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THE GENDERED IMPACTS OF AGRICULTURAL ASSET TRANSFER PROJECTS:

Lessons from the Manica Smallholder Dairy Development Program

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ABSTRACT

This paper looks at the gendered impacts of a development project that provided improved dairy cattle and training as part of a broader effort to develop a smallholder-friendly, market-oriented dairy value chain in Manica province, Mozambique. The project targeted households, registered cows in the name of the household head, and, initially, trained registered cow owners in various aspects of dairy production and marketing. Subsequently training was expanded to two members per household to increase the capacity within households to care for cows, a change which resulted in a significant number of women being trained. Using qualitative and quantitative data on dairy production and consumption and on gendered control over income and assets, the paper explores how men and women participated in and benefited from the project. We find that despite being registered to men, in practice dairy cattle are in some cases viewed as jointly owned by men and women. Beneficiary households dramatically increased dairy production and income, with men, women, and children all contributing labor. Women's incentives for participation in dairy are less clear. Despite their recognized rights and responsibilities related to dairy cow management, women exercise relatively little control over milk and milk income as compared to men. Various explanations related to monetary and nonmonetary benefits of MSDDP and dairying for women are explored, along with their implications for women's level of effort and overall project outcomes.

Keywords: gender, assets, dairy development, property rights, mixed methods

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THE GENDERED IMPACTS OF AGRICULTURAL ASSET TRANSFER PROJECTS:

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1. INTRODUCTION

Many agricultural development interventions distribute assets and build skills with the intention of improving the welfare of poor farming households. Such interventions often use the household as the unit of analysis for identifying their intended beneficiaries. In practice, however, assets and skills are rarely transferred to households but rather to individuals within households. While the expectation is that simply having an asset in the household will benefit all members, there is strong evidence that household members do not necessarily pool their resources towards the achievement of shared goals (Haddad, Hoddinott, and Alderman 1997). Rather, individuals within households often have different preferences for how they would like to see their own and household resources used, and the final outcome is often negotiated, based in part of how asset ownership is defined and distributed (Doss 2006; Manser and Brown 1980).

Projects that define beneficiaries as households rather than individuals are often referred to as “gender-blind.” While such projects do not explicitly target men or seek to benefit them disproportionately, that outcome often results. One way this happens is when the point of contact between the project and the household is the household head, usually a man. Where more than one household member participates in the project—for example, attending project events or taking up the activities that the project is promoting—the costs of participation may be distributed unequally among household members, and not necessarily in line with how benefits are distributed. The determinants of how benefits and costs of projects are distributed are complex, and depend on culturally defined gender roles, how property rights are defined in the law and in practice, and on the characteristics of households and individuals. Failure to consider how benefits and costs will be distributed when projects are designed, implemented, and evaluated could lead to inaccurate or incomplete estimates of net benefits, especially for key beneficiary groups like women and children.

The Manica Smallholder Dairy Development program (MSDDP) was a gender-blind intervention that targeted households, distributed dairy cows to household heads, and trained household members in dairy-related production and marketing. Because two individuals per household were ultimately trained, in many cases both a man and a woman in a household received training. The purpose of this study is to identify and understand the gendered impacts of this gender-blind intervention, in particular on women’s control of dairy income and ownership of assets. This study uses quantitative and qualitative methods to document local gender roles and

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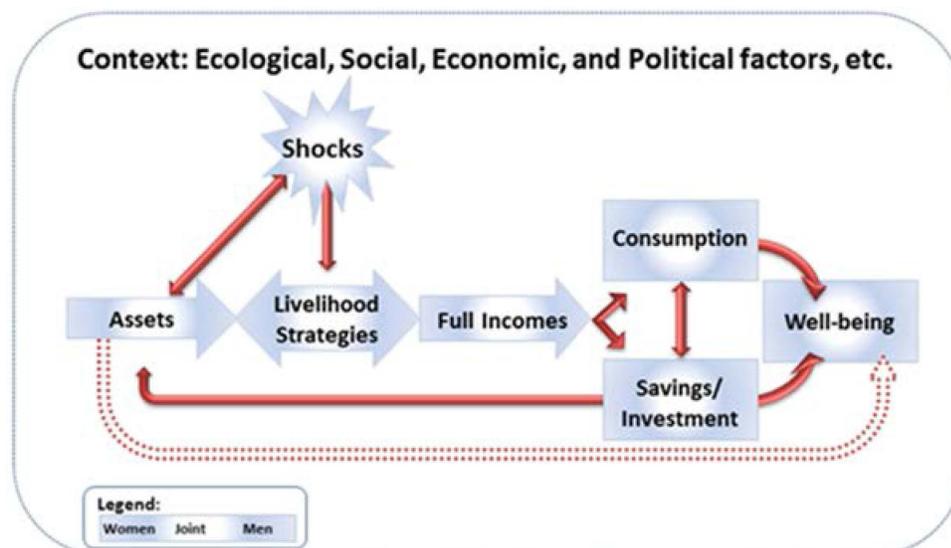
norms around dairy production and asset ownership, and to explore how men, women, and children in beneficiary households participated in, perceived, and benefitted from the project activities.

The following section describes the conceptual framework for the analysis based on the role of assets in agricultural development projects. Section 3 describes the Mozambique dairy sector and the MSDDP. Section 4 explains how and where data were collected. Section 5 describes men's and women's participation in the MSDDP. Section 6 looks at the impacts of the program on household milk production, consumption, and sales. Section 7 analyzes the gendered control over dairy income and how it influences expenditure and investment patterns of women and men. The paper concludes by summarizing the results and their implications for programs and for research.

2. GENDER, ASSETS AND AGRICULTURAL DEVELOPMENT

A growing body of evidence documents the gender gap in asset ownership, with men owning more assets and assets of higher value than women (Doss, Grown, and Deere 2008; Doss et al. 2011; FAO 2009; FAO 2011). The causes and consequences of this gap are diverse, and a focus of ongoing research. In the context of agricultural development programs, Meinzen-Dick et al. (2011) identify the main pathways through which assets can shape and be shaped by livelihoods strategies (Figure 1), and how they might vary depending on who owns the asset (shading of boxes in Figure 1). Ownership of or access to assets can influence the livelihood strategies available to individuals and households. For example, access to land may be necessary to engage in crop farming. Less obvious is that access to land may also be necessary for keeping livestock because even if animals are kept in stalls rather than grazed, they require feed that must be grown, gathered, or purchased. Human capital in the form of education or specialized skills may also be required for some livelihood strategies. Access to large social networks may be an advantage for some livelihood strategies. Men and women in a household may engage in joint livelihood strategies, or they may pursue strategies individually depending on the resources available to them. To the extent that men and women have access to different types and quantities of assets, their options in terms of livelihood strategies will be different.

Figure 1: Schematic representation of a gendered livelihood conceptual framework



Source: Meinzen-Dick et al. 2011

The full income—cash income plus the value of home production and leisure time—that results from these livelihood strategies determines what households have available for consumption and reinvestment. Whether the income is controlled by men or women may affect how it is spent, with implications for development outcomes (Haddad, Hoddinott, and Alderman 1997; Lundberg, Pollack, and Wales 1997). Through its effect on livelihoods strategies and on bargaining power of individuals in intrahousehold negotiations, ownership of assets is often a determinant of who controls the income and how it is spent (Doss 2006; Quisumbing and Maluccio 2003; Thomas, Contreras, and Frankenberg 2002).

Knowing who owns an asset may seem straightforward, however there are often different types of rights—often referred to as bundles of rights—that individuals and communities can have over an asset, and different people may hold different types of rights over the same asset. Rights are often divided into two main types: use rights and control or decision rights (Meinzen-Dick, Pradhan, and de Gregorio 2004). Differences between use and decision rights will vary by the type of resource or asset; some examples include the right to milk a cow (use right) versus the right to sell the cow (control right), or the right to fish from a pond (use) versus the right to fence the pond and prevent others from using it (control). State and customary patrimonial laws and gendered institutions in rural areas of developing countries often create complex systems of determining ownership, control, use, and disposition of productive assets (Fafchamps and Quisumbing 2002; Mabsout and van Staveren 2010).

Ownership of livestock in developing countries reflects complexities of both gender and property rights. There is a tendency for men to own large livestock such as cattle while women own small livestock such as chickens, pigs, and goats (Dillon and Quinones 2010; Doss et al. 2011; FAO 2009; FAO 2011; Kristjanson et al. 2010). While women may be able to sell a chicken without permission but not a

cow, women are often responsible for milking cows and therefore have some control over milk and milk income (Valdivia 2001). The extent to which women can control the income from milk rather than just the milk itself is a critical issue that affects whether women benefit from expansion of market access (Huss-Ashmore 1996; Njuki et al. 2011a; Njuki et al. 2011c; Thomas-Slayter and Bhatt 1994; von Braun and Webb 1989). Even where women's control is acknowledged, however, it can also be contested. In their study in northern Kenya, McPeak and Doss (2006) reported that although dairy production within the Gabra nomadic pastoral community was characterized by gender and age, men used migration decisions—where to move the herd in search of pasture—to limit their wives' ability to market the milk, resulting in more milk available for the calves and less income for the women.

Agricultural development programs tend to influence assets in two main ways. They can increase the stock of assets, for example by distributing land, livestock, or agricultural equipment, or improving human or social capital. Agricultural projects can also change the returns to existing stocks of productive assets by making available improved technologies such as seeds, improved fodder and feed, or fertilizers. Gender is likely to be important in both of these avenues. How and to whom the rights to distributed assets are assigned, whose assets see greatest returns from improved technologies, and who controls how those returns are used will ultimately influence who in the households benefits from the intervention and how much.

3. THE MANICA SMALLHOLDER DAIRY DEVELOPMENT PROGRAM

In 2000, the total national cattle herd in Mozambique numbered over half a million head, but fewer than two thousand were exotic dairy cows or crosses (Ministry of Agriculture 2010). The dairy industry in Mozambique is virtually nonexistent, due in part to the unfavorable agroecological conditions but also to other factors such as the country's long civil war. Milk production was lower in 2006 (68,800 tons) than it was in 1980 (71,500 tons) (Zvomuya 2009). As a result, the country depends almost entirely on imported milk from South Africa and Europe, estimated to be about 120,000 liters a day. The average Mozambican consumes 5.7 liters of milk annually, down 63 percent from 9.1 liters in 1990, well below the world average of about 79 liters (Zvomuya 2009).

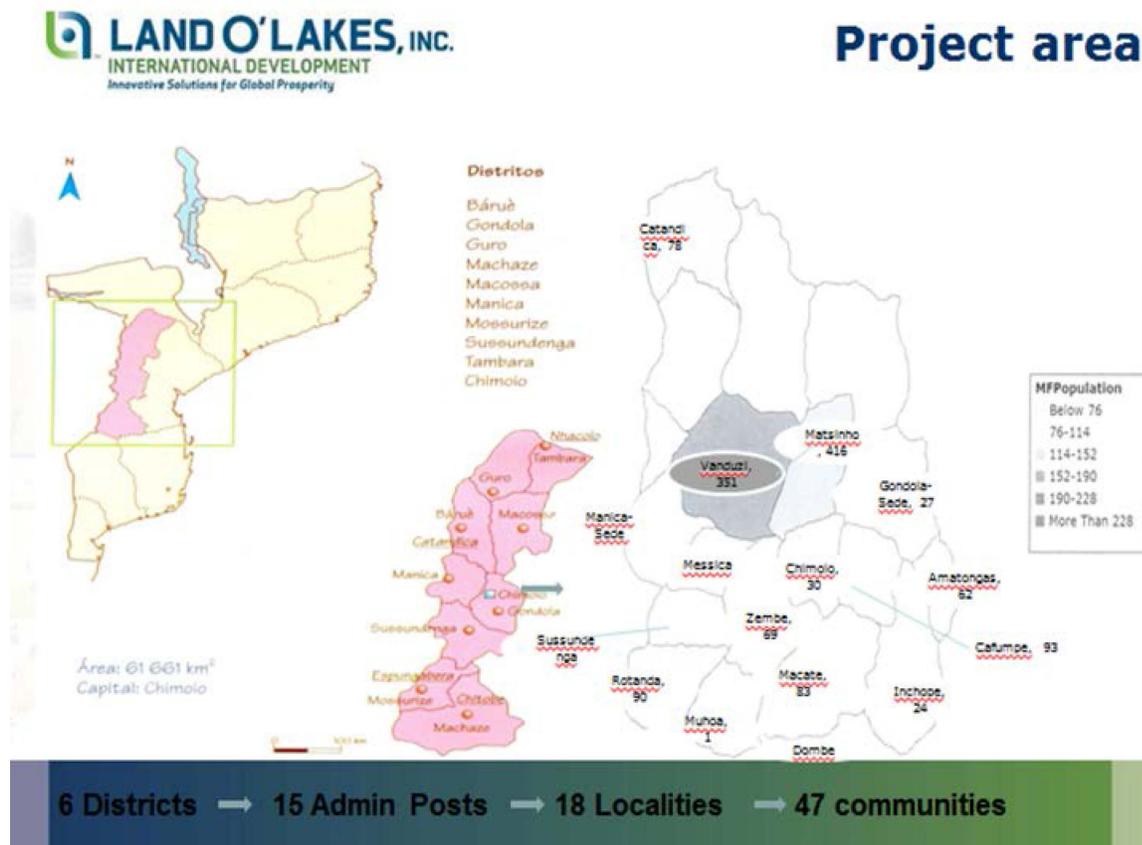
In July 2008, Land O'Lakes International Development was awarded a Food for Progress Program by United States Department of Agriculture (USDA) to implement a 42-month smallholder dairy development program in Manica province in central Mozambique. One objective of the program was to rebuild the country's dairy herd in a way that would integrate smallholder farmers into in the dairy value chain.² Participants in the MSDDP received an improved dairy cow, training in fodder crop and pasture management and animal husbandry, and assistance to establish producer-level cooperatives and milk collection centers to assure that milk

² The larger program included both the dairy component and a crop production component focused on animal traction. The components were implemented by different organizations and occurred in different parts of Manica province. This evaluation focuses only on the dairy component, which was conducted in a specific part of the province that is appropriate for dairy development.

produced by smallholders enters a cold chain and is handled properly to maintain quality. In total, the MSDDP distributed 500 cows.

The dairy zone of Manica lies within a 50 km radius of Chimoio, the capital of Manica province, and includes the administrative posts of Amatongas, Gondola-Sede, Matsinho, and Zembe in Gondola district and Vanduzi in Manica district (Figure 2). Any household in the project area that fulfilled the project pre-qualifying conditions was encouraged to participate. The conditions included the commitment of at least two household members to attend all the prescribed trainings, possession of adequate access to land and water, proximity to a milk collection center (MCC), active participation in a community group or cooperative, and the planting of pasture and fodder crops prior to receiving the dairy cow.

Figure 2: Map of project sites



Source: Land O' Lakes

Two members of each household were required to participate in trainings. Trainees were issued with a certificate after completing 75 percent of the modules. Once both trainees in a household were certified, the household was given an in-calf (4–6 months pregnant) heifer. If the cow gave birth to a female calf, the owner was obligated to pass it on to the project when it was 18 months old so that it could be given to another household.

Initially, only one member of each household was required to complete the training before receiving a heifer, however project staff observed that some of the cows that had been distributed to households were not being cared for properly. They also observed that while the majority of the trainees were men, women were responsible for many aspects of caring for the cow. The project had implicitly assumed that men would share the knowledge gained in the trainings with other household members. One explanation for the observed poor management of the cows was that this was not happening. As a result, in mid-2010 the project amended the rules of participation to require that two members of each household participate in order to ensure that there was more capacity within households to care for the cow. In many households, these were usually a man and a woman.

4. DATA USED IN THE STUDY

Quantitative and qualitative methods were used to analyze the role of gender in the MSDDP. The quantitative data were compiled from household surveys administered by Land O’ Lakes in 2011 and 2012 that gathered household-level data on dairy production and food security and sex-disaggregated data on household demographics, asset ownership, and agricultural labor. Households were drawn from a random sample selected as part of a baseline survey in 2009. The baseline sample included households that ultimately became beneficiaries as well as households that did not because they did not meet the project participation criteria described above. Because beneficiary households met the criteria and non-beneficiary household did not, they did not constitute a comparable sample of participants and non-participants. Therefore, the analysis focused only on beneficiary households. The dataset contains 125 households surveyed in 2011 and 150 surveyed in 2012. Ninety-eight households were in both survey rounds so the total number of unique beneficiary households is 193. All of the households reside in Manica province with about 50 percent of households in Manica district and 50 percent in Gondola district. Table 1 provides descriptive statistics on household asset, demographic, and program participation variables.

Table 1: Distribution of trainees by category and relationship to household head (percent)

	First trainee	Second trainee
Husband/hh head	66	4
Spouse	4	63
Father	9	1
Mother	10	0
Daughter	0	6
Son	1	14
Other	10	12
	100	100

Source: Land O’Lakes monitoring data

At the time of the 2011 survey, 80 percent of surveyed households had received cows from the program. By 2012, all households had received cows. The 2011 data permit comparison of recipients to non-recipients, and in both data sets we can look for effects of having had the cow for a longer period of time. However whether and when a household received a cow is at least partly endogenous. Some of the delays were due to MSDDP decisions and to how quickly calves became available, however households could influence how quickly their trainees graduated from the training program and thus became eligible. The same household characteristics that influenced these decisions are likely to be associated with outcomes such as agricultural productivity, income or food security. Our inability to control completely for this endogeneity limits the usefulness of these data for a rigorous impact evaluation, however we can use the data to explore how the MSDDP both influences and is influenced by gender relations and gendered access to assets.

To better understand how local perceptions related to assets ownership and MSDDP, focus group discussions (FGDs) were conducted within communities where the dairy intervention took place. Groups were single sex (either all men or all women) and were broken down by geographic location and whether or not households had received their dairy cows through the program. In total, 14 FGDs—seven all men and seven all women—were conducted in 2011. Ten groups had received cows and four were still waiting; the number of participants per groups ranged between 5 and 13. In March 2013, another two FGDs were conducted with women and men separately at the Vanduzi milk collection center in Manica district. This second set of FGDs was designed to explore specific issues identified during quantitative evaluation. Topics included training, labor and labor substitution, beneficiaries' interest in continuing dairy farming, milk consumption and dairy income management, milk marketing and income use, bull calf marketing, and income use.

Qualitative data collection tools were translated from English to Portuguese, and enumerators/FGD facilitators trained in Portuguese. The enumerators/facilitators/recorders then translated the questions in Portuguese to one of the local languages (Tchimanika, Chiute or Shona) and then recorded the responses in Portuguese. These responses were then translated to English.

5. PARTICIPATION OF MEN AND WOMEN IN THE MSDDP

Training

As mentioned above, the initial program plan called for training only one person in the household, usually the man. Many households appeared to be having difficulty taking care of their cows, and it was felt that this was due to the fact that improved dairy cattle are management-intensive, and training only one person did not ensure that there was sufficient capacity within the household to provide proper care for the cow. The program staff made a decision to train one other person from each household. Program staff also observed that women were playing an important role in caring for the cows, and that involving them in the training could be beneficial to the household. It was, however, not a requirement that the second trainee be a woman. According to program staff and FGD participants, it was left up to the

household members to agree among themselves who would be the “secondary” trainee. The most common outcome was that the household head and spouse were trained, but other family members such as parents or children were also sometimes the registered trainees (Table 1).

As a result of this change in the rules of participation, over 60 percent of project households (60 percent in 2011 survey and 68 percent in 2012 survey) had a woman trained. Direct engagement of women in program activities can be empowering as opposed to reinforcing the secondary role of women by assuming that when men were trained, they would pass on the information and skills to women. A study on intensification of dairy in the Kenyan coast found that where women in male-headed households were the contact farmers with extension agents, they reported greater access to and autonomy over household resources and decision making (Mullins et al. 1996). Unfortunately given how trainees were chosen in MSDDP, it would be difficult to determine whether women were more empowered because they were trained or were trained because they were more empowered.

To understand better why some households chose to select women as trainees, we ran several regression models in order to investigate the drivers of households having female trainees (Table 2). Only the baseline asset index is significant, though the size of the impact is negligible. Household with more assets are less likely to have a woman as a trainee.

Table 2: Determinants of whether a household had a female trainee

	<i>Female trainee</i>		
	Linear probability model	Probit	Logit
Household size	0.0182 (0.0123)	0.0517 (0.0363)	0.0860 (0.0620)
Number of children (<12 yrs.) in HH	-0.0098 (0.0235)	-0.0269 (0.0679)	-0.0453 (0.1118)
Sex of household head	-0.0941 (0.1889)	-0.3120 (0.6484)	-0.4967 (1.1300)
Average yrs. of education for females over 12 yrs. of age	0.0078 (0.0144)	0.0241 (0.0401)	0.0364 (0.0657)
Baseline asset index (2009)	-0.0015** (0.0007)	-0.0040* (0.0020)	-0.0065* (0.0034)
Constant	0.6510*** (0.2380)	0.4206 (0.7642)	0.6715 (1.3272)
Observations	144	144	144
Standard errors in parentheses			
="* p<0.10 ** p<0.05 *** p<0.01"			

Source: data from 2012 household survey

Where a beneficiary household—one that completed training and received a cow—had a female trainee is influenced not only by whether the households initially selected a woman, but also by whether both members successfully completed the training. According to FGD participants female trainees generally lagged behind male trainees, and more women dropped out than men. The reason given for the higher dropout rate among some women was that their farms were far from settlements where community activities such as trainings take place. This suggests that the household geographical location, specifically proximity to the nearest town or community center, is likely to be an important determinant of whether a beneficiary household had a female trainee.

Distribution of cows

Households that met the project conditions received a Jersey cow. Cows were registered to the household head, which means that in over 90 percent of surveyed households the cow was registered to a man. The implicit assumption in this allocation was that cattle belonged to men. FGD participants confirmed that according to local custom cattle are owned by men. The quantitative survey results, however, showed that only 52 percent of cattle were reported to be owned exclusively by men in 2009 when the project began (Table 3, column 1).³ Women exclusively owned only 15 percent, but 43 percent of cattle were reported as owned jointly by men and women. While men own a larger share of all types of household assets than women, these data suggest that women have significant ownership rights in nearly all asset categories.

Table 3: Asset summary statistics: baseline (2009) versus 2012

Asset	2009	2012
Acres of land owned	3.02 (4.27)	3.88* (4.37)
Proportion of land male owned	0.52 (0.46)	0.50 (0.46)
Proportion of land female owned	0.26 (0.40)	0.20 (0.35)
Proportion of land jointly owned	0.22 (0.40)	0.30 (0.44)
Number of cattle owned	3.53 (4.81)	3.93 (4.25)
Proportion of cattle male owned	0.42 (.44)	0.44 (.45)
Proportion of cattle female owned	0.15 (.32)	0.13 (.29)
Proportion of cattle jointly owned	0.43 (.45)	0.43 (.46)

³ We estimated baseline (2009) asset ownership using recall questions in the 2011 and 2012 surveys that ask how many of the currently owned assets had been acquired since 2009 and how many had been lost/sold/given away, and by whom, since 2009.

Asset	2009	2012
Number of local cattle owned	2.53 (4.72)	2.39 (4.03)
Number of crossbreed owned	0.02 (.18)	0.05 (.24)
Number of exotic owned	1.05 (1.28)	1.49*** (1.31)
Total household physical assets not including land or livestock (value of index ⁺)	39.87 (54.82)	43.21 (56.28)
Domestic assets (value of index ⁺)	11.07 (11.79)	11.89 (12.12)
Proportion of male domestic assets	0.38 (.37)	0.42 (.35)
Proportion of female domestic assets	0.16 (.24)	0.15 (.24)
Proportion of jointly owned domestic assets	0.46 (.40)	0.43 (.39)
Transportation assets (value of index ⁺)	19.43 (43.01)	21.39 (43.42)
Proportion of male transportation assets	0.66 (.46)	0.67 (.45)
Proportion of female transportation assets	0.02 (.12)	0.03 (.17)
Proportion of jointly owned transportation assets	0.32 (.45)	0.29 (.43)
Production assets (value of index ⁺)	9.38 (9.85)	9.94 (10.11)
Proportion of male production assets	0.16 (.31)	0.19 (.32)
Proportion of female production assets	0.11 (.26)	0.10 (.26)
Proportion of jointly owned production assets	0.73 (.38)	0.71 (.39)
Observations	150	150

+ The asset index assigns weights to various household assets and creates an index based on the combined assets. See Njuki et al. (2011b) for description of asset weights.
Asterisks indicate difference between 2009 and 2012; * p<0.10, ** p<0.05, *** p<0.01"

Source: Data from 2012 household survey

To better understand how asset ownership is defined and understood in the project area, focus groups were asked about what it means for men and women to own assets individually and jointly. The discussion started broadly talking about all assets, and then narrowed to focus on cattle. In response to the question on what it means for a man or a woman to own an asset, both men's and women's groups generally responded that ownership means the ability to utilize the asset at any time without having to ask permission. In the Vanduzi FGD, a man indicated that "when I am away a woman cannot lend an axe without asking me." When asked

whether the same was true about plates, the man answered “no, plates belong to women so they can lend them out without asking for permission.” Most of the men in the group agreed with this view. This implies a type of right that goes beyond use—lending is a type of control right—and also that some types of assets are owned by women and others by men.

Some of the men participants indicated women could own assets acquired from another marriage, implying that ownership can depend not just on the type of asset but also how and when it was acquired. It may also depend on how the previous marriage ended. In one group, a majority of the participants said all assets belong to men because women can’t take any assets with them in case of a divorce.

Responding to a question on what it means to own an asset jointly, most men said all assets that benefited everyone were jointly owned. Such assets were used without asking for anybody’s permission, for example domestic assets such as the house, furniture and dishes. In five groups, most of the women said they considered assets to be jointly owned when all household members used them and cared for them. These comments suggest a situation where use rights could be joint even when decision rights are not. This seems likely to occur where assets are used regularly by household members to the extent that it would be impractical to repeatedly ask permission.

Before presenting the results about ownership of MSDDP cows, it is useful to discuss the meaning of use rights and ownership rights for dairy cattle. Use rights relate to use of the milk or other outputs (such as manure) from the cow while decision rights relate to management (housing, feeding, preventing and treating disease), breeding, or alienation (sale or gift) of the cow itself. A distinction is often made between personal use of the outputs of an asset (use rights) and commercial use (usufruct rights). This is likely to be important in the context of market-oriented dairying.

When asked specifically about ownership of the MSDDP cows, most of the male focus group participants emphasized that men owned the cows in male-headed households and women owned them in female-headed households. Women, however, had different views. While some agreed that men owned the cows, others said the cows were jointly owned and could even be owned by the women despite being registered in the name of the man.

All FGD discussants were asked how registration of the cow in the man’s name influenced women’s decision making in dairy. According to some men, women were welcome to make decisions related to taking good care of the cow. For other men, women could only make decisions while the husband was away, and even then they were supposed to consult the husbands because they are “second in command to men.” Women observed that the decisionmaking process was a cultural practice, whereby men made all final decisions, and that this could not be altered by registering the cow in the woman’s or man’s name.

Asked what difference it would make if the cow were to be registered in the name of the woman or in both the man’s and woman’s names, some participants especially women maintained that it would not matter because the cow belonged to the household and the social rules could not be changed by registering cows in the woman’s name. Some of the men argued that registering the cow in a woman’s name would result in the woman’s parents claiming the cow. The concept of

registering a cow in a woman's name or in both the name of the man and the woman was in itself contested. In one men's FGD, most of the men were opposed to this saying cows could never be registered jointly as long as there was a male head of household and that registering the cow in a woman's name or jointly between men and women would signify that there is no man in that house. In three of the women's FGDs, and in one men's FGD, the majority also felt that registering the cow under men and women jointly would have no effect on how decisions were made because the rules on decisionmaking were , as one participant said, "bigger than who the cow was registered under."

In summary, the results suggest that focus groups participants had difficulty clearly defining what ownership means. Definitions were sometimes vague, and examples could be contradictory. FGD facilitators reported that fewer people participated in the discussion of these issues as compared to others. This is important to keep in mind when interpreting the quantitative data.

Having said that, it is clear that property rights are both complex and gendered. Control rights tend to be held by men, though women may have some management-related rights. Understanding the value of management rights will require knowing about control of the resulting outputs is distributed. Theory would suggest that use rights and management rights would be linked since the ability to control the benefits generated by the asset provide the incentive for good management. This issue is explored in the following sections.

6. IMPACTS OF MSDDP ON MILK PRODUCTION, CONSUMPTION AND INCOME

Milk production

Most households reported owning livestock at the time the project began, however milk production was low. "All milk worth talking about is from improved cows," said one member of a FGD. Households that had received a cow reported producing 34.8 liters of milk in the last week compared to 2.4 liters for households that had not yet received their cows (Table 4). The fact that improved cows were producing well suggests that the strategy of training two household members was effective.

Table 4: Milk production and costs

	Non-recipients	Recipients
Number of liters of milk produced in last week	2.64 (10.81)	34.81 (34.73)
Money received from MCC and village milk sales in last month (MZN)	60.00 (232.38)	1743.11 (2025.79)
Liters of milk sold to MCC, village, or bartered in last month	4.69 (18.75)	125.03 (156.31)
Total dairy costs in last month (MZN)	46.56 (101.76)	564.58 (719.36)
Number of observations	25	100
Mean coefficients; standard deviations in parentheses		
MZN= Mozambican meticale		

Source: calculated from 2011 data

High milk output comes at a cost. Small-scale dairy production costs are estimated to be between 30 and 40 percent of the total dairy gross income at the household level (Nhambeto, Marinho, and Hutchinson 2011). According to the 2011 survey data, households that had received cows spent 565MZM per month on purchased inputs related to feed, veterinary treatments, and animal housing compared to 47MZM for those who did not have an improved cow.

Labor use also increases significantly with an improved cow. According to FGDs, all household members are involved in dairy production. The common dairy activities done by men and women are given in Table 5, and are consistent with women having rights to make decisions about how cows are managed. When asked for their perceptions about who spends more time on dairying, groups reported that women played the major role in management and spent more hands-on time in day-to-day activities of dairy production. Focus groups also commented that men have a role in "supervising" and appear more involved with infrastructure and community issues related to the dairy industry and market for milk. The Vanduzi women-only FGD, through a proportional piling exercise, indicated that 41 percent of dairy work was done by women, 22 percent by boys, 19 percent by men, and 18 percent by girls. Women felt that their work load had increased most relative to other members of the household.

Table 5: Dairy activities done by men and women, according to focus groups

Activities commonly done by men	Activities commonly done by women	Activities done by men and women
Pasture and forage plot preparation	Feed cows	Cleaning Kraal
Construct Kraal	Fetch water and put in trough (water cows)	Change dirty water
Cutting grass for feed	Minor repairs of the kraal	Milking
Purchase of ration	Selling milk in the market	Baling Hay
Inspect cow	Looking for fodder	
Clean cow teats	Hand dressing cows (removing ticks)	
Take milk to milk collection center (MCC)		
Report sick cow to Paravet / technician		

Source: focus group discussions

Household survey results also show that households that had received a cow by the time of the 2011 survey spent much more time on both dairy and on crop activities than households that had not yet received a cow (Table 6). One explanation for the increase in crop labor is that households with improved dairy cattle are required to grow fodder to feed the cows, which are kept in stalls rather than let out to graze. The results also suggest that men spend more time than women on dairy-related work. While this seems to contradict the qualitative results, these findings are not directly comparable since the focus groups were asked about daily activities and the survey questionnaire included all labor whether occasional (for example, building the kraal and purchasing rations) or daily (feeding or watering the cow). The survey results also show that children spend a significant amount of time in both dairying and crop farming.

Table 6: Breakdown of mean household and hired labor hours, 2011

	Non-recipients	Recipients
Cattle (including dairy) labor		
Household male (hours)	4.5 (10.42)	15.16 (16.40)
Hired male(hours)	1.4 (3.74)	4.58 (15.07)
Household female (hours)	1.15 (3.29)	8.09 (10.83)
Hired female (hours)	0 (0.00)	0.47 (2.24)
Household child (<15 years) (hours)	2.16 (3.77)	9.31 (16.37)
Crop farming labor		
Household male (hours)	45.18 (35.73)	59.26 (54.72)
Household female (hours)	45.78 (25.34)	52.12 (42.69)
Household child (hours)	9.72 (16.22)	17.11 (33.08)
Number of observations	25	100

Source: Data from 2011 household survey

To look more systematically at how dairying affects household labor use, we regress household dairy and agricultural labor and hired dairy labor on whether or not a household has received a cow and other household characteristics (Table 7). Receiving a dairy cow is correlated with an increase in household labor hours on dairy activities for males, females, and children. Males had the largest increase in dairy labor hours; receiving a cow is associated with 7.26 more labor hours. For females the effect is 5.47 hours and for children, 6.69 hours. Male hired dairy hours also increases by approximately 5 more labor hours a month while there is no effect on female hired dairy hours. FGDs also noted that only men hired labor in response to the heavy workload associated with dairying. Receiving a cow is associated with an increase in household child labor hours spent on cropping activities though there is no effect on male or female household labor hours.

Table 7: Impact of cattle distribution on agricultural labor, by age, sex

	<i>Labor in dairy (hours)</i>					<i>Labor in cropping (hours)</i>		
	HH male	Hired male	HH female	Hired female	HH child	HH male	HH female	HH child
HH received cow	7.26**	5.44*	5.47***	0.34	6.69***	0.65	0.11	9.59*
	-3.22	-3.09	-1.61	-0.21	-2.45	-10.39	-6.49	-5.47
Household size	0.79	-0.28	0.65**	0.09	0.82**	3.69**	4.77***	2.30*
	-0.51	-0.3	-0.32	-0.07	-0.37	-1.5	-1.15	-1.18
Male household head	6.87**	6.17*	2.99	0.22	5.94**	25.10**	14.93	8.23
	-3.17	-3.17	-2.19	-0.18	-2.83	-10.21	-14.12	-9.65
Occupation of head	-1.78	-4.14	1.25	0.24	-4	13.06	-13.15	-4.35
	-4.22	-2.81	-4.69	-0.77	-4.66	-12.25	-9.5	-8.85
Education of head	0.1	0.52	0.28	0.01	0.32	0.03	0.9	2.71*
	-0.55	-0.35	-0.36	-0.05	-0.47	-1.57	-1.25	-1.47
Average yrs. of adult females education	-0.21	0.43	-0.31	-0.06	-0.51	-1.84	-1.37	-2.50**
	-0.76	-0.64	-0.53	-0.07	-0.88	-2.65	-1.7	-1.17
Proportion of adult female household members	-7.68	0.69	-3.65	0.91	-12.47*	10.7	44.90***	-26.71**
	-6.61	-3.39	-5.01	-0.82	-6.88	-18.33	-15.49	-12.54
Manica province	1.06	1.95	-1.52	0.2	2.32	-8.53	3.84	13.18*
	-3.11	-3.51	-2.05	-0.42	-3.2	-9.46	-7.26	-6.69
Number of cattle owned	0.52	0.08	0.08	0.01	0.2			
	-0.32	-0.08	-0.19	-0.02	-0.27			
Hectares owned						0.53	1.13	0.15
						-0.96	-0.88	-1.09
Constant	-6.11	-9.03*	-4.71	-1.11	-6.87	-0.56	-27.32	-19.81
	-6.91	-5.27	-4.62	-1.05	-6.89	-20.16	-20.22	-18.29
Obs	103	103	103	103	103	103	103	103

Standard errors in rows below.
(* p < 0.10, ** p < 0.05, *** p < 0.01)

Source: Data from 2011 household survey

It should be noted that while quantitative data focused on number of hours or amount of time, perceptions on labor can include other aspects such as level of

effort. Women may therefore have felt that they are putting in more labor into dairy activities if the activities they are involved in require more effort than those that men are involved in, such as cutting and carrying fodder versus taking milk to the MCC. The perception of women working more on dairy could also be attributed to the relative change in their involvement in dairy compared to the men. Women's labor allocation to dairy rose by 603 percent after the introduction of the dairy cow while men's rose by 246 percent. This is consistent with the observation from the men only FGDs that prior the MSDDP, women were not interested in or involved with cattle management.

The increased time spent on dairy implies that household members reduced time spent on other productive activities or on leisure. When asked how they coped with the increased workload, both men and women said that the introduction of the dairy cow "enabled them to become more diligent planners", which appears to be putting a positive spin on a challenging situation. Men noted that the increase in their workload had necessitated them to employ laborers to attend to other duties as they and their wives attended to the dairy cow. Women had to juggle between cropping and dairying activities. In addition, women noted that specific household members had to be assigned specific chores. Women had to leave very detailed instructions about the cow to the children and hired labor before going to tend the crops. Women could no longer stay away from home for long because the cow required them to come back and chop and mix feed, and feed and water it. Men in FGDs also stated that five women and four men in their community had dropped out of the MSDDP after certification because they could not cope with the work load they had seen other beneficiary household members experiencing.

Milk consumption and sale

While the MSDDP had an explicit focus on developing dairy markets, the increased milk production was intended for both home consumption and sale. According to the FGDs, women may place a higher priority on the milk consumption and nutrition benefits of dairying than men, who primarily value the income. In terms of decision making, according to men and women FGD participants, usually the male head of household alone or in consultation with his wife decides whether and how much milk to sell. During the FGDs, women reported that households sold a slightly higher percentage of milk than men did (70 percent versus 60 percent) and saved slightly less for the children (10 percent versus 20 percent). These percentages were reflective of the training given to them on how to apportion the milk production between the three key different uses of sale, consumption, and feeding the calf.

Table 8: Household dietary diversity score: summary statistics, by food group

	<i>HH received cattle</i>		
	No	Yes	% change
HDDS (score)	5.80 (2.61)	6.62 (2.50)	14.14 (0.15)
Food group	(% of households that consumed it in the last week)		% change
Nshima, millet, sorghum, or maize	0.92 (0.28)	1.00 (0.00)	8.70*** (0.00)
Rice, bread, or other wheat-based food	0.20 (0.41)	0.34 (0.48)	70.00 (0.18)
Pumpkin, carrots, squash, or sweet potato	0.28 (0.46)	0.29 (0.46)	3.57 (0.92)
Irish potatoes, cassava, or other root/tuber	0.32 (0.48)	0.38 (0.49)	18.75 (0.58)
Dark green leafy vegetables	0.60 (0.50)	0.73 (0.45)	21.67 (0.21)
Other vegetables	0.28 (0.46)	0.37 (0.49)	32.14 (0.40)
Fruits	0.68 (0.48)	0.65 (0.48)	-4.41 (0.78)
Beef, pork, lamb, goat, rabbit, wild game, chicken, duck, etc.	0.24 (0.44)	0.23 (0.42)	-4.17 (0.91)
Eggs	0.12 (0.33)	0.12 (0.33)	0.00 (1.00)
Fresh or dried fish	0.24 (0.44)	0.34 (0.48)	41.67 (0.34)
Beans, peas, lentils, or groundnuts	0.20 (0.41)	0.23 (0.42)	15.00 (0.75)
Sour milk yogurt, fresh milk or other milk product	0.12 (0.33)	0.43 (0.50)	258.33*** (0.00)
Oil, fat, or butter	0.56 (0.51)	0.64 (0.48)	14.29 (0.46)
Sugar or honey	0.52 (0.51)	0.42 (0.50)	-19.23 (0.37)
Coffee, tea, other beverages	0.52 (0.51)	0.51 (0.50)	-1.92 (0.93)
Observations	25	100	

Standard errors in row below
Two-sided p-value from a mean comparison t-test reported under percent change in the third column. * p < 0.10, ** p < 0.05, *** p < 0.01

Source: 2011 household survey

While we did not measure milk consumption directly, all of the female focus groups and most of male groups mentioned that increased milk consumption is improving the health status of the household members. Household dietary diversity scores⁴ were, on average, higher in households that had received cows than in households that had not (Table 8). Recipient households consumed approximately one more food group than households that had not yet received cows, and the largest difference between the two groups was in their likelihood of having consumed dairy products. These findings are consistent with other studies that have found that households engaged in smallholder dairy consume more milk than households that do not (Marchetta 2011; Mullins et al. 1996; Wyatt et al. 2013). The impacts of dairying on nutrition, especially of young children, are not unambiguous, however. Participation in higher levels of dairy production is negatively associated with exclusive breastfeeding, but does not affect dietary diversity for children over 6 months of age (Wyatt et al. 2013).

Consistent with their increased production and higher share of milk sold, beneficiary households report greater milk sales in volume and value than households that had not yet received cows (Table 4). From regression estimates we see that beneficiary households sold more milk, by value (Table 9) and volume (Table 10) than non-beneficiaries. Having a female trainee is positively correlated with the value of milk sales (Table 9), a result that project staff suggest could be explained by the greater attention to milk hygiene and quality that women display in training. This explanation was echoed in the focus group discussion where it was reported that women were more conscious of and concerned with milk hygiene and milk quality than men. While higher quality milk does not fetch a higher price at the MCC, it is less likely to be rejected.

⁴ The HDDS is the sum of all food groups consumed by the household in the last 24 hours, asked as a yes/no question with 15 total food groups. The HDDS is a proxy measure for the nutritional quality of food consumed by household members (Swindale and Bilinsky 2006).

Table 9: Determinants of income from milk sales in the last month (MZM)

	Model 1	Model 2
HH received cattle (1 if yes, 0 if still waiting)	1247.4224** (515.3749)	
Household had a female trainee	1053.3405** (460.2119)	1019.5298** (498.0601)
Months since HH received first cattle		-11.4963 (34.3267)
Household size	-98.2291 (71.8349)	-117.6745 (82.5660)
Sex of household head	-2280.8869*** (567.8466)	-2048.7788*** (753.2562)
Primary occupation of household head	-457.4000 (372.9222)	-334.6073 (392.4192)
Years of education of household head	102.9812 (120.4070)	137.5685 (131.7445)
Average yrs. of female education for females over 12 yrs.	-70.7879 (169.7130)	-31.2615 (188.3376)
Proportion of adult HH members who are female	937.9577 (1129.0524)	1029.0092 (1230.2967)
Constant	2058.7452* (1194.8342)	3065.4669** (1330.0778)
Observations	155	147
Standard errors in parentheses		
* p<0.10 ** p<0.05 *** p<0.01		

Source: Data from 2011 and 2012 household survey

Table 10: Determinants of liters sold last month

	1	2
HH received cattle	73.7820*** (27.5877)	
Primary or secondary dairy trainee was female	8.6903 (32.1106)	6.9587 (34.6512)
Months since HH received first cattle		-11.4963 (34.3267)
Household size	-0.9747 (4.6245)	-1.0224 (5.4281)
Sex of household head	-242.3368*** (47.3435)	-242.7496*** (58.5263)
Primary occupation of household head	-33.0181 (23.5938)	-31.4661 (25.1737)
Years of education of household head	-9.7639 (9.7191)	-8.2527 (11.2339)
Average yrs. of female education for females over 12 yrs.	-8.1051 (14.9134)	-8.5777 (16.6245)
Proportion of adult HH members who are female	95.2302 (79.0371)	88.0549 (81.4148)
Constant	316.7327*** (93.7574)	392.4644*** (117.3276)
Observations	158	149
Standard errors in parentheses		
* p<0.10 ** p<0.05 *** p<0.01		

Source: Data from 2011 and 2012 household survey

However another possible explanation for this result relates to the fact that both lower milk rejection rates and having a female trainee could be related to the household's proximity to the town, consistent with the discussion above regarding women having a hard time attending training located far from their land. FGDs also mentioned that the quality of milk deteriorated during the period between milking and delivery to the distant MCC leading to high milk rejection rates. The data available in this study do not permit us to disentangle these effects, but the

example emphasizes how complex it is to assess impacts in projects in which households make choices about how they will participate in programs, and in which gender is likely to influence these decisions in different ways.

Female headed households sell more milk than male headed households which may reflect a preference for income over milk, especially if there are fewer young children in the household.

7. GENDERED CONTROL OF INCOME

Control of income

In general, the morning milk, usually a much larger quantity, belongs to men and the evening milk to women. During the FGDs, the main reason given for this was that most of the morning milk is sold to the MCC by men while the evening milk is consumed at home by family and calves, with any surplus sold in the informal market by women. While households received a higher price per liter selling milk to neighbors than from the collection center (\$25 versus \$15), the potential for local sales can be very limited. Access to an MCC is an important determinant of milk production and sales. In the three FGDs where participants had no access to MCCs (men and women from Gondola Tete and women from Amatongas Sede) their biggest challenge was all the surplus milk they had, such that they were feeding their cattle less nutritious feeds so that they produced less milk as a strategy to cope with the poor market conditions and high cost of feed. This is a common strategy employed by farmers when the supply of milk exceeds the milk demand in the market and has also been reported in Kenya (Muriuki et al. 2003).

Payment for milk delivered to the MCC was made in cash once a month. The benefits of being paid in cash monthly at the MCC included the fact that farmers did not need to have bank accounts and pay ledger fees as they could purchase their monthly requirements with the money. Other projects have found that payment to bank accounts made it more difficult for women to access income since the accounts were generally in the name of the male household head (EADD 2009). Both male and female FGD participants mentioned that being paid monthly enabled them to save money for major projects. Men from Gondola, who received daily payments, said that they were able to pay for immediate daily needs, such as food and medicine, with the milk money. Women from Amatongas Sede found it difficult to save money from daily sales and also to find honest customers to sell milk to on monthly credit.

According to the FGD participants, men generally controlled the income from sales of milk at the MCC and they decide how to spend it either alone or, in some cases, in consultation with their spouses. One of the women groups said that milk income was managed jointly by men and women because the advantages of joint income management had been discussed during trainings.

In the Vanduzi FGD, participants discussed what control of income meant. One woman participant said that: "By control I mean that I tell my husband how much money I have made and what I want to do with it, he agrees, so, I control the money." When the women did a proportional piling exercise of who controls the money, results showed 88 percent of men and 12 percent of women controlled the milk income. The main reason given by women for this high control of milk income

by men was that they are the heads of households and they built the Kraal that houses the cow. Men were said to document the total milk produced and marketed and some women suggested that if a woman took the money without the permission of the husband, this could lead to the woman being beaten. Most women have to discuss and negotiate how to use the money before they use it to avoid conflict.

Men in the Vanduzi FGD agreed that often they are the ones that control the money, they measure and record the amount of milk produced and sold every day. At the end of the month, they know what to expect to be paid. Most of the men indicated they are the ones that keep the money either at home or in the bank and control how it is spent. A proportional piling by the men brought out almost similar results to that of women with 72 percent of men and 28 percent of women controlling income from milk. Interestingly, men did not mention that they controlled the income because they owned the cows but rather because they were the heads of households, reflecting that in this context being household head is synonymous with owning the cow.

Spending and investment priorities

How milk income was spent varied between women and men. However given the different ways in which men and women accessed dairy income, it is difficult to say to what extent their expenditure patterns reflect different priorities or different opportunities based on the amount and the timing of cash received. According to the FGDs, men focused more on investments such as in draft animal technology and plowing the money back to the cow feed and drugs, whereas women focused more on immediate household needs such as children's education, food, clothing, and improvement of household members' comfort. When asked about the assets purchased with dairy income, both men and women report that the main assets acquired are controlled by men (Table 11). Only in the case of kitchen utensils did women have the rights to buy, control and sell them. Men said that women could also sell chickens without permission but only in an emergency and she later has to inform him. Men and women's groups disagreed about whether men had the right to sell assets purchased with dairy income on their own without consulting their wives. When asked what assets they purchased with income generated from sale of bulls, women said that they did not buy any because they did not manage the income from sale of bulls. Men reported buying several kinds of assets, including agricultural tools, bicycle, construction material and livestock.

Table 11: Types and distribution of rights to assets bought using milk income

Asset	Women FGD				Men FGD			
	% reporting purchase	Who decides to buy	Who controls it	Who can sell it	% reporting purchase	Who decides to buy	Who controls it	Who can sell it
Kitchen utensils	56	Women	Women	Women	37	Women	Women	Women
Furniture	16	Men	Men	Men	—	—	—	—
Bicycle / transport	12	Men	Men	Men	22	Men	Men	Jointly men and wives
Livestock including chicken	16	Men	Men	Men	13	Men	Men	Jointly men and wives
Repair and /or build the house	—	—	—	—	28	Men	Men	Jointly men and wives

Source: Focus group discussions

Survey data show slight increases in asset stocks over the project period however the only changes that were statistically significant were exotic cattle and land (Table 3). None of the changes in distribution of ownership within the household was statistically significant.

8. DISCUSSION AND CONCLUSIONS

The MSDDP distributed improve dairy cows and training to smallholder farmers in Mozambique with the goal of increasing household income. The program was gender-blind in the sense that it took the household as the unit of analysis; initially both cows and training were given to the head of the household, in most cases a man. Participation in training was later expanded to include two people per household, and as a result a significant number of women were trained as well.

While it is difficult to identify the causal mechanisms due to the endogeneity of how cows were distributed, the project appears to have led to a significant increase in household milk production, sales, and income. Having a female trainee may be associated with increased income from milk sales. There is also some evidence that participating in MSDDP was associated with an increase in milk consumption in the household, and with household ownership not only of cattle but also of other non-livestock assets.

Intensifying dairy production was also associated with a large increase in the use of purchased inputs and of labor. While household members who have stayed in dairy, and were therefore in our surveys and FGDs, believe that the benefits of dairying outweigh the financial and labor costs, the demand for household labor of men, women, and children is significant, and the longer run effects of both children

shifting labor into dairy and away from other activities such as school or, in the case of women, care of small children, should be monitored to avoid unintended negative impacts.

Men and women both appear to have increased their income and assets from dairy, and for women this may be especially important source since they were not involved with cattle prior to the introduction of improved cows. It seems clear, however, that men control the majority of household dairy income and make decisions on its use. They also hold more and stronger rights over assets than women do. This raises the question of why women contribute so much labor to dairy when they control such a small share of the benefits.

One possibility is that benefits are pooled at the household level, and another is that women are not free to decide how much labor to contribute. Neither of these is entirely consistent, however, with project staff's initial observation that women were essentially neglecting the cows. A third possible explanation is that the milk and income that they do control, combined with the influence they are able to exert over that controlled by their husbands, is sufficient to justify the investment of their time. If this is the case, it is likely that women are underinvesting in terms of the effort they would make if they could control more of the benefits. An implication of the MSDDP is that if they could control a larger share of the benefits, they might invest more and the total household benefit might be greater.

A fourth possible explanation comes from the women themselves. Women participants in MSDDP reported that because of the important contributions that they make to care and maintenance of the improved cow, made possible by the technical knowledge that they acquired in the trainings, their husbands are consulting them more in decisions. Women appreciate this recognition of their skills, and they place value on the feeling that their household is working together in a joint livelihood strategy. If women see their participation in the dairy enterprise as contributing to a longer term change in intrahousehold gender relations, it would explain why they are willing to make the effort, even if it doesn't seem justified by their own direct economic benefit or even the profitability of dairy at the household level. These alternative explanations are not mutually exclusive, and while this analysis can't go further to say which are more or less likely or important, simply identifying them shows the importance of understanding what kinds of incentives projects are providing to men and women.

Despite being a gender-blind project, gender played a role in MSDDP implementation and outcomes. The MSDDP project team came to recognize the importance of taking gender into consideration and has shared experiences and findings within Land O'Lakes, including as members of the organization's gender task force.

In the future, gender-sensitive program implementation could allow women to better benefit from programs. For example, the feasibility and the practical usefulness of joint registration of a cow—with the goal of ensuring stronger control rights for women—should be explored further. Women clearly had some rights over the improved cows, and despite the widespread recognition that "decisionmaking is bigger than whose name the cows is registered under," there were some examples given of where joint registration could be meaningful. Some of the men's comments on what would happen if ownership were joint—women's families would take the cows, people would think there was no man in the household—might reveal more

about how men felt about the idea than about whether it was possible or what would actually happen as a result.

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