Determinants of Improved Dairy Practices Adoption in West Shewa Zone of Oromia, Ethiopia

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ABSTRACT

Though organized way of extension of improved dairy practices has been undertaking since 1950s in Ethiopia, the majority of the farmers are still practicing traditional dairy management. This study was carried out to find out the factors influencing technology adoption in dairy production. To achieve the objective of the study, cross sectional survey was employed using 150 farmers. A random 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, survey and observation were used for data collection. The data were analyzed using descriptive statistics, multinomial logistic regression and ranking. Multinomial logistic regression revealed that age, education level of household head, farm experience, livestock holding size, frequency of extension contact, availability of improved dairy practices and training were found to be positively and significantly influencing the adoption of improved dairy practices. The main reasons for non adoption of improved dairy practices were shortage of animal feed, in adequate improved dairy practices, cost of improved dairy practices, shortage of farm land and attention of extension services only to model farmers living at accessible areas. The study evidently indicated the need for the extension organization to revise the existing implementation scheme of extension works at field level; enhancing integrated action of multi-actors; capacitating farmers; creating ready market; developing need based and affordable improved dairy practices and promoting farmer-to-farmer extension for sustainable dairy development.

Keys words: *Adoption; Dairy extension; Improved dairy practices; Multi-actors;*

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; 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 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 (Ethiopian Institute

of Agricultural Research) also states that "despite 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.

The result of adoption study is the direct reflection of research and extension effectiveness. For instance, more adoption of a technology implies the fitness of the research results and the extension system to the requirements of the users. *CIMMYT Economics Program (1993)* also states that one of the reasons for doing an adoption study is to provide evidence of the returns to a research or extension effort.

Adoption is viewed as a variable representing behavioral changes that farmers undergo in accepting new ideas and innovations in agriculture. The term behavioral change refers to desirable change in knowledge, understanding and ability to apply technological information, changes in feeling behavior such as changes in interest, attitudes, aspirations, values and the like; and change s in overt abilities and skills (*Ray, 2001*).

A new technology is introduced to small holders farmer by itself alone does not guarantee for a wide spread adoption and efficient use. For efficient utilization of the technology the fulfillment of specific economic, technical and institutional conditions are required. From the farmers' perspective, the new technology should be economically more profitable than the existing alternatives. The new technology should also be technically easily manageable by small holders and adaptable to the surrounding socio-cultural situations. Similarly, the availability of the new technology and all other necessary inputs to small holders at the right time and place and in the right quantity and quality should be ensured; and changes like the awareness and attitude of farmers towards improved agricultural technologies and the institutional factors enhance adoption (*Ehui et al., 2004, Salim, 1986*).

The rate of adoption is influenced by the farmers' perception of the characteristics of the innovation, the changes this innovation requires in farm management and the roles of the farm family (*Ban and Hawkins, 1996)*. The authors further stated that innovations usually are adopted rapidly when they have a high relative advantage for the farmers; compatible with the farmers' values, experiences and needs; are not complex; can be tried first on small scale and easy to observe the results.

According to *Yilma et al., 2011* the main Ethiopian dairy sector challenges identified are : genetic limitation, inadequate animal feed resources, limited access and high cost of dairy heifers/cows, absence of an operational breeding strategy and policy, inadequate veterinary service provision, weak linkages between research, extension service providers and technology users, inadequate extension and training service, milk market related constraints, limited availability of credit to the dairy farmer, and unavailability of land.

In the light of these facts, this study intended to find out the factors influencing technology adoption in dairy production. Consequently, policy makers, researchers and other actors involved in dairy development get adequate information on the current status of dairy technology adoption which, in turn, would help them to suitably modify the strategies that enhance improved dairy practices adoption.

METHODOLOGY

Sampling techniques: This study was carried out in Ambo and Toke Kutaye districts of West Shewa zone. Purposive sampling technique was employed to include districts in which dairy production was undertaken. The districts were purposively selected due to the presence of dairy activities and the availability of information in line with the specific objective of the study. 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. Accordingly, from both districts 150 respondents were selected through simple random sampling techniques.

Source and types of data : The study used both primary and secondary data. The unit of analysis for the study was household head (farmers). Thus, primary data were collected from farmers, extension agents and model farmers. 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, survey and observation. In line with the research objectives, the questionnaire was prepared and pre-tested. The questionnaire mainly included socio-economic background of respondents, technological factors influencing adoption, reasons for low adoption. Information such as influencing variables of dairy technology adoption, and constraints encountered farmers for adopting improved dairy practices were generated.

Data analysis : The tools for data analysis were descriptive statistics such as per centages, frequencies, mean and standard deviations; ranking and multinomial regression analysis. Ranking of major constraints for adopting 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. Following Long (1997) the multinomial logit regression model can be specified as:

$$Prob\ (y_i = j) = \frac{e^{(\beta j x i)}}{\sum_{k=0}^{3} e^{(\beta j x i)}}, \text{ as j is } = 0,1,2$$

Where:

Pr (y_i= j) is the probability of that a household i to choice adopting either full or partial packages of improved dairy practices with non adopter as a reference group

J is the number of categories

J=0 is non adopter

Xi is explanatory variable vector that contains the set of factors about household demographic and socioeconomic characteristics

βj is a vector of the estimated parameters

The variables of the study were hypothesized as follows;

Age, continuous variable (+)

Education level of household head, continuous variable (+)

Experience, continuous variable (+)

Family size, continuous variable (+)

Land Size, continuous variable (+)

Livestock holding of household, continuous variable (+)

Extension contact, continuous variable (+)

Availability of technology, dummy variable (+)

Compatibility of the technology, dummy variable (+)

Training, dummy variable (+)

Demonstration, dummy variable (+)

Access to credit, dummy variable (+)

Market for the products, dummy variable (+)

RESULTS AND DISCUSSION

Determinants of Adoption of Improved Dairy Practices : The result of multinomial logit regression on determinates of improved dairy practices is presented in Table 1 using non adopter as reference category. The multinomial logistic regression model is estimated using maximum likelihood method. The χ^2 result shows that the parameters are significantly different from zero at P<0.01 for the adoption of improved dairy practices. The McFadden's R-square or Pseudo R^2 is 0.396, indicating that 39 per cent of the variations in probabilities of adopting improved dairy practices was explained by the selected explanatory variables.

Explanatory variables that were taken to the model are; age, education level of household head, experience, family size, land size, livestock holding size, frequency of extension contact, availability improved dairy practices, compatibility of improved dairy practices, training, demonstration, credit and market. Among the variables taken to the model age, education level of household head, experience, livestock holding size, frequency of extension contact, availability of improved dairy practices and training were found to be significant. Family size, land size, market availability, compatibility of improved dairy practices, visit demonstration, credit and market availability were insignificant. Explanatory variables that are selected for econometric model and statistically significant would be discussed

Age: The finding is in contrast to (*Motamed and Singh, 2003*) study that concludes young people are more flexible in deciding for change than aged people. It is also in contrary with the study conducted by *Million and Belay, 2004* that indicates age had a weak and at the same time negative association with adoption. In this particular study, age is influencing the choice of adopting of improved dairy practices positively. As the age gets older the respondents opt to own one or two cross bred instead of to owning many indigenous cows. It was also observed that owning one or two cross bred was not demanding extra labor and managed by the owner. It is positively significant at P<0.01, The odds that a farmer will choose to adopt improved dairy practices increases by a factor of 1.156 for farmers who are older, all other factors held constant. The finding

Table 1: Multinomial Logit Regression for factors influencing improved dairy practices adoption (N=150)

Category	Variables	β	SE	Wald	Df	Sig.	Exp (β)
Adopter	Intercept	-11.278	2.426	21.611	1	.000	
	Age	.145	.041	12.750	1	.001***	1.156
	Education	.227	.082	7.722	1	.005***	1.254
	Experience	-.242	.061	15.518	1	.001***	.785
	Family size	.061	.157	.153	1	.696	1.063
	Land size	-.223	.223	1.004	1	.316	.800
	Livestock	.467	.243	3.703	1	.054*	1.596
	Extension	.975	.272	12.879	1	.001***	2.650
	Availability	1.867	.824	5.136	1	.023**	6.470
	Compatibility	1.060	.804	1.738	1	.187	2.885
	Training	1.873	.851	4.840	1	.028**	6.506
	Demonstration	.646	.776	.693	1	.405	1.907
	Credit	.639	.937	.465	1	.495	1.894
	Market	.326	1.100	.088	1	.767	1.386
partial adopter	Intercept	-5.779	1.684	11.771	1	.001	
	Age	.126	.035	13.046	1	.001***	1.134
	Education	.087	.062	2.009	1	.156	1.091
	Experience	-.202	.050	16.616	1	.001***	.817
	Family size	.027	.128	.046	1	.831	1.028
	Land size	-.244	.180	1.839	1	.175	.784
	Livestock	.311	.199	2.449	1	.118	1.365
	Extension	.525	.228	5.313	1	.021**	1.690
	Availability	.656	.743	.779	1	.377	1.927
	Compatibility	.508	.650	.611	1	.434	1.662
	Training	1.861	.686	7.359	1	.007***	6.429
	Demonstration	.217	.656	.109	1	.741	1.242
	Credit	-.002	.792	.000	1	.998	.998
	Market	-.102	.827	.015	1	.902	.903
-2 Log Likelihood	197.124	Cox and Snell	.577				
Chi-Square	129.145	Nagelkerke	.651				
df	26	McFadden	.396				
p-value	0.000						

*****,** ** and * significant at P<0.01, P<0.05 and P<0.1 respectively

is in agreement with the studies of *Cramb, 2003*); *Omiti et al., 1997*, and (*Anandajayasekeram et al., 2008*) that investigate positive relationship between age and adoption behavior of farmers.

Education: Feder et al., 1985 notes that education improves the decision making process and thereby influences the level and/or composition of anther inputs. Hence, education would increase the knowledge, skills and attitude of farmers about the technology and enhance adoption of improved dairy practices. As hypothesized, education was a significant determinants of the choice to adopt improved dairy practices positively and significantly at P<0.01. The odds that a farmer will choose to adopt improved dairy practices increases by a factor of 1.254 for farmers who had more education level, all other factors held constant. The finding coincides with earlier studies of *Hassen et al., 1998, Feder et al., 1985, Cramb ,2003* and *Habtemariam, 2004* that conclude farmers' education had positive and significant influence on adoption.

Farm experience: Farmers who practice traditional dairy production develop more experience in dairying. *Rahman, 2007* also states that experience helps an individual to think in a better way and makes a person

more mature to take right decision. Though in most of the adoption study experience influences adoption positively and significantly, in this particular study, it affected adoption of improved dairy practices negatively and significantly at P<0.01. The odds that a farmer will choose to adopt improved dairy practices decreases by a factor of 0.785, all other factors held constant. To substantiate the finding with the qualitative study, observation and key informant interview was made with community leaders and development agents. It was observed that the majority of the adopters had less experience in dairying. The adopters were inhabitants of the vicinity of the town that engaged in dairying for additional income generation. The observation also rectified that the dissemination of improved dairy practices did not penetrate to the rural areas at large. It implies that the dairying would be managed with less farm experience and more farm experience is not necessarily stimulating adoption decision of improved dairy practices.

Livestock holding size: Livestock holding is a good proxy indicator of wealth status of the farmers in the study area. Mostly, Farmers with high number of livestock have a financial capacity to bear a risk that may occur due to a technology failure. As expected, livestock holding size influenced the choice to adopt improved dairy practices positively and significantly at P<0.1. The odds that a farmer will choose to adopt improved dairy practices increases by a factor of 1.596 for farmers who had large livestock holding size, all other factors held constant. In line of this, studies of *Getahun et al., 2000, Tesfaye et al., 2001 and Endrias, 2003* show that the numbers of livestock owned positively and significantly influence the probability of adoption of farm technologies in their respective studies, which in turn, encourages adoption of in new agricultural technologies.

Frequency of extension contact: Feder et al., 1985 notes that extension efforts increase the probably of adopting new technology by increasing the stock of information pertaining to modern production increment. Extension contact influenced the choice to adopt improved dairy practices positively and significantly at P<0.01. The odds that a farmer chooses to adopt improved dairy practices increased by a factor of 2.650 for farmers who frequently contact extension workers, all other factors held constant. The finding is in agreement with Feder *et al.,* 1985, Berhanu, 2002 and Makokha *et al.,* 1999 that confirm contact with extension has significant influence on the perception and adoption decision of farmers.

Availability of technology: The availability of the new technology and all other necessary inputs to small holders at the right time and place and in the right quantity and quality should be ensured (*Ehui et al., 2004*). The availability of all the necessary packages with the affordable cost stimulates the adoption of improved dairy practices. It influences the adoption of the practices positively and significantly at P<0.05. The odds in favor of adopting improved dairy practices increased by a factor of 6.470 for farmers who accessed improved dairy practices whenever they require, all other factors held constant. The finding is in line with a study by *Makokha et al., 1999* that finds technological attributes such as supply (availability), economic and yield benefit and convenience had significant influence on adoption decision. *Yilma et al., 2011* also points out limited access to technology as the main Ethiopian dairy sector challenges. The finding is also supported by *Yapa and Mayfeld , 1978* which identifies that adoption of an entrepreneurial innovation by an individual requires at least four conditions. These are: the availability of sufficient information, the existence of a favorable attitude towards the innovation, the possession of the economic means to acquire the innovation and the physical availability of the innovation.

Training: Rahman, 2007 states that training might have inculcated technical competency, more exposure to the subject matter and convinced to adopt the improved technologies in the farms. As also noted by *Rogers, 1983* Knowledge is the function in which an individual is exposed to the innovation's existence and gains some understanding of how it performs. Training influences the adoption decision of farmers positively and significantly at P<0.01. Providing training to the farmers on improved dairy practices increases the adoption by odds of 6.506, holding other factors constant. Prior studies of *Cramb, 2003* and *Anandajayasekeram et al., 2008* support the finding. *Likewise, Rogers, 1995* supports the finding in stating that research in the diffusion of agricultural innovations has demonstrated that knowledge/awareness of a new technology is a necessary first step in the adoption decision-making process.

With respect to the category of partial adopters, age, frequency of extension contact, training influenced the choice of a farmer to adopt at least one of the improved practices positively and significantly at P<0.01, P<0.05 and P<0.01 respectively. The odds in favor of adopting at least one of the improved practices increase by a factor of 1.134, 1.690 and 6.429 respectively. In the other way, it improves the adoption of at least one of the improved dairy practices by 13.4, 69 and 542.9 per cent respectively. However, with similar trend to adopter category "farm experience" influenced the adoption of at least one of the improved dairy practices negatively and significantly at P<0.01. It implies that activities of improved dairy practices could be managed with having less farm experiences.

Pathways and status of using improved dairy practices :Improved dairy practices were mainly transferred through livestock agency extension system. Each peasant associations have three development agents with an education background of animal production, crop production and natural resource management. Additionally, some Peasant associations have also middle level veterinary and cooperative organizer. The assumption of having development agents with different education background was to carry out extension activities in their area of expertise. However, it was observed that development agents were carrying out all extension activities irrespective of their educational background. On the other hand, reporting was made to the respective district offices independently.

The improved dairy practices of the study area are categorized into five major parts, namely, cross bred, improved feeds, veterinary service, improved housing and improved management. Though efforts were made by extension organization for several decades to disseminate cross bred, the number of cross bred adopters were insignificant. It was yet confined to urban and peri-urban for accessing market, AI service, veterinary service and extension service.

Table 2: Distribution of respondents by improved dairy practices (N=150)

Dairy Practices	Adopters	Non adopters	Discontinued practices
Cross bred	42 (28)	108 (72)	7 (29.2)
Feeds	53 (35.3)	97 (64.7)	17(70.8)
Vet. service	139 (92.7)	11 (7.3)	-
Housing	69 (46)	81 (54)	-
Management	42 (28)	108 (72)	-

Figure in the parenthesis indicates per cent;

As summarized in Table 2 except for veterinary service, less percentage of respondents adopted cross bred, improved seeds, improved housing and improved management practices. To substantiate the quantitative findings with qualitative methods, under the theme "status of using improved dairy practices" observation and key informant interview were made during the period of data collection. In the due course of discussion, one of the respondents raised as a reason for non-adoption of cross bred was that "The cost of a cross bred is about the cost of four or five local cows. In the other way, to adopt a cross bred, it needs to sell the whole my local cows. In the system there is no insurance, deciding and substituting four/five local cows with a cross bred is putting the livelihood of my family in a question. It is a great devastation for my family in case of death happening to the cross bred as they are easily susceptible to disease." Local cows are not only the source of milk but also the source of draught power and organic fertilizer. Number of cows also serves to determine the social status of the individual in the community.

To change this deep rooted belief, it needs an intensive work on changing the outlook of the farmers prior to the introduction of the improved dairy practices. Primarily, agricultural technology demands of the famers should be created before the introduction of the practices. The data evidently confirmed less adoption of improved dairy practices in the study area. It was emanated from the application of wrong implementation framework in the process of improved dairy practices dissemination. Hence, the extension organization needs to revise the existing implementation of extension works to ultimately achieve the desired objectives of the organization. The extension organization needs to have its own demonstration site. Agricultural technologies need to be tested and verified in the demonstration site. The farmers need to prove and witness the productivity of the technology. For the purpose, training and field day need to be organized on the demonstration site in the due course the farmers develop confidence on the agricultural technologies. Consequently, the demand to the agricultural technology comes from the farmers. The main role of the extension organization needs to create

demand to the technology. The existing experience of agricultural technology dissemination was that introducing the improved dairy practices to the model farmers directly with the assumption that the other farmers learn from the model farmers. However, the improved dairy practices were not trickled down; instead, discountenance of the practices was observed on cross bred and improved feeds. Every new agricultural technology was introduced to same model farmers. As a result, the current agricultural technology dissemination program benefited the model farmers and such approach may lead to income inequality among the farmers. The result agrees with *Belay and Abebaw, 2004* that clearly criticizes the public agricultural extension services of Ethiopia for patronizing only resource rich farmers.

In addition to these constraints, farmers and dairy research have different objectives on dairy production. The farmers are rearing dairy for getting draught animals, in kind saving and indication of social status whereas, dairy research is undertaking for improving the genetic makeup of dairy for increasing milk production. Thus, the dairy development of the study area was held back by the absence of shared vision between the key actors. The improved dairy practices releasing mechanism also lacks clear direction. After the technology is generated, the researchers verify it on the farmers' field and demonstrate to the farmers. It implies that the farmers in the vicinity of the research centre are benefiting from the improved dairy practices. Even, in the vicinity of the research center, model farmers are benefiting from the improved dairy practices. The assumption of using model farmers as approach is to trickle down the improved dairy practices through them to the follower farmers. Practically, there were no improved dairy practices that were trickled down to the farmers. The main reason was that the model farmers adopted the technology at subsidized price. On the other hand, the technology is supplied to other farmers at actual cost. However, the farmers expect the support that is made to the model farmers to adopt the technology. As such deviation noticed among the farmers, they resist adopting the technology. The farmers who are selected as model farmers are relatively resource rich farmers. Logically, resource poor farmers need support to adopt the technology as they are representing the majority of the farmers. Resource poor farmers who have interest to adopt the technology and have willingness to teach the others need to be considered as model farmers. There was also no well-designed mechanism that gives direction on how the improved dairy practices that are generated at research center link to the extension system to reach the large community.

In relation to dairy development, there was no technology multiplication center. In this regard, the involvement of the private sector was less as the investment payback period takes long. Hence, the intervention of the government in fulfilling the infrastructure and attracting the private sector is vital which in turn leads to exploit the potential that the country has in dairy.

For effective dissemination of improved agricultural /improved dairy practice, developing a framework to be followed for reaching the farming community has paramount importance. A new improved agricultural technology needs to be tested and verified at demonstration sites prior to disseminating to the farmers. The farmers also develop confidence about the practice and develop interest to adopt it. Creating strong linkage with sources of improved agricultural technologies, finance, input suppliers and marketing agency makes the dissemination program complete.

The demonstration site of the peasant association needs to play a central role in disseminating improved agricultural practices. Every modification required on the practices should be completed at demonstration site. For the purpose, it has to be equipped with the necessary infrastructure. The improved agricultural technologies that reach the farmers should bring significant impact on the livelihoods of the majority of farmers. In the other way, directly providing improved dairy practices to the model farmers affected the effectiveness of agricultural practices dissemination. As a consequence, the current fragile kind of dissemination of improved dairy practices needs due consideration for strengthening and making productive.

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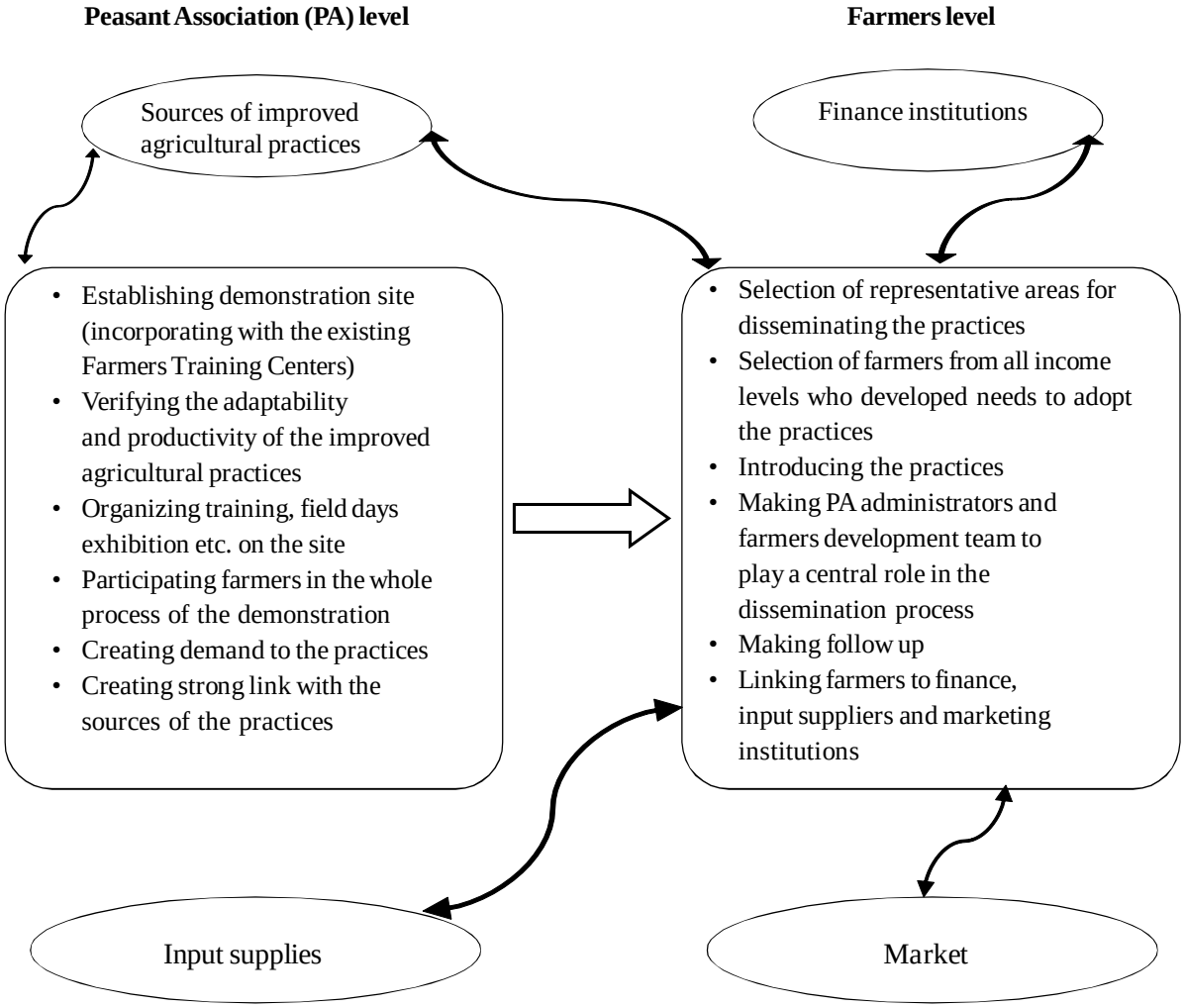

Fig 1. Scheme of improved agricultural practices dissemination process at field level

and develop interest to adopt it. Creating strong linkage with sources of improved agricultural technologies, finance, input suppliers and marketing agency makes the dissemination program complete.

Dissemination of improved dairy practices: Obviously, the generated improved dairy practices need to reach the end users particularly the farmers. The improved dairy practices bring the wide impact when it is multiplied and made available for the farmers. In this relation, except the forage varieties other dairy improved practices had no a set direction to enter into the existing extension system. As a result, the improved dairy practices were confined to the vicinity of the research center. Demonstration and dissemination of the improved dairy practices were mainly undertaken by the dairy researchers. The participation of socio economics researchers of the center in the demonstration and dissemination processes was less due to the complexity of the practices. However, generating the technologies and demonstrating to the end users consumes the time of dairy researchers. As a fact, the socio economics researchers need to develop their capacity and perform fully the demonstration activities. The improved dairy practices that initially envisaged reaching the farmers needs to participate the socio economics researchers during its whole research works/ generation which in turn support them to develop their capacity for proper demonstration and dissemination.

Constraints for less adoption of improved dairy practices: Identification of the constraints facilitate for taking right decision and appropriate action which in turn improves the adoption of the improved dairy practices. Constrains for less adoption of improved dairy practices are multifarious. It varies from farmer to

farmer and among categories of farmers (adopters, partial adopters and non adopters). Initially, the constraints were identified through group discussion with respondents from all categories. During the discussion, 10 major constraints that impeded adoption of improved dairy practices were identified. Finally, it was incorporated into the questionnaire to rank it in order of their importance. The respondents (adopters, partial adopters and non adopters) ranked the constraints. The ranking of the constraints were categorized into adopters, partial adopters, non adopters and aggregate of the whole categories. Separate ranking was made with the intention of making easier for taking action.

Table 3 depicted that shortage of animal feeds, cost of improved dairy practices, shortage of farm land and inadequate improved dairy practices were the main constraints for adopters. Likewise, inadequate improved dairy practices, inadequate extension support, cost of improved dairy practices and shortage of animal feed were the core constraints for partial adopters. Non adopters also ranked shortage of animal feeds, cost of improved dairy practices, shortage of farm land and inadequate improved dairy practices as the main causes for non adoption of improved dairy practices. The major constraints ranked by the category of the respondents were included in the aggregate ranking. Thus, shortage of animal feed, in adequate improved dairy practices, cost of improved dairy practices and shortage of farm land and were in the highest rank that affected the adoption of improved dairy practices. Though there are variations among the category of the respondents in ranking, there were similarities among the respondents in ranking of major constraints. Consequently, the data suggest that searching a solution for aggregate ranking is part of a solution for main constraints ranked by the category of the respondents.

Policy implications : Research, extension and other actors are engine to drive the dairy development. It necessitates the integrated action of multi-actors (research, input suppliers, animal health, marketing agency, livestock agency, cooperatives etc.). Well designed system in which these actors are clearly operating required.

For improving the adoption of improved dairy practices, it needs an arrangement of award for outstanding dairy farmers which, in turn, stimulates the adoption of improved dairy practices; adoption of improved dairy practices needs either subsidy or making the cost of generating the improved dairy practices lower; it necessitates for research, extension and farmers to have a common goal for dairy development which is probably the nucleus of all the solutions; making selection among the local cows and identifying the breeds that are at least suitable for milk production; the selection of model farmers needs to be from the representatives of the majority of the farmers

Urban and peri urban centered AI service did not bring significant impact on dairy development. With the existing number of AI technicians, it is difficult to reach the users with AI service under the scattered living situation of farmers. Thus, it needs the introduction of farmer-to-farmer extension which fills the gap of extension workers. The approach can also be sustainable in serving the farmers as occurring of job shifting of farmers is very less.

Table 3: major constraints of farmers for less adoption of improved dairy practices

Constraints	Adopter (n=42)		Partial adopter (n=48)		Non adopter (n=60)		Total (N=150)	
	Weightage	Rank	Weightage	Rank	Weightage	Rank	Weightage	Rank
In adequate improved dairy practices	69.347	4	80.710	1	76.640	4	75.858	2
Prevalence of Disease	64.364	6	54.549	8	59.517	6	59.199	6
Shortage of animal feed	84.9	1	70.272	4	83.194	1	79.283	1
Shortage of farm land	70.555	3	68.874	5	78.437	3	72.560	4
Inadequate extension support	55.757	9	75.821	2	66.282	5	66.641	5
Death of cattle	56.663	8	52.699	9	58.037	7	55.902	7
Inadequate AI service	46.244	10	55.210	6	55.394	8	52.994	9
Lack of milk storage facility	64.213	7	54.945	7	45.670	9	53.407	8
Cost of improved dairy practices	73.424	2	75.689	3	79.328	2	75.647	3
Lack of milk collection center	66.327	5	50.585	10	45.247	10	52.519	10

Mainly, the educational background of development agents at front line was plant, animal and natural resource management. With limited agricultural extension knowledge and skills undertaking effective extension work is unfeasible. Thus, it necessitates launching post graduate diploma in agricultural extension.

CONCLUSION

Dairying is being practiced as an integral part of agricultural activities in Ethiopia since a time of immemorial. Although the inception of dairy research and dissemination of improved dairy practices lasts for more than five decades, the majority of the farmers still continue to adopt traditional dairy practices. Dairy development is not the sole mandate of a single organization. The development of dairy sub sector is the shared effort of all stakeholders that explicitly and implicitly participate in the different activities of dairy development. High cost of improved dairy practices coupled with inappropriate selection of model farmers highly imbedded the dairy development.

As a result, low adoption of improved dairy practices was identified in the study area. On the other hand, having interactions with stakeholders involved in dairy development, initial capital; reducing cost of the technology are the most important factors for adopting the practices. By the same token, adoption facilitating activities (availability of improved dairy practices consistently, ready market, knowledge and skill based extension services, committed and visionary intervener) play a decisive role for adopting improved dairy practices.

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