

Full Length Research Paper

Challenges of development agents performance in technology dissemination: A case from Southern, nation, nationalities and peoples regional state (SNNPRS), Ethiopia

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Agricultural extension service is the cornerstone for any meaningful development in agricultural sector in agricultural countries. Hence, development agents are the critical actors in serving the community and expected to change farmers' knowledge, skill and attitude through dissemination of up-to-date information necessary in taking informed decisions towards improving their livelihood. This paper aims to identify the challenges of development agents in disseminating agricultural technologies and to assess the frequently used extension methods, approaches and media in disseminating improved technologies to farmers. A survey of 108 development agents in 12 administrative districts and informal discussion with key informants were used to collect data. The result of the survey revealed that effectiveness of development agents is challenged by job dissatisfaction; existence of poor communication, very poor formal linkage among farmers, development agents and researchers; and lack of motivation for development agents to fully serve community. Poor knowledge and skill of development agents in what, how, when and why to use and select combined extension methods, approaches, media and lack of infrastructural facilities are the main impediment factors while communicating with farmers. So on-the-job training is pertinent to up-grade the knowledge, skill and attitude of development agents in disseminating technology to farmers.

Key words: Ethiopia, challenges, job satisfaction, motivation, development agents.

INTRODUCTION

Improving the living standard of rural households and ensuring food security at the household and national levels require the invention and transfer of agricultural technologies which addresses the technological needs of all agro-ecological Zones, improving farmers' access to inputs and credits and improving the performance of the market and distribution systems (Gebrehiwot and Fekadu, 2012; Belay and Degnet, 2004; Ibrahim, 2004). Consequently, a recent policy document of the Government of Ethiopia, particularly the Agriculture Sector Policy and Investment Plan shows, Ethiopia is aspiring to achieve a middle income country status by 2025 and postulated that agricultural services has a lot to play in ensuring that Ethiopia achieves the millennium development goals of reducing poverty by half 2015

(Moard, 2010; Eremie, 2005). Yet achieving higher and sustained agricultural productivity growth remains one of the greatest challenges facing Ethiopia (Spielman et al, 2010). Hence, agricultural extension service which is determined by its institutional effectiveness and competency of the development agents at field has pivotal role to derive the transformation process. The contribution of development agents in knowledge, skill, and attitude with a full commitment is determinant in addition to the institutions and natural ecology.

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Both the hard and soft systems of technologies are essential and better to supplement each other. The effectiveness of the technology alone does not bring the desired change in the rural areas and partly depends on the capability of the extension workers to properly transferring them to the local populace. Change would be the result of the effectiveness of the extension workers to appropriately transfer the technologies and the quality of the technologies themselves. Apart from the quality of the technologies, the capacity of the extension workers, the appropriateness of the extension system and other factors affect the effectiveness of agricultural technology transfer in rural areas (Puskur et al., 2008). Agricultural extension is basically aimed at providing farmers with essential knowledge and skills that would assist farmers in taking vital decisions which would ultimately lead to increased production (Tzion et al., 2010). The mission of Extension is to extend education to people. The emphasis in extension education is on helping people to help themselves (Patton, 1987; Kaimowitz, 1991; Sanders and Mauder, 1966). Hence extension is an on-going process of getting useful information and disseminate to people and assisting them to acquire the necessary knowledge, skills and attitudes to utilize this information through its development agents. This makes agricultural extension paramount in ensuring sustainable food production especially in many sub-Saharan African countries where agricultural production is dominated by smallholder farmers. Motivation has been noted to be imperative in ensuring job satisfaction which is considered as a pro-active human resource management strategy (Belay, 2003). The level of job satisfaction will invariably affect the performance of extension agents which would in turn affect agricultural production.

The effectiveness of agricultural extension work highly depends on the availability of extension professionals who are qualified, motivated, committed and responsive to the ever-changing social, economic and political environment. In this respect, Anderson and Feder (2002) note that adoption of technology by farmers can be influenced by educating farmers about such things as improved varieties, cropping techniques, optimal input use, prices and market conditions, more efficient methods of production management, storage, nutrition, etc. To do so, extension agents must be capable of more than just communicating messages to farmers. They must be able to comprehend an often complex situation, have the technical ability to spot and possibly diagnose problems, and possess insightful economic management skills in order to advise on more efficient use of resources. However, many front-line extension staff in Africa lacks the competences (skills, knowledge, attitude and resulting behavior) they need to be effective in their work with farmers (Lindley, 2000). In the same line, a worldwide analysis of the status of agricultural extension reveals the low level of formal education and training of field extension agents in developing countries (Swanson

et al., 1990). It is obvious that the poor educational background of extension personnel and the rapid changes occurring in the extension environment necessitate regular in-service training to help extensionists develop the knowledge, skills and attitudes necessary to meet an increasing set of diverse demands. Yet, the real and main challenges of development agents in technology dissemination had no investigated so far and this was the concern of decision makers at all levels of the region.

Therefore, the study attempted to ascertain the challenges of development agents in technology dissemination and assess the frequently used extension methods, approaches and Medias to disseminate new and improved technology to the intended farmers in the Southern region of Ethiopia.

METHODOLOGY

Description of the study area

The study was conducted during the year 2011, in 12 selected weredas and 36 Kebeles (Kebele is the lowest administrative unit in Ethiopia as peasant association in other countries) of the Southern Nations, Nationalities and Peoples' Regional State (SNNPR). SNNPR occupy most of south-western part of Ethiopia, with a total land area of about 112,000 square kilometers, some 10% of the area of the country. The Region contains up to one-fifth of the country's population, with 15 millions (BoARD; CSA, 2007). SNNPR is the region of the country with by far the greatest number of ethnic and language groups diversified agro ecological Zones including: arable highlands (*dega*), midlands (*woina dega*) and lowlands (*kolla*), and pastoral rangelands (*bereha*). But the most characteristic environment of the Region is a relatively fertile and humid midland which contains the densest rural populations of Ethiopia.

Sample and sampling procedure

Multi-stage sampling procedure was followed to first select administrative Zones based on their agro ecology and at last the sample development agents (DAs) (DAs= Development agents). First, the region categorized in to four major Zones:

- (1) Western major Zone – containing 3 Zones (Kaffa, Bench Maji, and Sheka Zones).
- (2) Central major Zone – containing 6 Zones and 3 special districts (Gurage, Hadya, Siltae, Kembata Tembaro, Wolayta and Dawro Zones, Alaba, Yem and Konta special district)
- (3) Eastern major Zone – containing 2 Zones and 2

Table 1. Distribution of sample development agents by the frequency of contact with individual farmers per one production season, by major zone.

Frequency of contacts	Response of sample development agents, N=108				Total	χ^2
	Western	Central	Eastern	Southern		
One time	0	0.93	1.85	1.85	4.63	11.872
Two times	2.78	1.85	6.48	1.85	12.96	
Three times	1.85	7.41	1.85	2.78	13.89	
Four times	1.85	2.78	0.93	1.85	7.41	
Five or more	10.19	20.37	13.89	16.67	61.11	

Source: Survey Data 2011.

(4) special districts (Sidama and Gedo Zones, Amaro and Buji special districts.)

(5) Southern major Zone – containing 2 Zones and 3 special districts (South Omo and Gamo Gofa Zone, Derashe, Konso, and Basketo special districts).

Secondly, to ensure probability of selection of a sample to be equal for each stratum, districts were selected randomly proportional to their size from the four strata. Such proportional allocation is done to guarantee that the number of sampled districts to be proportional to the size of each strata. Accordingly, a total of 12 districts two from western major Zone, four from central major Zone, three from eastern major Zone and three from southern major Zone were drawn. However, the selection of special districts was done purposively as the number of special districts (only 8) compared to other districts (126) is small, proportional allocation doesn't guarantee the inclusion of special districts into the sample. Finally an equal total number of 108 development agents were selected after selecting three kebeles from each Woreda.

Type, source and method of data collection

Both primary and secondary data about the socio-economic aspects of the respondents were used. The data were qualitative and quantitative in nature. Primary data were gathered from 108 development agents using structured questionnaire and interview schedule by trained supervisors and researchers. Informal discussion with key informants such as head of district agricultural office, elder and religious households, extension experts, and Kebele chairman was also conducted to cross-check and enrich the validity of information collected from the sample respondents. Secondary data were reviewed and collected from secondary sources such as similar studies conducted in different areas. Literatures on policies, strategies and systems of agricultural extension of the country, curriculum of ATVETs, job descriptions and status of development agents were reviewed from related published books and journals.

Method of data analysis

Data collected through structured questionnaire and interview schedule were processed and coded using SPSS software for further analysis. Quantitative categorical type of data was analyzed using percentage, frequency, and chi-square test. While quantitative continuous types of variables were analyzed using one way minimum, maximum, mean and standard deviation to generate descriptive statistics. On the other hand, narrative type of analysis was also used to analyze qualitative data and to enrich and illustrate quantitative information specifically on the challenges of development agents in technology dissemination.

RESULTS AND DISCUSSION

DAs and agricultural extension

Development agents are assigned in the rural areas to promote modern agricultural practices with close technical guidance and convincing the farmer's outlook in using location specific modern agricultural inputs throughout the nation in general and the study area in particular though they are not necessarily sufficient. Accordingly, the statistical analysis result of the sample survey showed that 61.11, 13.89, 12.96, 7.41 and 4.6 percent of the sample development agents made five or more times, three times, two times, four times and one time individual contact with farmers per the last production season respectively (Table 1). Though the frequency of contact seems like high but the reality is under expected as the response from selected key informant farmers show and still smallholder farmers' livelihood is remain dependent on the support of external and internal NGOs assistance like world vision, Care Ethiopia, IPMS, and Action-Aid Ethiopia. Since extension contact fosters and strengthens the linkage between farmers, GO and NGO development stakeholders, those farmers who have more frequency of contact with development agents were able to access time oriented information and able to update their knowledge, skill and

Table 2. Distribution of DAs by their nominators and nomination criteria for PADETES in the past one production season.

Participants are selected by	Response of sample respondents, N=108	
	Yes	No
Farmers	38	62
Development Agents	88.9	11.1
Chairman of the kebele	59.3	40.7
Supervisors	8.3	91.7
Criteria for selection		
Voluntariness to participate	90.7	9.3
High income farmers	47.2	52.8
Middle income farmers	50	50
Poor income farmers	46.3	53.7
Supporter of the government policy	59.3	40.7

Source: Survey Data 2011.

experience via training, demonstration, visiting another farmer’s field and so on.

In contrast to the past extension system where the focus was limited either to technology transfer or human resource development, PADETES (Participatory Demonstration and Training Extension System) gives equal emphasis to human resource development (organization, mobilization, and empowerment) along with its effort in promoting appropriate technologies. Hence pertinent to the study area, PADETES has achieved remarkable success with expanding the use of improved technologies, especially fertilizer and improved seed varieties. The planning, execution, monitoring and evaluation of extension programmes have been decentralized. To this end, 77.8% of the farm families participate in preparation of annual plans of extension works. It is mostly on participatory demonstration and training be it method demonstration or result demonstration and on station (farm) or farmer training centre (FTCs). A total of 64.5% of the farmers participate in field days although the frequency of the field day is very limited. Moreover, there are different challenges in the process of participation for farmers training. The survey result in Table 2 indicates that development agents (88.9 percent) and chairman of the kebele (59.3%) are the crucial stakeholders in identifying clients to participate in PADETES and supplying technical inputs to them. Farmers themselves (38%) and extension supervisors (8.3%) played a marginal role in getting farmers involved in PADETES in the study areas. It is clear that performance of development agents is evaluated by the number of farmers adopting the technology packages in their mandate area and the desired changes bring on the livelihood of these new technology users. That is why development agents use any type of criteria which seems appropriate to them in

selecting farmers to take part in PADETES until they meet the quota given by their district supervisors.

The survey result depicted that voluntarily of farmers to participate in PADETES is seems like highly considerable. However, though voluntarily farmers is the basic one for selection the overall process of nomination is in mind to the attention of those who support the government policy and those who can easily access the technology like the relatively rich and middle income farmers (Table 2). And the resource poor farmers get little attention to participate in PADETES. As a result, this enhances the gap between the poor, middle and rich income farmers to highly widen up rather than narrowing it.

Serving large number of farmers is one among the very challenging workloads of development agents in Ethiopia. Likewise, the survey results indicated that one sample development agent serves in average 857 farmers with maximum of 5960 farm household heads but this figure not inclusive of all farmers within the sample Kebeles except thus farmers who have contact. In connection to this, DAs travel on average 13.78 km ($6.39 \times 2 = 13.78$) on-foot to travel from their office to the residence of a farmer they served and back to their office (Table 3). This briefly showed that development agents were challenged in performing their role effectively since they are work loaded in extension and non-extension activities, pressure of serving large number of farmers, the average large distance they travel on-foot to visit one farmer, existence of poor infrastructural facilities and a widely dispersed living style of the population.

DAs and communication factors in technology dissemination

As shown in Table 4, the study revealed that out of the total sample DAs, the response of 65.7% respondents

Table 3. Mean distribution of DAs to the farmer and the distance they travel to serve farmers

Independent variables	Response of Sample respondents, N=108			
	Min.	Max.	Mean	Std. Deviation
Distance between DAs office and farmers residence	0.21	15	6.39	6.530
DA to farmer ratio	350	5960	857	646.123

Source: Survey data 2011.

Table 4. Distribution of Development Agents by the frequency of channel /medium used in introducing new technology to the farmer.

Channel /Medium	Response of Respondents, N=108			
	High	Little	Very little	Don't know
Farmer training	65.7	32.4	0.9	0.9
Demonstration on farmers' farm	38.9	51.9	8.3	0.9
Direct extension through researchers	6.5	6.5	54.6	32.4
Field days	19.4	41.7	28.7	10.2

Communication methods		
	Yes	No
Home visit	94.4	5.6
Farm visit	99.1	0.9
Printed materials	16.7	83.3
Posters	17.6	82.4
Leaflets /brochures	12	88
Others	6.5	93.5

Source: Survey Data 2011.

were highly users of farmers training in technology dissemination. While the response of 51.9, 54.6 and 41.7% sample DAs were little, very little and little towards their frequency of utilizing demonstration on farmers' farm, direct extension through researchers and field days to disseminate new technologies to the farmer respectively. This clearly implies, most of the farmers in the region have theoretical based training which is unintended with their interests, needs and its complexity remains as difficult to implement its practical application at the end of the training rather than using practical oriented type of training. Beside to these, while 94.4 and 99.1% of DAs were highly used home visit and farm visit communication methods they were less user of printed materials, posters and leaflets /brochures (Table 4).

As indicated in Table 5, 76, 17 and 15% of the selected sample respondents use hybrid, top-down and bottom-up extension approaches respectively while they guide and advice farmers in technology dissemination. This clearly indicated that though there is no superior or inferior single

extension method than the other unless situations are specified it is not amazing development agents to use combination methods of extension approaches to investigate farmers problems and needs, convince and work interactively in a way to improve their livelihood in a sustainable manner.

As depicted in Table 5 majority (74.1, 64.4 and 61.1%) of the development agents was used contacting farmers individually, model farmers and by arranging public meeting to disseminate /create awareness about new agricultural technologies respectively. The least two methods were through kebele administrators (44.4%) and local leaders (33.3%) respectively. It is worth mentioning the finding indicates that no single extension method is sufficient in the training of farmers and the development agents used all the methods they know and able to show practically to reach the target farmers.

Development agents were asked to give their response as yes or no to the questions related to their performance as provided in Table 6. Accordingly, the survey result

Table 5. Distribution of DAs by the frequency of Extension approach and methods used in guiding and advising farmers.

Extension approaches	Frequency	Percentage
Top-down	17	15.7
Bottom-up	15	13.9
Hybrid (Participatory)	76	70.4
Total	108	100.0

Extension methods	Yes	No
Contacting farmers individually	74.1	25.9
Through PA administrators	44.4	55.6
By arranging public meeting	61.1	38.9
Through local leaders e.g. religious leaders, local organization leaders and elders	33.3	66.7
Using model farmers	64.8	35.2

Source: Survey Data 2011.

Table 6. Percentage distribution of DAs knowledge by the extension work related Questions in disseminating new agricultural technology to farmers.

Questions related to DAs performance	Response of sample DAs, N=108		Total
	Yes (%)	No (%)	
Do you think single extension method utilization is best for all extension contents?	18.5	81.5	100
Do you have the necessary knowledge, skill; and experience on media and extension method utilization?	32.4	67.6	100
Do you need training on media and extension method utilization?	90.1	9.9	100
Do you always practice location specific recommendation for a given package/s?	75.9	24.1	100
Have you ever faced any constraint/s while you use the extension methods? Like local language gap. Material shortage, transportation problem and technical skill gap.	70.4	29.6	100

Source: Survey Data 2011.

showed that of the total sample development agents 81.5 said no single extension method utilization is best for all extension methods. On the other hand the response of 90.1, 75.9, 70.4 and 32.4 percent of the sample respondents were need training on media and extension method utilization, always able to practice location specific recommendation for a given package/s, face constraints in using the extension methods like local language gap, material shortage, transportation problem and technical skill gap and have the necessary knowledge, skill; and experience on media and extension method utilization while they communicate with farmers in disseminating new agricultural technologies to farmers respectively.

Linkage between development agents and researchers

It is clear that, the more successfully extension and

research are linked and the better that knowledge management is organized, the greater the benefit for everyone concerned. However, the findings of this study revealed that, of the total respondents 56.5% and 71.1% of them were not made any type of contact and visit with researchers respectively (Table 7). In line with this, only 8.3 and 10.2 percent of the development agents made three or more times contact and visit with researchers per a year. This clearly showed that the research and extension linkage in the study area is very poor. As a result, the absence of formal linkage between extension workers and researchers denies DAs to access and disseminate environmentally friend and socially sound new technologies produced in research centers to farmers at the time of need.

As shown in Table 8, of the total sample DAs, 88.9 and 80.5 percent were could not gain any type of research report newsletters and face-to-face technical assistance from researchers in the past one year respectively.

Table 7. Distribution of Development Agents by the frequency of contact and /or visit made with the research experts in the last one Year.

Frequency of Contact and Visit	Response of Sample Respondents, N=108	
	Contacts (%)	Visits (%)
None	56.5	71.1
Once	21.3	12.0
Twice	13.9	16.7
Three or more times	8.3	10.2
Total	100.0	100.0

Source: Survey Data 2011.

Table 8. Distribution of development agents by the frequency of research reports and face-to-face technical assistance obtained from researchers in the last one year.

Frequency	Research Reports newsletter, , N=108		Face-to-face technical Assistance, N=108	
	Number	Percentage (100%)	Number	Percentage (100%)
None	96	88.9	87	80.5
Once	4	3.7	6	5.6
Twice	5	4.6	6	5.6
Three times	3	2.8	5	4.6
Four or more times	0	0	4	3.7
Total	108	100.0	108	100

Source: Survey Data 2011.

Accordingly, the dependence of development agents on research centers for the supply of improved technologies to the farmers remains infeasible in the region. So, strong coordination and interaction between research centers and development agents need to be enhanced on the way products of research centers are able to implement on farmers field and improve the livelihood of smallholder farmers.

Motivation factors related to development agents job

Motivation is a description of a person's motive to action. If you have a drive to towards a goal, objective, or target, we talk about you having positive motivation (MTD Training Academy, 2010). Accordingly, the assumption is that when development agents are motivated at their workplace it tends them to foster in serving people agricultural extension services effectively. As a result, the outcome of the agricultural extension service they provide leads them to increase job satisfaction, effort, working environment, create drive and everyone's full potential can be tapped and so that the performance of development agents in serving their community in general and in technology dissemination in particular can be very high.

As shown in Table 9, of the total Development Agents

67.6, 80.6, 69.4, 75, 47.2, 48.1 and 75.9% of them were dissatisfied with their monthly paid salary, allowance obtained, supervision made by the district experts, promotion opportunities they should have to gain, general administration style of their respective district leaders, unavailability of living houses to live closely with the farmer to give advice timely and absence of communication allowance like telephone fee as to day is the age of information respectively. This briefly indicates, lack of adequate incentive system is one among the main reasons for the poor performance of development agents' in disseminating new technology to the intended farmer of the SNNPRS in particular and Ethiopia in general. Those encourage DAs specially thus who work under difficult conditions to develop negative attitude and low morale towards working with farmers as a result DAs could perform poor performance in their role and high staff turnover and job resign occur.

CONCLUSION AND RECOMMENDATIONS

Development agents of the study area have limitations of extension method utilization. To this end, majority of the DAs use farm and home visit although they have different alternatives and it is in contrary with the insufficient number of development agents serving the community in

Table 9. Distribution of development agents by level of job satisfaction.

Job characteristics	Response of Respondents to their level of Job satisfaction, N=108						Total (100%)
	Satisfied	%	Undecided	%	Dissatisfied	%	
Salaries	5	4.6	30	27.8	73	67.6	100
Allowance (like per diem)	2	1.9	19	17.6	87	80.6	100
Supervision	31	28.7	44	40.7	33	30.6	100
Promotion opportunities	12	11.1	21	19.4	75	69.4	100
Training opportunities	22	20.4	35	32.4	51	47.2	100
General administration	19	17.6	37	34.3	52	48.1	100
Availability of Living House	10	9.3	17	15.7	81	75	100
Communication allowance	14	13	12	11.1	82	75.9	100

Source: Survey Data, 2011.

the study area in particular and the country in general. Only 32.4 percent have the necessary knowledge, skill and experience in selecting and utilizing extension methods. DAs are the key source of appropriate agricultural information to farmers since they are working closely with farmers beside to their profession than other stakeholders in agriculture. However, development agents found working under areas characterized by lack of infrastructural facilities such as transportation problem; residence problem; remoteness; extremely low salary and lack of incentives such as per diems, overtime and holiday payments and health problems due to the absence of health services in rural area. In connection to this, many of them also work in areas characterized by lack of mobility freedom, virtually no equipment /materials both at the field and office. These conditions hinder extension professionals not to perform their mandate as expected in their day to day working areas. Accordingly, there is a need to improve the working environment of DAs including availability of logistics, incentives in kind and promotion. Pertinent to the study area, PADETS has achieved remarkable success with expanding the use of improved technologies, especially fertilizer and improved seed varieties. Farmers of the kebeles, development agents, chairman of the kebeles and supervisors uniformly decide in selection of farmers for participation in PADETES. Voluntariness, income levels and supportiveness to government policy were the key nomination criterions of farmers to take part in PADETES. Hence, the finding of the data revealed that there was no equal participation among farmers, DAs and Kebele administrators in nominating trainee farmers to take part in PADETES. And it depicted that poor farmers were at the margin of extension service. Furthermore, there was no formal liaison between research and extension that could foster dissemination of ecologically friend, socially sound and market oriented agricultural technologies produced in research centre through DAs to the intended group of farmers on the time of need. To sum-up lack of adequate incentive system is one among the main reasons for the poor performance of

development agents' in disseminating new technology to the intended farmer of the Southern region in particular and Ethiopia in general. Thus encourage DAs specially thus who work under difficult conditions to develop negative attitude and low morale towards working with farmers as a result DAs perform poor performance in their role and high staff turnover and job resign occur. The findings of study imply that to mitigate the challenges of development agents performance in agricultural technology dissemination sustainably, all development stakeholders who are working in the region should give attention to:

- a) On-the-job training should be given to development agents to improve their level of knowledge, skill and attitude; able to select and utilize effectively combined extension methods, approaches and media while they work with farmers closely as extension experts;
- b) The government should have to give top priority and work to the development of rural infrastructure facilities such as rural road construction, telecommunication and transportation networks to make DAs accessible to farmers and farmers to market services, able to reduce marketing costs of inputs, save labour and time; and to improve their style of living condition;
- c) Poor smallholder farmers should be on the front of any attention for extension services as the first goal is to ensure food self-sufficiency and consequently to eradicate poverty; and
- d) Strong formal liaison, coordination and cooperation among research centers, development agents and farmers need to be created on the way products of research centers are able to implement on farmers field and improve the livelihood of smallholder farmers; and
- e) Adequate incentive system should be provided to development agents to have job satisfaction and develop their motive in serving the community.

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REFERENCES

- Anandajayasekeram P, Puskur R, Sindu W, Hoekstra D (2008). Concepts and practices in agricultural extension in developing countries: A source book. IFPRI (International Food Policy Research Institute), Washington, DC, USA, and ILRI (International Livestock Research Institute), Nairobi, Kenya. pp. 64-68.
- Anderson JR, Feder G (2002). Rural Extension Services, World Bank, Agriculture and Rural Development Department, Washington DC.
- Belay K (2003). Agricultural Extension in Ethiopia: The Case of Participatory Demonstration and Training Extension System', *J. Soc. Dev. Afr.*, 18(1): 49-83.
- Belay K, Abebaw D (2004). Challenges Facing Agricultural Extension Agents: A Case Study from South-western Ethiopia. Blackwell Publishing Ltd 2004, 9600 Garsington Road, Oxford, USA. pp. 139-168.
- Belay K, Degnet A (2004). Challenges Facing Agricultural Extension Agents: A Case Study from South-western Ethiopia. African Development Bank, Blackwell Publishing Ltd, Oxford, UK.
- CSA (2007). Central statistical authority population estimates (Volume I), CSA, Addis Ababa, Ethiopia. pp. 1-131.
- Gebrehiwot W, Fekadu B (2012). Household Livelihood Strategies in Drought Prone-Areas of Gulomekeda District, Tigray National Regional State, Ethiopia. *J. Dev. Agric. Econ.*, 4(6): 158-168.
- Ibrahim M (2004). Extension experiences in Ethiopia. Paper Presented at the "Ministry of Agriculture and Rural Development Planning Workshop," Addis Ababa, Ethiopia.
- Kaimowitz D (1991). 'The Evolution of Links between Extension and Research in Developing Countries', in W.M. Rivera and D.J. Gustafson (eds.), *Agricultural Extension: Worldwide Institutional Evolution and Forces for Change*, Elsevier Science, Amsterdam. pp. 101-112.
- Lindley WI (2000). 'Constraints and Potentials of Training Mid-Career Extension Professionals in Africa', in S.A. Breth (ed.), *Innovative Extension Education in Africa*, Sasakawa African Association, Mexico City, pp. 16-32.
- MoARD (Ministry of Agriculture and Rural Development), 2010. A Draft Ethiopia's Agriculture Sector Policy and Investment Framework: Ten Year Road Map (2010-2020).
- Patton MQ (1987). The Extension Organization of the future. *J. Ext.*, 2(5): 22-24.
- Sanders HC, Maunder AH (1966). Why an Extension Service Today? In Sanders, H.C. (Ed.), *The Cooperative Extension Service*. Englewood Cliffs, NJ: Prentice Hal. pp. 3-12.
- Spielman D, Byerlee D, Avid J, Alemu D, Kelemework D (2010). Policies to Promote Cereal Intensification in Ethiopia: The Search for Appropriate Public and Private Roles, *Food Policy* 35: 185-194.
- Swanson BE, Farner BJ, Bahal R (1990). 'The Current Status of Agricultural Extension Worldwide', in B.E. Swanson (ed.), *Report of the Global Consultation on Agricultural Extension*, FAO, Rome.
- Tsion T, Ranjan SK, Teklu T (2010). Effectiveness of training offered by Ethiopian Institute of Agricultural Research to farmers: The case of Holetta, Melkassa and Debre Zeit Agricultural Research Centres, *Ethiopia. Afr. J. Agric. Res.*, 5(7): 500-513.