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Research Article

Policy-Practice Nexus: Pesticide Registration, Distribution and use in Ethiopia

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Abstract

To promote environmental governance of pesticides, Ethiopia has developed a legal framework on pesticide registration, distribution and use. However, there is no clear answer to the question whether the policies on pesticide registration, distribution and use were implemented in an effective and sustainable way at the national and local levels. Therefore, this study is designed to assess the gap between the state pesticide policy and its implementation with respect to pesticides registration, distribution and use in Ethiopia. The data were collected from state's pesticide experts (regulators), distributors (importers and retailers) and end users (vegetable framers) through structured and semi structured interview, observations and existed documents. The data were analyzed in combination of qualitative and quantitative methods. The empirical results indicated that existing law do not function in an adequate way due to inefficient implementation and missing legal instruments. Thus, present shortcomings and future endeavors may need to find ways to envisage better implementation of the law that is designed to govern pesticide use by farmers from registration to distribution and use and monitoring, including quality control. Last but not least, there is a need to increase capacity of state actors (human, financial and material) both in the national and local level and participation of private actors should be considered for sustainable pesticide governance that will benefit Ethiopia.

Introduction

Pesticides in agricultural sector were introduced in Ethiopia in the 19640s. Different types of pesticides were imported by both private and public companies for agricultural uses. Since then, the use of pesticide has increased rapidly for crop protection [1,2]. Throughout the world [3-5] overuse and misuse of pesticides in agriculture cause environmental and health effects and Ethiopia is no exception. Pesticides were considered a safe and effective way to control pests and diseases. However, currently, pesticide usage by small holder farmers was frequently accompanied by misuse (abuse and overuse) of pesticides and resulted in poisoning users and caused chronic health effects; pesticide residue in food and drinking water [6-11]. Recently, Ethiopia has been considered as having the largest accumulations of obsolete pesticides in Africa. It is estimated that there were 1,500 tonnes of obsolete pesticides [12-14].

Under the current institutional arrangement, the Ministry of Agriculture (MoA) and its counterparts in the agricultural bureau of regional states are the major government agencies responsible for regulating, implementing, and monitoring pesticide policies: pesticide registration, importation, distribution and use. State environmental and social institutions and private actors (farmers, pesticides traders etc) could play important roles in pesticide governance to overcome failures of the state in pesticides policies [15]. However, in Ethiopia, the role- played by these actors in pesticide governance is weak.

Policy plays a vital role in the implementation of any regulatory framework [16,17]. In view of this, and by considering the overall issues associated with pesticide, the government of Ethiopia has formulated pesticide legislation (Pesticide Registration and Control Proclamation No. 674/2010) in order to govern pesticide use by farmers. This is taken into account by considering the whole pesticide life cycle, including registration and procurement, importation manufacturing of pesticides, distribution and use and monitoring, quality control, waste management and improving the environment, health of growers and the surrounding community [18]. However, it is important to point out that policy alone cannot accomplish these objectives unless they are enforceable. The enforcement of realistic pesticide policy is the most important component to address pesticide problems [5,19]. In Ethiopia, although there is legislation governing pesticide, it has not been enforced effectively at the federal, regional and grass root or district level. Formulation of pesticide policy by the state is not sufficient by itself.

The Plant Health Regulatory Directorate (PHRD) of the MoA has been mandated by legislation to: (i) regulate pesticide management, relating to importation, distribution, transportation, storage, retailing, and use; (ii) adopt regulations; (iii) promote the correct use of pesticides and search for alternatives to chemical pesticides; (iv) raise awareness and provide technical support when the need arises during project implementation time; (v) participate in monitoring and evaluation of stakeholders (vi) evaluate the competence of companies that are engaged in import,

export of agricultural inputs and (vii) conduct quality inspection on agricultural input production areas and on their stores and issue a certificate of competence for those who fulfill the requirements to ensure that quality agricultural inputs are distributed to users [20]. Although, the MoA should play an important role in these regard, it has failed to do so in many instances. The implementation of these legal instruments remains a real problem for the state. The enforcement of realistic pesticide policy and regulations is a major problem of most developing countries including Ethiopia. In relation to this, [3,5] survey indicated that about 25% of developing countries lack any kind of legislation to govern the distribution and use of pesticides, and 80% lack the resources to implement and enforce the legislation. About 60% do not have the analytical facilities to verify and control the quality of pesticides and most do not have systems in place to adequately handle the importation of banned or restricted compounds.

In fact, several studies have been conducted to analyze environmental and health effects of pesticide in developing countries. However, no specific studies have been carried out to ascertain pesticide governance, which are somehow neglected in these studies. Scientific research on pesticide governance and its shortcomings in Ethiopia is lacking. Owing to this, the objective of this paper is to assess the gap between the state pesticides policy and its implementation with respect to pesticides registration, distribution and use in Ethiopia. In order to meet this objective, this research focuses more specifically on why, how and on what aspects did state actors fail in adequately implementing pesticide policy in Ethiopia? What specific challenges are faced in the implementation process of the pesticide policy? After introducing the conceptual framework and the research methodology a detailed analysis of the pesticide registration, distribution and use is presented. The final section formulates conclusion and recommendations for a more sustainable use of pesticide to improve the environment, health of growers and the surrounding community.

Policy Implementation Framework

Problems of implementation constitute a subject of interest in the field of environmental policy evaluation. There are different approaches that can be used and the decision about which evaluation model to adopt depends on the interest and on the nature of the policy to be evaluated. Therefore, for this case, I focuses on output, which addresses how the policy operates on the ground, and how state actors are functioning, and asks whether or not the policy is achieving its objectives [16,17,21]. Here, outputs can be the tangible results of a measure or the noticeable effects shortly after the implementation of the policy instrument or even during the process.

After an extensive review of policy implementation literature, this paper identified a central framework for the activity based on the Contextual Interaction Theory (CIT). "If a well-written policy is designed, why is it not being implemented"? This theory allows us to explore how, why and under what circumstances a policy intervention might work or fail to work. The CIT has been developed over the years through application on different research efforts. The basic assumption of the Contextual Interaction Theory is thus that the course and outcome of the policy process depend not only on inputs (in this case the characteristics of the policy instruments), but more crucially on the characteristics of the actors involved, particularly their information, motivation, and interaction. All other factors that influence the process do so because, and in so far as, they influence the characteristics of the actors involved. The theory does not deny the value of a multiplicity of possible factors, but claims that theoretically their influence can best be understood by assessing their impact on the information, motivation and interaction of the actors involved [22].

Bressers and O'Toole, (1998) [23] were the first to propose the use of the CIT framework and they shed light on how actors' characteristics influence the implementation of a policy. Since then, they have modified and extended the model [22,24-27]. Recently, other authors have applied the framework to assess barriers of policy implementation [28-34]. The analytical part of the complex and dynamic implementation processes CIT has been successfully tested in, among others, understanding how actors influence policy implementation of wetland restorations in New Jersey, Oregon, The Netherlands and Finland [31]. It has also been applied to a variety of policy fields, for example, the enforcement of environmental permits in the Netherlands, the implementation of Clean Development Mechanism (CDM) criteria in Cameroon [30] and anti-HIV programs in China, Indonesia and Vietnam [32].

The theoretical framework used to study the chosen implementation processes needed to be able to show specific interactions taking place that affected the implementation process and connect this to the influential characteristics of the governance context(too long and not clear). In addition, the key CIT variables, new elements that made it appropriate for studying the impact of both the governance context and the actor's capacities to enable successful implementation in a complex and dynamic interaction process. The theory highlights three actors' characteristics (information, motivation and interaction) to better understand their effects on the likelihood of implementing policy output. The primary research question is how the characteristics of actors influence the implementation of pesticide policy.

Research Methodology

This research combines qualitative and quantitative methods for triangulation purpose; Kumar [35] stresses the importance of good research design, which helps the researcher to deal with four problems: what questions to answer, what data are relevant, how data need to be collected and how the results are to be analyzed. Therefore, answering these research questions require both theoretical and empirical work. This study, as a result, uses a combination of different tools for collecting data: in-depth interview, review of the existing literature and policy documents, and direct observation with the following stakeholders:

(i) National government staffs whose departments are tasked with direct responsibility for regulating, implementing or monitoring the pesticide policy were involved in the study. In-depth interview was conducted with policy makers (regulators) that include a total of 12 state pesticide experts from PHRD of the MoA. The interview focused on the legislative and administrative issues like registration process, inspection and quality control, post registration, collaboration, resources and barriers on the implementation process.

(ii) Interviews were also conducted with 15 importer companies about their interaction with regulatory bodies. From a total of 38 and

30 randomly selected retailers from Addis Ababa, Ziway, and Meki sites. Ziway and Meki districts have a larger number of pesticides traders and they are important vegetable producing area than any other regions in Ethiopia. The decision to conduct the fieldwork in Addis Ababa was based on the fact that it is the main commercial centre of Ethiopia where the majority of imports including pesticides. Retailers were consulted so as to gather information on trading practices such as pesticides source, interaction with state related issues such as competence of certificate, inspection, and interaction with users. During discussions, direct observation on the conditions of the shops, and licences was also carried out in the retailing shops.

(iii) The other interview was carried out with farmers who grow vegetable in Ziway and Meki because these farmers were the main users of pesticides in the country. A two stage sampling technique was used to select the interviewees. First, in consultation with the respective district agriculture offices, the kebeles in each district were clustered into two: rain-fed and irrigated vegetable producers. Second, after categorization, 65 farmers were selected from eight kebeles of Ziway and Meki using systematic random sampling from the list of names of farmers. Concerning the administration of the survey, all the items of the questionnaire were translated into Oromifa because the entire community in the study area is Oromifa speakers. The subjects were selected so as to obtain information on agricultural extension services like information, supporting, training and advising, frequency of contact with Development Agents (DAs), pesticides source and use of pesticide.

(iv)To get a further and more qualitative insight into the implementation and enforcement of state pesticide policies at local level, two surveys were conducted in Ziway and Meki agricultural offices. These actors are responsible for the provision of services related to the pesticide policy. The staff included all plant protection experts and 15 extension supervisors as well as 30 DAs or extension workers who have plant science background in irrigated vegetable producing kebeles so as to support farmers. The interview focused on challenges on agricultural extension system, linkage and interactions between federal and regional as well as district or lower level, and problems they faced in discharging their day-to-day activities. Open ended questions related to information, motivation, interaction of local actors was asked.

(v) Finally, these interviews were supplemented by additional four key informant interviews with relevant state authorities on the role of their institution and their collaboration with MoA in governing pesticide. These institutions are the most appropriate actors and members of Pesticide Advisory Board (PAB). In addition, document review was carried out with state and private actors (national and local level agricultural offices) as secondary data. Through these methods, extensive review of legal documents was performed to determine the key policies related to pesticide. This included the pesticide decree, proclamation, PRRP (Pesticide Risk Reduction Program) documents, and the national guide line for pesticide registration. In addition, various reports (published and unpublished) and related documents were observed to identify the practices (successes and failures) under national pesticide policies, legislation and decrees on pesticides distribution and use.

Finally, the data were collected through both qualitative and quantitative techniques to extract information on the key variables considered in the study. Analysis of the process of implementation allows us to explore how, why, and under what conditions a policy intervention might work or fail in the contextual factors underlying policy implementation.

Legal Framework of State Pesticide Policy and Registration System in Ethiopia

Pesticide regulatory frameworks

The first pesticide regulation was a single article included in the Plant Quarantine Decree No. 56 of 1971 [36]. According to this decree, the MoA was given the mandate to control the importation, production and sale of pesticide in the country. Then after, pesticide use and sales were introduced to the farmers and this time was considered as a startup for the use of pesticides by farmers. In 1972, Crop Protection and Regulatory Division were established within the MoA, and plant protection activities were started in a more organized manner. As a result, the control of migratory and outbreak pests was given more emphasis and pesticide use and sales were widely introduced to the farmers [37,38]. However, this decree lacked the necessary details to establish an effective pesticide registration scheme. Later on, through persistent efforts of crop protection experts, in 1990 another decree [39] was written and approved specifically to provide for the registration and control of pesticides. There has not been pesticide registration scheme in Ethiopia until recently. The registration process was commenced in 1996 where about 28 products were registered in that same year. Before issuing the 1990 Special Decree, Ethiopia did not register pesticide. This special decree was drafted based on the FAO guidelines. It had five sections and 29 articles. According to this decree, the manufacture, importation, sale or use of unregistered pesticides is prohibited. The decree also does not adequately incorporate international obligations and agreements to which Ethiopia is a member. Some examples of missing points are lacks of definition of relevant technical terms, lack of scope and provisions on operation of the advisory committee, pesticide register, and temporary prohibition, transport of pesticides, little powers to inspectors, lack of penal sanctions for defaulters to combat the illegal trade of pesticides in retail shops and in the open market [5,38-40].

In order to address the aforementioned gaps the government of Ethiopia has promulgated a new pesticide proclmation No. 674/2010 called Pesticide Registration and Control Proclamation, which has been enacted in August 2010 by Ethiopian government in cooperation with FAO legal section [18]. This proclamation gave authority to the MoA to regulate all pesticides including pesticides used for vector control in the public health sector. Under the current proclamation, many of international obligations and agreements are adequately incorporated and it also includes important issues which were not considered in the 1990 Decree. The proclamation has eight sections and 37 articles. This law provides information and will serve as guidelines to a well-functioning legal system for pesticide use in Ethiopia in order to regulate pesticide use by farmers, taking into account the environment, health of the growers and surrounding community, and stimulating the economic performance of the Ethiopian agricultural sector. However, there is still a big challenge on the enforcement of the pesticide legislation effectively.

Pesticides registration and importation procedures in Ethiopia

Pesticide registration system in Ethiopia: To promote environmental management of pesticide, Ethiopia has developed a pesticide registration distribution and use. The overall objective of pesticide registration is to ensure that the right types of pesticides are imported and safely used in Ethiopia [20]. The registration scheme combines most of the concepts and guidelines suggested by FAO and certain features from other countries. Pesticide registration is the process whereby the responsible national government or regional authority approves the sale and use of a pesticide following the evaluation of comprehensive scientific data demonstrating the effectiveness of the intended purposes and this registration does not pose an unacceptable risk to human or animal health or the environment [5,19]. In view of this, it is mandatory that any pesticide before importation and distribution should be first registered in accordance with the registration guideline adopted by the MoA [20]. To achieve this objective, a guideline having concepts and guidelines recommended by FAO format and incorporating the basic requirements based on the Southern and Eastern African Countries Regulatory Committee on Harmonization of Pesticide Registration (SEARCH) has been developed and. The registration process is usually carried out through the assessment of data provided by the formulator, or agent executed under the authority of the APHRD [41].

In Ethiopia, the evaluation of the local efficacy of a pesticide is part of the registration or authorization procedure (not clear). No pesticide shall be registered unless the efficacy, safety and quality is tested in field work or laboratory conditions and approved by the Ministry in accordance with Article 2 (3/1).Companies submitting a product for registration must supply data on its efficacy on the crops or for the uses involved. For a pesticide to be registered, its efficacy for the control of the intended pest should be tested through domestic research by the National Agricultural Research System (NARS) [42]. Fees are covered by the applicants with the registration agency monitoring and evaluating the results. The amount depends on the nature and extent of the field tests to be done [42].

Once, the file on pesticide registration application (the field report and dossier) is complete in all respects, it is sent to the pesticide registration technical team for evaluation depending on the pesticide category. Applications for insecticides are sent to entomologists, fungicides to plant pathologists, nematicides to nematologists, herbicides to the weed experts. This team is composed of experts from different disciplines within the PHRD. The team evaluates the document in detail and gives recommendation whether the product in question can be registered or not based on justifiable reasoning. The registrant will be asked if there is any document that is not completed through the department based on the report of the technical team. Any incomplete registration dossier will be re-assessed by the team whenever the registrant fulfils the documents. Finally, summary of the data will be submitted to the director of PHRD for approval. Subsequently, a Pesticides Registration Certificate is issued to the applicant by the Pesticide Registering Officer. The certificate of pesticide registration lasts for five years and can be renewed upon expiration.

Pesticide import procedure: Pesticide use in Ethiopia is increasing. For instance, 15 years of pesticides import data (1996-2011) by the MoA shows that 2973 tonnes of pesticides in between 1996-1998, 3670 metric tonnes between 1999-2001, 5079 tonnes between 2002-2004, 8302 tonnes between 2005-2006,and in between 2006 -2011 a total of 27,268.73 metric tonnes of pesticide were imported to the country [43]. However, such records do not include products imported illegally. As described above, any unregistered pesticide is not allowed to be imported to the country. The MoA is responsible for controlling pesticides by issuing import permit for the application submitted by importer who contains the necessary data as prescribed by the MoA. It is only after the confirmation of the ministry of agriculture that the National Bank approves foreign currency for an importer. The import permit is only valid for three months. Moreover, a pesticide may not be allowed to enter to the country unless it is inspected by MoA's inspectors and packed and labeled as provided in the proclamation, and unless the importer produces a written permission (i.e. import certificate) from MoA. Since pesticide registration in Ethiopia, 274 different types of pesticides have been registered.

Challenges on the current pesticide registration system in Ethiopia

One of the major challenges in the governance of pesticides is lack of appropriate registration system. Pesticide registration still encounters many problems; for example, very little attention is given to the system of evaluating the detailed data on physical and chemical properties, toxicology, efficacy, residues, environmental effects and proposed use on crop and/or pest. There is a need for a detailed risk assessment prior to registration of pesticides at federal level. The registration office currently lacks this. As informants from PHRD mentioned, capacity gaps have been widely articulated as the key challenge for Ethiopia's pesticide dossier evaluation and registration. In a recent pesticide registration system, we found that dossier evaluation is severely limited by available staffing, knowledge, and resources. Experts may have the theoretical knowledge about pesticide, however, pesticide registration is not supported by laboratory test (experimental details of its efficacy and safety) and research works have not been done on toxic chemical pesticides. The country also does not have competent and sufficient experts in the field of pesticides toxicology. These issues could be considered as deficiencies in registration procedure. Besides, as the regulatory directorate, PHRD of MoA is responsible for governance of pesticides in the country; Office of the Registrar of Pesticides has to depend on certification of quality products by the foreign manufacturers, but the directorate is not adequately equipped to verify the claims. At present, the registration process is carried out by assessing data provided by the registrant. Pesticide registration dossiers are important information sources for quality control. When the required information was missing in the dossier, the registrant was consulted to avail the data. In relation to this, many countries accept trial data from other countries as part of the registration dossier, on the condition that the registrant can validate comparability with cropping techniques, climatic condition, pet pressure and biology. Whether the use of foreign data is appropriate needs to be assessed on a case by case basis [5]. Foreign trial data have advantages that they are readily available, thus providing a larger data set for the registration authority to base its efficacy evaluation on. However, a drawback may be that a more in-depth assessment of such data is required to ensure that the results are relevant to the national situation.

The PHRD of the MoA has only 12 experts with two teams dealing with quality control activities; the teams are risk assessment,

inspection and certification teams. Over 80% of the individual experts have at least Master of Science (MSc) degree. However, their expertise is not cover a broad range of subjects relevant for evaluating dossier evaluation for pesticide registration. There are three pathologists, two biologists, one herbologist, two chemists, two entomologists, and two inspectors. Lack of human resource in general and qualified experts on environmental risk assessments and toxicology in particular are the critical problems of the directorate to ensure sound pesticide governance practice. There is a need to explicitly consider how to address the problem so as to develop sound and sustainable pesticide dossier evaluation system.

Strengthening this idea, most of the importers stated that the PHRD of the MoA lacks dedicated task force that can conduct pesticide registration in a fulltime. Most of the importers explained that, "We have a dossier deceiving the regulatory office for more than 6 to 9 months without any clarification". A system needs to be in place to give formal notice to the applicant if there are remarks relating to the requirements not fulfilled as per the guideline. And that the experts have included dossier evaluation work in their work plan and this is the system they follow. It is true that experts are not only engaged in dossier evaluation, other responsibilities are also there. The number of experts existing in the Directorate may not satisfy the demand desired for dossier evaluation.

It is also important to examine how plant protection specialists from Ethiopian Agricultural Research Institutions carry out field trials of the product for registration. After verification of the applicant's claims, samples are forwarded to the research institution for field tests for two crop seasons. These test results are evaluated by a senior plant protection specialist. Whenever necessary, consultation would be done to specialists in the area of herbology, entomology, pathology or others. However, agricultural research institutions, particularly in Ethiopia, often have limited resources and personnel's. As result, during the interview, most of the importers strongly complain on the delay of the efficacy trial. Research institutions do not dedicate their time to more relevant efficacy tests.

An equally important issue that hampers the current registration system is related to final mandate given to a single person. The summary of data with proper citation and an applicant's assessment of how these data support registration is submitted to the director and, the final mandate for pesticide registration rests on the director of PHRD of the MoA, who is responsible for the implementation of relevant laws on behalf of the MoA. However, under the decree of 1990, a pesticide advisory committee had been established and decisions were often made by a committee (e.g. pesticide advisory committee), that may be responsible for the final decision or for making a recommendation to the appropriate government officials [20,44].

Problems in Pesticide Inspection and Quality Control System at the National Level

The regulatory requirements on the basis of article 30 of the proclamation, the ministry or a regional state organ in charge of the agricultural sector shall have the power, at working hours, without a warrant and upon presentation of his identity card, to carry out all his responsibilities. However, evidences from the interview show that state pesticide regulators are not carrying out their tasks in conformity with the power given in the proclamation (law). Some of the gaps are discussed below:

Lack of monitoring and surveillance: post registration

Importing pesticides into Ethiopia is not a well-controlled process. The quality of foreign pesticides is also not consistent; perhaps as a result of higher-profit motives [45]. Many pesticides are known to be accumulated in the environment and to have detrimental effects on human health and the environment. Monitoring and surveillance will help to identify changes in pesticide pollution, danger spots, and particularly problematic pesticides and it will provide useful information for use in refining regulatory risk assessments on registered pesticides under re-evaluation or special review [46] (since it is too long, the meaning is lost). The MoA is the only one which is able to regulate pesticide issues by making some kinds of pesticide monitoring and controlling mechanisms by taking measures and by stimulating other control methods at all levels. This is in order to ensure safe and efficient use of pesticides in the interests of the users, consumers, traders and the overall public who are concerned with such risks. Systematic monitoring and surveillance are lacking to know the effects of pesticides on the environment and human health and the regulatory body have no information regarding the products ones registered. Registered pesticides are not checked while they are in circulation to assess whether their quality is in accordance with the requirements of the standards. The impacts of pesticides for a given locality has not been clearly identified, assessed and compiled. There is no system for risk monitoring and surveillance. For example, flower farms import unregistered pesticides. Even registered, pesticides may be subject to abuse and misuse such as adulteration, dilution or using field pesticides during post-harvest storage. This is because of the fact that registration of pesticide by itself does not guarantee safety.

So there are serious data gaps observed due to lack of capacity in monitoring data relating to health, environmental and specific incidents. However, there are little evidences that indicate the environmental and health effects of pesticide of Ethiopia. Some of the reported information are: In a survey by Yibrah (1999) 500 people got sick in Addis Ababa in 2000 due to bread baked of DDT contaminated flour; and over 2000 kg dumped around the store which resulted in death of 5 year old child,7 cows,3 goats, 13 hens,4 dogs and 9 birds. Amera [47] reported public health effects of pesticides like headache, vomiting, skin irritation and eye irritation in the enteral rift valley of Ethiopia. PAN UK's research on Ethiopia (2006) states that farmers used highly toxic insecticides to treat fleas, and even to try and cure open wounds [48]. In 2009 and 2010, the study conducted by Alterra shows that most surface water samples taken from the agricultural areas of Ziway and Meki contain residues of pesticides. The concentrations of these pesticides occasionally exceed 0.1µg/l, which is the European and Dutch standard for drinking water. The presence of DDT and its breakdown products in surface waters in the areas shows that DDT, being an obsolete and high risk pesticide, is still being used. The environmental risks of pesticide residues from these areas cannot be assessed on the basis of the limited monitoring so far [11]. Moreover, a survey by [49] stated that more than 350 metric tonnes of obsolete stockpiles of Persistent Organic Pollutants (POPs) that are resistant to environmental degradation are found in Ethiopia. Among the POPs, DDT is still being used against mosquitoes to combat malaria in Ethiopia.

The other weakness of the regulatory body on quality issues is slight level of data of pesticides that are expired in the list, cancelled from the national registered list, nationally unregistered pesticides; and also slightly loose level of domestic inspection on pesticide trading. In addition, the regulatory body does not have pesticide database system called Pesticide Stock Management System (PSMS) that monitors the distribution and use of imported pesticides and keeps track of records. Pesticide registration dossiers are important information sources and contain confidential documents. If they are left as they are handled now, they will cause further damage through time. This is because of the fact that there is no record on the existing pesticides distribution and uses by farmers or end users. There is lack of record for pesticide distribution and use at kebele, district, zone, region, or federal levels. The available records are only about import data. During the Survey we observed that the documented evidences of pesticide in PHRD office of the MoA are not yet properly organized. Pesticide dossiers are simply piled up in a room in a disorganized manner. These pieces of information were not even available with the registrants and extra efforts were needed to further obtain the missing data.

In conclusion, formulation of proper monitoring and surveillance system of the imported pesticide is essential to identify desirable and undesirable effects and to take corrective measures timely. Yet PHRD of the MoA lacks this. Therefore, developing monitoring and surveillance procedures to control the quality of registered pesticides and illegal pesticide trade is one of the major issues to be considered on governance of pesticides throughout their life-cycle.

Lack of quality control laboratory for pesticide analysis

There is an inspection system to manage the quality of registered pesticides under the inspection and certification team of APHRD. To conduct inspection of pesticides, the team was set up in two inspection centers namely Bole Airport and Kaliti. Imported pesticides can be inspected at different ports of entry depending on how the shipment arrived in Ethiopia. Upon arrival at the inspection site, the inspector must introduce himself, show federal identification card, explain the purpose of the inspection and issue a notice of inspection form with reason for inspection. The notice of inspection must be issued to the person who controls the product at the time of the inspection.

During the survey, inspectors remarkably pointed out major problems associated with inspection of pesticide. As informants mentioned, absence of laboratory to take samples of the product to test its quality makes the inspection process very difficult. The MoA does not have laboratory for analysis to determine and control the quality of the pesticides supplied by registrants. There has been no in-depth inspection and control over inert active ingredients at the customs. The only thing they have been inspecting was the label only. The inert ingredients of pesticides available on the market were not subject to laboratory analysis. Pesticides with the same active ingredients can vary a lot in efficacy and toxicity owing to the differences in the inert ingredients used. Pesticides with similar names may also have been very differently registered as active ingredients and mixture of inert ingredients. These may confuse consumers and users as to the nature and toxicity of the pesticides they use [5,50]. Another challenge in controlling the point of sale is the numerous trade names for the same or similar products. Trade names are loosely controlled by current legal instruments; one chemical can have multiple trade names making the active ingredient control difficult. In addition, some single ingredient pesticides may have many different trade names, making the control of usage and the maintenance of pesticide inventory difficult. The inspectors are expected to take samples from the markets and at ports of entry for laboratory analysis. The percentage of active ingredients must conform to the percentage proposed for registration. However, without laboratory analysis, it is very difficult to identify and control fake and sub-standard products in the country. Similarly, lack of laboratory for pesticide quality analysis is a problem existing in the country. It hinders the development of system for quality control of pesticides and their inspection; exposure assessment of store keepers, traders, transporters and farmers. Thus, specification of pesticides on the marketplace may differ from those registered under the MoA.

Problems associated with custom office

Custom officers and pesticide inspectors play a key role in checking import documentation and alerting the government about goods that do not comply with import permits. In order to properly carry out pesticide inspection and control, there is an urgent need to improve cooperation between custom authority and MoA. The importer must ensure that all label requirements, packaging and pesticide specifications have been met. Imported products that fail to meet the standards of inspection are rejected and are not allowed to be released. However, there are no specific custom regulations governing the procedure for pesticide imports. Nothing can replace a cooperative working relationship with customs and MoA inspectors. Some custom offices allow releasing pesticide without being inspected by pesticide inspectors from MoA, or from the ports of Kalitior Bole. Sometimes, even the label might have a different meaning depending on the inspector. Sometimes, custom inspectors consider pesticides as medicine (Medhanit) and release pesticide consignment without getting import permit or certificate from the MoA. This is because of the fact that those persons assigned at customs do not have agricultural background at all. Although MoA recognizes the problems, there are no trainings given to fill in the gap for custom inspectors in pesticide inspection. This makes it crucial that the periodic training for pesticide and custom inspectors is also important to strengthen their enforcement.

Weak pesticide advisory board

The weak Pesticide Advisory Board (PAB) was identified as one element contributing to the failure of pesticide policy implementation. Policies are not implemented in isolation, and actual enforcement needs to involve relevant stakeholders, partnership and this might lead to some changes in the proposed possibilities [51]. The International Code of Conduct on the use and distribution of pesticides [5,19,46] describes the shared responsibility of many segments of actors, including governments, industries, trade and international institutions for sound pesticide governance practices that minimize potential health and environmental risks. According to the Pesticide Proclamation No. 674/2010, the MoA is the major government agency, in collaboration with regional governments and relevant stakeholders, responsible for formulating, coordinating, monitoring and evaluating the implementation of relevant policies in the agriculture sector. PAB are drawn from different institutions representing key stakeholders. These are the Ministry of Agriculture, Ministry of Health, Environmental Protection Authority, Quality and Standard Authority, Ethiopian Institute for Agricultural Research,

Institute of Biodiversity, Ministry of Labor and Social Affairs, Revenue and Custom Authority, and Drug Administration and Control Authority [18]. However, in the current board, some very important private stakeholders like the Pesticide Importer Companies, and Ethiopian Horticulture Development Agency are missing.

The MoA was delegated in the task of chairing and being a secretariat to the board in the implementation of the proclamation. Although the proclamation stated that the PAB shall meet at least four times a year, from the survey, this study identified that the board met only once in two years time to get introduced to one another. Interviewed key informants from PAB members stated that a responsible office at MoA is not active in proper registration. MoA needs only the advisory service, which is nominal, where the supreme decision is made only by MoA. How can a single office be responsible for such very crucial decision making process, where many stakeholders should involve. The PAB does not have decision making role and it is not chaired by independent body. They also stated that it was not institutional participation; it was rather a reflection of individuals which was not binding by nature.

Similarly, inter-sectoral collaboration among other ministries that are board members (e.g. health and environment) and other relevant partners like extension directorate of the MoA, is essential in this regard. However, this survey revealed that there is a weak institutional collaboration among ministries to overcome the environmental and health impacts of pesticides in Ethiopia.

State Interaction with Pesticide Distributors and Users in Governing Pesticide

Pesticide distribution and sale

The main source of pesticides in Ethiopia is importation from international manufacturing companies; such as, Bayer, Syngenta, BASF, and Monsanto which are represented by local agents, active in Ethiopia. The agents act as importers/ distributors or suppliers of pesticides to retailers and users. In Ethiopia, pesticides are mainly imported from Switzerland, Germany, France, USA, China, and Israel. They are also imported from Kenya, and South Africa. The technical advisors in these big companies are usually technically competent in pesticide use and there is usually person-to-person communication with the large-scale users and agents. However, technical advisors generally do not serve the small scale end users in rural and scattered areas of the country.

Currently, there are 38 pesticide importers registered legally in MoA to operate in the country [52]. Pesticide companies can be divided into roughly two groups: importers or wholesalers and retailers. Some importer companies combine both functions. Private importers distribute their pesticides either through their own branches or through retailers. These retailers normally deal with more pesticides than the importers as they stock pesticides from different importers. The main buyers of pesticides met during the survey are retailer shops, cooperatives, flowers growers, and individual farmers. The imported or locally supplied pesticides reach vegetable farmers from retailers shop found at district levels.

The pesticide proclamation provides provisions to promote safer pesticide handling and use and to control the importation process, distribution and use of pesticide, and to regulate unauthorized pesticide trading and ensure the fulfillment of international commitments (too long). Based on this law, pesticide importers have to obtain a supporting letter or competence certificate from the MoA, upon fulfillment of the desired technical requirements such as (having trained personnel at diploma level), at least in general agriculture and experience of five years in crop protection, proper storage facilities and safety devices) prior to engaging in the business of formulation/ production, importation, distribution and repackaging of pesticides as well as fumigation service. Monitoring the business of pesticide retail service has been delegated to regional agricultural bureaus. However, due to problems with implementation, the relevant legal instruments have been largely ineffective and not implemented in accordance with the pesticide law. The result of this research shows that currently most dealers of pesticide are not abide by this proclamation and improper handling of pesticide is not getting the necessary attention in the study sites. Moreover, although the proclamation requires every importer to have records that show all quantities of pesticide product imported, type of pesticide, origin, port of entry, purpose, storage, and sale by the company, MoA did not request them (Article 32) to submit their records to the registrar annually. From 15 interviewed importers, only seven have well documented records. In the survey, I pointed out that none of the inspectors has conducted periodic inspection to pesticide stores of importers to ensure compliance with statutory regulations in 2012/2013 crop season. It proved that twelve of the 15 importers said that MoA never inspected their pesticide stores periodically and randomly unless they are invited for inspection as a pre conduction for renewal of licenses by the Ministry of Trade and Industry (MoTI). An interview conducted at the pesticide retailing shops revealed that most retailers violate the proclamation. In relation to this, the mandated regional Bureau of Trade and Industry (BoTI) of Oromia and Addis Ababa have never inspected retailers whether they had Certificate of Competence (CoC), license including renewal for the previous two years. More specifically, pesticide traders are required to be licensed and should get a CoC from the appropriate regulatory body. All importers have valid licence and CoC. However, none of the retailers had CoC in Ziway, Meki and Addis Ababa. Licensing pesticide distributors and retailers is an important aspect of pesticide governance and it is the responsibility of the regulatory authorities. This together with absence of strong control and monitoring has led to inappropriate handling and repackaging of the pesticide.

During the interview, many unauthorized pesticide retailers were observed in Ziway, Meki and Addis Ababa. Due to the large number of unlicensed retailers, the point of sale is ineffectively controlled, resulting in the purchase of unregistered pesticides, substandard pesticide, and the sale of expired pesticides. The list of licensed individuals was not available in the offices of agriculture at the district, regional and even federal level. Based on the information given in the interviews, about twelve (of the 30) retailers obtain the pesticides from only one importer, while eighteen (of the 30) have contacts with more than one importer. Additionally, from the 30 retailers, seven of them do not have valid licenses at all to sell pesticide. Fourteen of them have licensees but not renewed and only the remaining nine have renewed and valid licenses. During the survey, I also observed that license of retailers is only required for agricultural pesticides; however, some were selling household and public health pesticide. On the other hand, a number of expired pesticides were also found in few shops. The plant protection experts of the districts pointed out that absence of pesticide inspectors at the regional, zonal and district

levels worsen the problem of pesticide misuse, illegal trading etc. Pesticides are sold in local markets in the villages by unauthorized and untrained persons and in many other non-designated sites. Rodenticides and public health pesticides are common features in the streets and in most cases unauthorized pesticides are sold and repacked in small containers without the required label. The survey results also show that most of the importers had received training from the manufacturer and had posters from the manufacturers advertising their pesticides. However, none of the retailers had received training from manufacturers, importers or state. Although retailing shops are the major sources of information for the farmers, they never got training from state or importers to promote safe use of pesticides. This is because farmers are at a disadvantage on knowledge about qualities, volume, pricing among others compared to retailers.

This study also pointed out that twenty four out of the 30 retailers in the shops have no agricultural background or one year of closely related work experience. Retailers were asked whether they could read the labels of the pesticides they sold, and the interviewers checked the label instructions and their understanding was irregular in most retailing shops. Of the 30 asked, only five were able to give adequate explanations for most of the labels. Seventeen were unable to read and interpret complex pesticide labels (with no complete understanding), and the remaining eight had little understanding. Twenty six out of the 30 retailers did not have information, records, and reports of pesticides.

Pesticide users: Smallholder vegetable farmers

Smallholder's vegetable farmers in Ziway and Meki districts are the main users of pesticides in Ethiopia. The most important issues discussed in both districts were level of support, extension services provided for smallholder farmers, sources and uses of the pesticides. For instance, all of the interviewed farmers stated that they faced crop diseases during the 2012/13 crop season and they used pesticides to control pests and diseases [53]. The use of pesticides does not differ between the two districts. The majority said that they spray 5-8 times per season. Insecticides and fungicides (Ridomil, Selecron, Mancozeb, Ethiotate, Cruzate, Profit, Karate, Malathion among others) are usually used in irrigated vegetable growing farmers' fields [53].

The pesticide retailing shops remain the most important sources of pesticides to vegetable growing farmers in both districts. In 2012 crop season, a majority (86.6%) of farmers obtain pesticides from small shops of retailers in their respective towns, while the remaining farmers obtain from cooperative unions which account for 8.3 % and 4.1% from open markets that assume greater importance for the supply of pesticides at lower price compared to retailer shops. Smallholder farmers are also faced difficulties when buying pesticides from shops of retailers that do not have professionalism to provide information to customers. The absence of competent personnel in most retailers' shops does not conform both articles 8 (1) of FAO code of conduct and the Ethiopian Pesticide Registration and Control Proclamation No. 2010, which aims at ensuring that end users are provided with complete advice on risk minimization and proper use of pesticides.

Improvement in productivity can be possible if farmers use the required amount of pesticides properly, as recommended by agricultural experts. On the other hand, farmers can use the pesticides effectively if they have the required knowledge, skill and experience [5,46]. This in turn needs qualified, competent and sufficient number of DAs that can provide the necessary training, advice and technical support to the farmers in each kebele. It is believed that making contact with (DAs) may enable the farmers to get information about safe use of pesticides. The information in turn encourages farmers to use it appropriately. The planned number of trained DAs recommended to each kebele to implement the programme would have been three. One who has specialized in crop production and protection, another in animal production, and the third in natural resource protection [37,48]. Even though the policy recommends three professionals; there are a maximum of two DAs assigned to some kebeles, which is below the recommended number for participatory demonstration and training extension system (PADETES) [53]. As a result, most DAs are forced to cover the gaps by providing support and training to farmers outside their field of study. Once DAs are assigned in the work, they must serve as generalists, rather than specialists. For example, when a farmer approaches a DA, he does not have idea that the DA is a "specialist" in a particular field; therefore, the farmer asks for advice on a wide range of questions and is dissatisfied if the DA cannot help him or her in resolving the particular problem. In addition, DAs are busy for non-extension activities like collection of credit and taxes, and other government activities that do not typically fall under the mandate of extension department [48,54]. Therefore, the complaints raised by farmers are not only about the coverage or quantity of DAs but also their quality.

During the survey, I observed that vegetable farmers mix different types of pesticides without proper measurement and they do not use Personal Protective Equipment (PPE) in their areas. Most farmers in Ethiopia do not receive adequate technical assistance and information from official extension services. Regarding this, farmers were asked about source of information for crop protection measures. Forty-one percent of them stated that they depend on their own experience, 11.3% rely on their neighbors' experience, 22.1% depend on information obtained from sellers and 25.6% get the information from government extension services. Many farmers prefer to contact a pesticide retailer instead of an extension official when problems arise, because pesticide shops can be accessed easily at any time.

At present, the number of extension agents assigned to farmers is very small. For instance, in Ziway, the average extension agents to farmer ratio are 1:964. In Meki, it is 1:878, which is beyond one's reach [53]. This figure indicates that there is a serious shortage of extension workers in the study area to give better services to the farmers. This shows that there is little direct contact between the farmers and the development agents at farm level.

The new farmer-centered approach to extension, the Participatory Extension Approach (PEA), calls for a bottom-up approach of planning, implementing and evaluating of extension activities [37,54,55]. However, the opinion of farmers regarding participation is almost opposite to that of PEA and has been implemented in a top-down, supply-driven way from the federal level to achieve national goals [45,48,56,57]. About 86.7 % of the farmers said that the decisions related to agriculture are imposed from above, whereas none of them believes that the decisions are made based on the need of the farmers while the rest 13.3 % have given no comment. The farmers were asked whether they have got any opportunity to participate in the formulation of agricultural development plans. The

majority (92%) of the subjects responded that they have not got any opportunity in the formulation of plan. The farmers are not invited by any organ to participate in the formulation process. Even most of the farmers do not know who formulates the plans and how they are formulated. Farmers' conference held at kebele level involves only kebele management organ and few model farmers. To evaluate the currently running extension system, the sampled farmers were asked a question whether or not they are satisfied with the services delivered by extension service currently practiced in their areas. About 87.3% of the farmers gave a negative response. This implies that the extension programmed currently running in the study area is not capable of adequately responding to the questions forwarded by the farmers including pesticide.

State Pesticide Policy Implementation Barriers at the Local Level

In a country like Ethiopia where the majority of the farmers are poor and illiterate, agricultural extension would play a significant role in assisting farmers in production problems [48,58]. Agricultural Extension is conceptualized as any kind of advice or assistance given for farmers in order to improve their methods of production and is also believed to serve farmers in order to solve their acute problems [46,59,60]. In Ethiopia, pesticide management advice is mainly given to farmers by the extension system of the MoA, and Regional Bureaus of Agriculture in a decentralized method. Under the regions, there are zonal offices, which mainly function as liaison offices between districts and regions. However, the Agricultural Offices of the Districts (AOD) are the main frontline organizational structures implementing agricultural policies as well as assessing the overall accomplishments and impacts of the extension offices at the district and kebele levels. Therefore, in this study, the roles of agricultural extension service providers (local actors) are adequately addressed with regards to issues related to pesticide as component of agricultural extension package.

To realize this at the grass root level, the MoA designed a new development strategy. This new strategy includes among others, the placement of three DAs with different profession (agronomist, natural resource expert and livestock experts) who are living and working at each kebele [58]. They are trained in diploma from agricultural colleges of the country. Their duty is to advise farmers and solve problems related to their agricultural activities. Their activities include granting credit to farmers, collecting repayments, purchasing grain from local farmers on behalf of the state. As regards to the distribution and use of pesticides, the role played by local actors (DAs, extension supervisors and crop protection experts) in governing of pesticide use (advising farmers) is extremely crucial. However, a number of barriers and challenges have been observed from the actors that hinder the effective implementation of the policy. From this paper's perspective, policy implementation is a process in which varieties of decisions need to be constantly made, and information, motivation, interaction, and other elements of actors play a decisive role.

Lack of information and technical knowledge

The provision of useful agricultural information requires an understanding of policy issues by service providers, as well as by policymakers of what providers are able to supply to support the policymaking process [61]. Lack of information is mentioned as the major operational challenge of actors and stakeholders at the local level. Awareness creation and the provision of information about the pesticide management and policy, and the reasons why the state has adopted it, are crucial to obtain support for the policy's implementation from decentralized government units. However, there is lack of awareness and understanding among distributors and users at the district level. The information gap at the local level was even more pronounced when the pesticide policies were considered. When asked about their knowledge of the new pesticide law (proclamation), few protection experts immediately named the pesticide Decree of 1990 and all experts reported that they had heard only of the proclamation of 2010, but they had not seen it. All DAs and extension supervisors at both districts said they have never really heard of them. Whereas, all of the PHRD staffs from the MoA at the federal (national) level described themselves as very familiar with both the 1990 decree and the new proclamation of 2010. And that they were involved in policy development regarding the two pesticide policies of Ethiopia. However, plant protection experts, extension supervisors and DAs were not yet allowed to participate during the formulation of the current federal pesticide registration and control proclamation. The use of the term pesticide proclamation (law) is vague in the agricultural office of the districts. There is no common understanding on the concept of pesticide law among all plant protection experts, extension supervisors and DAs at district level. Inadequate policy dissemination and training was cited by experts as barriers of pesticide policy implementation. The policies provide the necessary legal protection framework and the main parameters for providing services to farmers. They also emphasized that even after the policies were approved, there was no dissemination and training to ensure implementers understanding of the content and how to implement these policies. And it is one of the major challenges to policy implementers. Informants also pointed out that it is not enough to approve and publish new policies. Regulatory bodies need to discuss and train service providers and other stakeholders down to the farmers' level on how to apply these policies. The only respondents who stated as the new pesticide policy are on plant protection were experts at Oromia Regional Agricultural Bureau, which is to be expected, as they are the main counterparts of MoA at the regional level.

Additionally, empirical findings by [48,58,62-64] showed that lack of technical competency among DAs and extension supervisors relating to innovation, interacting, social learning, policies, at the local level are major challenges of the current agricultural extension system in Ethiopia. In relation to this, there were noticeable gaps in technical knowledge about pesticide. DAs are trained to enable and advise farmers in using improved local farming methods and imported technology, such as pesticides, to increase crop production. However, the DAs are not adequately trained in aspects of pesticides and hence are unable to provide adequate services to farmers with regard to safe use of pesticides. In the survey, extension agents stated that they have no enough information and technical knowledge on the hundreds of agricultural pesticides available on the market. These information requirements are likely to be beyond the capability of the typical field extension agent. They also emphasized on the urgency of training on a variety of pesticide use. Information is needed on symptoms of pest attack, field diagnosis of pests, pest frequency, survey methods, safe and efficient pesticide use, and pesticide application methods.

Besides, farmers interviewed noted that DAs lacked the necessary practical experience and expertise to teach the skills. For instance in some kebeles, farmers claimed that they know better than the DAs in pesticide issue, and all they needed DAs only for fertilizer and improved seed supply. DAs' lack of technical knowledge on pest identification and recommendation of appropriate product against that pest is a major challenge as witnessed by few farmers and extension supervisors. Similarly they also blamed the existing curriculum. Most interviewed DAs indicated that the way of training was mainly theory-based and inadequate in practical applications due to shortage of equipment, practical tasks, labs, tools, and teaching materials. On the contrary, extension supervisors and DAs believe that some of the farmers have some knowledge from their long year experiences on how to use pesticide. In this regard, there are problems from the farmers' side too. As the majority of the DAs and extension supervisors indicated, most of the farmers are extremely resistant and lack willingness to learn from their advice. The problems have been raised through their long term experiences of practicing of pest application, lack of knowledge, insufficient orientation, and trainings given to them.

Low motivation and commitment of state actors

In this study, motivation refers to the dedication and willingness of the protection experts, extension supervisors and DAs to serve farmers. Strong motivation of these actors to serve farmers is crucial to transfer knowledge to the farmers and to enhance the implementation of extension services at the farmer level. There is a common understanding among all state actors at district level that lack of motivation is manifested by inadequate support from federal and regional states such as, inadequate training, lack of clear carrier structure, work load due to shortage of extension workers compared to the size of farmers and bureaucratic structures from regional states. DAs were supervised by extension supervisors. In line with this, in the survey, I identified that supervisors of each team do not have clear supervision guidelines to supervise the DAs. In both districts, although extension supervisors were in place, their limited number weakened the supervision activity. For instance, in Meki, one supervisor supervises extension activities in about 8 kebeles, and supervises up to 12 DAs. Supervisors themselves are diploma holders in plant science, with very little training in extension education.

In this study, most of the DAs pointed out that, experts of the districts are not committed to assisting the DAs in rural field works due to lack of transportation and other inconveniences. As a result, they rely on the periodic report they received from DAs, which may not always be reliable. The office usually evaluates DAs based on their political accomplishments rather than their professional duties. In addition to the professional work assigned to them, DAs are forced to collect credit payments (price of farm inputs, mainly fertilizer) from farmers which should have been the responsibility of the cooperatives and the district or kebele administration. This also results in the shortage of time to perform their formal duties. As a result, they fail to provide efficient and effective service to the farmers.

The findings revealed that there is also the opportunity for DAs to improve their education level. The top 5% of DAs (selected for the best performance) are allowed to upgrade themselves to BSc level. This is because promotion, reward and incentive systems will attract and motivate DAs. However, the lack of a clear career system that includes incentives, salary increment, awards, and/or other opportunities (for e.g., scholarships) for the extension field staff remains a major constraint and are causes for de-motivation. As some anonymous informants mentioned, being member of a political party is a hidden criteria for promotion from extension worker to extension supervisor and for the next position. Other reasons were also stated as points for de-motivation: In some cases, DAs have been shifted to different kebeles after only 6 to 12 months. As it is known, motivation and interest of a person towards a certain activity determines the quality of the activity he/she performs.

Regarding interest, about 12 (out of the 30) of the respondents reported that they liked their job. Among those who did not like their job, the majority (18) of the subjects indicated that the salary they earned were not equivalent with the workload they had and seven of them said that there were no incentives and on-the-job training. Furthermore, 11 of them reported that they had not obtained salary increment for over three years. One DA informant said, "I become a DA just for the sake of survival without any interest towards working in rural area." Besides, he pointed out that he lacked interest towards the profession because of lack of incentives, facilities (like clean water, electricity, and internet), social dignity and tiresomeness of the profession. In addition, another DA informant also explained that, "I have no interest in the profession. But I have higher interest in business and in the near future I will leave this and go on for business." Therefore, both the actual observation and interviewees' responses depicted that most DAs have less interest and motivation towards working with their profession.

Weak interaction or collaboration of relevant state and non-state actors

It is obvious that pesticide issues are multi-sectored in nature and there is a need to interact with a range of sectors, including health, environment, agriculture, importers, distributors, users, and local government officials in the whole pesticide management cycle. At local level, each agricultural office of the district is composed of five main teams: extension, irrigation, input supply, natural resources and food security [53]. The AOD represents a more operational level in terms of reaching smallholder farmers. The AOD does so using a team of experts. Experts are expected to deliver technical assistances and training services to farmers, DAs, and extension supervisors based on specific needs at the kebeles level. However, at present, the interaction between these teams is weaker and agricultural extension service activities are operating in a non-integrated manner. Experts pointed out that this problem should be seen in the context of the poor road network in the kebeles.

At district level, it was proved that 28 out of the 30 interviewed DAs noted that lack of collaboration between and among relevant actors of pesticides negatively affected proper management of pesticide at the study sites. The existing service delivery does not focus on provision of integrated services and information. This is especially true in health centres and agricultural offices of the districts. For example, a Dirty Dozen Pesticide (DDT) is used for the control of mosquito, malaria vector. But, diversion of DDT against agricultural pests, is a cause for resistance, which is very common in Ethiopia [1,12,65]. The prevention of such resistance requires routine monitoring as well as joint development of a strategy for resistance management between the offices of health and agriculture. However, nothing was

done in an integrated manner between the two offices. Similarly, lack of coordination tends to be observed between government and other stakeholders, such as the private sector (e.g. pesticide retailers, agricultural office, plant health clinic, and academia and research institutes).Consequently, challenges in pesticide governance faced by stakeholders may not be recognized and dealt with at an early stage by responsible state agency. In addition, the agricultural office is the single most important actor at the local level for farmers, especially in terms of pesticide. The private sector (retailers) and relevant state institutions such as, the district and kebele administrative councils, although they are becoming increasingly important in governing pesticide, are often left out of extension initiatives or their interaction is weak.

Experts were asked about the coordination with relevant sectors in governing pesticides .The experts revealed that lack of communication and information sharing is the major constraint within the extension line directorates and from the federal to the kebele levels. Currently, the information communicated between district agricultural offices and their respective agricultural bureaus was inadequate. Most of the problems in MoA and regional bureaus are concerned with restructuring of their respective offices. This discontinuity generally creates gaps in assigning an appropriate coordinating body. Although these efforts are very important, they do not know what they have been doing. Lack of network is a major problem. The repetition may distract what has been done and achieved by the others.

Lack of resources

The capacity of local actors in implementing pesticide policy and agricultural activities is an essential part of the governance arrangement at local level [13]. Several studies indicated that there is a clear capacity gap in handling and running different responsibilities under the decentralized system. In Ethiopia, [66,67] decentralization of authority to district levels has been a major government program over the last few years. However, there are many challenges including capacity limitations to implement development activities. By strengthening this idea, EEA/EEPRI, 2006; [48], pointed out that federal and regional states support capacity building. It incorporates essential trainings on skills and upgrading of all experts, supervisors and development agents.

It would also build an effective system of capacity building in terms of material, human and financial resources for district extension workers.

This paper identified serious constraints in the capacity (financial, human, and material resource) in both districts and most kebeles. This significantly influences the effectiveness of pesticide governance. Most of the state actors on pesticide issue at the local level pointed out that up to now the role played by the state in the promotion of safe use of pesticide is weak. The current extension system is mainly focused on provision of improved seed varieties and fertilizers. They also emphasized that the MoA has not completed compressive regulations, procedures or directives in order to govern pesticides appropriately. Many pesticide retailers and plant protection experts at district level said that they are still not using the new proclamation of pesticide registration and control. Training and awareness creation on various actors from federal to local level (regulators, importers, distributors, retailers, users, extension workers) were not handled seriously. Moreover, they emphasized that the MoA has no strong system to control the quality of pesticides in almost all the markets in the county.

The study also indicates that the majority of the DAs (23 out of the 30) indicated that there is lack of appropriate extension materials like motor cycles which another important factor is hindering their activities in the sites where they worked. This implies that appropriate teaching aids and guidelines had not been given to the DAs to effectively work and communicate with the local farmers. Apart from extension material problems, districts face serious trained personnel. The first is related to the availability of required number of staff in a particular position. For instance, there is no pesticide inspector in both districts, where many retailers' shops and intensive use of pesticide is carried out. As most experts, supervisors and DAs are not trained as inspectors, there is little understanding about what is going on in the retailers' shops at the district levels. Besides, lack of supervisors from regional sate has also contributed to pesticide misuse and overuse among retailers and end-users. The study found out that though there are some variations between districts in this regard, district agricultural officials repeatedly suggested that there are many vacant positions that remain unfilled in their respective offices (e.g, lack of pesticide inspector).This has serious implications for quality control of pesticides. Data obtained through interview reveals that the reasons for the presence of vacant positions is lack of adequate budget to hire new staff members and the inability to remunerate any prospective staffs that might come to the district. The second aspect of human resource capacity involves the capability of district agricultural office in assisting, disseminating information and training to farmers. The policy implementation capacity of staffs is minimal. I looked at the level of educational qualification of the agricultural office of the district and found that most personnel hold diploma and they attend summer educations. The staff attends classes in a rainy season where farmers need more professional support. Some individuals were also former graduates of 'General Agriculture' with little or no formal training in the critical areas of pesticides.

Conclusions

The study assessed the gap between officially formulated state pesticide policy and its implementation with respect to pesticide registration, distribution and use. In the light of the above findings, it is concluded that there is visible difference between ambitions and actual performance of the policy).On top of this, the survey results reveal that lack of appropriate pesticide registration, distribution and use system, inadequate monitoring of pesticides once registered, lack of regulations and directive to implement the policy, weak inspection to dealers and end users, lack of cooperation between MoA and pesticide advisory board, and several other constraints that may hinder the implementation of state pesticide policy have been highlighted. On the other hand, lack of information/technical knowledge, motivation, interaction and capacity (human, financial and material) of local actors contributed to weak agricultural extension system in supporting the small holder irrigated farmers in their pesticide use practices. Some of the constraints included shortage of DAs work with a large number of farmers and lack of extension materials, limited practical skills in identifying pests and pesticide and heavy workload of DAs.

Based on these results it is important that policymakers pay

utmost attention to the problems that exist in the implementation of state pesticide policy. It should be noted that the formulation of pesticide policy is not by itself a guarantee that the actions will solve the policy problem(s).The problem associated with pesticide is wide spread, serious and very urgent. Unless something positive is done quickly, the environmental loss and the damage to human health will be incalculable and irreversible. The issues that need immediate attention include, among others, the present national pesticide registration system has not been supported by laboratory test. On top of this, in the future, the pesticide registration system will be intensified in the direction of ensuring safe and effective use of pesticides by increasing the scientific, technical and legal request in pesticide governance including the requirement for quality analysis of pesticide products. Pesticide distribution and their use should be monitored and a system to trace them all along their life cycle should be developed. This is because of the fact that registration of pesticide will be granted if after a careful consideration of health and environmental risks and benefits of the pesticides use outweighs the risks of its use. In a nutshell, this study indicates that implementing pesticide law of registration, distribution and use reduces potential risks of pesticides to the environment and human health. Inadequate capacity building to improve problems associated with pesticide is not only limited at local or regional level but also at the federal level of the country's decentralized government system. Hence, it is important to establish capacity building programmers for both federal and local actors of pesticide to implement the policy in general and to promote and to improve their knowledge, skills, interaction and motivation for sustainable pesticide governance in particular).

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