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CASE STUDY

Identifying Farmers' Practices on Disposal of Empty Agrochemical Containers: A Case Study on Container Management Program of CropLife Sri Lanka-2017

P. Sooriyaarachchi[1], L. M. Abeywickrama[2], A. L. Sandika[3]

[1]Department of Agricultural Economics and Extension, Faculty of Agriculture, University of Ruhuna, Sri Lanka, [2]Department of Agricultural Economics and Extension, Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya, Sri Lanka, [3]Department of Soil Science, Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya, Sri Lanka

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ABSTRACT

Mismanagement of agrochemical waste constitutes a major environmental problem, resulting in pollution of soil, air, and water resources and compromising the agricultural products safety, the protection of the environment, and public health. A significant amount of agrochemical companies is operating currently in Sri Lankan market to supply agrochemicals to farmers producing a large number of empty containers to be disposed in a crop season. This study refers the project implemented by CropLife Sri Lanka to manage empty pesticide containers. The objectives were to find the current disposal practices of farmers, to assess the progress of the container collecting program and to examine and make appropriate recommendations. The study was carried out in Nuwara Eliya district of Sri Lanka among 100 farmers, selected based on convenience sampling technique. To accomplish the objectives of the study, field surveys, direct observations, and formal and informal discussions with the stakeholders and participatory appraisal techniques were employed. About 40% of the farmers interviewed were well aware about the triple rinsing mechanism. In addition, farmers cannot access easily to the barrels to put their empty bottles after spraying. The overall container management program was rated as "good" in this stage. It was identified the need of integrating the project with the existing government programs, existing Community-based organization (CBOs), and other possible stakeholders. Both short- and long-term adjustments were proposed.

Key words: Agrochemicals, collection, container management, disposal, empty

INTRODUCTION

The economy of Sri Lanka is mainly agriculture based, of which agriculture contributes about 10% of the GDP and about 30% of the labor force is engaged in agriculture and allied fields.[1] Since independence, all governments have channeled vast amounts of investments in developing the domestic agricultural sector. In mid-1960s, the "green revolution" or seed-fertilizer revolution took place and varieties of newly improved crops yielding a high response to chemical fertilizer were introduced. Hence, to reap a remunerative harvest, application of agrochemicals becomes an obligation and the changing pattern is irreversible.

At present, a large number of agrochemical companies are operating in Sri Lankan market to supply agrochemicals to the farmers in competitive manner. Therefore, a large number of empty containers have to be disposed in a crop season. So far, as there are no proper mechanisms adopted to dispose empty cans and bottles, *ad hoc* nature of disposing empty glass bottles and cans has become a menace in agricultural lands and in farmer fields. Mismanagement of agrochemicals plastic packaging waste (APPW) constitutes a major environmental problem, resulting in pollution of soil, air, and water resources and compromising the agricultural products safety, the protection of the environment, and public health. Mismanagement of APPW is reported in many countries of the world.

Address for correspondence:
P. Sooriyaarachchi,
E-mail: piumika.soo@gmail.com

As an illustrative example from the literature, the lack of APPW management in Thailand has created an environmental risk from pesticide residues. High concentration of organophosphate group of pesticides in sediments was shown in a study.[2] The effects of pesticide distributed from pesticide packaging waste chain in Thailand were also analyzed in the study of Patarasiriwong *et al*.[3] High concentration and highly toxic pesticides were detected in empty pesticide containers and soil and water samples which may lead to higher risk of harmful pesticide exposure to living organisms and the environment. An analogous study presented the generation and hazardousness of pesticide packaging waste in China.[4]

The worldwide consumption of pesticides is about two million tonnes per year: Of which, 45% is used by Europe alone, 25% is consumed in the USA, and 25% in the rest of the world.[5] To solve the aggregation of pesticide containers in agricultural lands and community areas, many countries have made several attempts to manage empty pesticide containers in the late 1990s. The main objectives of this attempt are to protect environment and the people from exposure, to treat and dispose used containers safely, and appropriately, to minimize wastes and maximize recycling and to ensure compliance with local requirements and legislation.

The total collection recorded in the world is about 17.3% out of the total amount of containers dispersed in the market. Many of the countries still do not have container collection programs, while Canada, Brazil, Austria, Belgium, Germany, Australia, and the Netherlands are the best performing countries. The US container recycling scheme collects about 3175 tonnes or about 10 million containers annually, and Canada's container management (CM) scheme collects and disposes of 658 tonnes annually.[6]

In view of the above main focuses, the CropLife Sri Lanka has initiated a CM project in Sri Lanka in the year 2012 and extended the project into eight districts (Kurunegala, Puttalam, Mathale, Anuradhapura, Polonnaruwa, Batticaloa, Nuwara Eliya, and Badulla) by developing infrastructure in four locations (Makandura, Pelwehera, Seetha Eliya, and Polonnaruwa) so as to cover the eight districts. The project consists of two major components, managing large containers and collecting of small triple rinsed glass and plant protection product containers from the end users for recycling.

The present study was conducted with the objectives to investigate the farmers' disposal practices of empty containers, to evaluate the progress of the existing CM programme, and to examine and make recommendations regarding the sustainability of the project.

METHODOLOGY

The study was undertaken in Nuwara Eliya district where agrochemical business and usage are high and cover up major classes of pesticides such as insecticides, fungicides, and weedicides. A sample of 100 farmers who had their own land or farm space was selected based on convenience sampling technique. Primary data were collected by observations and personal interview with the help of an interview schedule. Additional information was collected through systematic field observation.

To understand the current disposal practices of farmers, the interview included open-ended questions regarding background data, such as age, sex, years in farming, education level, previous pesticide training, knowledge and practices related to pesticide use, and knowledge and practices regarding the handling of empty pesticide containers.

To realize the progress of the container collecting program, necessary information was collected on outcomes, outputs, and related processes, strategies, and activities. The study mainly focused on summative evaluation which rather than evaluation of impact of different activities separately. Discussions were carried out with different categories of people including farmer leaders, dealers of agrochemicals, dwellers of selected households, neighbors of the selected households, and government officers such as agricultural officers and research officers. Participatory appraisal techniques were used to gather quantitative information at all levels of the evaluation. Evaluation of collecting centers of empty bottles was done by visits to individual centers by trained agricultural and management graduates who are well aware about the evaluation criteria. Furthermore, the collection centers were observed for the amount of the empty containers collected and the quality of the collection including the appearance, odor, and management aspects of the collecting centers.

RESULTS AND DISCUSSION

The interviewed farmers were mainly men with an average age of 42 years and all with a low level of education. Of the sample, 97% of farmers use pesticides, but very few had previous training in pesticide use and thus did not have the skills and knowledge for responsible management and use of pesticides. About the 40% of the farmers interviewed were well aware about the triple rinsing mechanism. Rinsing of the remaining of the farmers is not up to the standards due to inadequate communication. However, without knowing the triple rinsing mechanism, generally, farmers wash the pesticide bottles to take out the maximum possible amount of chemicals out of the bottle. This process is entirely dependent on the color of the solution (emulsion) as the farmer wash the bottle until the color of the washed water is vanished. Therefore, it can be stated that washing the bottles is up to the expectations in case of emulsion. When the emulsion is not colorful or not producing foam (froth) after adding water, in case of some weedicides, farmers normally wash the bottle only once. According to WHO[6] even after emptying the agrochemical into the spray tank and allowing it to drip, the container still contains on the average 2% of agrochemical. By applying the recommended rinsing methods, the quantity of the agrochemical utilized is increased by 2%. Furthermore, the farmers' practice is not matching with the process introduced by the CropLife Sri Lanka. Normally, farmers fill more than half of the bottle with water and just add to the spraying tank without shaking the bottle. According to CropLife,[7] triple rinsing removes more than 99.99% of contaminating residue.

It was observed that a considerable proportion of farmers (20%–70%) is willing to take the empty bottles to the barrels just after applying pesticides. However, the evaluation revealed that by the year 2017, the percentage of farmers who are aware about the collection process has been increased up to 50%–90% and a considerable percentage of farmers is willing to bring empty bottles to the collecting process if it is convenient. The problem encountered for many farmers was the distance from the place of application of pesticide to the barrel kept to dump empty containers.

There were well-established collecting centers for collecting small containers, and barrels have been kept at the common places and at the sales outlets of agrochemicals so that farmers can keep their triple rinsed empty containers. There were problems with the frequency of collection of the contents of the barrels as the barrels at some of the places were filled within a short period and some were not. The collecting centers were scattered throughout the district. Therefore, many farmers faced problems in accessing to the barrels to put their empty bottles after spraying. Moreover, as the numbers of barrels are limited and some catchment areas are too big, the numbers of barrels for such large areas were not sufficient. As the study revealed about 90%, the containers of pesticides are plastic in many of the retail outlets. Therefore, necessity of alternatives to find strategies to collect and to recycle plastic containers has been emerged.

It was observed that due to lack of awareness of the CM Project, many people have dumped not only empty agrochemical glass bottles into the barrels but also other kinds of bottles, polythene bags, and many other household wastes. However, the composition of the content was up to the standards at the places under observation of pesticide dealers and traders. The CropLife has made arrangements to coordinate with Ministry of Environment, Department of Agriculture, and the private sector industries to manage the disposal of both large and small containers.

The awareness programs conducted for the industry personals, dealers, and relevant officers were effective as all the people interviewed are well aware about the project. Some of the farmers who have not attended the training sessions are not aware about the objectives of the project. However, the sticker displayed on the barrels and attractive posters at collecting centers give information to common people about the project.

It was observed that all agrochemical companies have effectively integrated to initialize and implement project activities. Furthermore, in some areas, farmer organizations and agricultural officers of both central government and provincial councils have also integrated to implement the program. Almost all of the traders express that it is not possible to control putting other things into the collection of glass bottles. Therefore, still the pesticide dealers believe that a particular pricing mechanism for empty bottles may be more effective as the present collecting mechanism has to bear the costs of collecting irrelevant glass wastes of the households.

The officers of the Department of Agriculture and Department of Agrarian Services believe that the CM project should be incorporated with

existing government programs of agricultural development. Integrated approach may reduce the burden of project proponents (CropLife) and the end users of the collection.

CONCLUSIONS

Improper knowledge and handling of empty pesticide containers are common issue among farmers which pose a health risk to humans in the form of environmental pollution. Only 40% of farmers practice the triple rinsing mechanism, and also farmers cannot access easily to the barrels to put their empty bottles after spraying. An understanding of the need for action can be created among key stakeholders by raising the awareness of the importance of preventing environmental pesticide pollution. The evaluation process revealed that the existing CM program is progressive, and according to the FAO/WHO guidelines, it has successfully addressed all three aspects in a CM scheme including decontamination of containers directly after using the contents, prevention of inappropriate use of empty containers, and convenience in returning empty containers to the scheme. Although the project has successfully addressed the infrastructure needed for the activities, the progress of the process of the collection of small containers from the farmlands is not efficient compared to the development of infrastructure. Therefore, the overall program can be rated as "satisfactory" and the knowledge dissemination can be rated as good. The awareness about the project among stakeholders - including farmers - in national level is not significant. Only the farmers in the project sites are aware about the program. Further, it was observed that the implemented project is highly relevant to the present needs and the project has integrated a considerable set of stakeholders within the project areas. Therefore, evaluators believe that the project will be successful if the existing weaknesses are properly addressed.

It was identified the need of integrating the project with the existing government programs, existing CBOs, and other possible stakeholders. There are no proper mechanisms identified for the sustainable movement of the project. Therefore, it is recommended to think about the private financial benefits for all acting parties in future designs as the merely social benefits will not contribute significantly to the success of the project.

Recommendations

The evaluators recommend continuing the project with proposed short- and long-term adjustments as the proposed project is a timely need to address the burning issue at present.

Short term

Instructing to collect the empty bottles at the farmers own places and fixing 1 or 2 days per crop season to collect them at particular convenient common places. A kind of payment mechanism for the used and clean empty bottles will be cost-effective rather than keeping plastic barrels to collect empty bottles. A mechanism to buy cleaned empty containers in a pre-determined day at selected centers will promote the people to keep the containers clean and to bring to the collecting centers. Publicity through mass media in collaboration with the Ministry of Environment, Department of Agriculture, may be more effective rather than training classes and frequent visits. Furthermore, pesticide dealers can play a significant role in publicity.

Long term

As pesticide CM is a costly exercise, a sustainable funding mechanism should be established with the help of existing institutional settings to remain economically viable. Transferring from glass bottles to plastic containers may reduce the burden of damages caused by the sharp edges of the broken glass bottles, damaging to irrigation structures and heavy transportation cost and handling cost of supply chains of empty containers. Moreover, there are several plastic recycling companies, available in the country. Plastic wastes can be used as fuel in furnace (kiln) in cement and metal factories in many programs in the world. The project should be expanded to the entire country with the help of all stakeholders and the government regulatory intuitions.

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