

## DAIRY TECHNOLOGY IMPACTS ON LIVELIHOODS OF DAIRY PRODUCERS IN CENTRAL ETHIOPIA

**Kassahun Melesse**

Debre Zeit Agricultural Research Center P.O.Box 32 Debre Zeit, Ethiopia

Email: kasishmele@gmail.com

**Jeilu Jamal**

Holeta Agricultural Research Center, Holeta, Ethiopia

### **Abstract**

*A survey was conducted in 2012 to assess the impact of dairy technologies on the livelihood of dairying households in Ada'a and Lume districts of central Ethiopia. A total of 108 dairy farms were interviewed using structured questionnaire. Dairying has significant contribution as a sustainable source of income to the dairy producing households. It contributed about 62% and 66% of the total monthly income in Ada'a and Lume districts, respectively. Dairying was the first income source for about 80% and 62% of the dairy producing households in Ada'a and Lume districts, respectively. On the other hand, 92.9 % and 88.9 % of the respondents in Ada'a and Lume districts respectively explained that dairy technology adoption has significantly increased their household income. About 56% and 32% of households in Ada'a and Lume districts were found to save money from dairying in a traditional form of saving. Adoption of dairy technologies has also an impact on the consumption of milk and milk products as all family members in about 77.5% and 87.1% of households in Ada'a and Lume districts, respectively could consume more milk.*

**Key words:** *dairying, households, income, milk*

### **1. Introduction**

In the majority of the rural areas of Ethiopia livestock production plays important role in the provision of draft power, food, cash, transportation, fuel, and, especially in pastoral areas, social prestige. In the highlands, oxen provided draft power in crop production. In addition, dairy production plays significant role as a source of additional income to the farming community through sale of raw milk, processed milk products and live animals (EEA, 2002).

Dairy production is a critical issue in Ethiopia livestock-based society where livestock and its products are important sources of food and income, and dairying has not been fully exploited and promoted. The greatest potential for new technologies in dairying is expected in the highlands of Ethiopia, due to low disease pressure and good agro-climatic conditions for the cultivation of feed. High population densities and animal stocking rates, as well as easy access to markets, make this industry attractive in peri-urban areas of the country (Tangka F.K., et al 2002).

The cattle population in Ethiopia is estimated to be about 49.3 million, out of which female cattle constitute about 55.4 percent. About 99.28% of the total cattle are local breeds and the remaining are hybrid and exotic breeds (CSA, 2009). Though crossbreeding programs have been started in the country few decades before, the programs have had several problems. Most importantly, there were poor involvement of

livestock farmers and other stakeholders in the design and implementation of the program and weak planning of the program (Kelay, 2002). Fortunately under most of the agro ecologies the dissemination of the F1 (50% exotic blood level) progenies was successful. That means under the prevalent hard environmental conditions, disease and feed scarcity the F1 generations could be survive even under small scale farmers level where the availability of inputs are suboptimal. On the other hand, in urban and peri-urban areas of the country, due to the availability of commercial feeds and other inputs such as veterinary services, it is usual to see high grade dairy animals having more than 75% exotic blood level. Significant amounts of milk is produced and channeled to the major milk sheds of the country especially to the big cities such as Addis Ababa using dairy cattle having high exotic blood level inheritance.

On the other hand, different dairy technology and innovation packages focusing on breeding, management, husbandry, feeds and feeding and health have been identified and introduced to optimize the production as well as reproduction performance of the indigenous and/or cross breed dairy animals. Although these intervention methods can result in improvement of productivity and reproduction efficiency of dairy animals, impact of these technologies on the livelihood of dairy producers is not well studied and documented. Such information can be used as a tool for policy formulation in the dairy sector (breeding, marketing, health and other segments of the sector). Therefore, this study aims to assess the impact of dairy technologies on the livelihood of dairy producers in areas where different types of dairy technologies have been utilized by producers.

## **2. Materials and Methods**

### **2.1 Sampling and data collection**

The study was conducted in Ada'a and Lume districts of East Shoa Zone, Oromiya Region, Ethiopia which are found in the south East of Addis Ababa. These districts were selected based on their relative potential for dairy production and their better access to dairy technologies (breed, husbandry and management, health and processing) because of their proximity to government and non government institutions which are working on innovation and dissemination of dairy technologies.

After identification of the available technologies and innovations based on the population of dairy producers found in each district, 72 producers from Ada'a and 36 from Lume (having at least one crossbred animal) were purposefully selected from the list obtained from the respective district Livestock and Marketing Agencies. A total of 108 dairy farms were included in the study. A structured questionnaire was prepared and tested in a pilot area to make necessary adjustments before the actual data collection. A face to face interview method was employed to collect the data for this study.

### **2.2 Statistical analysis**

For qualitative data descriptive statistics like mean, standard error and frequency distribution were used to describe the household characteristics using Statistical Package for Social Sciences (SPSS, 2011). For quantitative data the General Linear Model (GLM) of the Statistical Analysis System (SAS) was employed (SAS, 2002). Means within the same category were separated using the Least Significant Difference (LSD) for those F tests that declared significance ( $P < 0.05$ ).

### 3. Results and discussion

#### 3.1 Sources of household Income

In developing countries, livestock production is a major source of income. For many mixed, smallholder farming systems, livestock is an important source of income (Sansoucy et al. 1995). In this study, it was observed that dairying has significant contribution as a sustainable source of income to the dairy producing households in both districts. The income generated from dairying is significantly different between the two districts ( $P < 0.05$ ) (Table 1). This might be due to the relatively higher herd size of crossbred dairy cattle found in Ada'a than that of Lume district. For the dairy producing households in Ada'a and Lume districts dairy contributed about 62% and 66% of the total monthly income, respectively. In Lume most of the respondents reported that they were not getting income from crop sale and this might be due to most of the dairy producers who have crossbred dairy animals concentrated in the town where it is difficult to get land for crop production.

**Table 1. Source of income for the dairy producing households in Ada'a and Lume Districts**

Monthly income from	Study district	N	Min	Max	Mean	SE
Dairy	Ada'a	70	300.00	10000.00	2431.14 <sup>a</sup>	219.76
	Lume	35	400.00	6000.00	1702.43 <sup>b</sup>	198.35
Poultry or eggs	Ada'a	4	100.00	600.00	337.50NS	124.79
	Lume	1	166.00	166.00	166.00NS	.
Other livestock	Ada'a	6	100.00	4000.00	1083.33NS	599.68
	Lume	2	300.00	3000.00	1650.00NS	1350.00
Crop sale	Ada'a	10	500.00	16000.00	3254.30	1472.39
	Lume	-	-	-	-	-
Wages, salaries and non-farm activities	Ada'a	45	120.00	3700.00	831.58NS	115.08
	Lume	24	150.00	3500.00	1006.58NS	164.58
Remittances	Ada'a	5	300.00	2400.00	920.00NS	389.10
	Lume	4	300.00	1000.00	700.00NS	177.95
Other sources of income	Ada'a	12	150.00	3000.00	1152.50NS	306.02
	Lume	3	500.00	750.00	616.67NS	72.65
Total monthly income	Ada'a	65	515.00	16800.00	3905.03 <sup>a</sup>	349.97
	Lume	35	760.00	7800.00	2595.97 <sup>b</sup>	257.11

Column means in the same category designated by different superscript letters are significantly different from each other at  $P < 0.05$ .

SE = Standard Error

N= number of respondents

NS=non significant

Dairy ranks first as income source for about 80% and 62% of the dairy producing households in Ada'a and Lume districts, respectively; compared with other income sources (Table 2). Due to this fact it can be said that dairying can serve as major income

source and create employment opportunity for the majority of households in the both districts.

**Table 2. Rank of dairy as income source in Ada'a and Lume districts**

Study district	Rank of dairy as an income source			Total	
		<b>1</b>	<b>2</b>		<b>3</b>
Ada'a	N	57	11	3	71
	%	80.3	15.5	4.2	100.0
Lume	N	21	12	1	34
	%	61.8	35.3	2.9	100.0
Total	N	78	23	4	105
	%	74.3	21.9	3.8	100.0

*N= number of respondents*

The dairy farm household's income in both districts is significantly raised due to adoption of dairy technologies. About 92.9 % and 88.9 % of the respondents in Ada'a and Lume districts, respectively explained that technology adoption has significantly increased their household income (Table 3). The higher income of these households is highly attributed to the sale of whole milk. Regarding the consistency of the generated income from the dairy sector, more than 90% of the respondent in both districts responded as their household income was sustainable and they earned permanent income through the adoption of these technologies. Similarly, Mohammed et al., (2004) reported

**Table 3. Impacts of dairy technologies on Household income in Ada'a and Lume districts**

<b>i. Household income is higher</b>				
	Ada'a		Lume	
	N	%	N	%
Yes	65	92.9	32	88.9
No	5	7.1	4	11.1
Total	70	100.0	36	100.0
<b>ii. If household income is higher</b>				
Higher due to milk sales	39	60.0	17	54.8
Higher due to milk products sale	-	-	1	3.2
Higher due to sale of dairy animals	1	1.5	1	3.2
Higher due to milk and dairy animals sale	23	35.4	12	38.7
Higher due to milk and milk products and dairy animals sale	1	1.5	-	-
Higher due to milk and milk products sale	1	1.5	-	-
Total	65	100.0	31	100.0
<b>iii. Household income is more regular</b>				
Yes	52	86.7	27	79.4
No	8	13.3	7	20.6
Total	60	100.0	34	100.0

*N= number of respondents*

that the significant raise in the household income of smallholder dairy farmers in the rural Ethiopia is due to the adoption of market-oriented dairy production using crossbred cows and improved dairy technologies. This study also confirms the adoption of dairy technologies is a significant determinant for the increase in the household income of dairying households in the study districts.

### 3.2 Informal Saving of Money-“Equib”

*Equib* is a traditional form of saving money by a group of people having common interest in a small community. Table 4 shows the proportion of dairy producing households who could save money obtained from dairy production in this system. Compared with Ada’a, higher proportion of households (56%) in Lume district were found to be members of equib; where as in Ada’a the proportion of households who could save money in such kind of savings were 32%. This might be due to the presence of relatively higher number of formal ways of saving money like banking system.

**Table 4. Proportion of households that save money in *equib***

Study district		Informal Saving “equib”		Total
		Yes	No	
Ada'a	N	23	48	71
	%	32.4	67.6	100.0
Lume	N	20	16	36
	%	55.6	44.4	100.0
Total	N	43	64	107
	%	40.2	59.8	100.0

*N*= number of respondents

Almost 70% of the household in Ada’a and 60% in Lume were found to save their money in the form of *Equib* on monthly and weekly basis, respectively (Table 5). The average amount of money deposited on weekly and monthly basis in Ada’a was 600±122.927 and 831.25±314.208 Birr, respectively. Whereas, in Lume the figures were 335±97.262 and 365.63±111.897.

**Table 5. Frequency of *Equib* and amount of money deposited in Ada’a and Lume districts**

Study district		Frequency of Equib		Total	Amount of money deposited (Ethiopian Birr)			
		Ada'a	Lume		Ada'a		Lume	
					Mean	SE	Mean	SE
Every week	N	7	12	19	600.00	122.927	335.00	97.262
	%	30.4	60.0	44.2				
Every month	N	16	8	24	831.25	314.208	365.63	111.897
	%	69.6	40.0	55.8				
Total	N	23	20	43				
	%	100.0	100.0	100.0				

*N*= number of respondents

*SE* = Standard Error

### 3.3 Milk Consumption

The impacts of dairy technologies on milk consumption were explained by increased consumption of milk and milk products by family members. Table 6 presents impacts of dairy technologies on consumption and family members who consume more milk. The consumption of milk and milk products increased in 81.4% and 83.3% of households in Ada'a and Lume districts, respectively. All family members could consume more milk as a result of adoption of dairy technologies in 77.5% and 87.1% of households in Ada'a and Lume districts, respectively. Children could also consume more milk due to adoption of dairy technologies and the proportion of households in which children could consume more milk were 22.5% and 12.9% in Ada'a and Lume districts, respectively. The consumption of milk improve household nutrition as quality foods of animal origin enhance human growth and development, particularly of children in chronically mild to moderately malnourished populations, because they contain amino acids absent in cereals and essential to human health (Sansoucy et al.1995). Dairying with crossbred cows and improved production technologies could have a positive impact on human nutrition, both directly by consumption of increased milk and dairy products and, indirectly via sale of increased output and the purchase of more and better quality food (Tangka F.K.,et al 2002).

**Table 6. Impacts of dairy technologies on milk consumption in Ada'a and Lume districts**

<b>i. Some household members consume more milk</b>					
	<b>Ada'a</b>		<b>Lume</b>		
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	
Yes	57	81.4	30	83.3	
No	13	18.6	6	16.7	
Total	70	100.0	36	100.0	
<b>ii. Family member who consume more milk</b>					
All household members	45	77.5	27	87.1	
Children	13	22.5	4	12.9	
Total	58	100.0	31	100.0	

*N= number of respondents*

### 3.4 Milk Sale

Above 95% of the respondents in both districts sale more milk due to the adoption of dairy technologies (Table 7). Only 4.3% in Ada'a and 2.8% in Lume districts could not sale more milk as a result of dairy technologies adoption. The higher proportion of households (64.1% in Ada'a and 45.7% in Lume) could sell all the milk they produced. Only 28.4% and 7.5% of the respondents in Ada'a district could sell all the surplus milk or half of the milk produced, respectively. These figures in Lume district were 45.7% and 8.6%. These figures showed that dairying plays an important role for the households as source of income. Similarly, Gryseels (1988) reported that in the mixed farming system of the Ethiopian highlands, sales of livestock and livestock products account for 83% of the cash income per year and dairy products account for over 50% of the sale of livestock products.

**Table 7. Impacts of dairy technologies on milk sale in Ada'a and Lume districts**

<b>i. Household sales more milk</b>					
	<b>Ada'a</b>		<b>Lume</b>		
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	
Yes	67	95.7	35	97.2	
No	3	4.3	1	2.8	
Total	70	100.0	36	100.0	
<b>ii. If household sales more milk</b>					
Sell all surplus milk	19	28.4	16	45.7	
Sell all milk	43	64.1	16	45.7	
Sell half of milk	5	7.5	3	8.6	
Total	67	100.0	35	100.0	

*N= number of respondents*

### 3.5 Household health

Table 8 shows that family members of dairy farm households get ill less frequently due to the betterment of their life through improved nutrition attributed to increased income they earn from dairying and consumption of milk and milk products. In Ada'a district 87.5% of the respondent reported they get ill very less frequently and this figure in Lume district was 66.7%. However, in Lume district more than 33% of the respondent reported they have health problem. These households might sell most of the milk produced and consume less at the household level. It has been well established by nutritionists that consumption of more dairy products results in a better human nutrition and health (Neumann et al. 1993). So, the family member of the households who consume more dairy products is healthier. Households that used market-oriented dairy production technologies increased their income and animal values significantly. The increased resources led to significantly higher food consumption, calorie intake and marketed surplus. The significantly increased marketed surplus has also the potential to improve diets of non-dairy households (Tangka F.K., et al 2002).

**Table 8. Family health status in Ada'a and Lume districts**

<b>i. Household members are ill less often</b>					
	<b>Ada'a</b>		<b>Lume</b>		
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	
Yes	56	87.5	24	66.7	
No	8	12.5	12	33.3	
Total	64	100.0	36	100.0	
<b>ii. If household members are ill less often</b>					
Consume more milk	23	41.1	6	25.0	
Nutrition of children improved	12	21.4	3	12.5	
Both	21	37.5	15	62.5	
Total	56	100.0	24	100.0	

*N= number of respondents*

### 3.6 Household members work load

Women take the lion's share of the household work as it is shown from table 9. Ninety percent of the household work load is on females shoulder in Ada'a district. This is mainly accounted for the society's belief that traditionally the majority of household tasks assigned for women according to unwritten law of gender division of labor. The share of man in both districts is almost similar; 66.7% and 61.1% in Ada'a and Lume, respectively; whereas 90% of Ada'a and 77.8% of Lume respondents believe more work is done by women/mothers. Children also have their share that more than half of the respondents in Ada'a believed children share a great deal of work in the household. In Lume district 41% of the respondents believed children share more household works.

**Table 9. Household members work load in Ada'a and Lume districts**

<b>i. Men in the household work more</b>					
	<b>Ada'a</b>		<b>Lume</b>		
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	
Yes	46	66.7	22	61.1	
No	23	33.3	14	38.9	
Total	69	100.0	36	100.0	
<b>ii. Women in the household work more</b>					
Yes	63	90.0	28	77.8	
No	7	10.0	8	22.2	
Total	70	100.0	36	100.0	
<b>iii. Children in the household work more</b>					
Yes	38	54.3	15	41.7	
No	32	45.7	21	58.3	
Total	70	100.0	36	100.0	

*N= number of respondents*

### 3.7 Construction of house

64.3% of the Ada'a district and 48.6% of Lume respondents responded as they have constructed their own house (Table 10). About 44.5% and 58.8 % respondents in Ada'a and Lume built their home using concrete, respectively. The same table shows farmers gradually leaving the traditional inconvenient types of wood and mud hut houses.

**Table 10. Construction of house in Ada'a and Lume districts**

<b>i. Household construct house</b>					
	<b>Ada'a</b>		<b>Lume</b>		
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	
Yes	45	64.3	17	48.6	
No	25	35.7	18	51.4	
Total	70	100.0	35	100.0	
<b>ii. If the household construct house</b>					
Using concrete	20	44.5	10	58.8	
Using corrugated iron	5	11.1	2	11.8	
Using wood and mud	5	11.1	1	5.9	
Using corrugated iron and wood and mud	11	24.4	1	5.9	
Using concrete and corrugated iron	4	8.9	3	17.6	
Total	45	100.0	16	100.0	

*N= number of respondents*



### 3.8 Education

As table 11 shows 79.7% of the Ada'a district respondents and 63.9% Lume district respondents could send their children to school. In Ada'a the respondents evenly send their children to public and private schools where as in Lume 56.5% of the respondents send their children to public schools and 26.1% of them send their kids to private schools. This result indicates that, as a result of the higher income from improved dairy technologies, the household earn higher income and they spend more on household items and educating their kids.

**Table 11. Education in Ada'a and Lume districts**

<b>i. Household can send children to school</b>				
	<b>Ada'a</b>		<b>Lume</b>	
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
Yes	55	79.7	23	63.9
No	14	20.3	13	36.1
Total	69	100.0	36	100.0
<b>ii. If the household can send children to school</b>				
Public school	23	41.8	13	56.5
Private school	22	40.0	6	26.1
Both	10	18.2	4	17.4
Total	55	100.0	23	100.0

*N= number of respondents*

### 4. Conclusion

The adoption of dairy technologies has significant impacts on livelihood indicators such as household income, nutrition, food security, health care and access to education. The result in both study areas shows a strong linkage between higher incomes and improvement of livelihood resulted from the introduction of dairy technologies. The income of dairy farmers in both districts is significantly raised due to the adoption of different dairy technologies most importantly improved breeds. The higher income of the farmers is highly attributed in both districts to the sale of milk. In the majority of dairy producing households the income from dairying is more sustainable and regular. Moreover, it can be concluded that adoption of dairy technologies is a significant determinant for the increase in the household income of dairy farmers in both districts.

As a result of the higher income from improved dairying, the household could spend more on household items and educating their kids. Moreover, per capita intake of milk and milk byproducts is improving in the majority of the households. The impact of dairy technology on nutrition and health may result from direct increases of household consumption of milk and dairy products. The impact can also be indirect through higher household expenditure on food, health and sanitation or both. It has been well established by nutritionists that consumption of more dairy products results in a better human nutrition and health.

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## References

- CSA (2009). *Central Statistical Authority*. Addis Ababa, Ethiopia.
- Ethiopian Economic Association-EEA (2002). *A research report on land tenure and agricultural development in Ethiopia*, October 2002, Addis Ababa, Ethiopia
- Gryseels G. (1988). *Role of livestock on mixed smallholder farms in the Ethiopian highlands. A case study from the Baso and Woreda district near Debre Berhan*. PhD dissertation. Agricultural University, Wageningen, The Netherlands. 249 pp.
- Kelay B. (2002). *Analyses of Dairy Cattle Breeding Practices in Selected Areas of Ethiopia*. PhD dissertation, University of Berlin, German.
- Mohamed A. M., Ehui, A.S. & Assefa Y. (2004). *Dairy development in Ethiopia*. EPTD discussion paper No. 123. International Food Policy Research Institute. Washington, DC 20006 U.S.A.
- Neumann, C., Bwibo, N. O., & Sigman, M. (1993). *Diet quantity and quality: functional effects on rural Kenyan families*, Kenya Project Final Report, Phase II - 1989-1992, Human Nutrition Collaborative Program Support Program, Office of Nutrition. Washington, DC: USAID.
- SAS (2002). *Statistical Analysis System (SAS)Users Guide*. Version 9. SAS Institute, Inc. Carry, NC.
- Sansoucy R., Jabbar M., Ehui S. & Fitzhugh H. (1995). Keynote paper: *The contribution of livestock to food security and sustainable development*. In: Wilson R., Ehui S. and Mack S.(eds), *Livestock development strategies for low income countries*. Proceedings of the joint FAO/ILRI
- ILRI (1995). *Round table on livestock development strategies for low income countries*, 27 February-2 March 1995.ILRI (International Livestock Research Institute), Addis Ababa, Ethiopia.
- SPSS (2011). *Statistical Procedures for Social Sciences (SPSS)*. IBM® SPSS® Statistics 20. IBM Corp.. Chicago, USA.
- Tangka F.K., Emerson R.D. & Jabbar M.A. (2002). *Food security effects of intensified dairying: Evidence from the Ethiopian highlands*. Socio-economic and Policy Research Working Paper 44. ILRI (International Livestock Research Institute), Nairobi, Kenya.