-hazardous classification is significantly higher (69%) than hazardous (38%).

⁴ *International Code of Conduct on the Distribution and Use of Pesticide; Guidelines on Management Options for Empty Pesticide Containers (World Health Organization and Food and Agriculture Organization of the United Nations (Rome, May 2008))*

Figure 4. Collection Rate of Plastics in CMS Programs with Non-Hazardous Classification (2018)

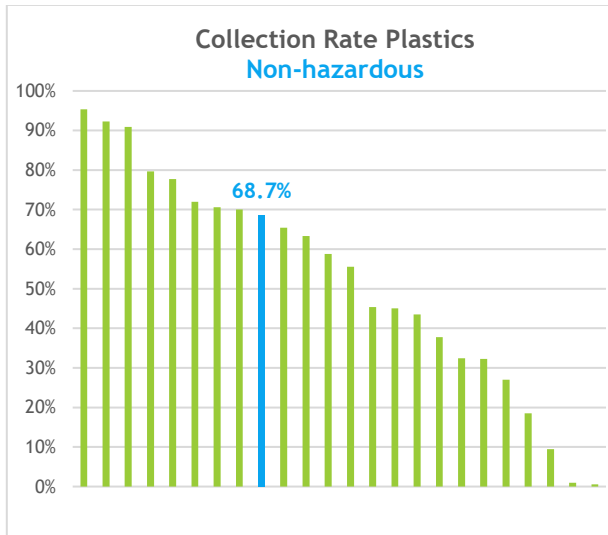
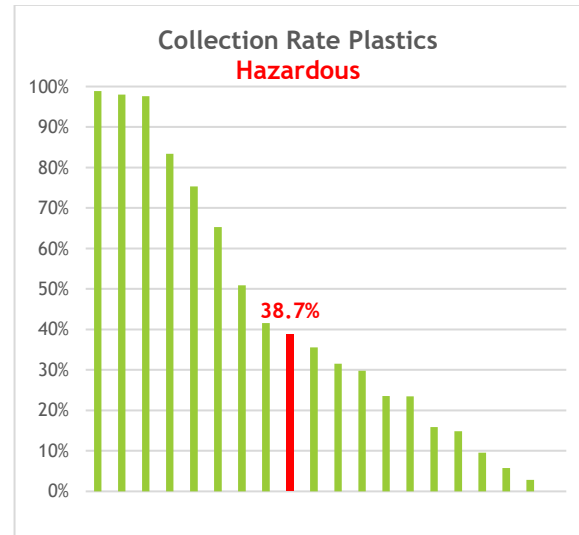
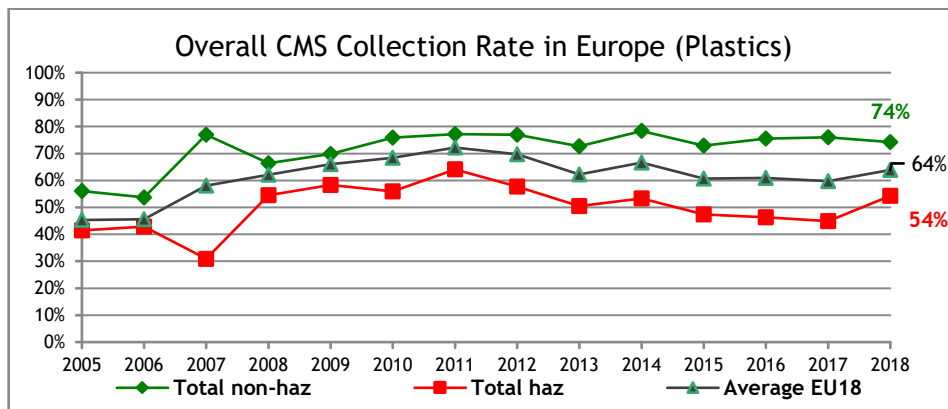


Figure 5. Collection Rate of Plastics in CMS Programs with Hazardous Classification (2018)



Similar conclusions can be drawn for European countries. An analysis of 18 benchmarked countries in Europe also demonstrates that the performance of programs with non-hazardous classification has been consistently and significantly higher since 2005, with an 8-30 percentage point difference (though several programs with a lower collection rate are still in the pilot phase and most have a hazardous classification, at least for the pilot).

Figure 6. Collection Rate for 18 European Countries (Plastics; CropLife Europe)



The higher collection performance and reduction of risks at source have been successfully used with authorities, particularly with ministries of environment, to advocate for a “non-hazardous” classification of empty PPP packaging.

In conclusion, the study showed that legal obligations have a noticeable, positive impact on collection rates. However, legal obligations are only as useful as their enforcement. In countries where obligation enforcement and control are poor, partnerships with stakeholders exerting authority on growers (e.g., cooperatives, agri-certification schemes, global agri-food producers; see below) are essential to ensure the implementation of good container management practices by farmers.

Agricultural and Farming Profiles

Agricultural and farming profiles in a country influence the performance of CMS. Organizing a program for tens of thousands of small-scale, family-run farms with an average “packaging” production of 5-10 kilograms per year has nothing in common with the logistics for a market dominated by a few thousand large, professional growers for export commodities delivering full trucks of empty containers each year. The mode of collection, effort in time, kilometers and communication to collect one ton of rinsed containers is very different and can significantly affect the collection rate if the CMS set-up and resources are not appropriate. Support from other stakeholders, such as agricultural state agencies, agri-certification schemes, cooperatives and farmer unions, is essential to reach out to all users and encourage compliance with good container management practices.

Geographical Coverage, Type of Agriculture and Size of Farm Holdings

The area to be covered by a CMS program, type of geography (mountainous or flat) and average size of farm holdings will affect the collection mechanism and may have an adverse impact on transport distance and collection costs.

Smallholder farmers producing a few empty containers of pesticide per year might also be tempted to simply dump this packaging waste into household waste or burn part of it (e.g., paper). Large, exporting farms are generally operated more professionally, better equipped for rinsing (e.g., with integrated rinsing devices) and transport, and more prone to be controlled by authorities and agri-certification schemes such as Global GAP.

In this context, it is interesting to look at the philosophy of the Brazilian system regarding collection and farmer responsibility. The program does not use the terms “collection service” or “collection points,” which suggest “reaching out to farmers to get waste.” On the contrary, the entire system is based on farmer responsibility and duty to return pesticide packaging to so-called “receiving units.”

Another major issue for large geographies is to find sufficient contractors interested and able to manage agricultural plastic waste. This is, for example, the case in the United States where affiliated collectors sometimes cover more than 15 states.

France, Mexico, Spain, Portugal, Brazil and most of the other countries with CMS programs covered in this study confirmed that large- and medium-size farm holdings are the “low-hanging fruits” for container management and rapid collection rate increases. Reaching out to small-scale farmers requires significantly more effort, means and resources. Yet, in terms of risk management and stewardship policy, they should not be forgotten. Collecting the first 30 percent of packaging mass is the easiest part of the job. However, the biggest impact on risk mitigation is probably achieved with the collection of the last 30 percent, which may represent the majority of users. The crop protection industry and stakeholders should acknowledge that a collection system will take more time to grow and reach high performance in regions or countries with high numbers of small-scale farmers. This should be reflected in a CMS strategy and plan.

Cooperatives and Other Forms of Organized Farming Structures

Reaching out to the maximum number of pesticide users is an obvious way to increase the collection rate of empty containers. But it is not something that a CMS program can do alone. All types of

agricultural institutions and organizations that are in direct contact with farmers (e.g., cooperatives, farmer unions, concessions, plantations, agri-certification schemes, extension services, training organization) should be involved. They can act as:

- Contact points to hundreds or thousands of pesticide users and as such, exponentially increase awareness, capacity-building and sharing of logistical information.
- Influencers on the implementation of best practices and compliance with production standards. These best practices and standards should be aligned with CMS.
- Providers of logistical support, such as distributing information and collection bags to users, managing a collection and storage center, investing in a shredder or compactor to increase storage capacity, and reducing transport costs, etc.

This study revealed that cooperatives play an important role in several countries, such as Spain (it has over 4,000 cooperatives, half of which have a collection center), Guatemala and Portugal. Other countries like Peru recognize them as important vectors to improve collection rates along with certification schemes.

Some cooperatives for growers of specific export commodities (tea, coffee, nuts, tobacco, cotton, etc.) operate as intermediaries for international brands with strong stewardship policies to promote best practices and safeguard their reputation. They are generally interested in collaborating on container management, sometimes even on a global level. These global brands could be interested in developing partnerships for new CMS programs in their cooperatives, concessions or plantations to ensure affiliated growers comply with good practices. This was the case in Guatemala and with a pilot project in Greece.

Certification schemes such as Global GAP, Rain Forest Alliance and fair-trade labels for smallholder growers or supermarket-owned schemes should be specific targets for CMS programs to maximize their collection. In many countries where law enforcement is lacking on correct waste management, these certification schemes are perhaps the only efficient mechanism to encourage farmer compliance. For many growers, these certifications are essential to their business as they enable access to important national and export markets. The influence of these certification schemes on boosting collection rates was confirmed by CMS programs in South Africa and Guatemala. This potential is still untapped or insufficiently executed in many countries and should be a priority for the CropLife International network globally and locally.

Packaging Portfolio

Pesticide products are sold to final users in one-way rigid containers or flexible packaging and in multi-trip drums, totes or Intermediate Bulk Containers. Generally, CMS programs only manage one-way primary packaging and sometimes just rigid plastic containers. This is because they represent the most important fraction and are easier to recycle. In addition, the industry is particularly keen to ensure that these containers are not reused for the storage of other goods or counterfeit products or recycled in ways that present a risk to human health or the environment.

Examining the “packaging portfolio” did not provide dramatic new insights regarding the impact of the type of packaging on collection rates. The return rate of flexible packaging remains low across CMS programs, even in the most developed systems. During interviews, CMS coordinators reiterated a clear message that a more homogenous packaging portfolio with all types of packaging being 100 percent

recyclable would enable them to significantly reduce the costs of waste management and increase collection capacity.

Outreach Programs

Communication and education are the cornerstones of successful container management in order to reach a maximum of growers, change farmer attitudes and practices, and call on them to return empty pesticide packaging to CMS programs.

Key message for CMS

- To rinse, drip and dry empty containers
- To puncture empty containers (though not enforced in all countries)
- To sort and prepare the waste in line with the rules of the local Collection Scheme
- To return the waste to the system collection points (or store it on-site until collector picks it up)

Communication channels

- Product labels.
- Companies' sales forces & retailers during product sales
- Communication campaigns by CMS programs: website, mailing, social media, traditional media (newspaper, newsletter, specialized agricultural papers, radio, TV, etc.)
- Agricultural educational programs
- Agricultural organizations: extension services, farmer unions, agri-certification schemes, agricultural institutions, etc.

All interviewed CMS managers confirmed the importance of communication to get farmers and other stakeholders to participate and increase collection rates. As nicely summarized by the Hungarian program, repetition is the mother of knowledge: CMS programs and all stakeholders must repeat the same messages over and over again and use all channels of information to promote best management practices as well as to raise awareness about CMS among new farmer generations and work forces, such as seasonal workers.

Colombia, Guatemala and Hungary stressed the importance of genuine face-to-face communication with farmers and a true dedication to them: “go out of the capital,” “be close to farmers,” “know the users’ needs,” “ask for feedback on the program’s services,” and “only promise what you can deliver” all important factors for creating interest in a CMS.

Societal and general awareness of environmental protection should also be taken into account. France’s CMS representatives pointed out that good management of agricultural waste is closely linked to awareness of the environment and general waste management. It is easier for collection programs to get farmer compliance where the duty of care for waste is already well established. Where this is not the case (e.g., Brazil and Bulgaria), CMS programs have to use all tools (communication, training, policy, control, etc.) to get the right practices from farmers. But farmer recognition and pride in the service has led to a huge success story!

Some programs also work with CMS ambassadors (nowadays called “influencers”), who are farmers convinced by the benefits of CMS that engage directly with their peers in their villages or through social media.

The interviews revealed that companies and sales forces have a critical role and interest in communication on good container management but their involvement is minimal and insufficient in

several countries. This could be due to the lack of willingness to discuss with customers about “waste” and duties. Perhaps they also don’t fully realize the benefits these programs bring to companies; the services provided by CMS could be used as excellent marketing points for companies and their products!

CMS Set-up and Mode of Collection

There are various elements to how CMS operate, which can impact collection rates.

Mode of Collection

The set-up of collection logistics is certainly one of the most important factors when establishing a new system and it has the highest impact on program costs and its capacity to reach a high collection rate. In fact, collection activities can absorb up to 60 percent or more of program costs.

The key to success for efficient collection is to find the most appropriate methodology to aggregate waste before it is taken over by the system. Most CMS request farmers to return their empty packaging to specific collection points. The challenge is to strike the right balance between limiting the paid kilometers covered by waste contractors and making the travel distance too far for farmers to participate. When doing so, a careful assessment of the local conditions (e.g., geographies, agricultural and farming profiles) and farmers’ capacity to transport their empty packaging is a prerequisite for the selection of the best option(s) and to find the appropriate density and locations of collection points (e.g., placing them as close as possible to main roads).

Mode of Collection Used by CMS

- **On-farm collection** by the waste operator(s) contracted by a CMS program (Bulgaria, Colombia, Russia, Serbia and Lithuania) or by distributors or retailers (for instance, when they deliver products to farms as in Slovakia and Hungary).
- **Permanently staffed collection points** (or return units) that can be either sale points (e.g., Canada, Cyprus, France, New Zealand, Poland, Portugal, Spain, etc.), distributor warehouses (Hungary, Romania, South Africa, Spain), oppositely built return units or regional receiving centers managed by CMS programs (Brazil, Guatemala, Mexico, Peru), municipal sorting centers (Australia or at landfill sites in Canada and the United States) or governmental facilities (e.g., extension services and in Mexico). They are accessible to farmers during business hours or occasionally at the owner’s convenience and have staff trained to inspect and collect the waste.
- **Scheduled mobile collection units** where farmers can return their empty packaging at specific locations on certain dates (usually 1-2 times per year) and the waste operator contracted by the CMS program uploads the waste directly onto a truck. The location can be retailers’ parking lots (Belgium, Germany), cooperatives or locations determined by municipalities (Croatia, Greece, Serbia and Brazil in some regions).
- **Unmanned drop-off units** that can be a simple cage placed along a road or in the vicinity of a sales point. This collection mode is partly used in Mexico and Guatemala or in some African countries in remote areas with scattered small-scale farmers. Usually, one local person is responsible to maintain the site clean and tidy and to call the system when it is full.

Some programs offer a hybrid collection scheme with free-of-charge collection at receiving units as well as on-farm collection for large quantities (e.g., minimum 500 kilograms in Australia or 40 full collection bags in France) or with a fee paid by farmers (e.g., France).

Density of Collection Network

One would expect that the density of collection points is critical for a high collection rate as it directly relates to the average transport distance for farmers to return their packaging waste. This study briefly looked at the number of collection points in several countries and found out that there is no rule of thumb to establish the correct density or number of collection points. In addition, countries of similar territory or population size show important discrepancies on the number of collection points but no big differences in collection rates: France (over 6,000) versus Germany (around 340), Canada (over 1,600) versus Brazil (420), Belgium (around 190), Hungary (140) and Colombia (140). All have a collection rate over 70 percent!

Thus, coverage of collection points is more important than the number. This point was raised by CMS personnel in South Africa. Some programs note that a key measure to increase their collection rate is to improve their coverage by expanding to new regions or increasing the density of return points in some areas (e.g., in Mexico, United States, South Africa). But as explained by the program in Portugal, more collection points are only valuable if they collect enough waste to justify collection costs. And any expansion of the collection network should be complemented by information campaigns to inform and encourage farmers. Countries with high collection rates, such as Belgium and Spain, wish to reduce the number of collection points to improve their cost efficiency and think that this can be achieved without a negative impact on the collection rate because good container management is already firmly a farmer habit.

To be efficient, recovery programs should also be aligned with agricultural activities:

- Coinciding sales and collection points allow farmers to return their empty containers when they purchase products or other agricultural materials.
- Training and collection days should avoid intensive agricultural periods (spraying or harvest times).
- Collection time should be carefully scheduled after high-spraying seasons as farmers might be unwilling to store big amounts of packaging for 6-12 months.
- Collection seasonality affects partnerships with waste operators and recyclers as MS programs are not able to provide continuous feedstock.

Collection of Other Agri-Plastics

Several CMS programs have extended the collection and recovery service to other plastic wastes generated on farms, such as rigid plastic containers for liquid fertilizers and biostimulants, flexible packaging for seeds and granular fertilizers, plastic films used on crops and for greenhouses, or even containers from veterinary hygiene products. The program in France is on the forefront of an "all plastic" service and separately collects around 20 different agricultural plastics. This accounts for more than 90 percent of plastic waste generated on farms.

Key drivers for extending the scope of collection to other plastic wastes are:

- Attract more farmers to return their pesticide containers by improving the collection service
- Pressure from other farmers and authorities
- Program participants selling other agricultural inputs with packaging (e.g., fertilizer, bio stimulants, seeds)
- Interest or obligation from other agri-suppliers to have their plastic wastes collected
- Economy-of-scale to reduce overall program costs

There seemed to be consensus among interviewees that an all plastics or all packaging solution is attractive to farmers and can boost collection rates of pesticide packaging.

However, the difficulties extending collection to other plastics, such as mulching or silage films and bale nets, should not be underestimated, as confirmed by some CMS coordinators (e.g., Brazil, France, Portugal). In addition, broadening the collection service is only recommended with sustainable funding sources for each waste fraction. A sound approach could be to gradually extend collection programs to other agricultural packaging (e.g., fertilizers, seeds, veterinary and dairy farming hygiene products) that requires similar waste preparation work on farms and collection logistics before tackling non-packaging agricultural plastics (films, nets, twines, irrigation pipes, etc.), which require a new set of procedures, training, logistic and treatment solutions.

The separate collection of unwanted or obsolete pesticides is another important service offered by some CMS programs (e.g., in Belgium, Brazil, Canada, France, Germany, Netherlands, New Zealand and Slovenia). CMS coordinators agree that this service can positively impact participants and the collection rate of empty packaging. But above all, it prevents these products from being disposed of with empty packaging, which would jeopardize the quality and classification of the plastics collected.

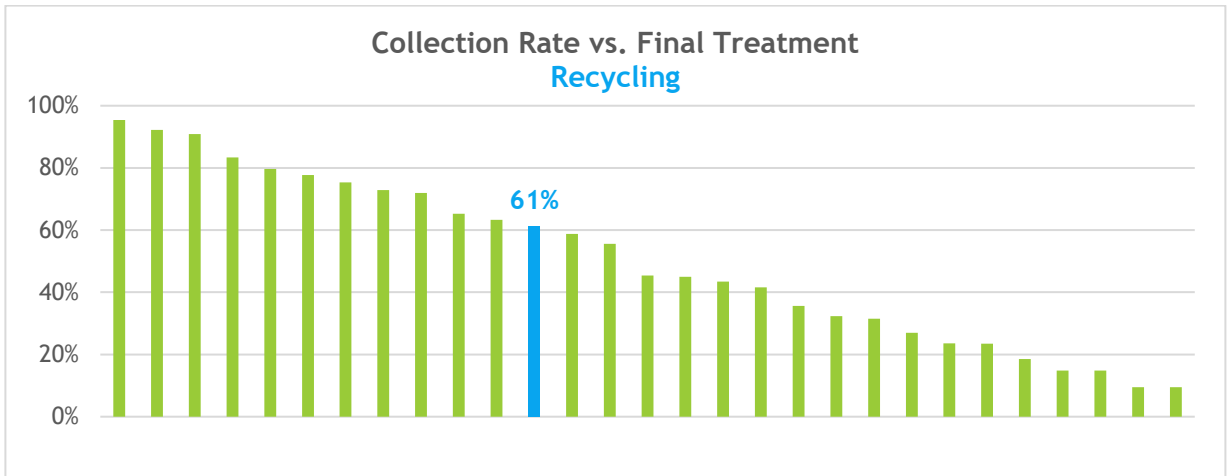
Recycling

The recycling of pesticide packaging augments the sustainable development of CMS programs when it is carried out in a controlled and risk-based manner.

The first finding from the CLI CMS database is that material recycling is the main treatment route for a majority of programs across the globe with at least 33 of the 55 countries sending collected plastics back to the market. In 11 countries, collected packaging is sent for incineration with energy recovery.

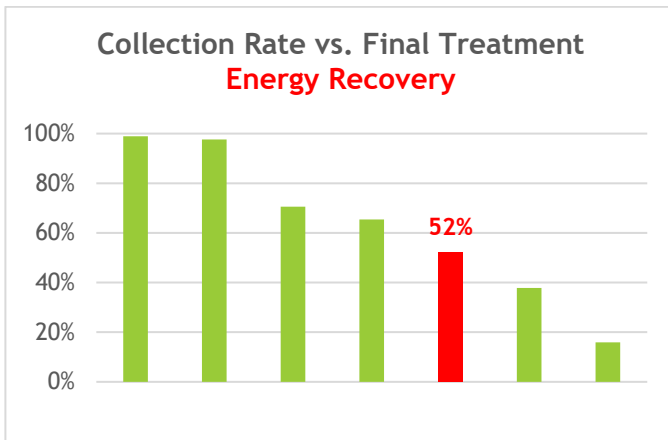
It is difficult to see a clear trend or quantified impact of recycling programs on collection rates due to some gaps in the database and different advancement phases of the programs. For this reason, the charts below provide collection rates of well-established systems (“mature” CMS) only. As for benchmarking other key factors, the collection rates range from the lowest to highest performance for both populations. Nonetheless, there is a difference in the overall collection rate of schemes with a recycling program.

Figure 7: Collection Rate of CMS with Recycling Programs



**Pilots are excluded.*

Figure 8: Collection Rates of CMS with Incineration Recovery



**Pilots are excluded.*

Examples in the box below show that recycling has a critical role in the sustainability of CMS programs but it can also be a bottleneck to increasing collection if alternative funding or treatment options are not available. The recycling market is currently in a difficult situation and only a few CMS programs reported sufficient demand and good pricing for post-consumer HDPE. Thus, funding mechanisms such as packaging fees in extended producer responsibility programs are a safety net that can help CMS programs maintain or even boost their collection performance during difficult periods. This might change in the future with strong political will to boost the recycling market, for example, through

mandated minimal content of recycled material in new plastic products (e.g., the Circular Plastic Alliance launched by the European Commission in 2018). But such a structural change will take time.

CMS Collection Rate and Recycling Programs

Recycling plays a key role in the sustainable development of CMS programs and it is even the lifeline for some of them, either because it is their unique source of revenue (most of the African CMS programs) or the only sound treatment option available in the country:

- The CMS program in South Africa is an outstanding example of a performant and self-sustained voluntary initiative built around recycling. With no legal obligation for manufacturers, the system managed to build a recovery program around a pool of approved collectors and recyclers that agreed to comply with the program's requirements (CLSA Certificate of Approval) while covering all logistical costs with recycling revenue. This program demonstrates that this business model can work. However, it also shows its limitations and risks, as the system can only expand and operate as long as the pricing for recycled HDPE remains favorable and collectors and recyclers can recover their costs with recycling revenue. This probably only works with limited distances or in the most profitable areas. This could explain why voluntary CMS programs in other African countries with the same business model are limited to some areas or agricultural sectors (e.g., flower growers in Kenya) and failed to systematically deploy to the whole country and all users.
- All legally mandatory and most voluntary CMS programs have contractual agreements with CLI member companies and funding mechanisms that enables them to have their CMS net costs covered, regardless of recycling revenues. This enables these systems to maintain (or increase) their collection performance, even when recycling programs can no longer cover collection costs or compete with lower prices of virgin plastic producers.
- Brazil's CMS program is another example that built its business model and success on a recycling program. It is the only container-to-container CMS program in the world with a recycling infrastructure built for that purpose, where a part of collected pesticide containers are recycled into new ones. By controlling the entire recycling loop, this CMS program can maximize value from the collected material by selling fully functional new products (new PPP containers) instead of plastic waste or granulates. So far, recycling revenue is not the sole source of funding, but economic self-sufficiency is a goal in the near future. The recycling success has certainly provided revenue, motivation and visibility to enable high-collection performance of the CMS program.
- A different impact of recycling is demonstrated in Russia, where it is the only sound treatment option available. Local waste incineration capacity is very limited and cement kilns are not retrofitted to incinerate alternative fuel such as plastic scraps. This means that only recyclable packaging can be collected, which is an issue for flexible pesticide packaging that accumulates on farms.

Incentives

Pesticide product users have a duty of care for the correct management of their waste and this is even more critical for professionals. To this end, CMS programs offer a very convenient solution for pesticide users. Yet, the major challenge for a CMS program is to attract all farmers. The first measure is to

prevent disincentives by making systems free-of-charge and convenient. However sometimes, this is not sufficient and CMS programs might consider incentives to motivate farmers to return their packaging waste. There is apprehension from CMS programs that financial incentives might send the wrong message and create long-term expectations .

Examples of CMS Incentives

Incentives to return packaging waste can take several forms and they can be either provided by law or voluntarily developed. They can offer financial or non-financial rewards and prior investigation about their effectiveness for this waste and specific country is recommended.

Non-financial incentives:

- **Giveaways** such as nitrile gloves, caps and protective uniforms are given to farmers in Spain during special collection events in exchange for empty packaging. They can be marked with the program brand to promote the system while being useful for farmers and delivering the right message. In Australia, they use drum spanners.
- **Fidelity programs** with “collection points” are used in Spain with good results.

Financial incentives:

- **Conditional agricultural subsidies:** In EU Member States, the main incentives are linked with cross-compliance subsidies under the Common Agricultural Policy (CAP). Farmers not respecting EU laws and agricultural production standards can expect a reduction of EU financial support or can lose their license to purchase and apply crop protection products. This incentive has been very useful for boosting the collection rate in several Member States (e.g., Bulgaria, France, Poland, Romania). Other Member States have shown some reluctance to enforce conditions for subsidies among farmers. However, agri-subsidies are specific to Europe and not available for CMS programs in most other regions. Therefore, it is recommended these regions look at alternatives that are already available, using similar leverages with proven impact on farmers when they are enforced, such as linking agri-certification scheme requirements to CMS program rules.
- **Deposit Refund System:** Authorities often prefer a direct incentive for farmers in the form of a deposit that is added to the product price at the time of purchase and can be reclaimed by farmers when they return empty packaging. However, experience in countries (e.g., Poland and Greece) has revealed that the deposit refund system is not adequate for pesticide packaging and very costly for small-scale packaging collection programs (see “Comparison with Other Sectors” below). **Incentives on collection points and waste collectors:** Some CMS programs that use sales shops as collection points realize that committed retailers have an important impact on farmers returning empty packaging. Some programs have implemented incentives for retailers to motivate farmers to return packaging. Incentives can be direct financial support to cover investment or refurbishment of costs (France), an annual contribution for information and collection (Hungary), an occasional financial award for the “best collection point” (Cyprus and Spain) or performance-related bonuses where retailers are paid per kilo of collected material. For farmers, there is a risk of a wrong message being sent by an automatic financial reward mechanism because it reduces the importance of the supply chain’s shared responsibility.

Mandates to Maximize Collection Rates

Most CMS are managed as not-for-profit programs for the responsible stewardship of pesticide packaging waste. A clear business approach is necessary to maximize collection rates while ensuring the sustainability of CMS programs and keeping their costs as low as possible.

The integrated business approach adopted by Brazil's CMS program and its capacity to capture the highest value from collected plastics are obvious success factors that have propelled the collection rate. South Africa's CMS program is the only one known to be entirely subsidized by recycling revenues. It is in large part due to the entrepreneurial spirit of certified collectors and recyclers who created the necessary demand for recycled HDPE within the construction sector.

The survey of CMS in agriculture and other sectors shows that adequate funding through packaging fees on member companies is a critical lever to increase collection rates. Discussion with high-performing CMS managers revealed that their members have given them "carte blanche" to maximize collection.

On the other side, CMS programs struggling with low collection rates too often operate with a flat budget. Consequently, outreach activities or partnerships with agricultural organizations on agri-certification schemes to attract more farmers may be limited so as not create expectations that can't be fulfilled. Boosting the collected quantity with a cap on CMS spending is challenging for a recovery program. Only a few set-up changes, such as a shifting from a hazardous to a non-hazardous regime or from incineration to recycling or more memberships, can free up sufficient funding to enable a substantial collection increase. Interviews revealed that CMS programs have already carried out such assessments and adopted several corrective measures.

A conclusion is that CMS programs should be given sufficient financial support to deploy and work on achieving ambitious collection targets. Economy of scale, collection optimization, better contract conditions, new treatment routes, etc. will gradually reduce per unit costs.

A close look at CLI CMS data also revealed that the total net unit costs of a system (i.e., dollars per kilogram collected) tends to decrease as the quantity collected increases and programs gain knowledge and experience in their market. This is shown in the two major regions that increased their collection rates the most between 2005 and 2018:

- In Latin America, the total quantity of plastics collected more than tripled while total CMS costs remained more or less the same, meaning that the cost to collect one kilogram of plastic was reduced three-fold!
- In Europe, the number of CMS programs tripled from six to 18, the total quantity collected was multiplied 2.5 times and the overall collection rate grew from 38 to 63 percent. Yet the total net costs for plastic collection only slightly increased, meaning that the cost to collect one kilogram of plastic was reduced two-fold!
- For the "region" comprising Australia, Canada, New Zealand and United States, the aggregated data indicates that the total quantity collected tendentially increased during the same period, but not at a statistically significant pace. The total cost also increased along with the quantity collected, meaning there was no increase in cost efficiency as seen in the other regions.

Thus, the regions that have pushed the most for high collection rates have also significantly improved the cost-efficiency of their programs. It has been possible for them to collect more without spending more!

CMS programs are sometimes requested to find partners and institutions to contribute financially. This is unlikely because a common view in an increasing number of countries and institutions is that the end-of-life management of pesticide packaging is a shared responsibility of product producers and users. However, stakeholders often provide in-kind services that help keep CMS costs low. This includes container rinsing, sorting recyclable fractions and return by farmers; collection by retailers and distributors; contributions to communication and training by state institutions and other stakeholders, etc. The cost savings from these in-kind services are generally not quantified by CMS programs but they are certainly significant.

Thus, the strategy used in many countries is to share responsibility among key stakeholders to reduce CMS costs through in-kind services, maximize revenues from recycling and have final net costs covered by the industry based on producers' share of packaging.

Comparison to Other Sectors

Other waste collection streams, whether for household (HH) waste or for commercial and industrial (C/I) waste, have the same challenges as collection programs for plant protection packaging. They struggle to maximize the collection and recycling of waste material in order to prevent poor or illegal waste management practices. This study investigated how other sectors are dealing with this challenge, the efficiency of several tools and their applicability to crop protection packaging.

Differences with Household and Industrial Packaging

EPR was presented above as a policy tool to put the financial or operational responsibility for compliant waste management on the producers of packed products.

The primary purpose of EPR schemes is to deal with the financing of collection, recovery or recycling of HH packaging, which comprises around 70 percent of total packaging for consumer goods. In addition to the greatest volume, HH packaging is the most expensive type to recover. In most cases, the cost to collect and treat it is by far higher than the value of the recycled materials recovered. EPR is called upon to bridge this gap in financing.

On the other hand, C/I packaging waste is generally produced in large amounts in specific unpacking facilities (e.g., shops, manufacturing plants, offices) which makes collection and treatment much easier and cheaper. In many cases, the value of the recyclable materials recovered from C/I packaging covers the cost to collect and prepare the material for recycling. For C/I packaging, the role of EPR is to fulfill recycling targets, ensure proper reporting of recycling figures and bridge the gap in financing when the market fails to do so.

In some countries, EPR schemes for HH or C/I packaging are left to the free market (France, Portugal, Germany, etc.). In other countries, EPR covers both types of packaging (Italy, Greece, UK, Ireland, Norway, Netherlands, Cyprus, etc.). In a few countries, EPR systems are specifically for C/I packaging (e.g., Belgium, Austria).

Managing Special Types of Packaging

The prevailing practice among the main EPR organizations for general packaging is to avoid special types of packaging, particularly if it has hazardous characteristics or may be difficult to de-classify to non-hazardous. The general packaging waste laws in most countries allows some cherry-picking from the general packaging recovery organisations (PROs) as long as legal collection and recycling targets are met. Even PROs that cover C/I packaging concentrate on packaging that is classified as non-hazardous (wrapping films, cardboard, pallets and drums of non-hazardous products) and avoid waste that contains chemicals and other hazardous substances. However, as the legal targets increase over time, this margin of manoeuvre for PROs will be reduced and collection programs will be forced to also manage packaging that is more difficult or expensive to recover.

Learnings from Other Professional Streams

Incentives to Boost Participation in Collection Schemes

Research on methods used for the collection of other professional packaging streams (mostly industrial packaging from chemicals collected as hazardous waste), shows that when systems want to collect more material, they increase their payments to the waste operators so that these collect more material. With additional funding, waste operators can reach to more users, or also provide incentives to get more packaging from their clientele or attract more waste holders.

Incentives for Household Streams

Increased participation in recycling programs for HH packaging is mostly dependent on educating the public and positive incentives for participation.

One of the main characteristics of municipal solid waste is that it can be sorted in various streams (packaging, organic matter, garden clippings, etc.) and based on whether they are recyclable or not. But there is always a residual mixed waste fraction that needs to be collected and treated because it is not sorted by waste holders or it is difficult to sort by automatic means, cannot be recycled or not environmentally or financially feasible. This mixed waste ends up in a central waste facility that charges disposal fees.

A strategy adopted in many countries to minimize the quantity of residual fraction and maximize recycling is to heavily tax the mixed waste through a Pay-As-You-Throw (PAYT) tool (also called “trash metering,” unit pricing, variable rate pricing or “user-pay”), whereas the separately collected recyclable wastes are free of charge. The intention is to promote waste sorting and cross-subsidize the management of recyclable materials that are not profitable by a higher charge on residual mixed waste. Experience in countries shows that the impact of PAYT on recycling is significant.

Another economic tool used along with PAYT schemes, or even in their absence (flat taxation systems) to incentivize the correct sorting of municipal waste at the source, is to increase the cost of disposal with taxes on landfill and incineration. This tax on the final disposal method of mixed waste promotes sorting waste and makes recycling more competitive. A good combination of the various economic tools encourages sorting at the source, increasing the collection and recycling rates of recyclable fractions and improving market conditions for secondary raw materials.

Obviously, these tools can have a positive effect in boosting the recycling rates of municipal solid waste. However, this method has limited application when it comes to special types of packaging and single streams. There are no combinations of streams for collection together as they would require variable charging to incentivize the sorting of materials.

Deposit Refund Systems

Deposit Refund Systems (DRS) have been used over the years to boost collection rates either for returnable or single use packaging. A DRS - also known as “deposit return system,” “advance deposit fee,” or “deposit return scheme,” - works by consumers paying an additional amount of money (a

deposit) for a recyclable product that is reimbursed upon the return of its packaging to a collection point (e.g., soda pop cans). While most commonly used with beverage containers, which account for about 40 percent of total HH packaging in Europe, DRS can be used with other materials like liquid and gaseous wastes. DRS can be voluntary or mandated by legislation.

Studies and feedback from country experts indicate that mandatory DRS for beverage packaging are an effective means for preventing littering and achieving high recycling rates. However, several countries without a DRS also achieved very performant collection and recycling rates (Belgium, Netherlands, Austria, Czech Republic and Spain).

Despite the fact that DRS have proven in many instances to quickly increase collection rates for the streams targeted, there are challenges in applying them to single streams of special types of packaging or other waste. It can be challenging to manually manage a nationwide DRS for a large portfolio of packaging types. Several recent DRS that work for multiple types of packaging have introduced reverse vending machines that automatically identify eligible packaging, sort it and refund the deposit, usually as coupons.

Figure 9: Reverse Vending Machines



Source: Kyriakos Parpounas

However, reverse vending machines face limitations for specific wastes and conditions. Most notably, they require high investment and operational costs that are not sustainable for small-scale programs. This is especially the case when the quantity of waste to be recovered is limited and many collection points are required. Surveys from other sectors estimate that the cost of a DRS can be several times that of an EPR program for normal packaging.

Practical Recommendations

The assessment of the factors that can impact the performance of collection and recovery programs for PPP packaging as well as interviews with coordinators of over 14 CMS programs was rich in learnings, resulting in a series of recommendations for the crop protection industry (globally and locally) and for CMS at large. Some of these recommendations are paired with a list of tools published as a separate toolkit available upon request from CLI.

CMS Data

“What you can measure, you can manage” is an adage in the CMS world. The CLI monitoring system and data provided by countries should be improved on several fronts to enhance data quality and the transparency of CMS programs. This should happen without distracting CMS programs from their key objective of maximizing the collection of PPP packaging waste! Recommendations are as follows:

- ❖ Improve data about “quantity shipped” into the market:
 - Data from many countries are missing or do not represent the full market. An assessment of the total market (e.g., based on sales data) per country, region and globally would be useful to appraise the full scope of CMS, their collection performance and for the industry to make informed, strategic decisions on CMS.
 - The CLI questionnaire sent annually to countries should ask for estimates of aggregated market share for quantities declared by member companies versus the total market. This would indicate the collection rates of both CMS and entire countries. The latter will properly characterize the situation and count most in discussions with policymakers.
 - The CLI questionnaire should ask respondents to provide the share of pesticide packaging shipped versus other agricultural products (e.g., fertilizers, hygiene and veterinary products).
- ❖ Improve data about “quantity collected” for recovery:
 - The CLI questionnaire should ask respondents to provide the share of pesticide packaging collected versus other agricultural products. To help obtain this data, countries can run regular surveys on collected waste.
 - CLI and its member companies can promote the use of a CMS logo on the labels of PPPs and restrict collection to packaging carrying the logo. This will not only prevent free riders but also improve the quality of the waste and data collected.
 - There are still countries with CMS that do not share their collection data with CLI. The global collection rate would significantly improve by getting these countries on board.
- ❖ The “true collection rate” should consider all primary pesticide packaging, not solely rigid plastic containers. The impact on collection rate would likely be negative and could even create operational hurdles (e.g., when material classified as hazardous waste is not recyclable and there

is no local incineration facility). Nevertheless, it would improve the transparency and coherence of CMS data presented to stakeholders.

- ❖ Improve and harmonize the definition, scope and metrics of data put in the CLI CMS database:
 - CLI should conduct a survey on how countries collect CMS data and which metrics are used in order to improve and harmonize the data where possible.
 - “Quantity shipped:” Is this based on detailed packaging declarations from member companies or on a market study? Which packaging is included (PPP, fertilizers, one-way or multi-trip, all sizes, etc.)?
 - “Quantity collected:” Is sorted waste or all packaging collected together?
 - Are metrics based on the weight of materials or number of items?
 - Based on this information, CLI could develop a standard model that CMS programs must use to declare packaging quantities.
- ❖ Recycling data should be systematically collected and highlighted by CLI.

Improving Waste Management Globally

There are still many markets around the world where there is no dedicated CMS system in place for empty pesticide packaging. Some of these markets are important and unfortunately, they are also sometimes where general waste management conditions are the poorest, the impact of waste mismanagement is the highest, and pesticide users have no capacity or alternatives to responsibly manage their packaging waste. This poses serious risks to human health and the environment, plus erodes the image of a responsible industry.

- ❖ CLI should list all countries without known or dedicated CMS and prioritize its efforts towards establishing schemes in those where the biggest benefit would require the least effort. For example, prioritization could use the following criteria:
 - Biggest markets (e.g., China, India, Indonesia, Ukraine, Turkey, etc.) and where CLI members have a good market position: Several pilots were conducted in some of these countries (India, Indonesia) but unfortunately, they failed after a few collection seasons due to lack of a long-term national strategy and buy-in from all producers.
 - Biggest potential for success: CLI could conduct a survey to identify these markets as well as potential partners (e.g., global agri-food brands with stewardship programs) that could have shared interests.
 - Countries with the highest risks: These risks can be to human health (e.g., container reuse for other purposes), the environment (e.g., where there are no sound waste management solutions) or the industry (i.e., counterfeiting, bad press).
- ❖ Intensifying awareness-raising and training on container rinsing is an effective strategy to reduce risks to health and the environment. This can be done where no collection programs are in place or to promote non-hazardous classification for easier implementation of a CMS program.
- ❖ CLI and its member companies should agree on regional CMS targets. For example, CropLife Europe has a circular economy commitment that calls for a dedicated CMS program in all Member States by 2025 with a collection rate of at least 75 percent. This would help build coordinated regional

strategies, facilitate knowledge sharing among countries with similar conditions and possibly international solutions.

- ❖ Commitments are only good when they are implemented. CLI member companies' global commitment to CMS should trickle down to individual countries. There are several cases where global companies are not participating in a CMS programs in some countries or reluctant to commit to higher collection targets.
- ❖ Companies should ensure that all PPP packaging is 100 percent recyclable to facilitate recovery by CMS programs and maximize revenues from post-consumer materials. The European Green Deal is working on such an obligation by 2030 for the European market!

Improving CMS Performance Locally

- ❖ Each country should do an assessment of key factors blocking the increase of its collection rate (if not already done). A toolbox developed from this study is available for CMS programs from CLI. It provides useful guidance and practical measures to boost collection rates.
- ❖ CLI and its member companies should agree on providing country collection targets where CMS programs are already in place. A sound proposal would be a +5-percentage point increase per year up to a minimum of 75 percent. Where legal targets are in place, programs should comply with the most stringent ones. Once this is decided:
 - Programs should develop a strategic plan to align all activities and resource needs to reach the targets.
 - Global companies should ensure their subsidiaries endorse the strategic plan and support requests for adequate funding.
 - Achievement of CMS targets should be part of company headquarters' responsibility and likewise for business performance targets.
- ❖ Let programs grow with adequate funding. The industry should recognize its stewardship responsibility for 100 percent of their primary packaging. Some programs reported that they could easily increase their collection rate by 20 percentage points (e.g., by collaborating with agri-certifications schemes) but were stopped short because of lack of funding.

Creating Favorable Policies for Performant CMS

- ❖ Without any doubt, creating an enabling legal framework can help the deployment of effective CMS. Key legal obligations that help increase collection rates are:
 - Making rinsing of empty PPP containers mandatory
 - Banning open (backyard) burning and burying of all waste, particularly for PPP packaging
 - Attributing a “non-hazardous” classification to properly rinsed PPP containers
 - Establishing a regulatory framework that creates a level playing field among all PPP producers and importers and prevents free riders. EPR is a good example and can be supported if it is fit for purpose and does not create unnecessary hurdles. Ideally, EPR regulation should set minimal requirements for EPR schemes and targets, give the authorities the power to accredit and control the schemes, and leave producers the freedom to decide on the “how” (system set-up,

partnerships with stakeholders, mode of collection, etc.). These obligations are most effective if they are anchored in regulation dealing with agriculture or the use of PPPs.

- Setting legal targets for collection and/or recycling rates with a grace period (e.g., minimum of 75 percent by 2030) or progressive collection increase (e.g., +5 percentage points per year until a minimum of 75 percent is reached)
- Obligating sale points to collect empty packaging

Adding Incentives

- ❖ CMS programs should be designed to best fit with local conditions and farmers' mindsets, be user-friendly and free of charge for users. When these factors are not sufficient for participation, properly designed incentives can help boost collection rates.
- ❖ Prefer non-financial incentives such as give-aways (caps, PPE set, stickers, drum spanner, etc.). They don't create wrong messages or expectations but they do reward farmers with useful gifts that can promote the safe use of products (e.g., PPE set), good container management and branding of the CMS program. Fidelity programs with "collection points" are also an option that has led to good results in some countries.
- ❖ Financial incentives. CMS programs in Europe can take advantage of agricultural subsidies by requesting authorities to include good container management in the cross-compliance package for farmers. Such conditional subsidies are indirect financial incentives (not directly paid by the system) that have proven very effective when properly implemented such as a DRS. But due to several risks, issues and high costs, consider DRS only as a back-up option when a low collection rate is the consequence of poor farmer participation and other measures have failed.
- ❖ Packaging collectors (retailers, distributors and waste operators) are crucial for reaching high collection rates. Incentivizing collectors could be even more effective than incentivizing farmers. But such incentives might have negative effects in the long run as they don't create a sense of shared responsibility in the supply chain. When collection objectives are reached, it might be difficult to stop incentives as retailers and distributors might consider them as normal retribution.

Boosting Outreach Activities

Without a doubt, collection rates increase with better communication and training campaigns. To this end, CMS programs should:

- ❖ Consider allocating a minimum of 5 percent of their total budget for outreach activities until a collection rate of 70 percent is reached.
- ❖ Include statutory obligations for member companies to actively promote them to the supply chain and end users along with good container management practices. The objective is for all sales forces in the field to promote the CMS programs and sound practices.
- ❖ **Involve all stakeholders:** Develop partnerships with agricultural organizations (cooperatives, farmers unions, agri-certification schemes, agri-dealers and distributors, etc.) to reach out to as many farmers as possible.
- ❖ Screen for all major agri-food retailers working with growers in the country and contact them to include sound container management in their production requirements and exert pressure on

affiliated growers to comply. Many agri-food companies have stewardship objectives and wish to safeguard their reputations! This strategy can also be extended to retailers of non-food crops (cotton, tobacco, flowers, etc.)

- ❖ Develop and roll-out specific communication strategies and campaigns for different types of growers.
- ❖ Prepare and roll-out training modules on container management in major agricultural education programs

About the Team



Steven Byrde has a master's degree in environmental sciences and more than 15 years of experience in waste collection and management, including hazardous waste. He conducted projects on pesticide waste and container management for the last 10 years for the plant protection industry, FAO and other organizations. Since 2013, he has been a CMS consultant for CropLife Europe and drives the continent's implementation of container managements.

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Evelyne Gsken has a master's degree in biological sciences and has worked for 15 years in scientific regulatory affairs focusing on plant protection products, biostimulants and biocides. She conducted several surveys on topics related to container management (e.g., legal obligation on rinsing, assessment of new regulation) and supported CropLife Europe's Packaging Expert Group in drafting industry guidance on the classification of empty, rinsed PPP containers according to ecotox criterion HP14.

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Kyriakos Parpounas has a degree in environmental engineering and a master's in business administration. For the last 15 years, he was involved in the design, accreditation and management of different EPR organisations for waste streams. He has 20 years of experience in waste management and a deep knowledge of business development. He gained experience in pesticide container management by designing, deploying and managing the CMS for Green Dot Cyprus and recently developed the business plan for a new CMS-compliant organization in Greece.

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