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Gender Participation and Commercialization of Smallholder Dairy Farming in Uasin Gishu County, Kenya

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Abstract: The women dairy farmers play crucial in dairy farming though they usually have limited access to land, financial resources and other resources for production. In developing countries, over 75% of the poor are rural smallholder producers who derive their livelihoods primarily from agriculture. Kenyan smallholder dairy producers constitute 80% of the dairy producers out of which 61% are women. Smallholder dairy producers produce about 80% of total milk production and 70% of the total milk marketed. Therefore, smallholder dairy producers have their livelihoods majorly dependent on dairy farming. Thus, commercializing smallholder dairy farming will be an important pathway out of rural poverty and will be a powerful tool for the improvement and sustainability of livelihoods of smallholder dairy producers. In Uasin Gishu County, the proportion of smallholder dairy producers in the commercialization scale is 70% subsistence, 20% semi-commercialized and 10% commercialized. This therefore, indicates that commercialization level is still low and variable. This may be contributed by the influences of gender participation in smallholder dairy farming. The objective of this paper therefore was to establish the influence of Gender participation on commercialization of smallholder dairy farming. Descriptive research design was used to obtain primary data through a sample size of 384 smallholder dairy producers who were selected using stratified random sampling technique. Data analysis procedures used includes: mean, standard deviation, Pearson correlation coefficient, Spearman's rank correlation coefficient and multiple regressions. Results obtained indicate that gender participation has significant influence on commercialization of smallholder dairy farming. It is therefore recommended that the Government of Uasin Gishu County together with policy makers; planners; smallholder dairy producers and other relevant stakeholders in the dairy value chain in the County should formulate policies, strategies and design programs and projects that will address the influence of gender participation in order to achieve sustainable rural development in the County and Kenya.

Keywords: Smallholder Dairy Producers, Commercialization of Smallholder Dairy Farming, Gender Participation, Uasin Gishu County

1. Introduction

Majority (over 75%) of the poor in developing countries are rural smallholder producers who primarily depend on agriculture for their livelihoods ([10, 37, 9, 45]). Kenyan smallholder dairy producers constitute 80% of the dairy producers and they produce about 80% of total milk production and 70% of the total milk marketed ([12, 22]). Dairy farming in Kenya is the source of livelihoods for the smallholder dairy producers. It contributes 4% of the total gross domestic product (GDP) and 14% of agricultural GDP ([12, 15, 22]). Globally, international development agencies are giving due attention to intensification and commercialization of smallholder farming as a means of achieving food and nutrition security, and poverty reduction. Kenya in particular is providing support to the transformation of the prevalent subsistence smallholder dairy farming to competitive, commercial and sustainable dairy industry intended to lead to economic growth, poverty alleviation, wealth and employment creation [12, 13, 14, 15, 22, 42].

The women dairy farming operators usually have limited access to land and financial resources [20, 22]. Land in Kenya is obtained either through purchase or inheritance and this makes it difficult for women to obtain land because traditionally family land is inherited by men only. Since land is the most used collateral to access credit, women then have the further problem of raising finance to expand their dairy operations ([5, 30]). Women have a significant involvement in dairy production and trading in Kenya and are more involved in dairy activities than men in most parts of the country [31]. A survey carried out in 1999 in a representative sample of households in Kenya, shows that 67% of dairy farm households are male-headed and 33% are female-headed [41]. Furthermore, even in male-headed households, 61% of the dairy operators were women. There is clear gender-based segregation of labour and responsibilities in dairying units, where women contribute more labour to collection and processing of feed, animal feeding, milking, marketing of milk, cleaning of sheds and fetching of water for animals while men are involved in establishment of the units, purchase of the animals and parasite control especially spraying and dipping. While there are ethnic and regional variations as to women contribution to labour in dairy enterprises, this general trend holds. Notably, in Rift Valley and Western Provinces, dairy operations hire male labour and where men are the household heads, women manage such labour. The adoption of a commercial orientation to smallholder dairy production entails additional investment costs, notably with respect to transport of feed, equipment for milking and hiring of labour for harvesting hay, forage crops, feeding, watering and herding of the dairy animals.

In commercial system, profit maximization is the main motive of the entrepreneur and inputs are predominantly obtained from markets [6, 12, 17, 34]). [36] defines agricultural commercialization as an agricultural transformation process in which farmers shift from mainly consumption-oriented subsistence production towards market- and profit-oriented production systems. The smallholder dairy producers in Uasin Gishu County are mainly subsistence oriented (70%) whereas semi-commercialized and commercialized one are (20%) and (10%) respectively [14]. This indicates that the commercialization of smallholder dairy farming is low and variable. This may be influenced by Genderparticipation.

2. Methodology

2.1. Area of Study

UasinGishu County has a total area of 3,327.8 Km^2. It extends between longitude 34° 50′ and 35 ° 37′ east and 0°03′ and 0°55′ north. It is made up of six Sub-Counties namely: Soy; Turbo; Kapsaret; Kesses; Ainabkoi and Moiben [14]. The county is the leading milk producing county in Kenya with three (3) categories of smallholder dairy producers namely: subsistence (70%), semi-commercialized (20%) and commercialized (10%) ([14, 16]). The County is therefore mainly characterized by subsistence oriented smallholder dairy producers.

2.2. Research Design and Method of Data Analysis

This paper used descriptive research design. Stratified random sampling was used to select 384 respondents with Sub-Counties constituting the strata. Data analysis used included descriptive and inferential statistics. Descriptive statistics used were mean and standard deviation while inferential statistics consisted of correlations (Pearson and spearman's rho), regression (multiple regressions) and Household Commercialization Index (HCI) as indicated by the formulas below:

$$\text{Mean } \bar{x} = \frac{\sum x_1}{n} \quad (1)$$

$$\text{Standard deviation } \sigma = \sqrt{\frac{\sum_1 (x_1 - \mu)^2}{n}} \quad (2)$$

$$\text{Pearson Correlation } r = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\left(\sum x^2 - \frac{(\sum x)^2}{N}\right)\left(\sum y^2 - \frac{(\sum y)^2}{N}\right)}} \quad (3)$$

$$\text{Spearman's rho } r_S = 1 - \frac{6(\sum d^2)}{n(n^2-1)} \quad (4)$$

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \ldots + \beta nXn + \varepsilon. \quad (5)$$

Where: Y = Average HCI (Dependent variable).
Xi-n = Gender participation (Independent variables)
β0= Constant or Point of intercept on Y axis
β1-n = Regression coefficients.
= Residual term or the error

$$HCI = \left[\frac{\text{Gross value of milk sales per household per month}}{\text{Gross value of total milk production per household per month}}\right] x100 \quad (6)$$

The Household Commercialization Index (HCI) ranges from zero to 100%. A value of zero indicates a totally subsistence oriented producer. The closer the index is to 100%, the higher the level of commercialization [29; 31]. In the determination of HCI, the study used dairy milk production and dairy milk sales. The ([9, 23, 29, 36, 45]) provide scale of commercialization (HCI) as: 0%-30%: subsistence oriented producers; 31%-65%:Semi-commercialized producers; 66%-100%: Commercialized producers.

3. Results and Discussions

3.1. Descriptive Results of Gender Participation

The Gender Participation of the smallholder dairy producers was analyzed using descriptive statistics (Tables1-7; figures 1-7 below):

The results show that majority of respondents (59.4%) had men alone accessing knowledge and technology in dairy development (table 1; figure 1 below).

Table 1. *Access to knowledge & technology.*

Access to assets by gender:	Frequency	Valid percent	Cumulative percent
Male alone	79	21.1	21.1
Both man and woman	284	74	78.9
woman alone	21	4.9	100
Total	384	100	

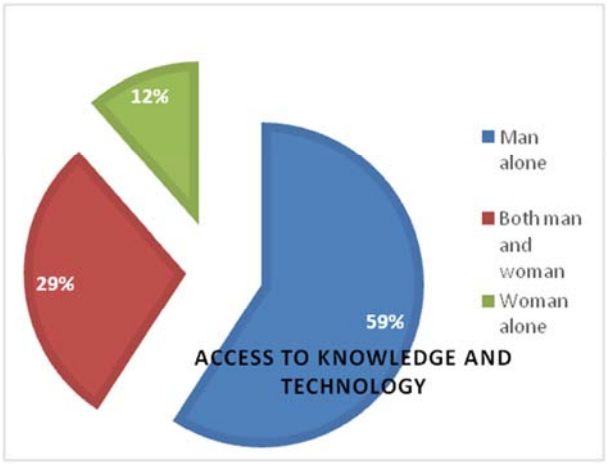

Figure 1. *Access to knowledge & technology.*

This means that most of the producers had man alone accessing knowledge and technology.

Majority of the respondents (74%) indicated that productive asset ownership was accessed by both men and women (table 2; figure 2 below).

Table 2. *Access to assets by gender.*

Access to assets by gender:	Frequency	Valid percent	Cumulative percent
Male alone	79	21.1	21.1
Both man and woman	284	74	78.9
woman alone	21	4.9	100
Total	384	100	

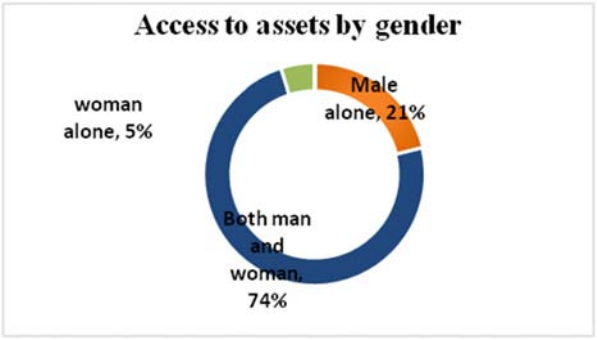

Figure 2. *Access to assets by gender.*

This indicates that both men and women were accessible to productive assets.

In the case of educational level, most of the respondents (81.6%) had attained secondary level of education and above while 95.4% of the respondents had attained primary level of education and above (table 3; figure 3 below).

Table 3. *Level of Education of the House Hold Head.*

Level of Education of the House Hold Head:	Frequency	Valid Percent	Cumulative Percent
Adult literacy education	18	4.6	4.6
Primary	53	13.8	18.4
Secondary	169	44	62.4
Diploma/Certificate level	66	20.9	83.3
Graduate level training	64	16.7	100
Total	384	100	

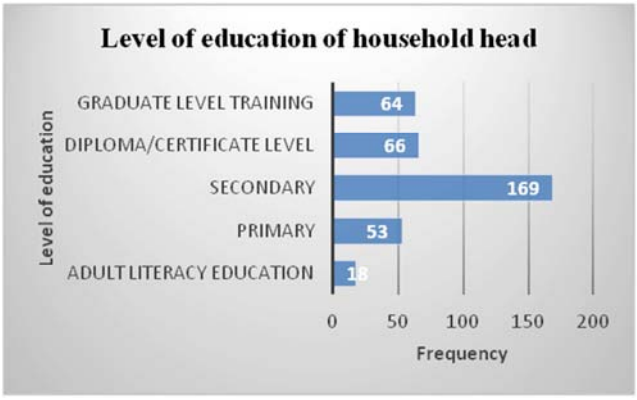

Figure 3. *Level of Education of the House Hold Head.*

Among the respondents, majority (65%) had men alone controlling income (table 4; figure 4 below).

Table 4. *Control of income by gender.*

Control of income by gender:	Frequency	Valid percent	Cumulative percent
Man alone	243	65	65
Both man and woman	101	26.7	35
Woman alone	40	8.3	100
Total	384	100	

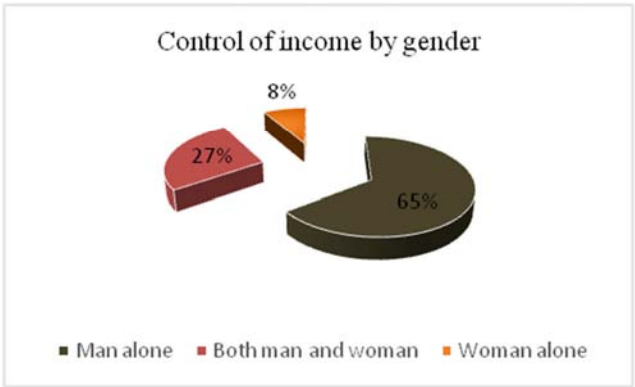

Figure 4. *Control of income by gender.*

This results imply that most of the respondents had men alone controlling income.

In the control of assets by gender, most of the respondents (74.9%) had men alone controlling assets (table 5; figure 5 below).

Table 5. *Control of Assets by Gender.*

Control of Assets by Gender:	Frequency	Valid percent	Cumulative percent
Man alone	280	74.9	74.9
Both man and woman	63	16.8	25.1
Woman alone	41	8.3	100
Total	384	100	

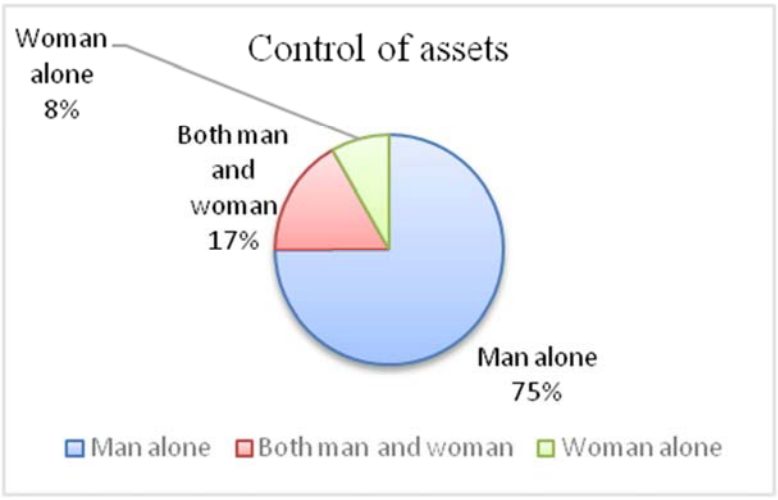

Figure 5. *Control of Assets by Gender.*

This shows that majority (74.9%) of the respondents had men alone controlling assets.

The results show that mostof the respondents (67.2%) had men alone making decisions on dairy aspects (table 6; figure 6 below).

Table 6. *Decision making on dairy aspects by gender.*

Decision making on dairy aspects by gender:	Frequency	Valid percent	Cumulative percent	Decision making on dairy aspects by gender:
Man alone	261	67.2	67.2	Man alone
Both man and woman	63	16.4	32.8	Both man and woman
Woman alone	60	16.4	100	Woman alone
Total	384	100		Total

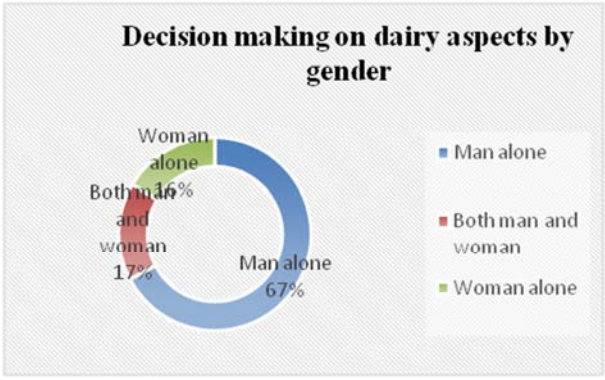

Figure 6. *Decision making on dairy aspects by gender.*

The results suggest that men dominated decision making on dairy aspects.

The proportion of respondents as per their land ownership was as follows: 44.5% of the respondents had family land/inheritance, 52.5% had purchased land, and 3.0% had leased land (table 7; figure 7 below).

Table 7. *Land ownership.*

Land ownership:	Frequency	Valid percent	Cumulative percent
Family land/inheritance	163	44.5	44.5
Own purchased land	200	52.5	55.5
Leased land	21	3	100
Total	384	100	

Figure 7. *Land ownership.*

This means that most of the respondents had purchased their land.

3.2. Inferential Results of Gender Participation

The inferential statistics used were correlations and multiple regression analysis.

3.2.1. Correlation Results

The correlations used were Pearson correlation coefficients and Spearman's rho and the results are shown in table 8 below:

Correlation results of a Pearson (0.940) and Spearman's rho (0.813) show that there is highly significant positive relationship between respondents' access to knowledge and technology, and the average Household Commercialization Index. The correlation results of a Pearson (0.875) and Spearman's rho (0.890) indicate that there is a highly significant positive relationship between respondents' access to assets, and the average Household Commercialization Index (HCI). The correlation results of a Pearson (0.820) and Spearman's rho (0.826) indicate that there is highly significant positive relationship between respondents' level of education and the average Household Commercialization Index (HCI).

According to results of a Pearson (-0.733) and Spearman's rho (-0.691), there is a highly significant negative relationship between respondents' control of income, and the average Household Commercialization Index. The results of a Pearson (-0.695) and Spearman's rho (-0.721) show that there is highly significant negative relationship between respondents' control of assets, and the average Household Commercialization Index (HCI. The correlation results of a Pearson (0.680) and Spearman's rho (0.600) show that there is highly significant positive relationship between respondents' decision making on dairy aspects, and the average Household Commercialization Index (HCI). The results of Pearson (0.501) and Spearman's rho (0.616) indicate that there is a significant positive relationship between respondents' ownership of land, and the average Household Commercialization Index (HCI).

Table 8. *Correlation Results of Gender Participation.*

No.	Independent variables	Correlation Model	
		Pearson Correlation	Spearman's rho
1	Access to knowledge and technology	.940**	.813**
2	Access to assets	.875**	.890**
3	Level of education	.820**	.826**
4	Control of income	-.733**	-.691**
5	Control of Assets	-.695**	-.721**
6	Decision making	.680**	.600**
8	Land ownership	.501*	.616*

Key to Table 8:** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). Sample size, N = 384. Correlation between each variable and itself = 1.00.

The correlation coefficients in table 8 above indicate that the Household Commercialization Index of the respondents and the Gender participation of smallholder dairy producers (independent variables) are significantly correlated. However, some correlations were more powerful statistically at 1% level of significance than the others at 5% level. Access to knowledge and technology; access to assets; level of education; control of income and decision making have correlation coefficients greater than 0.5 (+ or -) and they are significant at 99% confidence level. On the other hand, land ownership has low Pearson coefficients of 0.501 at $\alpha = 0.05$.

3.2.2. Regression Results

The regression results presented by the formula below show that Gender participation influence the average Household Commercialization Index (HCI) at various levels:

$$LnYi = .285 + .208X1i + .190X2i + .148X3i + .-108X4i + .-105X5i + .095X5i + .026X5i + \varepsilon$$

$$(.215)(.179)(.125)(.110)(.092)(.078)(.026)$$

The multiple regression (0.208) results confirm that access to knowledge and technology has highly significant positive association with average Household Commercialization Index. A unit (one percent) increases of level of access to knowledge and technology causes an increase of HCI by 0.208 (20.8%). According to the results, access to assets has a standardized coefficient of 0.190 meaning that access to assets is positively associated with average Household Commercialization Index and, coefficient is highly significant at 1%. A unit (one percent) increases of level of access to assets causes an increase of HCI by 0.190 (19%). The results show that level of education has a standardized coefficient of 0.148 meaning that level of education is positively associated with average Household Commercialization Index and, coefficient is highly significant at 1%. A unit (one percent) increases of level of education causes an increase of HCI by 0.148 (14.8%).

The findings show that control of income has a standardized coefficient of -0.108 implying that control of income by one gender is negatively associated with average Household Commercialization Index and, coefficient is highly significant at 1%. A unit (one percent) increases of level of control of income by one gender causes a decrease of HCI by 0.108 (10.8%). According to results, control of assets has a standardized coefficient of -0.105 meaning that control of assets by one gender is negatively associated with average Household Commercialization Index and, coefficient is highly significant at 1%. A unit (one percent) increases of level of control of assets by one gender causes a decrease of HCI by 0.105 (10.5%). The findings show that decision making on dairy aspects has a standardized coefficient of 0.095 implying that there was a significant positive relationship between respondent's decision making on dairy aspects, and the average Household Commercialization Index and, coefficient is highly significant at 1%. A unit (one percent) increases of level of decision making on dairy aspects by one gender causes a decrease of HCI by 0.095 (9.5%). The results indicate that ownership of land has a

standardized coefficient of 0.026 implying that owning land is positively associated with average Household Commercialization Index and, coefficient is significant at 5%. A unit (one percent) increases of owning land causes increase of HCI by 0.026 (2.6%).

The results of regression analysis show that the independent variables (Gender participation) influence the average Household Commercialization Index at various levels. The R Square statistics (0.774) means that the ten independent variables (Gender Participation variables) in the regression model account for 77.4 percent of the total variation in the given HCI. The model fits data with a high significance.

3.2.3. Gender Participation and Average Household Commercialization Index (HCI) Results

The determined HCI results are indicated in tables 9-15 and figures 9-15 below:

(i). Access to Knowledge and Technology

The majority of the respondents (59.4%) were men alone accessing knowledge and technology and had an average HCI of 29%.11.5% of the respondents who were women alone accessing knowledge and technology had average HCI of 26%. However, 29.1% of the respondents who were both men and women having access to knowledge and technology had the highest average HCI of 58% (table 9 & figure 9 below). The results therefore show that for higher commercialization index to be achieved in dairy farming, both gender should access knowledge and technology in increasing dairy production and access to markets for higher income. Until recently, women were usually excluded from variety of services such as access to inputs and they were neglected by agricultural extension services. In addition, some institutional arrangements such as market contractual agreements were exclusively for male-headed households.

Table 9. *Access to knowledge and technology by gender.*

Access to knowledge and technology by gender:	Frequency	Valid percent	Average Household Commercialization Index
Man alone	222	59.4	29
Both Man and Woman	110	29.1	58
Woman alone	43	11.5	26
Total	384	100	37.7

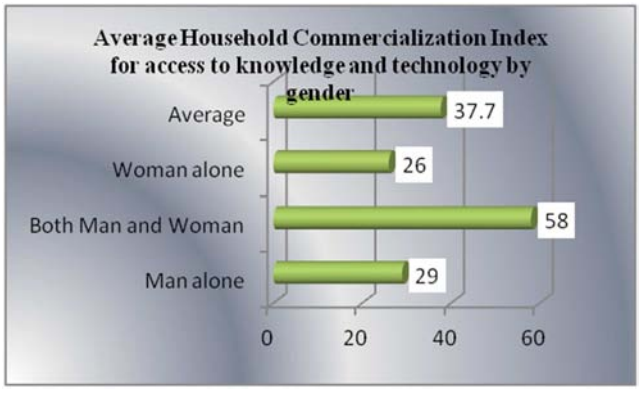

Figure 9. *Access to knowledge and technology by gender.*

This study finding is confirmed by results obtained by [8] that one of the biggest challenges to the stakeholders involved in the process of agricultural transformation in Sub-Saharan Africa is the high percentage (70-80%) of women responsible for household food production. According to [5; 26], demand for modern technologies promotes the input side of production and facilitates the development and advancement of technological innovations. The use of modern technologies can result in higher productivity and production entering markets ([1]. [23] found that specialized production leads to higher productivity through greater learning by doing, scale economies, exposure to new ideas through trade (better knowledge diffusion through exchange), and also better incentives in the form of higher income. The household-level technological changes can help to secure food self-sufficiency under a risky food-market environment. Limited knowledge and skills are the major issues affecting access to employment and income generating opportunities for both genders [7, 25, 35,43].

The importance of resource-saving and high-enhancing technological innovations and their adoption by the ultimate users are unquestionable in smallholder commercialization process [7; 21; 23]. Adopting a temporal perspective, [44] argued that, in the short-run, increased commercialization could occur without change in agricultural technologies, but the inverse would be less likely due to the indispensable demand-side pull for technological innovations. The findings also conform to that of [22; 33]that remoteness restricts access to information about technologies and changing prices, leaving the rural smallholders unable to respond to changes in market incentives. Limited knowledge and skills are the major issues affecting access to employment and income generating opportunities.

(ii). Access to Assets

The results show that 74% of respondents who were both men and women accessing assets had average HCI of 28%, whereas 4.9% of the respondents who were women alone accessing assets had average HCI of 23%. Furthermore, 21.1% of the respondents were men alone having average HCI of 24% (table 10 & figure 10 below). The involvement of both genders is crucial because the respondents are able to invest in dairy production jointly for higher dairy productivity and income. Men and women should all become agents of positive change and sustainable development in the society. Assets empower the rural poor and therefore highly vulnerable households are expected to have lower commercialization index. Relatively well endowed with agricultural capital have high potential of commercializing. The acquisition and ownership of productive assets can pave the way for household

to participate in economic activities. Households with relatively higher production levels have higher probability of market participation and commercialization.

Table 10. *Access to assets by gender.*

Access to assets by gender:	Frequency	Valid percent	Average Household Commercialization Index
Man alone	79	21.1	24
Both Man and Woman	284	74	28
Woman alone	21	4.9	23
Total	384	100	25

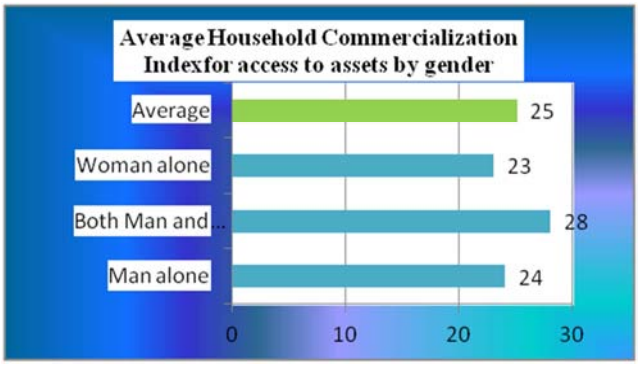

Figure 10. *Access to assets by gender.*

The results also conform to that of [18] who argue that assets empower the rural poor by increasing their incomes and make them less vulnerable to shocks and the extent of vulnerability determines household commercialization index. According to [24]improving access to land among the land-constrained smallholder households would be a seemingly effective way to reduce poverty, as a very small incremental addition to land access is associated with a large relative rise in commercialization and consequently in income. [9] found out in their study that coefficient for land is statistically significant at 1% while the coefficient for oxen ownership is relatively high but significant only at the 5%. The result also conforms to those of [4; 9; 29; 38].

(iii). Level of Education

According to HCI results, respondents (16.7%) with graduate level of training had the highest level of commercialization (69%), whereas 4.6% of the respondents with adult literacy education had the lowest commercialization level of 26% (table 11 & figure 11 below). The results show that HCI level increases with the increase of education levels. This is because the respondents with higher level of education are able to increase their dairy productivity through access to knowledge and technology, and access market through access to market information among others issues of marketing. Intellectual capital as captured by education is hypothesized to play a positive role in influencing market participation and HCI. Level of education gives an indication of the household ability to process information and causes some producers to have better access to understanding and interpretation of information than others. High education level is important, as it is likely to lead to the reduction of search, screening and information costs. Education also makes the producers to access market information and be able to engage in trade effectively. Education would significantly enhance producers' ability to make accurate and meaningful decisions and level of education raises human capital and increases their level of managerial abilities which is an incentive for commercialization. Traditionally low education levels have posed a major barrier to entrepreneurship and access to technology.

Table 11. *Level of Education of House Hold Head.*

Level of Education ofHouse Hold Head:	Frequency	Valid Percent	Average Household Commercialization Index
Adult literacy education	18	4.6	26
Primary	53	13.8	28
Secondary	169	44	29
Diploma/certificate level	66	20.9	48
Graduate level training	64	16.7	69
Total	384	100	40

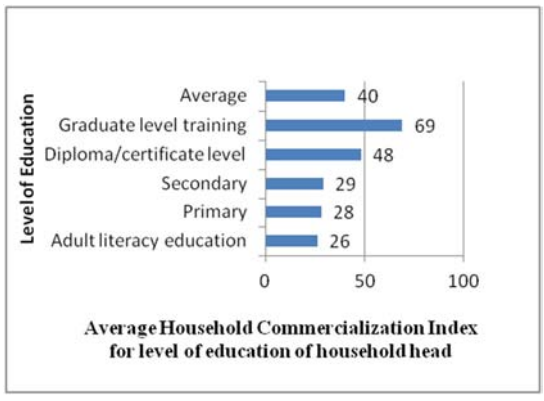

Figure 11. *Level of Education of House Hold Head.*

Education is an important tool to escape poverty, but only if the education system reaches the right people with the right content [18]. However, the expectation may be reversed when there are competing and more remunerative employment opportunities available in the area that require skills that are enhanced by more education [27]. [9] found out in his study that coefficient for literacy of the household head is positive and significant, which implies a high probability of better production among farm households with an educated head. According to [40], education would significantly enhance producers' ability to make accurate and meaningful decisions. [3; 32] also opined that level of education raises human capital and increases their level of managerial abilities which is an incentive for commercialization. [31] found out that educational status

increased technical efficiency of birds' production and HCI of commercial poultry farmers. [6], found out that on average a household head is married and has between 19 and 22 years of farming experience, and has had at least a primary school education, which indicates that they can at least read and write, an important factor in the commercialization of farming. There are some individuals who inherently have better skills and capabilities to do the implicit cost-benefit analyses required and apply their talents to quickly adapt to and exploit new opportunities [23]. The result is also in line with those of [1, 2, 4, 9, 21, 29, 38].

(iv). Control of Income

According to the HCI results, 26.7% of the respondents were both men and women controlling income and had the highest commercialization level of 68%, whereas 8.3% of the respondents were women alone controlling income and had the lowest average HCI of 25% (table 12 & figure 12 below). This is because the money generated and controlled by both men and women is reinvested in the dairy for increased productivity hence higher HCI. Whatever proportion of female labour is involved in dairy production, income from sales of milk is usually controlled by men.

Table 12. *Control of income by gender.*

Control of income by gender:	Frequency	Valid percent	Average Household Commercialization Index
Man alone	243	65	27
Both man and woman	101	26.7	68
Woman alone	40	8.3	25
Total	384	100	40

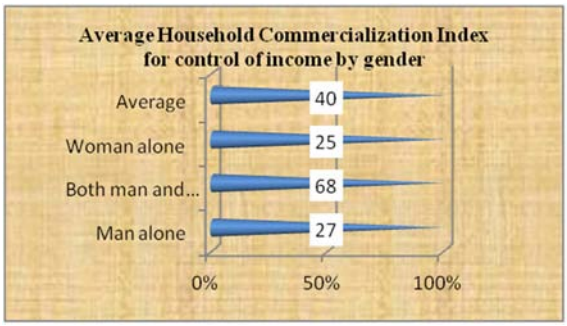

Figure 12. *Control of income by gender.*

[23], reported that the impact of smallholder commercialization on the gender dimension depends on the commodity's gender specific labour demand and on who controls the income generated. The shift from staple maize to sugarcane production in Kenya and the Philippines was associated with a significant reduction in the percentage of women's labour use in agricultural activities, from 50.5% to 1.2% in Kenya and from 9.1% to 2.5% in the Philippines ([44]). However, in Guatemala, the shift from maize to vegetable production increased the proportion of women's labour use from 6.1% to 21.5% ([44]). The finding conforms to that of [1].

(v). Control of Assets

The results indicate that 16.8% of the respondents were both men and women controlling assets and had commercialization index of 52%. 8.3% of the respondents were women only controlling assets and had commercialization index of 23%. However, 74.9% of the respondents were Men alone controlling assets and having average HCI of 25% (table 13 & figure 13 below). This is due to the fact that joint control of productive assets by both gender empowers them to increase the dairy productivity and access to markets hence increased HCI. The results are confirmed by those of[4, 9, 29, 30, 38].

Table 13. *Control of Assets by Gender.*

Control of Assets by Gender:	Frequency	Valid percent	Average Household Commercialization Index
Man alone	280	74.9	25
Both man and woman	63	16.8	52
Woman alone	41	8.3	23
Total	384	100	33.3

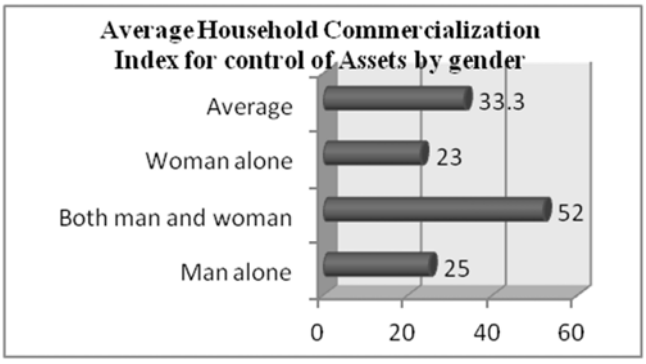

Figure 13. *Control of Assets by Gender.*

(vi). Decision making on Dairy Aspects

According to the results below, 16.4% of the respondents were both men and women making decision on dairy aspects and had commercialization index of 61%. 16.4% of the respondents were women alone making decision and had commercialization index of 21%. The 67.2% of respondents were Men alone making decision on dairy aspects and had average HCI of 24% (table 14 & figure 14 below). This is because women are also important agents in decision making on commercialization of smallholder dairy farming process. The findings are in line with those of [28] on reducing the gender gap in Agricultural extension and advisory services.

Table 14. *Decision making on dairy aspects by gender.*

Decision making on dairy aspects by gender:	Frequency	Valid percent	Average Household Commercialization Index
Man alone	261	67.2	24
Both man and woman	63	16.4	61
Woman alone	60	16.4	21
Total	384	100	35.3

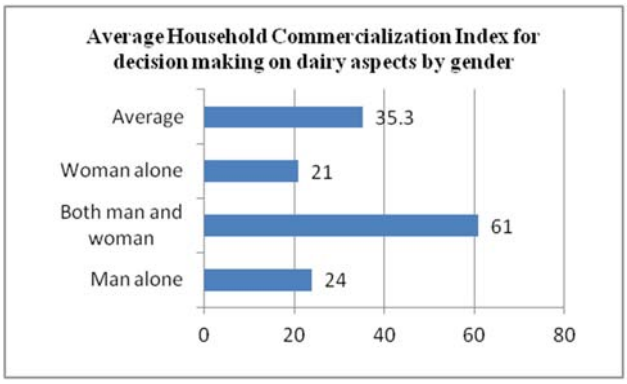

Figure 14. *Decision making on dairy aspects by gender.*

(vii). Land Ownership

According to the results, 52.5% of the respondents who own purchased land had higher commercialization index of 67%, whereas 44.5% of the respondents with family /inherited land had lower commercialization index of 20%. The 3% of the respondents with leased land had average HCI of 23% (table 15 & figure 15 below). This is because respondents who purchase land have high potential and capacity to maximally utilize the available land thereby obtaining higher productivity and HCI. The larger the size of arable land a household uses, the higher the production levels are likely to be, and the higher the probability of market participation and HCI.

Table 15. *Land ownership.*

Land ownership:	Frequency	Valid percent	Average Household commercialization Index
Family land/inheritance	163	44.5	20
Own purchased land	200	52.5	67
Leased land	21	3	23
Total	384	100	36.7

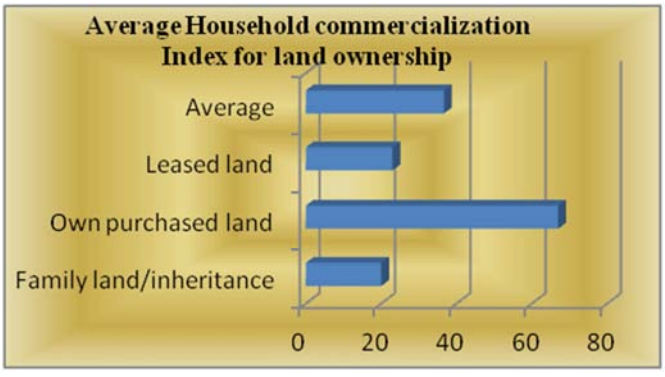

Figure 15. *Land ownership.*

[38], reported that access to arable land is a necessary condition for market participation. [9] found out that land and oxen, which could also be used as proxies for capital stock, are found to be important in explaining the variation in the level of production his sampled households. The coefficient for land is statistically significant at 1% whereas the coefficient for oxen ownership is relatively high but significant only at the 5% level. The findings are in line with those of [4, 9, 19, 30, 32].

The HCI results for the Gender Participation range from 25% (subsistence) to 40% (semi-commercialized). This means most of the respondents are not commercialized due to the influence of their Gender participation. Hence there is need to address the influence of Gender Participation of smallholder dairy producers on commercialization of smallholder dairy farming in order to achieve sustainable development.

4. Conclusions and Recommendations

The study results show that Gender Participation of smallholder dairy producers has highly significant influence on commercialization of smallholder dairy farming. It is therefore recommended that the County Government of Uasin Gishu in consultation with policy makers; planners; smallholder dairy producers and other players in the dairy farming should address Gender Participation issues particularly through formulating policies, strategies, projects and programmes that may promote access to knowledge and technology, assets by both men and women for increased level of commercialization; enforce access to education to all citizens and ensure that all sexes have control of income and assets for increased commercialization; develop special programmes for women empowerment to access credit, land and appropriate technology.

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