ABSTRACT

Objective: This study aims to analyze the implementation of reverse logistics in Rio Branco/AC to ensure proper disposal of pesticide and other agricultural product packaging.

Theoretical framework: Significant measures are being adopted worldwide to reduce the impact of human activities on the environment over time. In Brazil, the National Solid Waste Policy (PNRS) modernized solid waste management with the implementation of a reverse logistics system that seeks to reintegrate these wastes into the production cycle.

Method: For a comprehensive understanding of the subject, a multidisciplinary methodological approach was adopted, which combined a review of specialized literature with data collection through a semi-structured questionnaire applied in eight agricultural stores in Rio Branco/AC.

Results and conclusion: The majority of the interviewees had extensive experience in the trade of agricultural products, with 75% of them working in the sector for more than a decade. The research highlights the importance of proper training on handling and disposal of agricultural product packaging, with 87.5% of companies offering this type of training to their employees. However, the study also indicates the need to increase awareness and education to encourage customers to return packaging, as only 37.5% of clients correctly dispose of it.

Research implications: To promote proper disposal of empty packaging and minimize negative environmental impacts, it is crucial to raise awareness among users through educational campaigns and training. These efforts should emphasize the negative consequences of improper waste disposal and encourage the practice of reverse logistics.
Originality/value: Future studies are necessary for a better understanding of the effect of reverse logistics policies on sustainable agriculture, which should evaluate the effectiveness of these policies and also take into account the possible environmental and social consequences resulting from the inadequate disposal of agricultural waste, including pesticide packaging.

Keywords: Reverse Logistics, Pesticide Packaging, Disposal, Solid Waste, Agriculture Sector.

LOGÍSTICA REVERSA DE EMBALAGENS DE AGROTÓXICOS: UM ESTUDO DE CASO EM RIO BRANCO/AC, BRASIL

RESUMO

Objetivo: Este estudo tem como objetivo analisar a implementação da logística reversa em Rio Branco/AC para garantir o descarte adequado de embalagens de agrotóxicos e outros produtos agrícolas.

Referencial teórico: Em todo o mundo, estão sendo adotadas medidas significativas para reduzir o impacto das atividades humanas no meio ambiente ao longo do tempo. No Brasil, a Política Nacional de Resíduos Sólidos (PNRS) modernizou a gestão de resíduos sólidos com a implementação de um sistema de logística reversa que busca reintegrar esses resíduos no ciclo produtivo.

Método: Para uma compreensão ampla do assunto, foi adotada uma abordagem metodológica multidisciplinar que combinou uma revisão da literatura especializada com a coleta de dados por meio de um questionário semiestruturado aplicado em oito lojas agrícolas em Rio Branco/AC.

Resultados e conclusão: A maioria dos entrevistados possuía vasta experiência no comércio de produtos agrícolas, sendo que 75% atuavam há mais de uma década no setor. A pesquisa destaca a importância do treinamento adequado sobre manuseio e descarte de embalagens de produtos agrícolas, com 87,5% das empresas oferecendo esse tipo de treinamento aos seus funcionários. No entanto, o estudo também indica a necessidade de aumentar a conscientização e a educação para incentivar os consumidores a devolver as embalagens, uma vez que apenas 37,5% dos clientes realizam o descarte corretamente.

Implicações da pesquisa: Para promover o descarte adequado de embalagens vazias e minimizar os impactos ambientais negativos, é crucial conscientizar os usuários por meio de campanhas educativas e treinamentos. Esses esforços devem enfatizar as consequências negativas do descarte inadequado de resíduos e incentivar a prática da logística reversa.

Originalidade/valor: Estudos futuros são necessários para um melhor entendimento do efeito das políticas de logística reversa na agricultura sustentável, os quais devem avaliar a eficácia dessas políticas e também levar em conta as possíveis consequências ambientais e sociais decorrentes do descarte inadequado de resíduos agrícolas, incluindo as embalagens de pesticidas.

Palavras-chave: Logística Reversa, Embalagens de Agrotóxicos, Descarte, Resíduos Sólidos, Setor Agropecuário.

1 INTRODUCTION

In recent times, discussions on environmental issues have been prevalent in political, economic, and social circles. This is due to the visible imbalances that human actions have caused, including the misuse of chemical substances that lead to soil degradation (Barclay & Bartel, 2015). Unfortunately, a substantial gap persists between environmental rhetoric and the
actions taken by governments, corporations, and consumers. Nonetheless, there are some advances worth mentioning, such as the adoption of the sustainability concept (Gonzaga et al., 2021). This approach strives to fulfill the current generation’s needs while not jeopardizing the needs of future generations. Additionally, there is an economic aspect to consider, with businesses aiming to gain a competitive edge by incorporating values that resonate with their customers (Baumgartner & Rauter, 2017).

Around the globe, there are many significant measures being carried out to diminish the unfavorable consequences of human activities on the environment over time. In Brazil, the effectiveness of one of the most vital actions, the National Solid Waste Policy (PNRS), relies on the implementation of diverse strategies established by Law 12,305/2010 (Brazil, 2010). This statute introduces a modern approach and an array of crucial tools to facilitate the progress that the country must make to combat environmental, social, and economic challenges that result from poor management of solid waste (Soliani et al., 2019; da Silva & Ludwig, 2022).

The PNRS mandates the implementation of a reverse logistics system that involves a range of measures to reintegrate waste into the production cycle, including the return of packaging to manufacturers (Slomski et al., 2018). In addition, the law requires the establishment of collection centers that receive, control, reduce volume, package, and temporarily store empty pesticide and similar product containers. These centers offer services to users, commercial establishments, and stations, and ensure that the containers are removed for environmentally safe disposal (Rebehy et al., 2019).

The law is a significant achievement in the country’s environmental management since it tackles the issue comprehensively and emphasizes the idea of shared responsibility among the government, businesses, and the public in managing solid waste. It promotes the implementation of reverse logistics, which mandates companies to take responsibility for returning used products to the industry (Soliani, 2017). The responsibility for proper disposal of the products falls on the manufacturers once the packaging is disposed of, and they are required to establish a system to ensure their correct disposal.

With the growing introduction of a wide variety of new products on the market, the products’ life cycle is becoming increasingly shorter, resulting in excessive packaging waste and significant harm to the environment (Jang et al., 2020). Even after being emptied, the residues of pesticide packaging used in family farming and agribusiness remain harmful to society due to their persistence in the environment where they are discarded, resulting in illnesses and soil contamination (Quinteros et al., 2017).

This study focuses on the implementation process of the PNRS in the reverse logistics chain of solid waste from pesticides and agrochemicals industries in Rio Branco/Acre, with a specific emphasis on the adequate disposal of pesticide packaging and other products. The research question guiding this study is: how is the process of disposing of pesticide packaging and other products that require appropriate disposal for the implementation of reverse logistics carried out in the municipality of Rio Branco, Acre?

To investigate this question, a semi-structured questionnaire was used to collect information from agricultural companies in the municipality. The study aims to not only investigate the collection procedures but also showcase the impact of implementing reverse logistics for empty pesticide packaging on environmental preservation. Furthermore, identifying the challenges and opportunities for the sustainable development of this practice is also a goal of this study. A comprehensive analysis of the challenges and opportunities facing the agricultural industry in the implementation of reverse logistics policies can help develop more effective and sustainable policies.
2 THEORETICAL FRAMEWORK

2.1 Reverse Logistics (RL) in Business Management

Reverse logistics (RL) is an important part of business management whose goal is to manage and operationalize the return and recycling of material goods after their sale and consumption (Sellitto, 2018). This concept has evolved over time and now includes not only the treatment of consumer goods by the producer, but also a broader and environmentally conscious approach that addresses the challenges of post-consumption waste and its impacts on the environment. RL thus focuses on finding sustainable ways to handle product disposal and reduce its environmental impact (Peña-Montoya et al., 2020).

RL is divided into two major areas: the first area comprises post-consumer RL, where the physical flow of parts of products is prepared after the end of their useful life. These products can be disassembled and recycled, being directed to the secondary market for raw materials, or disassembled and restored, proceeding to the secondary components market. Additionally, post-consumer goods that are still in usable condition are designated for second-hand markets (Tong et al., 2018). The second area of RL deals with the physical flow of goods that come back to the direct distribution chain for various reasons, including products that are defective, unused, or have only been lightly used (Saruchera & Asante-Darko, 2021).

The concept of post-consumer RL is directly related to the use of returnable packaging, as these packaging options are one of the main ways to reduce the environmental impact of waste generated after consumption (Sellitto, 2018). The use of returnable packaging has many advantages beyond reducing the environmental impact of waste generated after consumption. One of the main benefits of returnable packaging is that it can help companies improve their supply chain efficiency. Since returnable packaging can be used multiple times, it reduces the need for constant reordering and transportation of new packaging materials, leading to a more streamlined and cost-effective supply chain (Coelho et al., 2020).

The adoption of RL is vital in reducing the environmental consequences of post-consumer waste. As laws banning disorganized waste disposal are enforced, the significance of recycling beverage containers and packaging materials has intensified (Gutberlet, 2015). Neglecting proper disposal practices can have severe consequences for public health and the environment. Hence, adopting sustainable and responsible practices is critical to reducing environmental damage. RL ensures the collection, treatment, and transformation of post-consumer materials into new products, ultimately reducing the environmental impact of waste and promoting a more sustainable future (De Oliveira et al., 2019).

RL is commonly linked exclusively to environmental concerns, given the growing focus on recycling (Fagundes et al., 2017). Nevertheless, RL is increasingly being viewed by companies as an economic issue, as they strive to boost their competitiveness by generating value for customers and ultimately, generating profits or minimizing losses (Fernando et al., 2023; Soliani et al., 2022). However, it is crucial to address sustainable development, which strives to meet present needs while preserving the capacity of future generations to meet their own needs. Adopting sustainable practices is imperative to safeguard the environment and ensure the responsible utilization of natural resources, preserving them for the future (Richnák & Gubová, 2021).

2.2 Brazilian Policies on Agricultural Waste Management

To meet the growing demand for food, the agricultural industry has widely adopted the use of pesticides, which are chemical compounds used to increase productivity, ensure product
quality, and protect crops from pests and diseases (Carvalho, 2017). However, improper disposal of these chemicals can have serious environmental consequences.

Pesticides work by eliminating or repelling pests and diseases that can harm crops, potentially reducing yields and decreasing produce quality (Mahmood et al., 2016). Nevertheless, if these chemical compounds are not properly used and disposed of, they can also negatively impact non-target organisms, including beneficial insects, birds, and mammals, as well as soil and water quality (Tudi et al., 2021).

In order to ensure proper management of waste generated by agriculture, the Brazilian government has enacted both Decree 4,074/2002, commonly referred to as the Pesticide Decree, and Law No. 9,974/2000, which address, among other issues, the final disposal of waste and packaging. According to the decree, agrochemical packaging must be disposed of within a year from the date of purchase (Brazil, 2002). It is critical to comply with these rules to prevent contamination of soil and water, safeguard public health, and protect the environment (Gyawali, 2018). Failure to adhere to these regulations or improper disposal of waste may result in fines and penalties for the producer.

By embracing the concept of shared responsibility, every stakeholder plays a crucial role in maintaining Brazil's position as a global leader in the proper disposal of waste materials (Rodrigues et al., 2021). The National Institute of Empty Packaging Processing (INPEV) is a non-profit entity created by agricultural pesticide manufacturers with the aim of promoting the correct disposal of empty packaging of their products. Based on statistics from INPEV (2017), the Brazilian program for the RL of empty agricultural pesticide packaging has achieved a significant milestone, having disposed of 450,000 tons of material through environmentally friendly methods since its inception in 2002. According to the Mato Grosso State Agricultural Defense Institute (INDEA, 2022), the state is an exemplary model in terms of collecting empty pesticide containers, with a compliance rate of 98% with federal legislation.

Under current legislation, it is mandatory for farmers to collect and dispose of empty containers at authorized collection units. Prior to collection, the containers must undergo a triple washing process and be rendered unusable with punctures in containers that permit such practice. Non-washable containers must remain intact, adequately sealed, and free of any leaks. Empty containers must be placed in standardized plastic bags, which are provided by dealers. Farmers have up to one year to deliver these containers to a registered collection point and obtain a delivery receipt, which must be kept with the product invoice. It is the responsibility of the manufacturer or their legal representative to ensure the collection of all materials deposited at the collection point.

Triple washing involves rinsing the empty packaging three times, as the name suggests, following the steps illustrated in Figure 1:

**Figure 1**: Steps performed during the Triple Rinse of pesticide containers

*Source: INPEV, 2022.*
Effective management of hazardous waste, such as pesticide containers and agricultural waste, is crucial for safeguarding the environment and the health of individuals involved in farming. Pesticide containers contain harmful residues that can pollute the soil and water, leading to detrimental effects on the local ecosystem. In case the disposal responsibility is delegated, it's vital to verify that the hired company adheres to environmental regulations.

3 METHODOLOGY

The topic of this study is of great importance as it involves various interconnected and complex dimensions. The process of RL for agrochemical packaging has far-reaching implications, not only on the economy but also on the environment and society as a whole. To gain a comprehensive understanding of the subject, a multidisciplinary methodological approach was employed, which integrated the collection of empirical data through a semi-structured questionnaire administered in agricultural stores in the city of Rio Branco, state of Acre, with a literature review of specialized publications.

The literature review adopts a rigorous and systematic approach to identify, analyze, and synthesize relevant literature related to the research question: "How is the process of disposing of pesticide packaging and other products that require appropriate disposal for the implementation of RL in the municipality of Rio Branco, Acre?". The search for relevant literature was conducted using three well-established databases: Scielo, Scopus, and Web of Sciences. These databases are widely recognized in the academic research community, particularly for bibliometric and meta-analysis studies (Zhu & Liu, 2020). The search was not limited by publication year. The search terms were carefully selected to ensure both relevance and comprehensiveness. Specifically, we used the search terms "Reverse Logistics" AND "Pesticide packaging" AND "Disposal" OR "Return" AND "Agrochemical packaging" AND "Disposal".

In selecting studies for inclusion, the review applies strict inclusion and exclusion criteria to ensure the quality and relevance of the sources. The inclusion criteria require that articles be published in either English or Portuguese, present empirical studies or reviews addressing the research question, and be published in peer-reviewed journals. In contrast, articles that do not address the research question, are not published in peer-reviewed journals, were excluded.

Conducting a practical study on the RL of agrochemical packaging required a meticulous approach to identify and select the most suitable agricultural stores for collecting relevant information. Prior communication was established with the responsible managers, introducing and clarifying the purpose of the research. A questionnaire consisting of seven specific questions was designed to gather data on the RL processes utilized by the companies and clients of these stores. Interviews were conducted with the managers of the eight selected stores during the second half of 2021.

The collected data was analyzed using graphs created in Microsoft Office Excel spreadsheet software. The descriptive analysis allowed for a deeper understanding of the RL processes of packaging and the disposal practices by customers, without interfering with its original characteristics, making the surveys more accurate. Furthermore, the research can be classified as an applied study, as it involved conducting technical site visits and making practical observations of the processes under investigation, which yielded valuable insights for addressing environmental management issues. As Schutt (2022) notes, this type of study has the potential to offer practical solutions to a wide range of problems across various fields.

The questionnaire provided specific and relevant information about the RL process of agrochemical packaging from the perspective of professionals who work in the local agricultural sector. The critical review of specialized literature included legal aspects, technical
reports, and relevant scientific productions, which were used to contextualize and substantiate the obtained data. This approach aimed to provide a comprehensive analysis of the issue, enabling a well-founded and consistent discussion about the RL process of agrochemical packaging.

4 RESULTS AND DISCUSSIONS

To assess RL practices for packaging from agricultural products, eight managers of sector companies in Rio Branco/AC were surveyed. The questionnaire aimed to verify return methods of product packaging such as pesticides and agrochemicals. This approach provided a precise understanding of waste disposal processes and identified possible improvements in policies and regulations.

The information collected shows that most of the interviewed companies in Figure 2 have extensive experience in the agricultural product trade, with approximately 75% of them operating in this sector for over a decade. This data is significant because it indicates that these companies possess extensive knowledge and expertise that can affect how they manage waste disposal from their products.

![Figure 2: Company operation and activity time (years)](image)

Source: Authors (2023).

The companies interviewed not only have a long-standing presence in the market but also distinguish themselves by their constant pursuit of qualification and product quality. It is worth emphasizing that these companies strictly adhere to the laws governing the commercialization of agricultural products. Furthermore, Figure 3 data indicate whether these companies provide training to their employees on the proper handling and disposal of pesticide and other agricultural product packaging.
Proper training of employees is essential to ensure the correct handling of agricultural packaging, resulting in environmental benefits (Jallow et al., 2017). When professionals are trained, they can assist in controlling the triple washing process, when applicable, and in returning the packaging to the receiving units. Thanks to this management and training work, along with farmers and receiving stations, the interviewed companies have been able to stand out in the market, remaining in compliance with current laws and achieving one of the best rates of proper disposal and recycling of empty packaging.

In addition to the importance of training employees, it is crucial to highlight that Federal Law No. 9,974/00 establishes the responsibility of everyone involved in the production and use of agricultural products to ensure proper disposal of pesticide packaging. Figure 2 demonstrates that the majority of the interviewed companies (87.5%) provide training to their employees on proper handling of these packages, thus establishing a complete cycle of production, sale, use, and return, characterizing the practice of RL. To efficiently manage the process, it is essential to identify the frequency of training offered by companies to their employees, as presented in Figure 4.
The findings indicate that the majority of the interviewed companies (66.7%) provide annual training to their employees on the appropriate handling of agricultural product packaging. However, considering the high turnover rate of employees in some companies, this frequency may not be sufficient. It is, therefore, recommended that companies provide more frequent training to ensure that all employees are adequately trained and up-to-date with the best practices for handling and disposing of packaging. This contributes to a proper cycle of production > sale > use > return and to the practice of RL, as mandated by Federal Law No. 9,974/00 (Brazil, 2000).

Figure 5 illustrates one crucial issue that was discussed during the interviews with the companies, which concerns the accidents that can happen while handling packaging.

![Figure 5](image-url)

**Figure 5:** Has there been any accident with any employee during the handling of these packages? (%)

Source: Authors (2023).

As evidenced in Figure 5, although the majority of interviewed companies did not report any accidents involving the handling of pesticide packaging, a small proportion (12.5%) reported some type of accident. This finding reinforces the importance of companies training their employees on the handling and use of these products in order to prevent accidents and raise awareness among consumers about the risks of improper use on the soil and improper disposal of packaging in the environment.

In Figure 6, it is possible to observe the behavior of consumers regarding the return of pesticide and other agricultural product packaging that require proper disposal. Based on the presented data, it is evident that there is a significant proportion of consumers who still do not adopt this sustainable practice. Therefore, it is important to raise awareness and encourage consumers to correctly return these materials, aiming to minimize negative environmental impacts.
Figure 6: Do customers usually return the packaging of pesticides or other agricultural products that require proper disposal? (%)
Source: Authors (2023).

Inadequate disposal of agricultural product packaging can lead to negative environmental impacts, such as soil contamination and water pollution. The fact that only 37.5% of customers in the surveyed area perform proper disposal of these packages is concerning. However, it is important to note that the responsibility for proper disposal does not solely fall on the customers. The association responsible for receiving and collecting these packages, Association of Agricultural Retailers of Acre (ARAAC), plays a crucial role in ensuring that customers have a clear and accessible avenue for disposal. Therefore, it is essential that ARAAC continues to raise awareness and promote proper disposal practices among customers. Additionally, other stakeholders, such as the government and the agricultural industry, should also collaborate in promoting sustainable practices and reducing negative environmental impacts (Ben Amara & Chen, 2020).

However, the research also revealed that 62.5% of customers do not return the packaging simply because they do not want to. This attitude can have serious environmental consequences, as the packaging may be improperly disposed of, causing damage to nature and human health. The improper disposal of pesticide and other agricultural product packaging can have severe consequences on the environment and human health (Rani et al., 2021). These packages may contain hazardous chemicals that can contaminate the soil, air, and water, affecting not only the ecosystem but also human beings who consume the contaminated produce.

The accumulation of these packages in landfills can also contribute to the generation of greenhouse gases, exacerbating the global climate crisis (Mona et al., 2021). Therefore, it is crucial to encourage customers to adopt responsible behavior and return the packaging for proper disposal. This can be achieved through educational campaigns, incentives, and effective enforcement of regulations (Muise et al., 2016).

According to 37.5% of the interviewees, many customers in the Northern region of Brazil still prefer to maintain inadequate practices that were common before legislation was enacted to regulate the disposal of pesticide packaging. Back then, empty packages were donated or sold without any control, and were often buried, burned, or thrown into rivers, causing severe environmental damage (Mello & Scapini, 2016).

It was also reported that some customers continue to abandon empty packages in the fields, along roadsides, and even in rivers and streams. The interviewees cited the lack of
awareness about the importance of proper disposal and the absence of incentives and support for the logistical return of packaging as the main justifications for this practice.

According to the data presented in Figure 7, it can be seen that only a small portion of 12.5% of companies in Rio Branco are unaware of the existence of collection points for empty pesticide packaging. This is a positive indication, as lack of knowledge about the existence of collection points can contribute to the improper disposal of empty pesticide packaging. It is important to emphasize that the promotion and dissemination of collection points are fundamental to encourage proper return of these packages, contributing to the preservation of the environment and public health.

Figure 7: Does the company know of any collection point for empty pesticide packaging in Rio Branco? (%)

Source: Authors (2023).

All companies responsible for the commercialization of pesticides reported carefully instructing rural producers (customers) on the necessary procedures for the proper disposal of empty packaging. From the correct washing of the packages to how they should be packaged, stored, transported, and returned, all steps are carefully explained. Companies instruct customers to wash empty packages immediately after use, using running water and other specific products for pesticide cleaning, thus avoiding contamination of the environment and the health of rural workers. In addition, the packaging must be properly packaged, with their respective caps, labels, and boxes separated by type, to facilitate the return and recycling process.

Companies also instruct customers to return empty packaging to the collection unit indicated by the retailer on the invoice within one year of purchase. This deadline is established by law and aims to ensure that packaging is returned as soon as possible, thus minimizing environmental impacts. These measures are fundamental to ensure proper return of empty pesticide packaging and contribute to the preservation of the environment and public health. Companies play a crucial role in this process by promoting awareness and guidance to customers on proper disposal procedures, as well as providing the necessary infrastructure for the return of empty packaging.

Figure 8 illustrates the percentage of companies that claimed to have knowledge about the PNRS.
The findings presented in Figure 8 demonstrate that all companies that participated in the survey possess knowledge of the PNRS. This comprehensive legislation encompasses several aspects, such as prioritizing waste prevention and encouraging sustainable practices in managing solid waste. Furthermore, the PNRS allows for the use of processes that convert waste into energy, providing various advantages such as resource recovery, reducing energy usage, and cutting down costs associated with waste disposal.

RL is highly advantageous for companies in terms of sustainability, promoting the reduction of discarded waste, decreasing material costs, and developing sustainable awareness (Soliani, 2017). However, it is important to remember that RL is an instrument of the PNRS, which establishes guidelines for waste management and prevents environmental, social, and economic problems. PNRS is essential to guarantee sustainable practices in companies and the proper treatment of waste generated by their activities.

5 CONCLUSIONS

The implementation of the National Solid Waste Management Policy (PNRS) has brought significant benefits to the reverse chain of empty agricultural pesticide packaging. By reintroducing these wastes into the productive chain, following the principle of RL, we can minimize their negative impacts on the environment and public health. This option is especially appropriate given the well-established RL structure, led and managed by the National Institute of Empty Packaging Processing (INPEV). To ensure the proper disposal of chemical waste, it is essential to promote and demand sustainable practices from all stakeholders. Adequate training is also necessary to ensure the safety of workers handling pesticides and similar products. Together, these efforts can help reduce the negative effects of chemical waste while promoting a more sustainable agricultural industry.

The implementation of effective RL for agricultural pesticide packaging requires the creation of legislation and public policies that establish clear guidelines for their collection and disposal, with the responsibility of all stakeholders involved in the chain, including farmers, retailers, producers, and public agencies. Collection centers for empty pesticide packaging play a critical role in the success of the RL program by reducing environmental contamination caused by these wastes. Nevertheless, some customers fail to return the empty packaging, which
can result in environmental damage and public health problems. Furthermore, inappropriate reuse of the packaging without following the RL guidelines can worsen these issues.

In order to promote proper disposal of empty packaging and minimize negative environmental impacts, it is crucial to raise awareness among users through educational campaigns and training. These efforts should emphasize the negative consequences of improper waste disposal and encourage the practice of RL.

To fully understand the impact of RL policies on sustainable agricultural practices, future studies should assess their effectiveness while also evaluating the potential environmental and social consequences of improper disposal of pesticide packaging and other agricultural waste. Taking a comprehensive approach to analysis can help identify challenges and opportunities facing the agricultural industry and inform the development of more effective and sustainable policies.

REFERENCES


