



## Research Article

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# **Breeding Objectives and Practices of Small Holder Sheep Production in Habru Woreda North Wollo Zone of Amhara, Ethiopia**

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## **Abstract**

The productivity of Ethiopian sheep's can be improved by improving management and selecting best animal for future mating. This study was conducted in Habru Woreda, North Wollo Amhara region, Ethiopia with the aim to identify breeding objectives and practices of sheep production in the study area. A total of 40 households were selected purposively based on high sheep population density and production potentials. The data was gathered using semi-structured interview, direct observation and discussion with key informants. The data was summarized and analyzed using Micro soft Excel computer program and presented using tables by using descriptive statistics like frequencies and percentages. The main reason of keeping sheep in the study area was for household income generation, meat, manure, culture, breeding and ceremony respectively. The majority of breeding rams for farmers originated from own flock. Mating was uncontrolled but in rare case there is controlled mating. Selection criteria for breeding rum in the study area were growth, coat color, tail type and selection criteria for breeding ewe were lamb growth, body size, lamb survival, coat color and multiple births, respectively. Maturity age for selection of breeding ewe was reported 6-8 month. Majority of sheep breeds were indigenous breeds (87.5%) followed by cross breed ones (12.5%). There are also poor cross-breeding activities at farmers' level and uncontrolled natural mating within local breeds was predominantly practiced by households. Selecting appropriate ewe and ram for the purpose of improving breeding objectives as well as its practice is important. To minimize the failure of sheep breed improvement program it is important to consider breed management system and trait preferences of the community.

**Keywords:** Breeding practice, Sheep, Breeding objective.

## **INTRODUCTION**

Ethiopia is endowed with huge livestock resources of varied and diversified genetic pools with specific adaptations to a wide range of agro-ecologies. Farm animals as a whole are an integral part of the country's agricultural system and are raised both in the highland and lowland areas. In developing countries, livestock production is mostly subsistence oriented and fulfills multiple functions that contribute more to food security [1, 2]. The demand for livestock products is increasing due to the growing urban population [3].

The population of sheep in Ethiopia is estimated at 29.33 million, out of which about 72.77 percent are females and from a total number of sheep population 99.78% are indigenous breeds [4]. In spite of the large population of sheep and great role of sheep both to the lively hood of resource-poor farmers and the national economy at large; the current level of on farm productivity in the smallholder production system is low. This is due to several constrained factors like feed shortages, diseases, poor infrastructure, lack of market information and technical capacity and an absence of planned breeding programs and policies [5].

The productivity of sheep can be improved by improving the management of sheep and improving the potential by selecting best animal for future mating [6]. This improves their contribution as sources of income, food (meat and milk), wool, skin, manure and others for small holder keepers in different farming system and agro ecological zone [7]. The nutrition of sheep is the most important factor affecting performances. Improving performances of sheep through nutrition is determined by consideration of availability of nutrients, type of feeding system and level of feeding management [8].

Identifying important traits for selection of sheep owners are prerequisite to set up genetic improvement

of smallholder [9, 10]. To develop sustainable genetic improvement schemes under small holder situation, knowing of indigenous animal breeding practice techniques is very important [11]. Breeding objectives and selection criteria are not explained well. The sheep has limited research focused on the breeding objectives and selection criteria [12]. Breeding practices and the selection criteria for a trait on which the livestock keepers wish to improve and base their selection have to be understood. Unfortunately, attempts to improve sheep in the country so far faced several constraints mainly due to weak planning, poor involvement of owners and implementing without taking into consideration the needs of farmers [10]. Therefore, understanding of farmers breeding objectives and practice, trait preference under small holder level is mandatory for an appropriate breeding and genetic improvement program. However, though Habru woreda has huge sheep population, information in regard to breeding objectives and practices, and trait preference under small holder level is not enough. Therefore, this study is aimed to assess breeding objectives and practices of small holder sheep production in the study area.

## MATERIALS AND METHODS

### Description of the Study Area

The study was conducted in Amhara region North Wollo zone, Habru woreda. Habru woreda is located in north eastern part of Ethiopia at 491 km far from Addis Ababa Ethiopia and 385 km far from Bahir Dar and also 30 km from Woldia cities. Currently this Woreda has 35 Kebele's. Out of them, five Kebele's are included in town administration whereas 30 kebeles are found in the rural areas. The woreda administrative center is Mersa town. In Habru woreda, the total human population is 241,867 people (urban and rural people) of which 117,671 males and 124,196 are females. The woreda covers approximately 1638km square area of land. The topography represents 40% plane, 30% mountain, 22% valley and 3% others. The mean annual temperature is 21.89 °C and mean rainfall is 725mm. Habru woreda cultivating land covers 24253 hectare. The economy of the woreda is predominantly depending on crop production followed by livestock production. The total livestock population of the woreda is 257,904. Recently the study area has total population of cattle 130,013, sheep 31,732, goat 72,751, equine 12,045, and camel 11,363. The main crops cultivated in the woreda are sorghum, teff, wheat, maize, and fruits and vegetables hectares cover [13].

### Sample Size and Sampling Techniques

From 35 kebeles found in Habru wereda, two kebeles which are Sirinka and Anto were purposively selected based on high sheep population density and production potentials. From these kebeles 40 households (20 from each kebele) were randomly sampled.

### Data Collection Method

Basically, two types of data sources which are primary and secondary data were collected. The primary data was collected directly from the field assessment while the secondary data was collected from rural agricultural offices of Habru wereda. Primary data like sheep production system, management practices (feed source and feeding, water source and watering, health care, constraints of sheep production, breeds of sheep, sheep breeding objective and practice under small holder condition) and secondary data such as livestock population, demographic structure, altitude, rainfall, topography, temperature was collected from agricultural offices of Habru woreda. The data was gathered using direct observation, open and close ended questionnaire from households. Both qualitative and quantitative data was collected.

### Data Analysis

Data was managed both in hard and soft copies. All collected data were entered into Microsoft Excel computer program. Data from focus group discussion and personal observations were briefly summarized using table and simple descriptive statistics like frequency and percentage was used to analyze the results.

## RESULTS AND DISCUSSIONS

### Socio-economic characteristics of households

In this study the number of females 7(17.5%) was found lower than males 33(82.5%). This cause gender bias in deciding sheep breeding objectives and causes gender imbalance in the participation of both sexes in sheep production and husbandry practices in two Kebele's (Sirinka and Anto). In the study area the age intervals who participate on sheep production was <30, 31-40, 41-50, and >50, and the percentage was 50, 12.5, 20, and 7.5, respectively. The majority age of respondents was less than 30 year (50%). According to this study area the educational status of the respondents was with (52.5%) illiterate, 25% reading and writing, (12%) elementary school and (10%) above secondary school, respectively. The respondent whose educational level of illiterate was highly participating in sheep production especially in Anto kebele since they have good indigenous knowledge in sheep breeding activities. The family size of respondents in the study area (1-5) and (6-9) were found (62.5 %) and (37.5%), respectively. Moreover, the marital status of the respondents was (67.5%) married, (15%) single, (10%) divorced and (7.5%) widowed, respectively and majority who were participating in sheep breeding and practice were married (Table 1).

### Source of income

According to respondents' source of income for a majority of households were crops (42.5%) and livestock/livestock products (25%). Other sources of income were off-farm business (7.5%), salary/wages (12.5%) and pension (12.5%). This might indicate smallholder farmers in the study area depend more on crops and livestock for source of income than other sources of income. Similar finding was reported by [14] in the agro pastoralist communities in Ethiopia (Table 2).

### Grazing land ownership

Majority of the household 30(75%) was found with their own grazing land but the remaining 10(25%) share common grazing land (Table 3).

### Members of household responsible for sheep activities

The study revealed that the activity of purchasing sheep (Table 4) was mainly done by adult males (40%) and females (10%). Other members of the household who are involved in purchasing sheep were boys (7.5%) and hired labour (5%). The activity of selling sheep was mainly conducted by adult males (32.5%) and adult females (17.5%). This activity was supported by boys (47.5%). Herding and feeding sheep was the main activity done by adult male (40%) followed by boys (35%), hired labour (5%) and herding and feeding for adult female (15%). This shows that the family labour is the main source of livestock farm labour and the use of hired labour for flock management is minimal and uncommon. In contrast [14] reported that children and women provide the bulk of labour in sheep management in Ethiopia. This difference in sheep management activities is due to differences in cultural considerations with respect to division labour.

### Sheep production and management practices

#### Production system

The main sheep production system in the study area was extensive (95%) and this is followed by semi-intensive (5%) (Table 5). The extensive sheep production system was characterized by poor housing, sanitation, feeding and management. The report of [15], showed it is usual to classify production systems as intensive, semi-intensive and extensive based on the development of inputs and intensification of production.

#### Management practice

#### Housing

Majority of the households 36(90%) construct sheep house from locally available materials like wood, grass, mood and the rest (10%) reported

that the house were constructed from concrete and iron sheet in order to prevent the animal from exposing of sun and wind (Table 6). This finding was related with <sup>[16]</sup>. In line with this, housing is made of varying designs and construction materials depending upon local custom and availability <sup>[17]</sup>.

### Feeding

The most used feed in the study area were roughage (42.5%) followed by (27.5%), (17.5%) (12.5%) for crop residue, hay and concentrate, respectively (Table 7).

### Supplementary feed

Most of the households use crop residue (27.5%) as a supplementary and the remaining supplementary feeds were concentrated, salt, furishka, nug seed cake with (25%), (20%), (17.5%), (10%), respectively (Table 8).

### Watering

The main source of water in the study area was river (80%), pond (15%) and tap water (5%). The frequency of watering per day varies among different households (Table 9).

### Constraints of sheep production

Sheep production in the study area were constrained by many factors like feed shortage (45%), shortage of grazing land (40%) and endemic disease (15%) (Table 10). According to key informants of Habru woreda agricultural office, lacks of feed was the major constraint of sheep production in the study area that accounts more than (50%). This was disagreed with <sup>[18]</sup> who identified disease problem was the first and the most important production constraint of Gumez sheep in North Western lowland of Amhara region.

### Breeding objectives and practices of sheep

#### Purpose of keeping sheep in the study area

Sheep were kept mainly for household income (32.5%), ceremony or cultural (27.5%) and breeding (10%) meat (17.5%) and manure (12.5%) (Table 11). Sheep were also sold by farmers for the purpose of obtaining cash for school fees, buying clothes or other household expenditures. Similar to the current finding, in many parts of the country sheep has reared for income generations as reported by several researchers <sup>[19, 20, 21]</sup>.

#### Purpose of keeping breeding ram

Most (57.5%) of the respondent reported that breeding ram were kept for mating purpose and the rest (17.5%) and (25%) of respondent used breeding ram for the purpose of socio-cultural and fattening, respectively (Table 12). Similarly, in Menz (65.5%) of the farmers keep rams for breeding <sup>[22]</sup>.

### Sheep flock structure

The flock structure of sheep in the two kebeles is presented in Table 13. Breeding ewes was the largest proportion (34.2%) of the flock followed by ewes (19.2%), ewe lambs (27.86%), ram lambs (9.28%), ram (7.9%), breeding ram (4.28%) and castrates (3.57%) for sirinka whereas the proportions of breeding ewes, ewe lambs, ewes, ram lambs, ram, breeding ram and castrates were 29.2%, 25%, 20.7%, 12.1%, 12.8%, 2.8% and 2.1, respectively for Anto. The current finding was in line with sheep flock structure reported for Menz sheep where breeding ewes (49.2%) are dominant <sup>[22]</sup>.

### Selection criteria for breeding ram

Among selection criteria considered for ram, fast growth was first ranked by sheep owners in Sirinka and Anto kebeles. The second most used selection parameter was body size of ram which accounts (27.5%) (Table 14). For selecting breeding ram several criteria were considered like

appearance or body size, coat color, tail type/length, fast growth, libido, age, adaptation and pedigree <sup>[23]</sup>. However, the result in the study area disagrees with the result of <sup>[24, 25]</sup> in Selale and East Hararghe, respectively indicated that traits like appearance was the most considered characters in selection of rams.

### Selection criteria for breeding ewe

In the study area lamb growth were the first and for most given criteria with a total of (32.5 %) used for selecting ewes (Table 15). However, multiple births were the least criteria given to selection purpose which account (7.5%). This result is not agreed with <sup>[26]</sup> where ewes for breeding were selected by farmers basing on size (88.8%) and conformation (71.9%). Breeding ewe were also selected based on parameters like, twining ability, lamb growth, color and lamb survival).

### Reasons of culling from the flock

The main reasons for culling sheep were small size (13.5%), old age (27.5%), drought (22.5%), poor fertility (11.5%) and over population (25%) (Table 16). Culling was rarely practiced owing to small flock size. From these reasons most sheep were culled when the sheep become old aged (27.5%), whereas the minimum amount of culling were due to poor fertility (11.5%). Culling should be stringent and used as a means of improving the genetic quality and productivity of a flock. Animals can be sold to enter the meat market. Flock size can be maintained by replacing culled animals by ewe lambs in the flock <sup>[27]</sup>.

### Breeding practice and source of ram

In the study area majority of respondents (87.5%) were used local breed sheep type and the rest (12.5%) were with crossbred sheep. This assures there was very minimal crossbreeding practice at small holder level in the two kebeles. There was huge uncontrolled mating system in the study area. For instance, (80%) in srinka, (90%) in Antto kebele. In the northern part of Ethiopia (Tigray region) (16.83%) control mating had been practiced <sup>[28]</sup>. There was less controlled breeding practice (15%) compared to <sup>[28]</sup> finding. The lower crossbreeding practice in the study area might be due to lower involvement of households and development agents for genetic improvement. The main purpose to castrate sheep was for fattening (37.5%), (30%) to improve meat quality, (27.5%) to get better price, (5%) control breeding and all (100%) of the sheep owner used closed castration method to castrate sheep for different purpose. Households castrate sheep with the age of 6-12 months (32.5%) and the majority of the respondents (67.5%) castrate their own sheep with the age of > 12 months (Table 17).

### Source of ram

The majority of breeding rams (67.5%) originated from own, respectively (Table 18). When breeding males were not reared in their flocks, the (25%) of sirinka farmers and (30%) of Anto farmers get the service from neighbours. It was also observed that few farmers (10%) get the service from gift in sirinka. Some farmers have breeding rams originated from the same flock and few purchases from market <sup>[26]</sup>.

## CONCLUSIONS AND RECOMMENDATIONS

The major sheep production system was traditional system. The common sheep houses were constructed from locally available materials and mostly attached to family and kitchen house. The types of available feed resources in the study area were crop residue, hay, roughage and concentrate. The feeding system of sheep in the study area was found highly dominated by free grazing on natural pasture. Prevalence of diseases and feed shortage were also the major constraints of sheep production. Majority of sheep breeds found were indigenous (local) breeds while the farmers main breeding objective were for household income, breeding, meat, cultural ceremony and manure. The selections criteria used by farmers for breeding ram in study area were body size, coat color, fast growth, while selection parameters for breeding ewe were lamb growth, body size, lamb survival, coat color and multiple births. There is a few cross-breeding activities at farmers level and uncontrolled

natural mating within local breeds was predominantly practiced by households.

As the result showed there is feed shortage in the study area, so improved forage development strategies, feed treatment activities and intensive feeding should be available with great support from government and other development agents. Practicing improved husbandry practices rather than traditional husbandry practices should be valued. Selecting appropriate ewe and ram for the purpose of improving the breeding objective as well as its breeding practice is important. To minimize the failure of sheep breed improvement program it is important to consider breed management system and trait preferences of the community.

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**Table 1:** General household characteristics of respondents in the study area

Household characteristics	Kebele				Total	
	Sirinka		Anto			
	Frequency	%	Frequency	%	Frequency	%
<b>Sex</b>						
Female	4	20	3	15	7	17.5
Male	16	80	17	85	33	82.5
Total	20	100	20	100	40	100
<b>Age</b>						
<30	11	55	9	45	20	50
31-40	3	15	2	10	5	12.5
41-50	3	15	5	25	8	20
>50	3	15	4	20	7	17.5
Total	20	100	20	100	40	100
<b>Educational status</b>						
Illiterate	9	45	12	60	21	52.5
Reading and writing	6	30	4	20	10	25
Elementary school	3	15	2	10	5	12.5
Secondary school and above	2	10	2	10	4	10
Total	20	100	20	100	40	100
<b>Family size</b>						
1-5	12	60	13	65	25	62.5
6-9	8	40	7	35	15	37.5
Total	20	100	20	100	40	100
<b>Marital status of house holds</b>						
Married	14	70	13	65	27	67.5
Single	3	15	3	15	6	15
Divorced	2	10	2	10	4	10
Widowed	1	5	2	10	3	7.5
Total	20	100	20	100	40	100

**Table 2:** Source of household income in the study area

Variable	Kebele				Total	
	Sirinka		Anto			
	Frequency	%	Frequency	%	Frequency	%
Salary wage	3	15%	2	10%	5	12.5%
Pension	2	10%	3	15%	5	12.5%
Livestock and livestock product	4	20%	6	30%	10	25%
Crop	10	50%	7	35%	17	42.5%
Off farm business	1	5%	2	10%	3	7.5%
Home industries	-	-	-	-	-	0%
Total	20	100	20	100	40	100

**Table 3:** Grazing land ownership of households in the study area

Variables	Kebele				Total	
	Sirinka		Anto			
	Frequency	%	Frequency	%	Frequency	%
<b>Ownership type</b>						
Own	16	80	14	70	30	75
Communal	4	20	6	30	10	25
Lease	0	0	0	0	0	0
Total	20	100	20	100	40	100

**Table 4:** Members of the household responsible for sheep activities in study area

Variables	Number of respondents (N=40)				
	Adult		Boys <15 yrs	Girls <15 yrs	Hired labour
	Male (31-40)	Female (31-40)			
Purchasing sheep	16(40%)	4(10%)	3(7.5%)	0(0%)	2(5%)
Selling	13(32.5%)	7(17.5%)	19(47.5)	0(0%)	0(0%)
Herding and feeding	16(40%)	6(15%)	14(35%)	10(25%)	2(5%)
Breeding decisions	20(50%)	0(0%)	12(30%)	3(7.5%)	3(7.5%)
Animal health	15(37.5%)	5(12.5%)	7(17.5%)	6(15%)	4(10%)

**Table 5:** Sheep production system in the study area

Production system	Kebeles		Total	
	Sirinka	Anto	Frequency	%
Extensive	18	20	38	95%
Semi-intensive	2	0	2	5%
Intensive	0	0	0	0%
Total	20	20	40	100%

**Table 6:** Housing practice in the study area

Housing	Kebele				Total	
	Sirinka		Anto			
	Frequency	%	Frequency	%	Frequency	%
From local Material	18	90	18	90	36	90
Concrete and iron sheet roof	2	10	2	10	4	10
Total	20	100	20	100	40	100

**Table 7:** Feeding practice of sheep in the study area

Feeds	Kebeles				Total	
	Sirinka		Anto			
	Frequency	%	Frequency	%	Frequency	%
Crop residue	5	25	6	30	11	27.5
Hay	3	15	4	20	7	17.5
Roughage	9	45	8	40	17	42.5
Concentrate	3	15	2	10	5	12.5
Total	20	100	20	100	40	100

**Table 8:** Supplementary feed in both dry and wet seasons of the study area

Feeds	Dry season		Wet season		Total	
	Frequency	%	Frequency	%	Frequency	%
Concentrate feed	6	30%	4	20%	10	25%
Crop residue	5	25%	6	30%	11	27.5%
Salt	3	15%	5	25%	8	20%
Wheat bran	4	20%	3	15%	7	17.5%
Nugseed cake	2	10%	2	10%	4	10%
Total	20	100%	20	100%	40	100%

**Table 9:** Source of water in the study area

Source of water	Kebele				Total	
	Sirinka		Anto		Frequency	%
	Frequency	%	Frequency	%		
River	17	85	15	75	32	80%
Pond	2	10	4	20	6	15%
Tap water	1	5	1	5	2	5%
Total	20	100	20	100	40	100%

**Table 10:** Constraints of sheep production in the study area

Constraints	Kebele				Total	
	Sirinka		Anto		Frequency	%
	Frequency	%	Frequency	%		
Feed shortage	11	55%	13	65%	24	60%
Poor mothering ability	0	0%	0	0%	0	0%
Mortality of lambs	0	0%	0	0%	0	0%
Shortage of grazing land	9	45%	7	35%	16	40%
Total	20	100	20	100	40	100

**Table 11:** Purpose of keeping sheep in the study area

Variables	Kebele				Total	
	Sirinka		Anto		Frequency	%
	Frequency	%	Frequency	%		
Manure	2	10	3	15	5	12.5
Meat	4	20	3	15	7	17.5
Cultural or ceremony	5	25	6	30	11	27.5
Breeding	2	10	2	10	4	10
Household income	7	35	6	30	13	32.5
Total	20	100	20	100	40	100

**Table 12:** The purpose of keeping breeding rum in the study area

Purpose	Kebeles				Total	
	Sirinka		Anto		Frequency	%
	Frequency	%	Frequency	%		
Mating	12	60	11	55	23	57.5
Social culture	3	15	4	20	7	17.5
For fattening	5	25	5	25	10	25
Total	20	100	20	100	40	100

**Table 13:** Sheep flock structures in Sirinka and Anto kebeles in the study area

Variables	Kebeles			
	Sirinka		Anto	
	Mean	%	Mean	%
Ram lambs (<6 months old)	0.65	9.28	0.85	12.1
Rams (6-12 months old)	0.55	7.9	0.9	12.8
Breeding rams (>12 months old)	0.3	4.28	0.2	2.8
Castrates (older than 1 year)	0.25	3.57	0.15	2.1
Ewe lambs (<6 months old)	1.95	27.86	1.75	25
Ewes (6-12 months old)	1.05	15	1.45	20.7
Breeding ewes (>12 months old)	2.4	34.2	2.05	29.2

**Table 14:** Selection criteria for breeding rum

Variables	Kebele				Total		Rank
	Sirinka		Anto		Frequency	%	
	Frequency	%	Frequency	%			
Body size	6	30	5	25	11	27.5	2 <sup>nd</sup>
Coat color	3	15	4	20	7	17.5	3 <sup>rd</sup>
Fast growth	9	45	8	40	17	42.5	1 <sup>st</sup>
Tail Type/length	2	10	3	15	5	12.5	4 <sup>th</sup>
Total	20	100	20	100	40	100	

**Table 15:** Selection criteria for breeding ewe

Variables	Kebele				Total		Rank
	Sirinka		Anto		Frequency	%	
	Frequency	%	Frequency	%			
Lamb growth	6	30	7	35	13	32.5	1 <sup>st</sup>
Body size	5	25	6	30	11	27.5	2 <sup>nd</sup>
Lamb survival	4	20	3	15	7	17.5	3 <sup>rd</sup>
Coat color	3	15	3	15	6	15	4 <sup>th</sup>
Multiple birth	2	10	1	5	3	7.5	5 <sup>th</sup>
Total	20	100	20	100	40	100	

**Table 16:** Reasons of culling from the flock in the study area

Variables	Kebele				Total	
	Sirinka		Anto		Frequency	%
	Frequency	%	Frequency	%		
Small size	2	10	3	15	5	13.5
Old age	6	30	5	25	11	27.5
Poor fertility	3	15	2	10	5	11.5
Over population	5	25	5	25	10	25
Drought	4	20	5	25	9	22.5
Total	20	100	20	100	40	100



**Table 17:** Breeding practice of sheep in the study area

Variables		Kebele				Total	
		Sirinka		Anto			
		Frequency	%	Frequency	%	Frequency	%
<b>Breed type of sheep</b>	Local	17	85	18	90	35	87.5
	Exotic	-	-	-	-	-	-
	Cross	3	15	2	10	5	12.5
	Total	20	100	20	100	100	100
<b>Purpose of castration</b>	Better price	5	25	6	30	11	27.5
	Control breeding	2	10	0	0	2	5
	Improve meat quality	6	30	6	30	12	30
	Fattening	7	35	8	15	15	37.5
	Total	20		20	100	40	100
<b>Age of castration</b>	6-12 Month	7	35	6	30	13	32.5
	>12 Month	13	65	14	70	27	67.5
	Total	20	100	20	100	40	100
<b>Method of castration</b>	Open castration	-	-	-	-	-	-
	Close castration	20	100	20	100	40	100
	Total	20	100	20	100	40	100
<b>Mating system</b>	Controlled	4	20	2	10	6	15
	Un controlled	16	80	18	90	34	85
	Total	20	100	2	100	40	100

**Table 18:** Rum source

Source of rum	Kebeles				Total	
	Sirinka		Anto			
	Frequency	%	Frequency	%	Frequency	%
Born in the flock	13	65	14	70	27	67.5
Gift	2	10	0	0	2	5
Neighbor	5	25	6	30	11	27.5
Total	20	100	20	100	40	100