

Innovation platforms for Institutional change: the case of Pesticide Stewardship Network in the Ethiopian Rift Valley

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Abstract: Ethiopia grows a wide range of crops for domestic use and the export market. Widespread use of more and newer range of pesticides, with different levels of persistence, associated with growth in the crop production sector, combined with aerial spraying programs against migratory pests have reached critical proportions in farming areas of the Ethiopian Rift Valley. A part of our research has been to study the threat posed to human health and the environment by the accumulation of pesticides in the region. We have also been viewing the Pesticide Delivery System (PDS) in Ethiopia as comprising of policy makers, researchers, pesticide manufacturers, wholesalers, vendors, civil society and farmers as end users. Based on the premise that all actors and institutions in the pesticide delivery system have to be engaged in efforts to reduce pesticide hazards, a multi-actor network of all institutions in the national PDS was established and legally registered in Ethiopia as the Pesticide Stewardship Association (PSA). System-wide pesticide stewardship implies the building of a shared sense of responsibility within institutions at all levels of the PDS to bring about an ethic of reduced and responsible use of pesticides to minimise the impact on human and environmental health. The network was viewed as a platform for collaborative learning and collective action driving institutional change at many levels. National, regional and local level engagement of the actors in the PDS has been attempted and these took the form of policy dialogue workshops, pesticide risk communication and risk reduction dialogues involving local authorities, and action oriented training workshops and Farmer Field Schools among vegetable and cotton growers. This paper will discuss the opportunities and barriers associated with the functioning of the multi-actor network across the PDS as an innovation, and the utility of 'stewardship' for systemic transformation when it is adopted by the pesticide industry as well as those working towards reduction of pesticide use, in the low income farming sector in Ethiopia.

Keywords: Innovation platforms, Institutional change, Pesticide Stewardship, Ethiopian Rift Valley

Introduction

Agriculture has been the mainstay of Ethiopia's economic development policies and strategies as well as a sole means of livelihood for 85% of the population mainly comprising small holder farmers. In line with this, pesticides have been promoted as pest control mechanism for better crop production since 1960s. Pesticides were introduced to Ethiopian smallholder farmers during the implementation of comprehensive integrated package projects in different parts of the nation. These projects include the Chilalo Agriculture Development Unit (CDAU, 1967), the Wolayta Agriculture Development Unit (WADU, 1970) and the Minimum Package Projects (MMP, 1971). Plant protection activities, however, started in an organized manner after the establishment of the crop protection and regulatory division in the Ministry of Agriculture in 1972. Since then the PDS of Ethiopia involved different actors with minimum integration of working together towards mitigating pesticide risks on human and environmental health. Moreover, excess purchase and prolonged storage of pesticides, excess donation and importation of unsuitable products without prior identification of their efficacy left Ethiopia with over 3,000 tonnes of obsolete pes-

ticides dispersed over 800 sites. This also created hazards to human health and the environment; and after a long outcry of local communities, the disposal of obsolete pesticides was finalized in the year 2013 (MoA, 2013). The resource used to collect, transport and dispose these products was more than what was used to purchase them. The hidden cost on human health and the environment is usually unaccounted.

Taking this into consideration, the Ministry of Agriculture (MoA) of Ethiopia and the Desert Locust Control Organization for Eastern Africa (DLCO-EA) in collaboration with the United States Agency for International Development (USAID) initiated a dialogue forum of all actors in the PDS of Ethiopia in 2009. The actors in the forum appreciated the gravity of the problem and proposed the establishment of an action oriented, policy directed pesticide stewardship network of all actors which can work on institutionalizing the idea of ethical approach to mitigate human health and environmental impacts of pesticides. Following legal procedures of the Charities and Societies Agency of Ethiopia, the network was established and formally registered as Pesticide Stewardship Association (PSA) and have been working at national, regional and local levels since 2011. The national level of action facilitates the policy dialogue among actors in the Pesticide delivery system. The regional and local level action takes place at the Ethiopian Rift valley where high amount of pesticides have been used for vegetables and cotton production.

The point of departure for bringing all actors in the PDS together is that every one of them have been working in a dispersed manner for over 40 years. All have been engaged in the work of crop production and economic development that they believe would be achieved through the use of pesticides but who gave little /or no practical action in mitigating the environmental and human health impacts. They were working independently of each other with different and contradicting agenda with regards to the impacts of pesticides to human health and the environment. This also led the grassroots end user farmers to consider pesticides as means only to protect crops from pests without any side effect. The practice on the ground, however, have been more poisoning of people and continued pollution of the environment. The dialogue, therefore, revealed that there was felt need for networking amongst actors which required institutional innovation (Woodhill 2010) so as to lead the required change in the PDS.

This paper examines the process of actors' dialogues through the lens of environmental communication and will discuss the supporting and inhibiting factors of the network built on stewardship as the binding concept and its potential for supporting institutional innovation and driving change towards reduced and responsible use of pesticides.

Conceptual framework for the study

Risk perception and risk communication

According to the World Health Organization (WHO, UNEP 1990) acute pesticide poisoning affects three million people and it accounted for 20,000 unintentional deaths each year of which the majority of farming communities in developing countries continue to be disproportionately affected. Studies in Ethiopia also indicated that impact of pesticides to human health and the environmental are high and this is associated with low level of pesticide risk perception among end users (Mekonnen and Agonafir 2002; Williamson, Ball et al. 2008). The economic development strategy of Ethiopia; which is based on Agriculture Development Led Industrialization (ADLI) promotes utilization of high agriculture inputs for better crop production (MoFED, 2002). This strategy, however, lacks dealing with pesticide risk communication so that it can contribute to the envisaged sustainable development of the nation.

Risk communication with farmers depends on the perception of farmers if that risk is immediate and visible (Peres, Moreira et al. 2006) which otherwise is considered as non-existent. In order to deal with risk communication and risk reduction there should be a common individual and group perception of the existence of risk (Tierney 1999; Breakwell 2000) and concerted effort to reduce it. Breakwell (2000) also emphasized that it was useful to know something about the basis for risk perception in order to understand the impact of risk communication. In order to narrow the actual impacts of pesticides and risk perception of farmers, two models of risk communication indicated by Cox could be used in the process of a research which envisions bringing about change. These models are technical model of risk communication which deals with translating numerical assessments of pesticide risks to farmers; and cultural model of risk communication which revitalizes local knowledge of affected farmers together with laboratory model of risk assessment (Cox 2012). This process, therefore, needs the involvement of both affecting and affected actors. The approach of risk communication in developing countries is, however, mostly blamed for not involving affected communities /the target audience (Rother, 2011) which is considered as the main cause for not bringing the required change. Networking of people and interaction among organizations (Sherwood 2009) could be one approach of involving influenced and influencing actors for the required change.

Stewardship

The concept of stewardship emerged as a responsibility for wise use and management of natural resources. When it is used in the natural resource management context, it takes the concept of “sustainability” which indicates the balanced account of the present society, future generation and other species (Worrell and Appleby 2000). In its broader approach, this comprises anthropocentric and eco-centric concepts which became the foundation for the biggest application of the word in forest stewardship council, marine stewardship council and many more natural resource use/management fields to exemplify institutionalized ways of promoting responsible behavior among users. In a more anthropocentric way of its definition, the World Health Organization indicated stewardship as the responsibility of the government for careful and responsible management of the wellbeing of the population (WHO, 2002).

When it comes to pesticide related and business approach, the use of the word stewardship has got a connotation of taking care of “products” with little or no mention of human health and environmental protection. The Pesticide Stewardship Council and Crop Life International (the association of pesticide producing industries) defined pesticide stewardship as “*the responsible and ethical management of a plant protection or biotechnology product throughout its lifecycle to support sustainable agriculture*” (Jones, 2006). This definition entirely focuses on pesticides as “product” and leaving out the responsibility from users’ point of view. Pesticides, however, pose risks and hazards to human health and the environment because of which the definition required “users’ stewardship” as an ethical approach to complement the only business approach of “product stewardship”.

Innovation platforms and intermediaries

If a problem persists in a society for a long period of time, repeating the usual actions taken to solve the problem may not bring the desired change. Leaving the way of business as usual and attempting to carryout actions that combine technical, institutional and organizational change is referred as innovation (Nederlof and Pyburn 2012). This first attempt (innovation) also needs meetings/platforms of those who perceive the same problem and agree to solve it (Röling 1994). Actors of the innovation platform on the other hand set their own rule/ institutions (Ruttan 1989) that can facilitate coordination amongst themselves so that everyone can act responsibly in the platform. This, however, cannot happen by itself without facilitation of the platform processes

(Röling, 1994). The facilitation, therefore is usually handled by innovation intermediaries (Howells 2006) or innovation brokers (Kilelu, Klerkx et al. 2011) who could be persons or organizations who can facilitate the interaction of the platform processes so as to bring the required institutional change.

Application of concepts to this paper

Pesticide Stewardship Network/Association in this paper appreciates the environmental and human health impacts of pesticides and tries to mitigate/solve the problem through institutional change. Ethic of pesticide stewardship, in this context, is defined as “the responsible and safe management of pesticides in a way it minimizes/avoids the possible hazard to human health and the environment”. This comprises both anthropocentric and eco-centric approaches by caring and recognizing the value (Berry 2006) of pesticide “users” so as to internalize the notion of “Ethic of pesticide users’ stewardship” as a rule (Ruttan 1989) which can lead towards institutional change in the PDS.

As innovation requires the involvement of different disciplines (Fagerberg, Mowery et al. 2006), this first attempt of multi-stakeholder engagement of actors in the PDS is believed to lead towards an innovation platform (Fagerberg, Mowery et al. 2006; Röling, 1994).

The initiative of pesticide stewardship network in the very beginning was facilitated by the Ministry of Agriculture (MoA), Desert Locust Control Organization for Eastern Africa (DLCO-EA) and the United States Agency for International Development (USAID). After the establishment and legal registration of Pesticide Stewardship Association (PSA), a PhD student at the Swedish University of Agricultural Sciences (SLU) and two diploma graduate field agents of PAN-Ethiopia (an Ethiopian NGO) have been acting as intermediaries who are facilitating the processes.

Methodology

In order to bridge the gap among actors in the PDS of Ethiopia; and to create a common forum for communication, participatory action research was followed as the main research philosophy and methodology. Participatory action research methodology follows the cyclic process of planning, taking action, evaluation of the actions which leads to further planning and more iterations of the cycle (Coghlan and Brannick, 2010). In addition to bringing about change on the ground, the Systemic Action Research process results in learning through reflection at different levels, within and among the institutions and individuals involved in the research process (Packham and Sriskandarajah 2005); (Arévalo, Ljung et al. 2010).

Participatory workshops were used as the main methods of contributing as well as enacting the network at different levels of the PDS and as the essential activity for the platform to be functionally realised. This paper is, therefore, based on the empirical work on participatory workshops conducted amongst all actors in the PDS, the processes underwent and practical activities at policy makers and grassroots level. The process of a pesticide stewardship network inception workshop and reflection of actors on the gaps in the PDS, pesticide stewardship association workshops and follow-up linkages and actions are also discussed.

Table 1: Summary of participatory workshops

No.	Event	Location and date	Participants	Intended purpose	outcome	Follow-up events
1	PSN Inception workshop	Aug.23-27, 2009; Nazareth, Ethiopia	MoA, EPA, DLCO-EA, Croplife, Universities, Research Institutions, Media, NGOs, USAID	-Initiating participatory dialogue among actors in the PDS	-Felt need for networking	Establishment of PSA
2	PSA workshop	July 25-26, 2011; Nazareth, Ethiopia	All indicated above and SLU	Policy level dialogue for institutional change	Collaboration of actors in the PDS to mitigate pesticide impacts	Policy level and grassroots actions
3	Pesticide risk reduction & Risk communication workshop	July 27, 2011; Ziway, Ethiopia	All in No.2, local government representative, district advisors, flower farms and small holder farmers	Pesticide risk mitigation	Risk communication dialogue started	Risk communication trainings and vegetable IPM
4	Cotton IPM-FFS workshop	July 29, 2011; Arba Minch, Ethiopia	All in No.2, local gov't, district advisors and cotton farmers	Promoting IPM-FFS as a means to mitigate pesticide impacts	Farmers engaged in IPM-FFS	Sustainable cotton and organic cotton production underway

Findings

Actors reflection on Pesticide stewardship network inception workshop

Reflection of the ministry of Agriculture and regional agriculture bureaux

The Ministry of Agriculture has been responsible for registration and control of the import of pesticides. Pesticide samples were randomly taken by research institutions and analyzed to confirm if the products meet the required quality specification. Through such procedure, the import of unregistered pesticides, pesticides that did not comply with Ethiopian pesticide registration and control requirements and excess import of registered ones were controlled. However, an interim procedure was also made for flower growers to import pesticides including unregistered ones.

The national distribution of pesticides ranges from pesticide producers/importers and retailers to small-scale farmers. Even though traders rarely have appropriate training on use and they are mostly biased with marketing of the product, most smallholder farmers receive advice on pesticide use from the traders.

It was also indicated that many pesticide users in the country lack resources, information and training to avoid risky practices. They said that poor practices resulted in spillages, over spraying and leaking. Pesticide poisoning to humans and damages to natural vegetation, natural enemies, beneficial insects (e.g. bees) and the environment occurred in different areas as a result of using high amount of highly hazardous and broad-spectrum pesticides.

As a pesticide problem prevention measure and in order to promote alternatives to pesticides, cotton Integrated Pest Management (IPM) through Farmers' Field School (FFS) scheme was introduced in Southern Nations, Nationalities and Peoples Region (SNNPR) in 2006. As the result of this scheme, government facilitators gained a better understanding of an eco-friendly way of cotton production. This in turn resulted in getting higher yields at less costs with no or minimized pesticide risks to farmers and to their environment. However, this activity was project based and the follow-up by the ministry interrupted as the project phased out.

Reflection of Crop life-Ethiopia as a representative of the pesticide industry

Crop life Ethiopia, the Ethiopian branch of Crop Life international (CLI), indicated that the main objective of the association is to assist its member companies in their endeavor to import and distribute safer and effective crop protection products.

Crop life Ethiopia declared that it promotes and encourages the responsible and safe manufacture, pack, store, transport, distribute, and use of crop protection products in a manner that does not damage the environment. The representative also said that the association disseminates relevant information concerning the crop protection products to the general public and Creates awareness, coordinates, expedites and assists in safe and responsible handling and use of crop protection products. As part of the Crop Life International's Product Stewardship activity, Crop Life Ethiopia had been facilitating the financial and technical support of CLI in the Africa Stockpiles Program (ASP) which was a multi-donor assistance project to dispose 3,000 tones of obsolete pesticides from Ethiopia.

Reflection of Desert Locust Control Organization for Eastern Africa (DLCO-EA)

The Desert Locust Control Organization for Eastern Africa (DLCO-EA) is a Regional pest and vector management organization established by member countries in 1962. Initially, the Organization was mandated to promote control operations and forecast techniques against upsurges and plagues of the Desert Locust, *Schistocerca gregaria* (Forsk.). Later, the mandate was extended to include better management of infestations of other migratory pests, such as the larvae of the African Armyworm moth *Spodoptera exempta* (Walker), the Grain-eating birds *Quelea quelea* (Linnaeus) and the Tsetse fly that transmits the deadly human sleeping sickness, Trypanosomiasis or Nagana to livestock.

In its course of 50 years migratory pest control, DLCO-EA indicated that the main challenges the organization have been facing were

- High probability of environmental contamination because of aerial application of wider areas during migratory pest occurrence peak seasons.
- High probability of obsolete pesticide accumulation because of guessed purchase prior to migratory pest occurrence; whereas they do not occur every year.

Reflection of Research and Academia

Representatives of research intuitions and academia of Ethiopia indicated that their main role had been identification and analysis of pest problems, generation of local efficacy data, the development and support of ecological pest management strategies, teaching, research and advisory services and assessment of problems related to pesticides in the country. The research and academic institutions work on issues related to mitigating pesticide risks to human health and the environment, however, was reported to be very low.

Reflection of Nongovernmental Organizations (NGOs)

Representatives of NGOs indicated that the economic benefits of pesticide use have been overestimated and the risks (health and environmental costs) of pesticides have been underestimated. Less emphasis had been given to balance the proper utilization of pesticides for crop production and equally minimization of environmental and human health impacts. These lead smallholder farmers to consequences of improper utilization. Actors in the PDS and even sector government ministries did not have integration at local levels in mitigating pesticide problems.

The NGOs highlighted the need of networking of all actors so as to cultivate stewardship attitudes and professional behavior. The network, as they indicated, could be a means to disclose existing pesticide impacts using researched evidences, trainings, workshops and panel discussions. This network would be a bridge for a dialogue forum at all levels to communicate the issues through radio and television programs, newsletters, leaflets, brochures, posters and scientific journals.

Final consensus and next steps

A detailed discussion was conducted on the reflections of actors. The discussants indicated that pesticide stewardship activities entail actions such as launching media campaigns to effectively get the message on the social and economic benefits and risks of pesticide use and handling to its broader audience. The effort and emphasis placed on behavior change among key stakeholder were indicated as the most challenging work to be expected. The workshop participants, therefore, unanimously agreed to establish a system-wide pesticide stewardship network where all actors can work together towards mitigation of pesticide impacts to human health and the environment; which resulted to the establishment of PSA.

Follow-up linkages created by PSA

Tackling pesticide dependency in cotton production in Ethiopian Rift valley

Farmers indicated their concern on continuation of cotton IPM-FFS which was appreciated by PSA; and based on that PAN-Ethiopia, ISD and the Ministry of Agriculture continued technical support just after the PSA workshop in Arba Minch in 2011. The three organizations developed a project proposal on wider expansion of IPM-FFS in Gamogofa Zone and secured a three years funding from TRAIID (a UK based organization) which is being implemented from January 2013. The first round of IPM-FFS practical trainings and field application of neem based pest control system indicated the possibility of reducing use of pesticides. Comparison of conventional and IPM based cotton gave a wider variation of 1.5 tons and 2.3 tons per hectare respectively. A total of 90 farmers are now engaged in cotton IPM and this process has been demonstrating a participatory action research which involves actors in the PDS in Ethiopia. In the coming three years, the project is aiming to incorporate 2000 smallholder farmers in producing cotton through IPM, to make 500 smallholder cotton producing farmers organic certified and to reach 300 private cotton farm workers in dialogues of cotton-IPM and pesticide risk reduction.

Since the project inception in January 2013, series of workshops and field visits to cotton IPM-FFS sites were conducted. A farmers' field day, where farmers shared experiences of what has been done and achieved, was also conducted on September 17, 2013. After the presentation of farmers about the IPM-FFS process and the cotton yield they got, the head of Gamogofa Zone Agriculture Department said that the ongoing cotton IPM-FFS has been and will be supported by the zonal agriculture department; and the government extension workers will be advised to insti-

tutionalize this at the community based “one to five” (1:5)⁵⁰ structure which the government is using for its political and development work at grassroots level. He also indicated that this integration and commitment encourages the zone, the region and even the nation because of the fact that the skills gained by cotton farmers are transferable to other crops and enterprises.

Mitigating pesticide impacts through agro-ecological solutions

The central Ethiopian Rift valley area has been a center of discussion for intentional and unintentional pesticide related incidents on human health and the environment in relation to mixed farming systems from smallholder farmers and medium sized vegetable producers; to large scale flower farms and pesticide formulating industry.

Addis Ababa University, PAN-Ethiopia (NGO), ISD (NGO) and the Institute of Biodiversity Conservation (Government institution) appreciated the magnitude of the problem and secured a three years project being financed by Defra since April 2013.

PAN-Ethiopia has been coordinating the follow-up of dialogues amongst farmers and local government offices; and facilitates experience sharing visits between Arba Minch cotton IPM-FFS farmers and Ziway partners. As IPM-FFS was not well practiced in the central Ethiopian Rift valley, experts from Arba Minch were invited and explained about the technique they have been conducting with cotton farmers and highlighted the importance of implementation of agro-ecological means in farming activities in Ziway.

Pesticide Risk Reduction Program (PRRP)

The issue of pesticide risk reduction had been the topic of civil society groups and NGOs who were lobbying the government and the industry to deal with proactive measures of mitigating pesticide impacts. The establishment of PSA bridged the gap and the Ministry of Agriculture is now coming forefront with a Pesticide Risk Reduction Program (PRRP); and is working with civil society organizations and the private sector. This project is financed by FAO, the quick start program of the Strategic Approach for International Chemicals Management (SAICM) and Wageningen University.

In the process of implementation of PRRP, the Ministry of Agriculture involved all actors in the PDS to validate the pesticide registration and control regulation which got inputs from all actors and is in the process of submission to the parliament for discussion and ratification.

Community capacity building to mitigate impacts of locust control pesticides

Ethiopia is one of the countries often attacked by the African Migratory locust (*Locusta migratoria migratoriodes*) and the tree locust (*Anacridium melanorhodon melanorhodon*). In 1958, the locust invasion of Ethiopia resulted in losses of 50-150 thousand tones of cereals in less than six months, equivalent to the annual cereals requirement of about one million people (Bidochka and Khachatourians 1991). Countries affected by locust are either recipients of outbreaks or have breeding sites or both. Ethiopia has several breeding areas in territories bordering the Sudan, Djibouti, Eritrea and Somali.

Despite the multifaceted efforts made to prevent crops and pasture land from locust in many African countries in general and in Ethiopia in particular, the problem still remains with no clear and sustainable management options in Place. Although there are many factors like behavior, weather and control approaches that have contributed for the failure; lack of strategies to properly identify and include stakeholders at grass roots level and at all level of locust control area could be one of the main reasons for repeated and excessive aerial application that resulted to the environmental and human health after effects of organophosphate locust control chemicals.

⁵⁰ “One to Five” structure is a system of community organization where one lead farmer heads a group of five farmers for political and development works at the grassroots level in Ethiopia.

Taking this as the basis; MoA, DLCO-EA and PAN-Ethiopia succeeded to get funding from the UK Department for International Development (DFID) to support a project aiming at raising awareness of locust control pesticide hazards among locust prone communities and building capacity of local civil society organizations to advocate for approaches that consider the health and livelihood implications of local people. This was also deemed to assist in reducing the pile up of unnecessary pesticide accumulations which would finally end up being obsolete requiring more resources for disposal.

Through the active involvement of actors in the PDS including Crop Life Ethiopia, the project created a dialogue forum on community-level impacts of locust control pesticides and the importance of local community involvement in the process of early detection and early control methods to minimize the wider aerial application. The project attempted to fill gaps through awareness raising and utilization of media (radio) so that every citizen in locust prone areas can be involved and contribute to efforts that have so far been handled mainly by the Government and DLCO-EA.

Barriers faced

The three years action and collaboration (since 2011) were trying to lay a foundation for PSA to be an action oriented and policy directed initiative leading to create and support a platform for institutional innovation in the PDS. In line with this a three years project proposal was developed and shared with members to look for funding. However, none of the attempts could succeed to solicit funding for PSA (as an independent organization). The directives of the Ethiopian Charities and Societies Agency (CSA), on the other hand, oblige PSA to solicit fund and deliver annual financial and activity report every year. Since PSA itself (as an independent organization) could not secure fund but all the activities were being conducted by the member organizations, it could not deliver activity report to the agency which could align with financial expense of its account.

Discussion and conclusion

Opportunities

As participatory action research is followed as a methodological approach, the direction of dialogue forums was not predictable. It was, therefore, kept flexible so as to lead towards institutional change through action while developing an understanding which informs the change in addition to what was known (Dick 2002). The emergence of partnering of high level actors at project and program implementation level, the felt need of pesticide risk communication in central Ethiopian Rift Valley and the continuation of cotton IPM-FFS in Arba Minch were results of the communication in the participative dialogue process. Pesticide Stewardship Association has, therefore, been playing a role as a learning platform by linking all actors in the PDS and taking "Pesticide users' stewardship as an overarching belief and practice.

In a network of actors whose interest is diverse and who have been acting independently for decades, a conflict of interest (Orlikoff and Totten 2004) was to be expected as pesticide users' stewardship is being internalized. The dialogue forums, however, revealed that the environmental pollution and human health impacts of pesticides were equally perceived by all actors in the PDS. Almost everyone of the actors know previously reported pesticide impacts and this common understanding of the situation convinced them to build an organizational ethic of stewardship with a better integrity (Hernandez 2008). Not one of the actors objected the idea of pesticide users' stewardship. This further created an opportunity to appraise the industry's "product stewardship" concept and how this concept can complement with "pesticide users' stewardship" in a more responsible way which can protect end users from pesticide hazards. The evaluation of the dialogue processes revealed that PSA could become the formal face of this multi-stakeholder network to

work on responsible and safe use of pesticides in Ethiopia, and as the means to establish such responsibility and duty of care among all actors in the PDS under the banner of pesticide users' stewardship.

PSA, to create and support an innovation platform, needed both software and hardware applications in the sense referred to by Woodhill (2010). The policy level dialogue and risk communication process at PSA level as well as the collaborative program implementation took participatory communication as software to bring about changes in practice; and the cotton IPM-FFS techniques were taken as hardware which have been implemented as technological innovation which would lead towards an agro-ecological way of mitigating pesticide impacts.

Power relations amongst actors in the PDS; especially the role of government in leading the national economic development strategy which is based on agriculture and the contribution of the industry in the agriculture sector as a primary ally in delivering chemicals for pest control, gives these two entities high power in the PDS. Empowering the previously marginalised actors (Reed 2008), grass roots farmers in the case of PSA, is one of the opportunities the dialogue forums created. This is reflected in the pesticide risk communication process and in the active involvement of cotton farmers in IPM-FFS which convinced the local government to institutionalize their practice.

The neem based bio-pesticide use like the one implemented in Benin(Nederlof and Pyburn 2012) became good model of organic cotton production and reducing pesticide dependency in Arba Minch area. This can be used as a means to meet the national and international demand for organics which can give the farmers a better chance to get premium price for organic products and make them able to access better market chain.

Challenges

An organization which acts as an innovation intermediary/broker (Winch and Courtney 2007) can be a for-profit (consulting firm) or a non-profit as PSA's establishment as an NGO. The position of PSA as an independent organization that attempts to facilitate an innovation platform acting as an innovation intermediary is still in question. The first approach of registering PSA as a non-governmental organization faced a funding problem which hindered it from fulfilling the requirement of the Charities and Societies agency of Ethiopia. If the members in the PDS want to change the status of PSA as a for-profit organization, it needs another process of legalization which may trigger a question of impartiality (Caldwell and Boyle 2007). The consensus reached at this point in time is to keep PSA as an informal (non-registered) network which can be facilitated by one of the organizations in the PDS but keeping it as a not-for-profit network.

Whether formal or informal; a for-profit or not-for-profit organization, PSA needs to have manager/managers who are themselves stewards (Caldwell, Hayes et al. 2008) of PSA and who can be responsive to situations and keep their integrity(Caldwell and Boyle 2007) so as to balance the overarching goal of organizational ethics of "pesticide users' stewardship" and the varied interest of actors in the PDS. These managers/leaders on the other hand require personal attitude and behaviour(Hernandez 2008) which internalizes what is at stake in PSA.

The ethics here deals with improper utilization/management of pesticides which is a culprit for acute and chronic human health impacts and environmental pollution that can even reach future generations. The leader/manager should, therefore, build trust of him and the organization(Joseph and Winston 2005) that it works to mitigate these negative impacts of pesticides. However, as individuals are different in their values(Washington, Sutton et al. 2006), getting such a leader with proved leadership will be a challenge for PSA.

Conclusion

The acknowledgment of “Pesticide users’ stewardship” among actors in the different organizations of the PDS is the first step taken by PSA as a guiding principle. The institutional change that is attempted to be achieved is the changes in practice at respective levels of the PDS in distribution and use of Pesticide. This is, however, only the beginning which showed us the potential for further improvement. Pesticide risk communication, IPM-FFS, PRRP and other collaborative actions of the PDS need to be program oriented and part of the government extension system. If the capacity of government extension agents is built both in theoretical and practical techniques, they proved to be result oriented actors of change (Poncet, Kuper et al. 2010). The need with the Ethiopian situation; and what PSA is doing, is involving them in the dialogue process of pesticide users’ stewardship and mainstreaming the concept in the extension system.

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