

The Contribution of the Livestock Marketing Program in Improving Household Food Security in Communal Areas of uMzimkhulu Local Municipality, Kwa-Zulu Natal

Sibongiseni Peacock, Denver Naidoo, Sikhhalazo Dube

Abstract—The study investigates the impact of the National Red Meat Development Program on household food security in rural areas of uMzimkhulu. Self-administered questionnaires were employed to gather data from 77 smallholder beef farmers participating in the St. Paul feedlot project. Data analysis utilized the Household Food Insecurity Access Scale (HFIAS) developed by USAID to assess the household food security status of St. Paul feedlot beneficiaries, with descriptive statistics employed for result analysis. Findings indicate that the majority (80.50%) of beneficiaries experienced food insecurity, while 9.50% were classified as food secure, with most participants falling within the category of moderate food insecurity. Food insecurity predominantly stemmed from challenges faced by farmers unable to sell their cattle or whose cattle were not market-ready due to bureaucratic obstacles hindering the program. Farmers identified feed shortages as the primary constraint, resulting in missed income opportunities. These findings underscore the critical need to address feed challenges and bureaucratic barriers to enhance the efficacy of the National Red Meat Development Program in promoting household food security in rural areas.

Keywords—National red meat development, household food security, St. Paul feedlot, livestock, HFIAS, Household Food Insecurity Access Scale.

I. INTRODUCTION

FOOD security, a paramount concern transcending national boundaries, is defined by the United Nations Food and Agriculture Organization (FAO) as a state in which every person enjoys ongoing availability of an ample supply of safe and nourishing food that aligns with their dietary requirements and desires, enabling them to lead an active and healthy lifestyle [1]. Poverty has emerged as a central determinant of food insecurity, limiting individuals' capacity to access adequate nutrition [2]. Globally, millions of people lack adequate access to nutritious food, a situation that is exacerbated by conflicts, natural disasters, climate change, and economic fluctuations [1]. The repercussions of food insecurity are profound, manifesting as malnutrition, both undernutrition and overnutrition, with detrimental effects on health and well-being, particularly among vulnerable populations [1].

South Africa, amid high unemployment rates, poverty, and

energy crises, faces pronounced challenges in ensuring food security for its population [3]. Aligned with the (SADC) objectives, South Africa endeavors to achieve not only national but also household and individual food security, necessitating a nuanced understanding of the factors at play [3].

Addressing food security mandates is a multifaceted strategy encompassing agricultural enhancement, sustainable farming practices, robust food distribution systems, social safety nets, and empowerment initiatives for vulnerable communities [4]. The National Red Meat Development Program (NRMDP) assumes a pivotal role within South Africa's agricultural framework, specifically targeting red meat production to bolster livestock farming, improve meat quality, and foster economic opportunities for smallholder farmers [4].

However, despite South Africa's agricultural capacity, a significant portion of its population remains food insecure, with over 3.1 million individuals living below the poverty line [3]. Moreover, approximately 14 million South Africans experience food insecurity despite the nation's ability to produce sufficient food [5]. Income disparities exacerbate household food security, highlighting the need for targeted interventions [2].

Recognizing the imperative to enhance food access, the South African government has undertaken strategic initiatives including the Integrated Food Security and Nutrition Program and the National Livestock Development Strategy [6]. Specifically, the NRMDP was implemented in 2013 in KwaZulu Natal province, aiming to integrate smallholder beef farmers into formal markets and commercialize their operations [6].

A. Background

Despite efforts to address food insecurity, many households in South Africa continue to experience hunger and inadequate access to nutritious foods. Although the NRMDP has been operating in KwaZulu-Natal (KZN) for more than 10 years, little is known about how it affects household food security and what factors influence that status, particularly in the uMzimkhulu Local Municipality. The effectiveness of the NRMDP in mitigating these challenges remains an open question. Specifically, we need to explore whether the NRMDP

Sibongiseni Peacock* and Denver Naidoo are with African Centre for Food Security, University of KwaZulu-Natal, School of Agricultural, Earth and Environmental Science, P. Bag X01, Scottsville 3209, South Africa (*corresponding author, phone: +27 81 435 9721, e-mail:

sibongisenipeacock@gmail.com).

Sikhhalazo Dube is with International Livestock Research Institute, P.O. Box MP 163, Mount Pleasant Harare, Zimbabwe.

positively impacts household food security, particularly in rural areas, where livestock farming plays a significant role. de Schutter, as cited in [7], stressed the importance of inclusive strategies involving communities and small producers to enhance food security in South Africa. The NRMDP, along with effective policy interventions, social protection measures, inclusive strategies, and sustainable agricultural practices, plays crucial roles in enhancing food security in South Africa. Addressing food insecurity requires a multifaceted approach that considers economic, social, and environmental factors to ensure the well-being of the population. Therefore, this highlights the necessity to conduct this research to illuminate the program's impact, particularly the custom feedlot facility on household food security status in KZN. The objective is to determine the household food security status of NRMDP beneficiaries since their implementation in the uMzimkhulu Local Municipality. This study employed the HFIAS to determine household food security status.

B. Overview of the NRMDP

A program for community engagement and livestock marketing called the NRMDP aims to boost farmers' participation in organized markets. The Eastern Cape Red Meat Project (ECRMP), which attempted to improve the formal market involvement of community livestock farmers, was the initiative's original driving force [8]. It was launched in 2005 by ComMark. The National Agricultural Marketing Council (NAMC) took over the initiative after its financing ran out in 2008 [8], [9]. Reference [10] mentioned that the NRMDP presents smallholder farmers who take part in the program are able to bring in more money from the sales of their animals than they would have without it. The program achieves this by offering feed, water, and vaccines in a controlled environment [10]. The income generated from the animals sold through this program tends to be higher than when the animals are to be sold without this mediation [8], [10]-[13].

Currently, the program has five operating CFPs in KZN, with one located in St. Paul, the largest of which has a capacity of 500 animals. They are called custom feeding facilities, as they accommodate all kinds of animals irrespective of age [8], [10], [11]. Cattle are put in a feeding program for three months, and in return, farmers pay a 7% fee per livestock. The fee was deducted from the money paid by the buyer for livestock during auctions [8], [9]. Currently, the program is funded by the Department of Agriculture, Land Reform and Rural Development (DALRRD). The department was formed because of a merger with the Department of Rural Development and Land Reform (DRDLR) and the Department of Agriculture, Forestry, and Fisheries (DAFF) following the President's redefinition of national priorities in June 2019.

II. METHODS AND MATERIALS

A. Study Area Description

The study was conducted in St. Paul Village, situated at coordinates $-30^{\circ}.14'46.6''S$ and $29^{\circ}.41'09.2''E$, within the municipality of uMzimkhulu. St. Paul Village is home to

approximately 197,286 individuals with a modest annual population growth rate of 0.34% [14]. The region experiences a humid climate characterized by annual rainfall ranging from 800 mm to 1,280 mm, with heavy mists being a common occurrence, contributing additional moisture. The average annual temperature in this area is $17^{\circ}C$ [14]. The communal grazing lands of St. Paul Village, managed under a collective land tenure system, provide essential resources for the community's livelihood, featuring mixed veld vegetation.

B. Study Participants and Sampling Procedure

The St. Paul feedlot, selected purposively as the beneficiary of the custom NAMC cattle feeding program, served as the focal point for this study. 77 households participating in the custom feedlot program in Mzimkhulu were included in the sample. Prior to data collection, meetings were conducted with the local leaders to obtain community consent and cooperation. Subsequently, a structured questionnaire focusing on food security was administered to both the feedlot committee and family representatives.

C. Data Collection Procedure

To ensure clarity and comprehension of the questionnaire items, we employed a face-to-face survey technique accompanied by prewritten prompts and probes. This approach aims to facilitate thorough responses and mitigate potential misunderstandings. The HFIAS was used to assess household food access within the study population. The questionnaire comprised standardized items designed to measure various dimensions of food insecurity, including anxiety about food availability, insufficient food intake, and coping strategies adopted to address food shortages.

D. Data Analysis

Descriptive statistics, including frequencies and percentages, were used to summarize the demographic characteristics and food security indicators within the study population. Spearman's and Pearson's correlations were computed to explore potential associations between demographic variables and food security outcomes. Statistical analyses were conducted using appropriate software packages, with significance levels set at $p < 0.05$ to determine the statistical significance of findings.

III. RESULTS AND DISCUSSION

Table I summarizes the respondents' sociodemographic characteristics. Socioeconomic variables play a pivotal role in understanding the demographic and economic landscapes of a population. This analysis delves into various socioeconomic factors such as gender distribution, marital status, education level, employment status, and occupation type.

Gender Distribution

The data indicated a significant gender disparity, with males comprising 74.0% of the population sample, while females constitute 26.0%. This observation aligns with broader societal trends, reflecting historical patterns of gender imbalances in various spheres including workforce participation and

educational attainment.

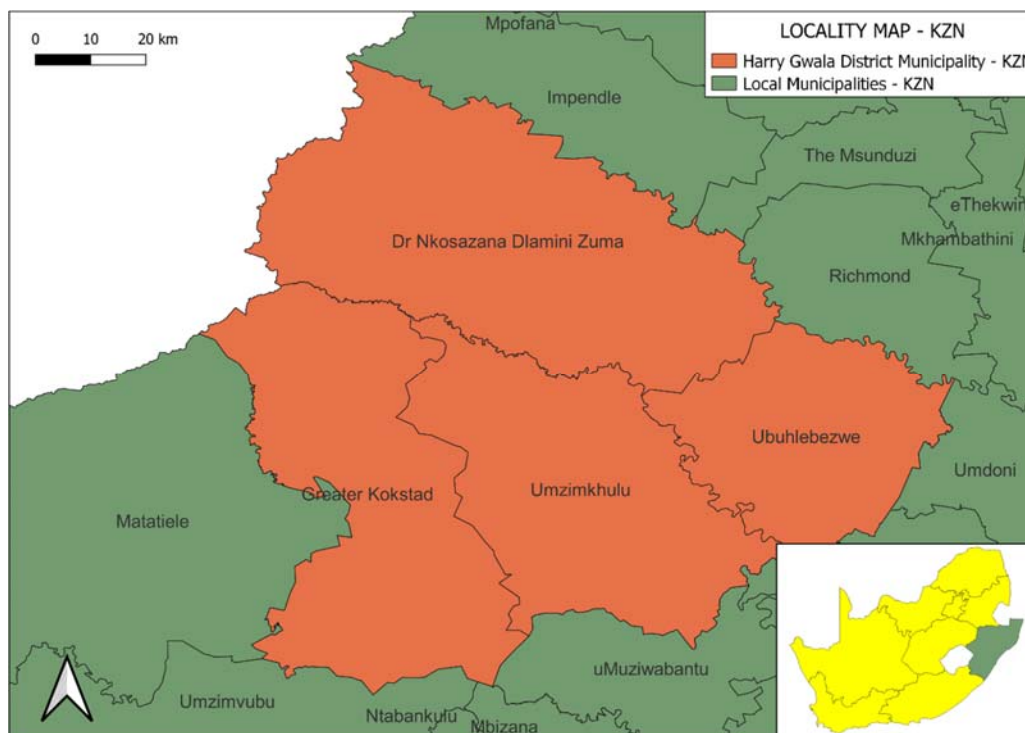


Fig. 1 Map of KwaZulu-Natal, South Africa showing the locations of the district in which, the study sites were selected

Marital Status

Marital status distribution revealed that a substantial portion of the population was married (62.30%), followed by single individuals (18.20%). Meanwhile, divorced, widowed, and widower statuses collectively account for 19.50% of the population. The predominance of married individuals suggests a prevalent societal norm favoring marital unions, whereas the presence of single and divorced individuals underscores the diversity of relationship structures within the community.

Education Level

The analysis of educational levels portrays a spectrum of attainment within the population. Primary school education emerged as the most prevalent category (36.40%), followed closely by secondary school (48.10%). Notably, a significant proportion of the population (9.10%) reported no formal education, signaling potential gaps in educational access or attainment. Meanwhile, tertiary level education represents a smaller yet noteworthy segment (6.50%), indicative of efforts towards higher academic achievement and skill development.

Employment Status and Occupation

Examining employment status reveals diverse patterns within the labor market. The majority of individuals were engaged in self-employment (14.30%) or employed for wages/salaries (10.40%) while out of work but not currently looking for work (9%). A considerable proportion of the population (16.90%) is actively seeking employment, highlighting ongoing

labor market dynamics and the pursuit of livelihood opportunities. Additionally, homemaker roles (1.30%) and pensioners (48.10%) represented significant segments, reflecting the diversity of occupational roles and life stages within the population.

Livelihood Activities

Livelihood activities, as indicated by occupation type, revealed a notable division between livestock-related occupations (40.30%) and crop and livestock combined (59.70%). This distribution underscores the significance of agriculture and related sectors as the primary sources of livelihood within the community, reflecting the agrarian nature of the economy and its dependence on agricultural production.

The observed trends in socioeconomic variables underscore the multifaceted nature of the population's demographic and economic landscapes. Gender disparities persist across various domains, emphasizing the need for targeted interventions that promote gender equity and inclusivity. Marital status distribution reflects the diversity of relationship structures, necessitating nuanced approaches to social policies and support systems. Education and employment patterns highlight both achievements and challenges in human capital development and labor market participation, calling for investment in education and skill enhancement initiatives. Furthermore, the dominance of agriculture-related livelihood activities underscores the importance of sustainable rural development strategies for enhancing livelihood opportunities and economic resilience.

TABLE I
SOCIODEMOGRAPHIC VARIABLES

Variables	Mean	Min	Max	Std. Deviation
Household size	8.0	1.00	23.00	4.136
Age	56.00	22.00	77.00	13.905
Household income (ZAR)	2399.87	350.00	25000.00	3642.776
Variables	Frequency		Percentage (%)	
Gender				
Male		57		74.0
Female		20		26.0
Marital status				
Married		48		60.30
Single		14		18.20
Divorced		2		2.60
Widow		3		3.90
Widowed		10		13.0
Education status				
No formal education		7		9.10
Primary school		28		36.40
Secondary school		37		48.10
Tertiary level		5		6.50
Employment status				
Self-employed		11		14.30
Employed for wage/salary		8		10.40
Out of work but looking for work		13		16.90
Homemaker		1		1.30
Pensioner		37		48.10
Out of work but currently not looking for work		7		9.10
Social grant				
No		16		20.80
Yes		61		79.20
Household farming practice				
Livestock		31		40.30
Crop & livestock		46		59.70

A. Impact of the NRMDP on Household Food Security

To ensure food security, households must possess the means to procure nutritious food and secure access to sustenance for healthy existence [15], [16]. Therefore, the present study endeavors to assess the extent to which the St. Paul feedlot program contributes to food security among its beneficiaries. The HFIAS serves as the primary instrument for gauging households' susceptibility to food access challenges over the preceding 30 days, as outlined by Sekhampu [17]. This tool comprises a series of inquiries concerning food-related apprehensions as well as the availability and accessibility of food items. Each household's HFIAS score was derived from responses to nine frequency-of-occurrence questions, aligned with the methodology outlined by [18], where scores ranged from 0 to 27, with higher scores indicating heightened vulnerability to food insecurity.

According to the study's findings, 19.5% of surveyed households affiliated with the St. Paul custom feedlot project were classified as food-secure, contrasting starkly with the remaining 80.5% identified as food insecure. This observation is consistent with earlier studies by [19]-[22], which underscores that KwaZulu-Natal is one of the provinces with the highest proportion of households living with chronic food insecurity, indicating a significant prevalence of food insecurity in the region. Nonetheless, the National Rural Development Program (NRDP) exhibits potential to bolster the economic engagement of smallholder farmers in the area. Research indicates that commercializing smallholder farmers in the agricultural sector is crucial for boosting economic growth and

development in developing countries [23]. By focusing on improving market participation among smallholder farmers, the NRDP can increase their income and livelihoods [24]. The prevalence of food insecurity among beneficiaries of the St. Paul custom feedlot project stems from various programmatic constraints, including cattle mortality within the facility, prolonged periods required for animal sales, the utilization of unsuitable cattle for feedlot purposes, insufficient feed provisions, and programmatic closures. Notably, the facility remained non-operational for an extensive duration of approximately 15 months during the study period, prompting some respondents to revert to alternative means of cattle marketing, including returning animals to their homesteads.

B. Food (In)Security Status of NRMDP Beneficiaries

According to [18], households with secure food access rarely experience anxiety about insufficient food. However, food insecurity can be characterized as the inability to access the nutritious food required to maintain a healthy body and life [25]. Food insecurity can be classified into three categories: mild, moderate, and severe. Mildly food-insecure individuals have experienced anxiety about insufficient food in the past 30 days. Moderately food-insecure households consume inadequate diets and eat less preferred food, which leads to a reduction in the quality of food intake and the number and proportion of meals consumed daily [26], [27]. Severe food insecure households are susceptible to food shortages, and individuals may go to bed or spend the entire day without eating.

TABLE II
PERCENTAGE OF HOUSEHOLDS IN EACH FOOD SECURITY CATEGORY (N=77)

	Food security categories			
	Food secure	Mild food insecure	Moderately food insecure	Severe food insecure
Percentage %	19.50	29.90	40.30	10.40
Frequency	15	23	31	8

TABLE III
HFIAS SCORES DURING THE PAST 30 DAYS

Strategy	Frequency in the last 30 days				Total
	Never	Once or twice	Three to 10 times	More than 10 times	
Anxiety about food insecurity	25	17	24	11	77
Inability to eat preferred foods	16	23	23	15	77
Availability of only a limited variety owing to a lack of resources	29	15	27	6	77
Inability to eat even less-preferred food	33	19	16	9	77
Availability of only smaller amounts of food	35	18	20	4	77
Reduced number of meals	33	20	21	3	77
Having no food in the house	49	15	11	2	77
Going to bed without having eaten any food	57	10	7	3	77
Spending the day and night without any food	55	12	8	2	77

According to [18], households with secure food access rarely experience anxiety about insufficient food. However, food insecurity can be characterized as the inability to access the nutritious food required to maintain a healthy body and life [25]. Food insecurity can be classified into three categories: mild, moderate, and severe. Mildly food-insecure individuals have experienced anxiety about insufficient food in the past 30 days. Moderately food-insecure households consume inadequate diets and eat less preferred food, which leads to a reduction in the quality of food intake and the number and proportion of meals consumed daily [26], [27]. Severe food insecure households are susceptible to food shortages, and individuals may go to bed or spend the entire day without eating.

The HFIAS classification measure of food insecurity revealed that approximately 19.50% of the out of the studied household, 10% were extremely food insecure, 40.30% were moderately food insecure, and 29.90% were mildly food insecure. The results are presented in Table II. The survey results indicate that 80.50% of households experienced food insecurity. Studies have shown that household food insecurity is prevalent across different regions and agro-ecological zones in South Africa [28]. Vulnerable populations, such as those receiving social grants, are particularly affected and experience lower food expenditure, dietary diversity, and wealth indices [21]. Furthermore, [29] cited the SANHANES 2012 survey and found that 26% of South Africans reported hunger in 2012, whereas 28.3% feared starvation. In all years, households in the poorest quintile had the most significant levels of moderate and severe food insecurity [3].

The HFIAS results are listed in Table III. The majority of the study participants never experienced any barriers to obtaining access to food for at least a day, with HFIAS scores ranging from two to 57.

The HFIAS data revealed several noteworthy trends across different dimensions of food insecurity. Anxiety about food insecurity emerged as a prevalent concern, with 77 of 77

respondents indicating some degree of apprehension. Similarly, the inability to eat preferred foods, limited food variety due to resource constraints, and inability to access even less-preferred food items were commonly reported experiences among the surveyed households. Furthermore, a substantial portion of respondents reported facing challenges related to the availability of smaller food quantities, a reduced number of meals, and instances of having no food in the house. Moreover, a considerable proportion of respondents reported experiencing severe forms of food insecurity, including going to bed or spending the day and night without food.

The prevalence of anxiety regarding food insecurity underscores the pervasive nature of this concern within the surveyed population. This reflects underlying uncertainties regarding food availability and access, which can exacerbate stress levels and compromise overall well-being. The inability to consume preferred foods and limited dietary variety due to resource constraints suggests compromised dietary quality and diversity, which can have adverse implications for nutritional intake and health outcomes. Additionally, experiences such as no food in the house, going to bed hungry, or enduring prolonged periods without food highlight acute forms of food insecurity, indicating severe deprivation and inadequate access to food.

The findings from the HFIAS data underscore the multifaceted nature of the food insecurity experienced by households. The study by [18] utilized HFIAS to assess food insecurity in a rural community in sub-Saharan Africa. The findings revealed that households experienced food insecurity not only in terms of insufficient food quantity, but also in terms of uncertainty about future food availability and feelings of powerlessness related to food access. This study exemplifies how HFIAS data can uncover the multifaceted nature of food insecurity by capturing not only the physical aspects of food access but also the psychological and social dimensions. Addressing these challenges requires comprehensive interventions that go beyond mere provision of food aid to

address the underlying factors contributing to food insecurity, such as poverty, unemployment, and inadequate social safety nets. Livestock ownership can play a significant role in addressing food insecurity, particularly in regions where livestock ownership is prevalent. Studies have consistently shown that increased livestock sales volume and income from livestock activities are associated with lower levels of food insecurity among households [30]. Livestock can contribute significantly to food security beyond meat and milk, as highlighted in various studies [31]. Efforts aimed at enhancing food accessibility, affordability, and nutritional quality are paramount for mitigating the adverse impacts of food insecurity on individuals and communities. Additionally, targeted interventions addressing specific vulnerabilities identified in the HFIAS data, such as limited dietary variety and severe food deprivation, can help tailor interventions to meet the unique needs of the affected households.

C. Key Determinants of Food Security

This study aimed to identify the relationships between the sociodemographic characteristics of households and their degree of food security. Table IV shows an example of a bivariate correlation study that examines whether there is a connection between the features of the surveyed families and the state of household food security. The bivariate analysis in this study used Pearson's r for the Pearson product-moment correlation coefficients. Two variables (Table IV) statistically affected how households in the research areas fared regarding food security. The survey findings indicate that education level and employment status are critical determinants of food security. This result supports [32] finding that household food security positively correlates with educational level, employment position, and household farming techniques. Despite the popularity of the NRMDP among smallholder farmers in KZN, little is known about its effects on food security and the factors that affect household food security, especially in the local uMzimkhulu municipality.

Age of the household head: The weak positive correlation ($r = 0.119$) between the age of the household head and food insecurity suggests that age may serve as a proxy for underlying factors influencing food security within households. Older household heads may face unique challenges, such as declining health, limited earning potential due to retirement, or increased caregiving responsibilities for dependents. The study by [33] examines the relationship between age and food security in rural communities in South Asia. The findings revealed that older household members, particularly older individuals, were more likely to experience food insecurity due to limited physical mobility, health issues, and reduced access to income-generating activities. This study highlights how age can serve as a proxy for vulnerability within households, thus influencing their ability to access an adequate and nutritious diet. These factors can contribute to the increased vulnerability to food insecurity among older individuals and their households. Understanding the complex interplay between age-related dynamics and food security can provide targeted interventions aimed at addressing the specific needs of aging populations,

including access to social support systems, healthcare services, and income-generating opportunities tailored to their circumstances.

TABLE IV
 PEARSON'S CORRELATIONS BETWEEN EXPLANATORY VARIABLES AND THE HOUSEHOLD FOOD SECURITY STATUS

NRMDP Beneficiaries (n=77)		
Variables	Pearson Correlation (r)	Sig. (Two-Tailed)
Marital status	1	c
Age of the household head	0.119	0.303
Size of the household	0.059	0.608
Level of education	-0.402**	0.088
Employment status	-0.272*	0.129
Head of the household monthly income	-0.064	0.581
Household's main source of income	-0.047	0.684
Households collect any type of social grant	0.204	0.075
Farming activities of the household	-0.227*	0.047

Notes: ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). C cannot be computed. Source: Survey data (2022) were computed using the SPSS software (version 27).

Size of the household: The very weak positive correlation ($r = 0.059$) between household size and food insecurity suggests that while larger households may face increased resource demands, household size alone may not be a strong predictor of food insecurity. Research by [34] in the Republic of Korea found that the association between food insecurity and participation in food assistance programs was weak and not statistically significant, suggesting that household size alone may not be a strong predictor of food insecurity. Similarly, [35], in Western Ethiopia, expected that larger household sizes would positively affect the extent of food insecurity, indicating a potential link between household size and food insecurity. Other factors such as income distribution, socioeconomic status, and household composition play significant roles in determining food security outcomes. Larger households with adequate resources and effective resource allocation strategies may effectively mitigate food insecurity risks, while smaller households with limited access to resources may experience higher levels of food insecurity, despite their size. Understanding the nuanced relationship between household size and food security can inform strategies to support vulnerable households in effectively managing their food needs.

Level of education: The significant negative correlation ($r = -0.402$) between the level of education and food insecurity underscores the protective role of education in mitigating food insecurity risk. Higher education levels are associated with enhanced access to employment opportunities, higher income levels, and better decision-making skills related to food purchasing and consumption. Additionally, education fosters greater awareness of nutrition, health, and food management practices, empowering individuals to make informed choices to support their dietary needs and overall wellbeing. Targeted interventions aimed at improving educational attainment, particularly among marginalized communities, can contribute to long-term food security by equipping individuals with the

knowledge and skills needed to effectively navigate socioeconomic challenges.

Employment status: The significant negative correlation ($r = -0.272$) between employment status and food insecurity highlights the pivotal role of stable employment in reducing vulnerability to food insecurity. Employment provides a reliable source of income, enabling households to meet food needs and access essential resources. These findings align with those of [36] and [37], which show that households with access to employment and income are more likely to be food secure. Additionally, [38] confirmed that diversifying into non-farm employment activities can improve rural households' food security status. Moreover, employment fosters financial stability, social inclusion, and access to social protection mechanisms, buffering households against economic shocks and food insecurity risks. Policies promoting job creation, skill development, and labor market participation are essential for addressing the root causes of food insecurity and fostering sustainable livelihoods for vulnerable populations. Additionally, social safety nets such as unemployment benefits, food assistance programs, and labor market interventions can provide crucial support to households during periods of economic hardship, reduce reliance on emergency food aid, and promote dignified access to nutritious food.

In summary, the correlations between demographic variables and food insecurity underscore the multifaceted nature of this complex issue influenced by a myriad of socioeconomic factors. Understanding these relationships is essential for designing evidence-based interventions and policies aimed at addressing the root causes of food insecurity, and promoting equitable access to nutritious food for all individuals and households.

D. Factors that Influence Household Food Security Status of NRMDP Beneficiaries

Smallholder farmers provide information on the elements that are important in establishing their level of food security. Insufficient sales of available cattle, dying cattle in the custom feedlot facility, insufficient income from cattle sales, poor nutrition, and low-quality breeds were among the factors mentioned by respondents as influencing appropriate food security. We used severe, moderate, and low influence ratings to gauge the influence of these elements. When a household participated in the program, it disclosed that the factors they thought were significant. The findings for households impacted by the conditions mentioned above are presented in Table V. The findings show that at 67.50% of smallholder farmers, the majority were severely impacted by the lack of cattle sales in the program. Only 16.90% were the least (lowly) affected, with 15.60% reporting a considerable impact on their household's food security because of their inability to sell their cattle. People who experienced a significant decrease in their households' food security status blamed the problem of the program's funding being abruptly cut off when the new government administration was implemented in 2019. Due to the poor condition of their cattle, this limits their ability to sell.

The study also shows that smallholder farmers were

negatively affected by the death of their cattle in the custom feedlot at a rate of 55.80%, and they would no longer be able to feed their families because of this. The death of their livestock at a feedlot affected approximately 15.60% of respondents moderately and 32.50% in a low way. These respondents did not rely solely on animals to make a living. According to [39], the death of cattle in the custom feedlot at Lahlangubo, Eastern Cape, affects smallholder farmers' revenue. Reference [40] recommended adopting alternate feed to cut costs.

Additionally, 74.0% of livestock farmers concurred that the poor income from cattle sales severely hampered their ability to provide for their families, while 14.30% and 11.70% said that, respectively, they were moderately and slightly affected by low income. This finding suggests that their reduced income was insufficient to cover their living expenses. This is consistent with [39], who reported that farmers in the Eastern Cape complained about lower pricing for their large cattle. This is in contrast to the reports by [13] and [12], who stated that program members had better incomes and profits.

The majority of respondents said that they often sell their cattle without knowing the price, resulting in lower revenue. Others had to sell because of the COVID-19 outbreak, when there was little demand for beef. According to [41], cattle production by smallholder farmers can improve household food security. As a result, a household will not have enough money to buy basic meals, and the majority of respondents (80.5%) experience food insecurity. This subpar breed harms food security and household income. According to the report, poor-quality breeds made it difficult for 37.70% of households to obtain sufficient food. This can be attributed to the classification system used in South Africa, which is not favorable for smallholder beef farmers [42]. According to [41] and [43], most smallholder livestock producers keep non-descript breeds.

E. The NRMDP's Role in Farmers' Income

Numerous scholars have highlighted the beneficial effects of the NRMDP in promoting smallholder farmers' engagement in markets and in developing a supportive environment for revenue generation. The program positively affects farmers' income [10]-[13]. According to [39], CFPs enable communal farmers to obtain higher prices for older animals and lower their transaction costs. According to [40], farming is the primary source of income for rural households in South Africa.

Key informants have acknowledged the NRMDP's contribution to enhancing smallholder farmers' income. Additionally, because there were fewer transaction expenses, farmers who took part in the program saw an increase in their revenue, and their cattle were sold at a better physical condition or weight. Despite administrative restrictions, the NRMDP significantly impacts the rural economy by creating jobs and allowing local residents to sell animals during auctions. As a result, it is essential to provide food for households; however, the difficulties faced in recent years have weakened the progress made. According to secondary data from the St. Paul feedlot, farmers earned more than R 208 884.06, through abattoir sales. However, important informants contended that

maintaining suitable livestock for the abattoir would have provided farmers with a higher income. Because of their age, the majority of the cattle were rated B2 and C2. For various reasons, 51.90% of farmers could not sell their livestock. A little more than 26.0% of farmers sold their cattle at an abattoir, 16.90% at an auction, and 3.90% at both auctions and abattoirs. Thus, the findings showed that most farmers could not make a living and were at risk of food insecurity. However, farmers whose cattle were successfully sold reported that they rarely experienced food insecurity when the program operated efficiently. To lessen family food insecurity, it is necessary to coordinate this program with the national government.

TABLE V
 FACTORS THAT INFLUENCE FOOD SECURITY

Lack of selling available cattle	Frequency	Percentage (%)
Severe	52	67.50
Moderate	12	15.60
Low	13	16.90
Cattle died in the custom feedlot facility		
Severe	43	55.80
Moderate	12	15.60
Low	25	32.50
Low income from cattle sales		
Severe	57	74.0
Moderate	11	14.30
Low	9	11.70
Poor quality breed		
Severe	29	37.70
Moderate	29	37.70
Low	19	24.70
Total	77	100.00

F. Household Food Insecurity Coping Strategies

According to [26], household food insecurity in South Africa remains a concern. Coping mechanisms change from household to household based on decisions, goals, opportunities, and limitations. [15]. According to [15], who cited Snel and Staring (2001), coping strategies are all deliberate actions that households use in low socioeconomic situations to reduce spending or generate revenue to afford basic needs. According to [26], households borrow food, limit portions, eat fewer meals per day, and rely on less-priced foods and locally accessible vegetables. Most (32.50%) of the households in the St. Paul feedlot that benefited from it testified to using stokvel as a coping mechanism when there is a food deficit in their home. Among the several coping mechanisms used by households, roughly 31.20% chose to grow extra vegetables and sell them, while 19.50% borrowed food, 3.90% worked for it, and 1.30% traded it. According to respondents' admissions to using various coping mechanisms, the study found that household food insecurity is widespread in rural areas (Fig. 2). Reference [44] asserted that households that employ different coping mechanisms to deal with food shortages may be categorized as food insecure.

Owing to the likelihood that poor households will employ more coping mechanisms, coping strategies reveal a household's vulnerability [15]. These coping mechanisms are not sustainable for households [44].

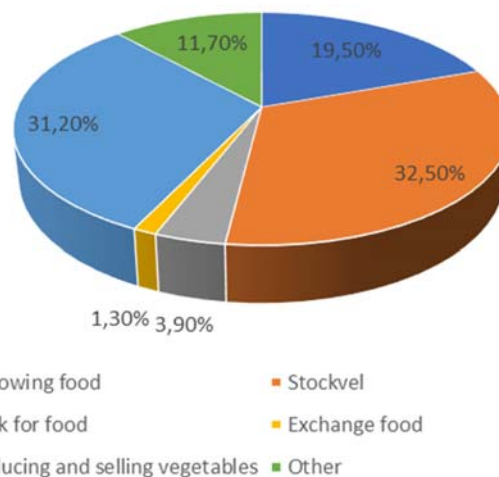


Fig. 2 Farmers' coping strategies during food insecurity

IV. CONCLUSION AND RECOMMENDATIONS

The study delves into the role of the NRMDP in enhancing household food security within rural areas of the uMzimkhulu Local Municipality, Kwa-Zulu Natal. Utilizing self-administered questionnaires, data were collected from 77 smallholder beef farmers engaged in the St. Paul feedlot project. Analysis was conducted employing the HFIAS to ascertain the food security status of beneficiary households. Results indicate that a substantial proportion, 80.5%, of beneficiaries grappled with food insecurity, while only 19.5% were deemed food secure. Primary constraints identified within the program revolved around feed shortages, leading to missed income opportunities for farmers.

Household food insecurity persists as a prevalent concern in rural South Africa, as underscored by this study's findings. Despite the implementation of the St. Paul feedlot project targeting smallholder farmers in uMzimkhulu, the initiative failed to significantly ameliorate the food security status of participating households. Utilizing the HFIAS instrument, which gauges household food access, revealed the prevalence of mild-to-moderate food insecurity among surveyed households. While households employed various coping mechanisms to mitigate food insecurity's impacts, the project's contribution to revenue generation cannot be overlooked. Farmers' ability to earn income through program participation emerged as a primary factor mitigating household food insecurity. However, administrative challenges at the national level impeded the project's efficacy in ensuring food security at the St. Paul feedlot.

Addressing the multifaceted challenges hindering household food security within the St. Paul feedlot necessitates a comprehensive strategy. It is imperative for all stakeholders involved in the NRMDP to coordinate efforts aimed at enhancing farmers' incomes and household food security. Consistent marketing of smallholder farmers' cattle is essential to bolster household food security. Capacity-building initiatives focusing on formal market requirements and imparting business acumen related to feedlot operations are imperative for farmers to capitalize on program benefits fully.

The NRMDP holds promise as a vehicle for enhancing household food security among smallholder farmers in rural South Africa. However, addressing programmatic challenges such as feed shortages and administrative inefficiencies is paramount to maximizing its impact. By implementing targeted strategies aimed at improving farmers' incomes, facilitating market access, and providing requisite training and support, the NRMDP can catalyze meaningful improvements in household food security within the uMzimkhulu municipality and similar contexts nationwide.

ACKNOWLEDGMENT

The authors express gratitude for the participation of farmers in the studied CFP.

FUNDING STATEMENT

This research received funding from the NAMC, which provided financial support for this MSc program, facilitating the study by S.P.

ETHICAL COMPLIANCE

All procedures performed in this study involving human participants were in accordance with the ethical standards of the Institutional and Research Committee and Protection of Personal Information Act. This study was approved by the University of KwaZulu-Natal Humanities and Social Sciences Research Ethics Committee (reference number: HSSREC/00003324/2021).

INFORMED CONSENT STATEMENT

Informed consent was obtained from all the subjects involved in the study. Participants were informed of their right to ask questions related to the research. Confidence and privacy were ensured throughout the study.

CONFLICTS OF INTEREST DECLARATION

The authors declare no conflict of interest with respect to the authorship and publication of this article.

AUTHORS' CONTRIBUTIONS

The authors contributed equally to the commencement of the manuscript and approval of the final version.

REFERENCES

[1] FAO (Food and Agriculture Organisation of the United Nations). (1996). Rome Declaration on Food Security. World Food Summit, 13 – 17 November 1996, Rome, Italy. Available from: www.fao.org/docrep/003/w3613e/w3613e00.HTM (Accessed 11 March 2020).

[2] Jacobs, P. (2009). Identifying targets for household food security in South Africa. Pretoria: Human Science Research Council.

[3] World Bank. (2018). National Planning Commission Secretariat at the Department of Planning, Monitoring Evaluation (DPME), Statistics South Africa, and Statistics SA. 2018. Overcoming poverty and inequality in South Africa. An Assessment of Drivers, Constraints and Opportunities.

[4] Jacobs, I., Taljaard-Krugell, C., Ricci, C., Vorster, H., Rinaldi, S., Cubasch, H. & Romieu, I. (2019). Dietary intake and breast cancer risk in black South African women: The South African breast cancer study.

British Journal of Nutrition, 121(5), 591-600. <https://doi.org/10.1017/s0007114518003744>

[5] Department of Social Development, DAFF (2013). National policy on food and nutrition Security.

[6] Ngarava, S., Phetshe, M. & Mushunje, A. (2019). Market Awareness and Participation for Cattle Farmers in the Kaonafatso ya Dikgomo (KyD) Scheme in KwaZulu-Natal Province, South Africa. *Agriculture* 2019, 9, 215; doi:10.3390/agriculture9100215 www.mdpi.com/journal/agriculture.

[7] McIntyre, A.M. and Hendriks, S.L., 2018. Interpreting food security research findings with rural South African communities.

[8] Sotsha K, Fakudze B., Khoza T. Mmbengwa V. Ngqangweni S. Lubinga M.H. Mazibuko N. Ntshangase. T. Nyhodo B. Myeki. L & Ngetu X. (2018). Factors Influencing Communal Livestock Farmers' Participation into the National Red Meat Development Programme (NRMDP) in South Africa: The Case of the Eastern Cape Province. *OIDA International Journal of Sustainable Development, Ontario International Development Agency, Canada* ISSN 1923-6654 (print) ISSN 1923-6662 (online) www.oidaijsd.com Also available at <http://www.ssrn.com/link/OIDA-Intl-Journal-Sustainable-Dev.html>.

[9] Fakudze, B.D. (2015). An economic evaluation of the National Red Meat Development Programme in the Eastern Cape Province, South Africa. Submitted in partial fulfillment of the requirements for the degree of MSc in Agric (Agricultural Economics) in the Department of Agricultural Economics, Extension and Rural Development Faculty of Natural and Agricultural Sciences, University of Pretoria.

[10] Sotsha and Mzibuko. 2017. Communal cattle farmers generate over R100 million over a period of five years through the NRMDP. *National Agricultural Marketing Council. Agripreneur issue 2017. National Agricultural Marketing Council (NAMC), Pretoria, South Africa.*

[11] Ntombela, S., Myeki, L. & Nyhodo, B. (2013). Mainstreaming subsistence farmers through communal feedlot: Case of Umzimvubu Custom Feeding Program in Mount Frere. *National Agricultural Marketing Council (NAMC), Pretoria, South Africa.*

[12] Myeki, L., Mmbengwa, V. & Ngqangweni, S. (2014). Assessing the use of communal feedlot in empowering women farmers: a case of Mount Frere cattle Custom feeding scheme, Ontario International Development Agency. ISSN 1923-6654 (print) ISSN 1923-6662 (online). Available at <http://www.ssrn.com/link/OIDA-Intl-Journal-Sustainable-Dev.html>.

[13] Lubinga, M. Mazibuko, N. & Sotsha, K. (2018). Comparing prices received by participating and nonparticipating farmers in the custom feeding initiative of the National Red Meat Development Programme: A case of Kwa-Zulu Natal Province. *National Agricultural Marketing Council (NAMC), Pretoria, South Africa.*

[14] IDP. (2022/2023). Umzimkhulu local municipality. Available: https://umzimkhululm.gov.za/wp-content/uploads/2022/05/30-03-2022-Draft-IDP-2022_2023.pdf

[15] Mkhathshane, N.W. (2019). An assessment of household food security status and food security determinants in Brazzaville informal settlement, Pretoria. Research dissertation submitted in fulfillment of the requirements for the degree of Master of Science in Geography in the Faculty of Science and Agriculture, School of Agriculture and Environmental Sciences at the University of Limpopo.

[16] Ndobo, F, P. (2013). Determining the food security status of households in a South African township. Dissertation submitted in partial fulfillment of the requirements for the degree Magister Commerii in the Department of Economics in the Faculty of Economic Sciences and Information Technology, North-West University (Vaal Triangle Campus).

[17] Sekhampu, T.J. (2017). Association of food security and household Demographics in a South African Township. *International Journal of Social Sciences and Humanity Studies*. Vol 9, No 2, 2017 ISSN: 1309-8063 (Online).

[18] Coates J, Swindale, A. & Bilinsky, P. (2007). Household Food Insecurity Access Scale (HFAS) for measurement of food access: Indicator guide. Food and Nutrition Technical Assistance (FANTA) and United States Agency for International Development (USDA) ([www.document](http://www.fao.org/fileadmin/user_upload/eufao-fsi4dm/doc-training/hfias.pdf)) http://www.fao.org/fileadmin/user_upload/eufao-fsi4dm/doc-training/hfias.pdf (accessed 19 June 2020).

[19] Stats SA. (2009). General household survey. Statistical release P0318.

[20] Mukwede, B.T. (2018). The role of rural youth in the smallholder farming sector: Challenges and opportunities in Okhahlamba Local Municipality, South Africa, submitted in partial fulfillment of the academic requirements of Master of Agriculture (Food Security), in African Centre for Food Security, School of Agricultural, Earth and Environmental Sciences, College of Agriculture, Engineering, and

- Science, University of KwaZulu-Natal, Pietermaritzburg, South Africa.
- [21] Mthethwa, S. & Wale, E. (2021). Household vulnerability to food insecurity in rural South Africa: evidence from a nationally representative survey data. *International Journal of Environmental Research and Public Health*, 18(4), 1917. <https://doi.org/10.3390/ijerph18041917>
- [22] Mtintsilana, A., Dlamini, S. N., Mapanga, W., Craig, A., Toit, J. D., Ware, L. J., & Norris, S. A. (2022). Social vulnerability and its association with food insecurity in the South African population: findings from a national survey. *Journal of Public Health Policy*, 43(4), 575-592. <https://doi.org/10.1057/s41271-022-00370-w>
- [23] Gebre, E. & Workye, A. (2022). Determinants of market participation among smallholder farmers in southwest Ethiopia: double-hurdle model approach. *Agriculture & Food Security*, 11(1). <https://doi.org/10.1186/s40066-022-00358-5>
- [24] Kyaw, N. N., Ahn, S., & Lee, S. H. (2018). Analysis of the factors influencing market participation among smallholder rice farmers in Magway region, central dry zone of Myanmar. *Sustainability*, 10(12), 4441. <https://doi.org/10.3390/su10124441>
- [25] Ramanyimi, N.D. (2019). Smallholder agriculture and food security in the City of Tshwane Municipality. Submitted in partial fulfilment of the requirements for the degree: 'Master's in development studies in the Faculty of Economic and Management Sciences Centre for Development Support at the University of the Free State Bloemfontein.
- [26] Abdu-Raheem, K. A. & Worth, S. H. (2011). Household Food Security in South Africa: Evaluating 'Extension's Paradigms Relative to the Current Food Security and Development Goals. *South African Journal Agricultural Extension.*, 39(2): 91 –103.
- [27] United States Department of Agriculture (USDA). (2012). Guide to measuring household food security. Revised 2000. U.S. Department of Agriculture, Food and Nutrition Service.
- [28] Chakona, G. & Shackleton, C. (2018). Household food insecurity along an agro-ecological gradient influences children's nutritional status in South Africa. *Frontiers in Nutrition*, 4. <https://doi.org/10.3389/fnut.2017.00072>
- [29] Shisana O, Labadarios D, Rehle T, Simbayi L, Zuma K, Dhansay A, Reddy P, Parker W, Hossain E, Naidoo P, Hongoro C, Mchiza Z, Steyn NP, Dwane N, Makoae M, Maluleke T, Ramlagan S, Zungu N, Evans M.G, Jacobs, L. & Faber, M. (2014). The South African National Health and Nutrition Examination Survey (SANHANES-1). Human Sciences Research Council.
- [30] Benti, Derib Woldeyohannes, Worku Tuffa Biru, and Workneh Kassa Tessema. 2022. "The Effects of Commercial Orientation on (Agro) Pastoralists' Household Food Security: Evidence from (Agro) Pastoral Communities of Afar, Northeastern Ethiopia" *Sustainability* 14, no. 2: 731. <https://doi.org/10.3390/su14020731>
- [31] Usman, M., Ali, A., Rosak-Szyrocka, J., Pilař, L., Baig, S.A., Akram, R. and Wudil, A.H., 2023. Climate change and livestock herders wellbeing in Pakistan: Does nexus of risk perception, adaptation and their drivers matter? *Heliyon*, 9(6).
- [32] Ngema, P.Z.; Sibanda, M. & Musemwa, L. (2018). Household Food Security Status and Its Determinants in Maphumulo Local Municipality, South Africa. *Sustainability* 2018, 10, 3307.5.
- [33] Smith, D.M., Rixson, L., Grove, G., Ziauddeen, N., Vassilev, I., Taheem, R., Roderick, P. and Alwan, N.A., 2022. Household food insecurity risk indices for English neighbourhoods: Measures to support local policy decisions. *Plos one*, 17(12), p.e0267260.
- [34] Kim, K., Kim, M. K., Shin, Y. J., & Lee, S. S. (2011). Factors related to household food insecurity in the Republic of Korea. *Public Health Nutrition*, 14(6), 1080-1087. <https://doi.org/10.1017/s1368980010003733>
- [35] Sani, S. & Kemaw, B. (2019). Analysis of household's food insecurity and its coping mechanisms in western Ethiopia. *Agricultural and Food Economics*, 7(1). <https://doi.org/10.1186/s40100-019-0124-x>
- [36] Mondal, R., Selvanathan, E., & Selvanathan, S. (2020). Nexus between rural nonfarm income and agricultural production in Bangladesh. *Applied Economics*, 53(10), 1184-1199. <https://doi.org/10.1080/00036846.2020.1827138>
- [37] Vu, L. & Rammohan, A. (2022). Is there an informal employment penalty in food security? evidence from rural Vietnam. *European Journal of Development Research*, 34(6), 2923-2947. <https://doi.org/10.1057/s41287-021-00498-7>
- [38] Mundowa, M. & Mumbengegwi, C. (2020). Analysis of factors influencing smallholder farmers' participation in non-farm employment activities and their impact on households' food security: the case of Mbire district, Mashonaland central province of Zimbabwe. *JESD*. <https://doi.org/10.7176/jesd/11-22-06>
- [39] Gwiriri, L.C, Bennett, J, Mapiye, C, Marandure, T, & Burbi, S. (2019). Constraints to the sustainability of a 'systematized' approach to livestock marketing amongst smallholder cattle producers in South Africa, *International Journal of Agricultural Sustainability*, 17:2, 189-204, DOI: 10.1080/14735903.2019.1591658
- [40] Kirsten, J., May, J., Hendriks, S.L., Lyne, M., Macheche, C. & Punt, C. (2007). The poverty alleviation and food security role of agriculture in South Africa. In: Bresciani, F. and Vald , A. (eds). *Beyond food production: The role of agriculture in poverty reduction*. Rome: FAO.
- [41] Nqeno, N. (2008). Reproductive Performance of Cows in Sweet and Sour Veld Types Under Communal Production Systems in the Eastern Cape Province of South Africa. MSc. Thesis, Department of Livestock and Pasture Sciences, University of Fort Hare, Alice, South Africa.
- [42] Chingala, G., Raffrenato, E., Dzama, K., Hoffman, L. C., & Mapiye, C. (2017). Towards a regional beef carcass classification system for Southern Africa. *South African Journal of Animal Science*, 47, 408–423.
- [43] Mngomezulu, S. (2010). Formal Marketing of Cattle by Communal Farmers in the Eastern Cape Province of South Africa, Can They Take part? MSc. Thesis, Animal Science, Wageningen University, Wageningen
- [44] Maluleke, M.Y. (2018). Assessing the access to nutritious food by households participating in the household food security short learning programme. Submitted in accordance with the requirements for the degree of Master of Consumer Science At the University of South Africa.