



Women Empowerment in
Agriculture Index (WEAI)
study in East Africa Dairy
Development project sites
in Tanzania: Survey report



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Women Empowerment in Agriculture Index (WEAI) study in East Africa Dairy Development project sites in Tanzania

Survey report

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Contents

Tables	iv
Figures	v
Acknowledgements	vi
1 Introduction	1
2 Methodology	2
2.1 Survey design and study area	2
2.2 Data collection, management and analysis	3
3. Study results and discussion	5
3.1 Socio-demographic characteristics of the households	5
3.1.1 Socio-demographic characteristics of the households by hub participation and gender	5
3.1.2 Social capital dynamics within households, by hub participation and gender	5
3.1.3. Women’s participation in non-dairy related groups	7
3.1.4. Gender and ownership of productive assets	7
3.1.5. Gender and decision-making in cattle keeping	9
3.1.6. Role in decision-making on non-livestock related production and income generation activities	12
3.1.7. Access to, and decisions on, credit	13
3.1.8. Physical mobility	14
3.1.9. Autonomy in decision-making`	15
3.2 Women Empowerment in Agriculture Indices (WEAI)	17
4 Conclusion	21
4.1 Dissemination of study results	21
5 Implications of the study	22
References	23

Tables

Table 1: Sample size estimation for the WEAI study	2
Table 2: Number of households interviewed (achieved sample) by hub and cluster	3
Table 3: Selected household and farm characteristics, by hub participation	5
Table 4: Selected household characteristic with regards to socio-capital dynamics	6
Table 5: Women's participation in non-dairy related groups	7
Table 6: Household and women's asset ownership	8
Table 7: Livestock production decisions, by female respondents	10
Table 8: Access to information necessary for livestock production	11
Table 9: Role in decision-making on production and income	12
Table 10: Participation and role in decision-making on consumption and access to information	13
Table 11: Access to and decisions on credit	14
Table 12: Physical mobility of women	15
Table 13: Autonomy in decision-making	16
Table 14: A-WEAI scores for households in EADD project sites in Tanzania	17
Table 15: A-WEAI scores: 5DE decomposed by dimension and indicator hub participants in EADD project sites in Tanzania	18
Table 16: A-WEAI scores: 5DE decomposed by dimension and indicator hub non-participants in EADD project sites in Tanzania	18

Figures

Figure 1: Percentage of household keeping different types of livestock, by status of hub participation.	9
Figure 2: Contribution of each indicator to disempowerment of hub participants.	19
Figure 3: Contribution of each indicator to disempowerment of hub non-participants.	20

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1 Introduction

The Women's Empowerment in Agriculture Index (WEAI) is a survey-based index designed to measure the empowerment, agency and inclusion of women in the agricultural sector (Malapit et al. 2015). It is the first comprehensive and standardized measure to directly capture women's empowerment and inclusion levels in the agricultural sector (Malapit et al. 2014). It was developed jointly by the United States Agency for International Development (USAID), the International Food Policy Research Institute (IFPRI), and the Oxford Poverty and Human Development Initiative (OPHI).

The WEAI, a survey-based index, was initially developed in 2012 as a tool to reflect changes in empowerment, agency and inclusion of women in the agricultural sector that may result from the US government's Feed the Future Initiative, which commissioned the development of the WEAI. However, the WEAI has also been used extensively since 2012 by a variety of organizations to assess the state of empowerment and gender parity in agriculture, to identify key areas in which empowerment needs to be strengthened and to track progress over time. In recognition that the original WEAI tool had little focus on livestock, the International Livestock Research Institute (ILRI) partnered with IFPRI to revise the tool and capture more indicators from livestock systems. Consequently, a new tool, 'Pro-WEAI Livestock Enhanced' has been produced.

The East Africa Dairy Development (EADD) project, led by ILRI, conducted a WEAI study in Tanzania between July 2017 and September 2017. Using the Pro-WEAI livestock enhanced survey tool, the objective of the study was to assess the state of empowerment and gender parity in agriculture in EADD project sites, in order to identify key areas in which empowerment needs to be strengthened and to track progress over time. The EADD project has been supporting the implementation of mechanisms to upgrade the dairy value chain by facilitating collective action that builds market linkages and enhances farmers' access to inputs in some of the milkshed areas of Kenya, Rwanda, Uganda and Tanzania. Among the countries where the project has worked in, Tanzania is the latest in terms of project implementation since EADD started working in the southern highlands of Tanzania in 2014 while implementation in the other countries began in 2008. To complement its main intervention, the dairy hub approach (see Mutinda, Baltenweck and Omondi [2015]), EADD employed a Social Capital Development (SCD) approach to farmer mobilization, with significant focus on gender interventions and mainstreaming, hence the interest to conduct a WEAI study. Consequently, the WEAI study was conducted in the project's sites in the southern highlands of Tanzania, covering Mbeya, Njombe and Iringa districts.

This report presents the details of the study including the study methodology and findings. The main results of the study, the estimation of the WEAI's five domains of empowerment and gender parity index were derived using the Abbreviated Women's Empowerment in Agriculture Index (A-WEAI) following the discussion by Malapit et al. (2017).

2 Methodology

2.1 Survey design and study area

The study was conducted in EADD sites in the southern highlands of Tanzania. Out of 12 producer organizations (POs), whose activities (collective action around access of dairy inputs and output markets for smallholder dairy farmers) cover distinct geographical areas of Mbeya, Njombe and Iringa districts, and with whom EADD is implementing its dairy hub approach, 10 POs were selected for the study. To assess the state of empowerment and gender parity in agriculture in project sites in Tanzania, to identify key areas in which empowerment needs to be strengthened and to track progress over time, the study aimed at gathering data from a sample of at least 300 representative farm households. Using a mix of two sampling strategies: stratified random sampling for EADD supported dairy hub/ dairy interest groups participants and snowballing for non-participants, both cattle and non-cattle keepers¹ in 326 randomly selected households from EADD hub catchment areas were interviewed (Table 1).

Table 1: Sample size estimation for the WEAI study

Sample details	Planned/ required sample	Actual sample after sampling and conducting interviews
Number of hubs	10	10
Sample size per hub	30	30-32
Total sample size*		
Total number of households	300*	326*#
Total number of males	300*	300*
Total number of females	300*	325*
Total Number of observations	600*	625*

Note: * hub participants + non-participants households at a ratio of 1:1. # 299 households had both male and females interviewed, 26 households had only females (1 per household) interviewed while 1 household had only a male interviewed.

Snowball (also known as chain referral sampling) is a method that yields study sample through referrals made among people who share or know others who possess some characteristics that are of research interest (Biernacki and Waldorf 1981). In our case, after a visit to every participant farmer selected using the stratified random sampling technique, each farmer was asked to give names of their neighbours who are non-participants. A list of the non-participant farmers would be drawn, from which the survey teams' supervisor would randomly select the required number of non-participant farmers, through lottery method. At the end of the survey, the sample consisted of 50% participants in EADD project

¹ EADD's Social Capital Development (SCD) approach did not restrict the membership of Dairy Interest Groups (DIGs) to cattle keepers only. The SCD activities were the main gender interventions driven by EADD, consequently, there was need for a representative sample to evaluate impacts of the project's gender interventions. Though EADD's previous evaluation approach has been to interview cattle keepers only due to the nature of the studies and the key response indicators, non-cattle keepers were included in this study for one main reason: to capture the entire spectrum of EADD participants (getting a representative sample) including non-cattle keeping households.

interventions (dairy hubs and their element, including dairy interest groups). For the stratified random sampling, a list of registered farmers was obtained from the dairy hubs and the dairy interest group member's registers, forming a sampling frame from which the 50% of the sample (participant farmers) was randomly selected. From the sampled participant farmers, the non-participant farmers were obtained using the snowball sampling technique. Note that the nature of EADD interventions precluded the existence of a perfect or near perfect control group hence only non-participants vs participants in the same hub catchment areas were analysed. Following IFPRI's recommendation on the minimum required sample size and the need to oversample female-headed households (see Malapit et al. 2015), Table 2 presents details of the sample size.

Table 2: Number of households interviewed (achieved sample) by hub and cluster

Cluster	Hub/ PO	Number of households interviewed	Per cent of total households interviewed	Number of female respondents	Number of male respondents
Mbeya	Vwawa/Mviwambo	33	10	33	30
	Kinyala	31	10	30	30
	Ilembo/Isaima	30	9	30	30
	Isange/Wamabu	33	10	33	33
	Uwemba/Lukamo	36	11	36	25
Njombe	Kichiwa/Wawaharjo	32	10	32	30
	Igima/Mshikamano	32	10	32	30
	Ifunda/IDCOG	34	10	34	32
	Igowole/MUDCO	32	10	32	30
Iringa	Mtito/Dagaba	33	10	33	30
Total		326	100	325	300

2.2 Data collection, management and analysis

Using the Pro-WEAI Livestock Enhanced survey modules (below), the study involved interviewing the main males and females (two per household, where applicable) in randomly selected households from both project participants and non-participants. From the households sampled to participate in the WEAI survey, a primary male and a primary female decision maker in each household was interviewed (personal interviews) separately and in private with their responses captured using a Computer-Assisted Personal Interviews (CAPI) system developed from the standard Pro-WEAI livestock enhanced module. Data on household, dairy production and household decision-making, all meant to contribute to the estimation of the WEAI's five domains of empowerment and gender parity index were captured, in addition to some basic household and farm characteristics.

[Click on the Excel icon to open the tool](#)

The sampling unit in the study was a farm household (considering the location of EADD project sites in rural farming communities), regardless of whether or not they keep cattle (note that in this study, some hub participants, through Dairy Interest Groups (DIGs) do not own cattle but were still included in the study since EADD's SCD approach was the core of the interventions at DIG level and had a strong gender transformation focus). To assure that proper research ethics were maintained throughout the study, its detailed protocol was approved by ILRI's Institutional Research Ethics Committee. These measures aimed at ensuring that proper respondent consent would be obtained, and the data collected from these farm households managed by a selected research team composed of ILRI and EADD staff who would ensure the data was given the privacy and confidentiality it deserves.

For efficient and effective data collection and quality assurance, the interviews were conducted by 12 enumerators and two supervisors (organized in teams of six enumerators under one supervisor). The enumerators administered the WEAI questionnaire CAPI (using tablets and the CSPRO application). Prior to commencing data collection, the enumerators received six days of training and participated in a pretest. With the CAPI, thorough training and efficient teaming was done to allow for learning and progressive increase in the rate at which the enumerators administer each questionnaire over time. Consequently, the survey took a total of 30 days to complete. To ensure that quality data was collected, the supervisors worked together with the enumerators during the whole survey period, organizing field logistics, sampling households and checking the questionnaires to ensure that the required data was collected in a consistent manner. In addition, a comprehensive data cleaning file was developed to check the data for consistency and completeness daily, guaranteeing the collection of quality data in a timely manner.

In this report, descriptive statistics of the data collected, covering household basic characteristics and decision-making patterns, particularly in cattle keeping is presented (reflecting the dual-purpose nature of cattle keeping – both beef and dairy – in the study areas' production system). Subsequent data analysis to derive both the five domains of empowerment (5DE) and gender parity indices (GPI) following the discussion by Malapit et al. 2017), generated A-WEAI scores.

Having interviewed both the main male and the main female in 92% of the households, using the same tool and asking similar questions (except for 1 module that was a female-only module), discordance among responses from males and females in the same household was expected, which is catered for in the design of the WEAI study. While noting that discordance in a response does not always imply inaccuracy, nor does concordance always imply accuracy, empirical evidence by Coates et al. (2010) reveals two broad types of factors that explain much of the observed discordance in a food security study where both male and females within households were interviewed: i) 'question referent,' i.e. questions asking about the respondent's own experiences are likely to produce higher rates of discordance (but elicit more accurate responses), than questions that ask the respondent about the experience of the 'family' or 'household'; and ii) 'question content' i.e. discordant results are likely when men and women have different experiences with, and different levels of knowledge about, the subject of the interview. Since discordance only suggests inaccuracy when the question is thought to be about a collective or shared experience in the household (Coates et al. 2010) an in-depth study on discordance would first identify and categorize all the data collected into the two broad categories of sources of discordance then exclude data collected using questions that fall under the 'question referent' category as this would generally result in higher discordance that may not always imply inaccuracy. However, this is not in the interest of the WEAI indicator score analysis. Consequently, for this report, we analysed questions that fall in both categories (i.e. question referent and question content) but only report observations from female respondents since at this preliminary analysis stage, i) no significant discordance was observed on data that falls under the question content category, and ii) female responses form a larger group of observations compared to male responses (i.e. due to the structure of the WEAI survey, women in both single female-headed and mixed main male and main female households were interviewed. See Table 1).

3. Study results and discussion

3.1 Socio-demographic characteristics of the households

3.1.1 Socio-demographic characteristics of the households by hub participation and gender

Table 3 summarizes some selected household and farm characteristics from the data collected. The means presented in the table are categorized by both hub participation (i.e. farmers listed as hub participants by EADD project versus non-participants). Hub participation by EADD was defined as accessing services from the dairy hubs (including bulking and selling of milk and obtaining any dairy related goods/ services from the dairy hubs or affiliated service providers) and/ or participating as a member of the DIGs established by EADD. From the results in Table 3, it is evident that there are significant differences between hub participants and non-participants. For instance, hub participants have significantly higher milk production and larger herd sizes than their non-participants counterparts.

Table 3: Selected household and farm characteristics, by hub participation

Household characteristics	Hub participants (n=163)	Hub non- participants (n=162)	All (n=325)	t-test
Household size	6.32	5.59	5.96	2.84***
Household head's age	48.82	44.41	46.62	3.10***
Household head's years of education	6.88	6.85	6.86	0.13
Cattle herd size	5.15	3.04	4.10	2.91***
Current milk production level i.e. production per cow per day (liters)>>	4.29	1.77	3.	6.14***
Proportion who own land (%)	100	99	99	-

Note: *, **, *** indicate significance at $P < 0.10$, $P < 0.05$ and $P < 0.01$, respectively.

>> estimated only for the 233 households who kept cattle i.e. n=149 for hub participants and n=84 for non-participants.

3.1.2 Social capital dynamics within households, by hub participation and gender

Social capital is defined by the Organization for Economic Co-operation and Development (OECD) as 'networks together with shared norms, values and understandings that facilitate co-operation within or among groups'². To explore the social

² <https://www.oecd.org/insights/37966934.pdf>

capital dynamics within the study households, two dimensions of social capital dynamics, membership in dairy-related groups and membership loyalty were used. Dairy-related groups in this case included both DIGs and EADD-supported dairy hubs. Table 4 presents the study findings, indicating the observations for the different household characteristics used to define both membership in dairy-related groups and membership loyalty.

The results presented in Table 4 shows responses from female respondents in the sample on selected socio-capital dynamics observable at household level. The results in Table 4 show that more hub participant households were registered as members of the DIGs compared to dairy hubs membership (i.e. membership in DIGs carries the bulk of hub participation). Women were largely under-represented in both EADD hub participation and DIG membership. However, the membership of women in DIGs was slightly higher compared to the hubs. Member loyalty to the hubs seems rather lean since less than 30% of hub participant households had ownership (shareholding) in the hubs and only about 20% were delivering milk to the hubs. Low production (i.e. having no surplus milk over and above the household consumption needs), dry cows (i.e. non-lactating cows), and alternative markets are the three main reasons offered by majority of dairy hub participants for not patronizing (i.e. selling milk through) the hubs.

Table 4: Selected household characteristic with regards to socio-capital dynamics

Selected household characteristics			Hub participants % of total sample (n=163)	Hub non- participants % of total sample (n=162)
Membership in dairy- related groups	Dairy hubs	% of households with members in dairy hubs	39.88	0
		% of households with more than one member in the hubs	9.20	0
		% of households with female members in dairy hubs	20.25	0
	DIGs	% of households with members in DIGs	70.55	3.70
		% of households with more than 1 member in DIGs	20.86	0.62
		% of households with female members in DIGs	36.81	0.62
	All (dairy hubs and DIGs) combined	% of households with members in dairy-related groups	85.89	0.04
		% of households with more than one member in dairy-related groups	22.70	0
		% of households with female members in dairy-related groups	58.90	0.62
Membership loyalty	% of households with elected leaders in dairy-related groups		7.36	0
	% of households with female elected leaders in dairy-related groups		4.29	0
	% of households with shareholding in EADD hubs		23.93	0
	Average value of shares (TZS) paid per household (n=39)		44743.59	0
	% of households delivering milk to the hubs		20.25	0
	Main reasons for not patronizing dairy hubs by delivering milk to dairy hubs		1. No surplus milk 2. Dry cows 3. Selling milk elsewhere: price	N/A

Note: The percentages are not additive across the rows or columns. Each percentage figure is a stand-alone estimate of the observations in that category out of the total observations (n), given in the title row. For instance, 85.89% of 163 households members in dairy-related groups implying that the remaining 14.11% of hub-participant household did not indicate having any households' members in dairy-related groups despite having been sampled from the hub membership lists.

3.1.3. Women's participation in non-dairy related groups

Table 5 presents results on women's participation in non-dairy-related groups. Results indicate that mutual help/insurance, religious and religious groups are the most patronized non-dairy-related groups by women. Women from hub participating households had relatively higher active participation in all the non-dairy related groups, except in civic groups where there was low but equal participation by both women in hub participating and non-participating households. For instance, while more than half (54%) of women from hub-participating households were active in mutual help groups, less than half (43%) of women from non-participating households indicated active participation in such groups. Among the group types with relatively high participation of women (i.e. mutual help/insurance, religious, and credit/microfinance), the percentage of women who felt that they could influence group decisions was highest for religious groups. However, it is mutual help/insurance groups that majority of women participants felt influenced life in the community.

Table 5: Women's participation in non-dairy related groups

Group type	Women hub participants			Women non-participants		
	% Active in groups (n=163)	% feeling the can influence group decisions	% feeling group influence life in community	% Active in groups (n=162)	% feeling they can influence group decisions	% feeling group influence life in community
Agriculture/livestock/fisheries	14.11	60.87 (n=23)	56.52 (n=23)	0.62	0.00 (n=1)	0.00 (n=1)
Water users	4.91	75.00 (n=8)	87.50 (n=8)	2.47	50.00 (n=4)	100.00 (n=4)
Forest users	1.23	100.00 (n=2)	50.00 (n=2)	0.62	0.00 (n=1)	0.00 (n=1)
Credit/microfinance	19.63	59.38 (n=32)	75.00 (n=32)	10.49	76.47 (n=17)	70.59 (n=17)
Mutual help/insurance	53.99	64.77 (n=88)	82.95 (n=88)	43.21	70.00 (n=70)	84.29 (n=70)
Trade and business	4.91	87.50 (n=8)	75.00 (n=8)	6.17	70.00 (n=10)	80.00 (n=10)
Civic	4.91	37.50 (n=8)	50.00 (n=8)	4.94	62.50 (n=8)	50.00 (n=8)
Religious	39.26	81.25 (n=64)	75.00 (n=64)	31.48	72.55 (n=51)	70.59 (n=51)

Considering that the sampling criteria was anchored around hub participation, it would be biased to compare the absolute levels of participation in dairy-related groups (Table 4) with participation in non-dairy related groups (Table 5), particularly for hub participants. Moreover, the type of data collected using the WEAI tool focused on active participation in non-dairy-related groups (Table 5) as opposed to membership (reported in Table 4). Consequently, no conclusive comparison can be made between women participation in dairy vs non-dairy related groups.

3.1.4. Gender and ownership of productive assets

All the households in the hub participation group owned agricultural land, but a few (1%) of the non-participants did not own land (Table 6). Ownership of dairy cows was generally low, half of hub-participating households own dairy animals while less than half (45%) of hub non-participating households own dairy animals. However, ownership of mixed dairy/beef cattle was higher in both groups of households. This is expected since the dairy production system in the study was dominated by dual-purpose (dairy/beef) cattle. Besides cattle, the most owned livestock species was poultry, being kept in more than 90% of all survey households. Generally, a higher proportion of hub-participant households compared to

non-participants kept each of the livestock species (i.e. large ruminants' dairy (cattle), large ruminants mixed (dairy and beef cattle), small ruminants, poultry and pigs). A similar pattern (of a higher proportion of hub-participant households owning assets) was observed in non-livestock assets, except fishpond/fishing equipment.

The proportion of women having joint or sole ownership of all the livestock species was higher in women from hub-participant households. Joint ownership by women was low in dairy cattle and small ruminants but was highest in poultry for women from both categories of hub-participation. For non-livestock assets, the proportion of women-reported joint/sole ownership was highest for housing/building, non-mechanized farm equipment, cell phones, small consumer durables and means of transportation but was lowest for mechanized farm equipment, large consumer durables, non-farm business equipment and non-agricultural land.

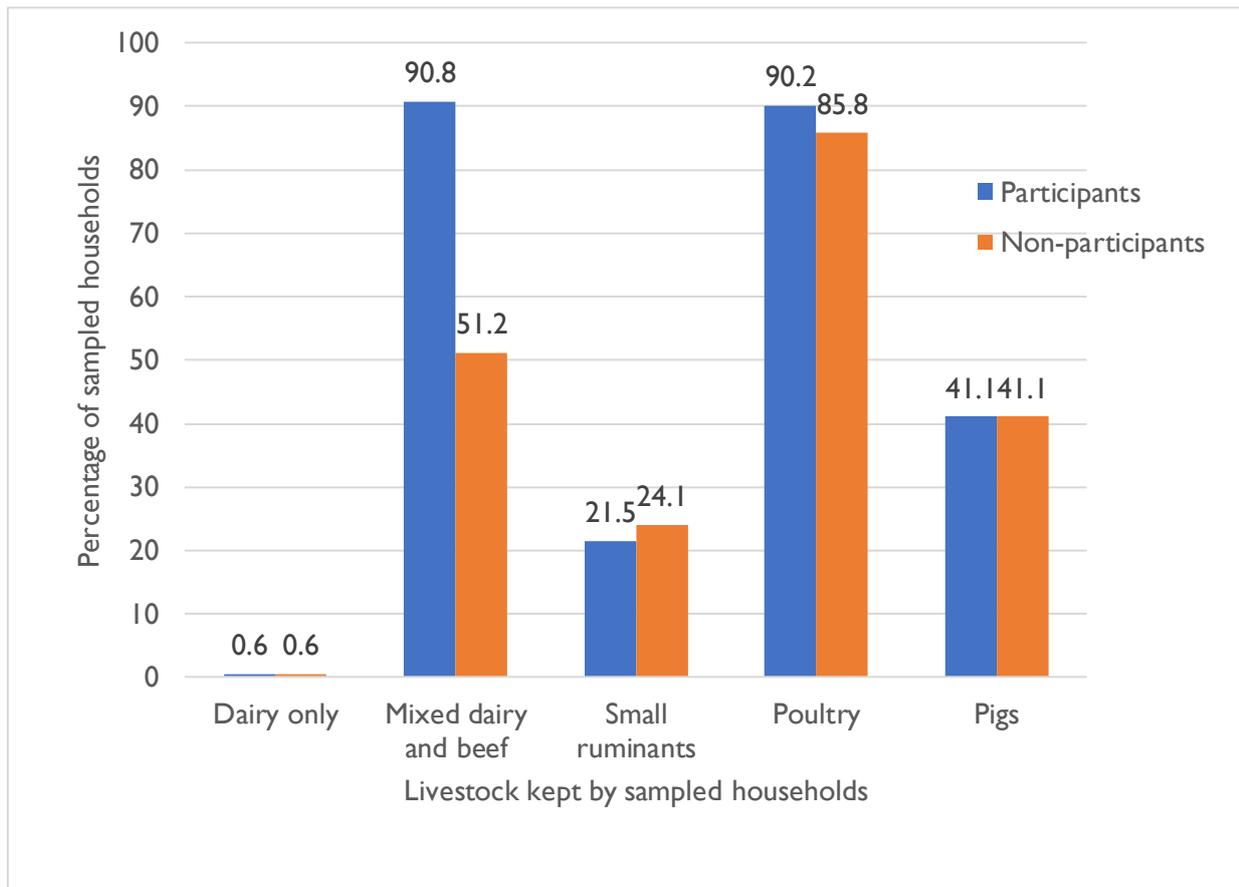
Table 6: Household and women's asset ownership

Asset type	Hub participants (n=163)		Non-participants (n=162)	
	Households owning (%)	Women with sole or joint ownership (%)	Households owning (%)	Women with sole or joint ownership (%)
Agricultural land	100.00	82.21 (n=163)	98.77	77.50 (n=160)
Dairy cattle	50.00	1.23 (n=81)	45.68	2.70 (n=74)
Mixed (beef/dairy) cattle	94.44	93.46 (n=153)	72.22	56.41 (n=117)
Small ruminants	53.09	38.37 (n=86)	58.64	36.84 (n=95)
Poultry	91.98	96.64 (n=149)	88.89	92.36 (n=144)
Pigs	49.38	60.40 (n=101)	44.44	57.27 (n=110)
Fish pond/equipment	62.35	7.50 (n=80)	67.90	2.78 (n=72)
Non-mechanized farm equipment (hand tools, animal-drawn plough)	85.80	98.56 (n=139)	81.48	93.94 (n=132)
Mechanized farm equipment (tractor-plough, power tiller, treadle pump)	46.91	5.26 (n=76)	44.44	0.00 (n=72)
Non-farm business equipment (solar panels used for recharging, sewing machine, brewing equipment, fryers)	59.88	36.08 (n=97)	51.23	27.71(n=83)
House/building	70.37	100.00 (n=114)	64.81	92.38 (n=105)
Large consumer durables (refrigerator, TV, sofa)	50.62	24.39 (n=82)	43.83	18.31 (n=71)
Small consumer durables (radio, cookware)	57.41	75.27 (n=93)	53.70	80.46 (n=87)
Cell phone	66.05	83.18 (n=107)	60.49	67.35 (n=98)
Non-agricultural land (pieces/plots, residential or commercial land)	55.56	25.56 (n=90)	48.77	11.39 (n=790)
Means of transportation (bicycle, motorcycle, car)	65.43	71.70 (n=106)	60.49	72.45 (n=98)

3.1.5. Gender and decision-making in cattle keeping

The livestock keeping status of households by type of livestock is presented in Figure 1. Results show that across the two household types (i.e. hub participant and non-participant), very few engaged in pure dairy farming (i.e. keeping dairy animals exclusively for milk production). Approximately all hub participant households (91%) kept mixed dairy and beef cattle compared to about half of hub non-participant households (51%). Other than cattle, the most common livestock across both categories of households was poultry with over 90% of hub-participants and 85% of hub non-participant households keeping poultry. Less than a quarter of both types of households keep small ruminants and almost 41% of both categories keep pigs.

Figure 1: Percentage of household keeping different types of livestock, by status of hub participation.



Further, Table 7 presents responses from female respondents in the study on selected livestock production decisions. The table shows percentages of households where the females indicated having participated in making the livestock production decisions and the level of input they perceived to have provided. The level of input was measured using a Likert scale format (i.e. on a scale from 'little to no input in decision-making' to 'decision solely made by the respondent'). The data in Table 7 shows that women were minimally involved in making major production decisions on cattle, with the exception of what to feed. In some milk consumption, and sales and income decisions, their participation was slightly above average. While women were minimally involved in making major production decisions on cattle, their input in these decisions was considerably large where they were involved.

Table 7: Livestock production decisions, by female respondents

Livestock production decisions on cattle		% of females participating in decision-making (n=231)		% of those participating in decision-making, having more input into ##	
		Hub participants	Hub non-participants	Hub participants	Hub non-participants
Feeding	What to feed	87 (n=148)	72 (n=83)	85 (n=129)	80 (n=60)
	What feed to grow	55 (n=148)	30.12 (n=83)	85 (n=82)	92 (n=25)
	Whether to purchase concentrates and supplements	67 (n=148)	46 (n=83)	85 (n=99)	86 (n=38)
Animal health	What preventive or curative health treatments to use	66 (n=148)	48 (n=83)	84 (n=97)	65 (n=40)
	Which animal to sell or slaughter?	31 (n=148)	19 (n=83)	80 (n=46)	88 (n=16)
Breeding	What breed(s) to rear?	24 (n=148)	23 (n=83)	97 (n=35)	84 (n=19)
	What breed-type for breeding animals are kept by the household (local, cross-bred, exotic)	28 (n=148)	19 (n=83)	95 (n=41)	75 (n=16)
	What breeding methods to use (own bull, bull from elsewhere, AI)	41 (n=148)	24 (n=83)	88 (n=60)	90 (n=20)
Milk consumption, sales and income	How much morning milk to put aside for household consumption?	66 (n=148)	40 (n=83)	93 (n=97)	90 (n=29)
	How much evening milk to put aside for household consumption?	59 (n=148)	24 (n=83)	97 (n=87)	95 (n=20)
	Where/whom to sell morning milk to (e.g. on farm-gate or to the cooperative)	49 (n=148)	22 (n=83)	96 (n=73)	83 (n=18)
	Where/whom to sell evening milk to (e.g. on farm-gate or to the cooperative)	43 (n=148)	17 (n=83)	95 (n=64)	93 (n=14)
	How to use income from sale of morning milk	66 (n=148)	25 (n=83)	93 (n=97)	90 (n=21)
	How to use income from sale of evening milk	53 (n=148)	17 (n=83)	97 (n=78)	100 (n=14)

Note: The percentages are not additive across the rows or columns. Each percentage figure is a stand-alone estimate of the observations in that category out of the total observations (n given in the parenthesis), for instance, 87% of 231 households participate in decisions on what to feed. ## If the respondent answered that she is involved, the next question was the extent of involvement. Consequently, the percentages reported here include those who answered: some to all the decisions as opposed to 'little to no involvement.'

In regard to cattle feeding and feeds decisions, the results in Table 7 reveal that women were considerably involved in deciding what to feed cattle but were not equally involved with men in decisions about what type of feeds to grow, which was important for EADD interventions to consider (i.e. who and how to target feed and forages interventions). Breeding decisions were the livestock production decisions on cattle that women were least involved in. This information was important for EADD interventions in terms of how to target breeding interventions (i.e. who and how to target breeding interventions).

Unlike in decisions on breeding, the results in Table 7 also reveal that women had some control on milk consumption, sales and income decisions, especially regarding sale of morning milk. This information was important for EADD interventions (i.e. who and how to target milk bulking and marketing interventions). Of great importance was the design of the dairy hub approach of bulking milk, particularly morning milk, and that consolidated earnings from milk sales were being paid to the household member who was registered in the hub. From Table 4 it is evident that women participation (membership) in dairy hubs as members was comparatively low. Moreover, as Table 4 shows, women in hub-participant households were found to have higher participation in decision-making regarding milk consumption (this may be related to the fact that these households have higher production levels). Consequently, it is possible that the dairy hub may be

making a woman's commodity (morning milk) financially lucrative for men leading to redistribution of incomes within households. Since women are largely involved in feeding cattle (an important production activity) and to a significant extent in decisions on milk consumption, they are likely not to patronize the hubs by increasing milk production (through feeding) and allocating more milk for sale to the hubs if the hub approach, by its design and implementation, reallocates revenues from milk sales from the control of women to that of men. Therefore, implementation of the hub approach may have significant gender implications that cannot be ignored when building sustainable dairy hubs (i.e. consequences of intra-household redistribution of incomes milk which would be similar to what was observed in Kenya. See Omondi et al. 2014).

This study also found that women participate, though at varied levels, in the decision-making on most of the livestock activities in their households. However, the results presented in Table 8 reveal that despite their participation, some of the women who participated in the specific decisions on livestock activities lacked access to important information that was key for day-to-day decision-making.

Table 8: Access to information necessary for livestock production

Livestock activity	Hub participants	Non-participants
	% with medium to high access to information	% with medium to high access to information
What to feed	54.26 (n=129)	50.00 (n=60)
What feed to grow	57.32 (n=82)	52.00 (n=25)
Whether to purchase supplements	51.52 (n=99)	39.47 (n=38)
What preventive or curative treatment to use	61.86 (n=97)	37.50 (n=40)
Which animals to sell or slaughter	39.13 (n=46)	50.00 (n=16)
How much of morning milk to sell or consume at home	65.98 (n=97)	48.28 (n=29)
How much of evening milk to sell or consume at home	66.67 (n=87)	45.00 (n=20)
What breeds to rear	65.71 (n=35)	52.63 (n=19)
What breed type for breeding animals are kept	58.54 (n=41)	37.50 (n=16)
Where or whom to sell morning milk to (e.g. farm gate or cooperative)	72.6 (n=73)	50.00 (n=18)
Where or whom to sell evening milk to (e.g. farm gate or cooperative)	73.44 (n=64)	50.00 (n=14)
Who takes milk to the selling point	59.49 (n=79)	31.58 (n=19)
How to use income from sale of morning milk	61.86 (n=97)	61.90 (n=21)
How to use income from sale of evening milk	65.38 (n=78)	71.43 (n=14)

3.1.6. Role in decision-making on non-livestock related production and income generation activities

Women also take part in non-livestock related decision-making activities. Table 9 presents results on the participation and the role of women in decision-making on aggregate activities around production and income generation of non-livestock related activities. Most women (in both hub participant and hub non-participant households) had input in decisions on staple crop farming regardless of household participation in hubs. There was, however, low participation by women in wage and salary activities, major household expenditure and non-farm activities. Almost all women participate in routine household expenditure, but rarely on major household expenditure.

Table 9: Role in decision-making on production and income

Activity	Hub participants			Non-participants		
	% who participate (n=163)	% with input in decisions (n=141)	% with input in decisions on income (n=149)	% who participate (n=162)	% with input in decisions (n=144)	% with input in decisions on income (n=140)
Staple crop farming	96.32	87.94 (n=141)	85.91 (n=149)	96.30	83.33 (n=144)	87.14 (n=140)
High-value crop farming	67.48	90.14 (n=71)	90.38 (n=104)	53.09	85.45 (n=55)	87.32 (n=71)
Fish pond culture	3.07	60.00 (n=5)	50.00 (n=4)	0.62	100 (n=1)	100 (n=1)
Non-farm activity	26.99	88.00 (n=25)	88.64 (n=44)	33.95	90.24 (n=41)	94.55 (n=55)
Wage and salary activity	11.04	92.86 (n=14)	88.89 (n=18)	9.26	100 (n=7)	86.67 (n=15)
Major household expenditure	22.09	80.56 (n=36)	-	17.90	71.43 (n=28)	-
Routine household expenditure	97.55	90.83 (n=109)	-	99.38	91.94 (n=124)	-

Note: The sections with '-' are where there was no decision to be made (i.e. there is no income decisions on expenditure items).

In terms of decision-making around consumption and access to information on non-dairy related activities, the results presented in Table 9 reveal that while the proportion of women who participated in decision-making on consumption of outputs from staple to high-value crop farming was very high, the proportion of women with access to information that could guide these decisions was slightly lower. This was also true for all other decisions, as is evident in Table 10, where the proportion of women who made the decisions or had high contributions to the decisions was higher than the proportion of those who felt that they had access to the information needed to make these decisions.

Table 10: Participation and role in decision-making on consumption and access to information

Activity	Hub participants			Non-participants		
	% with decision-making on quantity to consume	% with medium to high decision-making	% with medium to high access to information	% with decision-making on quantity to consume	% with medium to high decision-making	% with medium to high access to information
Staple crop farming	86.75 (n=151)	81.56 (n=141)	55.41 (n=157)	88.89 (n=144)	81.94 (n=144)	41.67 (n=156)
High-value crop farming	96.26 (n=107)	90.14 (n=71)	58.18 (n=110)	92.11 (n=76)	94.55 (n=76)	52.33 (n=86)
Fish pond culture	25.00 (n=4)	40.00 (n=5)	0.00 (n=5)	100 (n=1)	0 (n=1)	0 (n=1)
Non-farm activity	-	80.00 (n=25)	59.09 (n=44)	-	73.17 (n=41)	52.73 (n=55)
Wage and salary activity	-	71.43 (n=14)	55.56 (n=18)	-	57.14 (n=7)	66.67 (n=15)
Major household expenditure	-	77.78 (n=36)	47.22 (n=36)	-	82.14 (n=28)	48.28 (n=29)
Routine household expenditure	-	89.09 (n=110)	64.78 (n=159)	-	83.87 (n=124)	65.22 (n=161)

Note: The sections with '-' are where there was no decision to be made (i.e. there is no income decisions on expenditure items).

3.1.7. Access to, and decisions on, credit

One of the challenges that smallholder farmers face is in access to finance. Inadequate access to finance and insurance causes them to confine themselves to low-risk/low-yield crops and suboptimal inputs. This results in lower yield; makes their produce less competitive in the market and also increases the risk for other upstream value chain players due to low quality and uncertain supply (Tinsley and Agapitova 2018).

Lack of access to finance arguably limits smallholder's ability to invest in technologies and thus negatively affects productivity. Formal lending institutions view financing smallholders as a risky business. Other credit sources have come up to fill this gap, but the problem is still not addressed. The gap in agricultural finance is primarily due to perceived high credit risk in agricultural lending and incompatible financial products (Tinsley and Agapitova 2018). The results presented in Table 11 indicate that overall, higher proportions of hub-participant households, compared to their hub non-participant counterparts, accessed credit from all the types of sources except from friends and relatives, and formal lenders. Generally, access to credit across the two categories of households was low. However, the leading sources of credit for hub-participant households were informal saving/credit groups, friends and relatives, and group-based microfinance. For non-hub households, the leading sources of credit are friends and relative and informal credit/savings groups. Of the women who borrowed, very few (less than 30% for women in hub-participant households and less than 35% for women in hub non-participant households) had input in decisions to borrow from the various credit sources. Moreover, even after credit is obtained, a very small proportion of women (less than 25% in hub-participant households and 28% in hub non-participant households) had input in the decision on how the money was used.

Table 11: Access to and decisions on credit

Credit source	Women hub participants (n=163)				Women hub non-participants (n=162)			
	% who borrowed from this source	% with input in decisions to borrow	% with input in decisions on use	% who self-repay	% who borrowed from this source	% with input in decisions to borrow	% with input in decisions on use	% who self-repay
NGO	7.36	16.67 (n=12)	18.18 (n=11)	9.09 (n=11)	5.56	33.33 (n=9)	22.22 (n=9)	22.22 (n=9)
Formal lender	5.52	11.11 (n=9)	11.11 (n=9)	11.11 (n=9)	6.17	20.00 (n=10)	20.00 (n=10)	10.00 (n=10)
Informal lender	5.52	22.22 (n=9)	22.22 (n=9)	22.22 (n=9)	3.70	16.67 (n=6)	0.00 (n=6)	16.67 (n=6)
Friends/ relatives	22.09	19.44 (n=36)	15.15 (n=33)	14.29 (n=35)	28.40	15.22 (n=46)	15.56 (n=45)	13.33 (n=45)
Group-based microfinance	20.25	24.24 (n=33)	24.24 (n=33)	21.21 (n=33)	6.79	27.27 (n=11)	27.27 (n=11)	9.09 (n=11)
Informal credit/ saving groups	25.15	21.95 (n=41)	22.50 (n=40)	15.00 (n=40)	19.14	16.13 (n=31)	18.52 (n=27)	14.29 (n=28)

3.1.8. Physical mobility

Physical mobility is important for women empowerment since it allows them to seek opportunities that are outside of the home such as education, information and economic opportunities. Closer home, the ability to deliver milk to markets, attend training and other events where women can get information hinges upon market access, knowledge transfer and gender empowerment, which are the basic tenets of the EADD project. Attending hub or DIG meetings, training events and different gatherings are important avenues for women farmers to gather knowledge which can impact their productivity at farm level. However, beyond the production level, men dominate the milk value chain, limiting the opportunities for women to gain a voice in the leadership of producer organizations among other platforms. Consequently, physical mobility of women is a key element in not only increasing productivity (since women are not only involved in production as revealed in Tables 6 and 7) but also enhancing market access and hub sustainability, which are key EADD objectives.

Results in Table 12 indicate that less than 5% of women from across the two types of households self-decided to travel out of home to the various venues listed. Out of the ones who indicated that they have to seek permission in order to visit certain places, very few reported that the household head or any other household member objected to them travelling alone. However, for the even fewer that indicated they received objections to them travelling alone, majority (especially in hub-participant households) indicated that the objection prevented them from going alone. This implies that men are very key players in determining women's mobility (i.e. 95% of women do not decide on their own to travel out of their homes). However, these results also imply that men are not necessarily a stumbling block to women's mobility since very few of the women who sought permission from their husbands indicated receiving an objection to their intention to travel. This implication is key for any development agent supporting women empowerment in the study area (i.e. that men involvement in women empowerment activities is important but is not necessarily a hindrance to women's physical mobility).

Table 12: Physical mobility of women

Place	Hub participants			Non-participants (n=162)		
	% who self-decide to go (n=163)	% husband/household member objects to going alone	% objections prevent from going alone	% who self-decide to go (n=162)	% husband/household member objects to going alone	% objections prevent from going alone
Urban centre	3.07	1.69 (n=118)	50 (n=2)	0.62	5.74 (n=122)	20 (n=5)
Market	3.07	1.03 (n=97)	100 (n=1)	1.23	0 (n=94)	.
Visit family or relatives	3.07	2.61 (n=115)	100 (n=3)	0.62	4.67 (n=107)	25 (n=4)
Visit friends/neighbours	1.23	1.67 (n=60)	100 (n=1)	1.23	0 (n=53)	.
Hospital/clinic/doctor	0.61	1.02 (n=98)	100 (n=1)	0.62	1.06 (n=94)	0 (n=1)
Temple/church/mosque	0.61	0 (n=68)	.	0.62	0 (n=59)	.
Public village gathering	1.84	1 (n=100)	100 (n=1)	0.62	1.05 (n=95)	100
Training for NGO/programs	1.23	0.96 (n=104)	100 (n=1)	0.62	0 (n=96)	.
Outside your community/village	2.45	3.01 (n=133)	50 (n=4)	1.23	4.72 (n=127)	16.67

3.1.9. Autonomy in decision-making

As part of the variables that contribute to estimating the WEAI, this study collected data from women respondents in order to gauge their autonomy in making decisions on i) the types of crops to grow or raise for consumption and sale in market, ii) livestock keeping, iii) sale of crops or livestock/ livestock products, and iv) use income from agricultural and non-agricultural activities. From the results on the study (Table 13), majority of women from both groups (hub participants and non-participants) indicated high levels of autonomy in all the decisions. The results also show a consistent pattern of slightly higher proportion of women from households that participate in hubs being autonomous compared to their non-participant counterparts. Moreover, a relatively higher proportion of women indicated autonomy in use of income from agricultural and non-agricultural activities compared to other decisions.

Table 13: Autonomy in decision-making

Decision category	Description of autonomy levels	Hub participants (n=163)	Hub non- participants (n=162)
The types of crops to grow or raise for consumption and sale in market	Dependent on circumstances: Percentage of women who conform to their physical environment (i.e. cannot make autonomous decisions to grow crops that are not typically grown where they live)	28.22	32.1
	Dependent on instructions: Percentage of women who conform to other people's (family or close community) instructions (i.e. cannot make autonomous decisions to grow crops except what they are instructed to grow)	12.88	17.28
	Dependent on community expectations and approval: Percentage of women who conform to their community's expectation (i.e. cannot make autonomous decisions to grow crops other than what the community expects her to grow)	12.88	13.58
	Autonomous: Percentage of women who can make autonomous decisions to grow crops that they want to grow for consumption and sale in market and thinks are best for themselves and their families	87.73	84.57
Livestock raising	Dependent on circumstances: Percentage of women who conform to their physical environment (i.e. cannot make autonomous decisions to keep livestock types that are not typically kept where they live)	31.29	28.4
	Dependent on instructions: Percentage of women who conform to other people's (family or close community) instructions (i.e. cannot make autonomous decisions to keep livestock types and breeds except what they are instructed to keep)	11.66	16.05
	Dependent on community expectations and approval: Percentage of women who conform to community's expectation (i.e. cannot make autonomous decisions to keep livestock types or breeds other than what the community expects her to keep)	10.43	9.88
	Autonomous: Percentage of women who can make autonomous decisions to keep livestock types or breeds that they want to keep for consumption and sale in market and think are best for themselves and their families	88.34	85.19
Sale of crops or livestock/ livestock products	Dependent on circumstances: Percentage of women who conform to their physical environment (i.e. cannot make autonomous decisions how much on which product to take to the market because decision-making is dictated by what is available)	23.93	26.54
	Dependent on instructions: Percentage of women who conform to other people's (family or close community) instructions (i.e. cannot make autonomous decisions on how much or which product to take to the market but depends on instructions from other persons)	7.98	8.02
	Dependent on community expectations and approval: Percentage of women who conform to community's expectation (i.e. cannot make autonomous on how much or which product to take to the market)	8.59	8.64
	Percentage of women who can make autonomous decisions on which product to take to the market (i.e. depends on what they think is best for themselves and their families).	87.12	86.42

Decision category	Description of autonomy levels	Hub participants (n=163)	Hub non- participants (n=162)
Use income from agricultural and non-agricultural activities	Dependent on circumstances: Percentage of women who conform to their physical environment (i.e. cannot make autonomous decisions on how to use their income; decision-making is dictated by what is available by necessity).	41.1	38.89
	Dependent on instructions: Percentage of women who conform to other people's (family or close community) instructions (i.e. cannot make autonomous decisions on how to use their income)	9.82	10.49
	Dependent on community expectations and approval: Percentage of women who conform to community's expectation (i.e. cannot make autonomous decisions on how to use their income because they depend on community/ family expectation and approval)	12.88	13.58
	Autonomous: Percentage of women who can make autonomous decisions on how to use their income (i.e. depends on what they think is best for themselves and their families)	90.8	90.12

3.2 Women Empowerment in Agriculture Indices (WEAI)

From the data collected for this study, Table 14 presents the results of A-WEAI estimations, disaggregated by the hub participation status of interviewed households. The results reveal that majority of women (56.5% of the sample) were disempowered compared to 30% of men. In addition, women suffered greater intensity of disempowerment (33.7%) than men (31.3%). This resulted in a lower 5-DE empowerment index of women (0.810) compared to 0.906 for men. The overall WEAI was 0.829. Further, the analysis by hub participation revealed a similar pattern; where men were more empowered than women regardless of hub participation status. However, comparison of men by hub participation status showed that a lower proportion (22.15%) of men participating in hubs were disempowered compared to 37.7% in the non-participation group. Similarly, a lower proportion (55%) of women were disempowered compared to 57.8% of women hub non-participants.

Table 14: A-WEAI scores for households in EADD project sites in Tanzania

Index	Hub participants		Hub non-participants		All combined	
	Women	Men	Women	Men	Women	Men
% not achieving empowerment (1-H)	55	22.15	57.8	37.7	56.5	30.
Mean disempowerment score (1-5DE) for not yet empowered women (1-A)	32.3	30.7	35.0	31.6	33.7	31.3
Disempowerment score (1-5DE)	0.178	0.068	0.203	0.119	0.190	0.094
5DE Index (1-MO)	0.822	0.932	0.797	0.881	0.810	0.906
N	160	149	162	151	325	300
% of data used	98.2	100	96.9	100	92.3	100
% of women with no gender parity	47.9		40.0		44.0%	
Average empowerment gap	16.0		22.6		19.0%	
GPI	0.923		0.090		0.916	
WEAI	0.832		0.726		0.829	
Number of women in dual-adult households	146		145		291	

To increase empowerment among women, there is need to focus on the major sources of disempowerment for each category of hub participants. The results presented in Table 15 detail the composition of the 5DE index by dimension and indicator for hub participants while Table 16 gives the same composition for hub non-participants. From the two tables, it is evident that for both categories of women (hub participants and hub non-participants), access to and decisions on credit is the greatest source of disempowerment. Over half of all the women in both categories were not empowered and lacked access to, and decisions on, credit. For women in the hub participation group, workload, group membership and access to, and decision in, production followed in decreasing importance as contributors to disempowerment. On the other hand, for women in non-participating households, group membership, workload and decision-making were the next major sources of disempowerment in decreasing order (see also Figure 2 and Figure 3).

Table 15: A-WEAI scores: 5DE decomposed by dimension and indicator hub participants in EADD project sites in Tanzania

Sex of the respondent	Statistics	Production	Resources		Income	Leadership	Time
		Input in productive decisions	Ownership of assets	Access to and decisions on credit	Control over use of income	Group member	Workload
Women	Indicator weight	0.20	0.13	0.07	0.20	0.20	0.20
	Censored headcount	0.100	0.119	0.519	0.031	0.163	0.344
	% contribution	11.2	8.9	19.4	3.5	18.3	38.6
Men	Censored headcount	0.000	0.007	0.221	0.000	0.074	0.188
	% contribution	0.00	1.3	21.7	0.00	21.7	55.3

Table 16: A-WEAI scores: 5DE decomposed by dimension and indicator hub non-participants in EADD project sites in Tanzania

Sex of the respondent	Statistics	Production	Resources		Income	Leadership	Time
		Input in productive decisions	Ownership of assets	Access to and decisions on credit	Control over use of income	Group member	Workload
Women	Indicator weight	0.20	0.13	0.07	0.20	0.20	0.20
	Censored headcount	0.146	0.115	0.535	0.025	0.306	0.280
	% contribution	14.5	7.5	17.6	2.5	30.2	27.7
Men	Censored headcount	0.007	0.013	0.371	0.007	0.258	0.192
	% contribution	1.1	1.5	20.7	1.1	43.3	32.2

Figure 2: Contribution of each indicator to disempowerment of hub participants.

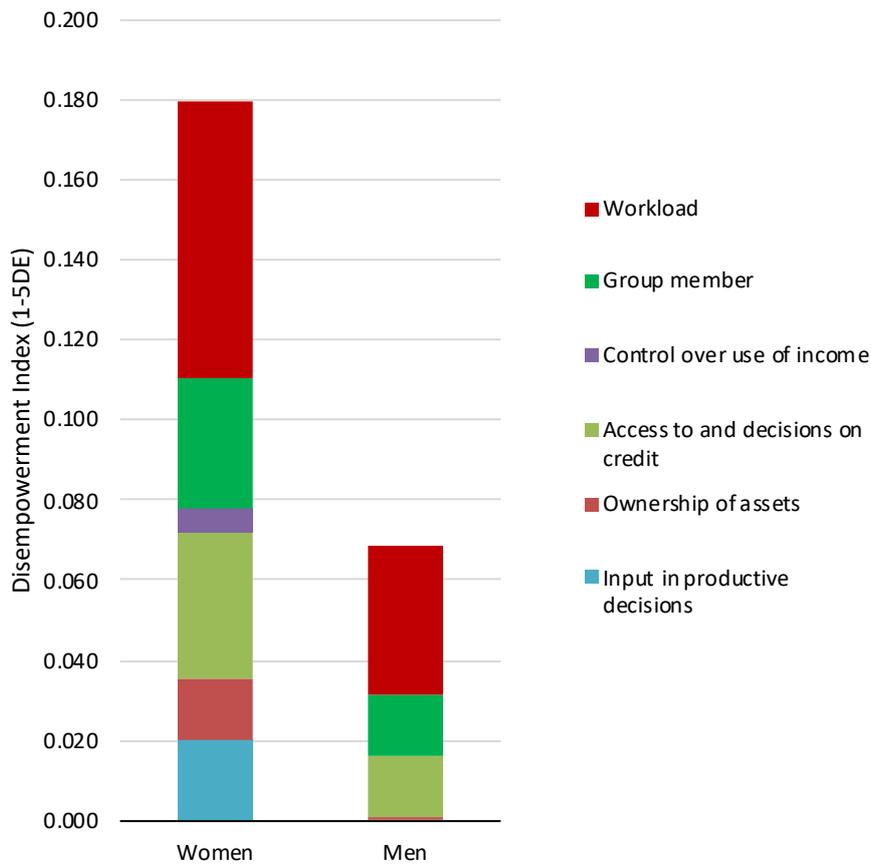
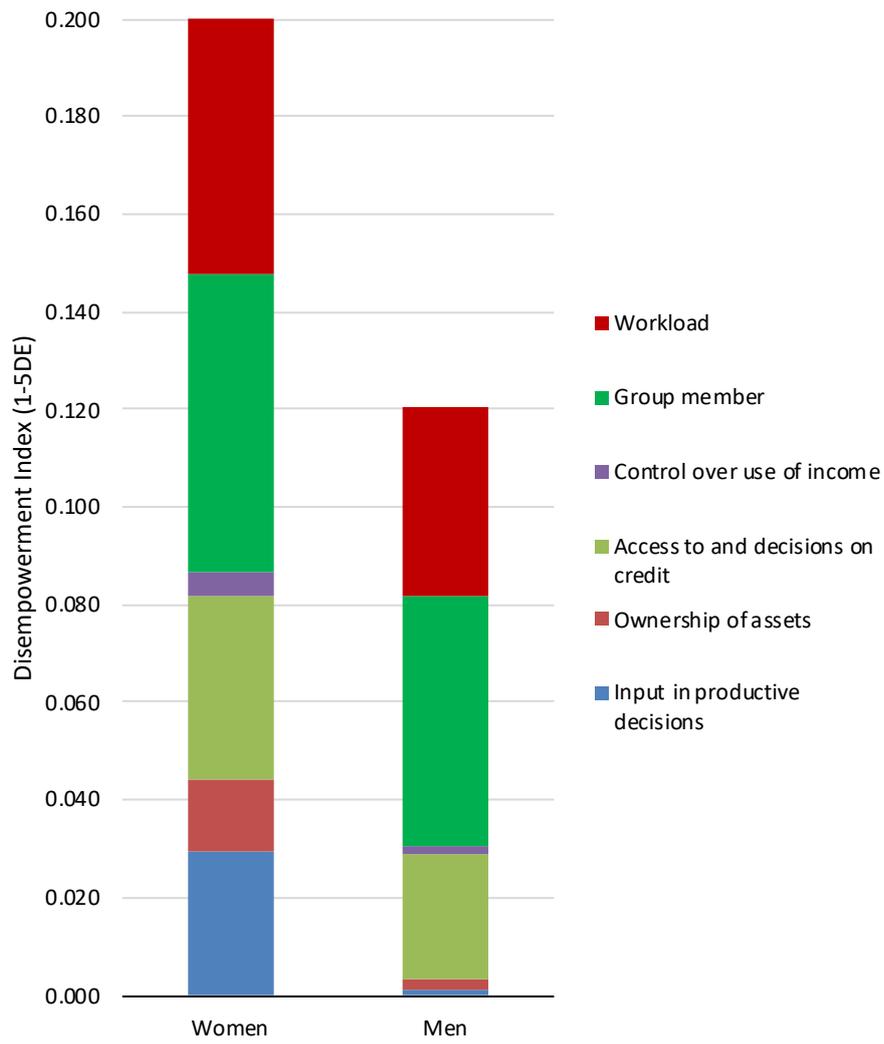


Figure 3: Contribution of each indicator to disempowerment of hub non-participants.



4 Conclusion

A key observation from this study is the need for intensified efforts to reach more female farmers within households when implementing the dairy hub approach. This is paramount because, among surveyed households who were hub participants, only one fifth had a woman member of the hub and about a third had a woman member of a DIG group. Yet women were more involved in decisions with respect to feeding practices and milk consumption, which are the key production and marketing decisions that underpin the core goal of the dairy hub approach. Moreover, their participation remained low for other livestock-related decisions, and particularly for animal sale and breeding. Women decision-making power was even lower in households that were not members of hubs, although it is not possible to attribute the entire difference to the participation in hubs, since the two types of households (those participating in hubs and those who are not) were quite different.

Another key observation from this study is that throughout the analysis and discussions, the study revealed that hub participants were i) significantly more economically endowed (kept more cattle and produce more milk), compared to their non-participant counterparts, and ii) comparatively more engaged in non-dairy related groups. Moreover, comparatively more of the main women in hub-participant households participated in decision-making regarding production, consumption and household income. More of these women were confident that they had access to information that was necessary to make these decisions. The women also showed comparatively higher proportions of autonomy in decision-making compared to their non-participant counterparts. To cap all these, is that hub participant households had a higher estimated WEAI and a higher percentage of women with no gender parity, compared to their non-participant counterparts. These findings lead to the conclusion that hub participants had generally a higher gender outlook. However, the question of whether or not participation in hubs contributed to this outlook cannot be answered from these results. A follow-up study is necessary to draw out attribution of the final outcomes at the end of the project's implementation period.

4.1 Dissemination of study results

The EADD project conducted its farmer mobilization using the Social Capital Development (SCD) approach. Using this approach, the farmers were organized into dairy interest groups (DIGs). The project's gender officers worked closely with the communities through these groups and also through the main producer organizations attached to these groups. The best avenues to disseminate the results of this research is through the use of SCD structures, by the gender officers, to inform the communities and also through feedback meetings with producers.

5 Implications of the study

The study provides a clear understanding of the relative status of men and women in household families participating or living within the EADD project sites in Tanzania. It details the socio-demographic characteristics of these households, highlighting participation in groups (social capital), ownership and decision-making on household assets, physical mobility and autonomy in decision-making, generally focusing on women, who the study found to be less empowered compared to their male counterparts. The information revealed in this study provided a strong basis for EADD project to review its gender strategy in Tanzania and to align it with the status of the target households.

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