



# Responsiveness of dairy research in generating improved dairy practices in West Shewa zone of Oromia, Ethiopia

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**ABSTRACT :** Dairy research has been undertaken since 1960s in Ethiopia. However, the majority of the farmers still continue to adopt traditional dairy practices. This study was made to look into the current status of dairy research in generating responsive improved dairy practices. To achieve the objective of the study, cross sectional survey was employed using 50 researchers in the area of livestock sector. A systematic sampling technique was employed to identify the sample respondents. Holistically, to capture all the relevant information, mixed methods such as focus group discussion, key informant interview, questionnaire and observation were used for data collection. The data were analyzed using descriptive statistics, content analysis and ranking. The study clearly indicated that the improved dairy practices generation process of the study area was less responsive mainly due to lack of clear dairy research strategy. Evidently, low dairy productivity and low level use of improved dairy practices are the key indicators. Likewise, inadequate laboratory equipments, inadequate laboratory facility (building) and inadequate budget support were the central constraints of the dairy research in order of their importance. Generally, in the dairy research efforts of several decades, the numbers of generated, disseminated and adopted improved dairy practices were not worth mentioning. It necessitates formulation of dairy research strategy that leads to the generation of responsive improved dairy practices which, in turn, brings significant impact on the dairy development.

**KEY WORDS :** Dairy research, Improved dairy practices, Livestock, Responsive

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## INTRODUCTION

Ethiopia ranks first in cattle population in Africa and it is also among the 10 countries who own highest cattle population in the world. As a result, dairy production is an integral part of agricultural activities in Ethiopia. Livestock contributes to the national economy about 15 per cent of the total GDP, 40 per cent of the agricultural

GDP and 31 per cent of the total employment (Aklilu, 2002 and Getachew, 2003) as cited in Yilma *et al.* (2011). This estimate did not include the value of draught power, manure and rural transportation services which could increase the contribution of the livestock sector beyond the estimated figure.

The introduction of improved dairy practices in Ethiopia was marked by 300 Friesian and Brown Swiss dairy cattle which were donated by United Nations Relief and Rehabilitation Administration in 1947. Modern extension system and agricultural research had also been started in 1950s and 1960s, respectively. Since then, research generated various improved dairy practices in the area of improved management practices, feed and

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feeding practices, health care practices, and breeding practices. Similarly, extension has been working on the dissemination of improved dairy practices to the end users. Scaling up of agricultural technologies and best practices program are also initiated. However, the coverage of Artificial Insemination technology is one per cent in the past six decades effort of research and extension works. About 0.15 per cent of rural livestock holders use improved forages (alfalfa and Napier grass) (CSA, 2008). Similarly, the use of industrial by-products like oil cake, bran and brewery residue is negligible (0.8%). EARO (2006), now EIAR (the apex national research organization of Ethiopia) also states that “despite of decades of research and development efforts, with the aim to provide farmers new technologies to improve their farming practices, agricultural productivity for both crop and livestock production is still very low.” Generally, Low productivity, low level use of agricultural technologies and low adoption of improved dairy farming technologies are the major concern.

Future agricultures consortium (FAC, 2011) clearly points out those lessons from across Africa show that the effectiveness of agricultural technology generation and dissemination institutions depends crucially on their relevance and responsiveness to farmer needs.

In many parts of Africa, realizing the potential of agricultural research to reduce poverty has been elusive as reported in 2006 by Forum for Agricultural Research in Africa (FARA), taking into account the existing prevalence of poverty, hunger and malnutrition among farm families, in many part of Africa.

Sumberg (2004) also notes that agricultural research in Africa had generally yielded few benefits for poor people because it was elitist and out-of-touch with rural realities. Similarly, Roling (2006) argues that the production of agricultural technologies by research, even if they ‘work’ in the experiment station, is absolutely no guarantee for diffusion.

The main factors that affect agricultural research in developing countries are: lack of qualified research personnel, inadequate resources and inappropriate resource allocation, (Ali *et al.*, 1994). The authors further state that lack of qualified personnel in the research organizations affect the technology development which ultimately affects agricultural extension work as the poorly developed technology is hard to be accepted or adopted by the farming community.

KAM (2012) using knowledge index (KI) ranks Ethiopia 140<sup>th</sup> out of 145 countries in ability to generate, disseminate and use knowledge. Additionally, a report by Azage *et al.* (2006) states that knowledge generated by the national research institutes of Ethiopia was not communicated in a useful and accessible manner to livestock keepers. Tesafye *et al.* (2008) also identified that the focus of dairy research has been on the generation of technical knowledge/technology with limited activities on technology transfer, marketing, service delivery and organization.

In Ethiopia, the responsiveness of research systems and researchers to farmer constraints and priorities remains unsatisfactory in too many cases. One of the main reasons for this is the lack of downward accountability by researchers (and others) to their customers. Research is accountable to those who provide the funds, usually government or contracted clients. Until it becomes more accountable to their real customers for at least a part of their funds, cementing close co-operation between research and extension and increasing their customer responsiveness, will remain an issue (Vince, 2005).

For making research effective frequent monitoring and evaluation needs to be a main regular activities of research organizations. In this regard, CIMMYT Economics Programme, (1993) summarizes as follows, “Organizations responsible for developing new technology need to know if the transfer process is functioning. Organizations responsible for promoting technology need to know if their message is being heard and community or regional development efforts need to judge to what extent technological change is contributing to their goals.”

In the light of these facts, this research project intended to look into the current status of dairy research in generating responsive improved dairy practices. Consequently, policy makers, researchers and other actors involved in dairy development get adequate information on the current status of dairy technology generation process which, in turn, would help them to suitably modify the strategies. Ultimately, the dairy sub sector contributes to wards poverty reduction and improvement of the livelihood of the rural people significantly.

## MATERIAL AND METHODS

This study was carried out in Ambo and Welmera districts of Oromia regional state, Ethiopia, in 2015. The

districts were purposively selected due to the presence of dairy research activities and the availability of information in line with the specific objective of the study.

### Sampling techniques :

Purposive sampling technique was employed to include districts in which dairy research was undertaken. Accordingly, Welmera and Ambo districts were selected for the study. From both districts 50 respondents (researchers) were selected through systematic sampling techniques. According to Storck *et al.* (1991), the size of the sample depends on the available fund, time and other reasons and not necessarily on the total population.

### Source and types of data :

The study used both primary and secondary data. The unit of analysis for the study was dairy researchers. Thus, primary data were collected from dairy researchers. Secondary data were also collected from research reports, bi-annual reports, journal and proceedings. Both qualitative and quantitative data types were used to address the objective of the study.

### Method of data collection :

Cross sectional survey was employed to collect the data for addressing the objective of the study.

Comprehensive information is obtained through mixed methods such as focus group discussion, key informant interview, questionnaire and observation. In line with the research objectives, the questionnaire was prepared and pre-tested. The questionnaire mainly included rates of dairy socio-economic background of respondents, technology generation, researchers' performance and research constraints. Information such as number of technology generated, disseminated, published, adopted and constraints encountered researchers for generating responsive improved dairy practices were generated.

### Data analysis :

The tools for data analysis were descriptive statistics such as percentages, frequencies, mean and standard deviations, ranking and content analysis. Content analysis is useful for examining the content of the qualitatively collected data (KII, FGD) to give meaning in line with the research question. Ranking of major constraints for generating improved dairy practices was made by

respondents and then converted to weightage following Alfares (2006) to get relative value of each constraint. The mean values of constraints were calculated and taken as a weightage of that particular constraint. Finally, rank of each constraint was given based on its relative value.

## RESULTS AND DISCUSSION

The results of the present study as well as relevant discussions have been presented under following sub heads:

### Socio-economic characteristics of the respondents:

The mean age and work experience of dairy researchers were 37.5 and 13.7 years, respectively. The mean family size of researchers was also 3.3 persons. With respect educational status of the respondents, evidently education is a powerful tool for developing social, economic and political activities of the society. It highly improves critical, logical and analytical thinking of the individuals which, in turn, contributes to solve developmental problems of the society. Thus, Human capacity building needs to be a precursor to all the development endeavors. As depicted in Table 1, about 28, 50 and 22 per cent of researchers were with the qualification of Ph.D., M.Sc./MA and B.Sc./BA, respectively (Table 1).

| Education level | Freq. | %   |
|-----------------|-------|-----|
| Ph. D.          | 14    | 28  |
| M.Sc./ MA       | 25    | 50  |
| B.Sc. / BA      | 11    | 22  |
| Diploma         | -     | -   |
| Total           | 50    | 100 |

### Dairy research strategy :

Well formulated research strategy provides a clear direction for undertaking a responsive research works. It has considerable contribution for developing effective improved dairy practices. Fig. 1 summarized that the majority (88%) of the respondents indicated the absence of clear dairy research strategy and the balance 10 and 2 per cent responded as lengthy and the presence of clear strategy, respectively. The key informant interview result also confirmed the absence of clear strategy that guides the overall research direction of dairy. Initially, the country adopted cross breeding as strategy for improving the dairy

sub sector of the country. Selection of indigenous cows and developing synthetic breed were not considered as option for improving the dairy sub sector of the country. Cross breeding was implemented without thorough identification of genetic materials of the entire local dairy breeds. For the purpose, Boran, Horro and Barka indigenous breeds were selected for crossing with Holstein Friesian and Jersey. The productivity of local cows is very low. For instance, the average milk yield/day for boran and cross bred is 1.6 lit and 8 lit at farmers level, respectively. FAO Statistical Database also evidently points out that globally, Ethiopia has the lowest average milk productivity (210kg/year/cow) and only it precedes Tanzania (174kg/year/cow).

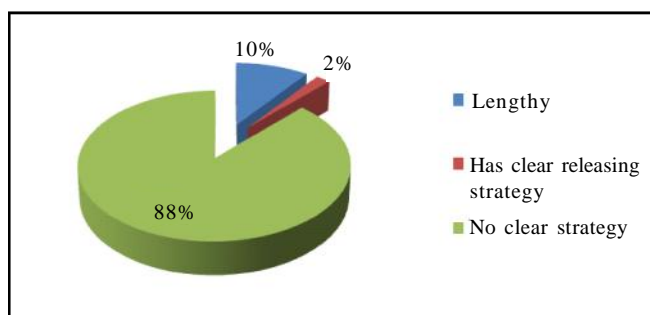


Fig. 1 : Status of dairy research strategy

It necessitates finding the potential dairy cows that give more milk production in the country. Thus, it needs exhaustive scanning and selection of the genetic resources of the cattle for improving the dairy subsector of the country. It is also evident from the literature that the Artificial Insemination (AI) coverage of the country is less than one per cent, in the long journey of cross breeding.

**Status of dairy research review process :**

A research review maintains the quality of the research works and it equally avoids effort duplication. In the study area, a research proposal review process of the university was completed in the university. However, the research proposal review process of the research

center took place at different stages and finally reaches the national research review meeting where the final approval of the research proposal is made. Table 2 revealed that 82 per cent of the respondents replied that the research review helped in improving the research work. The remaining 8 and 10 per cent of the respondents stated that the research review process of the study area was lengthy and full of professional bias, respectively. On the other hand, researchers were made to evaluate their level of research skills. The majority (60%) of the respondents replied as they have sufficient research skills and the balance 40 per cent of the respondents replied as they have insufficient research skills.

In relation to research review process, observation and key informant interview was made with senior researchers. Thus, the research proposal review process at Holetta Agricultural Research Center took place at five different stages, namely, process, commodity, centre, case team and national levels. At each stage, professionals of the discipline critically review following the presentation of the initiator/s of the research proposal. Technical soundness, relevance and financial viability of each proposal is evaluated for consideration. Similarly, the anticipated contribution of the research output to the national development; dairy sub sector development; technology needs of clientele are duly considered. At each stage of the research proposal review, the expectation is that the research proposals are getting more technically sound and problem solving. Finally, the research proposals that met the aforementioned requirements reach for national research proposal review level on which fund is granted.

As of the discussion made with the key informants, there was no well established research proposal review system. As a result, the research proposal review process lacks stability and subjected to frequent changing. Lack of stable and strong research review process emanate from the absence of in depth study during the change of the review process. As a result, the contribution of the review to the enrichment of the research proposal is minimal. In the other way, the current less development of responsive improved dairy practices is the reflection

**Table 2: View of researchers on research review and level of their research skills**

| Status of research review            | Research skills |                           |            |              |
|--------------------------------------|-----------------|---------------------------|------------|--------------|
|                                      | Lengthy         | Full of professional bias | Sufficient | Insufficient |
| Helps in improving the research work |                 |                           |            |              |
| 41 (82)                              | 4 (8)           | 5 (10)                    | 30 (60)    | 20 (40)      |

Figure in the parenthesis indicates percentage

of the less vigour of the research review process. The current research proposal review process was too long. Reviewing a single research proposal at five stages is monotonous and time consuming. Though the review process was made at various stages, there were no well designed criteria to each stage to serve as guidance for reviewing the proposal.

Dairy research took place by national research centers, regional research centers, universities, NGOs etc. There was no common forum for all the organizations though they undertook similar activities in relation to research activities. There was an effort to create common forum for national and regional research centers though it was not strong enough to reduce redundancy of research works. Roles and responsibilities of each institution were not well demarcated and observing redundancies of research activities were common during reporting at different research review forum. On the other hand, it leads to unnecessary resource competition for same research activity that took place at different organization. For instance, research centers and university which are located in the study area have no collaboration research work. Unexpectedly they had also no a common forum for reviewing research proposals. The finding is in agreement with Belay (2003) which states that the participation of different organizations in research and extension activities of Ethiopia is without proper co-ordination which, in turn led to redundancy of effort and wastage of resources.

Researchers were made to rate the effectiveness of improved dairy practices generation process. It is a self-evaluation for researchers. As depicted in Table 3, about 12, 30, 48 and 10 per cent of researchers rated as ineffective, rarely effective, moderately effective and highly effective, respectively. The majority of researchers (42%) rated the effectiveness of improved dairy practices process below the average. The data evidently confirms that the improved dairy practices generation process of

the study area is below the average. In needs revisiting of the dairy research process to meet the needs of the clientele and for more contribution to the dairy development of the country.

**Table 3:. Status of improved dairy practices generation process as rated by researchers (n=50)**

| Particulars          | Freq. | %   |
|----------------------|-------|-----|
| Ineffective          | 6     | 12  |
| Rarely effective     | 15    | 30  |
| Moderately effective | 24    | 48  |
| Highly effective     | 5     | 10  |
| Total                | 50    | 100 |

An assessment was made to identify the performance of researchers in generating improved dairy practices. In the previous discussion (under the sub topic “socio-economics characteristics of the respondents” the mean years of work experience for researcher was 13.7. As summarized in Table 4, mean of improved dairy practices generated by the researchers was 0.98. In the other way the researcher was generating on average  $(0.98/13.7) = 0.072$  improved dairy practices per annum during his/her employment period. The figure points out that the majority of the researchers were without having / developing a single improved dairy practices during their stay in the organization. Based on the field observation, the disseminated and adopted improved dairy practices were minimal. The mean number of journal publications was 5.16 *i.e.* on average a researcher had  $(5.16/13.7) = 0.38/$  annum during his/her employment period. Publication is useful tool for sharing scientific information among the scholars. However, the figure suggests that an effort of researchers in publications was not worth mentioning.

#### **Dairy research monitoring and evaluation :**

Observation and key informant interview was done

**Table 4: Researchers performance in generating and disseminating improved dairy practices**

| Particulars  | (n=50)  |         |        |      |                |
|--|---------|---------|--------|------|----------------|
|  | Minimum | Maximum | Sum    | Mean | Std. deviation |
| Number of improved dairy practices generated                     | .00     | 5.00    | 49.00  | 0.98 | 1.38           |
| Number of improved dairy practices disseminated to the end users | .00     | 3.00    | 39.00  | 0.78 | 1.06           |
| Number of improved dairy practices adopted by the farmers        | .00     | 3.00    | 39.00  | 0.78 | 1.06           |
| Number of improved dairy practices rejected by the farmers       | .00     | .00     | 00.00  | 0.00 | .00            |
| Number of journal publications since employment                  | .00     | 31.00   | 258.00 | 5.16 | 6.94           |
| Number of on going research projects                             | .00     | 5.00    | 80.00  | 1.60 | 1.67           |

at Holetta Agricultural Research Centre. It aimed at identifying the status of the center on research monitoring and evaluation. Thus, monitoring and evaluation is an important tool in rectifying the implementation of the research works as planned and also assists to make the necessary adjustments for achieving the set research objectives.

The centre has monitoring and evaluation committee that makes follow up on the overall research works of the center. The researcher also prepares progress report (status of research) and annual report (details of the activity). Monitoring and evaluation could not solve all the bottlenecks that exist within the research center. For instance, once the research proposal is approved, the researcher starts the research work without making a signed agreement with organization. The importance of agreement is to properly handover the research works when a researcher needs to leave the center due to various reasons. There is a mechanism of handover of the research works for those who leave the center officially. However, there is no enforcing mechanism to handover the research works for those who leave the center by their own. The research works of such individuals are made discontinued after consuming the resources. To overcome such problem, it needs a set agreement between researcher and organization which in turn makes the researcher to take full accountability.

A monitoring and evaluation committee needs to have a set guideline which supports them to make their activities objectively. What to monitor and evaluate? How to monitor and evaluate? When to monitor and evaluate? How to report the result of monitoring and evaluation? and how to communicate the monitoring and evaluation

result to the researcher? etc. needs to be set adequately before monitoring and evaluation took place.

Monitoring and evaluation committee is a mirror for the organization and it needs developing their capacity through short term training and experience sharing to render their services efficiently. Organizing monitoring and evaluation team at center level is not adequate to monitor and evaluate the whole research projects of the center. Thus, it needs to cascade to departmental level.

Furthermore, the researchers need to undertake impact evaluation on the adopted improved dairy practices. Impact evaluation is aiming at getting feedback about the performance of the improved dairy practices under farmers' circumstances. It is an important tool to pinpoint the status of the practices and to serve as a base for decision regarding possible changes and improvements on the technology and the whole research process. In the process of improved dairy practices dissemination, intensive follow up is a mechanism in making the adoption of the practices sustainable. It also assists to know the status of adopted improved dairy practices; the possible reasons for their discontinuation and non-adoption of the practices; socio-economic changes observed on the farmers due to adopting the improved dairy practices.

In respect to documentation of research works a key informant interview was done with senior researchers. Research work is made ready to use when it is well documented in the way that it is accessible to the users. In the research center, the completed research works are documented at center level. It comes to documentation after reviewing the research works at different research forums. However, there was no supervision on the final write up of the research work

**Table 5 : Ranking of major constraints for generating improved dairy practices**

| Sr.No. | Problems  | Weightage | Rank |
|--------|---|-----------|------|
| 1.     | Inadequate laboratory facility (building)           | 75.22     | 3    |
| 2.     | Inadequate laboratory equipments                    | 77.07     | 2    |
| 3.     | Lack of clear research strategy                     | 85.69     | 1    |
| 4.     | Limited research skills                             | 69.78     | 6    |
| 5.     | Inadequate research staff                           | 63.82     | 7    |
| 6.     | High cost of generation of improved dairy practices | 70.84     | 5    |
| 7.     | Frequent job shifting of researchers                | 60.12     | 9    |
| 8.     | Inadequate budget support                           | 71.12     | 4    |
| 9.     | Lack of team spirit among staff                     | 46.45     | 11   |
| 10.    | Inadequate research materials (inputs)              | 63.02     | 8    |
| 11.    | Inadequate incentives                               | 53.41     | 10   |

and full responsibility was given to the researcher. Monitoring and evaluation needs to be made starting from the research works to the implementation of the research findings. The documentation of research proposal and final write up are equally important. When the research proposal is developed, it should include clear strategy on how to the research finding reach the end users and act accordingly when the research work is completed. Final write up of a research is not an end by itself. It has to be translated in to action to solve the problem that the research was planned for.

Submission of the whole research works is not enough and the summary of the research findings needs to be prepared and documented separately. Though it is difficult to disseminate the full write up of a research works, the summary of the research findings needs to be disseminated to the users including the policy makers and planners.

#### **Major constraints of dairy research :**

Identification of the constraints that impede the effectiveness of generating improved dairy practices needs to be the prior activities of stakeholders participating in dairy research. By the same token, searching pertinent solution to the constraints boosts the generation, adaptation, testing and dissemination of improved dairy practices that solve the problems of the end users. The core constraints of dairy research were identified through group discussion with researchers and finally incorporated into the questionnaire. The respondents ranked the constraints in order of their importance (highest to lowest). Table 5 summarized the weightage of each constraint along with its rank. Lack of clear research strategy, inadequate laboratory equipments, inadequate laboratory facility (building) and inadequate budget support were the top constraints of the dairy research in order of their importance. Research mainly needs effective research management, competent and committed staff, resource and infrastructure. In the absence of such requirements, expecting problem solving improved dairy practices are unattainable. The research center has been making effort to generate improved dairy practices for more than five decades. Some technologies are generated, verified and popularized to the target group. For instance, determining the blood level of cross bred as per the agro ecological zone of the country; recommendation of agronomic practices of improved varieties of oats, vetch, tractucarne,

elephant grass; improved management practices, improved housing, feeding practices are some of improved dairy practices generated at the center. However, more sophisticated research works were lacking in the center mainly due to frequent restructuring, inadequate number of well experienced researchers, shortage of laboratory equipment, shortage of research inputs and lack of skilled laboratory technicians.

#### **Policy implications :**

The less responsiveness of dairy research necessitates revisiting of the current research policy/strategy; working on intensive capacity development of staff through short and long term training, experience sharing and staff exchange program. Similarly, improving research infrastructure, developing responsive improved dairy practices and strengthening actors linkage are the main areas that need due consideration for improving the effectiveness of dairy research.

#### **Conclusion :**

Dairy is a common farming enterprise and income-generating activity in the study area. For improving the dairy productivity of the area, dairy research has been undertaking since 1960s. Considerable dairy research activities have been undertaking in the areas of improved management, feed and feeding, health care and breeding practices. Though researchers made efforts to improve the dairy sub sector of the country, significant change is not observed on the sub sector. Dairy sub sector is characterized by low productivity. As a result, the dairy sub sector is not responding to the existing high demand of dairy products in the country. Putting into consideration the research efforts made for several decades, the less productivity of the dairy sub sector needs an urgent comprehensive response from the professionals of the respective actors.

#### **LITERATURE CITED**

- Alfares, H.K. (2006). Determining criteria weights as a function of their ranks in multiple-criteria decision making. Systems Engineering Department, King Fahd University of Petroleum & Minerals, Dhahran, SAUDI ARABIA.
- Ali, Tanvir, Khan, Saeed A., Malik, Niaz H., Ahmad, Munir and Saleem, Imran (1994). Investigation into some common factors which affect agricultural research and extension work in developing countries. *Pak. J. Agri. Sa.*, **31** (3): 245-249.

- Azage, Tegegne, Berhanu, Gebremedin, Dirk, Hoekstra and Nigatu, Alemayehu (2006). Rural urban linkage in market-oriented dairy development in Ethiopia: Lessons from Ada'a Dairy Cooperative, ADDIS ABABA.
- Belay, Kassa (2003). Agricultural extension in Ethiopia: The case of participatory demonstration and training extension system. *J. Soc. Develop. Africa*, **18** (1) : 49-84.
- Central Statistical Authority (CSA) (2008). *Agricultural sample survey*. Volume 2 Livestock, and livestock characteristics ). CSA, ADDIS ABABA, ETHIOPIA.
- CIMMYT Economics Programme (1993). *The adoption of agricultural technology: A Guide for Survey Design*. Mexico, D.F.: CIMMYT.
- EARO (Ethiopian Agricultural Research Organization) (2006). Research Extension- Farmer linkages strategy document. ADDIS ABABA.
- Food and Agriculture Organization of the United Nations (FAO) (2011). Statistical Database. Future Agricultures Consortium (FAC) Policy Brief 04, Future Agricultures Consortium Secretariat at the University of Sussex, BRIGHTON.
- KAM (Knowledge Assessment Methodology) (2012). The World Bank Knowledge for Development (K4D) website
- Röling, N. (2006). Conceptual and Methodological Developments in Innovation. In: Pascal, C.S. Waters-Bayer, A., Kaaria, S., Njuki, J. and Wettasinha, C. (Eds), *Innovation Africa: enriching farmers' livelihoods*. Earthcan, London, 9-34pp.
- Storck, H., Bezabih Emanu, Berhanu Adenew, Borowieck, A. and Shimelis, Hawariat W. (1991). Farming systems and farm management practices of small holders in the Hararge high lands. Farming systems and resource economics in the tropics, **11**. Wissenschaft surlang vau,kiel, GERMANY.
- Tesafye, Lemma R., Puskur, Azage T. and Hoekstra, D. (2008). April 7-9. "Exploring innovation capacity in the Ethiopian dairy systems." Paper presented on the international conference on: Advancing Agriculture in Developing Countries through Knowledge and Innovation, International Food Policy Research Institute, ADDIS ABABA.
- Vince, Ashworth (2005). The challenges of change for agricultural extension in Ethiopia, a discussion paper, ADDIS ABABA
- Yilma, Z., Emannuelle, G.B. and Ameha, S. (2011). A Review of the Ethiopian Dairy Sector. Ed. Rudolf Fombad, Food and Agriculture Organization of the United Nations, Sub Regional Office for Eastern Africa (FAO/SFE), Addis Ababa, Ethiopia, 81pp.

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