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Mengistie, B. T., Mol, A. P. J., Oosterveer, P., & Simane, B. (2015). Information, motivation and resources: the missing elements in agricultural pesticide policy implementation in Ethiopia. International Journal of Agricultural Sustainability, 13(3), 240-256. DOI: 10.1080/14735903.2014.959330

*International Journal of Agricultural Sustainability*, 2015
Vol. 13, No. 3, 240–256, http://dx.doi.org/10.1080/14735903.2014.959330

Routledge
Taylor & Francis Group

# Information, motivation and resources: the missing elements in agricultural pesticide policy implementation in Ethiopia

Belay T. Mengistie[a*], Arthur P.J. Mol[a], Peter Oosterveer[a] and Belay Simane[b]

[a]*Environmental Policy Group, Wageningen University, Hollandseweg 1, 6706 KN, Wageningen, The Netherlands;* [b]*College of Development Studies, Addis Ababa University, PO Box 1176, Addis Ababa, Ethiopia*

To promote pesticide governance that protects the environment and human health, Ethiopia has developed a legal framework for pesticide registration and control. However, in Ethiopia, pesticides are still registered, traded and used inappropriately. This research analyses how Ethiopia's pesticide policy is implemented and identifies the barriers for an effective implementation of this policy. With a theoretical framework based on the information, motivations and resources of relevant actors, data are collected from state pesticide experts, traders and end users (farmers) through in-depth interviews. The overall result reveals that major gaps exist between pesticides policy on paper and its implementation in practice. The key policy actors scored low on each of the three characteristics: they have poor information available, have low motivation to implement policies and lack sufficient resources. Involvement of and collaboration with private actors is likely to improve the implementation of pesticide governance, and contribute to sustainability in agricultural and food systems in Ethiopia.

**Keywords:** pesticides; Ethiopia; state actors; policy implementation; registration; inspection

## 1. Introduction

Pesticides are important agricultural inputs in crop production processes worldwide. In many countries, the pesticide sector is an important contributor to national income, employment and international trade (Hoi *et al.* 2009, 2013, Kateregga 2012). Simultaneously, countries are facing increasing national and global concerns about pesticide use and interrelated risk on the environment and human health. This negatively impacted on agricultural production and reduced agricultural sustainability (Pesticides Action Network (PAN) UK 2006, Williamson *et al.* 2008, Pretty *et al.* 2011, Food and Agricultural Organization (FAO) and World Health Organization (WHO) 2013). Governments are trying to change pest governance practices to more sustainable approaches, and to strengthen regulatory control on the distribution and use of pesticides to reduce these risks. These are major reasons among others behind the development of the pesticide policy (Kateregga 2012, FAO/WHO 2013).

Most of African countries lack proper pesticide management capacities and this situation has resulted in environmental, health and economic problems (Williamson 2003, Williamson *et al.* 2008). In a similar manner, Ethiopia is in the process of intensifying and diversifying its agriculture to meet not only national demands for food, but also to increase agricultural exports (e.g. coffee and flower). This may lead to increased use of agrochemicals such as pesticides. However, pesticides, when used wrongly, can affect agricultural productivity. It can also result in unintended effects on human health and the environment. This implies that sustainable agricultural production requires an

*Corresponding author. Emails: belay.mengistie@wur.nl, belaytizazu@yahoo.com

effective governance of pesticide along the entire pesticide phases (from registration to waste disposal) (Pesticide Risk Reduction Programme (PRRP)-Ethiopia 2012).

Pesticides in agriculture were introduced in Ethiopia in the 1960s when different types of pesticides were imported by both private and public companies. Since then, the use of pesticides has increased rapidly (Abate and Azerefegne 2007, Ministry of Agriculture (MoA) 2013). Currently, the need to feed the growing population of Ethiopia and the interest to produce exportable volumes to access the global market entail an increasing pressure to intensify agriculture and use chemical pesticides. For instance, during the main crop season (Summer) of 2011/2012, the total area where pesticides were applied by more than 3.48 million farmers was 2.27 million hectares (divided among 2,124,307 ha of cereals, 79,122 ha of pulses, 21,613 ha of root crops, 9120 ha of vegetables, 6019 ha of chat and 757 ha of coffee (MoA 2013). This figure only shows the treated area but not the frequency of pesticide application which is relatively high especially in vegetable growing areas in the Rift Valley.

Currently, pesticide usage by small holder farmers is frequently accompanied by misuse of pesticides leading to acute poisoning of users and health defects such as head ache, vomiting, skin irritation and eye irritation, and also to pesticide residues in food and drinking water (Mekonnen and Agonafir 2002, Williamson 2003, Alterra 2010). In a study conducted in 2009 and 2010, Alterra (2010) found that most surface water samples taken from the agricultural areas of Ziway and Meki contain pesticide residues. The presence of dichloro diphenyl trichloroethane (DDT) and its breakdown products in surface waters in the areas shows that although DDT is considered as an obsolete and high-risk pesticide, it is still being used (Alterra 2010). A study by Williamson *et al.* (2008) found that some farmers in Ethiopia develop their own recipes (formulation), a popular one being a mix of malathion with DDT (the latter is banned globally for all agricultural purposes under the Stockholm convention) but widely available in Ethiopia's malaria control programme called illegal diversion of DDT to the agriculture sector and applied to the hair to kill lice or to the skin to try and cure wounds. A survey conducted by Williamson (2011) showed a high poisoning rate among Ethiopian women and children.

In response, the government of Ethiopia has developed pesticide legislation ('Pesticide Registration and Control Proclamation No. 674/2010'). This law takes into account the whole pesticide life cycle: from registration and procurement, via import/local manufacture and distribution to end-use and monitoring, including quality control and waste management. However, a good law is not enough as law implementation and enforcement is a real problem for most developing countries (O'Toole 2000, Bressers 2004, 2007), including Ethiopia.

Several studies have been conducted to analyse the environmental and health effects of pesticide use in Ethiopia (Williamson 2003, PAN UK 2006, Abate and Azerefegne 2007, Amera and Abate 2008, Alterra 2010, PRRP 2012). However, no study has been carried out yet to ascertain the country's pesticide policy implementation. Therefore, this paper aims to analyse how, why and under what circumstances policy implementation might work or fail, by investigating the information, motivation and resources of actors involved in the policy implementation process. After introducing the conceptual framework and the research methodology, a detailed analysis of the pesticide registration system, inspection and quality control on distribution and use is presented to identify the roles of different actors and how they influence the implementation process. The final section formulates conclusions on the perspectives for an effective implementation of the pesticide policy to improve agricultural sustainability, the environment and the health of farmers.

## 2. Theoretical framework: analysing policy implementation

Based on a review of the policy implementation literature, we developed a conceptual framework based on the contextual interaction theory (CIT). The CIT (Bressers 2007) theorizes that the

implementation of a policy is a social process wherein policy actors and their interactions define the outputs and outcomes. The basic notion of CIT is that the course and outcome of the policy process depend not only on inputs but more importantly on the characteristics of the actors participating, particularly their information, motivation, resources and interactions. The theory does not deny the value of a variety of other possible factors, but all other factors that influence the implementation process can best be understood by assessing their impact on the information, motivation and resources of interacting actors (Sabatier 1991, O'Toole 2000, Bressers 2004, 2007). Implementation problems constitute an interesting subject in the field of environmental policy evaluation. We focused on output evaluation, which addresses how the policy operates on the ground, how state and non-state actors are functioning and whether the policy achieves its objectives. Outputs are the tangible results of a measure or the noticeable effects shortly after or even during implementation. Policy implementation entails the crucial transition from a policy design with its particular goals and instruments to its actual performance in influencing everyday reality (Figure 1). This policy implementation phase is realized by different actors; so the policy output depends on actor performance. In this study, three key variables are concurrently drawn into the analysis: the information held by the governance actors, their motivation and their resources. These variables jointly influence the implementation process and have a major impact on policy success (Bressers 2007, Weaver 2010).

Information refers to observations and knowledge gathered about reality, but also includes interpretations of that reality, influenced by frames of and interactions with other actors. Within the wider informational governance literature (Mol 2006, 2009), information is regarded as a (re)source that is formative in environmental governance processes. When examining the accessibility, quality and kind of information in a network, one needs to be aware of the possible influence from different actors (Bressers 2007).

Motivation and interest of a person towards a certain activity determine the quality of the activity he/she performs. Motivation orients behaviour but cannot be directly measured or observed. So, indirect indicators are required. For instance, successful experiences can increase actors' motivation and the opposite might also happen. When valuing motivation, one should not take into account the position of the actor towards the issue involved only, but also their relations with other actors (Ford 1992, Karwai 2005). This is because motivation can be strengthened through positive feedback from other actors. Scholars have developed different approaches when intending to measure motivation, such as (un)fairness and (in)equality (Adams 1963). In this study, satisfaction/dissatisfaction is used to measure motivation.

Resources can be attributed to actors by other actors (formal powers such as legal or institutional rights) and/or rooted in resources such as money, skills and agreement. With regard to resources, one should pay attention to the possible additional resources that an actor, who is active in the process, can access via other actors in their network (Van Horn and Van Meter 1977).

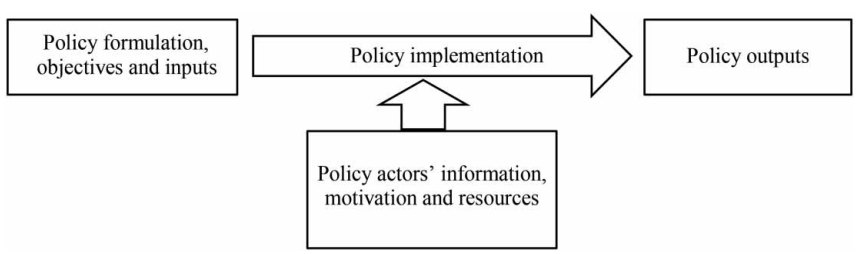


Figure 1. Policy implementation process and the role of policy actors.

The governance approach focuses on the interaction taking place between governing actors with information, motivation and resources. The interaction shapes actors and actors shape interaction patterns. The three variables information, motivation and resources may mutually influence each other as well. Access to resources may increase the motivation of actors and motivation will be affected by the reading of reality or access to information that actors may have (Bressers 2007). While resources are necessary for gathering additional information, information can become a strategic asset that increases the resources of certain actors.

While assessing the characteristics of the actors in the implementation process, it is important to be aware of the existence of policy networks. A policy network is described by its actors and the linkages between them (Sharpe 1985, O'Toole 2000, Oosterveer 2009). Through such networks, the policy implementation process acquires its particular shape.

## 3. Study area and methods

Ethiopia, a federal country located in East Africa between 3° and 15° north and 33° and 48° east, is one of the largest countries in Africa both in terms of land-area (1.1 million km$^2$) and population (80 million in 2011) (CSA 2011). The Ethiopian federal system has created nine regional states. Most regions of Ethiopia are suitable for the production of a wide range of tropical and sub-tropical vegetables due to the country's favourable climate and natural resources. Major vegetable export products include fresh fruits and vegetables and flowers. The volume of export of these products to neighbouring African countries, the Middle East and the rest of the world is growing and in 2008 Ethiopia earned US$ 186 million from horticulture exports of which 80% was generated by flower exports. The floriculture farms engage around 70,000 employees. However, in recent years, floriculture and vegetable growing have become heavy users of pesticides (EHPEA 2012, MoA 2013). This study was conducted in the vegetable and flower growing areas of Ziway, Meki, DebreZeit, Holeta and Addisalem in the Oromia region (Figure 2).

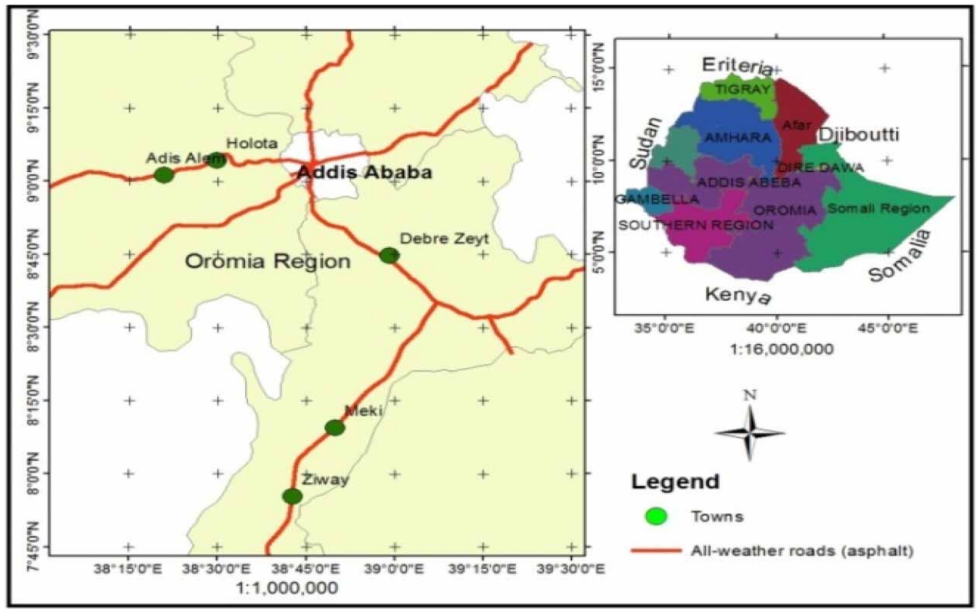


Figure 2. Study sites.
*Source*: Constructed by authors (2013).

To increase the reliability and validity of research through triangulation, Kummar (2005) suggests the use of qualitative and quantitative methods. Hence, this research uses the combination of qualitative and quantitative methods. To assess how, why and under what circumstances the pesticides policy implementation in Ethiopia works, we analysed the information, motivation and resources that different policy actors disposed of when dealing with pesticides registration, inspection and quality control. A number of semi-structured interviews were conducted with relevant public and private actors from federal to district levels between May and November 2012.

(i) A total of 12 in-depth interviews were conducted with policy-makers, including state pesticide experts from Animal and Plant Health Regulatory Directorate (APHRD) of the MoA. The interviews focused on the registration process, inspections and quality control, information, motivation and resources. (ii) Interviews were also conducted with 15 pesticides importing companies randomly selected from a total of 38, and 30 randomly selected pesticides' retailers from Addis Ababa, Ziway and Meki. Fieldwork was conducted in Addis Ababa, because it is the main commercial centre of Ethiopia where the majority of pesticides' imports take place. Ziway and Meki districts have a large number of pesticides' retailers and are important vegetable-producing areas in Ethiopia. However, due to the absence of a detailed list of pesticide shops/retailers at the national or local level, we applied snowball sampling to identify the retail shops that were interviewed to gather information about their interactions with regulatory bodies, their trading practices, inspections and interactions with pesticide users. During the interviews, direct observations on the condition of the retail shops and the licences were also made. (iii) Interviews were also carried out with 65 vegetable farmers to examine the level of support from state or other actors in Ziway and Meki, because these farmers are the main users of pesticides in the country. The *kebeles*[1] in these districts were clustered into rain-fed and irrigation-users. Hence, 65 farmers from the 8 irrigation-user *kebeles* were selected through the systematic random sampling technique. (iv) Because flower growers are potential users of the pesticides in the country, interviews were also conducted with them. Out of the total of 85 flower growers in Ethiopia, 15 were selected, which all had at least 5 years of operation. (v) Further interviews were conducted with 30 development agents (DAs) or extension workers who have a plant science background and work in irrigated vegetable-producing *kebeles*. These DAs were asked about problems they face in running their day-to-day activities and in particular on the key variables: access to information and resources, their motivation and their interactions with local actors.

The data were subjected to both qualitative and quantitative techniques with the help of SPSS (version 19) to extract information on the key variables considered. These key variables were measured using a five-point Likert scale. The reliability of the scales was determined using Cronbach's alpha method. If the result is above 0.5 (50%), this is generally considered to be reliable and acceptable (Eisinga *et al.* 2013).

## 4. Legal framework of state pesticide policy and registration system in Ethiopia

### 4.1. *Pesticide regulatory framework*

Policy plays a vital role in the implementation of any regulatory framework (O'Toole 2000, Mickwitz 2003). In view of this, and by considering the overall issues associated with pesticide, the government of Ethiopia has formulated pesticide legislation at different times in order to govern pesticide use by farmers. The first pesticide regulation was a single article included in the Plant Quarantine Decree No. 56 of 1971 (MoA 2009, PRRP 2012). In this decree, MoA was given the mandate to control the import, production and sale of pesticide in the country. In 1972, the Crop Protection and Regulatory Division was established within the MoA, and plant protection activities started in a more organized manner. As a result, the control of pests

was given more emphasis and pesticide use and sales spread widely. However, this decree lacked the necessary details to establish an effective pesticide registration scheme. In 1990, after persistent efforts from crop protection experts, a Special Decree was approved to register and control pesticides. The Special Decree was based on the FAO guidelines and had 5 sections and 29 articles. According to this decree, the manufacture, import, sale or use of unregistered pesticides is prohibited. However, the decree did not adequately incorporate international obligations and agreements to which Ethiopia is a member. It lacked definitions of relevant technical terms, of the scope and operational provisions of the advisory committee, and of a pesticide register. Little power was given to inspectors and penal sanctions to combat illegal trade were lacking (PRRP 2012, MoA 2013).

In order to address these gaps and to deal with the growing amounts and types of imported pesticides, the government of Ethiopia promulgated a new pesticide proclamation: the 'Pesticide Registration and Control Proclamation' (No. 674/2010) which was enacted in 2010 by the government in cooperation with the FAO legal section (Negarite Gazzeeta 2010). This proclamation gave authority to MoA to regulate all pesticides, including pesticides used for vector control in the public health sector. According to the proclamation, 'all pesticides intended to be used in the country need to be registered in accordance with article 3 (1)'. Many international obligations and agreements are adequately incorporated in this proclamation and it also includes important issues that were not considered in the 1990 Decree. The proclamation has 8 sections and 37 articles and includes the registration of pesticides, certificates for competence and licensing, safety measures, analysis, a Pesticide Advisory Board (PAB), inspectors and some miscellaneous provisions. In this proclamation, the PAB was created under section 7(27 and 28) to assist the APHRD of MoA in formulating national policies, regulations and guidelines for the safe management and use of pesticides and in the implementation of international conventions. The Board consists of nine members including an officer designated by the Minister (Chairperson), an officer in charge of pesticides registration and representatives of different relevant Ministries.

### 4.2. *Pesticides registration procedures in Ethiopia*

The current structure of MoA shows that the Ministry is working on three major sectors: agricultural development, natural resources and disaster prevention and food security. Of these three sectors, agricultural development has most to do with pesticides' management. This sector is divided into four directorates, of which the APHRD is responsible for the development and promotion of the pesticide lifecycle management system including the registration and post-registration activities. Additionally, efficacy tests are carried out by the Ethiopian Agricultural Research Institute and agricultural universities who send their reports and recommendations directly to the MoA for decisions. The regional bureaus are autonomous public bodies responsible for the implementation of regional pesticide issues (MoA 2013).

To promote pesticide governance that protects the environment and human health, Ethiopia has developed a pesticide registration system based on concepts and guidelines recommended by FAO. The overall objective of pesticide registration is to ensure that the right types of pesticides are imported and safely used in Ethiopia (MoA 2009, 2013). Through pesticide registration, the responsible national or regional authority approves the sale and use of a pesticide following the evaluation of comprehensive scientific data demonstrating that the product is effective for the intended purpose and does not pose an unacceptable risk to human or animal health or to the environment (FAO/WHO 2013). It is mandatory to register any pesticide in accordance with the registration guidelines adopted by the MoA before importation and distribution (MoA 2009, 2013). The registration process (Figure 3) is usually carried out through the assessment of data provided by the agent/importer (MoA 2009). These include (1) the application for registration,

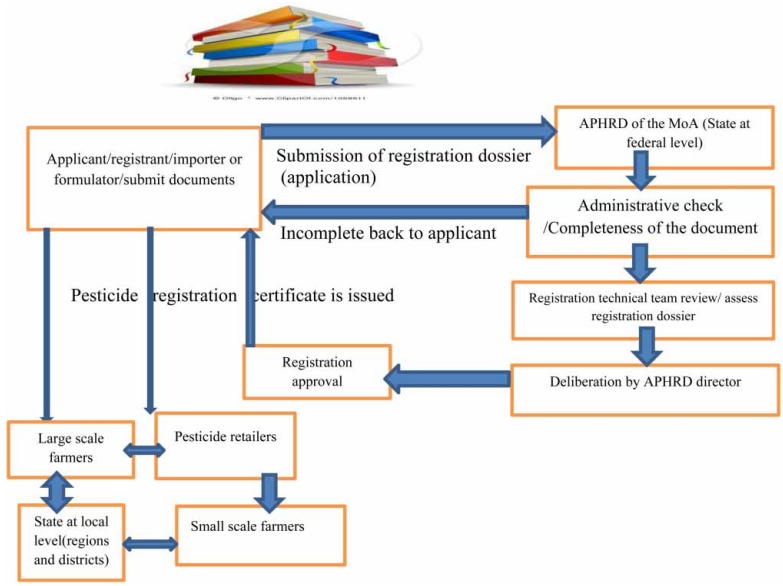


Figure 3. Schematic diagram of the pesticide product registration process.

(2) the active ingredient and formulated product dossier index (chemical and physical properties, toxicology, efficacy, residues and fate in the environment) and (3) country specific requirements such as (i) agency agreement between the agent and the manufacturer; (ii) batch certificate of analysis from independent accredited laboratory test; (iii) locally generated efficacy data from independent recognized research organization; (iv) samples of the pesticide submitted; (v) manufacturing licence in the country of origin of that particular brand by a recognized formulation plant and (vi) label in English and *Amharic* for the intended pest and crop and according to pack size (MoA 2012). The registrant should submit to the registrar a duly filled-in application for the registration of a pesticide and product dossier index (MoA 2009). Once, the application file is complete, it is sent to the pesticide registration technical team of APHRD for evaluation, depending on the pesticide category. The team evaluates the document in detail and gives a recommendation on whether the product in question can be registered or not based on justifiable reasoning. Finally, a summary of the data will be submitted to the director of APHRD for the approval of registration. Subsequently, a Pesticide Registration Certificate is issued to the applicant by the Pesticide Registering Officer. This certificate lasts for five years and can be renewed upon expiring.

Following this procedure, since pesticide registration started, 274 different types of pesticides were registered for agricultural and household uses. Of these, 44 constituted mixtures of 2 or more active ingredients while the rest contained single active ingredients. The year when the highest number of pesticides was registered was 2009. In the year 2008, the year that the Ministry was reformed, only one pesticide was registered. The increase in the number of pesticides registered in 2009 may be accounted for the increased demand and the slowdown of the registration process in the previous year. Pesticide registration declined again in 2010 due to the shortages of foreign exchange (Figure 4). Overall, the registered pesticides included insecticides (34.74%), fungicides (28.36%), herbicides (20.56%), acaricides (4.97%), aerosols (4.69%), rodenticides (2.84%) and anti-transpirants, adjuvants(3.84%) (MoA 2012).

The MoA is responsible for controlling the registration and importation of pesticides by issuing an import permit, provided the application submitted by importer contains the necessary

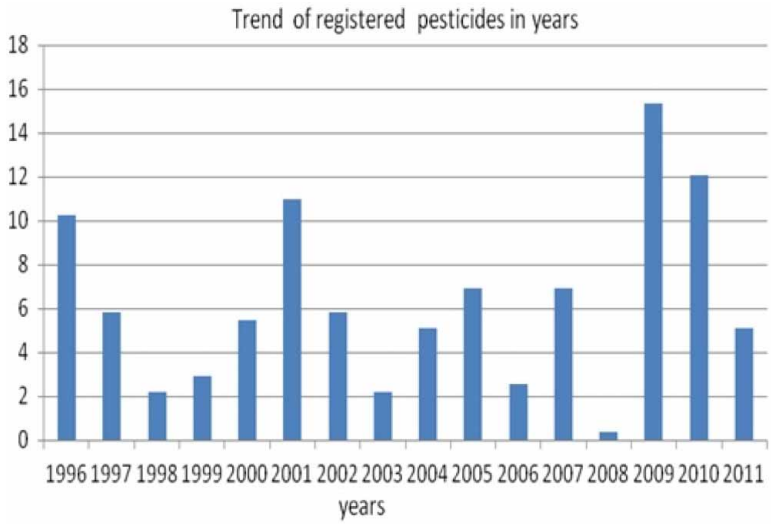


Figure 4. Registered pesticides in Ethiopia.
*Source:* MoA (2012).

data as prescribed by the MoA. Moreover, a pesticide may not be allowed to enter the country unless it is inspected by MoA inspectors and packed and labelled as provided in the proclamation, and unless the importer produces a written permission (import certificate) from MoA.

## 5. The role of policy actors in pesticide policy implementation in Ethiopia

This section reports on the empirical findings regarding the practical problems that the state pesticide policy and its implementation encountered with respect to pesticide registration, inspection and quality control. Our primary focus is on the characteristics of the state pesticide actors involved, particularly their information, motivation and resources.

### 5.1. *Access to information in the implementation of pesticide policy*

Access to information for policy implementers was considered inadequate at the national level and local level and seen as a major operational challenge. There is a lack of information among DAs and experts at the district level. The information gap at the local level was even more pronounced when pesticide policies were considered. When asked about their knowledge of the new pesticide law (proclamation), few respondents immediately referred to the old pesticide Decree of 1990 and all experts reported that they had only heard of the proclamation of 2010, but had never seen it (Table 1).

All APHRD staff from MoA at the national level described themselves as being very familiar with both the 1990 Decree and the proclamation of 2010, but none of the extension workers in both districts claimed to have heard of the pesticide law (1.00, very low information). Also, all pesticide retailers at the district level noted that they are not familiar with the proclamation of 2010. In theory, in the decentralized system of Ethiopia, decision-making is shifted to the local level but in practice the top-down approach is still in place. APHRD has only 12 experts in 2 teams dealing with quality control, risk assessment, inspection and certification. The lack of experts is a significant challenge to disseminate information on the pesticide policy with a simplistic approach.

Table 1. Information of state actors: $n = 30$.

| Items | Mean | Standard deviation/std | Ranking |
|---|---|---|---|
| *Information/technical knowledge* | | | |
| I am informed on pesticide law (proclamation) | 1.00 | 0.00 | Fourth |
| I have the necessary knowledge, and skill to identify symptom of pest attack? | 3.10 | 1.09 | Second |
| I know different pesticide application methods | 3.26 | 1.11 | First |
| I have technical knowledge on field diagnosis of pest | 2.50 | 1.13 | Third |
| *Grand mean* | *2.46* | | |

Cronbach alpha ($\alpha$) = 0.70.

Additionally, empirical findings showed that the lack of technical knowledge among DAs and extension supervisors, dealing with pesticides at the local level, is a major barrier for safeguarding the current pesticide distribution system and use in Ethiopia. The DAs reported that they have no enough information and technical knowledge of the hundreds of different agricultural pesticides that are available in the market. The survey revealed that the DAs technical knowledge to identify symptoms of pest attacks is moderate (3.10) as well as their knowledge of pesticide application methods (3.26). However, their knowledge of field diagnosis of pests, diseases and weeds is low (2.50), so performing this is likely to go beyond the capability of many field extension agents. Some DAs blamed the existing curriculum for this lack of knowledge, but most DAs pointed out that the trainings given were mainly theory-based with inadequate practical application due to shortage of the equipment, practical tasks, labs, tools and teaching materials. For instance, all the interviewed farmers in Ziway and Meki districts stated that they faced crop diseases during the 2011/2012 crop season and that they used pesticides to control pests and diseases. The most common pesticides currently used by vegetable farmers are DDT, Malathion, Seleron, Thionex, Mancozeb and Ridomil. Besides, farmers are using highly toxic, broad-spectrum pesticides (e.g. lambda-cyhalothrin and aluminium phosphide) (PRRP 2012). Pesticides whose use is restricted in industrialized countries are widely used in Ethiopia. For example, DDT (banned in 49 countries) is used in Ethiopia for the control of the mosquito malaria vector and against agricultural pests by small-scale farmers. Similarly, Stadlinger *et al.* (2013) found that pesticide dealers in developing countries misguide farmers by convincing them to buy excessive quantities of often more toxic pesticides that lead to severe health exposures. The absence of knowledgeable personnel in most retail shops does not comply with both articles eight of FAO code of conduct on pesticide distribution and use and the Ethiopian Pesticide Proclamation No. 2010, which aims at ensuring advice on risk minimization and proper use of pesticides. The average age of the pesticide retailer was 33 years. The youngest retailer was 12 years old, which is against the FAO guidelines on retail distribution of pesticide: 'pesticide must not be sold to a minor, usually any person below 18 years of age'. Only 6 of the 30 interviewed retailers had a formal education regarding pesticides at higher education institutions and the remaining 24 had no agricultural background or at least one year of related work experience or training. During the interviews, most farmers responded that they do not receive adequate technical assistance and information on the safe handling, storage and recommended doses from the official state extension services. Lack of information and advice are shown to inhibit safe use and handling at the farm level.

Information is normally considered vital in environmental governance (Mol 2006, 2009). Therefore, vegetable farmers were asked about their main source of information for crop protection measures and the majority (41%) responded that they depend on their own experience (Table 2).

Table 2. Source of information for pesticide ($n = 65$).

| Items | Percentage |
|---|---|
| Their own experience | 41 |
| Retailers when buying pesticides | 25.6 |
| Government extension services | 22.1 |
| Their neighbours' experience | 11.3 |

Table 3. Difficulties faced in using pesticide ($n = 65$).

| Items | Percentage |
|---|---|
| High price | 53 |
| Low quality (resistance) | 48 |
| Lack of safety devise | 9 |
| Unavailability when it is needed | 0 |

Although the competence of retailers is questionable, 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. There is little direct contact between the farmers and the state DAs at the farm level. Interviewed farmers (68%) stated that they contact DAs only when they face particular problems and not so frequently. This implies that there is a very low level of interaction between farmers and extension agents. The extension supervisors indicated that one of the main reasons for the limited contact between the farmers and extension agents is the relatively small number of DAs. The average farmer to DA ratio was 980:1, which makes regular visits clearly beyond their reach.

This lack of advice and technical support for farmers on pesticides use may lead to different problems. Indiscriminate use, high frequency of application and application of similar pesticides may lead to pest resistance and indirect costs (Oluwole and Cheke 2009). During the survey, we observed that farmers were spraying pesticides on perishable vegetables without clear sign or symptom of pest/disease presence. Mixing two or more pesticide products (fungicides with insecticides) was a usual practice in Ziway and Meki districts as mentioned by plant protection experts.

The survey showed that the high price of pesticide is the most common constraint (53% of the farmers), forcing them to use pesticides with low quality (potentially contributing to resistance). Reduced efficacy of pesticides is encountered by 48% of the farmers (Table 3). There is perhaps a large number of farmers who bought their pesticides from unauthorized retailers, indicating that quality problems exist in the pesticides' distribution network.

### 5.2. *Motivation of policy actors in the implementation of pesticide policy*

The motivation of state actors is crucial to transfer knowledge to farmers and enhance the implementation of policy at the farm level. Motivation is orienting behaviour, but it cannot be measured directly. So is job satisfaction, the presence of promotion opportunities and the level of salary are used as proxy indicators (Table 4).

Regarding interest at work, about 12 (out of the 30) respondents said that they were interested in their job. The majority of the subjects (18) said that the salary they earned was not proportional to the workload they had (2.03). This might be an important reason for disliking their job. One DA said, 'I became a DA just for the sake of survival without any motivation for working in rural areas'. He also pointed out that he lacked motivation for his job because there were few incentives

Table 4. Motivation of state actors ($n = 30$).

| Items | Mean | Std | Ranking |
|---|---|---|---|
| *Motivation* | | | |
| Frequent organizational restructuring on the current job is satisfactory | 2.13 | 1.22 | Fourth |
| In-service training, and skills development on the current job is satisfactory | 2.70 | 1.36 | First |
| The work itself is interesting | 2.30 | 1.44 | Third |
| Career structure that promotion on current job is satisfactory | 2.43 | 1.45 | Second |
| Salary is encouraging | 2.03 | 1.27 | Fifth |
| *Grand mean* | *2.31* | | |

Cronbach alpha ($\alpha$) = 0.77.

and facilities (such as clean water, electricity and internet). Moreover, low social appreciation and tiresomeness of the profession were also mentioned. We observed that some DAs were exhausted; they lacked physical happiness during their work. Therefore, both the actual observations and interviewees' responses illustrate that most DAs have little interest and motivation in staying in their profession.

A main factor undermining the motivation of DAs is lack of training. This study revealed that in-service training, in the form of orientation training for new staff, refresher training and career development training are not available/accessible (2.70). As many of the DAs in Ethiopia are diploma holders with very limited technical skills, it is expected that their involvement in in-service training programmes will benefit them a lot in advancing their skills and build confidence in what they are doing. However, this does not seem to be a priority for the authorities, because most DAs reported that they did not receive any in-service training on pesticides since they had begun working as extension worker. Similarly, the top 5% of DAs (selected for the best performance) are allowed to upgrade themselves to the BSc level. This is because promotion, reward and incentive systems will attract and motivate DAs. However, the lack of a clear career structure that includes incentives, promotion, awards and/or other opportunities (e.g. scholarships) for extension workers remains a major constraint and causes low motivation/lack of satisfaction (2.43). During the interviews, some DAs pointed out that district experts usually evaluate DAs' performance on the basis of their political accomplishments rather than their performance of professional duties. Additionally, supervisors and DAs are not trained as inspectors, so they have little understanding about what is going on in the retail shops at the district level. This has serious implications for quality control of pesticides at the local level.

The frequent restructuring of MoA and the regional bureaus of agriculture is found to be another major factor affecting the motivation of staff. Informants reported that organizational restructuring has taken place at least every two years in Ethiopia, often without evaluating the impact of the previous restructuring. Performance indicators to measure the success or failure of the current extension programme do not exist. Restructuring the public sector including MoA involves the dismantling of some departments and creating new ones. Although government officials aim at improving the quality of service provision through restructuring the organizations, most respondents expressed their views that restructuring has been used as a means for political revenge through sacking staffs affiliated to opposition parties. When an organization goes through frequent restructuring, the motivation of employees will be significantly affected (Karwai 2005) and tensions created among the employees, who are scared of being fired or reallocated to inaccessible areas. All these might discourage actors to serve and strive towards institutional goals. For instance, in the study areas where pesticide use is intensive and many retail shops are located, no pesticide inspector was found.

### 5.3. *Resources of policy actors in the implementation of pesticide policy*

The implementation of a policy is influenced by the resources of actors (Van Horn and Van Meter 1977). So, financial and human resources are core variables for determining policy implementation. During our survey, we observed serious resource constraints that affect pesticide registration, distribution and use at federal, district and most *kebele* levels. For instance, at the federal level, most of the experts have at least an MSc-degree, but their expertise is not evenly distributed along the broad range of subjects that are relevant for dossier evaluation of pesticide registration. There are three pathologists, two biologists, one herbologist, two chemists, two entomologists and two inspectors. However, as informants from APHRD mentioned, the current registration is hindered by lack of skilled manpower in pesticide dossier evaluation, lack of nationally applicable criteria for the acceptability of pesticides, delay of the efficacy trial, lack of pesticide laboratories to test samples, submission of incomplete documents by registrants (importers), failure of committee members to attend meetings regularly, insufficient post-registration monitoring on imported pesticides, and not yet developed analysis of pesticide distribution and use statistics (Table 5).

At the local level, the study indicates that the majority of the extension workers respond that there is a lack of appropriate extension material (2.23), like images of pesticide warning symbols. This implies that appropriate teaching aids and guidelines have not been given to the DAs to effectively work and communicate with the local farmers. It is striking that all the DAs stated that they have received just one type of extension material (like hand-outs or booklets) over a period of three years. Apart from problems with an extension material, districts also face a serious lack of adequate transportation facilities. The DAs pointed out that inadequate transportation facilities (2.40) cause a major barrier for their efforts to assist farmers in their use of agricultural inputs including pesticides. This problem should be seen in the context of the districts' and *kebeles*' poor infrastructure. About 70% of all farms are located at more than 4–6 hours walking distance from the office of the extension agents. The DAs reported that they have to travel up to 10–12 km to visit some of their target farmers and about 52% of them have to do this on foot and the remaining 48% use motorcycles or bicycles. Another constraint is the shortage of human resources (DAs) when assisting the farmers. The DAs in the study districts face heavy workloads for at least two reasons. First, a large number of farmers are assigned to them leading to disproportionality (1.86). For instance, in Ziway, the average extension worker to farmer ratio is 1:964. In Meki, this is 1:878, which is beyond everyone's reach (AoD 2012). As a result, most DAs are forced to cover the gaps by providing support and training to farmers outside of their field of study. Once DAs are assigned a position, they must serve as generalists, rather than as specialists. For example, when a farmer approaches a DA, he has no idea that the DA is a 'specialist' in a particular field. The farmer may ask for advice on a wide range of subjects and is dissatisfied if the DA cannot help him or her to resolve the particular problem.

Table 5. Resource of the state actors ($n = 30$).

| Items | Mean | Std | Ranking |
|---|---|---|---|
| *Resources* | | | |
| Transportation facilities are sufficient to access farmers | 2.40 | 1.45 | First |
| The number of DAs assigned to farmers is proportional | 1.86 | 1.66 | Third |
| Extension materials are available to effectively work and communicate with the farmers | 2.23 | 1.33 | Second |
| *Grand mean* | *2.66* | | |

Cronbach alpha ($\alpha$) = 0.79.

At the federal level, informants from APHRD stated that at present, the registration process is carried out through the assessment of data provided by the registrant (importers) themselves. Trial data from the country of origin are submitted to the APHRD and the values of efficacy and safety were obtained from the Codex Alimentarius or EU-MRL databases. The registration process is not supported by the independent laboratory test because MoA has no facilities to determine and control the quality of the pesticide. There is no in-depth inspection and control over inert active ingredients, while pesticides with the same active ingredients can vary a lot in efficacy and toxicity due to differences between the inert ingredients used. Pesticides with similar names may also have been registered differently as active ingredients and mixture of inert ingredients.

The pesticide inspectors pointed out that the absence of laboratory facilities to take samples and test its quality makes the inspection process very difficult as well. The inspectors are expected to take samples from the markets and at the points of entry for laboratory analysis. However, without laboratory analysis, it is very difficult to identify fake and substandard products that are held by retailers, traders, transporters or farmers. Additionally, as explained earlier, shortage of qualified experts is not limited to the agricultural offices at the district level, but also to the regional bureaus of agriculture and even to MoA. Pesticide users, especially small-scale farmers, in Ethiopia lack resources, information and training to avoid risky practices. Therefore, awareness raising in pesticide usage and handling needs to be set up at a relatively large scale to reach subsistence farmers and other pesticide users.

## 6. Output of the pesticides policy implementation process

The policy implementation process, analysed in the previous section, directly influences the output of the pesticide policy in Ethiopia. Despite the formal authority (Article 30(1)) pesticide inspectors have to carry out periodic inspections of facilities for pesticides, very few importers, retailers or growers report to have been inspected (Table 6).

This research shows that 12 of the 15 importers responded that MoA never inspected their pesticide stores unless inspectors were invited for inspection as a pre-condition for the renewal of licences by the Ministry of Trade and Industry. Also none of the inspectors pointed out that they had conducted a regular inspection of pesticide storage facilities owned by importers to ensure compliance with statutory regulations during the 2011/2012 crop year. This situation may lead to misconduct by corrupt or illegal pesticide dealers who import pesticides unlawfully and stock unauthorized pesticides on their sites. Interviews with pesticide retailers revealed that none of their shops had ever been inspected by the inspector from district or federal state. More specifically, pesticide traders are required to have a Certificate of Competence (CoC) from the appropriate regulatory body, but none of the retailers had a CoC. Another requirement for pesticide retailers is to have a licence to guarantee quality control and it is the responsibility of the regulatory authorities to assure this. From the 30 interviewed retailers, 7 had no valid licence to sell pesticides, 14 had licences but they were not renewed and only the remaining 9 had renewed valid licences. Most retailers were not even aware that pesticides were supposed to be registered with APHRD before they were allowed to sell them.

Table 6. Interaction of state pesticide inspectors with traders and growers.

| Pesticide actors | Samples (*n*) | Inspected | Not inspected |
|---|---|---|---|
| Pesticide importers | 15 | 3 | 12 |
| Pesticide retailers | 30 | 0 | 30 |
| Small-scale vegetable farmers | 65 | 0 | 65 |
| Commercial cut flower growers | 15 | 4 | 11 |

Ethiopia lacks an effective supervisory mechanism for controlling pesticide overuse and pesticide residues at farmsteads. None of the vegetable farmers in Ziway and Meki districts had been inspected and this may contribute to misuse of pesticides by small-scale vegetable farmers. Similarly, 11 of the 15 flower farms in our sample responded that they were supervised or inspected neither by MoA nor by other relevant actors from federal or regional government offices for health, environment or social affairs during the last two years. Although labour inspectors have the mandate to enter the workplace, take samples and investigate the health situation of workers, none of the sampled farms were inspected by them.

Additionally, considering the urgency of addressing pest problems in floriculture, the government made an interim arrangement for flower growers to allow the import without restrictions of unregistered pesticides they required for their own farms. Although this arrangement was important to solve the problem temporarily, it should not become a permanent situation. Still the government did not try to stop this special interim arrangement by providing a legal frame for pesticide regulation and protect the country from a pile of obsolete pesticides.

Policy implementation has also suffered from the absence of active collaboration between the relevant state pesticide actors. The PAB was so weak that it was identified as a major contributor to the failure of pesticide registration. In the current board, some very important private stakeholders such as the pesticide importers and local producer company, and Ethiopian Horticulture Development Agency are missing. Similarly, there is very poor communication between the federal and regional authorities as well as between the regional- and district-level authorities in issues related to pesticide governance. For instance, districts, zones and regions have no data regarding registered pesticide in Ethiopia, and this is only available at the federal level. Similarly, there is a lack of recording pesticide distribution and use at *kebele*, district, region, or federal levels. The only available data are based on import figures. Moreover, Ethiopia is a large country with thousands of kilometres of porous borders with five countries, which makes illegal pesticides' imports easy.

Monitoring and surveillance can help to identify pesticide pollution, spot dangers and provide useful information to refine risk assessment for registered pesticides under re-evaluation (FAO/WHO 2013). So far, however, systematic monitoring and surveillance are lacking and the regulatory body has no information regarding the products once they are registered. Besides, there is no Pesticide Stock Management System to monitor the distribution and use of imported pesticides. The only available records are about import data.

## 7. Conclusions and recommendations

Ethiopia has a relatively well-developed pesticides legislation on registration and control of pesticides intended to address its environmental and health effects. The overall conclusion from the study is that there are gaps between policy and practice. The gap and the challenges implied by its implementation is the main barrier to realize sustainable agricultural production. These findings have a number of implications for environmental policy and agricultural sustainability in general and the pesticide policy in particular. The central argument in this paper is that policy implementation processes are interaction processes between actors with their respective information, motivations and resources. The spectacular failure of the pesticide policy implementation in Ethiopia is mainly due to factors pertaining to the motivation of governmental actors to further elaborate the support system and address the administrative and material obstacles for building proper registration, distribution and use of pesticide. In Ethiopia, policy-makers in control of pesticide quality have not only to 'talk the talk' in creating policy but also to 'walk the walk' by implementing their policies to achieve sustainable agriculture. In view of this, weak policy implementation exposes communities and the environment to the side effects of pesticides and it is often the

poorest people who, indirectly, are most negatively affected by weak institutions (Baba 2012, Hoi *et al.* 2013, Stadlinger *et al.* 2013).

Most importantly, our study reflects on the governance literature. Private governance, which is the stronger involvement of non-state actors and a shift of state tasks and responsibilities to them, requires a 'policy space' for non-state actors, provided by the state (Sharpe 1985, Peters and Pierre 1998, Mol 2007). In relation to this, the governance literature, as well as current development strategies, has shown the importance of the involvement of private actors next to the public sector, requiring important changes in the public sector institutions and policies (Peters and Pierre 1998, De Vries *et al.* 2005, Pretty *et al.* 2011). The lessons being drawn from this paper point to the significance of moving concretely to governance reforms in Africa, related to among others transparency and more close involvement of non-state actors. State failures seem to be commonplace in environmental policies in most African countries, caused by weak recognition of sustainability in most policies, the absence of a national programme for the promotion of sustainable consumption and production, lack of enforcement capacity, weak institutional capacity for monitoring and lack of decentralization to local authorities, among others (Oosterveer 2009, Pretty *et al.* 2011). With a growing population, Africa is in urgent need of increasing agricultural production, which will unquestionably increase the use of pesticides. As demands for pesticides increase, effective pesticides policy implementation becomes even more important. The overall situation with regard to pesticide governance in Africa consists of a number of elements. There is an inadequate awareness of the possible risks posed by pesticides among major segments of the African population. This is further complicated by the general lack of reliable data and information on toxicity, safe use and sound disposal practices for pesticides. Insufficient international cooperation and very slow progress in defining national, regional and international best available technologies/safe pesticide alternatives make that pesticide risks in Africa remain inadequately recognized.

Harmonization and cooperation in pesticide of trade and policies among African countries could contribute to strengthening policies and strategies for the implementation and enforcement of sustainable governance of pesticides. Best practices exchange has been promoted to some extent by, among others, the formation of National Cleaner Production Centres, which now exist in 11 African countries. Additionally, some African countries, most notably Nigeria, Senegal and the Gambia, have started implementing the Globally Harmonized System of Classification and Labelling of Chemicals, which can provide a more integrated approach to pesticides management, not only in Africa (Baba 2012, Kateregga 2012, Bennett and Franzel 2013).

Finally, political will and commitment for collaboration between state and private actors (farmers, companies, NGOs, etc.) at multiple scales could play an important role in overcoming failures in pesticides policies. Besides comprehensive human and institutional capacity development of all actors involved in the manufacture, distribution and use of pesticides, the emphasis should be on alternatives to pesticide-based agriculture, such as the adoption and implementation of integrated pest management and the promotion of organic agriculture, with its use of multiple non-pesticide production methods (Oosterveer *et al.* 2011, Pretty *et al.* 2011, Bennett and Franzel 2013).

**Acknowledgements**

The authors are grateful to Wondu, Dr Bekalu, Kassahun and Teshager for their assistance with the paper. We are thankful to staff of APHRD of MoA, Ziway and Meki agricultural offices for providing necessary data. We are also very grateful to anonymous reviewers and editors for their insightful comments.

## Funding

This study was supported by the pesticide risk reduction programme (PRRP)-Ethiopia and Alterra, part of Wageningen UR (The Netherlands). Additional support was provided by the Netherlands Fellowship Programme.

## Note

1. The lowest administrative unit in Ethiopia.

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