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Dairy consumption, beliefs and practices among rural populations in Ethiopia

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Ethiopia is among the countries with the highest malnutrition burdens. Dairy is of particular nutritional importance, but Ethiopian per capita consumption is low. This study investigated the drivers and barriers to dairy consumption among rural households in West Amhara, Sululta-Fitche, Adama-Assela and Hawassa–Shashemene project clusters of SNV-BRIDGE project, using a combination of a) focus group discussions with community members; b) key informant group interviews with community leaders, religious leaders and health extension workers and c) quantitative household survey data. It found that cow ownership is the main factor associated with a higher average number of days on which yogurt, milk, buttermilk and cheese is consumed by rural households. More dairy was also consumed by those who report "Improves education performance", "Good for growth" and "Prevents disease" as advantages of milk consumption. For yogurt, two factors were found to be associated with dairy consumption frequency. Firstly, respondents who reported "gives energy" as an advantage of consuming yogurt consumed more yogurt than those who did not report this advantage. Secondly, respondents that reported that they didn't know about disadvantages consume less yogurt. The study concludes that efforts to increase dairy consumption in rural communities should promote cow ownership first, having the largest short-term benefit as the market does not (yet) form an alternative source. However, cow ownership should not be promoted without addressing the issue of the availability of animal feed. Respondents in general were aware of the fact that dairy has health benefits, but still experience a need for nutritional information. Specifically, there appear to be knowledge gaps regarding populations with special nutritional needs and regarding products where there was disagreement on healthiness (especially whey and yoghurt).

Keywords: Dairy consumption, Rural Households, Determinants, Barrier analysis, Ethiopia

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Contents

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List of abbreviations and acronyms

ASF	Animal source food
BRIDGE	Building Rural Income through inclusive Dairy Business Growth in Ethiopia
EMDHS	Ethiopian Mini Demographic and Health Survey
EPHI	Ethiopian Public Health Institute
FBDG	Food-Based Dietary Guideline
FDRE	Federal Democratic Republic of Ethiopia
FGD	Focus Group Discussion
FGDs	Focus Group Discussions
GDP	Gross Domestic Product
HPLE	The High Level Panel of Experts for Food Security and Nutrition
KIGI	Key Informant Group Interview
WCDI	Wageningen Centre for Development Innovation, Wageningen University & Research
WUR	Wageningen University & Research

Summary

Ethiopia is among the countries with the highest burden of malnutrition. Dairy is of particular nutritional importance, but Ethiopian per capita consumption is low. This study investigated the enablers of and barriers to dairy consumption among rural households in West Amhara, Sululta-Fitche, Adama-Assela, Hawassa–Shashemene and Mekele-Adigrat using a combination of a) focus group discussions (FGDs) with community members; b) key informant group interviews (KIGIs) with community leaders, religious leaders and health extension workers (HEWs) and c) quantitative survey data.

The qualitative part of the study consisted of 25 FGDs that were conducted over the 5 project clusters, involving 234 people (108 men, 126 women). In addition, 25 key informants were interviewed, among whom 2 health extension workers, 7 religious leaders, 9 community leaders, 6 (sub-)kebele leaders and 1 youth representative. As a second phase of this study, a quantitative survey was conducted on a total of 366 household members from 4 project clusters. One cluster (Mekele-Adigrat) could no longer be included due to the conflict in Tigray.

The study looked into which factors (reported enablers, barriers, advantages and disadvantages to dairy consumption) had a statistically significant correlation to dairy consumption frequency. It found that cow ownership is the main factor associated with a higher average number of days per week on which yogurt (+1 day), milk (+1 day), buttermilk (+1.5 day) and cheese (+0.5 day) is consumed by rural households. More dairy was also consumed by those who report "Improves education performance" (+0.5 day), "Good for growth" (+0.5 day) and "Prevents disease" (+0.5 day) as advantages of milk consumption. For yogurt, two factors were found to be associated with dairy consumption frequency. Firstly, respondents who reported "gives energy" as an advantage of consuming yogurt consumed more yogurt than those who did not report this advantage (+0.5 day). Secondly, respondents that reported that they didn't know about disadvantages consume less yogurt (-0.5 day). If the data is disaggregated according to cluster, more correlations were found and specific recommendations per cluster are therefore provided in the report.

FGD participants and key informants highlighted the fasting season and seasonal shortage of animal feed as the main bottlenecks for a stable dairy consumption year-round. The key informants added that household economic status also influences dairy consumption. FGD participants report that purchase of dairy products from the market is rare due to a lack of availability, distance to markets, quality concerns, and also a lack of "buying culture" for dairy products. FGD participants mentioned that personal tastes are the prevailing factor for varying consumption choices within a household. In other words: what a household member consumes, mainly depends on their individual preferences. FGD participants generally had positive attitudes towards dairy products, and mentioned several health benefits of dairy consumption. Regional differences were found in the perception of nutritiousness of whey. Awareness and knowledge are improved through several activities by the key informants, such nutrition education sessions by the health extension workers, sessions in the church by some of the religious leaders and /or through coffee ceremonies.

The study concludes that efforts to increase dairy consumption in rural communities should promote cow ownership first, having the largest short-term benefit, because the market does not (yet) form an alternative source. The study also underlines the importance of improving the availability of animal feed as one of the elements of effective dairy development. The findings provide insight into behaviour change messages to be used to increase dairy consumption among households and underlines the importance of involving key community members in this.

1 Introduction

1.1 Background

Ethiopia's agriculture sector accounts for about 39% of the country's Gross Domestic Product (GDP) and around 75% of export earnings. It is the major employer of about 83% of the labour force. The sector has registered an average real agricultural GDP growth rate of 6.6% per annum (FDRE, 2017). However, despite the tremendous achievements, the problem of food and nutrition security remains the main health and development issue for the country. According to the recently released mini-Demographic and Health Survey, 37% of children under 5 are stunted of which 12% are severely stunted. The prevalence of stunting generally increases steadily with age, from 22% among children 6-8 months up to 44% of children 48-59 months (EPHI and ICF, 2019). Micronutrient deficiency is also pervasive and severe in the country. About 44% of children under five, 30% of adolescents, 22% of pregnant women and 17% of women of reproductive age are anaemic (FDRE, 2017). This puts Ethiopia among the countries with the highest malnutrition burden[1]. Poor diet quality is an important cause of malnutrition in Ethiopia. Historically, diets have been cereal-based, with few additions of vegetables, fruits and tubers when available, and containing very little animal source foods, resulting in a very low dietary diversity among Ethiopians. This also affects young children and only 14% of children aged 6-23 receive an adequately diverse diet (EPHI and ICF, 2019).

Agriculture is the main source of food for poor rural households in Ethiopia and thus the main provision of dietary diversity, including animal source foods. Focussing on milk, Hoddinott (2015) found that cow ownership raises children's milk consumption, increases linear growth, and reduces stunting. This study also found that household cow ownership is less important where there is good access to local milk markets, suggesting that market development can substitute for household cow ownership.

A study by IFPRI (2018) reported that both per capita consumption and food budget shares of animal source foods (ASFs) are low in Ethiopia. This study splits expenditures by ASF categories and shows that expenses on dairy products make up almost half of all the ASF expenditures. Residents in urban areas spend twice as much on ASF per capita than in rural areas. The study also revealed that there is a significant variation over a year in consumption, seemingly associated with religious customs, such as fasting. The IFPRI study projects that dairy product demand will almost triple between 2011 and 2030. The expected expansion of ASF demand is likely to lead to improved health and nutritional outcomes in Ethiopia. However, the same study found that additional efforts towards behaviour change communication will be needed to assure that increased consumption of ASF, including dairy, can play a beneficial role towards improved nutritional outcomes in the country.

To support the consumption of ASF such as dairy, a good understanding of consumer consumption choices is needed. This requires knowledge of consumer practices and motives and how existing food systems influence the motives and behaviour of consumers. In turn, consumer food choices can shape food systems to ensure healthy diet choices. The conceptual framework applied for this study regarding consumer consumption choices can be found in 0.

This study explored the drivers and barriers of consumers' choice with regard to dairy consumption among rural households in the project clusters of the Building Rural Income through inclusive Dairy Business Growth in Ethiopia (BRIDGE) project. The study went beyond a focus on availability and accessibility of dairy, and aimed to identify the determinants of dairy product choice and consumption in a broad sense. The study also explored intrahousehold differences and differences between households with varying levels of dairy cow ownership (crossbreeds and/or local breeds). Additionally, the beliefs and practices that exist among households in the different project clusters that inhibit / encourage consumption of dairy products have been

[1] https://www.indexmundi.com/facts/topics/health

investigated. The results of this study can be used to inform behavioural change and communication strategies to improve dairy consumption among the households in the five project clusters.

1.2 Objectives and research questions

The main objective of this study is to understand dairy product consumption choices and their determinants, among rural households in the BRIDGE project clusters in Ethiopia. It addresses the following research questions:

1. What are the major determinants of dairy products' consumption choice in the study areas?
2. How do the identified determinants affect dairy products' consumption choice?
3. Is there a difference in dairy products' consumption choices between households with cross breeds, local breeds and no cows and if so: how is this difference explained?
4. Does consumption choice of dairy products vary among household members, religions, seasons or by household size?

The results of the combined qualitative study and the quantitative barrier analysis will provide:

- Understanding of the drivers of dairy product consumption choices, disaggregated by project cluster.
- Recommendations which determinants needs to be targeted, in order of importance per cluster, to improve the consumption of dairy products.

2 Methodology

2.1 Study design and tools

To gain a holistic insight about the existing consumption choices of dairy products in the study areas, a descriptive cross-sectional study design was used that employed a combination of qualitative methods (focus group discussions (FGDs) and key informant group interviews (KIGIs)) and aquantitative method (Helen Keller barrier analysis methodology (Kittle, B. (2013)). FGDs and KIGIs were conducted prior to the quantitative survey to enrich and shape the quantitative tool based on the findings from the FGDs and KIGIs.

FGDs create opportunities for the community to share their knowledge and ideas. FGDs were used to learn more about opinions about dairy products' consumption choice, as well as the determinants which influence dairy products' choice and consumption and how those interact. A FGD guide was developed and during the pre-testing checked for consistency, clarity and fitness for the purpose. Improvements were made to the questions to make them more appropriate and understandable to the participants. The number of participants per focus group discussions (FGD) was adapted based on the regulation of the COVID-19 government state emergency, but should not have exceeded more than 8 participants. The focus groups ended up slightly bigger than planned, with 8-10 participants instead of the planned 6-8. Due to practical concerns, the recommended group composition could not always be realised.

Key informant interviews were conducted to collect information from a wide range of people, including community leaders, professionals, or residents, who have first-hand knowledge about the community. For this study the key informants were asked about the situation in their kebeles regarding dairy intake disaggregated by gender and age, barriers and enablers of dairy product consumption choice, decision-making in consumption choices of dairy products, nutrition information sources and communication channels. Due to practical and logistical issues the key informants were interviewed in groups. Interviewers used a KIGI guide, developed for this purpose.

The quantitative study relied on the Helen Keller barrier analysis methodology (Kittle, B., 2013), which is widely used to identify behavioural determinants and develop behaviour change strategies for almost any behaviour. Using the results of the FGDs as input, a structured survey was designed to gather information pertaining to socio-demographic data, existing dairy products' consumption choice and associated factors affecting dairy products' choice and consumption.

All data collection tools (questionnaires and guiding questions) were prepared in English and translated into the relevant local languages (Amharic, Afan Oromo, Tigrigna and Sidamaigna). The tools were pre-tested on a small number of respondents with similar characteristics as study participants and respondents to detect instrument errors, as well as to test for respondent understanding.

Before starting with collection with any respondent, the team made the purpose of the study clear, stated the confidentiality of the information given, and ensured that verbal informed consent was given by the respondent.

2.2 Study population and study areas

The population for this study were the households members, community leaders and professionals, residing or working in the selected kebeles of three nutrition woredas in each of the five BRIDGE project clusters (namely: Mekele-Adigrat, West Amhara, Sululta-Fitche, Adama-Assela and Hawassa–Shashemene). Within each nutrition woreda, 3 kebeles were selected in consultation with BRIDGE project cluster offices. The current research aimed to understand dairy consumption for all households, regardless of cow ownership,

which means that household selection was not limited to only households that participate in BRIDGE activities (for which cow ownership is a requirement).

Qualitative data was collected in all five clusters. At the time of the quantitative data collection, data collection had become impossible in the Mekele-Adigrat cluster due to the conflict in Tigray.

2.3 Sampling procedures and sample size

Focus Group Discussions (FDGs)
Within the selected kebeles, Focus Group Discussion (FGD) participants were purposively selected using the maximum variation technique. This sampling strategy implied an intentional and systematic selection of study participants with varying characteristics (gender, age, religion, social status…).

In each BRIDGE project cluster; five FGDs were planned with the following groups:
- Adult females
- Adult men
- A mixed adult group
- Female adolescents
- Male adolescents

In total 25 FGDs were conducted. In total, 234 people participated in the FGDs of which 108 men and 126 women.

Key informant group interviews (KIGIs)
Key informant such as religious leaders, health extension workers and influential community leaders were selected for the group interviews from each of the selected kebeles.

A total of 5 key informant group interviews were conducted. The following key informants were included in the group interview specified per cluster:

West Amhara cluster: religious leader; community leader and a health extension worker;
Adama-Asela cluster: kebele peace and security officer; Orthodox church leader; local elder and kebele leader;
Sululta-Fitche cluster: religious leader; kebele leader; sub-kebele leader; farmer and community leader; farmer and kebele micro finance leader; community leader and a kebele youth representative;
Hawassa-Shashemene cluster: model farmer and community elder; religious leader and deacon/protestant; religious leader/Quran preacher; farmer and community elder; model farmer and community elder;
Mekele-Adigrat cluster: religious leader; community leader; health extension worker coordinator; church leader; kebele leader; and a sub-kebele leader.

From the above list of key informants, it can be observed there are differences in the type and the number of key informants per project clusters. For all clusters religious leaders and community representative were included and for two cluster also health extension workers were included. For one cluster even a youth representative was included. In total 25 key informants were interviewed, of which 2 health extension workers, 7 religious leaders, 9 community leaders, 6 (sub-)kebele leaders and 1 youth representative.

Quantitative barrier analysis
The size of the secondary sampling units (households) for the quantitative data collection was calculated using a double population proportion formula as there will be two population groups (i.e. doers and non-doers based on the barrier analysis approach). The sample size was determined as follows:

Where:

n = required sample size
p1 = proportion of households prefer to consume milk during fasting periods (41%)
p2 = proportion of households prefer to consume milk during non-fasting periods (60%)
Z1-a = the z-score corresponding to the desired confidence level (to be set at 5%, thus Z 0.95 = 1.96)
Z1-b = the z-score corresponding to the desired power level (typically, to be set at b = 0.80)
n = 101.68 ≈ 102
After adding a 10% non-response rate, the sample size will be ***113***.

However, to reach the households to be surveyed, the sampling process passes through four sampling units (national to clusters, clusters to woreda, woreda to kebele and kebele to household) and therefore, the sample size will be multiplied by 4 (design effect).

Finally, the total number of households to be surveyed was 4*113 = ***452.***

A multi-stage sampling procedure has been employed to select sample kebeles and households in the study areas. A Probability Proportional to Size (PPS) approach has been applied in the selection of samples, which provides a greater chance of selection of representative household numbers from each cluster.

To reach the households to be surveyed, the sampling process passes through two sampling units (woreda to kebele and kebele to households). From each of the selected nutrition woredas of the BRIDGE project clusters, 20-30% of kebeles (as rule of thumb) were included, in consultation with BRIDGE regional managers and nutrition advisors. The kebeles were randomly selected for the survey and the number of households to be surveyed per kebele were determined based on the PPS allocation method.

Households within kebeles were selected using the lottery method (in case rosters of households are available from the kebele agriculture/SNV office as sampling frame). If a sampling frame was not available, a systematic sampling procedure was employed and bottle spinning was done at a central location of each kebele where the line along the bottle was used to determine the direction of the enumeration team pairs' movement; one was headed to the direction of the top of the bottle and the other to the opposite direction.

The aim was to include an equal number of doers (households that consume dairy) and non-doers (households that do not consume dairy). The classification of respondents into doers and non-doers is based on consumption of dairy products.

Only four of the five BRIDGE project clusters were included due to the conflict in Tigray (Mekele Mekele cluster) as mention earlier and thus 366 respondents were included in the quantitative survey.

The targeted survey respondents were women of reproductive age (i.e., aged between 14 and 49 years) that had at least one child aged 19 or younger. Households that did not meet these criteria were excluded.

2.4 Field data collection and management

Recruitment of enumerators
Qualitative and quantitative data collection require engaging, competent and experienced professional enumerators. The enumerators were selected to be good communicators, friendly, flexible and able to interview and facilitate discussions in a way that minimizes the social distance between the interviewer and respondent. In addition, the ability to speak the local language was also an pre-requisite. For these purposes, local enumerators from universities of targeted clusters with previous survey experience were recruited.

Training of enumerators

Well-informed and trained enumerators ensured the best possible data quality. To this effect, a two-day intensive training was provided to the field team conduction the FGDs, KIGIs and the data collection of the quantitative barrier analysis. The training agenda included (but was not limited to):

- Review of terms of reference and expectations of the field team members;
- Description of the study: why it is being carried out, how and for what purpose the information was used;
- A clear and thorough understanding of the study objectives and how the data collected will serve assessment objectives;
- Review of participant selection methods and establishing contact with respondents and maintaining co-operation and obtaining informed consent;
- Question-by-question review of the questionnaire to confirm that the questions are clearly understood by interviewers;
- Identification of possible risks and mitigation measures;
- Review of COVID-19 state of emergency regulations, such as which of the participants need to receive protective face masks and not to forget to prepare sanitizers at the interview sites;
- How to account for non-responses, and which form needs be completed for households/respondents who do not give their consent or refuse to answer, households found to be empty or no adult above 18 is available (quantitative survey);
- Role-play of participant selection, ethical considerations/informed consent, non-responses, questionnaire administration (FGDs: interviewer, note takers, tablets etc), and log of visit outcomes;
- Role-play and practicing the assessment tools (guides, questionnaires and tablets);
- Data collection and data management using the tablets (quantitative survey only).

2.5 Ethical considerations

Prior to the study, official support letters and ethical clearances were obtained from the respective government offices (regional public health institutes). Each team leader/data collector carried a copy of the letter with them at all times during the data collection period. A standard consent form accompanied the questionnaire and the interview were preceded with reading out the consent statement and seeking verbal consent from the respondents. The team made clear to all participants, key informants or respondents that they are under no obligation to participate in the study. Confidentially of data was maintained by limiting access to data and removing personal identifiers. Prior permission was obtained for taking and use of visual/moving images and audio records for specific purposes, i.e., for including in the reports, participants were assured of the anonymity, confidentiality and protection of visual and audio data and its use for agreed purpose only.

2.6 Data quality assurance, control and management

To ensure data/information quality, the team took the following measures at various stages of the data collection.

Before data collection

- Highly experienced supervisors and enumerators with relevant educational background and language proficiency were recruited.
- A two-day intensive training was provided for the field team to make each person thoroughly familiar with data collection tools & procedures, and to certify them to be responsible for and to perform their duties and responsibilities.
- The data collection tools were first developed in English and later translated to local languages of interest (Amharic, Afan Oromo, Tigrigna and Sidaaigna) for better understanding.
- The final data collection tools were tested in a pilot area and necessary adjustments were made before commencement with the actual study.

- Measures have been put in place to ensure that non-responses are properly referenced. To account for non-responses, a form will be completed for households/respondents who do not give their consent or refuse to answer, households found to be empty or no adults above 18 is available.
- For the quantitative data collection, an electronic data collection system with a digitized questionnaire was uploaded to an online data platform for use on a mobile phone / tablet.

During data collection
- The quantitative data was collected using a mobile/tablet was employed. This to increase the quality of data gathered and the rapidity of data entry. In addition, the electronic data collection led to reduction of enumerators' errors, elimination of the need for data entry, improvement of the monitoring and evaluation of fieldwork as it enabled availability of data in real time for analysis and visualization and ensures safety of data through cloud-storage.
- Random spot checks were conducted to ensure that all data collection procedures are strictly followed.
- Field level team debriefing meetings were done at the end of each data collection day to discuss the progress made, challenges faced, actions taken and key considerations for the next field work day. Similarly, interviews were checked for completeness and consistency; accordingly, gap filling interviews were conducted at the end of each day.
- For the quantitative survey, random call-backs have been performed and answers on a subset of questions were compared to answers recorded during the face-to-face interviews to check accuracy of responses and for any potential concern.
- The FGDs and KIGIs were recorded with digital voice recorder, transcribed and were used to enrich the data that was recorded during the actual FGDs and KIGIs to allow more robust analysis.

2.7 Data processing and analysis

For the qualitative data, verbatim transcription was carried out for all recordings by the interviewers. When necessary, the transcripts were supplemented by field notes to clarify issues. For the data analysis the NVivo version 12 qualitative data analysis software was used. With this software data was analysed and compiled using a thematic approach by conducting an ongoing content analysis to determine the presence of certain words, themes, or concepts. Prior to the data analysis, a data coding framework was developed to facilitate the analysis.

To ensure quality during data transcription for the FGDs and KIGIs, correctness of transcription was checked for 5% of all the audio files. Minor corrections, such as incomplete forms, if any, or responses to the questions, were communicated to study team (interviewers' and facilitators) and corrected on subsequent transcriptions.

For the quantitative data, descriptive statistics (percentages, means and standard deviations) were used to present the findings. Mann-Whitney-U tests were used to identify the statistically significant determinants of dairy products' choice. Dairy consumption frequency served as the test variable, and the various potential enablers, barriers, advantages and disadvantages were grouping variables. P-values smaller than 0.05 were considered to declare statistical significance. Data presentation and description was made using tables, frequency distributions and graphs. IBM SPSS Statistics Version 27 was used to undertake the data analysis.

3 Results and discussion

3.1 Respondent characteristics

Table 1 provides insight into the group of rural consumers that responded to the quantitative survey.

Table 1 *Basic characteristics of the survey respondents*

	Adama Asela	Sululta-Fitche	Hawassa-Shashemene	West Amhara	Total
N	**89**	**91**	**94**	**92**	**366**
Marital status, n (%)					
Married and living together	77 (86.5)	74 (81.3)	89 (94.7)	85 (92.4)	325 (88.8)
Widowed	9 (10.1)	9 (9.9)	4 (4.3)	3 (3.3)	25 (6.8)
Separated	0	6 (6.6)	1 (1.1)	2 (2.2)	9 (2.5)
Divorced	3 (3.4)	2 (2.2)	0	2 (2.2)	7 (1.9)
Religion, n (%)					
Catholic	0	0	4 (4.3)	0	4 (1.1)
Muslim	3 (3.4)	0	37 (39.4)	0	40 (10.9)
Orthodox Christian	75 (84.3)	85 (93.4)	5 (5.3)	92 (100.0)	257 (70.2)
Protestant	11 (12.4)	6 (6.6)	47 (50.0)	0	64 (17.5)
Other	0	0	1 (1.1)	0	1 (0.3)
Highest level of education, n (%)					
Illiterate	25 (28.1)	22 (24.2)	14 (14.9)	50 (54.3)	111 (30.3)
Can read and/or write (informal education)	2 (2.2)	16 (17.6)	3 (3.2)	4 (4.3)	25 (6.8)
Grade 1-4	17 (19.1)	15 (16.5)	16 (17.0)	12 (13.0)	60 (16.4)
Grade 5-8	24 (27.0)	21 (23.1)	22 (23.4)	14 (15.2)	81 (22.1)
Grade 9-12	18 (20.2)	9 (9.9)	26 (27.7)	12 (13.0)	65 (17.8)
Tertiary education (Diploma and above)	3 (3.4)	8 (8.8)	13 (13.8)	0	24 (6.6)
Family size					
Average (SD)	5.7 (1.8)	5.7 (2.3)	6.3 (2.6)	5.8 (1.7)	5.9 (2.1)
Adolescents in the family, n (%)					
0	15 (16.9)	12 (13.2)	26 (27.7)	15 (16.3)	68 (18.6)
1-2	54 (60.7)	64 (70.4)	46 (49.0)	51 (55.5)	215 (38.8)
3-4	19 (21.4)	14 (15.4)	18 (19.2)	25 (27.2)	76 (20.8)
5-6	0	1 (1.1)	4 (4.2)	1 (1.1)	6 (1.6)
Children under 2 in the family, n (%)					
0	71 (79.8)	64 (70.3)	60 (63.8)	57 (62.0)	252 (68.9)
1	16 (18.0)	27 (29.7)	31 (33.0)	35 (38.0)	109 (29.8)
2	1 (1.1)	0	1 (1.1)	0	2 (0.5)

All respondents were women of reproductive age (aged between 14-49 years old), and had at least one child below the age of 19, as these were sampling criteria. A large majority of survey respondents indicated to be married and living with their spouse. In Adama Asela, Sululta-Fitche and West Amhara, most or all respondents were Orthodox Christians, whereas respondents in Hawassa-Shashemene tended to be protestants or Muslims. The highest level of education varies, but for all clusters except Hawassa-Shashemene, the largest group of respondents is illiterate. The average family size is roughly 6 people and is similar across the clusters. Most families included 1 or 2 adolescents, and no children under 2.

3.2 Product intake

3.2.1 Types of dairy products consumed

During the FGDs, consumers were asked about the types of dairy products they consumed. They mentioned various applications of milk (boiled, skimmed, fresh, cooled or milk added to coffee), butter (including clarified butter and ghee), cheese (soft, spiced, dried), buttermilk (arera, wogemit), whey and yogurt. The quantitative survey provides insight into which of these products is consumed most commonly (**Fout! Verwijzingsbron niet gevonden.**). It indicates that overall the consumption frequency of dairy among the sampled population is roughly half of the week. On average, milk and butter are the two most frequently consumed dairy products, followed by cheese and yogurt, while buttermilk and whey are consumed less frequently.

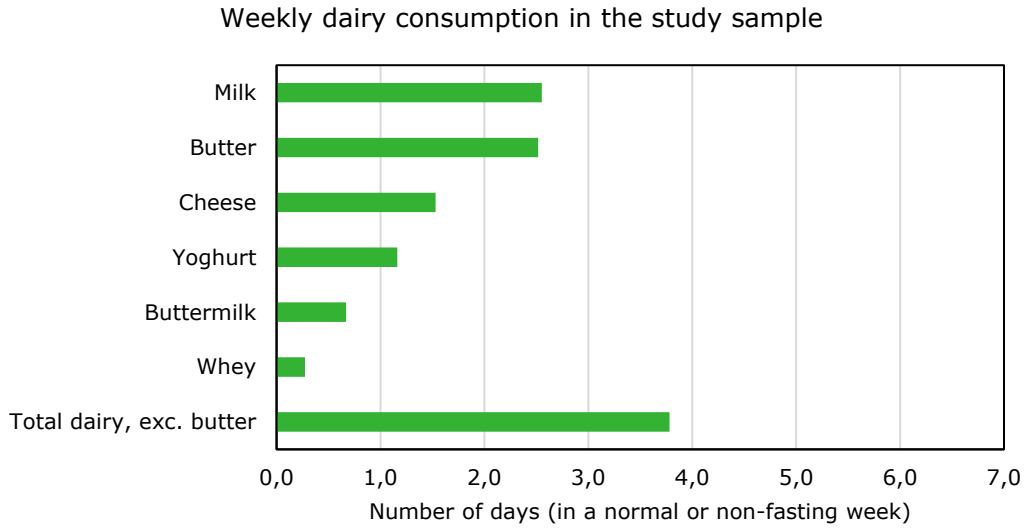

Figure 1 *Weekly dairy consumption in the study sample*

An overview of the types of dairy products consumed disaggregated according to the four clusters can be found in Table 11 (in 0).

3.2.2 Consumption frequency

The Ethiopian food-based dietary guidelines (FBDGs) (which will be published in the near future) advise daily dairy consumption. Butter is not counted as a dairy product. Taking into account at least two weekly fasting days among Orthodox Christians, this study used 5 days as a realistic target of the dairy consumption threshold. Table 2 shows that 58% of the studied households do not meet this consumption frequency.

Table 10 (in Appendix 2) provides an overview of the prevalence of consumption of the various dairy products, disaggregated according to the four studied clusters.

Table 2 *Consumption frequency of different dairy products (in % of respondents)*

Days per week	Dairy (excl. butter)	Milk	Buttermilk	Yogurt	Cheese	Whey	Butter
<5	58%	76%	98%	96%	92%	99%	68%
≥5	42%	24%	2%	4%	8%	1%	32%
0	2%	25%	73%	46%	34%	86%	23%
1	7%	13%	6%	19%	21%	4%	19%
2	16%	15%	10%	17%	21%	7%	14%
3	21%	14%	7%	13%	13%	2%	8%
4	13%	10%	2%	1%	3%	0%	4%
5	33%	17%	2%	4%	8%	1%	28%
6	1%	1%	0%	0%	0%	0%	0%
7	8%	6%	1%	0%	0%	0%	3%

Dairy intake of 5 days per week or more was considered adequate. These findings are not representative of the whole population of the studied clusters, as the study used strategic sampling to include both frequent and infrequent dairy consumers.

3.2.3 Intra-household differences and variation according to household size

Both FGD and KIGI participants report a few differences in dairy consumption patterns within their families. There is some mention of children being prioritized as dairy consumers if the supply is low. (Fresh) milk is deemed the dairy product of choice for children. Some participants specify that this milk should be boiled. One FGD group mentions that milk should also be boiled for pregnant women. Apart from this, intra-household differences are mainly based on personal (taste) preference ("I don't use yogurt because I don't prefer it") or health effects that are experienced after consumption. These effects can be either positive ("My younger sister uses fresh milk to prevent gastric problems") or negative (yogurt is "difficult for digestion"). Finally, there is a mention of arera (a kind of buttermilk) being given to adolescents specifically, and cheese to the head of the family. It is also reported that liquid dairy products (e.g., milk) are increased in quantity by adding water, which makes it easier to share the product with the whole family.

The quantitative survey shows that there is a statistically significant difference in the number of days on which a family consumes dairy products related to family size ($p<0.05$) (see 0 for details). The hypothesis that a bigger number of family members leads to a lesser dairy consumption per week can be rejected, as the evidence points to the inverse: a bigger number of family members is correlated to an increase in consumption of dairy products per week.

3.3 Motives for consumption

In the FGDs, health and sensory appeal were the most often mentioned consumers' reasons for consuming (certain) dairy products or not. Next, price and culture and tradition were the most often mentioned motives followed by safety, convenience, mood, and religion. Many reasons for the consumption of dairy products were also related to more practical issues rather than motives, such as use, habits, and availability. Below we describe the specific aspects that were mentioned in relation to the motives (see Table 3).

Table 3 *Motives for dairy consumption*

Motives	Aspects mentioned
Health	• **Good health in general**: health maintenance, has advantage for health, keep our health and live longer, important for our health, is / keeps healthy, health professionals motivate to eat dairy, helps us to stay healthy • **Disease**: **prevention**/ protection/ defence, decreases susceptibility, increases tolerance, heals when ill, "Milk is doctor" • **Gives strength**: body strength, physical strength, create strong body muscles, strength to the bones, gives endurance, makes individuals strong

Motives	Aspects mentioned
	• **Body building**: strong / healthy body building, builds up the body, good / useful for the human body, *"it builds body since these products consist of fat and many other nutrients"* • **Gives energy:** source of energy, helps to get fat • **Contains nutrients**: a lot of important nutrients to our body, all important nutrients for our health, rich in nutrients, fat, vitamin, micronutrient content, important substances for our health • **Growth of children:** indispensable for growth and development, advantage for children's grown • **Good for functions in the body**: brain/mental development, good for gastric problems / abdomen /stomach, when you consume milk you are free from "milk worm" • **No effect on health in a negative way** *"I consume all dairy products because it has no effect on my health" "there is no dairy product that we do not consume"* • **Not good for health in general**: face health problems when they consume it, prescribed by physicians not to consume, has effect on health (in a negative way), • **Not for children**: not recommended for / may cause sickness to (young) children • **No / lower nutritional value**, not contains required nutrients, lower nutritional content, less nutritious • **Not good for abdomen**: not suitable for stomach (difficult to digest), causes abdominal cramp, gastric complications • **Other**: make us to have a correct posture, healthier since processed through heating, food safety is also seen as an aspect of health
Sensory appeal	• **Good taste**, good flavour, liking, favourite food, delicious - or the opposite – don't like the taste. Feed type (which is seasonal) is cited to affect taste. • Individual and family **taste preferences** / interests – or the opposite: lack of desirability / interest • **Increases the appetite** • Convenient (familiar) taste – **inconvenient (unfamiliar) taste** • **Combination with other foods**, such as milk with kinche and "*Butter for enriching the taste of the other foods"; "In our environment kocho (flat bread made from false banana powder) is our favourite food that is somehow difficult without butter."* • Taste **related to processing/ preparation** *"We don't consume boiled milk because of its taste.* • **Lack of desire** to consume certain products naturally (products that cause abdominal crump) • **Temperature**: *"We do not prefer to consume wogemit (butter milk) because it is not boiled and also cold."* • Dislike of **sour taste** (whey) • Liking of **spices** (e.g. spiced cheese) • **Texture** of milk: *"Skimmed milk should be smooth and thick".* This is related to cow breed: *"Those which have cross breed cows produce relatively high milk [but] the texture seems very thin [compared to] indigenous breeds".* Feed type (which is seasonal) is cited to affect texture.

Price	• The selection of one product over the other depends on the **price/cost,** price of purchasing dairy is an issue for those who do not have dairy cows
	• Increased price during dry **season** when production declines
	• **Selling products to get money** (and buy other foods and goods) rather than consuming themselves
	  ○ Prefer to sell
	  ○ Have the habit "*We do not usually consume milk because it can be sold and considered as source of income.*"
	  ○ Selling of dairy is felt as a need/ something they depend on / being forced to do so due to economic problems and because they have to buy certain goods (e.g. animal feed, basic needs like oil, cloth, onion)
	  ○ Consumption of milk thus depends on the economic situation
	• Some foods are **preferred because they bring in more money**. "*Money obtained from fresh milk is somewhat higher as compared to money obtained from selling milk products.*", the economic advantage of cheese is that it can be obtained after milk is processed and butter (for the market) is produced.
	• Other consumers said that the **price of dairy products is good** / fair. "*No factor affects our consumption the price is very fair*."

Culture & tradition	• Respondents say they are **not used to consume** a certain dairy product or they use similar wording such as "not experienced", "not in the family culture", or lack of familiarity. *"Some people do not eat milk or butter because they have not been used to consume since childhood"* • **Tradition and family culture** motivates to eat certain dairy products. Respondents say they have been familiar with eating these foods for a long period of time, that dairy products are part of their culture, or that is it their family culture, practice or experience. *"A mix of milk, butter & Whey (so called Zur in local language) has desirable flavour and also these are frequently consume as inherited from ancestor families."*

Motives	Aspects mentioned
	• Some mention **cultural taboos** whereas others say there are no cultural barriers to consume dairy and dairy products. Specifically, in one group it was mentioned that "*In our community women does not consume fresh milk or yogurt. There are a beliefs if they drink and consume they will not have a milk products (Ex. Butter). Sometime if the adolescent girls consume it is believed that it increases the sexual interests and may make them to marry early.*" In another group yogurt was mentioned as a product with food taboos.

Food safety	• **Feeling that a food is not safe** and therefore do not consume it.
	• **Homemade versus market**:
	  ○ Homemade butter is not safe since it is not clarified (not matured) "*instead we buy clarified butter from market*"
	  ○ Prefer own production over dairy from the market "*there are safety issues of dairy products found from the market*"
	• **Boiled dairy products** (cheese, whey) are preferred over non-heated ones that can cause health / abdominal problems (wogemit, yogurt)
	• Dairy products are free of various **chemicals**, except for possible detergent residues

Convenience	• The food is **available in the household, they produce and store it** in the home (e.g. milk) and therefore easy to access "*I and my family consume milk and cheese because we can get it easily at home*" • The food is easy to eat since it **does not require a lot of preparation**, seasoning. "*other products (e.g. cheese) needs extra time for preparation and inputs like spices.*" • It **makes other food eaten more easily**, this is linked to sensory appeal and texture
Mood	• **Gives comfort**. "*Comfort is one of the reasons to choose milk product*" • Gives a **good mood**, makes happy
Religion	• **Religion** also affects consumption especially Orthodox religion (fasting seasons)

NB: # is number of references, for interpretation of this number keep in mind that this is qualitative data and numbers are based on small samples and influenced by for example the way questions were asked, the answers of other in the focus group, etc.

In addition to these motives, respondents also mentioned reasons for not consuming dairy products that were related to daily use practices and habits and availability.

- In several FGDs, all in the Adama Asela cluster, respondents said they did not consumer whey because it is given to animals as feed (calf and dogs) and **not known as food** or considered for human consumption.
- Also respondents simply mentioned that they were **not familiar or experienced** with a certain dairy product, or the other way, eat it because it is a food they are familiar with.
- Milk **can be mixed with water** and distributed within the household, contrary to yogurt.
- Certain dairy products are eaten because they **go along with other foods** (butter with kocho; milk with kinche (boiled and seasoned wheat)).
- Some foods are not eaten because there is **lack of knowledge on the production** (cheese).
- Or foods are not eaten because they are **not available in the household or in the areas**; this is described more detailed in the paragraph on availability and accessibility.
- Sometimes use was related to **production possibilities**: "*We are not giving the priority of consuming of yogurt, because this denies us from getting butter after skimming*", "*it [cheese] is obtained after the milk is processed to produce butter. So, instead of drinking milk, it is better to process it and produce butter for market and the cheese will be consumed*".

Most key informants have mentioned that the communities and households do make the connection between the increase of dairy consumption and the health of their family, school performance of children and/or the increased work productivity. They mention that consumption of milk and milk products are influenced negatively by the lack of knowledge and low household income. There are several beliefs mentioned with regard to the consumption of milk and dairy products especially for (pregnant) women and adolescents. The following has been mentioned by different key informants in the different clusters. These beliefs mentioned only by one or two key informants and could be community specific.

West Amhara

- There used to be a tradition that women drinking milk was considered as abnormal and was not appreciated by the community.

Adama-Asela

- The nutritional value of butter milk and whey is very low.
- Skimmed milk and whey are not used for human consumption, but are given to donkeys.

Sululta-Fitche

- Female adolescents cannot be permitted to consume milk, because the community believes consuming milk by this age increase feeling of sexual interest and they may practice and have increasing needs of contact with the opposite sex.
- Adolescents are not encouraged to consume milk and milk products because our community believes that they have grown enough and milk has no value for them.
- Anyone who has amoeba disease should not consume milk, because the community believes that milk aggravated amoeba disease.

Mekele-Adigrat

- Pregnant mothers at the third trimester need to stop consuming milk, because the society believes that if the woman drinks milk during the third trimester, the milk will stick (covered by white colour) on the skin of the child during birth.
- Pregnant women are not allowed to eat eggs for fear of size increments of the foetus, which makes delivery difficult.
- If someone is sick because of an unknown reason, people say "do not give him/her milk".

3.4 Enablers, barriers, advantages and disadvantages

The enablers, barriers, advantages and disadvantages listed by FGD participants were taken up in the quantitative barrier analysis to assess which ones were most frequently mentioned. Table 4 lists the results of this analysis per product. Only aspects that were mentioned by at least 20% of respondents for at least one product are included. The results show that cow ownership was the most reported enabler for the consumption of all dairy products, followed by good taste. Similarly, not owning a cow was the most barrier, as well as production-related barriers such as need to sell the product (milk and cheese) and to make butter (yoghurt and milk). The most frequently reported advantages for milk products were "source of energy", "good for growth", "good for bones", and "good for health in general". Gastric complaints were relevant mostly for yoghurt and buttermilk. For whey, the advantages and disadvantages seemed less relevant and also buttermilk scored lower compared to the other dairy products on most advantages.

Table 4 *Frequency of enablers and barriers mentioned per product (% of total respondents)*

	N=366	Yogurt	Milk	Buttermilk	Cheese	Whey
ENABLERS						
Cow ownership		58%	70%	42%	55%	27%
Good taste		40%	40%	15%	33%	5%
Familiar		23%	25%	15%	22%	7%
Suitable for all family members		13%	21%	7%	18%	3%
BARRIERS						
Nothing		32%	32%	28%	31%	13%
Lack of availability from own cow		31%	31%	16%	31%	11%
Need to sell the product		12%	27%	5%	21%	0%
Need to use the product to prepare butter		28%	20%	4%	1%	0%
Unfamiliar		2%	3%	16%	11%	33%
ADVANTAGES						
Gives satisfaction		28%	19%	11%	26%	2%
Increases appetite		12%	9%	6%	24%	1%
Increases education performance		7%	15%	3%	9%	1%
Good for growth		43%	67%	23%	28%	5%
Good for bones		37%	57%	19%	20%	3%
Good for health in general		46%	59%	20%	28%	8%

	N=366	Yogurt	Milk	Buttermilk	Cheese	Whey
Heals or prevents disease		18%	30%	12%	14%	3%
Source of energy / strength / fat		55%	64%	41%	31%	10%
Nothing		1%	0%	14%	5%	31%
I don't know		5%	0%	17%	16%	37%
DISADVANTAGES						
Gastric complaints		30%	15%	25%	13%	11%
Nothing		38%	60%	21%	55%	11%
I don't know		30%	19%	36%	23%	33%

Table 5 shows the results of a statistical test of whether mention of a specific enabler, barrier, advantage and disadvantage is correlated with the number of days that dairy is consumed. In other words: this analysis shows which factors are associated with either a higher or a lower dairy consumption frequency. A finding is seen as statistically significant if p is smaller than 0.05. The digit that is shown in the table is the change in mean days of weekly dairy consumption between groups that do and do not mention this particular aspect.

Table 5 *Enablers and barriers that correlate with consumption frequency*

	Yogurt	Milk	Buttermilk	Cheese	Whey
ENABLERS					
Owning cows	+0.91	+1.04	+1.62	+0.73	-
ADVANTAGES					
Gives energy	+0.40	-	-	-	-
Improves education performance	-	+0.58	-	-	-
Good for growth	-	+0.40	-	-	-
Heals or prevents disease	-	+0.41	-	-	-
DISADVANTAGES					
I don't know	-0.38	-	-	-	-

Only those enablers, advantages and disadvantages that were correlated to dairy consumption frequency are listed. A "-" means that no statistically significant correlation with dairy consumption frequency was found for that particular combination of factor and product.

The table shows that the main factor that enables dairy consumption is cow ownership. Having a cow is associated with a higher average number of days on which yogurt, milk, buttermilk and cheese is consumed. The differences are shown in the table for each product category. They range between an extra 0.73 day of dairy consumption (if "cow ownership" is mentioned as an enabler for cheese consumption) and an extra 1.62 days (if "cow ownership" is mentioned as an enabler for buttermilk consumption). Statistically significant correlations ($p<0.05$) were also find for three advantages of milk consumption. Respondents that mention "Improves education performance", "Good for growth" and "Prevents disease" as advantages of milk consumption, consume dairy more frequently than those who do not mention these advantages. For yogurt, two statistically significant correlations were found. Firstly, respondents that reported "gives energy" as an advantage of consuming yogurt consume more yogurt. Secondly, respondents that reported that they didn't know about disadvantages consume less yogurt. For most other enablers, barriers, advantages and disadvantages studied, and across products, no significant differences were found according to number of dairy consumption days per week.

Interestingly, many of those factors in Table 4 that were considered enablers, barriers, advantages or disadvantages by a large share of the respondents, were not correlated to dairy consumption frequency. Apparently, these are factors that respondents face regardless of their current dairy consumption. Only the factors in Table 5 are linked to a difference in consumption frequency.

More statistically significant correlations have been found when the data is analysed per cluster. The results of this analysis can be found in 0. These results can be helpful to inform cluster-specific interventions (including, but limited to, behavioural change campaigns).

3.5 Accessibility and availability

3.5.1 (Home) dairy production

In line with the findings described under section 3.4, FGD participants indicate that home production is the most common source of milk and milk products. The quantitative survey showed that 336 of the 366 sampled households own at least one cow (Table 6). The mean number of days/week that these households consume dairy is 3.86, while the households that do not have cows consume dairy on average 2.87 days per week - a statistically significant difference ($p<0.05$) using a T-test for 2 independent means (more details in 0). There is also a statistically significant difference in dairy consumption frequency between households that only own local cows, and households that only own crossbreeds: crossbreed owners consume dairy roughly one more day per week (see Table 6).

Table 6 *Dairy consumption frequency and cow ownership*

	Owns no cows	**Owns cow(s), any type**	**Own local cow(s)**	**Own crossbreed(s)**	**Owns only local cow(s)**	**Owns only crossbreed(s)**
N	30	336	193	270	66	143
Mean consumption frequency (# days/week, sd)	2.87 (2.0)	3.86 (1.6)	3.75 (1.6)	4.05 (1.6)	3.09 (1.3)	4.02 (1.6)

There is variation in the perceived availability of milk and milk products in the various kebeles. Some groups indicate that, in the right season, there is enough milk available in their kebele. However, most groups say that even in the most favourable season, the quantity of milk in their kebele is inadequate. Seasonality plays a big role in milk availability. In the lean season, milk production reduces due to a lack of animal feed. Another factor to milk availability at the household is that cows do not produce milk at the end of their pregnancy until the birth of their calf. Some FGD participants point to a variation of product availability throughout the week. On the days that butter and cheese are produced, no milk is left for direct consumption.

As an overall trend, FGD participants see an increase of milk availability over the years. The introduction of crossbred cows and improved animal care techniques are cited as reasons for this increase. Participants note that the improved breeds do come with challenges. Some participants say that it is even more difficult to obtain enough feed for crossbred cows because they have higher requirements (although other participants disagree). There are also reports of one breed being passed off as an different breed in the market.

The above findings were also mentioned by the key informants across the clusters, who indicate that the availability of milk in the households and the community at large is dependent on the availability of milking cows, grassland and fodder (availability and costs). In addition, they mentioned that cross-breeds are producing more milk than local breeds. Other issues mentioned are the availability of cross-breed cows, water (too little and too much and changes due to climate change) and land, the availability of bulls for breeding or artificial insemination, and availability of medication.

There were only a few cluster specific issues reported with regard to dairy production. In Adama-Asela cluster, the key informants mentioned the need for milk collection centres and the need for milk processing machines. Land infertility and cold weather are problems that are affecting milk production are mentioned by key informants in the Sululta-Fitche cluster.

3.5.2 Obtaining dairy products outside the household

Purchasing milk and milk products was much less common than consuming what is produced at home. In some communities, it was unheard of, whereas it was a bit more common in others. Possibilities to obtain

dairy products outside the household include receiving from neighbours, buying from neighbours, buying from the market, or buying from (mini)processing centres. In Mekele-Adigrat, getting milk and milk products from neighbours and relatives seemed to be more common than in other regions. Dairy products can be given as gifts, borrowed or purchased there[2]. Distance to market plays a role in making purchasing milk and milk products unattractive. Sometimes, markets are too far away, or too pricey to reach.

Commonality of purchasing of milk and milk products is also product-dependent. Purchasing processed milk products is more common than purchasing raw milk, especially when the type of processing cannot be achieved at home (e.g. clarifying butter). Feast season means a larger likelihood to purchase specific dairy products (e.g. cheese and butter) but also higher prices.

Safety and quality aspects also form a barrier to purchasing dairy in the market. The following concerns were voiced by the groups:

- Milk is suspected to be adulterated with water or mixed with last night's milk to increase its volume. Salt may be added to prevent clotting. Formalin may be added to milk in the processing unit. Cream may be removed.
- Butter can have banana, flour, salt or (solid) oil added to it. It may have a bad flavour or smell. Some participants mention that they wash butter before use at home. Butter of crossbred cows has a red colour according to some (which is not good).
- Other people (outside the own household) are suspected of not caring about product quality and safety. Equipment and containers are suspected to be handled unhygienically.

Some participants indicate that they are able to easily distinguish between quality and non-quality products in the market. If the product is not of the right quality, they will not buy it.

3.5.3 Selling dairy products

Milk is marketed through factories, cooperatives / farmers' union and directly from home (possibly after processing). Some vendors check milk before accepting it, increasing the perception of quality among the FGD participants.

According to the key informants, some households take all their production to the market. Mostly because the household needs to the income from selling the production, and is a few cases because they feel that the family does not need milk and milk products and that it can be all sold. Especially the households in Sululta-Fitche, Hawassa-Shashemene and Mekele-Adigrat clusters are mainly selling their milk production and their butter on the market. Other households only are selling the surplus that they have after feeding the family. Morning milk is often sold for income, while afternoon milk is often being used for home consumption. In some cases it is mentioned, that the milk of local cows are use used for home consumption as the milk tastes better, and the milk of the cross-breeds is sold.

The FGDs showed that selling milk products can also lead to a change in the type of dairy products that are available at the household. If cheese and butter are produced for sale, households are left with whey and buttermilk instead of milk.

This qualitative survey cannot pinpoint a general interaction between milk production, market access and household dairy consumption. There are reports of households not consuming dairy themselves as they market everything they produce. There are also reports of family consuming all of their dairy as they do not have any place to sell it to. Both the FGDs and the quantitative survey show that "need to sell the product" is a somewhat common barrier to dairy consumption (Table 4). However, it is not associated with a change in dairy consumption frequency as compared to households who do not mention this barrier. A possible explanation for this observation is that households that do not experience a need to sell the product also produce less. It points to the existence of a kind of consumption threshold; a production amount that needs

[2] Because of this finding, one would expect that household cow ownership would be less of a decisive enabler to dairy consumption in Mekele-Adigrat, compared to other areas. Unfortunately, no quantitative data could be collected for Mekele-Adigrat to check this hypothesis.

to be reached before households start considering selling "surplus" production. Market access could be a factor in reaching that threshold; it could affect both production quantity and sales opportunities.

If milk is sold, the income that is obtained is reported to:
- Purchasing animal feed (during dry season) and medication
- Purchasing consumables, such as salt, pepper, coffee, oil, grains/flour (e.g. wheat, teff, barley, false banana), vegetables/legumes (e.g. onions, tomato, shiro, beans)
- School necessities (e.g. uniforms, exercise books)
- Agricultural inputs (e.g. seeds, fertilizer)
- Clothes
- Savings
- Food and non-food items for household use and community self-help contribution

The decision what to buy with the money made from selling milk and milk products is mostly made by the woman of the household. A reason that is cited is that the woman is the one responsible for selling the dairy products, and that she is more familiar with the family's needs. Others say that the decision is the result of discussion between the husband and wife. One group mentions that the man decides to buy cow food, and the woman decides on the purchase of anything else. The groups are unanimous in saying that there is no difference between different dairy products in terms of decision making.

3.6 Promotion and discouragement of dairy consumption

3.6.1 Actors that promote dairy consumption

The FDG participants mentioned the following actors that promote the consumption of dairy:
- (Woreda) agricultural professionals
- Agricultural bureau
- Agricultural extension workers
- Education / Science
- Elders
- Family
- Farmer unions
- Health extension workers
- Media (including radio)
- Neighbours and community members
- Religious leaders
- SNV
- Veterinary professionals

In the quantitative survey, encouragement from others was not frequently mentioned as an enabler (<20%). It was also not associated with an increase or decrease in consumption frequency.

According to the key informants, the communities knowledge including the importance of consumption of milk and milk products is acquired through nutrition education sessions by the health extension workers, sessions in the church by some of the religious leaders, through coffee ceremony and other platform (not specified) by several community representatives, but also by other organisations like NGOs. A few community representatives also mentioning the knowledge that they received by health extension workers and development agents trained by BRIDGE.

Health extension workers have monthly conferences where mothers are educated on how to improve their diet, that of their children and the family as a whole. Mothers are also encouraged to include milk while preparing complementary foods for their children. There are no training sessions that only focussed on consumption of dairy products and its impact on health.

Some of the religious leaders also promote the consumption of dairy products and the positive impact on health during church. In addition, some of the community representatives use the coffee ceremony to speak about the consumption of dairy products and the impact on health. Another issues that is discussed during these occasions is the prioritizing milk and dairy products for family consumption before the sale of these products.

3.6.2 Actors that discourage dairy consumption

None of the FGD participants mentioned anyone that discouraged dairy consumption. In the quantitative survey, discouragement from others was not frequently mentioned as an enabler (<20%). It was also not associated with an increase or decrease in consumption frequency. The fasting that is encouraged as part of the Orthodox Christian religion does not seem to be experienced as a discouragement by the interviewees. The taboos that are listed in section 3.3 do not seem to be enforced by a particular actor.

According to the key informants interviewed, in ***non-fasting*** times, all family members, including women and children can consume milk and milk products, although the consumption of raw milk is discouraged and personal dislike of milk prevents consumption. There are some practices that are encouraged:

- Children less than seven years, shall consume milk and milk products for appropriate growth physically and mentally both in fasting and non-fasting period. For some communities, the age range is up to three years and for others up to five years.
- Postpartum mothers to drink milk and even her neighbours usually come with dairy products to congratulate her (with a belief "Mary will get angry if we hide the milk for postpartum women").
- Postpartum women are to drink a lot of milk, because it is believed that milk will compensate/ replace what they had lost during delivery.

During a ***fasting period***, Orthodox Christian families normally do not consume animal source foods including milk and milk products. Key informants report the following on the practice of consuming milk and milk products (excluding the external other factors influencing consumption like income, availability and beliefs):

- During fasting periods, no milk and milk products are consumed due to the religious dogma from the Ethiopian Orthodox church.
- Children under 7 years should not fast; instead they should consume whatever they get at home. But some parents do not feed animal sources foods (including dairy) to their children during fasting and children do not consume animal source foods as well.
- Religious leaders strongly command that pregnant women should fast the same way others do. Most of lactating women also fast the whole fasting period.
- For pregnant women, it's not allowed to consume milk and milk products, unless they deliver or get sick since no religious evidence issued on it. If they delivered, they can consume until the infant get baptized.
- Pregnant women in Orthodox religion (except medically ordered) do not consume milk and milk products during fasting period due to their religion purpose.
- Lactating women are also exempt from fasting for 10 days if they give a birth of male baby and 20 days if they give a birth of female baby. Another key informant reported that lactating mothers can eat animal source foods for up to 40 days from the date of delivery.

The role of religion is further studied in the quantitative survey. Amongst the sample population, five different types of religion were identified: Orthodox Christian, Muslim, Protestant, Catholic and Other. The latter two were excluded from the calculation of average consumption and further statistical comparison, as their samples were too small.

Table 7 *Dairy consumption across religious groups*

N=336	n (%)	Average dairy consumption per week (days, sd)
Orthodox Christian	257 (70.2)	3.68 (1.42)
Protestant	64 (17.5)	3.64 (1.76)
Muslim	40 (10.9)	4.65 (2.36)
Catholic	4 (1.1)	N/A
Other (specify)	1 (0.3)	N/A

A Kruskal-Wallis test identifies that there is a difference ($p<0.05$) in the number of days one consumes dairy products according to religion (more details in 0). It gives an indication that protestants consume dairy products on the least number of days, followed by Orthodox Christians (the difference between these two groups is not statistically significant). Muslims can be expected to consume dairy products during most of the days – a statistically significant difference compared to Orthodox Christians and Protestants. However, as can be seen in Table 1, the prevalence of religions varies across clusters. This means that the observed differences in milk consumption could also be due to other cluster-related factors.

3.7 Information and communication

3.7.1 Information needs

Focus group discussion participants were asked to share which topics they would like to learn more about. Table 8 lists the aspects that were mentioned.

Table 8 *Information needs*

Topic	Aspects mentioned
Nutrition	• **Benefits** of a diversified diet and of specific products. Participants cited milk and milk products, kocho and kocho products and barley as examples. *"[What] is the importance of milk and milk products, how can it help our body?"* • How to **produce balanced diets**, in practical terms, and specifically for mothers and children • **Usage and preparation** of specific products, like dairy products, meat and meat products, grain and grain products, legumes and fruits and vegetables (through practical training) • How to produce **fortified food** using locally available food items: *"what should be mixed with what?"* • Awareness **not to market all dairy products** before fulfilling the consumption demand of the household • Consumption of **protein-rich foods**. • How to feed dairy products to children
Handling milk	• How to handle milk **hygienically** • How to **process milk and prepare milk products**
Animal care and production	• How to prepare **cow feed;** what type of feed is needed, enriching the food with locally available inputs • How to feed calves: *"in what way we have to give cow's milk to its calf"* • How to **handle cross breed cows** specifically • **Housing** of cows: *"Which type of house is better for cow milk? Cement or mud-made?"* • Increase **milk production of cows**: *"Strategies on how to improve milk availability to be [...] enough beyond household consumption"*
Marketing milk	• Making milk production **profitable** • **Improving the market chain**

3.7.2 Information delivery preferences

There is a general preference for scheduled direct (face-to-face) trainings. Other information delivery methods are deemed less effective due to illiteracy, and lack of access to and time for media. If media is used, radio is preferred. The possibilities to have practical demonstrations and ask questions at direct trainings are also appreciated.

4 Conclusions and recommendations

4.1 Conclusions on the research questions

What are the major determinants of dairy products' consumption choice in the study areas? How do the identified determinants affect dairy products' consumption choice?
The motives that were found to drive dairy products' consumption choice are summarized in Table 9. The + or – signifies the indicated direction of the impact on consumption frequency. The motives that were found to be statistically significantly associated with dairy consumption frequency are emphasized in **bold,** with the specific food that this correlation was found for between brackets.

Table 9 *Motives of dairy consumption*

Aspect	Reasons why it promotes consumption	Reasons why it inhibits consumption
Health	+ Promotes general health	- Not suitable for children's health
	+ Prevents disease [milk]	- No/low nutritional value
	+ Gives strength	- Not good for abdomen
	+ Builds body	
	+ Gives energy [yogurt]	
	+ Contains nutrients	
	+ Promotes growth of children [milk]	
	+ Improves education performance [milk]	
	+ Good for functions in the body	
	+ No negative effects	
Sensory appeal	+ Good/convenient taste	- Does not meet preferences
	+ Meets preferences	- Taste negatively impacted by processing
	+ Increases appetite	- Lack of desire to consume
	+ Combines well with other food	- Temperature not preferred
	+ Liking of spices	- Dislike of sour taste
	+ Pleasant texture	
Price	+ Fair price	- Too high price/cost
		- Dry season inflates prices
		- Preference to sell
Culture & tradition	+ Familiarity with a product	- No culture of consuming a product
		- Cultural taboo
Food safety	+ Boiled products	- (Perception of) unsafety
		- Adulteration of products
Convenience	**+ Availability in the household (production and storage) [all products; from own cows]**	
	+ Does not require a lot of preparation	
	+ Makes it easier to eat other food	
Mood	+ Gives comfort	
	+ Gives a good mood	
Religion		- Fasting season in Orthodox religion
Knowledge		**- Don't know about disadvantages [yoghurt]**

The table points to availability of milk from own cows as the major enabler of dairy consumption. At the same time, from the FGDs and KIGIs we know that purchasing dairy from the market is not (yet) an alternative to home production. This points to promotion of cow ownership as the best way to increase consumption on the short term. From the FGDs and KIGIs, we also learned that year-round availability of dairy within households is limited due to lack of feed in some but not all areas, confirming the importance of taking this into account when promoting cow ownership. Another issue related to cow-ownership is that dairy

is not available daily due to practices of making cheese or butter that requires all milk on the day of production. Rest products such as whey were consumed in some but not all clusters (considered animal feed, not nutritious or unsuitable for humans).

Awareness of the advantages of dairy on dairy on disease prevention, energy, growth and education performance may also help to increase dairy consumption. We learned that respondents in general were aware of the fact that dairy has health benefits, but there is still a need for nutritional information. Specifically, there appear to be knowledge gaps regarding populations with special nutritional needs and regarding products where there was disagreement on healthiness (especially whey and yoghurt).

Interpreting the findings of this study, it should be re-emphasized that the bold findings in Table 9 are *correlations*, and not necessarily *cause-effect relationships*. While we can conclude, for example, that people who report that milk promotes growth of children are more likely to have a higher dairy consumption than those who do not mention this advantage, we cannot conclude with certainty that convincing people that milk has this advantage will lead to increased dairy consumption.

Is there a difference in dairy products' consumption choices between households with cross breeds, local breeds and no cows and if so: how is this difference explained?
The current study shows differences in dairy products' consumption between these types of households. Households that do not own cows consume dairy less frequently than households that have any type of cows (roughly 1 day a week less). Households that have crossbreeds consume dairy more frequently than households that only have local cows (roughly 1 day a week more). In most of the clusters studied, it is uncommon to obtain dairy products outside the own household (Mekele-Adigrat being the exception). Explanations provided are an insufficient milk supply, a lack of buying culture, distance to markets and quality concerns for purchased dairy products.

Does consumption choice of dairy products vary among household members, religions, seasons or by household size?
FGD participants report few differences in dairy consumption patterns within their families. There is some mention of children being prioritized as dairy consumers if the supply is low. (Fresh) milk is deemed the dairy product of choice for children. Some participants specify that this milk should be boiled. Apart from this, intra-household differences are mainly based on personal preference or health effects.

However, key informants do report that during fasting times there are difference on dairy consumption for pregnant and lactating women based upon religious beliefs and practices. Although most religious leaders report that children under a certain age can consume dairy products, the practice might be different due to practical reasons at the households (afraid of cross contamination in the kitchen).

Religious fasting among Orthodox Christians is a clear influence on dairy product consumption. Dairy consumption is reduced during the Orthodox Christian fasting season, and increased during the feast season. The study shows no difference between the average dairy consumption frequency of Orthodox Christians and Protestants. Muslims seem to consume dairy more frequently. However, regional differences could be at the root of differences in consumption frequency.

Seasonality has a big impact on dairy consumption, with animal feed availability being the main driver of milk availability. During the dry season, the amount of animal feed declines, leading to lower milk production and availability.

The quantitative survey shows that there is a difference in the number of days on which a family consumes dairy products related to family size. The hypothesis that a bigger number of family members leads to a lesser dairy consumption per week can be rejected, as the evidence points to the inverse: a bigger number of family members is correlated to an increase in consumption of dairy products per week.

4.2 Recommendations

General recommendations

1. The current study finds that availability of milk from own cows as the major enabler of dairy consumption. This could have the largest short-term benefits. This research suggests that household cattle ownership might have the largest short-term benefits in setting where markets are highly underdeveloped (Hoddinott, Headey & Dereje, 2015). However, before promoting cow-ownership by households, the other issues mentioned that influences milk production and consumption such as the availability of animal feed needs to considered and addresses, so that these households can avoid these problems. Experiences from the BRIDGE project could be used as an example.
2. Future action research could experiment with SBCC strategies that highlight the advantages that are correlated with higher dairy consumption frequency. This would uncover whether the correlation is a cause-effect relationship while possibly increasing dairy consumption in rural areas. Since there is already awareness of dairy health benefits in general, this communications should be targeted at populations with low awareness and to the information needs reported.

Recommendations for BRIDGE

1. Other research has found support for the hypothesis that cow ownership in underdeveloped rural settings is an important driver of dairy product consumption, and of the linear growth of young children. This research suggests that household cattle ownership might have the largest short-term benefits in setting where markets are highly underdeveloped. On the longer term, market development is however deemed to be crucial for sustainable impact (Hoddinott, Headey & Dereje, 2015). The current study identifies reduced home consumption as a potential adverse effect of increased market access for the dairy farmer families themselves. BRIDGE could monitor at-home milk and milk product consumption relative to volumes marketed. This would provide insight into any unintended nutrition effects of BRIDGE's interventions, and also provide valuable information on the trade-offs between production, home-consumption and marketing.
2. Buttermilk does not seem to be consumed as much as it could be. As a side product of butter production, many households have access to it. However, various participants to the interviews hold the misconception that it does not have any nutritional value and report feeding it to animals instead. Promoting safe consumption of buttermilk (possibly with added spices) could be a quick win. For this purpose, the nutritional value and safety of this home-made product, at the moment unknown in Ethiopia, could be analysed. This could support the promotion of this product.
3. The results underpin the relevance of animal feed interventions as part of the BRIDGE programme (e.g. silage). A reduced milk production is reported when animal feed becomes scarce. Alternatively, the household has to use its income to purchase feed for the cows. Both scenarios reduce the likelihood of households consuming milk and milk products.
4. For the BRIDGE SBCC strategy on the promotion of dairy consumption, the result of the study suggest that messages need to be adjusted to practices and beliefs reported in the different project clusters. In addition, the existing well established routes of communication on nutrition and health, such as nutrition education sessions by the health extension workers, sessions in the church by some of the religious leaders and /or through coffee ceremony to increase the knowledge of the communities on the benefits of dairy consumption could be explored to support further positive impact on dairy consumption of households.
5. BRIDGE is currently exploring the potential of marketing probiotic yogurt. The current study identified several prevalent beliefs about yogurt that should be taken into consideration in the marketing strategy of probiotic yogurt:
   - The reported of health aspects of yogurt go two ways. On the one hand, yogurt is considered to be a tasty and nutritious product. On the other hand, a number of groups report health complaints (e.g. abdominal cramps) because of yogurt consumption. The explanation provided is that yogurt cannot be boiled before consumption, rendering it unsafe.
   - Producing yogurt at home is reported to compete with butter production, in which butter production is generally prioritised.
   - One group in Adama-Asela reports a food taboo related fresh products like yogurt for adolescent girls: "Sometime if the adolescent girls consume it is believed that it increases the sexual interests and may make them to marry early."

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Appendix 1 Conceptual framework

The High Level Panel of Experts for Food Security and Nutrition (HLPE) identified three core constituent elements of food systems: food supply chains, food environments and consumer behaviour, which are influenced by drivers, shape diets and determine the nutritional, health, economic and social outcomes of food systems (HLPE, 2017).

The food environment is defined as "The physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food" (HPLE 2017). Food environments are considered healthy when they "*enable consumers to make nutritious food choices with the potential to improve diets and reduce the burden of malnutrition*". The food environment consists of; "*food entry points*" - the physical spaces where food is purchased or obtained - features and infrastructures of the constructed environment that allow consumers to access these spaces; *personal determinants* of consumer food choices (including income, education, values, skills etc.); and surrounding political, social and cultural *norms* that underlie these interactions. Therefore, working toward making food environments enablers of healthy food choices offers an untapped opportunity to positively affect diet quality and nutrition (FAO, 2016; HLPE, 2017).

Food choices are determined by personal attitudes and motives such as familiarity with the foods, taste preferences, convenience (time scarcity, food prices), perceived safety of foods, and health-related motives (Herforth and Ahmed (2015), HPLE (2017)). In this context, nutrition knowledge, as well as skills and availability of time for food preparation, influences consumer food choices and could lead people to choose for healthier foods.

The individual-level factors come together to determine consumer behaviour, defined as "*all the choices and decisions made by consumers, at the household or individual level, on what food to acquire, store, prepare, cook and eat, and on the allocation of food within the household (including gender repartition and feeding of children*" (HPLE 2017). Consumer behaviour is influenced by personal preferences, determined by a variety of interpersonal and personal factors including, but not limited to, taste, convenience, values, traditions, culture and beliefs (Glanz *et al.,* 1998; Sobal and Bisogni, 2009).

According to Herforth and Ahmed (2015), the food system determines how people access, prepare and consume food. Thus understanding how food systems in general and food environments in particular operates including drivers of food systems / food environments is crucial to orient consumer behaviour towards healthier diets. Five main categories of drivers of food system changes are identified, namely: 1) biophysical and environmental, including natural resource and ecosystem services, and climate change; 2) innovation, technology and infrastructure, including new research and new technologies, better access to and use of existing technologies and context specific solutions for local ecosystems, 3) Political and economic drivers including leadership, globalization, foreign investment and trade, food policies, land tenure, food prices and volatility, conflicts and humanitarian crises; 4) socio-cultural including culture, religion, rituals, social traditions and women's empowerment.; and 5) demographic drivers, including include population growth, changing age distribution, urbanization, migration and forced displacement (HPLE 2017). The relative impact of each driver will depend on the type of food system in question, the type of actors involved, and the type of actions and policies that are decided upon (IOM and NRC (2015).

Consumer behaviour and food choice is a complex process and influenced by personal preferences. These personal preferences can vary during to life stages. Determinants that influence personal food choices include:

- Availability: presence of food source or product including seasonality;
- Affordability: food prices, purchasing power;
- Accessibility: physical access, proximity, mobility, and mode of transport;
- Socio-cultural: religions, social norms, gender relationships and norms, beliefs;

- Desirability: taste, preferences, attitudes, desires, acceptability, cultures, knowledge and skills;
- Convenience: relative time of effort of preparing, cooking and consuming food product, time allocation;
- Psychological: mood, stress and guilt;
- Vendor and product properties: opening hours, services, composition, level processing, shelf live, packaging, food quality and safety;
- Marketing and Regulation: promotion, advertising and information and transparency.

The figure below illustrates what we expect to find through our research, including how the variables we are considering might relate to each other and how might they affect the dairy products' choice and consumption among the rural households in the study areas.

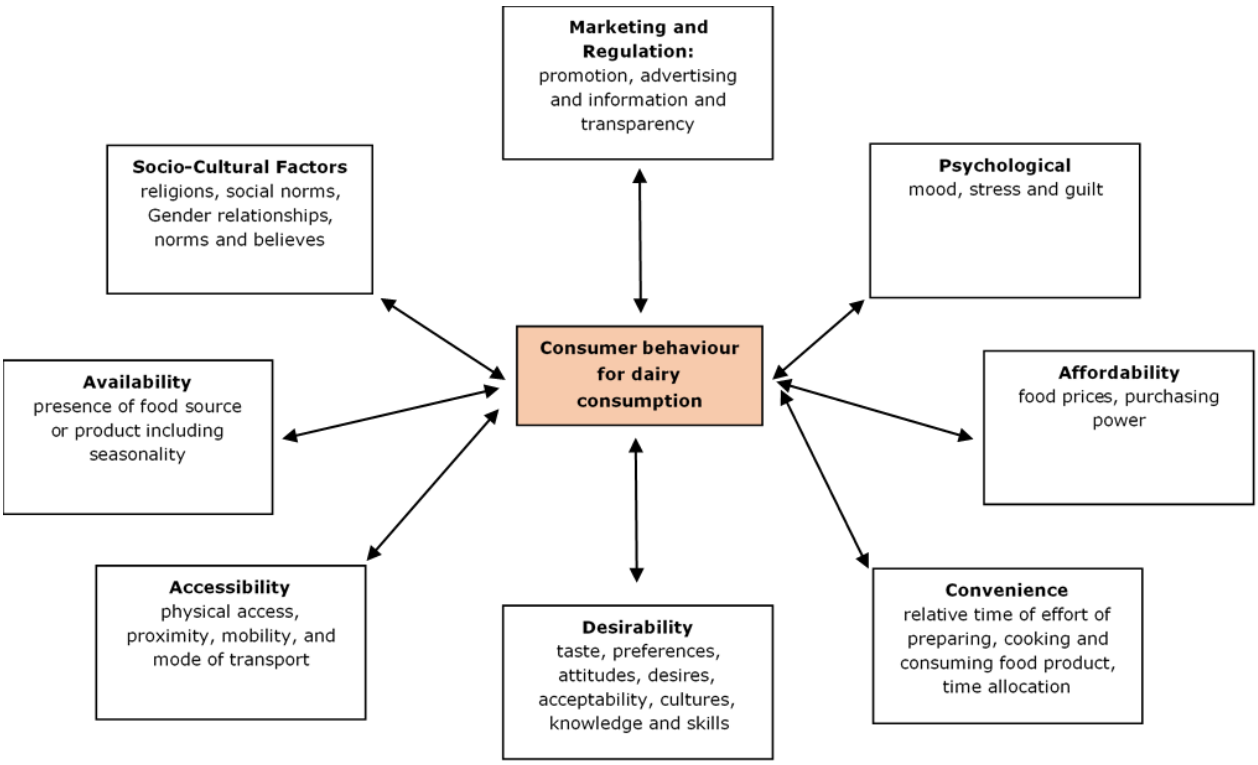


Figure 2 *Interrelationship among determinants and consumer behaviour of dairy consumption*

Appendix 2 Results per cluster

Consumption frequency

Table 10 *Consumption frequency data, disaggregated to clusters*

	Adama Asela	Sululta-Fitche	Hawassa-Shashemene	West Amhara
N	**89**	**91**	**94**	**92**
Consumption below or above FBDG threshold (adjusted for fasting, exc. butter) (n, %)				
<5 days/week	50 (56.2)	61 (67.0)	61 (64.9)	42 (45.7)
≥5 days/week	39 (43.8)	30 (33.0)	33 (35.1)	50 (54.3)
Frequency of dairy consumption (exc. butter) (n, %)				
0 days/week	1 (1.1)	0	2 (2.1)	3 (3.3)
1 day/week	1 (1.1)	13 (14.3)	8 (8.5)	2 (2.2)
2 days/week	18 (20.2)	15 (16.5)	12 (12.8)	14 (15.2)
3 days/week	21 (23.6)	17 (18.7)	24 (25.5)	15 (16.3)
4 days/week	9 (10.1)	16 (17.6)	15 (16.0)	8 (8.7)
5 days/week	35 (39.3)	27 (29.7)	10 (10.6)	49 (53.3)
6 days/week	0	0	3 (3.2)	0
7 days/week	4 (4.5)	3 (3.3)	20 (21.3)	1 (1.1)

Types of dairy products consumed

Table 11 *Types of dairy products consumed, disaggregated to clusters*

	Adama Asela	Sululta-Fitche	Hawassa-Shashemene	West Amhara
N	**89**	**91**	**94**	**92**
People consuming dairy products at least once a week (n, %)				
Milk	68 (23.6)	81 (89.0)	59 (62.8)	79 (85.9)
Buttermilk	15 (16.9)	12 (13.2)	54 (57.4)	19 (20.7)
Cheese	81 (91.0)	72 (79.1)	6 (6.4)	87 (94.6)
Butter	67 (75.3)	80 (87.9)	59 (62.8)	82 (89.1)
Whey	4 (4.5)	4 (4.4)	1 (1.1)	42 (45.7)
Yogurt	69 (77.5)	46 (50.5)	35 (37.2)	59 (64.1)
Other	0	0	1 (1.1)	5 (5.4)

Enablers to dairy consumption

Table 12 *Frequency of enablers to dairy consumption, disaggregated to clusters*

	Adama Asela		Sululta-Fitche		Hawassa-Shashemene		West Amhara		Overall	
N	**89**		**91**		**94**		**92**		**366**	
	n	**%**	**N**	**%**	**n**	**%**	**N**	**%**	**n**	**%**
Market availability										
Milk	3	3%	10	11%	11	12%	3	3%	27	7%
Buttermilk	0	0%	3	3%	8	9%	2	2%	13	4%
Cheese	1	1%	15	16%	9	10%	6	7%	31	8%
Whey	0	0%	0	0%	1	1%	2	2%	3	1%
Yogurt	0	0%	8	9%	4	4%	3	3%	15	4%

	Adama Asela		Sululta-Fitche		Hawassa-Shashemene		West Amhara		Overall	
N	89		91		94		92		366	
	n	%	N	%	n	%	N	%	n	%
Cow ownership										
Milk	68	76%	47	52%	51	54%	91	99%	257	70%
Buttermilk	16	18%	27	30%	48	51%	64	70%	155	42%
Cheese	54	61%	30	33%	36	38%	81	88%	201	55%
Whey	3	3%	8	9%	13	14%	74	80%	98	27%
Yogurt	50	56%	38	42%	49	52%	77	84%	214	58%
Ease of preparation										
Milk	6	7%	9	10%	12	13%	10	11%	37	10%
Buttermilk	2	2%	6	7%	7	7%	1	1%	16	4%
Cheese	10	11%	7	8%	6	6%	1	1%	24	7%
Whey	0	0%	0	0%	1	1%	1	1%	2	1%
Yogurt	10	11%	11	12%	11	12%	1	1%	33	9%
Encouraged by others										
Milk	1	1%	7	8%	3	3%	11	12%	22	6%
Buttermilk	0	0%	1	1%	2	2%	2	2%	5	1%
Cheese	0	0%	7	8%	2	2%	0	0%	9	2%
Whey	2	2%	4	4%	0	0%	1	1%	7	2%
Yogurt	1	1%	6	7%	2	2%	2	2%	11	3%
Familiar										
Milk	13	15%	43	47%	29	31%	6	7%	91	25%
Buttermilk	15	17%	22	24%	18	19%	0	0%	55	15%
Cheese	19	21%	41	45%	14	15%	7	8%	81	22%
Whey	1	1%	5	5%	16	17%	3	3%	25	7%
Yogurt	20	22%	44	48%	14	15%	5	5%	83	23%
Good taste										
Milk	31	35%	48	53%	26	28%	42	46%	147	40%
Buttermilk	15	17%	17	19%	11	12%	13	14%	56	15%
Cheese	19	21%	45	49%	5	5%	50	54%	119	33%
Whey	2	2%	4	4%	0	0%	13	14%	19	5%
Yogurt	41	46%	46	51%	29	31%	32	35%	148	40%
Hygienic / Safe										
Milk	25	28%	15	16%	5	5%	7	8%	52	14%
Buttermilk	4	4%	10	11%	2	2%	3	3%	19	5%
Cheese	9	10%	11	12%	3	3%	24	26%	47	13%
Whey	0	0%	2	2%	0	0%	2	2%	4	1%
Yogurt	18	20%	10	11%	6	6%	8	9%	42	11%
Makes it easier to eat other food										
Milk	10	11%	5	5%	21	22%	13	14%	49	13%
Buttermilk	16	18%	1	1%	24	26%	6	7%	47	13%
Cheese	39	44%	5	5%	4	4%	55	60%	103	28%
Whey	1	1%	1	1%	0	0%	2	2%	4	1%
Yogurt	24	27%	5	5%	17	18%	42	46%	88	24%
Suitable for all family members										
Milk	16	18%	26	29%	16	17%	19	21%	77	21%
Buttermilk	3	3%	5	5%	13	14%	6	7%	27	7%
Cheese	13	15%	28	31%	4	4%	21	23%	66	18%
Whey	0	0%	3	3%	6	6%	2	2%	11	3%
Yogurt	14	16%	12	13%	9	10%	14	15%	49	13%
Can be mixed with water										
Milk	0	0%	0	0%	0	0%	2	2%	2	1%
Buttermilk	0	0%	2	2%	1	1%	0	0%	3	1%
Cheese	0	0%	1	1%	4	4%	0	0%	5	1%
Whey	0	0%	1	1%	0	0%	0	0%	1	0%
Yogurt	0	0%	0	0%	1	1%	0	0%	1	0%
Nothing										
Milk	5	6%	6	7%	5	5%	0	0%	16	4%
Buttermilk	39	44%	42	46%	11	12%	21	23%	113	31%
Cheese	6	7%	8	9%	25	27%	0	0%	39	11%
Whey	68	76%	65	71%	29	31%	13	14%	175	48%
Yogurt	11	12%	10	11%	5	5%	7	8%	33	9%

Table 13 lists the potential enablers that were studied, for each dairy product. The cells marked in green highlight a statistically significant difference ($p<0.05$) in number of dairy consumption days between the consumers that and did not list this particular enabler as relevant to their own consumption. The cell shows the size of that difference (in number of days), and the p-value that was returned out the Mann-Whitney-U test.

Example: in Hawassa-Shashemene, respondents that mentioned "cow ownership" as an enabler to their milk consumption consume dairy more frequently than those who did not list it. On average, they consume dairy 1.98 days/week more often.

Table 13 *Effect of enablers to dairy consumption, disaggregated to clusters*

	Adama Asela	Sululta-Fitche	Hawassa-Shashemene	West Amhara
N	**89**	**91**	**94**	**92**
Market accessibility; difference in number of days (p)				
Milk	- (.069)	- (.352)	-1.59 (.008)	- (.981)
Buttermilk	N/A	- (.340)	- (.201)	- (.726)
Cheese	- (.270)	- (.478)	- (.066)	-2.03 (.004)
Whey	N/A	N/A	- (1.000)	-1.94 (.041)*
Yogurt	N/A	- (.353)	- (.074)	- (.307)
Cow ownership (difference, p)				
Milk	+1.06 (.004)	- (.289)	+1.98 (.000)	+3.95 (.043)*
Buttermilk	- (.864)	- (.861)	+1.19 (.002)	- (.793)
Cheese	+1.86 (.008)	- (.318)	- (.099)	+1.85 (.000)
Whey	- (.309)	- (.126)	- (.364)	+1.33 (.001)
Yogurt	+.89 (.005)	- (.104)	+1.03 (.019)	+1.47 (.001)
Ease of preparation (difference, p)				
Milk	- (.478)	- (.999)	+1.29 (.037)	- (.531)
Buttermilk	- (.989)	- (.470)	- (.870)	- (.913)
Cheese	- (.600)	- (.567)	- (.364)	- (.750)
Whey	N/A	N/A	- (.840)	- (.913)
Yogurt	- (.765)	- (.727)	- (.053)	- (.750)
Encouraged by others (difference, p)				
Milk	- (.270)	- (.866)	- (.856)	- (.396)
Buttermilk	N/A	- (.824)	- (.955)	- (1.000)
Cheese	N/A	- (.321)	- (1.000)	N/A
Whey	- (.989)	- (.523)	N/A	- (.913)
Yogurt	- (.270)	- (.400)	- (.661)	- (.438)
Familiar (difference, p)				
Milk	- (.220)	- (.184)	- (.529)	- (.042)
Buttermilk	- (.924)	- (.414)	- (.849)	N/A
Cheese	- (.693)	+.64 (.042)	- (.083)	- (.663)
Whey	- (.270)	- (.412)	- (.870)	- (.718)
Yogurt	- (.121)	- (.097)	- (.849)	- (.277)
Good taste (difference, p)				
Milk	- (.553)	- (.982)	- (.616)	+.97 (.002)
Buttermilk	- (.364)	- (.402)	- (.723)	- (.115)
Cheese	- (.345)	- (.140)	- (.993)	- (.423)
Whey	- (.400)	- (.728)	N/A	- (.059)
Yogurt	- (.999)	- (.186)	- (.179)	+.92 (.001)
Hygienic / Safe (difference, p)				
Milk	- (.907)	- (.228)	- (.914)	- (.063)
Buttermilk	- (.998)	- (.930)	- (.661)	- (.233)
Cheese	- (.090)	- (.627)	- (.149)	- (.256)
Whey	N/A	- (.370)	N/A	- (.438)
Yogurt	- (.371)	- (.550)	- (.829)	+1.07 (.039)

	Adama Asela	Sululta-Fitche	Hawassa-Shashemene	West Amhara
N	**89**	**91**	**94**	**92**
Makes it easier to eat other food (difference, p)				
Milk	- (.600)	- (.875)	- (.315)	- (.110)
Buttermilk	- (.866)	- (.637)	- (.275)	- (.911)
Cheese	- (.404)	- (.602)	- (.620)	+.92 (.006)
Whey	- (.663)	- (.637)	N/A	- (.438)
Yogurt	- (.753)	- (.602)	- (.215)	- (.092)
Suitable for all family members (difference, p)				
Milk	+.92 (.013)	- (.296)	- (.197)	- (.208)
Buttermilk	- (.309)	- (.618)	- (.898)	- (.623)
Cheese	+.95 (.021)	- (.349)	- (.708)	+.99 (.004)
Whey	N/A	- (.503)	- (.829)	- (.438)
Yogurt	+.90 (.021)	- (.835)	- (.780)	- (.147)
Can be mixed with water (difference, p)				
Milk	N/A	N/A	N/A	- (.494)
Buttermilk	N/A	- (.934)	- (1.000)	N/A
Cheese	N/A	- (.473)	- (.708)	N/A
Whey	N/A	- (.473)	N/A	N/A
Yogurt	N/A	N/A	- (.106)	N/A
Nothing (difference, p)				
Milk	-1.28 (.048)	- (.950)	-2.07 (.049)	N/A
Buttermilk	- (.728)	- (.735)	- (.314)	- (.250)
Cheese	- (.206)	- (.061)	- (.357)	N/A
Whey	- (.349)	- (.108)	- (.671)	-1.23 (.002)
Yogurt	-.92 (.046)	- (.867)	- (.427)	-2.06 (.000)

Results marked with * are based on a comparison where one group only consisted of 1 or 2 participants. While statistically significant, this heavy reliance on only a few observations means that the findings should be considered less reliable.

Barriers to dairy consumption

Table 14 *Frequency of barriers to dairy consumption, disaggregated to clusters*

	Adama Asela		Sululta-Fitche		Hawassa-Shashemene		West Amhara		Overall	
N	**89**		**91**		**94**		**92**		**366**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Lack of market availability										
Milk	3	3%	6	7%	3	3%	3	3%	15	4%
Buttermilk	1	1%	8	9%	6	6%	1	1%	16	4%
Cheese	2	2%	8	9%	9	10%	4	4%	23	6%
Whey	2	2%	5	5%	4	4%	2	2%	13	4%
Yogurt	4	4%	9	10%	4	4%	2	2%	19	5%
Lack of availability from own cow										
Milk	13	15%	6	7%	45	48%	51	55%	115	31%
Buttermilk	2	2%	1	1%	32	34%	24	26%	59	16%
Cheese	14	16%	6	7%	39	41%	55	60%	114	31%
Whey	0	0%	0	0%	10	11%	29	32%	39	11%
Yogurt	13	15%	8	9%	42	45%	49	53%	112	31%
Need to sell the product										
Milk	42	47%	40	44%	7	7%	11	12%	100	27%
Buttermilk	5	6%	8	9%	4	4%	1	1%	18	5%
Cheese	37	42%	31	34%	5	5%	3	3%	76	21%
Whey	0	0%	0	0%	0	0%	0	0%	0	0%
Yogurt	13	15%	17	19%	12	13%	1	1%	43	12%

	Adama Asela		Sululta-Fitche		Hawassa-Shashemene		West Amhara		Overall	
N	89		91		94		92		366	
	n	%	n	%	n	%	n	%	n	%
Need to use the product to prepare butter										
Milk	29	33%	13	14%	6	6%	24	26%	72	20%
Buttermilk	3	3%	7	8%	2	2%	2	2%	14	4%
Cheese	0	0%	3	3%	0	0%	0	0%	3	1%
Whey	0	0%	0	0%	0	0%	0	0%	0	0%
Yogurt	33	37%	25	27%	13	14%	31	34%	102	28%
Difficult to prepare										
Milk	0	0%	0	0%	0	0%	0	0%	0	0%
Buttermilk	4	4%	0	0%	5	5%	0	0%	9	2%
Cheese	2	2%	3	3%	10	11%	0	0%	15	4%
Whey	0	0%	0	0%	3	3%	0	0%	3	1%
Yogurt	0	0%	0	0%	1	1%	0	0%	1	0%
Discouraged by others										
Milk	0	0%	1	1%	1	1%	0	0%	2	1%
Buttermilk	1	1%	10	11%	0	0%	0	0%	11	3%
Cheese	0	0%	0	0%	1	1%	0	0%	1	0%
Whey	1	1%	13	14%	0	0%	0	0%	14	4%
Yogurt	0	0%	0	0%	0	0%	0	0%	0	0%
Unfamiliar										
Milk	2	2%	3	3%	6	6%	0	0%	11	3%
Buttermilk	8	9%	17	19%	7	7%	26	28%	58	16%
Cheese	1	1%	0	0%	38	40%	0	0%	39	11%
Whey	25	28%	24	26%	57	61%	13	14%	119	33%
Yogurt	1	1%	0	0%	5	5%	3	3%	9	2%
Poor taste										
Milk	0	0%	1	1%	6	6%	2	2%	9	2%
Buttermilk	11	12%	10	11%	8	9%	16	17%	45	12%
Cheese	0	0%	1	1%	1	1%	0	0%	2	1%
Whey	16	18%	11	12%	2	2%	21	23%	50	14%
Yogurt	1	1%	0	0%	1	1%	5	5%	7	2%
Don’t know how to prepare										
Milk	0	0%	0	0%	2	2%	0	0%	2	1%
Buttermilk	5	6%	0	0%	1	1%	0	0%	6	2%
Cheese	1	1%	1	1%	7	7%	0	0%	9	2%
Whey	9	10%	2	2%	2	2%	0	0%	13	4%
Yogurt	0	0%	0	0%	0	0%	0	0%	0	0%
Unhygienic										
Milk	0	0%	2	2%	3	3%	0	0%	5	1%
Buttermilk	4	4%	5	5%	1	1%	23	25%	33	9%
Cheese	2	2%	7	8%	2	2%	0	0%	11	3%
Whey	3	3%	3	3%	0	0%	2	2%	8	2%
Yogurt	0	0%	3	3%	1	1%	15	16%	19	5%
Cannot be mixed with water										
Milk	0	0%	0	0%	0	0%	0	0%	0	0%
Buttermilk	0	0%	0	0%	0	0%	0	0%	0	0%
Cheese	0	0%	0	0%	3	3%	0	0%	3	1%
Whey	0	0%	0	0%	0	0%	0	0%	0	0%
Yogurt	0	0%	0	0%	1	1%	0	0%	1	0%
Reserved for animal food										
Milk	0	0%	0	0%	0	0%	0	0%	0	0%
Buttermilk	1	1%	4	4%	3	3%	1	1%	9	2%
Cheese	0	0%	0	0%	0	0%	0	0%	0	0%
Whey	57	64%	47	52%	15	16%	30	33%	149	41%
Yogurt	0	0%	0	0%	0	0%	0	0%	0	0%

	Adama Asela		Sululta-Fitche		Hawassa-Shashemene		West Amhara		Overall	
N	89		91		94		92		366	
	n	%	n	%	n	%	n	%	n	%
Too expensive										
Milk	7	8%	11	12%	0	0%	4	4%	22	6%
Buttermilk	0	0%	2	2%	0	0%	0	0%	2	1%
Cheese	6	7%	16	18%	0	0%	0	0%	22	6%
Whey	0	0%	0	0%	0	0%	2	2%	2	1%
Yogurt	6	7%	9	10%	0	0%	2	2%	17	5%
Nothing										
Milk	32	36%	29	32%	29	31%	28	30%	118	32%
Buttermilk	22	25%	27	30%	38	40%	14	15%	101	28%
Cheese	38	43%	32	35%	13	14%	29	32%	112	31%
Whey	7	8%	20	22%	7	7%	15	16%	49	13%
Yogurt	37	42%	37	41%	28	30%	15	16%	117	32%

Table 15 lists the potential barriers that were studied, for each dairy product. The cells marked in green highlight a statistically significant difference ($p<0.05$) in number of dairy consumption days between the consumers that and did not list this particular barrier as relevant to their own consumption. The cell shows the size of that difference (in number of days), and the p-value that was returned out the Mann-Whitney-U test.

Example: in Sululta-Fitche, respondents that mentioned "lack of market accessibility" as a barrier to their milk consumption consume dairy less frequently than those who did not list it. On average, they consume dairy 1.55 days/week fewer.

Table 15 *Barriers to dairy consumption, disaggregated to clusters*

	Adama Asela	Sululta-Fitche	Hawassa-Shashemene	West Amhara
N	89	91	94	92
Lack of market accessibility; difference (p)				
Milk	- (.200)	-1.55 (.015)	- (.096)	- (.257)
Buttermilk	- (.270)	- (.595)	- (.430)	- (.217)
Cheese	- (.783)	- (.180)	- (.349)	- (.214)
Whey	- (.193)	- (.265)	- (.074)	- (.121)
Yogurt	- (.174)	- (.400)	- (.339)	- (.126)
Lack of availability from own cows				
Milk	-1.31 (.002)	- (.528)	-.82 (.029)	- (.569)
Buttermilk	- (.193)	- (.473)	- (.197)	- (.951)
Cheese	-.96 (.035)	-1.37 (.025)	- (.366)	- (.786)
Whey	N/A	N/A	- (.880)	- (.092)
Yogurt	-1.04 (.027)	- (.537)	- (.358)	- (.851)
Need to sell the product				
Milk	- (.894)	-.75 (.023)	- (.550)	- (.586)
Buttermilk	-1.28 (.048)	- (.331)	-2.39 (.023)	-3.95 (.043)*
Cheese	- (.675)	- (.201)	- (.832)	-3.34 (.000)
Whey	N/A	N/A	N/A	N/A
Yogurt	- (.242)	- (.103)	- (.746)	- (.913)
Need to use the product to prepare butter				
Milk	- (.607)	- (.792)	- (.065)	- (.829)
Buttermilk	- (.377)	- (.567)	- (.754)	- (.121)
Cheese	N/A	- (.196)	N/A	N/A
Whey	N/A	N/A	N/A	N/A
Yogurt	- (.617)	- (.936)	- (.690)	-1.02 (.000)

	Adama Asela	Sululta-Fitche	Hawassa-Shashemene	West Amhara
N	**89**	**91**	**94**	**92**
Difficult to prepare				
Milk	N/A	N/A	N/A	N/A
Buttermilk	- (.447)	N/A	- (.255)	N/A
Cheese	- (.193)	- (.954)	- (.596)	N/A
Whey	N/A	N/A	- (.392)	N/A
Yogurt	N/A	N/A	- (.447)	N/A
Discouraged by others / cultural taboo				
Milk	N/A	- (.637)	- (.585)	N/A
Buttermilk	- (.270)	- (.085)	N/A	N/A
Cheese	N/A	N/A	- (.319)	N/A
Whey	- (.663)	- (.131)	N/A	N/A
Yogurt	N/A	N/A	N/A	N/A
Unfamiliar				
Milk	- (.193)	- (.948)	- (.516)	N/A
Buttermilk	- (.681)	- (.901)	- (.074)	- (.364)
Cheese	- (.899)	N/A	- (.562)	N/A
Whey	- (.724)	- (.597)	- (.529)	- (.535)
Yogurt	- (.270)	N/A	- (.796)	-1.97 (.017)
Poor taste				
Milk	N/A	- (.824)	- (.226)	-2.97 (.012)*
Buttermilk	- (.461)	- (.820)	- (.510)	- (.268)
Cheese	N/A	- (.824)	- (.319)	N/A
Whey	- (.650)	- (.984)	- (.661)	- (.532)
Yogurt	- (.899)	N/A	- (.319)	-1.80 (.028)
Not enough knowledge to prepare				
Milk	N/A	N/A	- (.397)	N/A
Buttermilk	-1.26 (.030)	N/A	- (.840)	N/A
Cheese	- (.663)	- (.637)	- (.841)	N/A
Whey	- (.881)	- (.825)	- (.845)	N/A
Yogurt	N/A	N/A	N/A	N/A
Unhygienic/unsafe				
Milk	N/A	- (.607)	- (.981)	N/A
Buttermilk	- (.355)	- (.468)	- (.319)	- (.691)
Cheese	- (.400)	-1.57 (.009)	- (.661)	N/A
Whey	-1.87 (.012)	-2.19 (.013)	N/A	-1.94 (.041)*
Yogurt	N/A	-2.19 (.013)	- (.840)	- (.755)
Not suitable for all family members				
Milk	N/A	N/A	- (.118)	N/A
Buttermilk	- (.816)	- (.835)	- (.262)	- (.293)
Cheese	- (.050)	N/A	- (.059)	- (.217)
Whey	- (.636)	- (.187)	- (.812)	- (.244)
Yogurt	- (.989)	N/A	- (.096)	- (.108)
Cannot be mixed with water				
Milk	N/A	N/A	N/A	N/A
Buttermilk	N/A	N/A	N/A	N/A
Cheese	N/A	N/A	- (.636)	N/A
Whey	N/A	N/A	N/A	N/A
Yogurt	N/A	N/A	- (.447)	N/A
Reserved for animal food				
Milk	N/A	N/A	N/A	N/A
Buttermilk	- (.663)	- (.263)	- (.636)	- (.750)
Cheese	N/A	N/A	N/A	N/A
Whey	- (.132)	- (.637)	- (.454)	- (.178)
Yogurt	N/A	N/A	N/A	N/A

	Adama Asela	Sululta-Fitche	Hawassa-Shashemene	West Amhara
N	**89**	**91**	**94**	**92**
Too expensive				
Milk	+1.34 (.009)	+1.34 (.008)	N/A	- (.459)
Buttermilk	N/A	- (.607)	N/A	N/A
Cheese	- (.423)	- (.121)	N/A	N/A
Whey	N/A	N/A	N/A	- (.726)
Yogurt	- (.423)	- (.682)	N/A	- (.820)
Nothing				
Milk	+.83 (.005)	+1.26 (.000)	- (.161)	- (.550)
Buttermilk	- (.529)	- (.066)	- (.742)	- (.841)
Cheese	- (.052)	+1.33 (.000)	- (.489)	- (.436)
Whey	- (.934)	- (.503)	- (.841)	- (.813)
Yogurt	+.84 (.010)	+1.01 (.002)	+.97 (.029)	+1.16 (.002)

Results marked with * are based on a comparison where one group only consisted of 1 or 2 participants. While statistically significant, this heavy reliance on only a few observations means that the findings should be considered less reliable.

Advantages to dairy consumption

Table 16 *Frequency of advantages to dairy consumption, disaggregated to clusters*

	Adama Asela		Sululta-Fitche		Hawassa-Shashemene		West Amhara		Overall	
N	**89**		**91**		**94**		**92**		**366**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Gives satisfaction										
Milk	11	12%	21	23%	7	7%	30	33%	69	19%
Buttermilk	13	15%	11	12%	8	9%	8	9%	40	11%
Cheese	36	40%	22	24%	12	13%	24	26%	94	26%
Whey	1	1%	3	3%	0	0%	4	4%	8	2%
Yogurt	23	26%	23	25%	20	21%	36	39%	102	28%
Increases appetite										
Milk	1	1%	9	10%	4	4%	18	20%	32	9%
Buttermilk	6	7%	8	9%	8	9%	1	1%	23	6%
Cheese	34	38%	18	20%	2	2%	35	38%	89	24%
Whey	0	0%	1	1%	1	1%	1	1%	3	1%
Yogurt	6	7%	13	14%	4	4%	20	22%	43	12%
Helps digestion										
Milk	4	4%	17	19%	19	20%	0	0%	40	11%
Buttermilk	0	0%	15	16%	23	24%	0	0%	38	10%
Cheese	1	1%	17	19%	1	1%	1	1%	20	5%
Whey	0	0%	9	10%	1	1%	1	1%	11	3%
Yogurt	4	4%	19	21%	17	18%	1	1%	41	11%
Improves education performance										
Milk	13	15%	15	16%	13	14%	14	15%	55	15%
Buttermilk	0	0%	4	4%	3	3%	4	4%	11	3%
Cheese	1	1%	6	7%	2	2%	0	0%	9	2%
Whey	0	0%	1	1%	0	0%	2	2%	3	1%
Yogurt	5	6%	8	9%	10	11%	1	1%	24	7%
Good for growth										
Milk	59	66%	59	65%	69	73%	58	63%	245	67%
Buttermilk	2	2%	32	35%	35	37%	15	16%	84	23%
Cheese	9	10%	41	45%	32	34%	20	22%	102	28%
Whey	0	0%	8	9%	1	1%	9	10%	18	5%
Yogurt	24	27%	53	58%	55	59%	24	26%	156	43%

	Adama Asela		Sululta-Fitche		Hawassa-Shashemene		West Amhara		Overall	
N	89		91		94		92		366	
	n	%	n	%	n	%	n	%	n	%
Good for bones										
Milk	68	76%	56	62%	45	48%	41	45%	210	57%
Buttermilk	5	6%	27	30%	11	12%	28	30%	71	19%
Cheese	9	10%	32	35%	18	19%	15	16%	74	20%
Whey	0	0%	6	7%	0	0%	4	4%	10	3%
Yogurt	33	37%	47	52%	26	28%	29	32%	135	37%
Good for health in general										
Milk	68	76%	50	55%	32	34%	65	71%	215	59%
Buttermilk	10	11%	25	27%	12	13%	25	27%	72	20%
Cheese	26	29%	27	30%	14	15%	35	38%	102	28%
Whey	2	2%	6	7%	2	2%	19	21%	29	8%
Yogurt	58	65%	46	51%	22	23%	41	45%	167	46%
Combats “milk worm”										
Milk	0	0%	0	0%	1	1%	0	0%	1	0%
Buttermilk	0	0%	2	2%	2	2%	0	0%	4	1%
Cheese	0	0%	0	0%	0	0%	1	1%	1	0%
Whey	0	0%	0	0%	1	1%	0	0%	1	0%
Yogurt	0	0%	1	1%	0	0%	0	0%	1	0%
Heals or prevents disease										
Milk	6	7%	39	43%	39	41%	24	26%	108	30%
Buttermilk	0	0%	24	26%	14	15%	5	5%	43	12%
Cheese	0	0%	26	29%	10	11%	17	18%	53	14%
Whey	0	0%	8	9%	1	1%	3	3%	12	3%
Yogurt	7	8%	31	34%	21	22%	6	7%	65	18%
Source of energy / strength / fat										
Milk	70	79%	41	45%	52	55%	70	76%	233	64%
Buttermilk	30	34%	25	27%	28	30%	67	73%	150	41%
Cheese	23	26%	24	26%	23	24%	45	49%	115	31%
Whey	2	2%	7	8%	3	3%	23	25%	35	10%
Yogurt	63	71%	36	40%	46	49%	57	62%	202	55%
Source of vitamins										
Milk	23	26%	14	15%	16	17%	6	7%	59	16%
Buttermilk	10	11%	6	7%	6	6%	2	2%	24	7%
Cheese	14	16%	8	9%	6	6%	4	4%	32	9%
Whey	6	7%	0	0%	0	0%	0	0%	6	2%
Yogurt	39	44%	10	11%	16	17%	3	3%	68	19%
Nothing										
Milk	0	0%	0	0%	0	0%	0	0%	0	0%
Buttermilk	9	10%	18	20%	18	19%	5	5%	50	14%
Cheese	2	2%	8	9%	7	7%	2	2%	19	5%
Whey	32	36%	37	41%	18	19%	28	30%	115	31%
Yogurt	1	1%	0	0%	2	2%	0	0%	3	1%
I don’t know										
Milk	0	0%	0	0%	0	0%	0	0%	0	0%
Buttermilk	38	43%	9	10%	7	7%	9	10%	63	17%
Cheese	6	7%	7	8%	39	41%	8	9%	60	16%
Whey	36	40%	23	25%	64	68%	14	15%	137	37%
Yogurt	0	0%	0	0%	7	7%	12	13%	19	5%

Table 17 lists the potential advantages that were studied, for each dairy product. The cells marked in green highlight a statistically significant difference ($p<0.05$) in number of dairy consumption days between the consumers that and did not list this particular advantage as relevant to their own consumption. The cell

shows the size of that difference (in number of days), and the p-value that was returned out the Mann-Whitney-U test.

Example: in West Amhara, respondents that mentioned "gives satisfaction" as an advantage to their milk consumption consume dairy more frequently than those who did not list it. On average, they consume dairy 0.99 days/week more often.

Table 17 *Advantages to dairy consumption, disaggregated to clusters*

	Adama Asela	Sululta-Fitche	Hawassa-Shashemene	West Amhara
N	**89**	**91**	**94**	**92**
Gives satisfaction; difference (p)				
Milk	- (.216)	- (.928)	- (.092)	+.99 (.002)
Buttermilk	- (.206)	- (.951)	- (.966)	+1.07 (.039)
Cheese	- (.056)	- (.067)	- (.622)	- (.307)
Whey	- (.663)	- (.794)	- (.803)	- (.280)
Yogurt	- (.650)	- (.479)	- (.593)	+.70 (.028)
Increases appetite; difference (p)				
Milk	- (.663)	- (.458)	- (.783)	+.67 (.038)
Buttermilk	- (.125)	- (.189)	- (.750)	- (.288)
Cheese	- (.838)	- (.308)	- (.059)	- (.665)
Whey	N/A	- (.473)	- (.840)	- (.750)
Yogurt	- (.478)	- (.202)	- (.308)	- (.711)
Helps digestion; difference (p)				
Milk	- (.570)	N/A	- (.094)	N/A
Buttermilk	N/A	- (.575)	- (.671)	N/A
Cheese	- (.270)	+.75 (.044)	- (1.000)	- (.217)
Whey	N/A	- (.661)	- (1.000)	- (.913)
Yogurt	- (.780)	- (.952)	- (.889)	- (.217)
Improves education performance; difference (p)				
Milk	- (.180)	- (.056)	+1.84 (.005)	+.87 (.022)
Buttermilk	N/A	- (.116)	- (.122)	- (.429)
Cheese	- (1.000)	- (.603)	- (.167)	N/A
Whey	N/A	- (1.000)	N/A	-1.94 (.041)*
Yogurt	- (.601)	- (.703)	- (.352)	- (.750)
Good for growth; difference (p)				
Milk	- (.416)	- (.566)	- (.552)	+.73 (.024)
Buttermilk	- (.050)	- (.547)	- (.983)	- (.310)
Cheese	- (.895)	- (.627)	- (.770)	+.83 (.014)
Whey	N/A	- (.486)	- (.479)	- (.226)
Yogurt	- (.706)	- (.735)	- (.174)	+1.04 (.001)
Good for bones; difference (p)				
Milk	- (.558)	- (.240)	- (.152)	- (.650)
Buttermilk	- (.914)	- (.828)	- (.148)	- (.943)
Cheese	- (.983)	- (.068)	- (.264)	- (.283)
Whey	N/A	- (.799)	N/A	- (.601)
Yogurt	- (.257)	- (.782)	- (.957)	- (.509)
Good for health in general; difference (p)				
Milk	- (.767)	- (.197)	- (.776)	+.75 (.027)
Buttermilk	- (.248)	- (.730)	- (.685)	- (.282)
Cheese	- (.729)	- (.306)	- (.806)	- (.713)
Whey	- (.998)	- (.547)	- (.726)	- (.570)
Yogurt	- (.538)	- (.334)	- (.550)	+.57 (.033)
Combats "milk worm"; difference (p)				
Milk	N/A	N/A	- (1.000)	N/A
Buttermilk	N/A	- (.652)	- (.360)	N/A
Cheese	N/A	N/A	N/A	-3.95 (.043)*
Whey	N/A	N/A	- (.585)	N/A
Yogurt	N/A	- (1.000)	N/A	N/A

	Adama Asela	Sululta-Fitche	Hawassa-Shashemene	West Amhara
N	**89**	**91**	**94**	**92**
Heals or prevents disease; difference (p)				
Milk	- (.585)	- (.634)	+1.17 (.011)	- (.613)
Buttermilk	N/A	- (.775)	- (.933)	- (.615)
Cheese	N/A	- (.441)	- (.364)	- (.463)
Whey	N/A	- (.492)	- (.479)	- (.940)
Yogurt	- (.997)	- (.554)	- (.461)	- (.425)
Source of energy / strength / fat; difference (p)				
Milk	-.84 (.019)	- (.160)	- (.690)	- (.929)
Buttermilk	- (.078)	- (.358)	- (.810)	- (.217)
Cheese	- (.925)	- (.751)	-.98 (.021)	- (.300)
Whey	- (.193)	- (.968)	- (.322)	- (.602)
Yogurt	- (.254)	- (.287)	- (.247)	+.37 (.010)
Source of vitamins; difference (p)				
Milk	- (.691)	- (.076)	- (.093)	- (.534)
Buttermilk	- (.211)	- (.107)	- (.163)	- (.438)
Cheese	- (.945)	- (.949)	- (.112)	- (.601)
Whey	- (.174)	N/A	N/A	N/A
Yogurt	- (.290)	- (.275)	- (.412)	+1.83 (.041)
Nothing / none; difference (p)				
Milk	N/A	N/A	N/A	N/A
Buttermilk	- (.774)	- (.119)	- (.431)	- (.804)
Cheese	- (.989)	-1.45 (.008)	- (.099)	- (.438)
Whey	- (.201)	- (.661)	- (.994)	- (.354)
Yogurt	- (.663)	N/A	- (.059)	N/A
I don't know; difference (p)				
Milk	N/A	N/A	N/A	N/A
Buttermilk	- (.474)	- (.072)	- (.530)	-1.00 (.049)
Cheese	- (.684)	- (.428)	- (.435)	- (.082)
Whey	- (.206)	- (.692)	- (.917)	- (.929)
Yogurt	N/A	N/A	- (1.000)	-1.04 (.020)

Results marked with * are based on a comparison where one group only consisted of 1 or 2 participants. While statistically significant, this heavy reliance on only a few observations means that the findings should be considered less reliable.

Disadvantages to dairy consumption

Table 18 *Frequency of disadvantages to dairy consumption, disaggregated to clusters*

	Adama Asela		Sululta-Fitche		Hawassa-Shashemene		West Amhara		Overall	
N	**89**		**91**		**94**		**92**		**366**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Bad for health										
Milk	4	4%	1	1%	5	5%	8	9%	18	5%
Buttermilk	3	3%	2	2%	1	1%	21	23%	27	7%
Cheese	2	2%	0	0%	1	1%	0	0%	3	1%
Whey	4	4%	0	0%	0	0%	1	1%	5	1%
Yogurt	0	0%	1	1%	0	0%	17	18%	18	5%
Decreases appetite										
Milk	0	0%	0	0%	0	0%	0	0%	0	0%
Buttermilk	0	0%	0	0%	0	0%	2	2%	2	1%
Cheese	0	0%	0	0%	2	2%	0	0%	2	1%
Whey	1	1%	0	0%	0	0%	3	3%	4	1%
Yogurt	9	10%	0	0%	0	0%	2	2%	11	3%

	Adama Asela		Sululta-Fitche		Hawassa-Shashemene		West Amhara		Overall	
N	89		91		94		92		366	
	n	%	n	%	n	%	n	%	n	%
Gastric complaints										
Milk	25	28%	14	15%	13	14%	4	4%	56	15%
Buttermilk	28	31%	25	27%	10	11%	28	30%	91	25%
Cheese	11	12%	15	16%	11	12%	9	10%	46	13%
Whey	22	25%	14	15%	0	0%	3	3%	39	11%
Yogurt	29	33%	26	29%	15	16%	38	41%	108	30%
Low nutritional content										
Milk	0	0%	0	0%	0	0%	0	0%	0	0%
Buttermilk	8	9%	6	7%	5	5%	0	0%	19	5%
Cheese	2	2%	4	4%	2	2%	0	0%	8	2%
Whey	10	11%	18	20%	4	4%	20	22%	52	14%
Yogurt	0	0%	0	0%	0	0%	0	0%	0	0%
Not refreshing										
Milk	2	2%	0	0%	0	0%	0	0%	2	1%
Buttermilk	4	4%	4	4%	2	2%	2	2%	12	3%
Cheese	0	0%	1	1%	0	0%	0	0%	1	0%
Whey	5	6%	6	7%	0	0%	2	2%	13	4%
Yogurt	0	0%	1	1%	0	0%	0	0%	1	0%
Useless										
Milk	0	0%	0	0%	1	1%	0	0%	1	0%
Buttermilk	5	6%	7	8%	7	7%	1	1%	20	5%
Cheese	2	2%	0	0%	0	0%	0	0%	2	1%
Whey	11	12%	22	24%	7	7%	25	27%	65	18%
Yogurt	0	0%	0	0%	0	0%	0	0%	0	0%
Nothing										
Milk	44	49%	65	71%	46	49%	64	70%	219	60%
Buttermilk	5	6%	12	13%	45	48%	14	15%	76	21%
Cheese	60	67%	60	66%	5	5%	77	84%	202	55%
Whey	3	3%	5	5%	1	1%	31	34%	40	11%
Yogurt	45	51%	30	33%	32	34%	32	35%	139	38%
I don’t know										
Milk	17	19%	10	11%	32	34%	12	13%	71	19%
Buttermilk	34	38%	47	52%	24	26%	26	28%	131	36%
Cheese	12	13%	12	13%	57	61%	5	5%	86	23%
Whey	28	31%	37	41%	34	36%	20	22%	119	33%
Yogurt	16	18%	34	37%	47	50%	11	12%	108	30%

Table 19 lists the potential advantages that were studied, for each dairy product. The cells marked in green highlight a statistically significant difference ($p<0.05$) in number of dairy consumption days between the consumers that and did not list this particular disadvantage as relevant to their own consumption. The cell shows the size of that difference (in number of days), and the p-value that was returned out the Mann-Whitney-U test.

Example: in West Amhara, respondents that mentioned “gastric complaints” as a disadvantage to their milk consumption consume dairy less frequently than those who did not list it. On average, they consume dairy 0.55 days/week less often.

Table 19 *Disadvantages to dairy consumption, disaggregated to clusters*

	Adama Asela	Sululta-Fitche	Hawassa- Shashemene	West Amhara
N	**89**	**91**	**94**	**92**
Bad for health; difference (p)				
Milk	- (.323)	- (.176)	- (.321)	- (.233)
Buttermilk	- (.678)	- (.934)	- (.840)	- (.861)
Cheese	- (.989)	N/A	- (.106)	N/A
Whey	- (.142)	N/A	N/A	- (.913)
Yogurt	N/A	- (.824)	N/A	- (.545)
Decreases appetite; difference (p)				
Milk	N/A	N/A	N/A	N/A
Buttermilk	N/A	N/A	N/A	- (1.000)
Cheese	N/A	N/A	-3.53 (.004)*	N/A
Whey	- (.270)	N/A	N/A	- (.718)
Yogurt	- (.864)	N/A	N/A	- (.726)
Gastric complaints; difference (p)				
Milk	- (.825)	- (.752)	- (.884)	- (.318)
Buttermilk	- (.465)	- (.260)	- (.724)	- (.655)
Cheese	- (.186)	- (.177)	- (.224)	- (.547)
Whey	- (.465)	- (.680)	N/A	- (.064)
Yogurt	- (.935)	- (.899)	- (.612)	-.55 (.038)
Low nutritional content; difference (p)				
Milk	N/A	N/A	N/A	N/A
Buttermilk	- (.206)	- (.838)	- (.321)	N/A
Cheese	- (.345)	- (.116)	- (.081)	N/A
Whey	- (.523)	- (.793)	- (.708)	- (.369)
Yogurt	N/A	N/A	N/A	N/A
Not refreshing; difference (p)				
Milk	- (.989)	N/A	N/A	N/A
Buttermilk	- (.895)	- (.760)	- (1.000)	- (.438)
Cheese	N/A	- (.637)	N/A	N/A
Whey	- (.591)	- (.291)	N/A	- (1.000)
Yogurt	N/A	- (.637)	N/A	N/A
Useless; difference (p)				
Milk	N/A	N/A	- (.106)	N/A
Buttermilk	- (.091)	- (.463)	- (.599)	- (.750)
Cheese	- (.989)	N/A	N/A	N/A
Whey	- (1.000)	- (.135)	- (.747)	- (.153)
Yogurt	N/A	N/A	N/A	N/A
Nothing; difference (p)				
Milk	- (.223)	- (.360)	+1.10 (.008)	+.94 (.003)
Buttermilk	- (.705)	- (.720)	- (.965)	- (.338)
Cheese	- (.875)	+.78 (.023)	- (.835)	- (.423)
Whey	- (.678)	- (.649)	- (.585)	- (.140)
Yogurt	- (.212)	+.92 (.014)	+.82 (.033)	- (.001)
I don't know; difference (p)				
Milk	- (.080)	- (.745)	-1.21 (.009)	-1.61 (.000)
Buttermilk	- (.271)	- (.332)	- (.988)	- (.985)
Cheese	- (.060)	- (.274)	- (.077)	- (.433)
Whey	-.87 (.017)	- (.099)	- (.689)	- (.521)
Yogurt	- (.086)	- (.053)	- (.134)	-1.02 (.040)

Results marked with * are based on a comparison where one group only consisted of 1 or 2 participants. While statistically significant, this heavy reliance on only a few observations means that the findings should be considered less reliable.

Appendix 3 Analysis outputs

Correlation family size and dairy consumption frequency

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Family_size[b]	.	Enter

a. Dependent Variable: How many DAYS do you consume dairy products over the course of a NORMAL, NON-FASTING WEEK? Do not include butter in the count.

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,157[a]	,025	,022	1,627

a. Predictors: (Constant), Family_size

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24,307	1	24,307	9,187	,003[b]
	Residual	960,449	363	2,646		
	Total	984,756	364			

a. Dependent Variable: How many DAYS do you consume dairy products over the course of a NORMAL, NON-FASTING WEEK? Do not include butter in the count.

b. Predictors: (Constant), Family_size

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3,083	,248		12,432	,000
	Family_size	,121	,040	,157	3,031	,003

a. Dependent Variable: How many DAYS do you consume dairy products over the course of a NORMAL, NON-FASTING WEEK? Do not include butter in the count.

Correlation (type of) cow ownership and dairy consumption frequency

An online T-test calculator for 2 Independent Means was used to compare the means of the different groups. The calculator can be accessed via https://www.usablestats.com/calcs/2samplet&summary=1.

Table 20 *Dairy consumption frequency and cow ownership*

	Owns no cows	Owns cow(s), any type	Own local cow(s)	Own crossbreed(s)	Owns only local cow(s)	Owns only crossbreed(s)
N	**30**	**336**	**193**	**270**	**66**	**143**
Mean consumption frequency (# days/week, sd)	2.87 (2.0)	3.86 (1.6)	3.75 (1.6)	4.05 (1.6)	3.09 (1.3)	4.02 (1.6)

The outputs of the tests were as follows:

	N	Mean	StDev	SE Mean
Sample 1 (Owns no cows)	30	2.87	2	0.3651
Sample 2 (Owns cow(s), any type)	336	3.86	1.6	0.0873

Observed difference (Sample 1 - Sample 2): -0.99
Standard Deviation of Difference: 0.3754

Unequal Variances
DF: 32
95% Confidence Interval for the Difference (-1.7547 , -0.2253)
Test Statistic t = -2.6372
Population 1 ≠ Population 2: P-Value = 0.0128

Equal Variances
Pooled Standard Deviation: 1.6355
Pooled DF: 364
95% Confidence Interval for the Difference (-1.7282 , -0.2518)

Test Statistic t= -3.1767
Population 1 ≠ Population 2: P-Value = 0.0016

	N	Mean	StDev	SE Mean
Sample 1 (Owns only local cows)	66	3.09	1.3	0.16
Sample 2 (Owns only crossbreed cows)	143	4.02	1.6	0.1338

Observed difference (Sample 1 - Sample 2): -0.93
Standard Deviation of Difference: 0.2086

Unequal Variances
DF: 153
95% Confidence Interval for the Difference (-1.3421 , -0.5179)
Test Statistic t = -4.4583
Population 1 ≠ Population 2: P-Value = < .00001

Equal Variances
Pooled Standard Deviation: 1.5122
Pooled DF: 207
95% Confidence Interval for the Difference (-1.3413 , -0.5187)

Test Statistic t= -4.1328
Population 1 ≠ Population 2: P-Value = < .00001

Correlation religion and dairy consumption frequency

Amongst the sample population, five different types of religion were identified: Orthodox Christian, Muslim, Protestant, Catholic and Other (to be specified). The frequencies are given in the following table.

		Frequency	Percent
Valid	Orthodox Christian	257	70,2
	Protestant	64	17,5
	Muslim	40	10,9
	Catholic	4	1,1
	Other (specify)	1	,3
	Total	366	100,0

As there are very few catholic and other religions represented amongst the sample, these are excluded for further analysis. (Size will not be representative for the target population)

Ranks

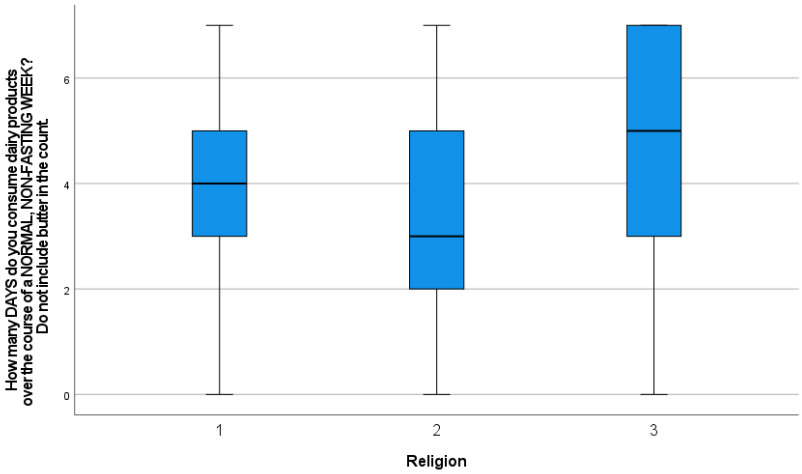
	Religion	N	Mean Rank
How many DAYS do you consume dairy products over the course of a NORMAL, NON-FASTING WEEK? Do not include butter in the count.	Orthodox Christian	257	178,04
	Protestant	64	168,34
	Muslim	40	220,31
	Total	361	

Test Statistics[a,b]

	How many DAYS do you consume dairy products over the course of a NORMAL, NON-FASTING WEEK? Do not include butter in the count.
Kruskal-Wallis H	7,215
df	2
Asymp. Sig.	,027

a. Kruskal Wallis Test

b. Grouping Variable: Religion



The Kruskal-Wallis test identifies that there is a difference (p=0.027<0.05) in the number of days one consumes dairy products and religion. It gives an indication that protestants consume dairy products on the least number of days, followed by orthodox Christians. Muslims can be expected to consume dairy products during most of the days (see the boxplot).

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Report WCDI-22-195

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To explore the potential of nature to improve the quality of life

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