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Existing Dairy Farming Technologies among Rural Women in Khwisero, Kakamega County, Kenya

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Abstract:

Rural women play key roles in Kenyan dairy farming. In an effort to establish factors of adoption of dairy farming technologies by rural women in Kakamega County, the researcher sought to determine the already existing technologies among them. The descriptive survey collected both qualitative and quantitative data from Khwisero sub-county, Kakamega County in Kenya. The study targeted 720 female dairy farmers in the cooperative groups in Khwisero. Random sampling was used to sample location and sub-location and to select 72 respondents. The study found several existing technologies; a mixture of the traditional and exotics ones. The main ones however were cross bred cows, improved nappier grass, mullato and sweet potatoes vines implemented on small portion of land. Nevertheless, there was no observed farm household that practiced fodder conservation technologies. Although women in the household's understudy provided more than 50% of the labour and were usually more present on the farm on a day-to-day basis, the study established that the existing technologies were mostly influenced by the men. Therefore, the study recommended that both women and men be empowerment on the best dairy technologies for their households.

Keywords: Dairy farming technologies, exotic technologies, fodder preservation technologies, improved napier grass, mullato, rural women, traditional technologies

1. Introduction

The rising global demand for dairy cows and products called for technologies that contribute to more productive, resilient and sustainable dairy farming systems. In their studies, Mohamed, Simeon & Yemesach (2004) observed that dairy farming technology encompassed the use of exotic cow breeds, improved feed production and conservation methods, among other management practices. These were scientifically researched technologies that required an awareness creation and dissemination by dairy stakeholders. King (2006) asserted that governments, development practitioners, and Non-Governmental Organizations (NGOs) around the world were advocating for adoption of dairy farming technologies. This aimed at reducing household resource input as well as for the improvement of dairy production. Determining therefore what technologies already exist would help in enhancing adoption of dairy technologies and increase dairy production.

Food and Agriculture Organisation FAO (2011) report observed the dairy sector was becoming more technologically sophisticated, commercially oriented and globally integrated. The report, thus, encouraged dairy development agencies to increase their drive for the gender agenda in the uptake of dairy farming technologies. In order to succeed in this impetus, the missing link between gender and dairy technologies adoption needed to be identified and addressed. The FAO (2011) report noted that in most cases, dairy farming technologies were designed in developed countries and then deployed across the world, a factor that could adversely affect their adoption.

In Kenya, a study by Wakhungu and Kangethe (2008) found out that the dairy sector played a critical role in the livelihood of many Kenyans. The study also established that the industry contributed 4.5% of total Gross Domestic Product (GDP), making Kenya one of the largest producers of milk in East and Sub-Sahara Africa. There was therefore need for a study to assess the existing dairy farming technologies to sustain future milk production. Likewise, a report by the Kenya Dairy Board, (2014) estimated that 80% of the milk produced in rural areas was dominated by rural women subsistence farmers. A furthermore the report disclosed stagnation in dairy farming across agro-regional zones

characterised by uneven adoption of dairy farming technologies. The report also indicated that this stagnation was occasioned by the persistent use of traditional practices among rural women in their households.

2. Factors Influencing the Existence Dairy Technologies in Kenya

The Kenyan landscape is abounding with an array of dairy technologies. These include the entire range of things dairy farmers do in a bid to improve dairy production such as the breeding, the feeding, rearing systems; and milk and its products. The Kwisero study concentrated on three main technologies; namely exotic dairy breeds, fodder establishment and fodder conservation as core variables in dairy production. The existing technologies are a mixture of tradition and the exotic. Given that dairy farmers are aware of the many newer technologies that come with many benefits, the reality is that their uptake has been slow and hampered by the existence of the seeming less attractive traditional technologies. According to Karanja's (2003) in a Kenyan study on the post liberalization of dairy industry, there are more exotic cows in the highlands of Kenya due to cultural adaptability, smaller land sizes as well as dairy farming being undertaken as a business enterprise by rural women. On the other hand, in areas where traditional culture is strong, and the pressure on land deemed not as severe, the likelihood of farmers keeping exotic dairy animals is less. Abayomi's (2014) study on factors explaining dairy cattle adoption behaviour by smallholder farmers in Kenya exposed the fact that dominance by indigenous breeds hampered every effort of dairy farming technology adoption. On the other hand, Baltenweck and Staal (2006) in their study on the dynamic changes in dairy technologies uptake in the Kenya highlands, found that the adoption of exotic cows was hampered by risks related to diseases, fodder requirements, unreliable milk market and breeding challenges. FAO (2006) too reported poor linkage and low advisory services as a factor in the low adoption of dairy technologies by rural women farmers in the Kenyan highlands.

2.1. Rural Women Influence on Existence of Dairy Technologies

Understanding gender perspectives in adoption especially in developing countries would also go a long way in addressing both the equality and equity of adoption of dairy farming technologies. Rural women have played a key role in determining what dairy technologies currently exist as labourers and managers; a factor that is often overlooked. According to Muriuki et al. (2003) rural women in Kenya were the main actors in the daily activities of dairy farming including cutting and carrying fodder, feeding cows, and fetching water. The researchers noted however, that their passion to adopt dairy farming technologies in their households was less robust. Examining the existing dairy technologies in relation to households and the role played by women in the specific household needs a better approach for future interventions at the household level. To identify these constraints among rural women dairy farmers and also find out how their subordinate status in the community affect their uptake of suitable dairy technology cannot continue to be ignored if dairy production is to be stepped up.

Abel, Osoro and Getabu (2015) observed that dairy farming technologies had several benefits namely, excellent reproduction potential, faster growth rate and higher yields for both dairy animals and fodders, and improvement of household welfare. However, they stated that adoption of such technologies by rural women in Sub-Sahara Africa was still wanting. In addition, King (2006) found that milk production in Africa had not kept pace with the growing population and added that there still existed significant levels of traditional dairy production. On the other hand, Bongiwe and Susan (2015) found that dairy development agencies put great responsibility on African rural women than men counterparts in adoption of dairy farming technologies. They also established that women made up 52% of the total population in the dairy sector, and were responsible for roughly 50% of the manual labour on African farm land. This was the reason why more effort was needed in identifying strategies to help them embrace dairy technologies. A United Nations report (1990) cited by Sulo et al. (2012) indicated that rural women were farmers, livestock managers, workers and entrepreneurs within the sector. The report however, noted that the level and quality of participation did not result in sustainable socio-economic development benefits. This was also observed by Anouka Van Eerdewijk and Katrine Danielsen, (2015) who found that rural women often achieved lower yields in dairy farming than men; which was attributed to women's low demand for and articulation of dairy technologies. Needless to say, there were widespread gender gaps, informalities and disparities hindering the rural women from adopting dairy farming technologies in Africa.

What dairy technologies exist is dependent on the attitude of women towards them and the power they have to independent decision on them. Adoption of technologies entails a behaviour change and acceptance that new technologies have better outcomes than the existing ones. In many places where dairy farming is carried out, some level of adoption, albeit on a small scale does exist. There are many studies that have been carried out on the existence of dairy farming technologies among rural women in different countries and ecological zones. Findings on existence of exotic cow's breed indicate that social-economic variables do have an influence. For instance, Mekonnen (2006) explored rural women's role in the production, processing and marketing of milk in Ethiopia. The study observed that most rural women had not embraced exotic cow breeds but instead persistently kept traditional cows, despite the known benefits of embracing improved cows' breed. Similarly, a study by Chawala et al. (2014) in Tanzania on status of adoption of dairy farming technologies, was centered on social influences and resource input as factors in adoption. This study found that the few rural women who had adopted exotic cattle breeds attributed this low implementation rate to social influences and low resource input available to them. This being the case, it is important to note that the labour requirement exotic cows breed rearing is high. This coupled with household labour division that heavily burdens a rural woman; as well as women's rights and authority to household resource ownership can act as great deterrents to the uptake of these technologies.

2.2. Fodder Technologies

Kiptot et al. (2010) defined fodder technology as fodder shrubs, herbaceous legumes, and pasture grasses, weeds gathered from cropping areas, crop by-products and residues, agro industrial by-products and purchased concentrates. It is of essence to note that a more encompassing definition needs to take into consideration the level of understanding that rural women have regarding to content and context within which it is applied. In other words, the information packaging and how implementers contextualise scientific application to rural situations can affect the user understanding and their acceptance of technologies. This could be a more practical way of improving on the methods used during dissemination of fodder technologies and conservation methods.

A study conducted by Cikić (2003) in Serbia, established that fodder production had existed as a practice in a traditional peasant society, while fodder establishment and conservation technologies are modern practices based on up-to-date scientific knowledge. The study also asserted that integration of modern scientific knowledge in the traditional knowledge of local farming practices and circumstances was still lacking. Gitonga's (2014) study in Githunguri on adoption level of fodder establishment and conservation methods noted that there existed low quality and quantity of feed resources. The study registered a level of competition between human food and cow feeds; with more focus being put on food crops rather than fodder production and conservation. In the same research on preferences and adoption of fodder practices among farmers in dairy management groups in Kenya, it was observed that availability and access to feed resources had been hampered by competition for feed resources especially grain between human and dairy cows. In seeking to establish preferences and adoption of fodder practices among farmers in dairy management groups in Kenya, the Kiptot et al. (2010) research noted that availability and access to feed resources had been hampered by competition for feed resources especially grain between human and dairy cows.

FAO (2011) too reported that dairy fodder production and use was driven by increases in human population and reduced income. The report further revealed that the demand for milk in Kenya would grow and thus called for increased demand for dairy cow feeds. From literature, it could be ascertained that there was a need for assessment on existing fodder technologies, levels of adoption as well as household practical gender needs as a measure for future implementations. In order to increase the uptake of fodder technologies, it would be paramount to identify the relationship between influences of family basic needs and the adoption of fodder establishment technologies as a future reference point in positioning of fodder technologies by implementers. It would be important too to determine how fodder establishment can be integrated with food crops within individual farms.

A study by Ngigi (2005) in East Africa on building on successes of smallholder dairying established that fodder production in Kenya was facing challenges due to the rising trend of input prices, global warming and global inflation, as a result of which, dairy cow production has been most hit in terms of scarcity and seasonality. This was supported by Odero and Waitituh (2017) study in Kenya on smallholder dairy production which found that the greatest constraint to dairy cow productivity in the country was the shortage of fodder especially in the dry season. The findings also stated that scarcity of fodder was due to climatic change, seasonal variability's, input costs and high population of dairy cows. The above studies focused on nature and resources, notwithstanding how activities were carried out within the period of seasonal variabilities. The gender roles in fodder production and seasonal variability of the fodder cannot be ignored either. Identifying specific roles and decision to fodder production within each household can help in selling the technologies and increasing their existence.

On the influence of climate change on smallholder productivity, Kirui et al. (2015) observe that adoption of fodder technologies by rural women dairy farmers varies and is household-specific rather than dairy-specific. The study further noted that fodder conservation methods (hay and silage making) level of adoption was low due to discrepancies between awareness and adoption of these practices. For this reason, examination of the existing fodder technologies, constraints experienced and the status of adoption of fodder establishment by rural women could better inform on future process evaluation and planning's of technologies by stakeholders.

In 2017, the Kenya Dairy Board estimated that Kenya had annual processing capacity of 1.4 billion litres of milk which translated to 3.9 million litres a day (Kenya Dairy Board, 2017). The study also established that the volume of milk produced in the country went down by 17 % to 535million litres from 648 million litres in 2016 due to low quality and quantity fodder conservation. Although the drop in milk production could have many causes, it was not difficult to relate it with the existing dairy feeding systems existing among rural women dairy farmers. There is a possibility that one of the reasons could be the lack of understanding by rural women of the link between the level of feeding of dairy cows and the low milk production. Helping women to clearly perceive the relationship between fodder production and milk output would go a long way improving the adoption of fodder technologies. It would also help in informing both the County and National governments planning for integrative and sustainable dairy sector.

3. Methodology

This study used a descriptive survey research design to collect both qualitative and quantitative data from Khwisero sub-county, Kakamega County in Kenya. The study aimed to establish the existing technologies in the location of study. The target population for the study comprised all women who were dairy farmers in the cooperative group in Kwisero. The total population was 720 comprising of trained rural women in dairy farming technologies. Random sampling was used to sample location and sub-location and to select 72 respondents from the target of 720. The study used different instruments to collect both primary and secondary data. These included questionnaires, key informant interview guides, focus group discussions guides and an observation checklist.

4. Results and Analysis

The first objective of the study from which this article is drawn was to identify the existing dairy farming technologies among rural women dairy farmers in Khwisero, Kakamega County in Kenya. The study concentrated on three areas of dairy technologies namely: Exotic cow breeds, fodder establishment and conservation as core variables in dairy production.

4.1. Types of Dairy Cows in Existence in Kwisero

Dairy Cows Owned	Women	Frequency	Percent
Exotic Friesian	8	8	16
Cross bred cows	20	20	42
Indigenous cows	5	5	11
Mixed of exotic, crossbred, indigenous cows	7	7	16
Exotic Friesian and Cross bred cows	3	3	6
No response	2	2	9
Total	45	45	100

Table 1: Dairy Cows Existing in Kwisero

Data on Table 1 portrays, 42% of the respondents adopted cross bred cows as compared to other breeds of cows in the study area. This was also observed while distributing questionnaire that most of the rural women in Khwisero had one cow per household which was mostly cross bred. This was attributed to the level of awareness of the benefits of cross bred cows than the other breeds. Key informants asserted that cross bred cows were encouraged due to the beneficial characteristics that they carried from traditional dairy animals such as resistance to diseases and requirements of less fodder as compared to pure breeds.

On the same view, one key informant commented;

'Farmers are trained on different types of cows. The selection of cows though to be donated is done by project Veterinary Doctors and dairy experts. Generally, the women are given cross bred cows which are less labour intensive compared to exotic cows and resistant to disease. Selection of women to benefit on technologies is based on amount of fodder planted as well as assessments on individual willingness to adopt. Only training on exotic cows is done in groups but the allocation is per household which aims improving livelihood' (KIs Livestock Office).

Similarly, the response from woman in FGDs, reflected that;

'Those cows at our farms were bought and brought to us in selected women groups through donor support and smallholder dairy initiative programme by county government of Kakamega.' (FGDs, Mundaha).

The study further asked during KIs interview why rural women were the majority adopters of cross bred cow as compared to men and the response was;

'...Rural Women have ease way of forming social groups, attend most of the trainings and carryout dairy activities through social network which costs time not money. When it comes to registration to be allocated cows, men fear and send women to be registered since they are to take care of cows at homestead and' (KIs, Lead Farmer).

The findings revealed that even though other dairy breeds existed, cross bred cows were more than the other types of cows in the study area. The responses showed that women were not involved in selection of the dairy cows to adopt, but rather donors dictated what was donated. The study also found out that more rural woman than men had adopted cross bred cows. From FGDs perspective, women reckoned that men perceived the cross bred cows as being lower yielders as compared to the exotics one hence the lack of motivation to adopt them. While others noted that rural women were the caretaker of homestead activities as men searched for alternative incomes away from homestead.

Key informants, however, revealed that due to gathered skills, women social group support and men's willingly let their wives to adopt dairy technology as the main caretakers of homestead activities enabled the existence of cross breeds. In addition, the study found women to have been the majority adopters due to awareness creation that had targeted women groups. This can be inferred to mean that men in study area were willing to support women to adopt technologies which seemed non-productive to them. Furthermore, women being recognised as caretakers may be as a result of socialisation that describes women as home makers and men as off farm income generators. This finding was in line with Anounka et al (2015) conclusions that rural women adopted technologies based on their gender needs, social network and support of men in the society. The finding is also supported by social cognitive theory of gender development and differentiation which holds that gender concepts and role behaviour are the products of broader influences operating in individual households as well as a major factor on household choices and preferences.

In summary, the types of dairy cows adopted by rural women in study area were predominantly cross bred cows. This was based on the choices of selection done by implementers mainly NGOs and County Government Smallholder Dairy Initiative Programme. Consequently, gender training should be integrated during awareness as a facilitative process of developing all-inclusive capacity on gender issues. This is approach that engages men and women as beneficiaries in addressing their personal responsibilities and supporting partners in adoption of exotic cows. Furthermore, the implementers should base dairy cow selection in accordance with identifiable gender roles and needs of rural women as a way to promote buy in from programme design, implementation and sustainability upon programme exit.

4.2. Fodder Establishment and Conservation

Fodder Established on Farm	Women	Frequency	Percent
Sweep potato vines	4	4	9
Mixed improved variety nappier and mullato grass	12	12	28
Lucerne	4	4	7
Maize fodder and Caliandra	6	6	13
Mixed sweet potato vines and improved variety nappier	11	11	26
Mixed sweet potatoes, improved variety nappier, maize fodder	3	3	7
Nappier and Lucerne	3	3	6
No Response	2	2	4
Total	45	45	100

Table 2: Existing Fodders

Table 2 show that 28% of respondent adopted improved variety nappier grass and mullato grass, followed by 26% that adopted sweet potato vines and improved variety nappier grass. Other scientifically researched fodder like caliandra, lucerne, maize for fodder and fodder conservation were the lowest in adoption.

The research established that sweet potatoes vines were popular as a source of food for the family and surplus sold for income. On the other hand, it was established that improved variety nappier grass was easily accessible through women social network in community, less labour intensive and occupied less land as compared to other fodders as reported by FGDs. The research therefore deduced that improved variety nappier grass and sweet potatoes vines existed more due to the fact that they are beneficial to the family in terms of food, income, require less labour and land. In addition, it was clear from the observation that rural women dairy farmers allocated smaller portions of land for fodder production, especially improved variety nappier grass and sweet potatoes vines in comparison to food crops. Key informant commented that the NGOs, County and National government as implementers of dairy technologies; carry out gender need analysis and technical planning processes. These were procedures of technologies that might meet the most essential needs of rural women in their household as well as address socioeconomic outcome in the community. Further, interview with key informants on the role of men in adoption of fodder technologies pointed out that:

'Socialisation rendered fewer men to support fodder establishment since this was seen as woman's roles and men took active roles of non-farm activities; and they leave women to work on farms to avoid stigma'(KIs, Dairy Co-operative).

The above shows that gender stereotypes on the role of women and men in dairy farming determined the existence of dairy technologies in Kwisero. It was established that men in study area were more active in non-farm activities hence left women as dairy farm labourers. The study also established that rural women in the study area had common shared social responsibilities and depended on one another for inputs; for instance, cuttings from improved variety nappier grass, mullato and sweet potato vines. Therefore, it could be argued that dairy farming technologies that were available at affordable costs were less labour intensive, and fitted into the existing household basic needs would be adopted by rural women in study area. This finding is consistent with the study of Baliya (2014) who stated that rural women in Tanzania adopted fodder technologies that were common among them and improved household family wellbeing. The results were also in agreement with social cognitive theory of gender development and differentiation Bassey& Bandura (1999) which stipulated that gender conception and role behaviour operates in a social system and influences an individual's everyday life decisions.

5. Conclusion

The existing dairy farming technologies in Khwisero were several. The main ones however were cross bred cows, improved variety nappier grass and sweet potatoes vines implemented on small portion of land. This was advanced through NGOs and the County Government dairy farming support initiative programmes. Fodder conservation technologies were the least adopted by rural women dairy farmers. The technologies improved variety nappier grass, mullato and sweet potato vines were more in the study area than other available and scientifically researched fodder. In the study area, there was no observed farm household that practiced fodder conservation technologies. The adopted fodder was attributed to immediate benefit to household family as food, income and relatively less resource input. In addition, it was established that men had moved outside homestead in search for non- farm income as women were left with all activities related to fodder establishments. Therefore, the study envisioned that women and men empowerment be carried out on other scientifically researched types of fodder. It could entail building capacity of all members in households to overcome socio economic and other power inequalities; in context where these abilities were previously denied. This can be embraced as an effort towards the expansion of fodder establishment and conservation technologies.

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