

Livestock and Women's Livelihoods: A Review of the Recent Evidence



Patti Kristjanson, Ann Waters-Bayer, Nancy Johnson, Anna Tipilda,
Jemimah Njuki, Isabelle Baltenweck, Delia Grace and Susan MacMillan

ILRI
INTERNATIONAL
LIVESTOCK RESEARCH
INSTITUTE

Discussion Paper No. 20

INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

Livestock and Women's Livelihoods: A Review of the Recent Evidence

Patti Kristjanson, Ann Waters-Bayer, Nancy Johnson, Anna Tipilda,
Jemimah Njuki, Isabelle Baltenweck, Delia Grace and Susan MacMillan



Discussion Paper No. 20

INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

For limited circulation




International Livestock Research Institute discussion papers contain preliminary research results and are circulated prior to a full peer review in order to stimulate discussion and solicit comments from researchers and partners.

For this reason, the content of this document may be revised in future.

© 2010 International Livestock Research Institute (ILRI)



This publication is copyrighted by the International Livestock Research Institute (ILRI). It is licensed for use under the Creative Commons Attribution-Noncommercial-Share Alike 3.0 Unported License. To view this license, visit <http://creativecommons.org/licenses/by-nc-sa/3.0/>. Unless otherwise noted, you are free to copy, duplicate, or reproduce, and distribute, display, or transmit any part of this publication or portions thereof without permission, and to make translations, adaptations, or other derivative works under the following conditions:

-  **ATTRIBUTION.** The work must be attributed, but not in any way that suggests endorsement by ILRI or the author(s).
-  **NON-COMMERCIAL.** This work may not be used for commercial purposes.
-  **SHARE ALIKE.** If this work is altered, transformed, or built upon, the resulting work must be distributed only under the same or similar license to this one.

NOTICE:

For any reuse or distribution, the license terms of this work must be made clear to others.

Any of the above conditions can be waived if permission is obtained from the copyright holder.

Nothing in this license impairs or restricts the author's moral rights.

Fair dealing and other rights are in no way affected by the above.

The parts used must not misrepresent the meaning of the publication. ILRI would appreciate being sent a copy of any materials in which text, photos etc. have been used.

Design and layout—ILRI Editorial and Publishing Services, Addis Ababa, Ethiopia.

Cover photo by: Stevie Mann.

Correct citation: Kristjanson, P., Waters-Bayer, A., Johnson, N., Tipilda, A., Njuki, J., Baltenweck, I., Grace, D., and MacMillan, S. 2010. Livestock and Women's Livelihoods: A Review of the Recent Evidence. Discussion Paper No. 20. Nairobi, Kenya, ILRI.

International Livestock Research Institute

P O Box 30709, Nairobi 00100, Kenya

Phone + 254 20 422 3000

Email ILRI-Kenya@cgiar.org

P O Box 5689, Addis Ababa,
Ethiopia

Phone + 251 11 617 2000

Email ILRI-Ethiopia@cgiar.org

www.ilri.org

Contents

Abstract	1
1 Introduction	2
2 Conceptual framework	3
2.1 Pathway 1: Helping women secure, build and safeguard their assets	3
2.2 Pathway 2: Helping women increase and sustain their livestock productivity	4
2.3 Pathway 3: Helping women participate in and benefit from livestock markets	4
3 Helping women build and safeguard their assets	6
3.1 Women's ownership of livestock and the importance of livestock assets to women	6
4 Helping women increase and sustain the productivity of livestock	10
4.1 Role of women in livestock keeping	10
4.2 Women's constraints on technology adoption	11
5. Helping women participate in and benefit from livestock markets	16
5.1 Women as suppliers of livestock products	16
5.2 Women as processors and retailers	17
5.3 Impacts of commercialization of milk on women	18
5.4 What kinds of livestock interventions increase women's market participation and benefits?	19
6 Summary and conclusions	21
6.1 Securing livestock assets	21
6.2 Increasing livestock productivity	21
6.3 Enhancing participation in livestock markets	22
References	23

Abstract

This paper synthesises evidence of the contributions that livestock make to the livelihoods of poor women in sub-Saharan Africa and South Asia and identifies factors that enhance or constrain livestock-related opportunities for women. We apply a gender lens to three livestock-related pathways out of poverty—securing, building and safeguarding livestock assets; increasing and sustaining livestock productivity; and enhancing participation in and benefits from livestock markets. For each pathway, we summarize what is known and what this knowledge implies for programmatic and policy interventions. Assembling this information is a first step towards identifying some of the large gaps in our evidence base as well as some indications of the kinds of research and development interventions, made in relation to which species and value chains, that appear most likely to benefit poor women and their families.

Key words: gender, livestock, women, livelihoods, poverty, assets, productivity, markets, sub-Saharan Africa, Asia

1 Introduction

After several years of relative neglect, livestock in livelihood studies are in the limelight, as the realization dawns—once again—that livestock are important for livelihoods and have significant potential for poverty alleviation, often in areas where few other options exist of the 2010. However, there is also an increasing awareness that certain types of livestock systems are associated with important downsides such as environmental degradation, greenhouse gas emissions, zoonotic and emerging infectious diseases, or food-borne illnesses. There is a need to balance these positive and negative aspects as is made clear by the title of the recent State of Food and Agriculture (SOFA) report ‘Livestock in the balance’ (FAO 2009). Gender will be central to achieving this balance. Livestock are important in women’s livelihoods and asset portfolios.

The fact that past livestock interventions appeared to not benefit women led to the inception of considerable research on gender and livestock systems in the 1980s and 1990s. As a result, subsequent livestock development projects became better targeted, focusing on species (poultry, small ruminants, dairy cows) and using approaches (participatory, group-based) that make them, at least in theory, more appropriate for and accessible to women. This is now an appropriate time to review past and current research on gender and livestock in order to identify pertinent issues and knowledge gaps for the livestock R4D agenda in coming decades.

Although two-thirds of the world’s 600 million poor livestock keepers are rural women (Thornton et al. 2003), little research has been conducted in recent years on rural women’s roles in livestock keeping and the opportunities livestock-related interventions could offer them. This is in contrast to considerable research on the roles of women in small-scale crop farming, where their importance is widely recognized and lessons are emerging about how best to reach and support women through interventions and policies (e.g. Gladwin et al. 2001; Quisumbing and Pandolfelli 2010). In the past decade, some researchers provided some evidence on causal relations between gender and livestock production (e.g. Bravo-Baumann 2000; Herath 2007; Deshingkar et al. 2008; Flintan 2008) but, as this review demonstrates, there remains a dearth of quantitative information on this subject, especially for the mixed crop–livestock systems where most livestock and livestock keepers are found and where the major increases in production will have to occur if the global demand for meat, milk and other animal products in coming decades is to be met (Herrero et al. 2010). Furthermore, the multiple roles livestock play in livelihoods of the poor make generalizing about women’s roles in, and economic contributions to, livestock development problematic, and prioritizing livestock research and interventions for women’s development both challenging and necessary (Niamir-Fuller 1994; Rangnekar 1998; LID 2004; Aklilu et al. 2008). By applying a conceptual framework that allows us to organize and better understand existing knowledge about this complex subject, we aim to help identify research for development gaps and opportunities, made in relation to which species and value chains, that appear most likely to benefit poor women and their families.

2 Conceptual framework

This review applies a gender lens to a conceptual framework for understanding livestock pathways out of poverty developed by the International Livestock Research Institute (ILRI 2008). This framework takes a ‘livelihoods approach’ that centralizes the importance of assets, markets and other institutions. The framework has been used to explore different aspects of small-scale livestock production and marketing, such as the impacts of animal diseases on poverty (Perry and Grace 2009). This is the first time the framework has been used to investigate gender issues.

The three hypothesized livestock pathways out of poverty are: (i) securing current and future assets; (ii) sustaining and improving the productivity of agricultural systems in which livestock are important; and (iii) facilitating greater participation of the poor in livestock-related markets. While these three pathways are distinct, with each requiring particular strategies and interventions to be successful, they are closely interlinked. At different instances, each of these pathways may offer a greater opportunity to reduce poverty than others. Nevertheless, livestock keepers, researchers and developers alike must attend to all three pathways if they hope to sustain and optimize development of livestock-based enterprises.

2.1 Pathway 1: Helping women secure, build and safeguard their assets

Recent research on livelihoods and poverty dynamics recognizes the importance of assets to the poor (Carter and Barrett 2006). While poverty is often measured in terms of income or food security, a household’s ability to meet its material needs is determined largely by its assets—the physical, human, social, financial and natural kinds of capital that determine what livelihood strategies a household can pursue and how well it can cope with risks and shocks (Sparr and Moser 2007). Beyond material wealth, assets provide the basis of agency, or the ‘power to act, to reproduce, challenge or change the rules that govern the control, use and transformation of resources’ (Sen 1997).

Research on intra-household dynamics has shown that it is not only the total amount of household assets that determines development outcomes, but also who in the household controls the assets. Interventions that increase women’s access to, and control over, assets have been shown to improve household food security and child nutrition and education as well as the wellbeing of women themselves (World Bank 2001; Quisumbing 2003; Smith et al. 2003). Quisumbing and Maluccio (2003) also show that the greater a woman’s asset holdings are at marriage, the larger the share of wealth the household will later spend on educating its children. In Bangladesh, in households where women have higher shares of assets, girls tend to have better health (Hallman 2000). By owning assets, women gain power and authority in their households and communities while lessening their risk of mistreatment (Flintan 2008).

An implication of this research is that development interventions designed to reduce poverty should pay attention to how households accumulate—as well as lose—access to assets. Livestock are an important asset for women because it is often easier for many women in developing countries to acquire livestock assets, whether through inheritance, markets or collective action processes, than it is for them to purchase land or other physical assets or to control other financial assets (Rubin et

al. 2010). However, the relative informality of livestock property rights can be disadvantageous to women when their ownership of animals is challenged. Interventions that increase women's access and rights to livestock, and then safeguard the women from dispossession and their stock from theft or untimely death, could help women move along a pathway out of poverty.

2.2 Pathway 2: Helping women increase and sustain their livestock productivity

One way of improvements in the productivity of livestock systems could be by increasing outputs such as milk, meat, eggs and surplus animal stock. Other ways could be through a reduction of environmental degradation (e.g. less pollution of water sources by livestock excrement); more efficient use of natural resources (e.g. of water used to grow fodder crops); and lowering health risks associated with keeping livestock (e.g. brucellosis). While measuring the productivity of small-scale livestock systems is complex, in part due to the multitude of economic and social roles livestock play in livelihoods, it is generally believed that there is a considerable scope for improving the productivity of most small-scale livestock systems in the developing world (FAO 2009; Staal et al. 2009).

The three conventional pillars for improving small-scale livestock productivity lie in improving animal feeds, breeds and health. Other potential avenues for improving productivity of livestock systems being explored include improving crop–livestock interactions in mixed smallholder farms, livestock water productivity, carbon sequestration on rangelands, and efficiency of farm animal labour. In spite of the relatively low investment by the public sector in livestock research, many technologies that appear to be appropriate for smallholder systems exist. Their adoption rates remain low (FAO 2009) probably because they are not appropriate and/ or accessible. Overcoming problems of appropriateness and access to existing technologies and/or developing new ones could have significant benefits in terms on increased productivity—for sale or for home consumption in the form of nutritious animal-source foods—and in reducing negative environmental and health impacts.

Since both productivity and environmental improvements arise from changes in the way people manage (feed, water, treat, herd, care for) livestock, it is important to understand how these decisions are made, and what factors promote or constrain adoption of new, more efficient technologies and practices. Men and women often manage different types of animals and are responsible for different aspects of animal care. Women and men also typically have different objectives for keeping animals, different authorities and responsibilities regarding animal management, and different abilities to access and use new information and improved technologies. These differences may lead them to have different priorities regarding investments in the adoption of new technologies and practices. To have impact, therefore, research and development organizations may need to take these differences into consideration in the types of technologies developed, and the manner in which they are refined, disseminated and supported.

2.3 Pathway 3: Helping women participate in and benefit from livestock markets

The increasing global demand for animal products has been dubbed the 'livestock revolution' (Delgado et al. 1999). This demand is expected to provide incentive for adoption of productivity-

enhancing technologies and practices for those producers who have access to markets for sales of milk, meat or eggs. This rising demand could also generate increased employment opportunities along the entire livestock value chain. Because livestock market chains are long and complex, in theory they provide myriad opportunities for the poor to participate through, for example, provision of livestock inputs and services or the marketing and processing of livestock products.

Women tend to face more challenges than men in accessing and benefiting from markets, especially more formal markets. In particular, the indirect consequences for women of 'gender-neutral' market development projects need to be carefully examined: where women have insecure rights over livestock or limited control over livestock products and income from their sales, they may have difficulty maintaining control as livestock become more economically attractive to men.

Poor livestock keepers worldwide face a daily tradeoff between selling their (relatively expensive) milk, meat and eggs to increase their household income and consuming the same (high-quality) foods to increase their household nutrition. Because animal-source foods are so dense in nutrients, including micro-nutrients that help prevent 'hidden hunger', decisions in these matters have potentially large implications for the nutritional as well as economic health of households. Given women's traditional responsibility for household food security, their level of control over decisions about whether to sell or consume the family's animal products, as well as over how to use any income obtained from the sale of animal foods, could greatly determine the nutritional wellbeing of household members.

The remainder of this review provides specific information from the published literature and other sources on the different roles women play in livestock production and the contributions to livelihoods that women are making through livestock-related activities. For each pathway, findings are organized around key questions on the role of women and lessons about interventions targeting women. Assembling this information is a first step towards identifying some of the main gaps in our evidence base as well as some of the kinds of research and development interventions, made in which species and value chains, that are most likely to benefit poor women and their families.

3 Helping women build and safeguard their assets

3.1 Women's ownership of livestock and the importance of livestock assets to women

Evidence from many different developing countries and covering many different small-scale livestock and agricultural production systems and livestock species reveals that poor women can and do own livestock. A common perception is that women are more likely to own small stock, such as chickens, sheep and goats, than larger animals, such as cattle, water buffaloes and camels. While often the case, studies show that the type of species owned by women varies by region and culture and can be dynamic.

In Asia, for example, analysis of a project involving the Grameen Bank, which provided micro-credit loans to women (Todd 1998), showed a clear investment trajectory, with the women given credit investing their new capital in poultry keeping and then moving to goats and eventually to milk cows. In India, Heffernan et al. (2003) found that, despite a common perception that only men own bullocks, they were of particular interest among landless women, who rented them to farmers. In pastoral areas of Ethiopia a study documented women purchasing bulls (Rubin et al. 2010) while in mixed crop–livestock systems men and women both own cattle, goats and sheep, though men own more (Yisehak 2008). In pastoral societies women frequently own fewer animals than men, however, livestock assets are generally more equitably distributed between men and women than are other assets like land (Flintan 2008). In Uganda, Kenya and Nigeria, most urban cattle farmers are women. (Grace 2007). And though women and men in East Africa were found to keep similar numbers of cattle, men in northern Nigeria own more than ten times as many cattle as women do (Grace 2007).

In Iraqi Kurdistan, 70% of both female- and male-headed households own livestock, with female-headed households on average owning twice as many animals as male-headed households (Waite 2000). The value of livestock in the female-headed households is also considerably greater than that of livestock in the male-headed households. In this society, where women do not engage in paid labour or other alternative income-earning activities, the care of livestock has traditionally been regarded as a 'female activity'. In Ethiopia, on the other hand, a study in the Western Shoa region found that women in female headed households own fewer livestock than men and than women in male headed households (Torkelsson and Tassew 2008).

Men and women are also likely to differ in the types of breeds they own within a given species, with men more likely to have improved animals than women in dairy areas of Kenya (EADD 2008). While a higher percentage of female-headed households than male-headed households own local cattle, the reverse was observed for (higher-yielding, genetically improved) exotic cattle, with 63% of male-headed households owning exotic cattle compared to 49% of female-headed households. These results are consistent with those from Rwanda, where 45% of male-headed households owned exotic cattle compared to 32% of female-headed households (EADD 2008). Results from the same study show that, in Rwanda and Uganda, female-headed households also owned significantly fewer local cattle (at an average of 4.2 and 5.1 head per household, respectively) than did male-headed households (7.8 and 12.6).

Men and women may also differ in the types of rights they have to livestock. Rights can be divided into user rights, including resource access, rights to withdraw products, rights to exploit commercially, and decision-making rights, such as management, exclusion, or alienation (Meinzen-Dick et al. 2004). For example, in many cases women control cattle milk when it is used for home consumption, however they cannot sell it and keep the income (Valdivia 2001). Guèye (2000), in a review of backyard poultry in Africa, states that women generally own and care for poultry; however, they can seldom take sole decision over the use of the birds or eggs (consumption, selling, exchange etc.). McPeak and Doss (2006) found that, among mobile pastoralists in northern Kenya, women had the right to sell milk; however, men were responsible for the overall herd and had the right to decide where the household would camp. If women's marketing objectives conflicted with men's herd management objectives, men used location to limit women's ability to market. In some societies, women may 'own' some animals (e.g. having brought them into the family upon marriage or later through inheritance) but have little say about selling or slaughtering them, e.g. among the Maasai (Talle 1988). Yet in other societies, e.g. among the Nandi (Oboler 1996), the women may have a say in sales decisions even though they do not 'own' the animals. Flintan (2008) observed that in some pastoral societies men cannot sell without approval of women and sometimes also children.

Women may also differ from men in their preferences for livestock *vis-à-vis* other assets. Although we hypothesize that livestock are especially important to women because they are among the few assets that many women can own, the literature reviewed includes no information about what proportion of women's assets are in the form of livestock, nor about whether and under what circumstances women, given a choice, would increase their livestock assets more than their other assets. Thomas-Slayter and Bhatt (1994) noted that, in a Nepalese village, while men regarded the acquisition of buffaloes as a good investment, women tended to consider the more troubling management aspects of such acquisitions, such as the increased workload the animal would demand of them. Heffernan et al. (2003) also found sharp differences between the sexes in their perceptions of the roles of livestock in Kenya, where women viewed livestock primarily as a means of ensuring food security for the family, while men perceived livestock as a means of making longer-term investments. Rubin et al. (2010) found that livestock are the preferred investment for both men and women in micro-credit schemes.

3.1.1 How do women acquire livestock?

Women acquire animals as gifts, they inherit them from family members, they receive them from development projects, and they buy them in markets (as do men). The literature indicates that women are more likely than men to acquire livestock through non-market rather than market channels, however this is not always the case. For example, Rao et al. (2002) found that most landless women in their study in India purchased milking cows out of their own savings coupled with the earnings of their husbands, or depended on money-lenders, or (in the case of Pondicherry) purchased cows through loans taken from the government or private agencies. Only very few (3 out of 57) had obtained the animals as a 'family gift' (i.e. a non-market channel).

Data disaggregated by production system and agro-ecological zones from a recent study on acquisition of livestock in Kenya revealed that only a few female-headed but most male-headed

pastoral households purchased their animals (Heffernan et al. 2003). Heffernan concluded that women in Kenya appear more able than men to access informal networks to obtain livestock. Results from a similar study in India, on the other hand, revealed that women had fewer informal or formal mechanisms for acquiring livestock than men.

Zambian women said that they could not buy livestock because income from both livestock and crop agriculture, including their vegetable plots, was controlled by men (Chawatama et al. 2005). This concurs with more widespread evidence on the importance to developing country women of informal mechanisms for obtaining livestock assets. It also suggests that the reason that these women do not buy more animals in the market is not that they cannot access markets but rather that they have no cash with which to purchase animals. Removing this constraint, for example, through microcredit, can result in more women buying livestock (Todd 1998; Rubin et al. 2010).

Livestock have been provided to women free of charge by organizations such as Heifer International, FARM-Africa and Land O'Lakes for many years in many countries in Africa and Asia. In Bangladesh, the Self-Employed Women's Association and Rural Advancement Committees are examples of more local initiatives that organize women in the informal economy and facilitate their access to productive resources such as livestock as well as critical services such as health, housing and childcare. Past livestock development—especially emergency aid initiatives such as restocking—overlooked gendered access issues and, as a result, did not benefit or even had a negative effect on women. Over time, these failures have been documented and lessons (Niamir-Fuller 1994; Heffernan et al. 2003), which are not always taken on board, identified.

While few rigorous evaluations have been conducted on the impacts of these more recent initiatives, anecdotal evidence on their benefits to women is positive and the projects have done much to bring attention to the value developing-country women place on livestock, and on building assets. For example, in 1998, Heifer International established a 'Women in Livestock Development (WiLD)' initiative to help women use livestock to care for themselves, their families, their environments and each other. A project is designated 'WiLD' if 70% or more of the participants in the project, including its leaders and decision-makers, are women. WiLD projects provide women with cows, goats, water buffaloes, poultry and other farm animals (Heifer International 2008).

3.1.2 Threats to livestock assets

Livestock kept by poor people in poor countries face many threats. The animals are typically raised in harsh environments where drought and theft are common, and commercial feed and veterinary services are beyond the means of most people. Women have the most difficulties in obtaining the inputs necessary to keep their animals alive. They may also face unique threats due to cultural or legal limits to their rights over their livestock. Interventions that increase women's ability to keep their animals alive and healthy—or compensate them for losses via insurance or re-stocking—will increase the asset value of livestock to women.

We found little evidence that women lose animals to drought, disease or theft at a higher rate than do men but, given women's limited access to livestock-related inputs and services, it is likely that

in many cases they do lose more¹. Women's tolerance for risk may also be different from men's, either because they are inherently more risk averse (Rubin et al. 2010) or because they would have a more difficult time rebuilding assets because of the specific constraints they face. Preliminary results from an ongoing pilot project on index-based livestock insurance in northern Kenya found that women were more likely than men to purchase insurance for their animals (Mude 2010).

Understanding risk preferences and ability to cope with shocks is likely to become more important in the face of increasing climate variability. Turner (1999) found that repeated droughts in Niger strengthened women's control over livestock because they were able to invoke a cultural norm that made men responsible for household food security, with the result that men had to sell their livestock before women's. This led to a change in regional herd composition and an increase in women's relative control. However, another study found that many women in the Sahel felt that they would lose traditional access to resources if competition for rangeland and other livestock resources increased due to increasing climatic vagaries (IFAD 2005).

Another way women lose access to livestock assets is through the dissolution of households, either through divorce or death of a spouse (Goe and Mack 2005; Mutenje et al. 2008). In such situations, cultural norms often dictate that animals are transferred to other family members (Goe and Mack 2005; Kanyamurwa and Ampek 2007). While some developing countries such as Namibia have enacted legislation to protect women from loss of property upon the death of their husbands, these laws many not be implemented in practice (Engh et al. 2000). In addition, most widows in any case do not possess the resources to employ legal experts to help them protect their property. While legislation exists to prevent property/asset grabbing in many areas of northern Namibia, for example, it is still common practice for a husband's family to take livestock and other resources from a widow and/or remaining children upon the husband's death (Engh et al. 2000).

Many NGO projects are now addressing the issue of dispossessing widows of their livestock. In Zambia, a Heifer International project, through training people, raising awareness and conducting negotiations at different levels, has enabled women not only to co-own livestock with their husbands, but also to continue their ownership of the animals after their husbands die, animals that otherwise would have been taken away from them by their husbands' relatives. In Thailand, where a high incidence of HIV/AIDS has led to the disintegration of many families, women heads of households are being provided with water buffaloes and training in their management to help the women not only to bring in the rice harvest but also to generate cash incomes through renting out these valuable animals to other community members (Heifer International 2008).

1. See next section for information on women's access to inputs and services. This is included in the productivity pathway; admittedly, distinctions between inputs and services for keeping animals alive versus increasing their productivity are mostly artificial.

4 Helping women increase and sustain the productivity of livestock

Given the general lack of data on productivity of smallholder livestock systems, it is perhaps not surprising that we found few studies comparing productivity of livestock kept by men versus women. A study of an intensive dairy intervention in coastal Kenya found no significant differences in this respect; in fact, female-owned and operated farms performed better than male-owned and operated ones (Mullins et al. 1996). Studies from cropping systems show that, controlling for access to resource such as land and credit, productivity levels are similar between men and women (Smale and Heisey 1994; Njuki 2001; Alene et al. 2008). Perhaps the key issue is not whether the current low levels differ between men and women but whether the opportunities and constraints to improving productivity differ between men and women, since ultimately it is the improvement that will be key to realizing this pathway out of poverty.

The relationship between gender and livestock productivity is not straightforward. Poor men and women keep animals for multiple purposes, both productive (food security, income) and non-productive (savings, insurance, cultural). To the extent that non-productive reasons predominate and productivity does not correlate highly with asset or cultural value, improving productivity may not be a priority.

As discussed in the previous section, the fact that women own animals does not necessarily mean that they have full rights over use and sale of animals and their products. Without such rights, women may not have the incentive to invest in productivity improvements even if they are in a position to influence how animals are managed, including investments in improving productivity. Where women play a role in caring for animals that belong to the household but not to them, the relationship between women and productivity improvement is particularly complex. Many interventions aimed at intensifying livestock production, such as shifting from grazing to stall-feeding or by keeping potentially higher-yielding but also more demanding breeds, increase the workload of women and girls, because the intensification lies in their traditional tasks (Okali and Sumberg 1985; Mullins et al. 1996; Wangui 2008). To the extent that improvements in productivity require additional labour from women which is not compensated, they may have less incentive to apply the new technology or practice. Helping women contribute to and benefit from improvements in livestock productivity requires careful attention not only to the size but also to the distribution of the costs and benefits associated with improved productivity, especially who benefits from improvements and who makes the investments (financial and time) in generating them.

4.1 Role of women in livestock keeping

While there is great variability across systems and socioeconomic contexts, women generally play a major role in managing and caring for animals, even when they are not the owners. Flintan (2008) documented participation of women in every aspect of livestock management in different pastoral systems around the world. In intensive Asian livestock systems, more than three-quarters of livestock-related tasks are the responsibility of women (Niamer-Fuller 1994). In Nepal, 90% of women, compared to 75% of men, are engaged in agricultural production (Herath 2008).

Indian women play a significant role in livestock-keeping by providing labour; in poorer families, their contribution typically exceeds that of men (George et al. 1990). In India's tribal, low-rainfall and semi-arid areas, much of the work of managing animals has been transferred to women because the men have left to find jobs elsewhere (a similar phenomena is seen in most of Africa).

In sub-Saharan Africa, women's roles in crop and livestock production are strongly determined by gender and cultural norms. In Nigeria, Ayoade et al. (2009) report that women feed and manage vulnerable animals (calves, small ruminants and sick, injured and pregnant animals), clean barns, milk cows, and make butter and cheese, but are not involved in livestock marketing or managing livestock diseases. These trends are similar to what was found in the Ethiopian highlands, where women clean cowsheds; milk cows; look after calves and sick animals; cut the grass and supervise the feeding and grazing of cows; make dung cakes, butter and cheese; and sell these products once or twice a week. Men, on the other hand, feed the oxen and take the animals for veterinary treatment when the need arises (Yisehak 2008). Njuki et al. (2004), in a study in central and eastern Kenya, found women were more engaged in feeding of cattle while men were more involved in watering and disease management. The total time allocation to dairy-related work did not, however, differ significantly between men and women.

4.2 Women's constraints on technology adoption

In spite of the central roles they play in small-scale livestock systems, women are severely limited in their ability to make decisions regarding livestock enterprises. In addition, they receive little outside support to help them make better decisions about those enterprises. The agricultural service and input-delivery systems are dominated by men and therefore difficult for women to access (Upadhyay 2005).

4.2.1 Access to land

Although land is not a prerequisite for keeping livestock (if feed can be purchased), grazing lands are key to livestock production in many areas and many traditionally communal grazing areas are being privatized. In agropastoral systems in Peru and Bolivia, taking animals to graze is the task mostly of female heads of households. Guillet (1992) documented the benefits of growing alfalfa, a feed resource, in fallow fields is gaining in importance in the Altiplano region. The shift to alfalfa farming has reduced the availability of fallow fields, which women may use for herding their sheep or *criollo* cattle, especially those women in poor households without access to land with appropriate soils for growing alfalfa (Valdivia 2001).

Group ranch, or 'block grazing', systems have been tried in various countries, including Kenya, Nigeria, Sierra Leone, Somalia and Tanzania. In almost all cases, the planners failed to understand the fundamental importance of pastoral reciprocity and alliances in maintaining viable livestock production in ecologically fragile and climatically variable areas. In many regions, this failure led to range wars and a rush for privatization and expropriation of rangelands (Oxby 1985; Mwangi 2005), with particularly negative impacts on women, most of who were not allowed to join the group ranches, but became unpaid workers taking care of their husbands' livestock instead (Talle 1988; Kipuri 1989). With an increasing exodus of men from pastoral to urban areas in search of

jobs, the women left behind could not influence decision-making and governance within the group ranches on such important matters as land use and ownership (Mwangi 2005).

4.2.2 Access to extension services, information and training

Gender disparities in access to extension services, information and training exist throughout the developing world. A study in the Taurus Mountain villages in Turkey found that most women farmers had little access to information about animal production through public extension services (Budaka et al. 2005). Similar findings have been documented in Cameroon, Ghana and Madagascar (Salman et al. 1999), in Pakistan (Teufel et al. 1998) and in the Gambia (Jaitner et al. 2001). The reasons given for this lack of access by women to extension services included women's long workdays, which precluded them from engaging with, or searching out, extension officers, a neglect of women's needs and circumstances when targeting extension work, and widespread female illiteracy.

Among Maasai pastoralists in southern Kenya, women's access to extension services was restricted by cultural as well as time constraints. Women typically rely on their husbands for information, but delivering extension messages through women's groups was also found to be effective (Kimani and Ngethe 2007). Zimbabwean women complained that cattle are generally registered in their husband's names with the Department of Veterinary Services (for the purposes of dipping the animals in acaricides to prevent tick infestation), which excludes the women from livestock initiatives (Chawatama et al. 2005).

Some countries have succeeded in increasing access by women to agricultural extension, information and financial services. The Indian woman dairy farmer has been credited with raising the country's milk production levels to among the highest in the world (Herath 2008). Women constitute 93% of total employees in India's dairy production (World Bank 1991). Having started two decades ago, Indian policymakers have recognized the importance of women in dairying and encouraged their growing participation in the country's large dairy sector. Many dairy cooperative societies were formed across the country, including some specifically for, and run by, women in the states of Andhra Pradesh and Bihar (World Bank 1991).

India has also recruited and trained women extension workers, who are playing crucial roles in disseminating information and technologies. Since the late 1980s, the country's National Dairy Development Board has made women's extension training central to their cooperative development program, which was designed to strengthen the role of women in the control and governance of dairy cooperatives. By 1998, 6000 out of 7000 dairy cooperative societies in India were women's societies (Patel 1998). Subsequent projects such as the Women's Dairy Cooperative Leadership Program have helped Indian women continue to gain more control over the sale of milk and the use of income from it.

Some of the governance-related lessons from India have been applied in other countries such as Tanzania, where the formation of district and regional networks of a self-help initiative proved an ideal platform for linking women dairy producers with the Tanzania Milk Producers' Association and the Tanzania Dairy Board (Herath 2005).

In The Gambia, where the proportion of female agricultural extension workers has increased from 5% in 1989 to more than 60% today, more attention is being paid to women's livestock information needs, especially regarding small ruminant and poultry production (FAO 2003). Gambian women farmers did not feel comfortable around male extension workers, with 45% reporting in one study that they preferred training programs delivered by female extension workers (FAO 2003). Similarly, Due et al. (1997) found that, in Tanzania, 40% of women farmers preferred to work with female extension agents and 51% of the women interviewed mentioned that they wanted to receive information on small ruminant production. Almost all the women (94%) pointed out that they could attend demonstrations and training courses only if these were conducted in their villages.

Gender of the extension agent can influence not only women's access to information and technology but also how benefits of improvements are distributed. A study on the impact of dairy in coastal Kenya found that women performed the major part of the work on all farms; however, where women extension agents worked with households, women benefited in proportion to their labour contributions (Mullins et al. 1996). Where extension agents were male, households still benefited from the intervention package but at the expense of women's labour.

In a study on mixed rain fed farming in India, Rangnekar (1998) found a great need for redesigning training and extension interventions to suit the requirements of women. She recommended that these interventions be practical, useful in the short term, use audiovisual material, and be made in the afternoons and close to the women's homes. She also recommended employing women as training and extension officers.

Roy and Rangnekar (2007) concluded that participatory and systems approaches applied to development of rural dairy business systems in Andhra Pradesh were particularly useful in understanding the perceptions of women producers, the constraints they faced, and the kinds of training most appropriate for them. An assessment of the impacts of a livestock training course in Kotli, India (Hussain et al. 2004) found that all the women who had received gender-sensitive training thereafter used their new knowledge, particularly regarding vaccination of animals.

Ndungu et al. (2004) found that Kenyan women pastoralists pay more as individuals than do men for information—whether for livestock extension materials, for animal-disease warnings or for livestock market updates. Particularly in the informal economy, groups of women producers are better able than individuals to access information and services. Clusters and networks of women can access resources more cheaply as well as more easily than can individuals. Groups of women entrepreneurs requiring the same service are usually in a better negotiating position with potential suppliers or can bargain more effectively with buyers than they could alone. A study in Mozambique (Gotschi et al. 2009), on the other hand, found that women often were restricted from participating in group activities thus limiting their access to livestock-related services and information.

4.2.3 Access to animal health services

A promising new trend that is benefiting women is the linking of public health and veterinary services. While traditionally working independently, the medical and veterinary sectors recently

have been coming together to tackle zoonoses—diseases transmissible between animals and humans, particularly emerging zoonotic diseases such as highly pathogenic avian influenza. In Mongolia, researchers demonstrated that, if the costs of a proposed vaccination against brucellosis in livestock were allocated to both sectors in proportion to the benefits, disease control was profitable and cost effective for both livestock and public health sectors (Roth et al. 2003).

Human and livestock health services often fail to serve the poorest livestock keepers, particularly in remote rural settings in Africa and Central Asia, because of financial, logistic and service-delivery constraints (Heffernan and Misturelli 2008). Between 2000 and 2005, Schelling et al. (2007) demonstrated the feasibility of combining human and animal vaccination programs for nomadic pastoralists and their livestock in Chad. By sharing transport and equipment costs, medical doctors and veterinarians reduced their total costs. Joint delivery of human and animal health services is highly valued by hard-to-reach pastoralists. In intervention zones, for the first time, about 10% of nomadic children were fully immunized annually and more children and women were vaccinated daily in joint human–livestock vaccination rounds than in vaccination campaigns targeting only people. By optimizing use of limited logistical and human resources, public health and veterinary services both became more effective, especially at the district level.

The literature also points to a need to strengthen institutional links among agricultural research, agricultural extension and veterinary services. An example of how this can be useful are routine vaccination systems for small ruminants established by agricultural extension services collaborating with veterinary services (Devendra and Chantalakhana 2002; Haenlein and Abdellatif 2004).

Strong producer organizations can also play an important role in efficiently delivering veterinary services to poor livestock-keepers. For example, the Kenya Women’s Veterinary Association has partnered with the government to develop the country’s semi-arid and arid areas through improvements in livestock-keeping. By building capacity in livestock and disease management skills in local communities, the association has helped improve control of zoonoses and reduce the incidence and costs of tick-borne diseases in cattle and Newcastle disease in poultry. A recent impact study (Kimani and Ngethe 2007) reports that the formation of women’s groups has helped improve control of livestock diseases, particularly transboundary diseases, in Kenya.

Several projects in East Africa are experimenting with training villagers to be animal health workers (also known as paravets, community animal health workers or community animal first-aid workers) (Allport et al. 2005). A few of them have trained women to become paravets, especially for treating small ruminants and dealing with poultry diseases and vaccinating birds (John Young, ODI, pers. comm., Msoffe et al. 2010). An evaluation of the projects attributed their success to the participatory nature of their activities and to their ability to train independent local workers, who were effectively monitored and supported by government services (for medicines, vaccination campaigns and referrals on serious cases). The evaluation also concluded that women were more heavily involved in the management of ruminants than was previously thought and that, consequently, their participation in the training program should be increased.

In many parts of the world, however, socio-cultural barriers continue to hinder women’s access to animal health services at community level. For example, a CARE-led community animal health

initiative in Puno, Peru found that women were generally not allowed to take part in training courses, although the women spent more time than did the men with the animals and were thus in a better position to recognise animal health problems earlier (Rivière-Cinnamond 2005).

4.2.4 Access to credit

In developing countries men generally have greater and easier access to credit than do women, whose lack of collateral makes them appear not creditworthy. Women dairy operators in Kenya, for example, typically lack secure titles to property, which prevents them from obtaining credit from formal financial institutions. A survey in Kenya, Rwanda and Uganda showed that significantly more men than women had applied for loans from financial institutions or local cooperatives (EADD 2008). Female dairy operators in Kiambu, Kenya, reported that their enterprises would have been more productive had they had access to financial resources to purchase more feed and feed supplements and more land on which to grow forage (Tangka et al. 1999). Since women run most dairy operations in Kenya, their inability to obtain cash and credit is a significant constraint to expanding the country's small-scale milk production. The fact that many Kenyan dairy women cannot read and write is a further obstacle to their engagement with government and other formal institutions.

In many countries, however, women have developed their own small credit systems. Credit funds and revolving savings of women's groups are common throughout Africa. Members of a group each save a certain amount of money monthly, which is then granted in turn to each of the women as a loan, normally at no interest. Most of these loans go towards non-income-earning activities (Place et al. 2004), although some groups allow loans of animals or milk for processing. These systems tend to function best at the village or neighbourhood level, where tight social connections ensure that loans are repaid.

Women livestock-keepers have worked together to overcome credit constraints, as in India and Uganda, where they established group bank accounts so the women could access their dairy payments. In another case, a Danish-financed smallholder poultry development project demonstrated the important role that women's groups play in accessing credit in Bangladesh, Benin, Senegal, Burkina Faso and Togo. This project took a holistic approach involving capacity building, organization of women into groups, and farmer field schools aimed at giving poor illiterate women farmers and local food vendors the knowledge required to benefit from collective action (Riise et al. 2008).

5 Helping women participate in and benefit from livestock markets

When we think of ways to increase women's participation in livestock markets, we usually think of increasing their ability to sell animals or animal products. While this can be an important way to improve the welfare of women and their families, the issues raised in previous sections make it clear that, unless women are able to make decisions about which products and animals are sold and what is done with the proceeds of the sale, increasing market participation alone may not benefit women.

The actors in livestock value chains include not only livestock producers but also input suppliers, traders, processors, wholesalers and retailers. Helping women gain access to labour, product and service markets all along the value chain, and improving their working conditions, are additional ways in which women can benefit from participation in livestock markets. While women may play many of these roles along the value chain in many regions, the literature mainly cites their roles as suppliers of livestock products, particularly milk products, and as processors of animal source foods, often street foods.

5.1 Women as suppliers of livestock products

Among the settled Fulani in Nigeria, women are responsible for all milk processing and marketing and for deciding on the quantity of milk to be sold or consumed by the family. Some milk is exchanged for grain. Marketing is seen as both an economic and social activity. Only a handful of wealthy Fulani women and strictly Muslim women sell their milk using female intermediaries. Nearly all others personally sold their dairy products (butter, ghee, fermented milk mixed with millet) in local markets and door-to-door to consumers. The women used the money they earned to buy everyday necessities and sometimes to buy small ruminants. The revenue the women generated from their dairy products contributed substantially to their household incomes (Waters-Bayer 1985).

Among the Fulani societies in Ferlo, Senegal, milk production is entirely controlled by women, who have sole control also over the sale of any surplus. Because fresh milk is difficult to conserve in Senegal's hot climate, it is usually sold directly to consumers near the place of production or bartered there for cereals. Fermented and skimmed milk, butter and butter oil are also sold in rural or urban markets (Dieye et al. 2005). A few mini-dairies also source their milk through this channel, profiting from the low prices for milk during the rainy season. These second-degree resellers often accumulate a large quantity of milk, which they can then supply to mobile saleswomen who transport it to more attractive markets after having transformed it into fermented milk. Mini-dairies run by women source their milk through contract farmers (Corniaux 2003). These small processors or pasteurizers generally operate with the support of NGOs or development agencies.

Women in Kafr al Bal, in the Nile Delta, are responsible for rearing small ruminants as well as milking cows and small ruminants, processing milk and selling dairy products (Zimmerman 1982). A study of evolving pastoral markets in northeastern Somalia (Nori 2008) documents the crucial

role that women play in the commoditization of pastoral camel milk. When pastoral women can sell milk, it enhances local food security (Dietz et al. 2001). Market exchanges and related terms of trade are of particular importance during the dry season, when food production does not always suffice to satisfy the energy requirements of pastoral households. This is supported by other case studies such as that in the Ogaden in Ethiopia's Somali Region—a traditionally food-insecure area—which shows that women's participation in the sale of livestock milk products generates more than 80% of the income needed to satisfy basic needs among pastoral households (while it contributes about 40% during the rainy season, when milk is in surplus) (Nori et al. 2006).

The degree of control over livestock can vary according to the relative importance of different livestock products in total household income. For example, in most pastoralist societies, women traditionally milk animals and dispose of their products (Talle 1988; Watson 1994). Linked to this is the decision as to the amount of milk allocated for sale versus home consumption (Waters-Bayer 1985; Nori et al. 2006). In these cases, women may have a large amount of influence over the viability of the herd (Bruggeman 1994).

IFAD's *Rural Poverty Report* divides market access issues into three distinct categories: physical, structural, and informational or organizational (Niamir-Fuller 1994). All three kinds of access significantly affect women's ability to enter, engage in and profit from livestock markets. Distances from villages to markets throughout Africa are often long, and milk is heavy to transport, particularly for women, who typically do not ride bicycles. The problem of long distances to markets is aggravated by structural problems—particularly inadequate roads and inefficient transport systems. Finally, lack of information can hinder women's access to and benefits from livestock marketing. In the Mandera triangle, at the intersection of the borders of Kenya, Ethiopia and Somalia, Wabekbon (2009) cites lack of education and lack of access to accurate information and infrastructure as the most critical factors hindering women from selling milk and small ruminants.

In northern Kenya, Coppock et al. (2006) noted that self-initiated groups convened and managed by women were able to access livestock markets. They recommended that development initiatives that increased direct access by women to small local livestock markets or to cooperatives that could broker their livestock transactions could enable women to have more control over the income generated.

5.2 Women as processors and retailers

Animal-source foods are among the most common street foods in most countries and often are derived from animals kept in cities (FAO/WHO 2005). In most African countries, most street-food processors and vendors are women (Canet and N'Diaye 1996). As well as being one of the few income-generating activities open to poor women, the street-food sector is of great importance to the economy. In the cities and towns in East Africa where data are available, on average about 33% of urban dwellers are engaged in agriculture, whereas in West Africa, reported figures vary from more than 50% in Dakar, Senegal, to 14% in Accra, Ghana. As much as 60% of the milk sold in Dar es Salaam, Tanzania, is produced in and around the city (Canet and N'Diaye 1996).

In most cities in Pakistan, women provide the dairy needs from their urban and peri-urban plots. Similarly high levels of urban and peri-urban milk production are cited for Nairobi, Kenya, and Addis Ababa, Ethiopia. In South Africa, street food is probably the single largest informal sector employer (von Holy and Makhoane 2006). In Harare, around 9000 people (81% women) are involved in making and selling street food (Graffham et al. 2005).

A major concern about urban agriculture and informally marketed food is public health (Moy et al. 1997). The pathogens found in street food include *Escherichia coli*, *Staphylococcus aureus*, *Salmonella* spp and *Bacillus cereus*. Animal-source foods are the most common cause of diseases in urban areas. For example, in Zimbabwe, cooked meats posed the greatest health risk of all food sold on the street (Grace 2007). Zoonotic diseases, including most food-borne diseases, are both important and neglected in most developing countries (WHO 2006).

Authorities in many African countries have responded to this problem with weak and erratic implementation of legislation on street food and urban agriculture (Bryld 2003). As formal and informal standards grow, there is a real risk that the poor will be excluded from markets (Perry et al. 2005). Whereas food-safety/quality initiatives that have attempted to eliminate urban agriculture, and informal food markets have been viewed as gender insensitive (Nduna 2004), the literature also provides examples of food-safety regulations that benefit women livestock keepers.

5.3 Impacts of commercialization of milk on women

Studies conducted among the Fulani in northern Nigeria (Waters-Bayer 1985, 1988) demonstrated how the commercialization of milk has eroded women's traditional control over milk products, thereby decreasing their power within the household. With greater integration of the Fulani in commercial markets, men have been taking over the milking of animals from women, with large consequences for the women and their households. The men, who traditionally are responsible for selling stock and who control all income from animal sales, are most interested in ensuring that enough of the daily milk produced by the household cows is left for the suckling calves that the men are raising for the beef market. The women, who fully control the dairy earnings, are more interested in selling as much milk and dairy products as they can to obtain cash; the men therefore feared that, if the women milked, they would not leave enough for the calves. This change in the division of labour, with men taking over the milking role, reduced women's access to milk and thus to dairy income, thereby diminishing their ability to control the welfare of their matrifocal household units under polygamous relationships.

Evidence from East Africa shows that where and which milk is sold can determine whether women manage the milk income or not. Women have greater control over the evening milk than the morning milk and manage more income from milk sold at local markets and to neighbours and mobile traders than they do from milk sold to collection centres or chilling plants. A survey of dairy households in Kenya, Rwanda and Uganda showed that women received dairy income in 35% of the households that sold milk to individual traders but in only 16% of households that sold milk to collection centres (EADD 2008). Formalizing milk markets through member-based collection centres and cooperatives can in some instances lead to women losing their income from milk.

In a review of literature on the impact of commercialization on the role of labour in African pastoral societies, Sikana and Kerven (1991) noted that, where live animal marketing dominated, women's labour in pastoral production was devalued, since dairying was no longer emphasized. Likewise, where marketing led pastoralists to shift from large to small stock (which can have a higher market value), women's role in managing small stock diminished.

It may be too simplistic to conclude that commercialization only erodes women's power. Where a strong market value for milk and/or dairy products is established, women's roles in dairying may be enhanced and their labour refocused on marketing rather than production. This latter effect is described by Micheal (1987, cited in Sikana and Kerven 1991) for Baggara pastoralists of Kordofan, Sudan, where over the previous 30 years there had been a growth of seasonal cheese factories dependent on purchasing milk from Baggara women. These factories are the main suppliers of cheese to Sudan's urban areas, while cash income from milk sales is estimated to comprise about a quarter of pastoral family income for the Baggara. The author noted that although men sold cattle and recognized the value of milk in herd growth, they had less control over milk than women. The increasing urban demand for milk and milk products meant that women's traditional role in controlling milk output from the herd also evolved into their control of milk marketing (see also Nori 2008).

5.4 What kinds of livestock interventions increase women's market participation and benefits?

There appears to be more awareness of the importance of gender in market-related livestock projects than in projects focused on raising livestock productivity. Whether this awareness translates into effective livestock marketing strategies for women is unclear. A Heifer International report on activities in East Africa found that women provided more labour in dairy enterprises than men, but the level of women's control of the dairy income did not usually match their contribution. This was in spite of Heifer's finding of a strong correlation between women's control of dairy income and the productivity and success of dairy projects (Heifer International 1996).

Women's groups initiated by development projects are widely used to support women pursuing urban agriculture; these groups provide women with micro-credit schemes and other forms of support for their dairying, poultry production, livestock marketing, and food transformation and sale (Niamir-Fuller 1994; de Haan 2001). Joining such groups may be the only way for many poor women to obtain sufficient resources to start up and profitably operate a livestock-related enterprise. Membership in such groups enables women to more effectively lobby government departments and other decision-making agencies affecting their livelihoods. Although the performance of such women's groups has been reported as variable, group membership gives many developing-country women the freedom to participate in livestock development activities, enabling them to protect their interests, to overcome legal hurdles facing them, and to access the training and equipment they need to increase their production and sale of safe livestock foods.

In Bangladesh, the Bangladesh Rural Advancement Committee (BRAC) poultry model is an interesting example of a market-oriented intervention because, in order to achieve its goal of increasing income and nutrition of poorest women through poultry production, the model also

supports a range of supply (parent stock, feeds, vaccines) and service (training, credit, extension) activities and involves women in all these areas (Dolberg 2001). Women who provide supplies receive support in order to be able to do so on a commercial basis to program and non-program participants. By 1999, BRAC was reaching more than 1.4 million women with this model, and it has been scaled out to other NGOs and to several African countries.

6 Summary and conclusions

This paper reviewed the evidence for three main livestock-related pathways out of poverty for women—securing, building and safeguarding assets; increasing and sustaining livestock productivity; and enhancing participation in and benefits from livestock markets.

6.1 Securing livestock assets

With respect to assets, while there is widespread evidence of women owning livestock, their circumstances and the kinds of livestock they keep vary considerably by region, culture and even by household. Women's ownership can also be very dynamic. The implication is that while it is important to be cognizant of existing ownership norms and patterns in the design of interventions, these should not be taken as given. They can change, to the benefit or detriment to women depending on how interventions are designed and implemented.

In many cases, women's ownership of stock does not correlate with their control over use of products or decision-making regarding management or sale. Although some women buy livestock in markets, many obtain animals through inheritance, gifts and other informal mechanisms. The relatively informal means by which most developing country women acquire livestock may help explain the limited rights women have over animals, if more informal means of acquisition are seen as conferring fewer rights to control than outright purchase. Interventions that secure women's rights to livestock—their own or those of their households in the event of dissolution—could be of great benefit to women. Other threats to livestock assets owned by women include their lack of access to complementary assets and to services for livestock health, production and marketing, and increased commercialization, particularly of milk and dairy enterprises. Reducing these threats will help make securing livestock assets a viable pathway out of poverty for women.

The review found relatively little information on the relative importance of livestock in women's current asset portfolios or on their preferences for livestock versus other assets. While animals are often among the few assets many developing country women can own, the relative insecurity of their rights to these animals, coupled with the greater responsibility they may have for livestock-related tasks, could make them less desirable than other physical or financial assets. Addressing this gap should be a priority for research.

6.2 Increasing livestock productivity

When it comes to helping women increase the productivity of the livestock enterprises for themselves and their households, it is important to recognize the key roles women play in these enterprises. Women may have different production objectives than men. Interventions focused on areas where women are responsible (e.g. milking, tending young stock, poultry feeding) need to be targeted to women if they are to have impact on how animals are managed, whether or not women are the 'owners' of the animals in question. This implies that women need to be more involved in technology design and testing, and in dissemination processes.

Little information is available on the relative productivity of livestock enterprises managed by women versus men, although quite a lot is known about the constraints women face to accessing information, training and improved technologies. Livestock-keeping women are disadvantaged by their lack of access to complementary assets, such as land for growing forages, and to livestock production inputs and services that could enhance their productivity. Greater access to livestock extension services seems to be especially important for women, and some examples of promising approaches targeting women are being tried.

Owing to their close proximity to animals and their handling of animal products, women are in many cases more exposed to zoonotic diseases and other livestock related health concerns than men. Addressing these issues could improve the productivity of livestock systems and improve the wellbeing of women and their families. Relatively little information is available on the relationships between gender and the negative environmental impacts of livestock production. Women's responsibility for gathering feed may contribute to degradation of forests and watersheds. At the same time, women are also likely to suffer the impacts of degradation; for example when contamination by livestock of a water source requires them to get water from more costly (in time or money) sources. Addressing this gap will be important in order to change the environmental footprint of livestock in ways that help rather than hurt women.

6.3 Enhancing participation in livestock markets

The scarce literature that exists on women and livestock markets indicates that developing country women participate in livestock value chains mainly as suppliers of dairy products and as producers and sellers of processed animal-source foods in informal markets. Although increasing the participation of women in livestock markets and value chains clearly has the potential to improve welfare, the increasing commercialization of livestock markets presents women with risks as well as rewards. The literature cites many cases where women's control over livestock enterprises and incomes is diminished rather than maintained or enhanced with increasing commercialization. Women stand to benefit substantially from improvements in food safety, especially in informal markets, but are often inadvertently hurt by the unintended consequences of inappropriate policies and regulations. The conditions leading to these different outcomes need to be much better understood. While market-oriented livestock projects, perhaps more than productivity-focused projects, are increasingly recognizing the need to pay attention to gender, the challenge remains to identify strategies that help women enter into and benefit more from livestock markets.

References

- Aklilu HA, Almekinders CJM, Udo HMJ, Van der Zijpp AJ. 2008. Village poultry consumption and marketing in relation to gender, religious festivals and market access. *Tropical Animal Health and Production* 39:165–177.
- Alene AD, Manyong VM, Omany G, Mignouma H D, Bokanga M, Odhiambo G. 2008. Smallholder market participation under transactions costs: Maize supply and fertilizer demand in Kenya. *Food Policy* 33:318–328
- Allport R, Mosha R, Bahari M, Swai E, Catley A. 2005. The use of community-based animal health workers to strengthen disease surveillance systems in Tanzania. *Rev. sci. tech. Off. int. Epiz* 24(3):921–932.
- Ayoade JA, Ibrahim HI, Ibrahim HY. 2009. Analysis of women involvement in livestock production in Lafia area of Nasarawa State, Nigeria. *Livestock Research for Rural Development* 21:220. (Available from <http://www.lrrd.org/lrrd21/12/ayoa21220.htm>) (Accessed on 14 January 2010).
- Bravo-Baumann H. 2000. Gender and livestock: capitalisation of experiences on livestock projects and gender. Working Document. Swiss Agency for Development and Cooperation, Bern. (Available from <http://www.fao.org/wairdocs/LEAD/X6106E/x6106e00.HTM>)
- Bruggeman H. 1994. Pastoral women and livestock management: examples from northern Uganda and Central Chad. Issue Paper 50, IIED, London.
- Bryld E. 2003. Potentials, problems, and policy implications for urban agriculture in developing countries. *Agriculture and Human Values* 20:79–86.
- Budaka DB, Darca N, Kantar M. 2005. Women farmers and extension services in small ruminant production in mountain areas of Turkey. *Journal of Arid Environments* 62(3):507–515.
- Canet C, N'Diaye C. 1996. Street food in Africa. FAO/Food, Nutrition and Agriculture No. 17/18. (Available from <http://www.fao.org/aa/agr/publications/fna>).
- Carter M, Barrett C. 2006. The economics of poverty traps and persistent poverty: as asset based approach, *Journal of Development Studies* 42(2):178–199.
- Chawatama S, Mutisi C, Mupawaenda AC. 2005. The socio-economic status of smallholder livestock production in Zimbabwe: a diagnostic study. *Livestock Research for Rural Development* 17(12). (Available from <http://www.cipav.org.co/lrrd/lrrd17/12/chaw17143.htm>).
- Coppock D L, Desta S, Wako A, Aden I, Gebru G, Tezera S, Tadecha C. 2006. Collective action by women's groups to combat drought and poverty in northern Kenya. Pastoral Risk Management Project Research Brief 06–01. Global Livestock Collaborative Research Support Program, University of California–Davis, Davis, California. (Available from www.glcrrp.ucdavis.edu).
- Corniaux C. 2003. La filière lait et produits laitiers dans la région de Saint-Louis. ISRA/CIRAD-PSI, Saint-Louis, Sénégal.
- Delgado C, Rosegrant M, Steinfeld H, Ehui S, Courbois C. 1999. Livestock to 2020: the next food revolution. Food, Agriculture and the Environment Discussion Paper 28. IFPRI (International Food Policy Research Institute), Washington, DC.

- Deshingkar P, Farrington J, Rao L, Akter S, Sharma P, Freeman A, Reddy J. 2008. Livestock and poverty reduction in India: findings from the ODI Livelihood Options Project. ILRI Discussion Paper 8. Nairobi (Kenya): ILRI. (Available from http://mahider.ilri.org/bitstream/10568/281/1/LivesPovertReduc_DiscPaper8.pdf).
- Devendra C, Chantalakhana C. 2002. Animals, poor people and food insecurity: opportunities for improved livelihoods through efficient natural resource management. *Outlook on Agriculture* 31(3):161–175.
- Dietz, T, Abdirizak Arale Nunow, Adano Wario Roba and Zaal, F. 2001. 'Pastoral Commercialisation: On Caloric Terms of Trade and Related Issues', In *African Pastoralism, Conflict, Institutions and Government*, eds. M. Mohamed Salih, Ton Dietz and Abdel Ghaffar Mohamed Ahmed. Pluto Press in association with Organization for Social Science Research in Eastern and Southern Africa, Amsterdam Research Institute for Global Issues and Development Studies (AGIDS). University of Amsterdam, Amsterdam, 194–234.
- Dieye PN, C Ly, Sane FCN. 2005. Etude des service d'élevage dans la filière laitière au Sénégal. Pro-Poor Livestock Policy Initiative (PPLPI) Internal Report, FAO, Rome.
- Dolberg F. 2001. A livestock development approach that contributes to poverty alleviation and widespread improvement of nutrition among the poor, *Livestock Research for Rural Development*, Vol 13, No 5
- Due JF, Magayane AA, Temu A. 1997. Gender again: views of female agricultural extension officers by smallholder farmers in Tanzania. *World Development* 25(5):713–125.
- EADD. 2008. East Africa Dairy Development Project. Baseline Report No 6. Gender, dairy production and marketing. EADD/ ILRI, Nairobi Kenya.
- Engh, I-E, Stouklal, L. and du Guerny, J. 2000. HIV/AIDS in Namibia: the impact on the livestock sector. FAO, Rome. (Available from <http://www.fao.org/sd/wpdirect/WPan0046.htm>).
- FAO. 2009. Livestock in the Balance, The State of Food and Agriculture, FAO, Rome.
- FAO/WHO. 2005. Informal food distribution sector in Africa (street foods): importance and challenges. FAO/WHO Regional Conference on Food Safety for Africa, Harare, Zimbabwe, 3–6 October 2005.
- Flintan F. 2008. Women's Empowerment in Pastoral Societies. WISP, GEF, IUCN, UNDP.
- George, P. S .and Nair, K. N. 1990. Livestock Economy of Kerala. Kerala:Centre for Development Studies. (Available from <http://www.smallstock.info/reference/LID/livestock.pdf>) (Accessed on 2 July 2010).
- Goe MR, Mack S. 2005. The linkages between HIV/AIDS and livestock in Eastern and Southern Africa: proceedings of a technical workshop. FAO Animal Production and Health Unit, Rome. (Available from <http://www.fao.org/docs/eims/upload/207140/hivlivestocksector.pdf>).
- Gotschi E, Njuki J, Delve R. 2009. Equal Numbers, Equal Chances? A Case Study of Gender Differences in the Distribution of Social Capital in Smallholder Farmer Groups in Búzi District, Mozambique. *European Journal of Development Research* 21(2):264–282.

- Grace D. 2007. Women's reliance on livestock in developing-country cities. ILRI Working Paper. International Livestock Research Institute, Nairobi, Kenya.
- Graffham A, Zulu R, Chibanda D. 2005. Improving the safety of street vended foods in Southern Africa. Final Report, CPHP Project R8272. *In: Engendering Agricultural Research*. IFPRI Discussion Paper 00973. International Food Policy Research Institute, Washington DC. (Available from <http://www.ifpri.org/publications/results/taxonomy%3A468>).
- Guèye, El Hadji Fallou. 2000. Women and Family Poultry Production in Rural Africa. *Development in Practice* 10(1):98–102.
- Guillet DW. 1992. 'The impact of alfalfa introduction on common field agropastoral regimes: Quechua villagers in southwestern Peru'. pp. 111–123 in C. M. McCorkle (ed.). *Plants, Animals and People*. Boulder, Colorado: Westview Press.
- de Haan N. 2001. Of goats and groups: a study on social capital in development projects. *Agriculture and Human Values* 18(1):27–39.
- Haenlein GFW, Abdellatif MA. 2004. Trends in small ruminant husbandry and nutrition and specific reference to Egypt. *Small Ruminant Research* 51:185–200.
- Hallman K. 2000. 'Mother–father resource control, marriage payments, and girl–boy health in rural Bangladesh.' Food Consumption and Nutrition Division Discussion Paper 93. IFPRI, Washington DC.
- Heffernan C, Misturelli F. 2008. The delivery of veterinary services to the poor: preliminary findings from Kenya. Veterinary Epidemiology and Economics Research Unit Department of Agriculture, University of Reading, Reading. (Available from www.livestockdevelopment.org).
- Heffernan C, Misturelli F, Pilling D. 2003. Livestock and the Poor: Findings from Kenya, India and Bolivia. Animal Health Programme, Department for International Development, London.
- Herath S. 2007. Women in livestock development in Asia. *Journal of Commonwealth Veterinary Association* 24(1):29–37.
- Heifer International. 2008. 2007–2008 Project profiles: where we work and what we do. Heifer International, Little Rock AR. (Available from <http://www.heiferproject.org>).
- Herrero M, Thornton PK, Notenbaert A, Wood S, Msangi S, Freeman HA, Bossio D, Dixon J, Peters M, van de Steeg J, Lynam J, Parthasarathy Rao P, Macmillan S, Gerard B, McDermott J, Seré C, Rosegrant M. 2010. Smart Investments in Sustainable Food Production: Revisiting Mixed Crop–Livestock Systems. *Science* 327:822–825.
- von Holy A, Makhoane FM. 2006. Improving street food vending in South Africa: achievements and lessons learned. *Int J Food Microbiol* 111(2):89–92.
- Hussain S, Zakaria M, Hassan Y, Mukhtar Y, Ali S. 2004. Gender Role in Livestock Rearing and Effect of National Rural Support Programme (NRSP) in Livestock Training Course in Kotli (Azad Kashmir). *International Journal of Agriculture and Biology* 6(2):424–425.
- IFAD. 2005. Livestock services and the poor. International Fund for Agricultural Development, Rome.

- ILRI. 2002. Livestock—A Pathway out of Poverty. ILRI's strategy to 2010. International Livestock Research Institute. Nairobi (Kenya). 24 p.
- Jaitner J, Sowe J, Secka-Njie E, Dempfle L. 2001. Ownership pattern and management practices of small ruminants in The Gambia — implications for a breeding programme. *Small Ruminant Research* 40(2):101–108.
- Kanyamurwa J, Ampek G. 2007. Gender differentiation in community responses to AIDS in rural Uganda. *AIDS Care* 19(S1):64–72.
(Available from http://www.fsublishers.org/p_issuevol.jsp?&acc1=VOL_6_NO_2).
- Kimani TM, Ngethe EW. 2007. Enhancing livestock management skills amongst Maasai pastoral women of Magadi Division in Kenya: a CVA funded Kenya Women Veterinary Association Project. 4th Pan Commonwealth Veterinary Conference, 4–8 November 2007. Barbados, West Indies.
- Kipuri N. 1989. Maasai women in transition: Class and gender in the transformation of a pastoral society. Unpublished Ph.D. Dissertation, Temple University.
- LID (Livestock in Development). 2004. Livestock services and the poor. Veterinary Epidemiology and Economics Research Unit Department of Agriculture, University of Reading, Reading.
(Available from www.livestockdevelopment.org).
- McPeak J, Doss C. 2006. Are household production decisions cooperative? Evidence on migration and milk sales from northern Kenya. *American Journal of Agricultural Economics* 88(3):525–541.
- Meinzen-Dick R, Pradhan R, di Gregorio M. 2004. *Collective Action and Property Rights for Sustainable Development: Understanding Property Rights*, 2020 Focus Brief 11. International Food Policy Research Institute, Washington, D.C.
- Moy G, Hazzard A, Käferstein F. 1997. Improving the safety of streetvended food. *World Health Stat. Quart.* 50:124–131.
- Msoffe PLM, Bunn D, Muhairwa AP, Mtambo MMA, Mwamhehe H, Msago A, Mlozi MRS, Cardona CJ. 2010. Implementing poultry vaccination and biosecurity at the village level in Tanzania: a social strategy to promote health in free-range poultry populations. *Tropical Animal Health and Production* 42 (2):253–263. (Available from <http://ukpmc.ac.uk/classic/articlerender.cgi?tool=pubmed&pubmedid=19688307>).
- Mullins, G L, Wahome P, Tsangari A, Maarse L. 1996. Impacts of Intensive Dairy Production on Smallholder Farm Women in Coastal Kenya. *Human Ecology* 24(2):231–253.
- Mutenje M, Mapiye D, Mavunganidze A, Mwale M, Muringai V, Katsinde C, sGavumende I. 2008. Livestock as a buffer against HIV and AIDS income shocks in the rural households of Zimbabwe. *Development in Southern Africa* 25(1):75–82.
- Mwangi EN. 2005. The transformation of property rights in Kenya's Maasailand: triggers and motivations. CAPRI Working Paper 35, IFPRI, International Food Policy Research Institute: Washington DC. (Available from www.capri.cgiar.org/pdf/capriwp35.pdf).

- Nduna JN. 1990. The struggles for survival of street traders in Umtata, Transkei, 1980–89. *GeoJournal* 22(3):1572–9893.
- Ndungu LW, Randolph TF, Coetzee G, Krecek RC, Perry BD. 2004. An economic assessment of current delivery pathways for the control of tick-borne diseases in Kenya. International Livestock Research Institute: Nairobi, Kenya.
- Niamir-Fuller M. 1994. Women livestock managers in the Third World: focus on technical issues related to gender roles in livestock production. Staff Working Paper 18, IFAD, Rome.
- Njuki, JM. 2001. Gender roles in agroforestry: A socio-economic analysis of Embu and Kirinyaga Districts, Kenya. PhD Thesis, Sokoine University of Agriculture, Tanzania.
- Njuki J, Kihyo M, O'kingati A, Place F. 2004. Male versus Female Labour in an Agroforestry System in the Central Highlands of Kenya: Correcting the Misconception. *International Journal of Agricultural Resources, Governance and Ecology* 3(1–2):154–170.
- Nori M. 2008. Milking Drylands: Gender networks, pastoral markets and food security in stateless Somalia. Thesis, Wageningen University, Wageningen, NL. (Available from <http://library.wur.nl/WebQuery/wda/lang/1929205>).
- Nori M, Kenyanjui MB, Yusuf MA, Mohammed FH. 2006. Milking drylands: the emergence of camel milk markets in stateless Somali areas. *Nomadic Peoples* 10(1):9–28.
- Oboler RS. 1996. Whose cows are they, anyway? Ideology and behaviour in Nandi cattle 'ownership' and control. *Human Ecology* 24(2):255–272.
- Okali C, Sumberg JE. 1985. Sheep and goats, men and women: household relations and small ruminant development in south-west Nigeria. *Agricultural Systems* 18:39–59.
- Oxby C. 1985. Women unveiled: class and gender among Kel Ferwan Tuareg. *Ethnos* 52(1–2):119–36.
- Patel. 1998. Women and the White Revolution. *Cooperative Dialogue* 8(1):20–25.
- Perry B, Grace D. 2009. The impacts of livestock diseases and their control on growth and development. *Philosophical Transaction of the Royal Society* 34:2643–2655.
- Perry BD, Nin-Pratt A, Sones K, Stevens C. 2005. An appropriate level of risk: balancing the need for safe livestock products with fair market access for the poor. Pro-poor Livestock Policy Initiative Working Paper 23, FAO/ILRI, Rome. (Available from <http://www.fao.org/ag/againfo/programmes/en/ppipi/workingpapers.html>).
- Place F, Kariuki G, Wangila J, Makauki A, Ndubi J, Kristjanson P. 2004. Assessing the factors underlying differences in achievements of farmer groups: methodological issues and empirical findings from the highlands of Central Kenya. *Agricultural Systems* 82(3):197–353.
- Quisumbing AR (ed.). 2003. *Household Decisions, Gender, and Development: A Synthesis of Recent Research*. IFPRI, Washington DC.
- Quisumbing A, Maluccio J. 2003. 'Resources at marriage and intrahousehold allocation: Evidence from Bangladesh, Ethiopia, Indonesia, and South Africa' *Oxford Bulletin of Economics and Statistics* 65(3):283–328.

- Quisumbing A, Pandolfelli L. 2010. Promising approaches to address the needs of poor female farmers: Resources, constraints and interventions. *World Development* 38(4):581–592.
- Rangnekar S. 1998. Women in livestock production in developing countries. International Conference on Sustainable Animal Production, 24–27 November, Hisar India.
- Rao SVN, Ramkumar S, Waldie K. 2002. Dairy farming by landless women in the southern states of India. In: Morrenhof J, Ahuja V, Tripathy A (eds), *Livestock services and the poor: papers, proceedings and presentations of the international workshop*, Bhubaneswar, India, pp 73–86.
- Riise JC, Permin A, Kryger KN. 2008. Strategies for developing family poultry production at village level: experiences from West Africa and Asia. Network for Smallholder Poultry Development (NESPOD), Dyr-laegevej 2, 1870 Frederiksberg, Denmark.
- Rivière-Cinnamond A. 2005. Animal health policy and practice: scaling up community-based animal health systems, lessons from human health. Pro-Poor Livestock Policy Initiative Working Paper 22. Rome: FAO.
- Roth F, Zinsstag J, Orkhon D, Chimed-Ochir G, Nansalmaa M, Hutton G, Cosivi O, Carrin G, Otte J. 2003. Human health benefits from livestock vaccination for brucellosis: a case study. *Bull. World Health Organ.* 81:867–876.
- Roy S, Rangnekar DV. 2007. Farmer Participatory Need-based Extension (FPNE) approach: a sustainable model adopted by cooperative milk unions in Andhra Pradesh, India. *Livestock Research for Rural Development*. Volume 19 (144). (Available from <http://www.cipav.org.co/lrrd/lrrd19/10/roy19144.htm>).
- Rubin D, Tezera S, Caldwell L. 2010. A calf, a house, a business of one's own: Microcredit, asset accumulation, and economic empowerment in GL CRSP projects in Ethiopia and Ghana, Global Livestock Collaborative Research Support Program.
- Salman MD, Morley PS, Ruch-Gallie R (eds). 1999. International Society for Veterinary Epidemiology and Economics, Nairobi (Kenya). Proceedings of the 9th symposium of the International Society for Veterinary Epidemiology and Economics. Paper 333. Nairobi.
- Schelling E, Abdoulaye M, Wyss K, Randolph TF, Zinsstag J. 2007. Human and animal vaccination delivery to remote nomadic families. *Chad* Vol. 13, No. 3: Emerging Infectious Diseases, Centre for Disease Control. < <http://www.cdc.gov/ncidod/EID/index.htm>>
- Sen AK. 1997. *Choice, Welfare and Measurement*. First Harvard University Press. Cambridge, Mass.
- Sikana PM, Kerven CK. 1991. The impact of commercialisation on the role of labour in African pastoral societies. Pastoral Development Network, ODI, London.
- Smale M, Heisey P W. 1994. Comment: Gendered impacts of fertilizer subsidy removal programs in Malawi and Cameroon. *Agricultural Economics* 10(1):94–99.
- Smith LC, Ramakrishnan U, Ndiaye A, Haddad LJ and Martorell R. 2003. *The importance of women's status for child nutrition in developing countries*. IFPRI Research Report 131. IFPRI (International Food Policy Research Institute), Washington, DC, USA.

- Sparr P, Moser C. 2007. International NGOs and poverty reduction strategies: the contribution to asset-based approach. Working Paper #08, Brookings Global Economy and Development, Brookings Institution, Washington DC.
- Staal S, Poole J, Baltenweck I, Mwachero J, Notenbaert A, Thorpe W, Nzuma J, Herrero M. 2009. Targeting strategic investment in livestock as a vehicle for rural livelihoods. ILRI working document. International Livestock Research Institute. Nairobi, Kenya.
- Talle A. 1988. *Women at a loss: changes in Maasai pastoralism and their effects on gender relations*. Thesis, Dept of Social Anthropology, University of Stockholm.
- Tangka FK, Jabbar MA, Shapiro BI. 1999. Gender roles and child nutrition in livestock production systems in developing countries: a critical review. ILRI, Nairobi.
- Teufel N, Kuettner K, Gall C. 1998. Contribution of goat husbandry to household income in the Punjab (Pakistan): a review. *Small Ruminant Research* 28:101–107.
- Thomas-Slayter B, Bhatt N. 1994. Land, livestock, and livelihoods: changing dynamics of gender, caste, and ethnicity in a Nepalese Village. *Human Ecology* 22(4):467–494.
- Thornton PK, Kruska RL, Henninger N, Kristjanson PM, Reid RS, Robinson TP. 2003. Locating poor livestock keepers at the global level for research and development targeting. *Land Use Policy* 20(4):311–322.
- Todd H. 1998. Women climbing out of poverty through credit; or what do cows have to do with it? *Livestock Research for Rural Development*. (Available from <http://www.cipav.org.co/lrrd/lrrd10/3/todd103.htm>).
- Torkelsson A, Tassew B. 2008. Quantifying women's and men's rural resource portfolios—empirical evidence from Western Shoa in Ethiopia, *The European Journal of Development Research* 20(3):462–481.
- Turner M. 1999. Merging Local and Regional Analyses of Land-Use Change: The Case of Livestock in the Sahel. *Annals of the Association of American Geographers* 89(2):191–219.
- Upadhyay B. 2005. Women and Natural Resource Management: Illustrations from India and Nepal. *Natural Resources Forum* 29:224–232.
- Valdivia C. 2001. Gender, livestock assets, resource management, and food security: lessons from the SR-CRSP. *Agriculture and Human Values* 18(1):27–39.
- Wabekbon Development Consultants. 2009. Women's Milk and Small Ruminant Marketing in Mandera Triangles (Kenya, Ethiopia and Somalia), CARE-Ethiopia. (Available from <http://www.elmt-relpa.org/FCKeditor/UserFiles/File/elmt/200910/Final%20Women%20milk%20and%20Shoat%20tradings%20final%201%5B1%5D-edited.pdf>).
- Waite. 2000. How is household vulnerability gendered? Female headed households in the collectives of Suleimaniyah, Iraqi Kurdistan. *Disasters* 24(2):153–172.
- Wangui EE. 2008. Development interventions, changing livelihoods, and the making of female Maasai pastoralists. *Agriculture and Human Values* 25:365–378.

- Waters-Bayer A. 1985. Dairying by settled Fulani women in Central Nigeria and some implications for dairy development. ODI Pastoral Development Network Paper 20c. Overseas Development Institute, London.
- Waters-Bayer A. 1988. *Dairying by settled Fulani agropastoralists: the role of women and implications for dairy development*. Vauk Wissenschaftsverlag, Kiel.
- WHO. 2006. The control of neglected zoonotic diseases: a route to poverty alleviation, Report of a Joint WHO/DFID-AHP Meeting with the participation of FAO and OIE Geneva, 20–21 Sept. 2005. http://www.who.int/zoonoses/Report_Sept06.pdf
- World Bank. 2001. *Engendering development: through gender equality in rights, resources, and voice*. World Bank, Washington D.C.
- Yisehak K. 2008. Gender responsibility in smallholder mixed crop–livestock production systems of Jimma zone, South West Ethiopia. *Livestock Research for Rural Development*. 20:11. (Available from <http://www.lrrd.org/lrrd20/1/yise20011.htm>) (Accessed on 14 January 2010).
- Zimmerman SD. 1982. The cheese makers of Kafr al Bahr. Women in Development Series/Egypt, University of Leiden, Leiden.