

Post-independence agricultural modernization and women's technology adoption in Homa Bay District, Kenya, 1963–1985

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<https://doi.org/10.51867/ajernet.7.3.84>

ABSTRACT

Post-independence Kenya placed agricultural modernization at the centre of national development through the promotion of improved seeds, fertilizers, mechanization, extension services, credit, cooperatives and commercial agriculture. However, the extent to which these initiatives transformed women's access to agricultural technologies at the local level remains insufficiently understood. This article assesses how post-independence government agricultural policies and modernization strategies shaped women's access to and adoption of agricultural technologies and influenced food production in Homa Bay District between 1963 and 1985. The study adopted a historical research design within an interpretivist orientation and was guided by Post-Colonial Feminist Theory and Techno-Feminism Theory. It drew on archival records, national and district development plans, oral interviews, key informant interviews, focus group discussions and secondary sources. The broader study involved 80 respondents, comprising 56 individually interviewed participants and 24 participants in three focus group discussions, selected through purposive and snowball sampling. Data were analysed qualitatively using thematic and content analysis, with oral, archival and secondary evidence corroborated across sources. The findings show that state-led modernization expanded access to fertilizers, hybrid seeds, mechanization, extension services, land registration, cooperatives and agricultural markets. However, women's access remained constrained by male-dominated land ownership, credit requirements, cooperative membership, household authority and institutional definitions of the recognized farmer. Women therefore adopted technologies selectively by combining improved and indigenous seeds, fertilizers and organic soil-management practices, communal labour, informal exchange and group-based resource pooling. The United Nations Decade for Women and organizations such as Maendeleo Ya Wanawake widened opportunities for training, savings and collective action but did not fundamentally alter gendered control over land and capital-intensive technologies. The study concludes that post-independence agricultural modernization produced technological expansion without corresponding gender equality in access, control and benefits. It recommends gender-responsive agricultural policies that strengthen women's land rights, direct access to credit and extension services, participation in cooperatives, and access to affordable labour-saving technologies while integrating women's indigenous agricultural knowledge into food-security programmes.

Keywords: Agricultural Modernization; Food Production; Gender, Homa Bay; Post-Independence Kenya; Technology Adoption; Women

I. INTRODUCTION

Agricultural modernization became a central feature of development policy during the twentieth century. In Europe and North America, it was commonly associated with mechanization, commercialization, scientific farming and increased agricultural productivity (Johnston & Mellor, 1961; Bernstein, 2002). Similar ideas influenced newly independent African states, where governments viewed agriculture not only as a source of food but also as a foundation for wider economic transformation. State-led planning, agricultural extension, improved seeds, fertilizers, credit, cooperatives and market integration consequently became important components of post-independence development strategies (Bates, 1987; Bryceson, 1990). However, the benefits of agricultural modernization were not distributed evenly. Access to new technologies was often shaped by landholding, class, institutional recognition and existing gender divisions of labour.

Kenya adopted this modernization model soon after attaining independence in 1963. Successive National Development Plans placed agriculture at the centre of economic growth and promoted hybrid seeds, fertilizers, mechanization, agricultural credit, extension services, cooperative marketing and land registration as means of increasing smallholder productivity (Republic of Kenya, 1965; Republic of Kenya, 1970; Government Printer, South Africa, 1979). These policies reflected the expectation that greater use of modern inputs and participation in agricultural markets would transform rural production. Yet modernization operated through institutions that frequently favoured farmers already recognized as progressive and commercially oriented producers (Ndege, 2000). Access to land titles, credit, cooperative membership and extension services therefore remained closely related to control over productive resources and household authority.

This contradiction was particularly significant in Homa Bay District, where women remained central to household food production but were less likely to control titled land or occupy positions within formal agricultural institutions. Women provided much of the labour required for planting, weeding, harvesting, processing and storage, yet their access to fertilizers, hybrid seeds, credit and mechanized services was often mediated by land ownership and institutional membership. Post-independence land reforms frequently strengthened male ownership, while many women continued to obtain land through husbands and other male relatives (Mackenzie, 1989; Okoth-Ogendo, 1991). Consequently, women's technology adoption cannot be understood merely in terms of the availability of innovations; it must also be examined in relation to access to land, capital, and information, labour and decision-making authority. Although scholarship has examined Kenya's agricultural modernization and gender relations, the historical interaction between these processes at the local level, particularly in Homa Bay, remains insufficiently examined.

The period nevertheless witnessed important changes in women's position within development policy. From the mid-1970s, the United Nations Decade for Women increased the visibility of women as economic and development actors. Women's organizations, including Maendeleo Ya Wanawake, created avenues for agricultural training, collective savings, knowledge exchange and small-scale income-generating activities, while national planning increasingly acknowledged women's participation in development (Ndeda, 2002; Nyakwaka, 2013; Republic of Kenya, 1974). These initiatives widened women's exposure to agricultural technologies but did not necessarily transform inequalities in landholding, credit or agricultural authority.

Against this background, this article assesses how post-independence government agricultural policies and modernization strategies shaped women's access to and adoption of agricultural technologies and influenced food production in Homa Bay District between 1963 and 1985. It argues that post-independence modernization expanded technological opportunities without producing corresponding equality in access, control and benefits. Women responded through selective adoption, informal exchange, collective resource pooling and adaptation of introduced technologies to household food-production needs. The analysis covers three related phases: 1963–1970, characterized by early national planning; 1970–1975, marked by intensified input use, extension, cooperatives and land reform; and 1975–1985, characterized by the United Nations Decade for Women and expanding women-focused development initiatives, culminating in the 1985 Nairobi World Conference.

1.1 Statement of the Problem

Kenya's attainment of independence in 1963 created expectations that agricultural development would move beyond the inequalities associated with colonial rule. The post-independence government placed agriculture at the centre of national development and introduced policies intended to increase smallholder productivity through improved seeds, fertilizers, mechanization, agricultural extension, credit, cooperatives, land registration and expanded market participation. National Development Plans and related agricultural programmes therefore substantially increased the availability of modern agricultural technologies during the first two decades of independence.

However, increased technological availability did not necessarily translate into equitable access. In Homa Bay District, women remained central to household food production, yet many of the institutional conditions governing access to modern agricultural technologies continued to favour male farmers. Land titles were predominantly associated with male household heads, while access to agricultural credit, cooperative membership, extension services and mechanization was frequently linked to formal land ownership, commercial production and recognition as a "progressive farmer." Consequently, women could perform much of the labour involved in food and cash-crop production while remaining less able to independently acquire, control and benefit from technologies promoted under state modernization programmes.

This created a significant post-independence agricultural paradox. While the independent state expanded agricultural technologies and institutions in the name of national development, the mechanisms through which these resources were distributed remained socially and institutionally gendered. Women consequently adopted fertilizers, hybrid seeds, mechanized services and other innovations selectively, often relying on husbands, informal exchange, women's groups, rotating savings, seed preservation and labour-sharing arrangements. The emergence of women's organizations, Maendeleo Ya Wanawake, adult education programmes and the United Nations Decade for Women

between 1975 and 1985 widened some opportunities for training and collective resource mobilization, but did not necessarily transform women's underlying access to land, credit or formal agricultural authority.

Existing scholarship has examined post-independence agricultural modernization in Kenya from the perspectives of agricultural growth, commercialization, state planning and political economy (Bates, 1987; Heyer, 1981; Ndege, 2000). Other studies have examined land tenure, women's development, agricultural labour and gender relations (Mackenzie, 1989; Ndeda, 2002; Nyakwaka, 2013; Okoth-Ogendo, 1991). While these studies provide important insights into Kenya's agrarian transformation, they do not sufficiently reconstruct how the different instruments of post-independence modernization interacted over time to shape women's actual access to and adoption of agricultural technologies within Homa Bay District.

There is therefore a need for a localized historical examination of the relationship between post-independence agricultural modernization and women's technology adoption. In particular, limited attention has been given to how National Development Plans, fertilizers and hybrid seeds, mechanization, agricultural extension, land reform, agricultural credit, cooperatives, market integration, women's organizations, education and labour relations jointly shaped women's technological opportunities and constraints in Homa Bay. Examining the period from 1963 to 1985 is especially important because it captures the transition from colonial to independent rule, the consolidation of state-led agricultural development and the United Nations Decade for Women, culminating in the 1985 Nairobi World Conference. The period therefore provides an opportunity to assess both change and continuity in women's position within agricultural modernization.

This study addresses this historical and empirical gap by examining whether the expansion of post-independence agricultural modernization translated into meaningful technological empowerment for women food producers in Homa Bay District or whether access to agricultural innovation continued to be mediated by gendered land, institutional and household relations.

1.2 Research Objective

To assess how post-independence government agricultural policies and modernization strategies shaped women's access to and adoption of agricultural technologies and influenced food production in Homa Bay District, Kenya, between 1963 and 1985.

II. LITERATURE REVIEW

2.1 Theoretical Review

The study is principally anchored in Post-Colonial Feminist Theory and Techno-Feminism Theory. The two perspectives are complementary. Post-colonial feminism provides a historical explanation of how institutions created after political independence could retain social and gender inequalities inherited from colonial rule. Techno-feminism, on the other hand, enables the study to examine how access to agricultural technologies, knowledge and institutions was shaped by gendered relations of power. Together, the theories make it possible to move beyond measuring whether technologies were available and instead examine who accessed them, through which institutions, under what conditions, and with what consequences for women's food production.

2.1.1 Post-Colonial Feminist Theory

Post-colonial feminism emerged partly as a critique of both mainstream post-colonial scholarship and Western feminist approaches that tended to generalize women's experiences without sufficient attention to colonial history, race, class, culture and locality. Scholars associated with the perspective argue that women in formerly colonized societies cannot be understood apart from the historical institutions and power relations created through colonialism and subsequently inherited, modified or reproduced after independence (Mohanty, 2003; McClintock, 2013). Mohanty (2003) particularly challenges representations of women in the Global South as a single undifferentiated category of victims. Such representations obscure differences of class, access to resources, social position and historical experience. This proposition is useful for the present study because women farmers in Homa Bay did not encounter post-independence agricultural modernization in identical ways. Access to land, employment, education, household resources and women's organizations affected their ability to obtain new agricultural technologies.

Post-colonial feminism is also concerned with the persistence of colonial institutional arrangements after formal political independence. McClintock (2013) argues that colonialism restructured political, economic and gender relations in ways that often outlived direct colonial administration. This perspective is relevant to Kenya, where independence changed political authority in 1963 but did not necessarily dismantle the gender relations embedded in land registration, agricultural administration and definitions of legitimate farmers. Post-independence agricultural modernization could therefore reproduce earlier inequalities even while operating under national rather than colonial development objectives.

The theory is particularly useful in analysing land and agricultural authority. Post-colonial institutions could appear formally gender-neutral while operating within social arrangements in which male household heads were more likely to control titled land, participate in cooperatives and interact with state agencies. Such arrangements affected women's access to credit, improved seeds, fertilizers, mechanization and extension services. Post-colonial feminism therefore draws attention to the distinction between formal national development and substantive gender transformation.

The approach also recognizes women's agency. Women are not treated simply as victims of colonial legacies or patriarchal institutions. They negotiate, reinterpret and sometimes circumvent restrictive structures through collective organization, indigenous knowledge, informal exchange and household bargaining. This aspect is important in understanding women's groups, Maendeleo Ya Wanawake and informal agricultural networks in Homa Bay. Post-colonial feminism therefore enables the study to examine both structural exclusion and the strategies through which women sought to expand their agricultural opportunities.

A limitation of post-colonial feminism is that an excessive emphasis on colonial legacies may understate indigenous forms of patriarchy that pre-dated colonial rule or imply that all post-independence gender inequalities originated with colonialism (Suleri, 2005). It also does not on its own explain how particular technologies acquire gendered meanings or why apparently neutral technologies may benefit men and women differently. For this reason, the study complements it with Techno-Feminism Theory.

2.1.2 Techno-Feminism Theory

Techno-feminism, particularly as developed by Wajcman (2004), challenges the assumption that technology is socially neutral. It holds that technologies are developed, distributed and used within existing social relations and are therefore shaped by power, institutions and gender. Gender and technology are mutually constituted: social relations influence technological systems, while technological change can reinforce or reshape existing gender relations (Wajcman, 2004). This perspective is especially relevant to agricultural modernization. Fertilizers, hybrid seeds, tractors, ox-ploughs and other improved inputs may appear to be purely technical innovations, but their benefits depend on access to land, credit, training, markets, information and decision-making authority. If these supporting resources are concentrated among male landowners, the technology itself becomes embedded within a gendered institutional system. Wajcman (2004) approach therefore shifts attention from the mere presence of technology to the social processes through which it becomes accessible and useful.

In the context of Homa Bay, techno-feminism is useful for examining the relationship between land ownership and technology adoption. Where access to credit required titled land, and titles were predominantly held by male household heads, technologies financed through formal credit became indirectly gendered. Similarly, where extension officers targeted registered or "progressive" farmers, technological knowledge could be concentrated among men even though women performed much of the actual food-production labour.

Techno-feminism also provides a basis for recognizing women as technological actors rather than passive recipients of externally introduced innovations. Women may modify, combine or reject particular technologies according to household needs, ecological conditions, financial risk and food-security priorities. Selective fertilizer application, combining improved and indigenous seeds, labour sharing, organic soil management and negotiated access to farm machinery can therefore be understood as forms of technological agency rather than evidence of resistance to modernization. The usefulness of combining the two theories lies in their different explanatory strengths. Post-colonial feminism explains the historical and institutional continuities that shaped women's position after independence, while techno-feminism explains how those power relations became embedded in specific technologies and systems of agricultural knowledge. Together, they provide an appropriate framework for examining why the expansion of agricultural modernization after 1963 did not automatically produce equal technological opportunities for women.

2.2 Empirical Review

2.2.1 Post-Independence Agricultural Modernization and State Development

A major strand of scholarship views agricultural modernization as central to national economic transformation. Johnston and Mellor (1961) argued that increasing agricultural productivity through technological change was essential to wider economic development. This modernization perspective strongly influenced development policy in newly independent African states, where governments promoted improved seeds, fertilizers, mechanization, agricultural credit and extension as means of transforming smallholder agriculture.

Kenya followed this trajectory after independence. Heyer (1981) observes that technological diffusion, particularly improved maize varieties and fertilizers, contributed significantly to post-independence agricultural development. Eicher and Baker (1982) similarly associated agricultural research, extension and technological

innovation with improved smallholder productivity in sub-Saharan Africa. From this perspective, state-led modernization created opportunities for farmers to move beyond low-productivity production systems.

However, political-economy scholarship questions whether productivity gains were distributed equitably. Kitching (1980) argues that economic transformation in Kenya generated differentiated rural classes rather than benefiting all smallholders uniformly. Bates (1987) similarly demonstrates that state agricultural interventions were shaped by political and market considerations and frequently favoured producers who were more commercially integrated. Ndege (2000) further shows that Kenya's early post-independence modernization programmes prioritized economic growth, commercialization and state-directed development.

These interpretations create an important analytical tension. While modernization scholarship emphasizes expanded technological availability and productivity, critical political-economy scholarship draws attention to differentiated access and benefits. The weakness in both approaches, for purposes of the present study, is that women's specific relationship to agricultural technologies is often secondary to broader questions of national production, class formation or state policy. The present study therefore shifts the analysis from whether modernization expanded agricultural technology to how women in Homa Bay actually gained access to, adopted and controlled these technologies between 1963 and 1985.

2.2.2 Land Tenure, Credit and Gendered Technological Access

Land ownership is repeatedly identified as a critical determinant of agricultural modernization. Haugerud (1989) argues that land tenure reform in Kenya sought to increase productivity by providing secure individual ownership, which could support investment and access to credit. Formal title could therefore enable farmers to obtain loans for fertilizers, improved seeds and mechanization. However, the gender consequences of individualized land tenure complicate this modernization argument. Mackenzie (1989) demonstrates that the formalization of land rights frequently strengthened male claims at the expense of women's customary cultivation rights. Okoth-Ogendo (1991) similarly shows that transformations in Kenyan land law converted flexible customary interests into more individualized property relations, with important consequences for people whose rights had previously depended upon family and community membership.

Boserup (1970) provides a broader gender interpretation of agricultural modernization, arguing that modern agricultural services and technologies have often been directed towards men even in societies where women perform substantial agricultural labour. When land ownership, formal training and access to productive resources become associated with male farmers, modernization may widen rather than reduce gender inequality. These arguments are particularly relevant to technological adoption because land is more than a production asset. It can function as an institutional gateway to credit, cooperative membership, extension and investment. The thesis evidence on Homa Bay similarly treats land tenure as a "technological gatekeeper": where titles were concentrated among men, women's access to inputs and formal finance became correspondingly constrained. The existing scholarship nevertheless tends to discuss land reform and technology adoption as separate subjects. This study connects them by asking how post-independence land arrangements shaped women's capacity to adopt specific agricultural technologies.

2.2.3 Fertilizers, Hybrid Seeds and Mechanization

The literature on agricultural inputs reveals disagreement over whether modernization should primarily be understood through productivity gains or through the social distribution of technology. Smale and Jayne (2003) regard the spread of hybrid maize in eastern and southern Africa, particularly Kenya, as an important agricultural success. Their analysis demonstrates that farmers can adopt improved seed rapidly where technological performance, supportive institutions and economic incentives are favourable. Yet technological availability does not by itself explain gendered adoption. Rocheleau (1995) emphasizes that woman farmers possess substantial ecological and soil-management knowledge and may combine introduced inputs with locally developed practices rather than simply replace one system with another. This challenges interpretations that equate selective or limited adoption with technological conservatism. Cleaver (1993), by contrast, places stronger emphasis on institutional deficiencies such as limited extension coverage in explaining low adoption among African smallholders.

Mechanization produces similar debates. Bigot and Binswanger (1987) associate animal traction and mechanization with increased cultivated area, improved timeliness and relief from labour constraints. Bernstein (2002), however, stresses that access to productive technologies is structured by agrarian class relations. Mechanization may therefore reinforce the advantage of wealthier producers where ownership or hiring costs exclude poorer farmers. These debates are important for women in Homa Bay because adoption cannot be reduced to a binary distinction between users and non-users. Women could use fertilizer on selected plots, combine hybrid and indigenous seeds, or obtain occasional access to ploughing and tractor services without controlling the technologies themselves. Existing studies provide valuable insights into technological diffusion but give less attention to the distinction between adoption, access, control and benefit. This distinction is central to the present study.

2.2.4 Agricultural Extension, Education and Gendered Knowledge

Agricultural extension is another important mechanism through which modernization is translated into practice. State extension programmes commonly assume that scientific agricultural knowledge transferred through demonstration plots, field days and trained farmers will diffuse more widely within rural communities. Yet scholarship on gender and agricultural knowledge questions the neutrality of this process. Rocheleau (1995) shows that women's ecological knowledge, intercropping, soil-management and biodiversity practices have often been undervalued within formal agricultural systems. Trauger et al. (2008) similarly demonstrate that agricultural knowledge exchange is influenced by gender identity and by institutional definitions of who is recognized as a legitimate farmer. Where training is organized around male-dominated institutions, women may receive technological information indirectly even though they are actively engaged in production.

Kenyan historical scholarship also points to uneven educational opportunities. Maxon (1995) demonstrates that the independent state rapidly expanded education as part of national development, but gender disparities remained. Nyakwaka (2013) similarly traces the continuing effects of gendered education on women's participation in public and economic institutions. The thesis further notes that women were less represented in agricultural training opportunities, limiting their exposure to formal instruction in modern farming practices. The literature consequently suggests that extension and education do more than transmit information. They also define whose knowledge is legitimate and who is recognized as an agricultural decision-maker. However, there is limited historical scholarship on how these processes operated specifically in Homa Bay during the first two decades of independence. This study addresses that gap by examining formal extension alongside informal female knowledge networks and collective learning.

2.2.5 Women's Organizations and the United Nations Decade for Women

Women's organizations constituted an alternative avenue through which women sought economic resources, training and collective influence. Chitere (1988) documents the importance of women's self-help groups in Kenya in mobilizing savings, reciprocal labour and household resources. Ndeda (2002, 2015) similarly shows that women's organization has a longer historical trajectory and became increasingly significant in post-independence development. Maendeleo Ya Wanawake Organization became particularly important as an institutional platform for women. Although its earlier activities emphasized welfare and domestic improvement, its post-independence activities gradually incorporated women's economic empowerment and agricultural skills. Muleka and Okoth (2022) demonstrate that MYWO developed more explicit economic empowerment activities over time, including support for women's collective organization.

The international context also changed substantially during the United Nations Decade for Women, 1975–1985. Nzomo (1989) argues that the Women's Decade influenced Kenyan policy by making women's participation in development increasingly visible and encouraging new programmes and state institutions concerned with women. This represented an important shift from earlier development policies that often assumed that general economic development would automatically benefit women.

Nevertheless, greater policy visibility did not necessarily produce structural transformation. Women's groups could facilitate training, savings, seed acquisition, poultry production and small-scale income-generating activities without fundamentally altering women's access to titled land, formal credit or high-cost agricultural technology. This distinction between collective inclusion and structural empowerment remains insufficiently explored in the literature. The present study examines how women's organizations expanded technological opportunities while operating within persistent land and institutional inequalities.

2.2.6 Commercialization, Women's Labour and Food Production

The relationship between commercialization and women's agricultural labour is also central to understanding post-independence modernization. Bryceson (1990) demonstrates that the expansion of market-oriented agriculture in African economies often coexisted with continued dependence on unpaid household and subsistence labour. Women therefore remained central to social reproduction even where commercial agriculture expanded. Boserup (1970) similarly drew attention to the tendency for modernization to transfer access to improved agricultural resources towards men while women continued to carry substantial subsistence responsibilities. Bernstein (2002) places this process within wider agrarian differentiation, showing that commercialization can generate unequal control over productive resources.

In Kenya, Zeleza (1988) shows that women's labour-force participation expanded after independence but remained shaped by historically unequal employment and educational structures. Women continued to perform both productive and reproductive labour, particularly in rural households. Maxon (1992) likewise demonstrates that post-independence agricultural commercialization expanded African participation in crops and markets from which they

had previously been restricted. The problem is that studies of commercialization frequently focus on marketed output, national growth or cash crops, while women's food-production systems receive comparatively less attention. Yet technological adoption in food production may follow different priorities from commercial agriculture. A woman responsible for household food security may value affordability, seed retention, crop diversity and risk reduction differently from a commercially oriented producer. This study therefore examines women's technology adoption as a historically situated process shaped not only by productivity considerations but also by food-security obligations, labour availability and household responsibilities.

2.2.7 Synthesis of the Literature and Research Gap

The reviewed literature establishes that post-independence agricultural modernization expanded the availability of improved seeds, fertilizers, mechanization, credit, extension and commercial opportunities in Kenya (Johnston & Mellor, 1961; Heyer, 1981; Eicher & Baker, 1982; Ndege, 2000). At the same time, political-economy and gender scholarship demonstrates that access to the benefits of modernization remained differentiated by class, land ownership, institutional membership and gender (Boserup, 1970; Kitching, 1980; Mackenzie, 1989; Bates, 1987; Bryceson, 1990). A second strand of scholarship shows that land tenure, extension systems and agricultural knowledge were critical to technological participation (Haugerud, 1989; Mackenzie, 1989; Okoth-Ogendo, 1991; Rocheleau, 1995). Other studies demonstrate the importance of women's organizations and the United Nations Decade for Women in increasing women's visibility and collective participation in development (Chitere, 1988; Ndeda, 2002, 2015; Nzomo, 1989; Muleka & Okoth, 2022).

Despite these contributions, three gaps remain. First, much of the scholarship treats agricultural modernization, gender relations, land tenure and women's organizations as separate subjects rather than examining how they interacted to shape women's technology adoption. Second, studies of agricultural modernization frequently emphasize national-level policies and aggregate production, leaving localized historical experiences underexplored. Third, although women's contribution to Kenyan agriculture is widely acknowledged, comparatively little historical attention has been given to how women actually negotiated the adoption, adaptation and control of specific technologies within household and institutional constraints. This article addresses these gaps through a localized historical study of Homa Bay District between 1963 and 1985. Its contribution is to connect national agricultural policy with women's lived technological experiences by examining how land tenure, credit, extension, improved seeds, fertilizers, mechanization, markets, women's organizations, education and labour relations interacted over time. In doing so, the study treats women neither as passive beneficiaries nor as inherently resistant to modernization, but as technological actors whose choices were shaped by unequal access to productive resources and by the need to sustain household food production.

III. METHODOLOGY

3.1 Research Design

The study adopted a historical research design within an interpretivist orientation. Historical research involves the systematic collection, evaluation and interpretation of evidence to reconstruct and explain past events and processes (Kothari, 2004). The design was appropriate for examining how post-independence agricultural policies and modernization strategies shaped women's access to and adoption of agricultural technologies in Homa Bay District between 1963 and 1985. It enabled the study to combine documentary evidence with oral accounts and to examine changes and continuities in land tenure, agricultural extension, technology distribution, women's labour and food production.

3.2 Study Area

The study was conducted in Homa Bay District, presently Homa Bay County, in western Kenya. Historically, the area formed part of South Nyanza and is situated along Lake Victoria. The population is predominantly Luo, with agriculture, livestock keeping and fishing forming important livelihood activities. The area was suitable for the study because women have historically played a central role in smallholder food production, while post-independence agricultural modernization introduced changes in land tenure, extension services, markets and access to farm technologies.

3.3 Target Population

The target population comprised men and women smallholder farmers, agricultural officers and extension personnel, opinion leaders, clan elders, leaders and members of women's organizations, local administrators such as chiefs, and leaders of farmers' cooperative societies. These categories were selected because they possessed historical

or institutional knowledge relevant to agricultural modernization, women's access to productive resources and technology adoption in Homa Bay.

3.4 Sampling and Sample Size

The underlying historical study employed purposive and snowball sampling techniques. Purposive sampling enabled the researcher to select participants with knowledge relevant to the study objectives, while snowball sampling assisted in identifying additional knowledgeable respondents through referrals (Mugenda & Mugenda, 1999). The broader study involved 80 respondents, comprising 56 individually interviewed respondents and 24 participants distributed across three Focus Group Discussions (FGDs). Each FGD consisted of eight participants, with sampling continuing until data saturation was achieved. This article draws specifically on evidence relevant to the 1963–1985 post-independence periods.

3.5 Data Collection Instruments and Procedures

Data were collected through oral interviews, Key Informant Interviews (KIIs), FGDs, archival research and documentary review. Interview guides were used with smallholder farmers, local administrators, clan elders, cooperative leaders, women's organization leaders and other knowledgeable respondents. KIIs targeted agricultural officers, extension personnel, agronomists and administrators. Three FGDs were conducted with women smallholder farmers, members of the Luo Council of Elders and agricultural experts in Kadongo, Oyugis and Kendu Bay.

Archival research was undertaken at the Kenya National Archives in Nairobi and regional archives in Kisumu and Kakamega. Sources included district and provincial reports, government correspondence, memoranda and other records relating to agricultural policy, land, extension and technological change. Secondary sources included government policy documents, books, journal articles, newspapers and published and unpublished theses. Evidence from oral, archival and secondary sources was triangulated to strengthen historical interpretation.

3.6 Data Analysis

The data were analysed qualitatively using thematic and content analysis. Oral testimonies, archival documents and secondary materials were coded and organized around themes directly related to the article's objective, including National Development Plans, fertilizers and hybrid seeds, mechanization, extension services, land tenure, market integration, women's organizations, education and agricultural labour. Content analysis was also applied to government policy documents and historical records to identify patterns in the state's approach to agricultural modernization. The evidence was corroborated across sources and interpreted through Post-Colonial Feminist and Techno-Feminist perspectives.

3.7 Ethical Considerations

Ethical approval and the necessary research permissions were obtained before fieldwork. Approval was secured from Masinde Muliro University of Science and Technology, including its Institutional Scientific and Ethics Review Committee (MMUST-ISERC), followed by a research permit from the National Commission for Science, Technology and Innovation (NACOSTI). Authorization was also obtained from relevant Homa Bay County authorities. Participants were informed about the purpose of the research and provided voluntary informed consent before interviews and FGDs. Permission was sought before audio recording, and all secondary and archival materials were appropriately acknowledged.

IV. FINDINGS & DISCUSSION

4.1 Post-Independence Agricultural Modernization and Expansion of Technological Opportunities, 1963–1985

4.1.1 National Development Planning and the Modernization of Agriculture

Kenya's attainment of independence in 1963 marked an important change in the political context within which agricultural development was pursued. The new government regarded agriculture as central to economic growth, food security and national development and therefore sought to expand smallholder production through state planning, commercialization and technological modernization (Ndege, 2000, p. 107). Sessional Paper No. 10 of 1965 on *African Socialism and its Application to Planning in Kenya* and successive National Development Plans promoted improved seeds, chemical fertilizers, mechanization, agricultural research, credit, cooperatives and market participation (Republic of Kenya, 1965).

The findings show, however, that agricultural modernization was not experienced uniformly by rural households in Homa Bay. Government programmes expanded the range of technologies available to smallholders, but access was frequently directed towards farmers who possessed land, participated in commercial agriculture and were recognized by state institutions as progressive producers. In practice, these criteria favoured male landowners. Women

remained deeply involved in planting, weeding, harvesting, processing and household food provisioning but were less likely to control the institutional resources through which modernization was delivered.

This finding supports Ndege (2000) argument that post-independence modernization strengthened the capacity of the state to mobilize resources and promote economic transformation while producing uneven social outcomes. It also agrees with Heyer (1981) and Bates (1987), who show that Kenya's agricultural policies emphasized productivity and market participation more strongly than social redistribution. The Homa Bay evidence, however, extends these arguments by demonstrating the gendered mechanisms through which this unevenness operated. Modernization was not simply unequal between richer and poorer farmers; it also distinguished between those institutionally recognized as farmers and women whose agricultural contribution was often treated as part of household labour.

Women consequently occupied what may be described as a post-independence agricultural paradox. They assumed substantial responsibility for food production while remaining comparatively marginal to formal structures of technological modernization. This finding corresponds with Bryceson (1990) argument that commercialization in African rural economies expanded alongside the continued dependence of households on women's unpaid subsistence and domestic labour. In Homa Bay, modernization did not replace women's subsistence responsibilities. Instead, market-oriented agriculture expanded while women continued to sustain household food production.

The findings therefore qualify interpretations that associate rising agricultural productivity automatically with improved rural welfare. Eicher and Baker (1982) emphasize the developmental benefits of agricultural research, technological diffusion and productivity growth. The Homa Bay evidence does not contradict the productivity benefits of modernization, but it demonstrates that increased technological availability did not necessarily translate into equitable technological empowerment. The question was not simply whether modern technologies existed, but who could obtain, finance, control and decide how they were used.

4.1.2 Fertilizers, Hybrid Seeds and Mechanization

Fertilizers, improved seed varieties and mechanization formed the core technological package promoted under Kenya's early National Development Plans. This reflected a wider modernization perspective that regarded technological intensification as necessary for increasing agricultural productivity and stimulating structural economic transformation (Johnston & Mellor, 1961). The First and Second National Development Plans therefore encouraged hybrid maize, chemical fertilizers and improved land preparation methods as part of the transition towards more productive smallholder agriculture (Republic of Kenya, 1965; Republic of Kenya, 1970).

The findings indicate that women in Homa Bay did adopt these technologies, but rarely in a uniform or complete manner. Fertilizer adoption, for example, was constrained by cost, access to credit and women's weaker participation in cooperatives. Women therefore tended to apply fertilizer selectively while continuing to use manure, compost and other locally available soil-fertility practices. Rather than abandoning indigenous methods, they combined them with introduced inputs.

This pattern supports Rocheleau (1995) argument that women's continued reliance on indigenous soil-management practices should not be interpreted as technological conservatism. Women possessed ecological knowledge that informed decisions about soil fertility, cropping diversity and household food security. The Homa Bay findings therefore qualify Cleaver (1993) argument that limited fertilizer adoption among African smallholders can largely be explained by inadequate extension. Extension was important, but the evidence suggests that information alone could not overcome limited purchasing power, unequal landholding and restricted credit. Women could understand fertilizer technology while still being unable to obtain or use it extensively.

The evidence on hybrid maize reveals a similar pattern. Hybrid varieties offered higher potential yields, but they required cash for seed and, in many instances, complementary inputs. Women therefore balanced potential yield increases against the need to preserve seed security and reduce household financial risk. Susan Omodho explained:

"Hybrid maize was good for harvests, but it was not good when there was no money. We kept the old seeds because they belonged to us and did not need to be bought every year." (S. Omodho, personal communication, December 12, 2025)

The testimony demonstrates that the continued cultivation of indigenous varieties was not necessarily evidence of resistance to agricultural modernization. It represented a rational response to the recurrent costs associated with purchased seed and the uncertainties of smallholder production. Women combined hybrid maize with local maize, sorghum, cassava, legumes and other crops in order to spread climatic and economic risk.

This finding qualifies the more celebratory interpretation of hybrid maize diffusion advanced by Smale and Jayne (2003). Their argument that Kenya represents an important African success in hybrid maize adoption remains relevant because improved varieties did expand and farmers recognized their productive advantages. However, the Homa Bay evidence shows that adoption was socially differentiated and could coexist with continued use of indigenous seeds. It is more consistent with Davison (2019) emphasis on gendered agricultural resources, although the

findings also qualify any suggestion that women were simply excluded from improved seed. Women were not outside modernization; they participated in it selectively and strategically.

Mechanization exhibited an even stronger gender pattern. Ox-ploughs and tractor services increased the speed of land preparation and could expand cultivated acreage, but control over these technologies remained predominantly male. Oral evidence indicated that women often depended on husbands or other male owners to determine when fields would be ploughed (O. Opar, personal communication, August 15, 2025). Delayed access could postpone planting, particularly for food crops, thereby affecting yields.

The finding supports Bernstein (2002) argument that mechanization is embedded in existing agrarian relations rather than functioning as a socially neutral technological improvement. In Homa Bay, mechanization strengthened the productive capacity of farmers who already controlled land, livestock or financial resources. For many women, it did not eliminate manual agricultural labour. Indeed, where mechanization expanded the acreage under cultivation, women could face additional responsibilities for planting, weeding, harvesting and processing. The Homa Bay evidence therefore demonstrates that agricultural technology cannot be evaluated solely according to its technical capacity to increase productivity. Its social consequences depended upon control. Fertilizers were selectively purchased, hybrid seeds were combined with indigenous varieties, and mechanized services were often accessed through men. Women's adoption was consequently partial, adaptive and risk-conscious, rather than a linear movement from traditional to modern farming.

4.1.3 Agricultural Extension and the Construction of the “Recognized Farmer”

Agricultural extension constituted an important mechanism through which the independent state attempted to diffuse agricultural knowledge and technologies. Extension officers conducted demonstrations, field visits, agricultural shows and training programmes intended to promote scientific farming practices under the National Development Plans (Republic of Kenya, 1965). The findings show that extension services expanded agricultural knowledge in Homa Bay, but access to that knowledge was strongly influenced by how state institutions defined the legitimate farmer. Training was commonly organized through chiefs' barazas, cooperative societies, demonstration farms and registered farmers. These spaces were predominantly occupied by men. Women who cultivated household food fields were therefore frequently approached indirectly or treated as assistants to male household heads rather than as independent farmers.

One respondent recalled that women commonly received seeds, fertilizers and information through husbands, brothers or other community intermediaries rather than directly from extension personnel (I. Opecho, personal communication, November 11, 2025). This institutional arrangement meant that the dissemination of knowledge reproduced the same gender inequalities evident in access to physical inputs. The finding supports Rocheleau (1995) critique of agricultural knowledge systems that privilege formal scientific knowledge while undervaluing women's ecological expertise. Extension programmes emphasized hybrid maize, monocropping, fertilizer application and commercially oriented production, whereas women's knowledge of mixed cropping, indigenous seed preservation and household food crops received less formal recognition.

It also extends Trauger et al. (2008) argument that agricultural knowledge exchange is shaped by gender identity and institutional recognition. In Homa Bay, the issue was not simply that fewer women attended extension programmes. The more fundamental problem was that agricultural institutions frequently constructed the farmer as a male landholder. This definition affected who received information, credit referrals, demonstration opportunities and new inputs. The findings consequently challenge the assumption that agricultural knowledge will automatically diffuse from a formally trained household head to all persons involved in production. Women had different responsibilities, cultivated different crops and faced different technological constraints. Knowledge provided primarily to men therefore did not necessarily respond to women's food-production priorities.

Women addressed these limitations by relying on elder farmers, neighbours, women's groups, seed exchange and communal learning. Such networks allowed them to evaluate new seeds, exchange cultivation knowledge and adapt introduced practices to local conditions (P. Okello, personal communication, November 8, 2025). These practices demonstrate technological agency, but they also underline an institutional weakness: women's agricultural innovation often occurred outside rather than through the formal extension system. Overall, the findings show that the modernization drive between 1963 and 1985 substantially expanded the technological landscape in Homa Bay. However, modernization created opportunities within an institutional system that did not treat all producers equally. This explains why increased availability of fertilizers, hybrid seeds, and machinery and extension services did not produce corresponding equality in women's technological participation.

4.2 Gendered Mediation of Women's Technology Adoption and Food Production

4.2.1 Land Tenure, Credit and Control over Productive Resources

Land emerged as the most important institutional factor linking agricultural modernization to women's technology adoption. Independence raised expectations that land reform would redress inequalities inherited from colonial rule. Settlement schemes and land-registration programmes expanded African landownership, while secure title was expected to encourage agricultural investment and enable farmers to use land as collateral for credit (Harbeson, 1971; Leys, 1975).

In Homa Bay, however, land adjudication and registration were strongly gendered. Oral evidence indicates that much of the land adjudicated during the late 1960s was registered in the names of male household heads. This placed men in a stronger position to obtain loans and purchase improved seeds, fertilizers, machinery and other inputs. Archival evidence similarly shows that the Homa Bay land adjudication committee appointed in 1970 consisted entirely of men (Kenya National Archives, 1970, p. 3).

The finding supports Mackenzie (1989), who demonstrates that land adjudication in Kenya often transformed male household heads into formal owners even where women had long exercised customary cultivation rights. It also supports Okoth-Ogendo (1991) broader argument that individualization transformed flexible customary rights into legally defined property interests that could privilege particular household members. The evidence, however, qualifies Haugerud (1989) emphasis on the productivity-enhancing potential of land tenure security. Secure title could indeed promote investment by giving farmers access to credit. The Homa Bay evidence confirms this mechanism but demonstrates that its benefits depended upon who received the title. Where men were registered as owners, tenure security could increase household access to technology while simultaneously reducing women's independent control over technological investment.

Land therefore functioned as a technological gatekeeper. Access to credit, cooperative membership and capital-intensive technologies often followed formal property ownership. Wajcman (2004) argument that technology is embedded within social relations is particularly relevant here: exclusion from a tractor or fertilizer programme could begin long before the technology itself was distributed, through the gendered allocation of land rights. Nevertheless, the evidence also reveals women's agency. Women participating in a focus group in Kabondo recalled pooling money through groups to purchase land, while women with salaried employment sometimes acquired land independently (Women farmer focus group participants, personal communication, August 13, 2025). These examples show that gendered land relations were restrictive but not absolute. The findings therefore extend existing land-tenure scholarship by connecting formal property rights directly to technological participation. Land registration did not merely restructure ownership; it influenced who could finance, control and sustain agricultural modernization.

4.2.2 Market Integration, Cooperatives and Technological Access

Post-independence agricultural policy also promoted stronger integration of African smallholders into commercial markets. Africans gained greater opportunities to cultivate commercial crops, while cooperative societies, marketing institutions and agricultural credit were expanded as instruments of rural development (Maxon, 1992). In Homa Bay, the expansion of market-oriented agriculture encouraged the adoption of fertilizers, improved maize seed and other inputs. Hybrid maize gradually became increasingly prominent, although local maize, sorghum, cassava, finger millet, groundnuts and sweet potatoes remained important. The South Nyanza District Development Plan, 1979–1983, nevertheless reported that adoption of hybrid maize remained constrained by limited credit, difficulty in obtaining inputs and challenges in land preparation (Republic of Kenya, 1979).

This finding is important because it demonstrates that market integration did not produce an immediate technological replacement of food-production systems. Rather, commercialization existed alongside continued cultivation of indigenous crops. Women were especially likely to maintain diversified food-production systems because they carried responsibility for household provisioning. The evidence thus qualifies Maxon (1992) account of the expansion of post-independence commercial agriculture. Commercial opportunities increased, but their technological benefits were mediated by gender. Men were more likely to control cash-crop income and cooperative membership, while women frequently supplied labour to both cash and food crops.

The findings also show that increased commercialization could create competing claims on women's labour. Cotton, coffee and other commercial crops required planting, weeding and harvesting, even when women did not control the resulting income. Women therefore performed labour for commercial production while retaining responsibility for household food crops. This contributed to intensification rather than a straightforward technological reduction of labour.

Economic difficulties during the late 1970s and early 1980s further exposed these tensions. Declining agricultural performance, rising input costs, unfavourable weather and problems within marketing systems reduced smallholder incomes (Ndege, 2000, pp. 204–209). The food shortages of 1979–1980 contributed to the formulation of Sessional Paper No. 4 of 1981 on National Food Policy, which prioritized greater national self-sufficiency in cereals (Republic of Kenya, 1981, pp. 1–2). However, the policy remained largely gender-neutral despite women's central role in household food production. The finding therefore extends the critique offered by Spring (2009): sidelining

women's food-production systems can undermine food security even when national policies seek to raise aggregate agricultural output. The Homa Bay evidence demonstrates that food policy could identify the production problem without fully addressing the gendered resource structures affecting those responsible for producing household food.

4.2.3 Women's Organizations and the United Nations Decade for Women, 1975–1985

Women's organizations provided an important alternative route into technological adoption. Although Maendeleo Ya Wanawake Organization (MYWO) originated before independence, it expanded its role during the post-independence period. Local women's groups mobilized savings, reciprocal labour and material resources and increasingly became spaces for agricultural training and income-generating activities (Chitere, 1988; Ndeda, 2015). The findings show that women's groups in Homa Bay helped members acquire knowledge about improved seeds, soil conservation, composting, fertilizer application, poultry production and food storage. Extension personnel sometimes used organized women's groups as points of contact for agricultural training. One respondent recalled that women were trained in land preparation, planting, use of high-yielding maize varieties, weeding, harvesting and storage (M. Ochieng, personal communication, August 15, 2025). This finding supports Chitere (1988) regarding the importance of women's self-help organizations as mechanisms for pooling resources and mutual assistance. It also agrees with Muleka and Okoth (2022) that MYWO gradually developed stronger economic empowerment functions, particularly from the late 1970s.

The United Nations Decade for Women, 1975–1985, further raised the visibility of women within development policy. Before this period, Kenyan development planning was largely gender-blind because it was assumed that general economic growth would benefit men and women alike (Ndeda, 2002). The creation of the Women's Bureau and greater government engagement with women's organizations reflected a gradual change in this approach (Nzomo, 1989; Too, 2007). Significantly, the Third National Development Plan explicitly referred to women's integration into development and proposed increased expenditure on agricultural extension, training, credit, input supply, cooperative development and marketing (Republic of Kenya, 1974).

The findings therefore support Nzomo (1989) argument that the Women's Decade altered the visibility of women in Kenyan policy. However, the Homa Bay evidence qualifies any interpretation of this period as a complete shift towards gender equality. Women obtained greater opportunities for training, collective savings and local projects, but major productive assets—particularly titled land, formal credit and expensive machinery—remained largely under male control. Women's groups therefore represented both progress and limitation. They widened women's technological knowledge and helped circumvent exclusion from formal institutions, but they did not fundamentally redistribute the resources that determined access to capital-intensive technologies. The findings extend the literature by demonstrating that collective organization could improve technological participation without necessarily producing structural transformation in property ownership or agricultural authority.

4.2.4 Education, Employment and Women's Agricultural Labour

Education constituted another important determinant of technological participation. After independence, the Kenyan government expanded educational opportunities and treated education as central to overcoming poverty, ignorance and disease (Sunday Nation, 1963; Maxon, 1995). The Ominde Commission and subsequent development policies sought to build the human capital required for national economic development. Female access to education improved, but significant gender inequalities persisted. Girls constituted approximately 38 per cent of primary enrolment and 26 per cent of secondary enrolment in 1966 (Maxon, 1995, p. 130). Agricultural training reflected similar inequalities. Women were less represented than men at agricultural training centres, including Homa Bay, limiting their exposure to formal instruction on agricultural technologies (Central Bureau of Statistics, 1972).

These findings support Nyakwaka and Ndeda (2023) in showing that independence expanded women's educational opportunities without immediately removing structural gender inequalities. They also extend the argument by showing how educational disparities translated into unequal technological opportunities. Literacy, training and institutional confidence influenced women's ability to interpret extension information, participate in cooperatives and interact with agricultural officials. Women's increased entry into formal employment created some alternative pathways. Their share of formal employment increased from about 12.2 per cent in 1964 to 14.3 per cent in 1970 and 19.7 per cent by 1985 (Zezeza, 1988). Salaried women could use income to purchase land, farm inputs or other productive resources. Nevertheless, men remained substantially more represented in formal employment, reflecting educational, cultural and institutional inequalities inherited from the colonial period (Waiyego, 2004; Nyakwaka, 2013).

The relationship between modernization and women's labour was therefore complex. Women provided labour for food crops such as maize, cassava, sorghum, finger millet and sweet potatoes as well as cash crops including cotton and coffee (Government Printer, South Africa, 1979). The expansion of commercial agriculture did not relieve women of their household food-production responsibilities. Instead, many women assumed a dual burden. This

finding is consistent with Jalang'o-Ndeda (1991) and Zeleza (1988), who emphasize the historical centrality of women's productive and reproductive labour. It also supports Bryceson (1990) argument that market expansion in African agriculture can coexist with intensified unpaid female labour.

However, the Homa Bay evidence goes further by connecting labour directly to technological inequality. Technologies did not always reduce women's work. Where men controlled ploughing and mechanized services, expanded cultivated acreage could increase women's weeding, harvesting and processing responsibilities. Where technologies were too expensive, women continued to depend on manual labour. Agricultural modernization therefore sometimes reorganized drudgery rather than eliminating it.

4.2.5 Overall Pattern: Expansion without Equal Technological Empowerment

Taken together, the findings show that post-independence agricultural modernization in Homa Bay between 1963 and 1985 was characterized by expansion without equalization. The state widened access to improved seeds, fertilizers, extension services, agricultural credit, cooperatives and mechanization, but the institutions through which these resources were distributed remained strongly influenced by land ownership, household authority and gender. The findings support Heyer (1981) and Kitching (1980) in showing that technological modernization produced differentiated benefits, but they extend their analyses by locating women's everyday technological choices at the centre of the process. They also support Mackenzie (1989) and Okoth-Ogendo (1991) regarding the gendered implications of land formalization, while demonstrating that land inequality had consequences beyond property itself: it structured access to credit, inputs, cooperatives and machinery.

At the same time, the findings qualify interpretations of low adoption as evidence of traditionalism or resistance. Women in Homa Bay adopted hybrid seeds, fertilizers and other technologies where these were compatible with household resources and food-security needs. They retained indigenous seeds, used manure and compost, practised crop diversification, shared labour and accessed technologies through women's groups because these strategies reduced economic and ecological risk. This pattern supports Rocheleau (1995) and is consistent with techno-feminist arguments that users actively reinterpret technologies rather than merely receive them (Wajcman, 2004).

The central finding of the study is therefore that women's adoption was constrained but not passive. Women were technological actors operating within unequal institutional conditions. They experimented, combined old and new practices, pooled resources and created alternative networks for accessing knowledge and inputs. Their technological choices were shaped not simply by the characteristics of a fertilizer, seed variety or machine, but by the wider social system within which that technology was embedded.

Post-independence modernization consequently generated a gendered technological order in which men were more likely to control land, credit, cooperatives and capital-intensive agricultural technologies, while women remained central to labour-intensive household food production. The United Nations Decade for Women and women's organizations widened opportunities for training and collective action, but they did not fully transform the underlying distribution of productive resources. The Homa Bay case therefore contributes to scholarship by demonstrating that the success of agricultural modernization cannot be assessed solely through the expansion of technology or aggregate productivity. A historical assessment must also consider access, control, adaptation and benefit. Between 1963 and 1985, women's food production was modernized unevenly: technological opportunities increased, but institutional structures continued to constrain women's independent technological agency. Women sustained food production not because modernization had fully incorporated them, but because they continuously negotiated, adapted and combined available technologies within a gendered agrarian system.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

This study assessed how post-independence government agricultural policies and modernization strategies shaped women's access to and adoption of agricultural technologies and influenced food production in Homa Bay District between 1963 and 1985. The findings demonstrate that independence brought a significant expansion of agricultural modernization through National Development Plans, improved seeds, fertilizers, mechanization, extension services, agricultural credit, cooperatives and increased market integration. However, the expansion of these technologies did not produce equal access between men and women.

Women remained central to household food production but were disadvantaged by the institutional arrangements through which agricultural modernization was implemented. Land registration largely favoured male household heads, while access to formal credit, cooperative membership, extension services and mechanized technologies was frequently linked to land ownership and recognition as a commercial or progressive farmer.

Consequently, women often accessed agricultural technologies indirectly through husbands, relatives, women's groups and informal networks.

The study further established that women's relatively limited uptake of some modern technologies did not reflect resistance to innovation. Rather, their technological choices were shaped by affordability, access to land and credit, labour demands, ecological conditions and responsibility for household food security. Women therefore combined hybrid and indigenous seeds, used fertilizers alongside manure and compost, relied on communal labour and selectively adopted technologies according to their productive circumstances. Their engagement with modernization was consequently adaptive and strategic.

The United Nations Decade for Women and the growth of organizations such as Maendeleo Ya Wanawake widened women's access to training, collective savings and agricultural knowledge. Nevertheless, these initiatives did not fundamentally alter the gendered distribution of land, credit and capital-intensive agricultural technologies. Education and formal employment also created new opportunities for some women, but gender disparities continued to limit their participation in agricultural training and institutional decision-making. The study therefore concludes that post-independence agricultural modernization in Homa Bay produced technological expansion without corresponding gender equalization. Modern technologies became increasingly available, but access, control and benefits remained mediated by gendered property relations and agricultural institutions. Women nevertheless demonstrated considerable technological agency by negotiating, adapting and combining introduced technologies with existing knowledge to sustain household food production.

5.2 Recommendations

Based on the findings, agricultural policies and programmes should deliberately recognize women as primary agricultural producers rather than treating them mainly as members of male-headed households. Access to extension services, improved seeds, fertilizers, mechanization and other agricultural technologies should therefore be designed to reach women directly. Government institutions should strengthen women's secure access to land and productive resources. Since land ownership historically influenced access to credit, cooperative membership and agricultural technologies, measures that improve women's ownership and control of land are necessary for meaningful technological empowerment. Agricultural credit and cooperative institutions should also reduce barriers that disadvantage women who lack conventional collateral. Women's groups and cooperative organizations can be strengthened as channels for affordable credit, collective acquisition of farm machinery, improved seeds and other productive inputs.

Extension and agricultural training programmes should be gender-responsive and recognize women's existing agricultural knowledge. Training should combine scientific innovations with locally developed practices in seed preservation, intercropping, soil fertility management and crop diversification instead of presenting modernization as the replacement of indigenous knowledge. Finally, agricultural modernization should prioritize labour-saving and affordable technologies suited to women food producers. Mechanization, input programmes and extension services should be evaluated not only according to their effects on productivity but also according to whether they reduce women's labour burden, strengthen their decision-making power and improve household food security.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding Declaration

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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