

Full Length Research Paper

Role of action research in reducing farmers' livelihood vulnerability: A case of Gotu-Onema, central rift valley, Ethiopia

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Accepted 3 July, 2012

The livelihood of farmers in Gotu-Onema, central rift valley of Ethiopia has been vulnerable for recurrent drought and other socioeconomic stressors. It is getting worse despite disciplinary research and technology transfer efforts to reverse the situation. As a result of this failure, an action oriented research has been implemented between 2004 and 2009 using 64 selected pilot farming households with the objective of reducing household vulnerability through institutionalization of agricultural input supply and participatory variety development. In addition to continuous assessments, semi-structured surveys were made to understand initial livelihood context and impact of interventions. The process has been managed to be participatory where farmers prioritized their problems and actions were taken accordingly. The results of the study show that farmers' livelihood has been improved during the first consecutive three seasons despite drought caused productivity setback in the fourth season. Pilot farmers have been able to follow cropping calendar and other appropriate farming recommendations. Moreover, social learning as a result of the action research has led to the establishment of cooperative to ensure sustainable input supply and market. By the end of the project period, farmers have been technically and institutionally equipped to better respond to the causes of vulnerability.

Key words: Vulnerability, action research, livelihood, Gotu-Onema.

INTRODUCTION

In arid areas of Ethiopia, livelihood vulnerability to drought and other stressors is a recurrent phenomenon, which often leads to poverty and famine. Vulnerability is resulted from the incapability to overcome social-ecological stresses and hazards due to internal and external threats (Adger, 2006; UNDP, 2004; Ellis, 2000; Reilly and Schimmelpfennig, 1999). Drought, political unrest (local conflict), poverty, flooding, etc are some of the most important factors perpetuate livelihood vulnerability. To curb the situation and improve farmers' livelihood security, several top down government led research and development projects has been implemented to increase yield and supporting services.

The research and development process is designed and primarily concerned with generating and transferring modern technology to the end-users (Gonsalves et al, 2005). However, technologies produced and communicated in such a top down approach have had limited impact (Feder et al, 2004).

The limited impact of research on disciplinary line can be attributed, in large part, to the institutional disconnect between research and research methods on the one hand, and development practice and practitioners on the other (Agbamu, 2000). Thus, increased transdisciplinary linkages, methodological pluralism place-based knowledge and practical focus on policy relevance are highly required (Cutter, 2003). This calls for interdisciplinary action research, which requires a concerted effort from farmers and researchers of various fields to design and implement research and development for an adaptive

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livelihood strategy (van de Fliert and Braum, 2002; Reason and Bradbury, 2001).

Action research is increasingly seen as a promising approach for improving the impact of research on development and change (Hammersley, 2004; Reason and Bradbury, 2001). It is a flexible spiral process, which allows action (change, improvement) and research (understanding, knowledge) to be achieved at the same time. Moreover, action research emphasizes a "bottom-up" approach creating knowledge on locally defined priorities and local perspectives (Cornwall and Jewkes, 1995). Action research shares the following common elements: a collaborative process between researchers and people in the situation; a process of critical inquiry; a focus on social practice; and a deliberate process of reflective learning (Lewin, 1946) and Dick (2002) cited by (German and Stroud, 2007). Due to its holistic approach, action research accelerates technology generation, adoption and institutionalization of knowledge and technology. Moreover, research partnership among technology users and formal researchers improves the innovation performance, productive relationship and ensures sustainability of innovation (Hall et al., 2001).

As a result, the Wondo Genet College of Forestry and Natural Resource has initiated development oriented interdisciplinary action research with financial support from SIDA and technical backstopping from Center for Forestry Research (CIFOR) and Swedish Agricultural University (SLU). Before research proposals are invited, trainings and workshops have been conducted on how to do action research. After trainings and workshops conducted and well internalized, project proposals have been written and submitted to start actual research process. Promising projects have been selected. One of those projects was this project with a title Reducing Farming Household Vulnerability to Hardships as a Basis for Improving Livelihood. Thus, this research aims to describe the intervention approach, process, impacts and challenges. Particular emphasis has been given on the role of action research in reducing vulnerability through technology generation, farmers' field school and cooperatives.

METHODOLOGY

Study area

This case study was conducted in GotuOnema peasant association (*kebele*), Oromia region, Ethiopia. The *kebele* is found in the central rift valley system of Ethiopia. It is located between $7^{\circ}09' N$ to $7^{\circ}12' N$ latitude and $38^{\circ}58' E$ to $38^{\circ}61' E$ longitude.

Four hundred ninety one households were reported in the Kebele (SZPEDD, 2004). Based on the information gathered at the beginning of the action research, the production system in the Kebeles rain fed agriculture, with the main crop of maize, potato, and *teff* and minor crop of wheat, haricot bean and sweet potato. Irrigation water is also available to households to produce cash crops such as sugarcane, coffee and chat in the southwestern part of the Kebele. *Enset* is the major home garden crop, which also

constitutes major subsistence food along with maize and potato.

Research procedures

The methodology for this type of research is not a one way process. It is an iterative process where results lead to more improved method, more learning and experiences. However, the following agreed upon procedures were followed in consultation with key informants.

The baseline information was collected to assess livelihood condition and source of vulnerability of the farming households using participatory rural appraisal tools. Then continuous and rigorous discussion with *kebele* officials, community elders and the whole communities of the *kebele* were made. During meeting of the whole community, a total of 64 households that represent the various socioeconomic status (rich, medium and poor in equal proportion) have been selected for pilot learning or farmers' field school. Following this, a detail household survey of livelihood assets and resources was carried out.

Basic socioeconomic characteristics of the selected households, household resources, livelihood condition and sources of vulnerability were collected using semi-structured interview questionnaire and group discussions. Interviews have been conducted three times: at the beginning of the project (2004/5), after two years harvest and at the end of the project. Based on these data, major sources of vulnerability were identified, prioritized and thereafter input supply, farmers' field school and formation of cooperatives as action areas were determined.

Provision of input supply

One of the major problems identified during the first survey was financial capacity to purchase input. To address the problem, farmers were divided in to three groups. The first group includes those with no capacity to buy input. The second group is who can afford buying 50% of their input requirement. And the third group who could contribute to buy 75% of their input requirements. Thus, the project on average covers 60% of the total cost required. Moreover, the project facilitated access to input and transported inputs to the village. After inputs were provided, farmers who have not have drought animal have also been supported by renting oxen.

Participatory potato variety selection

Participatory variety selection is considered as an important issue based on the farmers priority for improved varieties. Thus, it provides an opportunity for farmers to select one or more varieties suitable for their locality from elite genotypes from plant breeding programs. Participatory approach is selected to improve farmers' competency in sustaining the technology beyond the project period and improve researcher and farmer relationship.

The first implementation period was conducted between January and August 2006. The trial was repeated for one more year. Six types of improved potato varieties were planted along with the local potato on farmers' plot. The varieties were Digemegn, Gudene, Gussa, Jalene, Shonkola and Zengenga, which were brought from Holetta Agricultural Research Center. They were planted at 10×10 m plots on 12 farmers' field. All improved agronomic packages were offered as per recommendations. These agronomic packages include fine seed bed preparation, ridge planting, spacing between rows and plants, and recommended fertilizer rates.

Farmers were encouraged to make their own evaluation of the improved varieties against their local varieties at different vegetative growth stage and at harvesting. Then, the technologies was evaluated and ranked based on farmers' indigenous knowledge and

researchers' scientific knowledge. The methodologies are analogous to the approaches recommended to this type of action research (Muturi et al., 2001). Farmers were advised to document the development of varieties and various aspects of performances and other characteristics. Researchers also visit the experiment regularly and recorded vegetative features and yield performance.

Farmers field school and formation of cooperatives

The households selected for farmers' field school were grouped into four subgroups based on their location in four distinct villages. Each subgroup is considered a unit of a Farmer's Field School. The division was agreed and made for reducing travel distance, and improving frequency of contact and social interaction among members.

The Field School has been established as major area of action to increase the production of the land through training, securing appropriate level of inputs, establishing a network of support systems, follow-up and expert support of the production season and creating a mechanism to sustain the effort in the future. A curriculum has been put together to follow the cropping season and practically be implemented parallel to the production work.

Concurrently with variety selection and institutional development activities, frequent training were given about the different phases of the agricultural activity calendar including land preparation, planting methods (improved variety, time of planting, depth of planting etc.), fertilizer application (type of fertilizer, amount, time of application etc.) and post-harvest handling and technologies. The training was so participatory that farmers were involved in demonstrating by themselves and they expressed their ideas freely. It was both practical and theoretical in order to make the school smooth and easy to understand. The impacts of the training were asked in terms of a feedback and later by administering a separate interview questionnaire.

Cooperative association was established by initiation and encouragement of researchers to sustain access to input supplies which are often less accessibly for individuals. It is the result of the social learning. During the action research period, it is realized that input producing and supplying institutions prioritize institutional requests to individual farmers. Therefore, for timely access to input supply, the need for cooperatives has been recognized. Details are found in the result part to present the whole context without breaking into process and result.

Data analysis

The data sets have been systematically recorded, checked for errors and inconsistencies. Then descriptive analysis was carried out and the data put in a frequency table and analyzed accordingly.

RESULTS AND DISCUSSION

Livelihood context and sources of vulnerability

The result of the survey on households' livelihood condition and sources of vulnerability showed that the average landholding of a household was about 1 ha. However, the actual averageland holding was less than 0.6 ha because of redistribution of land within families, parents giving-out land for their children and local transactions. Major crops of households were potato and maize, often produced alternatively on their own croplands. Whenever, there is sufficient rain, farmers

produce twice in a year; first potato followed by maize or *teff* or wheat; or maize followed by *teff*, wheat, or haricot bean. Home gardens are reserved for *enset*, fruits and vegetable production. However, although home gardening is still practiced, it has been declined due to rainfall scarcity. Few farmers opted for livestock as their major source of income, due to lack of nearby grazing land and fodder as well as animal diseases.

Poverty and vulnerability to drought and other stressors is a frequent phenomenon to this semiarid region. Majority of the residents were poor and vulnerable to one season rainfall failure or scarcity. Many of the households strongly felt that things are not heading for the better, their livelihood is declining, and exposed to chronic food shortage. Particularly, the period between March and May was indicated as the most challenging period for most of the interviewed families. The causes are multifaceted and multileveled. All households of the three wealth categories appeared to live with heightened vulnerability to hardships. In many cases, the boundary between being well and disastrously poor is a one or two-season crop failure or an outbreak of disease affecting more members of a household.

The majority of the causes of vulnerability were identified and prioritized. All farmers reported that low farm productivity, drought and access to input supply as the most critical factors leading to vulnerability. The causes for the low farm productivity were attributed to several factors. One of the most frequently mentioned is, however, limited access to input supply. Due to the uncertainty of supply through the extension networks, better off farmers purchase inputs with inflated prices from the open market in Shashemene town. However, more than half of the households reported that they have no financial capacity to buy even access to input improved and made available at the local market (Table 1).

As can be seen in Table 1, all respondents mentioned drought, which can be as a result of insufficient quantity of precipitation and/or its fluctuation, and lead farmers to livelihood vulnerability. The effect was also documented later in the project period. After an improvement in their economic status with the help of appropriate input supply, farmers fail again to buy their input due to hard drought condition in 2007. In the survey of 2008, for instance, almost 80% (51) of farmers' field school members mentioned that they could face shortage of food supply and they reiterated that the reduction of this year's rain will affect their resilience for possible drought in the coming year. In the final survey, only five of the interviewed 64 households boldly speak that they can tolerate complete lack of rainfall for a year time. This shows that drought is a fundamental factor that sustains vulnerability and consequently poverty in the study site.

Another issue mentioned as a problem especially by those towards the foot of the hilly areas was increased frequency of flooding that they are encountering. An elder

Table 1. Major sources of vulnerability identified.

Source of vulnerability	No. of farmers affected	Intervention
Low crop productivity	64	Variety improvement and application of input
Irregular access to input supply	64	Facilitated input access and establish cooperative for sustained access
Drought	64	Has no direct solution
Social unrest/conflicts	44	No solution at our disposal
Limited finance to purchase input	38	Provision of seed money
Flood	23	Is not dealt with due to financial and time constraint
Crop pest and disease	7	Training and appropriate storage technology demonstrated
Lack of draught animal	5	Facilitated oxen rent
Illness	1	No solution from the project
Lack of labour force	1	No solution

farmer respondent expressed the situation as follows: "Our farmlands are dry but when it rains it is washed away by water coming from two peasant associations. The flood takes everything, planted seeds, household goods, and anything it finds on its way. Last week it washed away 12 quintals of potatoes planted recently. People are now in empty houses" translated by the researchers.

Some farmers also identified to be vulnerable due to lack of draught animal. Those farmers are usually forced to wait until the other farmers are done with their activities. This will lead to losses in the best cropping season, perpetuate the vicious cycle of poverty and increase their vulnerability for hardships in the coming year.

The combined outcome of the aforementioned sources of vulnerability lead to low or failed crop productivity. These in turn aggravate their vulnerability and complicate their coping mechanisms. Thus, the action research team where the farmers are active member has address problems in order of priority of importance. However, problems which are beyond the capacity of the team have not been addressed.

Interventions and their impact

Participatory analysis of the sources of vulnerabilities shows that there is a need for diversity of interventions as coping mechanisms. Those interventions that can be accomplished like improving access to input, variety selection and adaptation, technical training about agronomic practices, cooperative formation to facilitate institutionalization of access to input and market were identified, implemented and their impacts studied.

Input supply

Before the onset of the following harvest season, the

impacts of input supply on livelihood were evaluated. For this purpose, farmers were asked if they benefited from the input supply and to list specific improvements. Some invested to educate their children, others constructed better quality houses, some of them bought new farmland and all of them expressed that they eat as much as they needed (avoided malnourishment) and some of them reserved their products. More importantly, all of them except one women headed household with lack of sufficient labour force and one man headed household virtually with lack of perseverance to engage were able to buy all their input by themselves in the coming year (Table 2). Thus, the research team including the farmers has realized that timely supply of quality seed and fertilizer can easily take them out of poverty. It also assured that farmers can reduce some of the sources of their vulnerability that could arise due to lack of access and/or incapability for input supply purchase within one year's partial financial aid and reasonable technical advice.

Participatory variety selection and skill development

Lack of improved variety suitable for the local conditions and low productivity were one of the major priorities to deal with. Since potato is a major subsistence and commercial crop widely produced in the communities using local varieties for long, our research has been focused on it. Several improved potato varieties have been generated and commercialized through research in a different agroecological condition of Ethiopia. Despite the fact that the study site has immense potential in potato production, there has been no technology tested to adapt in the study site. Thus, our action research has done adaptation trial on potato technologies that were developed and tested in different parts of Ethiopia and compared with local variety. Farmers evaluated the results based on various set criteria (Table 3).

The participatory variety evaluation enabled farmers to

Table 2. Summary of investment as a result of improved productivity.

Investment type	Frequency*	Percent
Fully secured their food requirement	64	100
Capable of buying their input	62	97
Send their children to school	18	28
Leased(bought) additional farm land	3	5
House construction	2	3
Buy cattle	2	3

* One respondent may mention more than one answer

Table 3. Farmers' ranking of potato varieties based on selected parameters

Variety	Vegetative growth	Tuber no./hill	Tuber size	Market condition	Earliness	Yield/ton	Rank
Jalene	1 st	21	Medium	Very attractive	Late	22.91	1
Gudene	3 rd	21	Medium	Attractive	Late	19.41	3
Gussa	4 th	16	Small	Attractive	Medium	16.52	5
Digemegn	2 nd	16	Large	Very attractive	Late	21.78	2
Zengeba	5 th	25	Medium	Attractive	Medium	16.05	4
Shonkola	6 th	14	Medium	Attractive	early	11.83	6
Local	7 th	12	Large	Attractive	early	9.75	7

know the presence of best-bet technologies suitable to their locality. As result, the farmers selected the best adapted and high yielding potato varieties. Jalene, Digemegn and Gudene were found to be the best three varieties for the area, based on growth performance, yield and tuber quality (Table 3).

Based on continuous feedback and interview response, the result of the agricultural practices training to field school members showed that all of them perceived the training as relevant. They follow cropping calendar, continued or introduced organic fertilization and proper pre- and postharvest technological trainings. However, three of the field school members have not shown the relevance of the training in their fields. Thus, the training can be considered as successful and adopted by the majority of the field school members.

In order to reduce damages of potato by diseases and pests at storage and enhance seed self-sufficiency, which were mentioned as one of the core problem for potato production, a diffused light store (DLS) has been constructed by farmers' field school members with external technical and material support. The DLS has been handed over to the peasant association and expected to be the training and demonstration structure for farmers to construct similar types of stores by themselves.

Establishment of farmers' cooperative

It was recognized that quality seeds are available in the national seed enterprise and research institutions. These

institutions prefer cooperatives and other organized groups to provide seeds to individual farmers for a number of bureaucratic reasons. Therefore, cooperative formation was found as an option to solve the seed availability problem for the farmers in the long term. Then, the idea was disclosed to farmers and promised by the researchers to facilitate the beginning of a legal process for cooperative establishment if farmers are willing to organize themselves. In order to improve farmers' knowledge about cooperative formation, its significance and administration, trainings were given by invited experts.

Finally, 30 farmers agreed and took the initiative to organize themselves and to elect motivated farmers from among themselves who work as executive committee for two years. Once farmers agreed to organize, cooperative experts from the regional government substituted the researchers' facilitation role. Researchers then only attended meetings to document and evaluate the process and impact of the cooperation.

In 2008, the cooperative was established, executive committee members were selected and certificate of acceptance as a multifunctional cooperative was issued. In the same year, farmers were able to buy fertilizers through the name of their cooperative. They foresaw to increase the role of the cooperative to bigger trading firm. They planned to distribute inputs to non-members of the cooperatives, store their products and sale when the price is high. Moreover, they wanted to extend its role as a credit and saving association. Thus, it serves as a buffer to protect them from future vulnerability as a result

of inadequate input use.

Conclusion

Action research of this type which involves farmers in all the steps of the research process was found useful to integrate detailed and site specific local knowledge for problem identification, prioritization and investigation. Moreover, the local communities not only clearly understood the process and outcomes of the research but also they are the researchers and owners of the project outcomes.

The action research assisted in addressing multiple sources of household vulnerabilities. The intervention on improving input supply and crop variety selection has increased crop productivity while improved storage facility for potato has reduced post-harvest damage to their produce. The formation of cooperative increased and sustained access to input supply.

To reduce vulnerability sustainably, improving capacity of the farmers were found indispensable. As a result, the formation of farmers' field school and provision of intensive on-farm technical training through the farmers' field school were found useful for improving the role of farmers during the research process and sustaining the farm management practices.

Thus, in spite of severe drought at the last year of the project draws back farmers economically, they are now better equipped technically and institutionally to reduce their vulnerability to the effects of drought. Thus, since a combination of factors lead farmers to vulnerability, adaptive intervention approaches in the future has to address all the major factors possible, which otherwise curtail the effect of the other interventions.

ACKNOWLEDGEMENTS

We acknowledge SIDA (Swedish International Development Agency) for financing the research process. The community of GotuOnema deserves our heartfelt thanks for their continuous willingness to actively participate in the implementation of the research, humbly contributing their wonderful idea and respond to lengthy interview questions. We also thank the anonymous reviewers for their insightful comments on the draft

manuscript.

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