

**ANALYSIS OF THE FOOD SECURITY STATUS OF PHEZUKOMKHONO MLIMI
BENEFICIARIES, NKOMAZI LOCAL MUNICIPALITY, SOUTH AFRICA**

by

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DEDICATION

This achievement is dedicated to my mother, **Ms Mtshimba Esther Magagula**. From my childhood you have been an inspiration for me to take education seriously. This is despite you never having had the opportunity to attend school yourself. You motivated me to aim high. During my MSc graduation, your celebrations were muted when you saw the honour given to PhD graduates in red gowns. This made me realise that I needed to pursue doctoral studies. Your guidance, encouragement, support and sacrifices have made me who I am today. I do not have words to thank you enough.

DECLARATION

I, **THEMBA ANDRIES SAMBO** hereby declare that the thesis, with the title: **ANALYSIS OF THE FOOD SECURITY STATUS OF PHEZUKOMKHONO MLIMI BENEFICIARIES, NKOMAZI LOCAL MUNICIPALITY, SOUTH AFRICA** which I hereby submit for the degree of **DOCTOR OF PHILOSOPHY IN AGRICULTURE** at the University of South Africa, is my own work and has not previously been submitted by me for a degree at this or any other institution.


I declare that the thesis does not contain any written work presented by other persons whether written, pictures, graphs or data or any other information without acknowledging the source.

I declare that where words from a written source have been used the words have been paraphrased and referenced and where exact words from a source have been used the words have been placed inside quotation marks and referenced.

I declare that I have not copied and pasted any information from the Internet, without specifically acknowledging the source and have inserted appropriate references to these sources in the reference section of the thesis.

I declare that during my study I adhered to the Research Ethics Policy of the University of South Africa, received ethics approval for the duration of my study prior to the commencement of data gathering, and have not acted outside the approval conditions.

I declare that the content of my dissertation/thesis has been submitted through an electronic plagiarism detection program before the final submission for examination.

Student signature: 

Date: November 2021

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ABSTRACT

Background and aim

In response to the continuing food insecurity levels observed at household and individual levels, the Mpumalanga Provincial Government introduced the Phezukomkhono Mlimi (PKM) programme in 2005. While the programme has been running for some time now, with massive funds spent each year, evidence to show whether the programme is achieving the intended food security outcomes is scanty. Therefore, this study analysed the food security status of agricultural households that benefitted from the PKM programme in the Nkomazi Local Municipality, South Africa during the 2018/19 production season. "Agricultural household" refers to a household in which at least one member of the household or the household head is practising farming as an economic activity.

Methodology

The study applied a mixed methods study design to realise the objective of this study. Questionnaires were used to collect quantitative data from agricultural households (N=355) that volunteered and consented to participate in the study. Focus group discussions with members of the cooperative (N=10) and interviews with key informants consisting of District PKM Coordinators (N=2) and agricultural advisors (N=7) overseeing the PKM programme were used to collect qualitative data. The objectives of this study were achieved by analysing the quantitative data using descriptive statistics and multivariate analysis, as well as by computing the Food Security Index, Household Food Insecurity Access Scale and Household Dietary Diversity Score. Thematic analysis was employed to analyse the qualitative data.

Results

The results revealed that participants in this study tended to be elderly female farmers, aged 60 years and above. Most had low levels of education, low farm income, large households (i.e. 6-10 members per household) and small plots of farmland. Even though most agricultural households were food-secure, food insecurity among the respondents was very high overall. The majority (49.86%; n=177) of the households had a medium

Household Dietary Diversity Score (HDDS) of 4.4, with cereals plus green and yellow vegetables comprising the main foods consumed by the respondents. Factors that were significantly correlated with food security among the households included marital status (coefficient=0.385; p=0.020), education level (coefficient=0.052; p=0.006) and annual farm income (coefficient=0.020; p=0.020). Regarding the factors that were significantly correlated with household dietary diversity, the odds of having a higher dietary diversity score among households headed by respondents with no formal education was 0.20 (Odds Ratio (OR)=0.20; 95% Confidence Interval (CI): 0.06-0.61) times lower than for households whose heads had tertiary education. Similarly, the odds of having a higher dietary diversity score for households with a monthly income of R3 000.00 or less was 0.51 (OR =0.51; 95% CI: 0.31-0.85) lower than for households that had a monthly income of more than R3 000.00. On the other hand, the odds of having a higher dietary diversity score for households with 1-5 members was 10.41 (OR=10.41; 95%CI: 1.05-103.20) times higher than for households that had 16-20 members. Moreover, for every unit increase in the age of the household head, the odds of the household's having a higher dietary diversity score increased by 1.03 (OR=1.03; 95%CI:1.01-1.05). The households adopted various strategies to cope with food shortages, which included eating uncultivated and wild vegetables and fruits (96.9%; n=344), harvesting immature food crops (96.6%; n=343), buying less expensive food (79.4%; n=281) and consumption of unconventional foods (68.7%; n=243). The type of assistance offered by the PKM programme included mechanisation services, production inputs, infrastructure support and extension and advisory services. Challenges encountered by farmers included unavailability of and/or non-operational storage, packing and milling facilities, lack of marketing facilities and access to formal markets, late delivery, insufficient and poor quality of production inputs and a limited number of tractors and implements for mechanisation. The suggested framework for improving the food security status of the programme beneficiaries proposed the establishment of partnerships between public and private organisations and interdepartmental collaboration to promote smooth facilitation of the PKM programme. The framework also identified activities that need to be prioritised to enhance the achievement of the outcomes of the programme.

Conclusion

Although the level of food insecurity among agricultural households was approximately twice the national South African household food insecurity level, the PKM programme managed to decrease the severity of food insecurity among the respondents. However, the PKM programme in its current format is unable to lower the figures of individuals experiencing food insecurity in the study area significantly. Therefore, the respondents are encouraged to make use of other non-farm activities to boost the food security status of their households. Given that most participants in this study were above 60 years of age, programmes to make agriculture more appealing to the youth are needed to safeguard the future of farming and household food production in the study area. Considering the observed low consumption of fruits and protein-rich food sources, educational programmes on nutrition should be introduced to create awareness of cheaper sources of protein and the health benefits of a diverse diet. Through the rural land reform programme, efforts should be made to increase the farm size, which has been shown to have the potential to increase farm income. For the PKM programme to realise its intended goals more efficiently, there is a need to integrate different skills and knowledge. Based on the proposed framework, key strategic elements of the programme with the potential to improve its impact include timely and adequate provision of production resources and operationalisation of all the available storage and agro-processing facilities. In view of this, the managers of the programme should consider these factors to address bottlenecks that hinder the realisation of the goals of the programme. This can be achieved through developing a holistic approach to address food insecurity by promoting collaboration between different stakeholders, such as nutritionists, agricultural advisors, researchers and land-reform specialists.

Keywords: agricultural households, consumption, diet, diversity, food groups, food insecurity, Food Security Index, framework, Household Dietary Diversity Score, Household Food Insecurity Access Scale, small-scale farmers.

OPSOMMING

Agtergrond en oogmerk

In reaksie op die voortdurende voedselonsekerheid waarmee huishoudings en individue moet saamlewe, het die provinsiale regering van Mpumalanga die Phezukomkhono Mlimi (PKM) voedselprogram in 2005 geloods. Hoewel hierdie program reeds jare lank loop, en hoewel enorme bedrae jaarliks hieraan bestee word, is daar min bewyse dat die bedoelde voedselsekerheidsuitkomst daarvan wel bereik word. Daarom is tydens die 2018/19-produksieseisoen ondersoek ingestel na die voedselsekerheid van landbouhuishoudings in die Nkomazi plaaslike munisipaliteit wat by die PKM-program baat gevind het. 'n "Landbouhuishouding" is enige huishouding waarvan die hoof of enige lid landbou as 'n ekonomiese aktiwiteit beoefen.

Metodologie

Gemengde metodes is as studieontwerp toegepas ten einde die oogmerk van hierdie studie te bereik. Vraelyste is ingespan om kwantitatiewe data te versamel by landbouhuishoudings (n=355) wat vrywillig toegestem het om aan hierdie studie deel te neem. Kwantitatiewe data is versamel deur fokusgroepbesprekings met lede van die koöperasie (N=10) te hou en onderhoude met sleutelinformante te voer. Onder laasgenoemde tel PKM-distrikskoördineerders (N=2) en landbouadviseurs (N=7) wat oor die PKM-program toesig hou. Die oogmerke van hierdie studie is bereik deur die kwantitatiewe data aan die hand van beskrywende statistiek en meervariëteanalise te ontleed en die Voedselsekerheidsindeks, die Toegangskaal vir Huishoudelike Voedselonsekerheid en die Huishoudelike Voedseldiversiteitstelling te bereken. Hierbenewens is die kwantitatiewe data tematies ontleed.

Resultate

Volgens die resultate was die deelnemers meestal bejaarde vroulike boere van 60 jaar en ouer. Die meeste is laag opgelei, hulle inkomste uit boerdery is gering, hulle het groot huishoudings (6 tot 10 lede), en hulle boer op klein stukke grond. Ofskoon die meeste landbouhuishoudings voedselsekerheid geniet, is voedselonsekerheid onder die

respondente in die algemeen baie hoog. Die Huishoudelike Voedseldiversiteitstelling (HVDT) van die meeste huishoudings (49,86%; n=177) is middelmatig teen 4,4. Graangewasse en groen en geel groentes is die stapelvoedsel van respondente. Faktore wat beduidend met voedselsekerheid gekorreleer het, was huwelikstatus (koëffisiënt=0.385; p=0.020), vlak van opleiding (koëffisiënt=0.052; p=0.006) en jaarlikse boerderyinkomste (koëffisiënt=0.020; p=0.020). Wat die faktore betref wat beduidend met huishoudelike voedselverskeidenheid gekorreleer het, was die kansverhouding (KV) van 'n hoër voedselverskeidenheid onder huishoudings waarvan die hoofde geen formele opleiding het nie, 0.20 keer kleiner (relatiewe kansverhouding (RKV)=0.20; 95% vertrouensinterval (VI): 0.06=0.61) as dié van huishoudings waarvan die hoof tertiêre opleiding geniet het. Insgelyks was die kansverhouding van 'n hoër voedseldiversiteitstelling onder huishoudings met 'n inkomste van R3 000.00 per maand of minder 0.51 (RKV=0.51; 95% VI: 0.31=0.85) keer kleiner as dié van huishoudings met 'n maandelikse inkomste van meer as R3 000.00. Aan die ander kant was die kansverhouding van 'n hoër voedseldiversiteitstelling vir huishoudings met 1 tot 5 lede 10.41 (RKV=10.41; 95% VI: 1.05-103.20) keer hoër as vir huishoudings met 16 tot 20 lede. Bowendien het huishoudings se kansverhouding om 'n hoër voedseldiversiteitstelling te behaal, vir elke eenheidstoename in die ouderdom van die huishoudinghoof met 1.03 (RKV=1.03; 95% VI:1.01-1.05) gestyg. Huishoudings het verskeie strategieë gevolg om hul voedseltekorte aan te vul. Hulle eet wilde groente en vrugte (96.9%; n=344), oes onryp graangewasse (96.6%; n=343), koop die goedkoopste voedsel (79.4%; n=281), en verbruik onkonvensionele voedselsoorte (68.7%; n=243). Die PKM-program bied hulp aan boere in die vorm van meganisasiedienste, produksie-insette, infrastruktuursteun en uitbreidings- en adviesdienste. Die probleme waarmee boere te kampe het, behels die onbeskikbaarheid van bergingsgeriewe en/of bergings- en verpakkingsaanlegte of meulens wat buite werking is; gebrekkige bemarking en toegang tot formele markte; laat lewering; onvoldoende produksie-insette en insette van 'n minderwaardige gehalte; en min trekkers en implemente vir meganisasie. Volgens die voorgestelde raamwerk om die programbegunstigdes se voedselsekerheidstatus te verbeter, moet vennootskappe gesluit word tussen openbare en private organisasies, en moet departemente met mekaar saamwerk om die PKM-program te fasiliteer. Die raamwerk het ook

werkzaamhede aangetoon wat voorrang behoort te kry sodat die uitkomst van die program bereik kan word.

Opsomming

Hoewel die voedselonsekerheidsvlak onder landbouhuishoudings byna twee keer so hoog was as die nasionale Suid-Afrikaanse huishoudelike voedselonsekerheidsvlak, het die PKM-program wel daarin geslaag om die erge voedselonsekerheid onder die respondente te verlig. In sy huidige formaat is die PKM-program egter nie in staat om die getal individue in die studiegebied wat met voedselonsekerheid te kampe het, aansienlik te verminder nie. Daarom word die respondente aangemoedig om hulle op ander bedrywighede benewens boerdery toe te lê ten einde die voedselsekerheidstatus van hulle huishoudings te verbeter. Aangesien die meeste deelnemers aan hierdie studie ouer as 60 was, moet gepoog word om landbou vir jongmense aantreklik te maak om nie slegs die toekoms van boerdery nie, maar ook huishoudelike voedselproduksie in die studiegebied te verseker. Gesien die lae verbruik van vrugte en proteïenryke voedsel, behoort voedingsprogramme ingestel te word om mense bewus te maak van goedkoop bronne van proteïen en die voordele van 'n diverse dieet. Plase behoort deur die landelike grondhervormingsprogram vergroot te word omdat groter plase 'n groter boerderyinkomste meebring. Om die PKM-program se doelwitte te bereik, sal kennis en vaardighede beter geïntegreer moet word. Die mees strategiese elemente van hierdie program is, volgens die voorgestelde raamwerk, die tydige en genoegsame voorsiening van produksiemiddele en die inbedryfstelling van alle beskikbare opbergings- en verwerkingsinstallasies. As die programbestuurders werk hiervan sou maak, sal die knelpunte verdwyn en die programoogmerke verwesenlik word. Dit is moontlik met 'n holistiese benadering tot voedselsekerheid waarvolgens onder andere voedingkundiges, landbouvoorligters, landbounavorsers en grondhervormingspesialiste saamwerk.

Sleutelwoorde: boerderyhuishoudings, verbruik, dieet, verskeidenheid, voedselgroepe, voedselonsekerheid, Voedselsekerheidsindeks, raamwerk, kleinboere

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Ngekubukana nemazinga ekweswelakala kwekudla emakhaya nasemazingeni angamunye, Hulumende Wesifundza wetfula luhlelo lwePhezukomkhono Mlimi (i-PKM) nga-2005. Nanoma-nje loluhlelo beluloku lusebenta sikhatsi lesidze, futsi lutfola timali letinyenti njalo ngemnyaka, bufakazi bekukhombisa kutsi loluhlelo luyayitfolo yini imiphumela lehlosiwe yekutsi kudla kutfolakale. Ngako-ke, lolucwaningo luhlathiye timo tekubakhona kwekudla kumindeni/emakhaya lelimako lazuzisa kuloluhlelo lwe-PKM kuMasipala Wenzawo WaseNkomazi, eNingizimu Afrika ngesikhatsi sekulima sanga-2018/19. “Imindeni lelimako” kusho imindeni noma-ke emakhaya lapho khona lokungenani linye lilunga lemndeni noma-ke inhloko yelikhaya iyalima njengemsebenti wetemnotfo.

Indlelanchubo

Lolucwaningo lusebentise tindlelakwenta letehluka letihlanganisiwe kute kutsi kutfolakale injongo yalolucwaningo. Kusetjentiswe tinhlumibuto kugcogca imininingwane/lwatiso yebungako kumakhaya lalimako (n=355) lavolontiya aphindze futsi avuma kuhlanyela kulolucwaningo. Tingcoco temacembu lekugcilwe kuwo acocisana nemalunga ekoporasi (N=10) kanye netingcocoluhlolo nebatisi labakhulu labafaka ekhatsi Bachumanisi Besigodzi Be-PKM (N=2) kanye nebeluleki betekulima (N=7) labangamele loluhlelo lwe-PKM kugcogca imininingwane yebunyenti. Tinjongo talolucwaningo tifyelelwe ngekuhlathiya imininingwane yebunyenti kusetjentiswa tibalo letichazako kanye nekuhlathiya lokuhlukahlukene, kanye nekwenza nekubala Inkhomba Yekutfolakala Kwekudla, Sikali Sekungatfolakali Kwekudla Kwemakhaya kanye Nemaphuzu Ekuhlukahlukana Kwekudla. Kusetjentiswe luhlathiyo lwetingcikitsi kute kutsi kuhlathiye imininingwane yebunyenti.

Imiphumela

Imiphumela ikhombise kutsi bahlanganyeli kulolucwaningo bebavamise kutsi kube ngumlimi longumuntfu wesifazane lomdzala, loneminyaka lenge-60 noma ngetulu

ngebudzala. Linyenti labe bebanelizinga letemfundvo leliphasi, imali yekulima lengenako lencane, imindeni lemikhulu (k.k. emalunga la-6-10 likhaya ngalinye) kanye nemaploti lamancane emhlaba wekulima. Nanoma-nje emakhaya lamanyenti lalimako bekanako kudla, kungabi nekudla kwebaphendvuli bekusezingeni lelisetulu kakhulu. Liyenti labo (49.86%; n=177) wemakhaya bebane Liphuzu Lekwehlukahlukana Kwekudla Kwelikhaya lelisemkhatsini (i-HDDS) ya-4.4, lokufaka ekhatsi emasiriyeli netibhidvo letiluhlata satjani naletimtfubi lokungukona kwenta kudla lokusisekelo lokudliwa baphendvuli. Tintfo lebetihambisana kakhulu nekuba khona kwekudla emindenini bekufaka ekhatsi simo setemshado (i-coefficient=0.385; p=0.020), lizinga letemfundvo (i-coefficient=0.052; p=0.006) kanye nemalingena yemnyaka yekulima (i-coefficient=0.020; p=0.020). Mayelana netintfo lebetihambisana kakhulu nekwehlukahlukana kwekudla kwemindeni, ematfuba ekuba neliphuzu leliphakeme lekwehlukahlukana kwekudla emkhatsini wemindeni leholwa baphendvuli labete imfundvo lehlelekile bekungu-0.20 (Ireshiyo Yelitfuba (I-OR)=0.20; 95% Umgamu Wekutetsemba (I-CI): Emahlandla la-0.06-0.61) ngaphasi kunemakhaya lapho khona tinhloko tawo betinemfundvo lephakeme. Ngekubukeka, litfuba lekuba neliphuzu nekudla lokwehlukahlukene lanemalingena le-R3 000.00 ngenyanga noma ngaphasi bekungu-0.51 (I-OR =0.51; 95% CI: 0.31-0.85) ngaphasi kunemakhaya labekanemalingena yangenyanga lengetulu kwe-R3 000.00. Ngakulolunye luhlangotsi, ematfuba ekuba nelinani leliphakeme lekwehlukahlukana kwekudla kwemindeni lenamalunga la-1-5 beka-10. 10.41 (I-OR=10.41; 95%CI: 1.05-103.20) emahlandla langetulu kunemakhaya labekanemalunga la-16-20. Ngetulu kwaloko, kuko onkhe kukhula kweyunithi eminyakeni yebudzala yenhloko yelikhaya, imiphumela yelikhaya lelineliphuzu lekudla lokwehlukahlukene wakhula nga-1.03 (OR=1.03; 95%CI:1.01-1.05). Emakhaya asebantisa emasubuciko lehlukahlukene kute kutsi akhone kubukana nekweswelakala kwekudla, lobekufaka ekhatsi kudla tibhidvo netitselo letilinywako kanye naletingalinywa (96.9%; n=344), kuvuna tilimo letingakavutfwa (96.6%; n=343), kutsenga kudla lokubitako (79.4%; n=281) kanye nekudla lokungetayeleki (68.7%; n=243). Luhlobo lwelusito loluniketwa luhlelo lwe-PKM belufaka ekhatsi tinsita temishini, imikhicito, lusito lwesakhiwonchanti netinsita tekwelula kanye netekweluleka. Tinsayeya balimi labahlangabetana nato betifaka ekhatsi kweswelakala kanye/noma tilondvoloti letingasebenti, tikhungo tekupakisha nekugaya, kweswelakala kwetikhungo tekumaketha kanye nekufinyelela timakethe letihlelekile,

kuletfwa kwetintfo ngemuva kwesikhatsi, kudla lokungeneli kanye netintfo letingekho ezingeni letifakwako kute kube nemkhicito kanye nelinani lelincane letigulumba naleminye imishini yekulima. Loluhlakamsebenti loluphakanyiswako lwekwenta ncono simo sekutfolakala kwekudla kwebazuzi baloluhlelo loluhlongote lubanjiswano emkhatsini etinhlango letingaphasi kwahulumende naletitimele kanye nelubanjiswano lolusemkhatsini wematiko kute kutsi kukhutsatwe kuchutjwa kahle kwaloluhlelo lwe-PKM. Loluhlakamsebenti luphindze futsi lwakhomba imisebenti ledzinga kutsi ibekwe embili, kucalwe ngayo kwentiwa kute kutsi kwentiwe kuzuzwa kwemiphumela yaloluhlelo kube ncono.

Siphetfo

Nanoma-nje lizinga lekweswelakala kwekudla kulamakhaya lalimako belicishe liphindze kabili kunelizinga lavelonkhe lemakhaya aseNingizimu Afrika, loluhlelo lwe-PKM lwakhona kunciphisa umtselela lomubi kakhulu wekweswelakala kwekudla emkhatsini webahlanganyeli/baphendvuli. Nanoma kunjalo, loluhlelo lwe-PKM kulesimo lolukuso manje alukhoni kakhulu kunciphisa emanani ebantfu lababukene nekweswelakala kwekudla endzaweni yalolucwaningo. Ngako-ke baphendvuli bakhutsatwa kutsi bente leminye imisebenti lengasiyo yekulima bafukule simo sekutfolakala kwekudla kwemindeni yabo. Uma kubukwa kutsi bahlanganyeli labanyenti balolucwaningo bebangetulu kweminyaka lenge-60 budzala, kudzingeka tinhlelo tekwenta kulima kuhehe lusha kute kuvikeleke likusasa lekulima nekukhicitwa kwekudla kwemindeni kulenzawo yelucwaningo. Uma kubukwa lizinga leliphasi lekudliwa kwetitselo kanye nekudla lokumitfombo lenotsile yemaphrotheni, kufanele kutsi kungeniswe tinhlelo letifundzisa ngekudla lokunemsoco kute kutsi kucapheliswe bantfu ngemitfombo yemaphrotheni leshiphile kanye netinzuzo tetemphilo tekudla kudla lokwehlukahlukene. Ngekusebentisa luhlelo lwekuhlelwa kabusha kwemhlaba wasemaphandleni, kufanele kutsi kwentiwe imitamo yokukhulisa emapulasi, lasakhombise kuba nemandla ekukhulisa imalingena yeliphulasi. Kute kutsi luhlelo lwe-PKM luzuze imigomo lehlosiwe ngalo ngalokusimeme, kunesidzingo sekuhlanganisa emakhona kanye nelwati lolwehlukene. Ngekumisela kuloluhlakamsebenti loluhlongotwako, emasubuciko aloluhlelo lanemandla ekwenta kancono umtselela walo afaka ekhatsi kuniketwa ngesikhatsi lesifanele futsi nangalokwenele imitfombolusito yokukhucita kanye nekusebenta kwato tonkhe

tilondvoloti letikhona kanye netikhungo temkhicito wetekulima. Uma kubukwa loku, baphatsi baloluhlelo bafanele kutsi bacabange ngaletintfo leti kute kutsi kulungiswe lapho kunetinkinga khona letivimbele kuzuzwa kwemigomo yaloluhlelo. Loku kungazuzwa ngekutsi kwentiwe indlela lenkhulu yekulungisa ludzaba lwekweswelakala kwekudla ngekutsi kukhutsatwe kusebenta ngekubambisana emkhatsini walabatsintsekako labehlukene, njengalabo lababukene netekudla lokunemphilo, baluleki betekulima, bacwaningi kanye netingcweti tetekuhlelwa kwemhlaba.

Emagama labalulekile: emakhaya/imindeni lelimako, kudla lokudliwako, indlela yekudla, kwehlukahlukana, emacembu ekudla, kweswelakala kwekudla, Inkhomba Yekubakhona Kwekudla, luhlaka, Liphuzu Lekwehlukahlukana Kwekudla Kwemindeni, Sikalo Sekufinyelela Kweswelakala Kwekudla Kwemindeni, Balimi labalima kancane.

TABLE OF CONTENTS

DEDICATION	i
DECLARATION	ii
ACKNOWLEDGMENTS	iii
ABSTRACT	v
OPSOMMING	viii
SIBUTSETELO	xi
TABLE OF CONTENTS.....	xv
LIST OF TABLES	xx
LIST OF FIGURES	xxi
LIST OF ABBREVIATIONS AND ACRONYMS	xxii
CHAPTER 1	1
1.1. Introduction.....	1
1.2. Background to the problem.....	4
1.3. Problem statement.....	4
1.4. Aim, research questions and objectives of the study	5
1.4.1. Aim of the study	5
1.4.2. Research questions	5
1.4.3. Objectives of the study	6
1.5. Significance of the study	6
1.6. Key concepts	7
1.7. Limitations of the study	7
1.8. Outline of the thesis	8
CHAPTER 2: LITERATURE REVIEW	9
2.1. Introduction.....	9
2.2. The concept of food security.....	9
2.3. Pillars of food security.....	9
2.3.1. Food availability	10
2.3.2. Food accessibility	11
2.3.3. Food utilisation	12

2.3.4. Food stability	12
2.4. Framework for food security analysis	12
2.5. Household food security measurement techniques	14
2.5.1. Household Dietary Diversity Score	15
2.5.2. Household Income and Expenditure Surveys.....	15
2.5.3. Coping Strategy Index	15
2.5.4. Household Food Insecurity Access Scale.....	16
2.5.5. Food Insecurity Experience Scale	17
2.5.6. Anthropometry	17
2.5.7. Household Food Inventory.....	18
2.5.8. Food Security Index.....	18
2.6. Global food security statistics	18
2.7. Regional food security statistics	20
2.8. South African food security status	21
2.9. Causes of food insecurity in South Africa	23
2.9.1. Inadequate safety nets and food emergency management systems.....	24
2.9.2. Weak support networks and disaster management systems.....	24
2.9.3. Inadequate and unstable household food production	25
2.9.4. Lack of purchasing power.....	25
2.10. Socio-demographic factors associated with food security and dietary diversity.....	26
2.11. Impact of small-scale agriculture to food security	28
2.12. Participation of women in agriculture	30
2.13. Support given by government to smallholder agriculture	31
2.14. Challenges faced by small-scale farmers	33
2.15. The Phezukomkhono Mlimi Programme.....	35
2.16. Summary of the chapter	40
CHAPTER 3: RESEARCH METHODOLOGY	41
3.1. Introduction.....	41
3.2. The study area.....	41
3.3. Research design and method.....	43
3.4. Population.....	44
3.5. Sample and sampling	44

3.5.1. Sampling of the agricultural household.....	45
3.5.2. Selection of focus group discussion.....	45
3.5.3. Selection of key informants for schedule interviews	46
3.6. Data collection instruments.....	46
3.7. Pilot study	49
3.8. Main data collection process	49
3.9. Data analysis	51
3.10. Validity of findings.....	60
3.11. Ethical considerations.....	60
3.12. Summary of the chapter	61
CHAPTER 4: RESULTS.....	62
4.1. Introduction.....	62
4.2. Demographic and socio-economic information of the respondents	62
4.2.1. Demographic profile of participants	62
4.2.2. Socio-economic profile of the participants	63
4.3. Household food security status of the households benefiting from the PKM programme.....	64
4.3.1. Determination of household food security status using the Food Security Index..	64
4.3.2. Determination of food security status using Household Food Insecurity Access Scale	65
4.3.3. Determination of food security status using Household Dietary Diversity Score...	68
4.4. Factors associated with food security among the households.....	69
4.5. Factors associated with dietary diversity among the households	70
4.6. Coping strategies adopted by households to deal with household food shortages..	71
4.6.1. Increasing short term availability of food.....	71
4.6.2. Rationing strategies	72
4.6.3. Dietary changes.....	73
4.6.4. Decreasing the number of people present in the household.....	73
4.6.5. Non-consumption and irreversible coping strategies	74
4.7. Assistance received and challenges encountered by beneficiaries of PKM programme	75
4.7.1. Assistance received by beneficiaries of PKM programme	75

4.7.2. Challenges faced by beneficiaries of PKM programme	77
4.8. Summary of the chapter	80
CHAPTER 5: DISCUSSION OF THE RESULTS.....	81
5.1. Introduction.....	81
5.2. The social economic status and demographic profile of the respondents	81
5.2.1. Demographic profile of participants	81
5.2.2. Socio-economic profile of the participants	83
5.3. Household food security status of the households benefiting from the PKM programme.....	84
5.3.1. Household food security status based on Food Security Index	84
5.3.2. Food security status based on Household Food Insecurity Access Scale	84
5.3.3. Food security status based on the Household Dietary Diversity Score	87
5.4. Factors associated with food security among the households.....	90
5.5. Factors associated with dietary diversity of the households	91
5.6. Coping strategies used by households to help deal with food shortages	93
5.6.1. Increasing short term availability of food.....	93
5.6.2. Rationing strategies	94
5.6.3. Dietary changes.....	94
5.6.4. Decreasing the people present in households.....	95
5.6.5. Non-consumption and irreversible coping strategies	95
5.7. Types of assistance received, and challenges encountered by beneficiaries of PKM programme.....	96
5.7.1. Types of assistance received by beneficiaries of PKM programme.....	96
5.7.2. Challenges faced by beneficiaries of PKM programme	100
5.8. Proposed framework for improvement of food security status of the PKM programme beneficiaries	104
5.9. Summary of the chapter	111
CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS.....	112
6.1. Recapitulation of the aim and objectives of the study.....	112
6.2. Overview of the conclusions of the study.....	112
6.2.1. Conclusion on the socio-demographic characteristics of the participants.....	112

6.2.2. Conclusion on household food security status of the households benefiting from the PKM programme	112
6.2.3. Conclusion on the factors associated with food security among the agricultural households.....	113
6.2.4. Conclusion on the factors associated with dietary diversity among the agricultural households supported by the PKM programme	113
6.2.5. Conclusion on the coping strategies used by households to deal with food shortages	114
6.2.6. Conclusion on the challenges and types of assistance received by beneficiaries of PKM Programme.....	114
6.2.7. Conclusion on the framework for improvement of food security status of the PKM programme beneficiaries.....	115
6.3. Contribution of the study to knowledge.....	115
6.4. Recommendations.....	116
6.4.1. Recommendations for agricultural/farming households.....	116
6.4.2. Recommendations for the PKM programme.....	117
6.4.3. Recommendations for the development and implementation of similar interventions	117
6.5. Recommendations for future research.....	117
REFERENCES	119
APPENDIX A1: QUESTIONNAIRE	147
APPENDIX A2: SISWATI TRANSLATED VERSION OF THE QUESTIONNAIRE	161
APPENDIX B: FOCUS GROUP DISCUSSION QUESTIONS	176
APPENDIX C: KEY INFORMANT INTERVIEW QUESTIONS.....	178
APPENDIX D: PERMISSION LETTER TO CONDUCT RESEARCH	180
APPENDIX E: RESEARCH ETHICS CLEARANCE	181
APPENDIX F: INFORMED CONSENT FORM	184
APPENDIX G: LIST OF PUBLICATIONS	185
APPENDIX H: LANGUAGE EDITING CERTIFICATE	189
APPENDIX I: TURN IT IN DIGITAL RECEIPT	190

LIST OF TABLES

Table 2.1: Identification of maize mills constructed with the support of PKM Programme in Mpumalanga Province	37
Table 2.2: Implementation phases of the PKM programme	39
Table 3.1: Definition of the independent variables used in the probit model	57
Table 4.1: Demographic information of the respondents (N=355).....	63
Table 4.2: The Socio-economic profile of participants (N=355).....	64
Table 4.3: Food security status of the respondents produced from Food Security Index (N=355)	65
Table 4.4: Distribution of respondents based on the replies to the nine standardised HFIAS questions (N=355)	66
Table 4.5: Distribution of households by food groups consumed in the preceding 24 hours (N=355)	68
Table 4.6: Distribution of households by the level of household dietary diversity (N=355)	69
Table 4.7: The adjusted coefficients of the Probit regression analysis of the factors associated with food security among agricultural households (N=355).....	70
Table 4.8: Ordered logit regression results of the factors correlated with dietary diversity among the households in the PKM programme (n=355).....	71
Table 4.9: Distribution of households according to types of assistance received from PKM programme (N=355).....	76
Table 4.10: Distribution of households based on the number of visits by agricultural advisors during 2018/19 production season (N=355).....	76
Table 4.11: Distribution of households by the types of production inputs received from the PKM programme (N=355)	77
Table 4.12: Distribution of respondents based on accessibility and type of storage method (N=355)	78
Table 4.13: Distribution of respondents according to type of markets accessed and challenges encountered (N=355)	79

LIST OF FIGURES

Figure 2.1: Food security conceptual framework	13
Figure 2.3: Ranking of the best ten Sub-Saharan African countries based on food security score 2021	21
Figure 2.4: Proportion of households experiencing inadequacy and severely inadequacy access to food by provinces	22
Figure 2.5: Individuals and households' vulnerability to hunger and access to food, 2010-2018.	23
Figure 3.1: Map of the Study Area (Nkomazi Local Municipality)	42
Figure 4.1: Distribution of households by their Experience Food Insecurity Access-related Domains (N =355).....	67
Figure 4.2: Distribution of households by food insecurity prevalence (N=355).....	68
Figure 4.4: Rationing strategies adopted by households (N=355).....	73
Figure 4.5: Dietary changes strategies adopted by households (N=355).....	73
Figure 4.6: The various strategies related to decreasing number of people in the households that were adopted by the households (N=355)	74
Figure 4.7: Non-consumption and irreversible coping strategies adopted by households (N=355)	74
Figure 5.1: Framework for improvement of food security status of the beneficiaries of the PKM programme	106

LIST OF ABBREVIATIONS AND ACRONYMS

ARC	Agricultural Research Council
CASP	Comprehensive Agricultural Support Programme
CRDP	Comprehensive Rural Development Programme
CSI	Coping Strategy Index
CI	Confidence Interval
COVID-19	Coronavirus Disease of 2019
COS	Council of Stakeholders
DRC	Democratic Republic of Congo
DAFF	Department of Agriculture, Forestry and Fisheries
DARDLEA	Department of Agriculture, Rural Development, Land and Environmental Affairs
EDM	Ehlanzeni District Municipality
EPWP	Expanded Public Works Programme
FIES	Food Insecurity Experience Scale
FSI	Food Security Index
FGT	Foster Greer Thorbecke
GFSI	Global Food Security Index
GNP	Government Nutrition Programme
GESS	Growth Enhancement Support Scheme
HFG	Homestead Food Garden
HDD	Household Dietary Diversity
HDDS	Household Dietary Diversity Score
HFIAS	Household Food Insecurity Access Scale
NKLM	Nkomazi Local Municipality
OHOF	One House One Farm
OR	Odds Ratio
1hh1Ha	One household One Hectare
1hh2DC	One Household Two Dairy Cows
PKM	Phezukomkhono Mlimi
PPPs	Plant Protection Products
SADC	Southern African Developing Community
SPSS	Statistical Package for Social Science
SDG	Sustainable Development Goals
UMP	University of Mpumalanga
VIF	Variance Inflation Factors

CHAPTER 1

1.1. Introduction

Food is part of the fundamental requirements for a person's survival (Omonona & Agoi, 2007). However, the perpetuation of food insecurity and poverty is a critical problem that humanity faces (Stamoulis et al., 2001), and it is a threat to the economic development of several nations (World Bank, 2019). This led the United Nations to commit in the attainment of the Sustainable Development Goals (SDGs) by 2030. These SDGs prioritise poverty and hunger alleviation as a global agenda, with the main target being to reduce the proportion of individuals experiencing poverty and hunger by 50% in 2030 (UNDP, 2018). This has led to the global community giving vigorous attention to developmental programmes on poverty and food insecurity. Since, poverty and food insecurity are growing developmental concerns facing the world (Sati & Vangchhia, 2017), as an affiliate of the United Nations, South Africa is not excluded from these global commitments.

South Africa is food secure nationally, this is demonstrated by its first-class position in the Global Food Security Index (GFSI) when compared to other countries in the Sub-Saharan Africa region (EIU, 2021). Furthermore, it is a net exporter of cereals (FAO, 2020) and largest importer of agricultural products (Viljoen, 2017). Despite these achievements, a number of households and individuals in South Africa are still food insecure (Masuku et al., 2017). As revealed by Statistics South Africa (2019a), the level of household food insecurity in South Africa stands at 20.2%, while it is at 28.4% in the Mpumalanga Province. As records show, the figure of food insecure individuals in South Africa has grown from 6.8 million in 2017 to 9.3 million in 2021 (IPC, 2021). In addition to the effects of drought and economic decline, high food prices and rising unemployment rate (IPC, 2021), this status quo has been aggravated by the Coronavirus Disease of 2019 (COVID-19) (Mlaba, 2020; Mthethwa & Wale, 2021). The Mpumalanga Province, where the present study is conducted and seven other provinces are stressed, while Kwa-Zulu Natal province is said to be in a crisis (IPC, 2021). The recent riots and looting are going to push the Kwa-Zulu Natal province further into a crisis (Tatsvarei et al., 2021).

Global and domestic laws safeguard the entitlement to food (Du Toit, 2011). Food security is catered under section 27 of the South African constitution. Furthermore, this constitution guarantees all members of the republic an entitlement to access enough food and water and mandates the government to consider rational statutory and additional avenues, within its accessible assets, to reach the advancing fulfilment of each of these entitlements (CSA, 1996). In view of this, since South Africa was democratised in 1994, the administration has increasingly been pre-occupied with the battle against hunger and poverty. This has been via developing and adopting policies and intervention programmes which have resulted in food security receiving a lot of attention (Masuku et al., 2017). In particular, the Reconstruction and Development Programme classified food security as an important policy objective in 1994. Then South Africa reviewed public expenditure towards enhancing the food security state of previously underprivileged citizens (DOA, 2002). In addition, small-scale agriculture has been targeted as catalyst to develop rural areas and advance the livelihood of a minimum of 370 000 individuals in these areas (NPC, 2011).

In addition, to further deal with the problems of hunger, the Food and Nutrition Security Policy together with the Household Food and Nutrition Security Strategy were endorsed in South Africa (RSA, 2014). The main objective of this policy is to assure that safe and nutritive food is available, accessible and affordable in the country and at household level (DSD & DAFF, 2013). Subsequent to this, the government of South Africa initiated various agricultural related programmes to eradicate poverty and assure food security at various spheres. The Phezukomkhono Mlimi (PKM) programme, formerly known as Masibuyele Emasimini programme is one such programme initiated by the Mpumalanga Provincial Government in 2005. The overall objective of the PKM programme is to assist peasant farmers and poor households to utilise the under-utilised pieces of land to produce sufficient food to realise household food security (DARDLA, 2011).

The PKM programme aims to provide the beneficiaries of the programme the following: -

- Production inputs such as seeds, fertilisers and chemicals.
- Mechanisation support for tilling the land.
- Support with basic infrastructure for farming.

- Agricultural extension and advisory services

After the rollout of the Comprehensive Rural Development Programme (CRDP), the focus of the PKM programme was directed to all the 18 municipalities of the Mpumalanga Province in the 2009/10 financial year. During that financial year, the programme ploughed and planted 67 023 hectares of land for 48 642 households. This initiative benefited approximately 163 453 people from rural communities. Through this programme, a total of 238 people were employed for a three-year contract. Among those who were employed included securities, tractor drivers, mechanics and managers (DARDLA, 2010a). Then, the construction of maize mills in rural municipalities of the province was prioritised. The aim was to assist vulnerable and subsistence household producers, smallholder farmers and land reform beneficiaries to access value chain systems to ensure food security, and creation of permanent and sustainable jobs in the milling facilities (DARDLA, 2010b).

The Department of Agriculture, Rural Development Land and Environmental Affairs (DARDLEA) has made several configurations in the implementation of the PKM programme since its inception. This is characterised by the several changes made in the administration of the mechanisation aspect of the programme (i.e., tractors) over the years. For instance, the mechanisation service was administered by co-operatives from 2005 to 2007 (DARDLA, 2011). Then the external service providers managed the mechanisation service from 2008 to 2013 while secondary cooperatives in each municipality of the province were mandated with providing mechanisation service in 2013 (DARDLA, 2013). The DARDLEA took responsibility for the management of the mechanisation service from 2014 till 2018. In late 2018, the DARDLEA allocated tractors and implements to individual farmers, co-operatives and other farmers' groups who showed interest and had the capacity to run the fleet (DARDLEA, 2019). The mechanisation assistance of the programme has been provided free of charge to all beneficiaries over the years (DARDLA, 2010b). However, more recently due to budgetary constraints, it has necessitated some categories of beneficiaries with the exemption of subsistence and vulnerable household producers to contribute towards fuel and lubrications when needing assistance with mechanisation (DARDLEA, 2019).

1.2. Background to the problem

South Africa has dual commitments concerning eradication of poverty and hunger, which is an essential development objective to achieve health and human capital outcomes (NPC, 2011; UNDP, 2018). Through the National Development Plan, South Africa made a commitment to eradicate poverty and inequality among its citizens by 2030 (NPC, 2011). Furthermore, as a co-signer to the SDGs, South Africa has an obligation to the attainment of the objectives and targets as outlined in the SDG1 and SDG2, which call for a reduction of poverty and hunger by half in 2030 (UNDP, 2018).

Thus, South Africa has adopted numerous strategies and/or plans whose main priority is poverty relief and ensuring food security. However, evidence to show that the effects of these strategies and/or programmes have been extensively evaluated is scanty (Hendriks, 2013). The evaluation of such developmental programmes is needed to help assess the progress made towards realisation of achieving the SDGs by 2030.

1.3. Problem statement

Since the introduction of the PKM programme in the Mpumalanga Province in 2005, there have been negative reports about the programme. This raises concerns about the ability of the programme to meet its intended goals, which include ensuring food security among others. Further to this, according to available literature, the programme appears to be facing many challenges as compared to benefits (Masoka, 2014; Moselakgomo, 2011). In fact, an investigation conducted by Moselakgomo (2011) revealed that the multi-million government run PKM programme is on the verge of failure, while on the other hand, disadvantaged small-scale farmers who qualify to benefit from the programme have indicated that they no longer benefit from the programme because corrupt tractor drivers demand money for assistances which are meant to be offered free of charge. In the study that was conducted at Bushbuckridge Local Municipality of the Mpumalanga Province, Shabangu (2015) also observed that the government was unable to deliver production inputs on time and the programme did not have sufficient tractors to offer the mechanisation service. Grobler (2016) supports this view in his study that was conducted throughout the municipalities of the Mpumalanga Province by revealing that the PKM programme failed to plough and plant at least 25% of the planned targets for three

consecutive years in some of the municipalities from the 2013/14 up to 2015/16 financial year. Grobler (2016) further reports that a considerable number of tractors from the programme remain broken across the province.

Several critics claim that the PKM programme is not able to meet its objectives and the needs of emerging farmers (Grobler, 2016; Moselakgomo, 2011; Nyathi, 2014). However, the breadth of the challenges faced by the PKM programme has not been examined thoroughly. Despite the massive funds that have been invested in the programme since its inception in 2005, in several municipalities of the Mpumalanga Province, no assessment has been conducted. In addition, the progress of the implementation of the programme objectives has not been extensively researched. Moreover, the voice of the beneficiaries is lacking and/or challenges facing the programme and the impact of this programme to food security have not been documented. Shabangu (2015) assessed the effect of the PKM programme on food security, however the study was executed with a small sample size, in a different study area using a different methodology. Furthermore, the study did not address all objectives this study seeks to address. For example, food accessibility was not assessed using standardised instruments adopted in this study. Furthermore, there is no evidence of a framework for improvement of food security status of the beneficiaries of the PKM programme.

1.4. Aim, research questions and objectives of the study

1.4.1. Aim of the study

The aim of this study was to assess the food security status, and factors associated with food security among households benefiting from the PKM programme in the Nkomazi Local Municipality, and to identify the challenges faced by the programme.

1.4.2. Research questions

The research questions of the study were: -

- What is the level of the food security status of the agricultural households benefiting from the PKM programme?
- What factors determine or predict food security among agricultural households benefiting from PKM programme?
- What factors are associated with dietary diversity among agricultural households supported by the PKM programme?
- What coping strategies are adopted by the beneficiaries of the PKM programme to deal with household food shortages?
- What type of assistance is offered by the PKM Programme and challenges the programme face from the perspective of the beneficiaries and agricultural advisors?
- How can the performance and/or the impact of the PKM programme be improved?

1.4.3. Objectives of the study

The research objectives of this study included the following:

- To examine the household food security status of the households benefiting from the PKM programme.
- To identify factors that are associated with food security among the agricultural households benefitting from the programme.
- To identify the factors associated with dietary diversity among the agricultural households supported by the PKM programme.
- To identify the coping strategies adopted by beneficiaries of the programme to deal with household food shortages.
- To describe the types of assistance received and challenges faced by beneficiaries of PKM Programme.
- To develop a framework for improvement of food security status of the beneficiaries of the PKM programme.

1.5. Significance of the study

The democratic government of South Africa has initiated some agricultural development programmes including the PKM programme aimed at fighting poverty and improving food security at household level. It is important to better understand the impact of programmes

such as the PKM programme, more particularly, its influence on food security of agricultural households and/or small-scale farmers. Firstly, the findings of the study will reveal whether the PKM programme is achieving its objectives of dealing with the challenges of food insecurity at household level. Moreover, investigation of the food security status of the household could assist in finding the best approaches that the communities, government or other partners can adopt to alleviate food security in the area. Given that there is scant evidence of research that has been conducted to assess the impact of government intervention through programmes such the PKM programme, the results of this study can serve as the basis for informed policy decisions. The suggested framework will supplement knowledge and can be adapted for similar projects located elsewhere in the country.

1.6. Key concepts

The study identified agricultural households, food availability, food security, and smallholder farmers as key terms, and for purposes of this study, they are defined as follows: -

- **Agricultural household** refers to a household in which at least one member of the household or the household head is practising farming as an economic activity (SSA, 2016).
- **Food availability** means the tangible presence of adequate food ready for people's consumption which may come from own production or from markets (Løvendal & Knowles, 2005).
- **Food security** is a state whereby adequate, healthy and nutritive food is accessible to all individuals all the time in order to sustain their dietary requirements and food choices for an active and healthy life (FAO, 2001).
- **Small-scale farmers** refer to those farmers with limited resources operating on land smaller than five hectares and grow crops for own consumption and sometimes sell the surplus produce (DAFF, 2012).

1.7. Limitations of the study

The present study concentrated only on agricultural households that benefitted from the PKM programme during the 2018/19 production season in the Nkomazi Local Municipality. Therefore, findings reported here cannot be extrapolated to other areas or

projects. A broader targeted study area and a broader targeted study group would expand the horizon of this research, possibly bringing additional dynamics for future interrogation. This study concentrated on food accessibility only, and as a result, the other elements of food security were not covered. Furthermore, this study collected the data during pre-harvest season when households normally face food shortages. In view of this, the results of this study should be interpreted with caution. However, this study provides baseline information on the status of food security among agricultural households benefiting from the PKM Programme in the Nkomazi Local Municipality. This information was previously not available. Furthermore, information generated in this study can be used by future research into similar projects.

1.8. Outline of the thesis

This thesis is organised in six chapters. **Chapter one** presents contextual information and rationalisation of the study. It also states the problem statement, research questions as well as the aim and objectives of the study. The key terms used in the study are defined in this chapter.

Chapter two provides various definitions of the conception of food security and discusses the pillars of food security, framework of food security analysis and household food security measurement techniques. It reviews literature on global and regional food security statistics. It discusses the food security status and causes of food insecurity in South Africa. The chapter also discusses the socio-demographic factors connected with food security and dietary diversity. It also looks at the effect of smallholder agriculture to food security, participation of women in agriculture, support given by government to smallholder agriculture, challenges faced by small-scale farmers and PKM programme. Chapter three presents the methodologies applied to realise the objectives of the present study. It also covers the population, sampling methods, instruments used for data collection and analysis. **Chapter four** reports the results while **chapter five** analyses and discusses the results reported in chapter four. The study's conclusion and recommendations are presented in **chapter six**.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

In this chapter, the various definitions of the conception of food security are outlined. The chapter discusses food security based on its pillars and measurement techniques at household level. It reviews literature on global and regional food security statistics and outlines the food security situation and causes of food insecurity in South Africa. The chapter discusses the socio-demographic factors associated with food security and dietary diversity and analyses the role of small-scale farming to food security, participation of women in agriculture, support given by government to smallholder agriculture, challenges faced by small-scale farmers and PKM programme.

2.2. The concept of food security

There were about 200 definitions of the concept of food security that have been adopted in the past two decades (Maxwell and Smith, 1992). Thus, food security is a complicated concept which has been broadly discussed and described in different manners in both national and bilateral policy documents as well as academic work.

Food security became an issue around the 1970s during the deliberations of the global food crisis. Subsequent to that, it has developed into a matter that is highly significant (Ayalew, 1997). In the 1970s, the main attention was put ensuring global and national food availability (Maxwell and Smith, 1992), but Sen (1993) challenged this idea and proved that availability of food does not ensure that everyone has access to it. The current accepted delineation of food security was approved by the World Food Summit in 1996. It considers food security as “a state whereby adequate, healthy and nutritive food is accessible to all individuals at all the time in order to sustain their dietary requirements and food choices for an active and healthy life” (FAO, 2001).

2.3. Pillars of food security

Food security is identified as a flexible concept resting on three hierarchical pillars or dimensions i.e., availability, accessibility and utilisation of food. While availability of food is necessitous, it does not ensure access to food. Likewise, while food accessibility is necessitous, it does not ensure that food is efficiently utilised (Barrett, 2010). In light of

this, Bajagai (2017) asserts that food systems that are competently functional result into food security. A weakening of one or more of these dimensions or pillars results into food insecurity. The pillars are interlocked, and no individual pillar can secure food security by itself. This view is supported by FAO (2017) which is of the view that all the pillars necessitate to remain satisfied concurrently to lead to the realisation of food security. Therefore, a competent food system considerably impacts on every one of the three pillars, including the conception of food stability included as a fourth pillar.

Food security and its pillars are vulnerable to risks. The risks in question, are defined by characteristics such as type, level, frequency, timing, and severity, which determines their effects of a specific risk on food security and the respective pillar they affect (Løvendal & Knowles, 2005). These risks can be natural, social, economic, environmental, political and health in character. The risks can affect food security and its pillars at different levels ranging from individual, household, national and global level (World Bank, 2000). The following subsections briefly describe the four pillars of food security.

2.3.1. Food availability

This means the tangible presence of adequate food ready for people's consumption which may come from own production or from markets (Løvendal & Knowles, 2005). Availability deals with the supply side and it is affected by production, distribution and exchange mechanism. Production influences the quantity and type of food that can be produced and reserved locally for future consumption. On the other side, distribution influences the way food is physically moved as well as the physical form and timing when food is moved to its intended recipients. Exchange mechanism refers to the manner in which food can be acquired, which could be through barter, trade, purchase, or loans (Fraanje & Lee-Gammage, 2018). Food availability at household level can be affected by economic risks e.g., unemployment and harvest failure and health risks. Health risks such as illness, disability and injury lower the capacity of individual households to produce food (Løvendal & Knowles, 2005).

2.3.2. Food accessibility

Food accessibility means the capability of households and individuals to possess necessary means to obtain the right amount of high-quality foods for nutritious diet. It may be through production, purchasing or donation (Bajagai, 2017). Food will be accessible to all households and individuals, provided it is at the correct locality at a particular time, and individuals must be financially independent or must hold buying capacity to obtain sufficient quality plus quantity of nutritive food (Jrad et al., 2010). Therefore, households and individuals capacity to access food is dependent on the economic and physical accessibility (FAO et al., 2013).

Economic accessibility suggests affordability of food. The price of food should be reasonably such that high quality and sufficient quantity food can be accessed easy without giving up on other essentials such as education fees, health, clothing or rent. Therefore, food affordability is assured when the minimum incomes or social security assistance is enough to meet the cost of nutritive food and other basic needs (OHCHR, 2010). Food affordability determines access to food by individuals (Capone et al., 2014). In view of this, individuals must be financially independent or must hold buying capacity to obtain enough food of nutritive value (Jrad et al., 2010). Therefore, economic accessibility to food is affected by disposable income, costs of food and the provision of social assistance (FAO et al., 2013).

Physical accessibility means that food should be easily reached by all people, together with those that are physically vulnerable for whom it may not be easy to go out to acquire food, for instance children, sick people, older people and those living with disabilities (OHCHR, 2010). Physical accessibility of food is influenced by the convenience of proper physical infrastructure that support transportation, storage, processing and marketing of food (FAO et al., 2013). For instance, to assure physical access to food by individuals residing in inaccessible areas, the road infrastructure has to be upgraded, so that people are able to reach markets by public transport (OHCHR, 2010).

Health risks such as illness, disability and injury affect food accessibility at household level. This is due to increased health costs for family members. Economic risks e.g., unemployment and harvest failure result in reduced asset holdings and income earned.

The effect of all these factors is negative on household food access (Løvendal & Knowles, 2005).

2.3.3. Food utilisation

Food utilisation is the manner whereby the human system ingests and absorb enough and high value food for the continuance of high-quality healthiness (Gross et al., 2000). It is generally influenced by the intake of healthy diet. It is also revealed in the nutritional status of a person (Riely et al., 1999). Social risk such as unequal intra-household food distribution has an effect on food utilisation at household level (Løvendal & Knowles, 2005).

2.3.4. Food stability

This is the uniform or unvarying provision (availability), ease of access and proper consumption of adequate food during the year. Factors such as unstable prices of food, natural disasters, political instability and unemployment have a substantial effect on the stability status of food security (Bajagai, 2017). Stability has an influence on each and every one of the other pillars (Fraanje & Lee-Gammage, 2018). Thus, in order to realise food security, with regard to availability, access and utilisation, food stability must exist (Napoli, 2011).

2.4. Framework for food security analysis

Literature (Barrett, 2010; Napoli, 2011) indicates that a single indicator cannot quantify all the pillars of food security. As averred by Carletto et al. (2013), an effective approach to understand the indicators of food security is to associate every indicator to a particular pillar(s). Food security has varying status across its levels, ranging from global to individual level. Similarly, food security may exist at national or regional level, but yet some individuals may be generally considered to be food insecure and vice versa (Fraanje & Lee-Gammage, 2018).

Figure 2.1 presents the reasoning regarding food security indicators at various levels. At the highest level (global), the fundamental matter is the availability of food across the globe. Food productivity and reserves in a certain time of the year affect food availability at global level. At national level, the fundamental matter is national food availability, which is shaped by the domestic food production in addition to foreign food imports which supplement national food stock. According to Carletto et al. (2013) natural resources, climate, capitals, procedures, and the efficiency through which the accessible assets are utilised influence the capacity and potential of a country to produce food. Conversely, the country’s food imports depend on drivers such as national income, foreign exchange availability and prices in the international markets at a particular time.

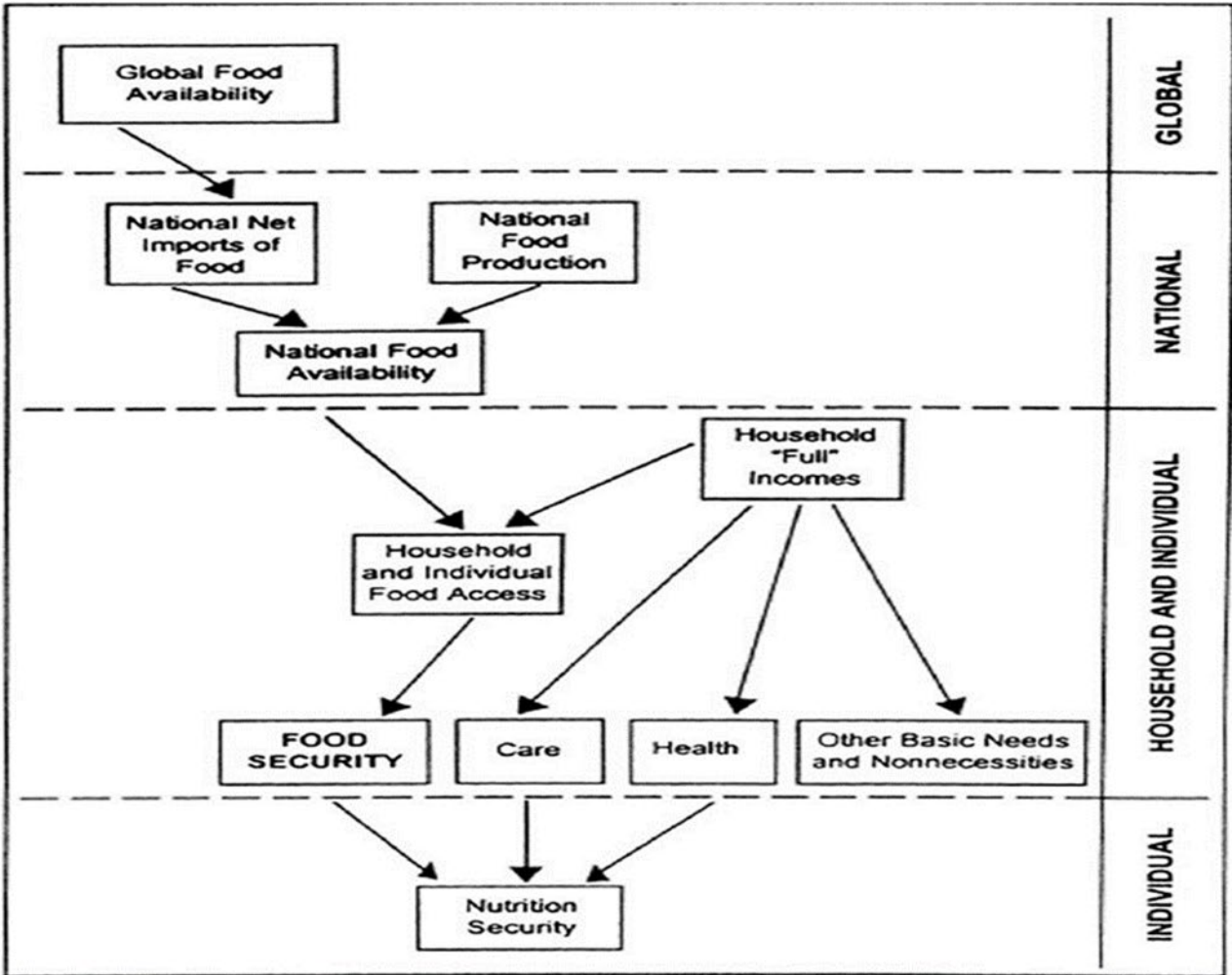


Figure 2.1: Food security conceptual framework (source: Carletto et al. (2013) and Smith, et al. (2000))

Figure 2.1 further shows that food accessible to households and individuals depends on food availability at national level as well as household incomes. When households and individuals have access to enough food, food security is ensured at household and individual level. Household incomes allow households and individual to acquire and afford not only food, but also healthcare, clothing, schooling and other basic needs.

This framework (Figure 2.1) differentiates concerning food security and nutrition security. Food security is one the fundamental needs amongst other needs that the household must satisfy with the available budget and resources (Carletto et al., 2013). Individual nutrition security depends on food security and other basic such care, health, education, sanitation etc.

2.5. Household food security measurement techniques

As mentioned under section 1.1, food is part of the fundamental requirements for a person's life and every person has a fundamental right of access to food (CSA, 1996; Omonona & Agoi, 2007; Smith & Subandoro, 2007). Persistence of food insecurity is therefore a key development problem throughout the world, affecting health, productivity, and the very existence of the people. Therefore, attempts to conquer this problem commences with precise measure of important indicators (Smith & Subandoro, 2007). Just like food insecurity that can arise at three different levels: individual, household and national/regional level (Fraanje & Lee-Gammage, 2018), different food security measurements also apply to the same three levels.

As highlighted in section 2.4, one indicator is not suitable for measuring a full range of food security at different levels, instead different indicators are utilised to capture experiences and behaviours that are indicative of changing degrees of food insecurity (Barrett, 2010; Napoli, 2011). While there are several indicators, a focus here is on few indicators that are applicable at household and individual levels. These measurement techniques (i.e., Household Dietary Diversity Score, Household income and expenditure surveys, Coping Strategy Index, Household Food Insecurity Access Scale, Food Insecurity Experience Scale, Anthropometry, Household Food Inventory and Food Security Index) are described below:

2.5.1. Household Dietary Diversity Score

The Household Dietary Diversity Score (HDDS) measures mainly food accessibility. The HDDS shows accessibility to variety of quality diets. It is based on a recollection of food groups eaten by the households preceding 24 hours (Kennedy et al., 2010). The HDDS is determined by adding up equally weighted response data based on a set of 12 food groups. The person who prepares food in the household is questioned whether any member of the household has eaten anything listed in the food group in the preceding 24 hours. The answers are added up to get a score ranging from 0 to 12 (Swindale & Bilinsky, 2006).

2.5.2. Household Income and Expenditure Surveys

This technique provides facts on the expenditure patterns of the households, on top of the demographic, social, and economic factors of households (GAS, 2018). It also provides information about the household and individual's monthly income and expenditure on food and other household needs. It uses varying reference periods e.g., weeks or months before collection of the data to calculate approximately the calories consumed on average by a member of a household in a daily basis. The technique measures food access (Pérez-Escamilla & Segall-Correa, 2008).

To take full advantage of using this technique, households must give facts on the amount of food bought and expenditures related to various foods eaten in the household (Pérez-Escamilla & Segall-Correa, 2008). Through this technique, households at risk, instigators and effect of food insecurity can be identified and assessed. The collected dietary quality data can be valuable in comprehending the dimension of the food insecurity construct (Pérez-Escamilla & Segall-Correa, 2008). However, this method is relatively costly and cannot be applied nationally on an annual basis (Carletto et al., 2013).

2.5.3. Coping Strategy Index

The Coping Strategy Index (CSI) is a measure of food security at household level by assessing the magnitude to which harmful coping strategies are used by the households when they experience food shortages (Maxwell et al., 2003). The CSI is formulated based on a listing of strategies that are or might be used by the households when facing food

shortage (Coates et al., 2006). According to Maxwell and Caldwell (2008), there are four strategies that are commonly used to deal with food shortages. They include the following: -

- **Dietary changes:** This strategy involves switching the diet of the households e.g., households might move from consumption of preferred foods to inexpensive food that they did not prefer.
- **Short-term measures to increase household food availability:** in this strategy, households can decide to improve the quantity of food available by applying strategies that are not sustainable in a long run. This strategy can only be effective in the short term such as buying food on credit, consumption of immature food crops, consumption of seed stocks, and consumption of wild fruits and vegetable and even begging.
- **Reducing the quantities of people to feed:** this is a short-term strategy whereby households can attempt to reduce the number of people to feed by sending some members of the household somewhere else. For instance, send out children to eat at the relatives or other members of households migrate to search for jobs.
- **Rationing, or managing the shortfall:** households can try to deal with the shortage by controlling the quantity of food available in the household. This can include limiting portion size, stop adults from eating to allow children to eat, reducing the number of meals in a day etc.

2.5.4. Household Food Insecurity Access Scale

The Household Food Insecurity Access Scale (HFIAS) is a tool applied to find the household's experience of food insecurity (access) over the preceding 30 days. This technique applies nine fixed questions about worry and availability of and accessibility to foods for the household during the past 30 days (Coates et al., 2007). The HFIAS assesses the severity of food insecurity by applying questions that capture responses about the domains of the household food insecurity experience (Deitchler et al., 2011). It also uses the basic system for scoring to assess the four HFIAS indicators which include HFIAS-related conditions, HFIAS-related domains, HFIAS-score and HFIAS-prevalence (Coates et al., 2007). The technique can also be applied at national and regional levels

to examine the status of food insecurity, and to monitor and evaluate the impact of intervention programmes (Jones et al., 2013).

2.5.5. Food Insecurity Experience Scale

The Food Insecurity Experience Scale (FIES) is a newly established global standard tool. The FIES is capable for approximating the extent of acuteness of food uncertainty (Ballard et al, 2013). It is a metric for food insecurity severity which is established on perception of people, meaning that it based on the trust of people on honest replies to queries concerning how easy is adequate accessible to them. The FIES is intended to measure only food accessibility by using self-reported information gathered at the household and personal level (VOH, 2018). There is an alignment between FIES and SDG Target 2.1, because it gives indicators that are measures of people's access to food (FAO, 2017).

The progress on attaining one of the SDGs, Goal 2.1 which aims at eradicating malnutrition and assuring food access can also be tracked by using FIES (UNDP, 2018). The FAO and an increasing number of countries currently use FIES to track national and global food security trends, identify households that are susceptible to food insecurity and direct and watch the impacts of food security strategies and programmes. The FIES is also useful in identifying the associated risk factors and consequences of food insecurity (INDDEX, 2018).

2.5.6. Anthropometry

Anthropometry is generally used as an alternate measure of food utilisation, the third element of food security. Anthropometry measures the body dimensions (i.e., body size, weight and height of individual) (Pérez-escamilla & Segall-Correa, 2008). The anthropometry is a practical and applicable technique used to assess children's growth patterns in their early years of life (Jones et al., 2013). These measures are highly standardised, simple and relatively cheaper. Anthropometry can be applied at local and national level to indicate food security and can also be useful in knowing trends, causes and effects of malnutrition at the individual level (Pérez-escamilla & Segall-Correa, 2008). Data on the frequency of the different types of malnutrition is useful in identifying

populations or individuals at risk (Jones et al., 2013). Well-trained personnel is needed to guarantee that data collected using the anthropometric indicators is accurate and trustworthy after adhering to well-regulated procedures (Ballard et al., 2013; Willett, 2013).

2.5.7. Household Food Inventory

The Household Food Inventory is one of the methods developed to evaluate the availability of variety food items in the household (Gichunge et al., 2016). An inventory of all food items that might be present in the household is developed prior to data collection. However, the number of observations needed to get more precise interpretation of the food items that are normally present in the home is still unknown. Therefore, more than one observation is essential to account for changes that occur within the months on food stocks (Sisk et al., 2010).

2.5.8. Food Security Index

The Food Security Index (FSI) uses two approaches i.e., household's food expenditure and household's food consumption pattern to assess the economic accessibility of food by households. The first approach measures the household gross production and purchases overtime to determine whether there is an upward or downward change in food stock in the household. The latter uses a recollecting process for household's food intake and convert into calorie content for the entire household (Maxwell, 1996).

2.6. Global food security statistics

Eradicating hunger and ensuring food security continue to be a global challenge (World Bank, 2019). Recent estimates show that between 720 and 811 million individuals around the globe were facing hunger in 2020. This is a rise of 161 million from 2019 (FAO et al., 2021). This sudden rise in numbers of food insecure individuals is attributable to the outbreak of COVID-19 (Baquedano et al., 2021). The COVID19 pandemic elevate food insecurity through reduction in household incomes, rise in food prices and supply disruptions (Lechler, 2021). More than 30% of the world population is food insecure. This situation has affected all regions of the world. However, Africa is severely affected with a

rate of food insecurity of 60%. The levels of food insecurity in the regions such as the Latin America and the Caribbean, and Asia stand at 41% and 26% respectively. The least affected region is the Northern America and Europe (9%) (FAO et al., 2021). According to FSIN (2020) 135 million people in 55 countries were in crisis or worse. Africa is severely affected with 53% of the population, followed by Middle East and Asia (32%).

The global prevalence of undernourishment had risen by 1% from 8.9% in 2019 to 9.9 in 2020 (Figure 2.2). The records indicate continuing and disturbing regional inequalities. The proportion of undernourished people is high (21%) in Africa. Almost one in five people is facing hunger. The Latin America and the Caribbean rose by 2% to 9.1% in 2020 while Asia recorded a rise by 1.1% to 9.0% in 2020. The Oceania, Northern America and Europe are the three regions with low prevalence of undernourishment and no change observed between 2019 and 2020.

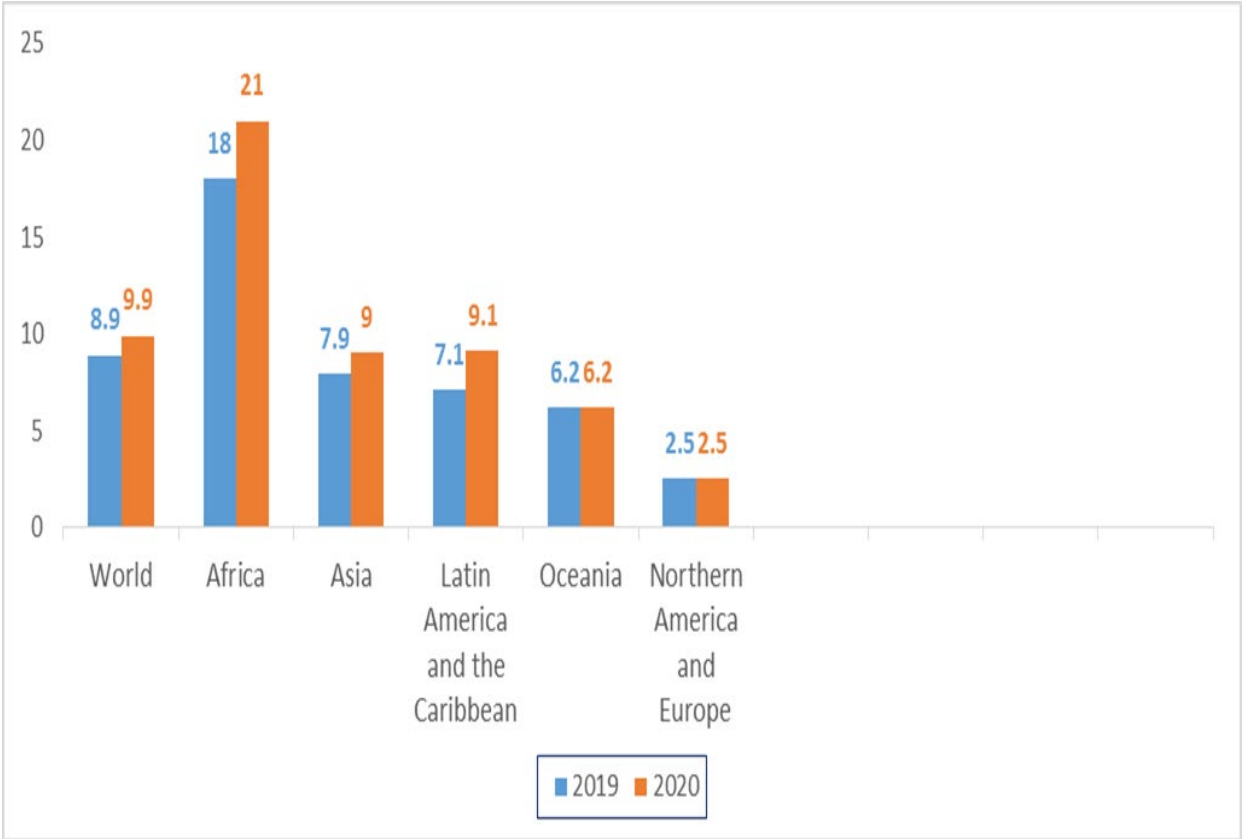


Figure 2.2: Prevalence of undernourishment in the world, 2019-2020 (Source (FAO et al., 2021))

2.7. Regional food security statistics

As indicated in section 2.6, Africa has a high (60%) rate of food insecurity (FAO et al., 2021). Over half (53%) of the residents is in crisis (FSIN, 2020) and the proportion of undernourished people is also high (21%) in Africa (FAO et al., 2021). Despite the COVID-19 pandemic's major effect on food security and livelihoods all over the world. Conflicts, drought and locust infestation also contribute to food insecurity in Africa. For instance, more than 18 million individuals are displaced in states affected by conflict. These individuals suffer from loss of access to land and cannot produce food to feed their families. The sources of their incomes have been destroyed and as a result their purchasing power is affected (Lechler, 2021). Since the El Nino induced drought during the 2015/2016 production season, drought has persisted especially in the SADC region, thus eroding coping mechanisms and resilience of the population and increasing food insecurity. Furthermore, ongoing desert locust infestation is another instigator of food insecurity as it has driven almost 20 million people into acute food insecurity in Eastern Africa (SADC, 2020).

Additionally, a significant number of crops were lost due to flooding during the 2019/2020 season in the DRC, Madagascar and Mozambique. Madagascar was further affected by outbreaks of diseases such as fall armyworm (for maize), *Tuta absoluta* (for tomatoes), avian cholera bacteria, Newcastle viral (for poultry) and African swine fever. In Comoros, over 60% of food crops were lost due to Cyclone Kenneth (SADC, 2020). All the above-mentioned conditions pushed the population of the countries down into food insecurity. In the Sub-Saharan African region, countries like the DRC, Madagascar and Mozambique are food insecure (EIU, 2021). The food insecure population in the DRC and Mozambique is around 13.24 million and 1.10 million people, respectively. These people are in crisis, the Integrated Phase Classification of Food Insecurity (IPC) Phase 3 or worse) (SADC, 2019).

The 10 most food secure countries in the Sub-Saharan African are shown in Figure 2.3. The GFSI positions the nations based on their food security score and compares the core index issues of affordability, availability, quality and safety of food amongst 113 nations. The index varies from a score of 0 and 100, greater scores indicate more favourable situation of food security (EIU, 2021). South Africa has the highest (57.8) overall GFSI in

the Sub-Saharan Africa region. This could be due to its outstanding capacity in producing and exporting large enough stock of cereals than the rest of countries in the region (FAO, 2020). Botswana, Ghana, Mali, Cote d’voire and Kenya are amongst the ten food secure countries in the region (Figure 2.3).

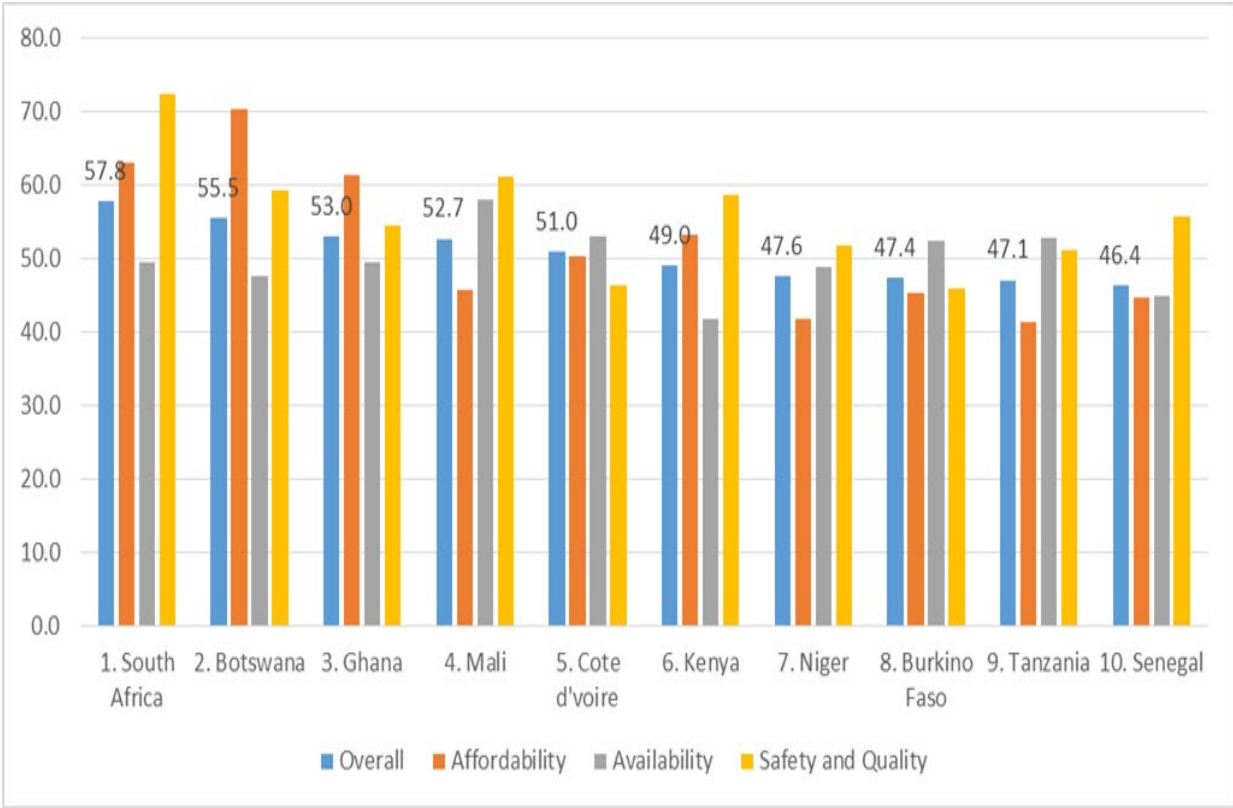


Figure 2.3: Ranking of the best ten Sub-Saharan African countries based on food security score 2021 (Source: (EIU, 2021))

2.8. South African food security status

As mentioned under section 1.1 and 2.7, South Africa is considered food secure at national level (EIU, 2021; SSA, 2019a). However, available evidence suggests that 20.2% of households in the country are food insecure (SSA, 2019a). This problem is worse at provincial level (Figure 2.4). For instance, the North West Province is the most affected with a rate of household food insecurity of 36.6%. Followed by the Northern Cape (32.3%), Mpumalanga Province (28.4%) and Eastern Cape (25.4%). The least affected provinces are the Limpopo province (7.2%), Gauteng (12.8%) and the Free State

Province (19.4%), with levels of household food insecurity below the national level (20.2%).

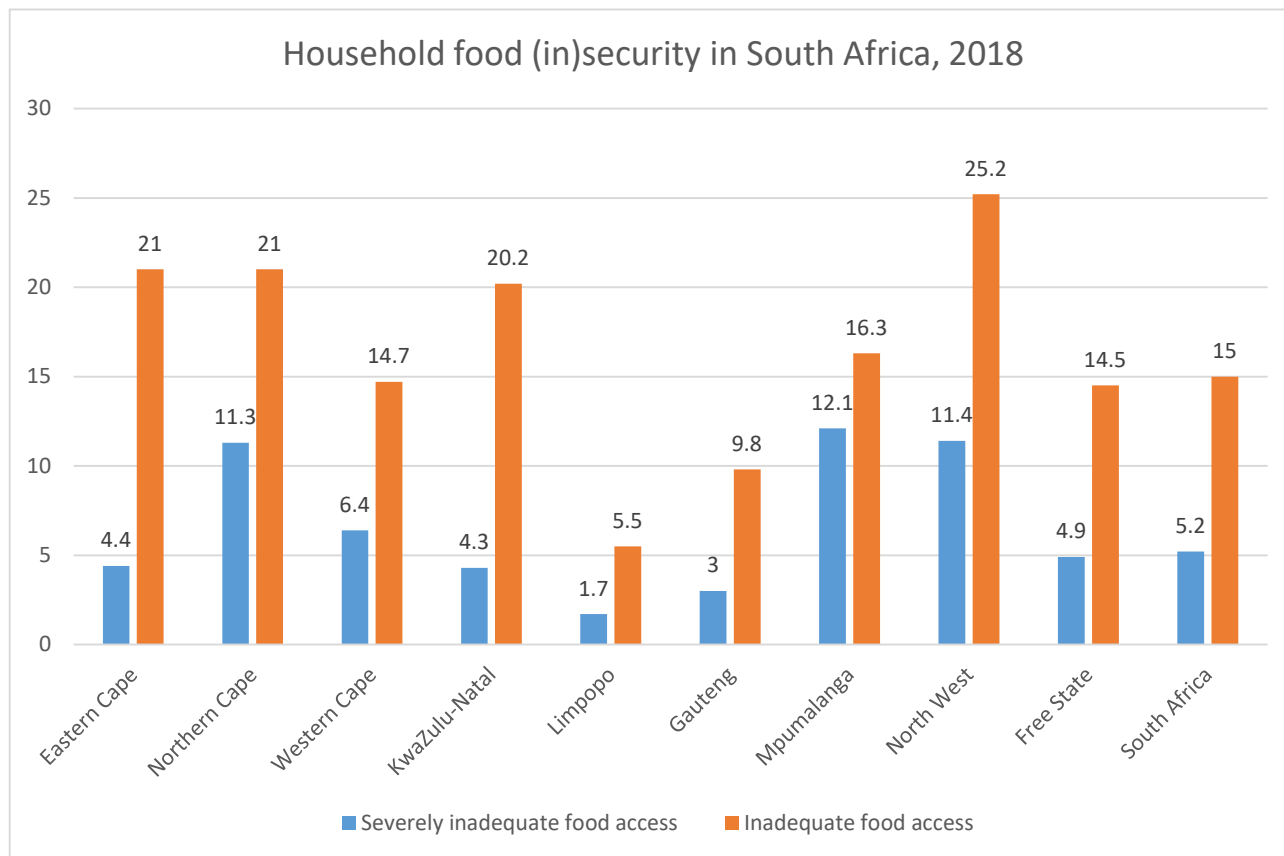


Figure 2.4: Proportion of households experiencing inadequacy and severely inadequacy access to food by provinces (Source: SSA (2019a))

Figure 2.5 demonstrates the vulnerability to hunger and accessibility to food by households and individuals from 2010 to 2018. Evidence from SSA (2019a) shows that there has been a general drop in the proportion of people who were vulnerable to hunger from 16.1% in 2010 to 11.3% in 2018. At some point the proportion rose to 13.7% in 2016 before keeping its decrease (Figure 2.5). The proportion of households prone to hunger followed the same trend as experienced by individuals as it dropped by 3.3% from 13.0% in 2010 to 9.7% in 2018. In 2016, it increased to 11.7% then continue with its decline.

According to Aliber (2003) the elderly, people with disabilities and households headed by females are severely food insecure in South Africa. Furthermore, black Africans and households headed by females are most susceptible to hunger and food insecurity (SSA,

2019b). The figure of households that had difficult access to food decreased by 3.4% to 20.2% in 2018 from 23.6% in 2010. The proportion of individuals with difficult access to food also followed the same trend, decrease by 5.3% to 23.8% in 2018 from 29.1% in 2010 (Figure 2.5).

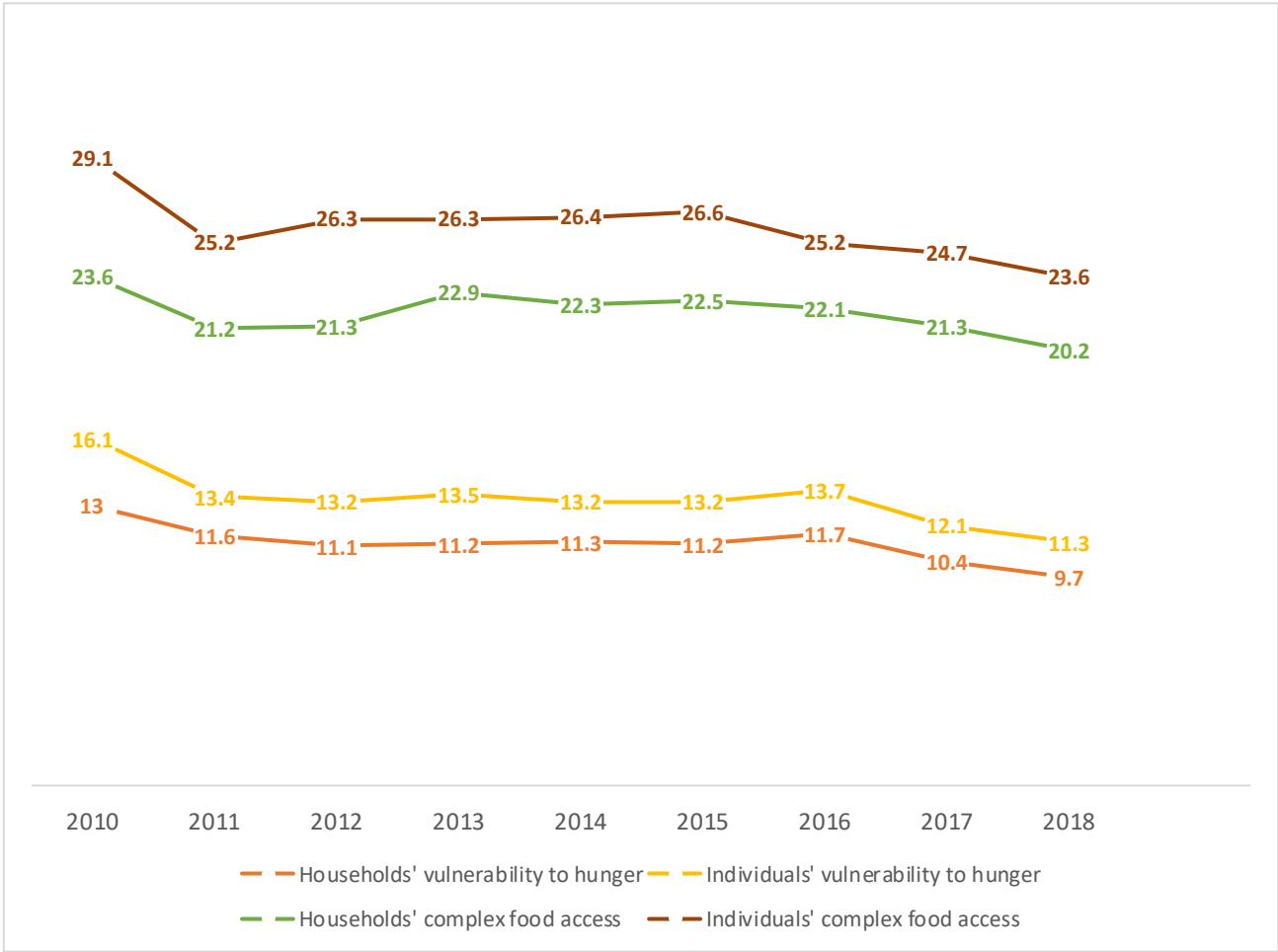


Figure 2.5: Individuals and households' vulnerability to hunger and access to food, 2010-2018. (Source: SSA, (2019a))

2.9. Causes of food insecurity in South Africa

The national policy on food security of 2013 listed sources of food insecurity in South Africa (DSD & DAFF, 2013). These included: inadequate safety nets and food emergency management systems, weak support networks and disaster management systems, inadequate and unstable household food production and lack of purchasing power. These causes of food insecurity are discussed in the proceeding sections.

2.9.1. Inadequate safety nets and food emergency management systems

The safety nets and food emergency management systems in the country are not adequate to support and protect all the needy and vulnerable people and households in dealing with poverty, social exclusion, inequality and food insecurity through their lives (DSD & DAFF, 2013). In reality, social protection and safety net programmes are considered essential in responding to cyclical social policies that can reduce the effects of crises, shocks and food price volatility (FAO, 2012b). Safety net programmes are a component of the social protection strategy, with the aim of addressing risks, vulnerability and social exclusion (Devereux, 2008). Some of safety net instruments used in South Africa include: -

- **Cash transfers instruments:** In South Africa, social grants are paid to vulnerable people such as the disabled people, elderly, orphans, war veterans etc. (SASSA, 2020). Despite the yearly increments on social grants over the years Devereux and Waidler (2017) are of the view that social grants are not enough to meet food needs. While the DSD and DAFF (2013) argue that dependency of households to social grants and migrant remittance make them vulnerable to food insecurity.
- **Food assistance programmes:** This includes food parcels, food vouchers and feeding programmes. School feeding programmes are a key part of food aid and discourage parents from withdrawing children from schools during food crisis (Demeke et al., 2009).
- **Employment-based safety nets:** Such as the Expanded Public Works Programme (EPWP) creates temporary jobs in the different spheres of government (Mokoena, 2020). Public work programmes can create temporary employment, particularly to deal with unfavourable effects of seasonality, economic shocks and cyclical downturn. These programmes focus on providing work for the poor and vulnerable people to alleviate the impact of the crisis on unemployment (Lieuw-Kie-Song & Philip, 2010).

2.9.2. Weak support networks and disaster management systems

South Africa has no organised system of managing food security disasters, such as droughts, riots, veldt fires or floods. The regular occurrence of these disasters can significantly put the food security status of agricultural households at risk. Crop failure in addition to asset loss severely affect households with insufficient stocks to pull on (DSD

& DAFF, 2013). The severe drought in 2015 tested the systems of managing disaster in South Africa. This proved that the current disaster management systems are poor (Mokwena, 2016).

Furthermore, South Africa was also poorly prepared to deal with the civil unrest that engulfed Gauteng and KwaZulu-Natal province in July 2021. As a result, the security forces did not respond quickly enough to the unrests (Ramaphosa, 2021b). There has been looting from businesses and destruction of property and infrastructure necessary for the operation of economy and the delivery of services to the public. The unrest caused significant shortages on food, fuel and medical supply (Ramaphosa, 2021a) as well as 75 000 job losses (DoL, 2021). Unemployment affects the economy and makes individuals and households more susceptible to hunger, starvation and food insecurity (Dodd & Nyabvudzi, 2014). As a quick response to food security challenges that might ensue the unrests, the government of South Africa announced a relief package amounting to R38.9 billion to assist businesses and individuals affected by recent unrests and Covid-19 restrictions (MOF, 2021).

2.9.3. Inadequate and unstable household food production

Most households in the rural areas of South Africa rely on consuming bought food. They are unable to produce and feed their households making them vulnerable to price fluctuations. Their household needs are met on non-farm income (DSD & DAFF, 2013). Therefore, affordability is the main factor determining food accessibility amongst household depending in market because they are unable to produce food (Devereux & Waidler, 2017).

2.9.4. Lack of purchasing power

The economy and labour market in South African is also experiencing the effect of the COVID-19 pandemic. The national lockdown caused contraction of the economy and job losses. Some businesses had to remain closed or reduce hours of operation resulting to job loss and salary cuts to a significant number of employees (SSA, 2020b). The majority of citizens and households in South Africa have very low purchasing power. This is because of the high levels of unemployment and poverty that sit at 32.6% and 49.5% respectively (SSA, 2018; SSA, 2021)

2.10. Socio-demographic factors associated with food security and dietary diversity

Several studies were carried out to identify socio-economic factors associated with food security and dietary diversity. Those studies have considered variables related with household characteristics such as level of education, age and gender of household head as well as household size, household income, marital status etc. These factors are briefly discussed below: -

i. Level of education of household head

Education is an essential and powerful weapon for economic and social development and can be utilised to fight poverty and food insecurity (SSA, 2020c). Education as a social capital, is needed to rise the responsiveness of farmers to up-to-date agricultural practices (Antwi & Nxumalo, 2014). Previous studies have established that an increase in level of education of the head of household has significant improvement on food security status of that household (Nkomoki et al., 2019). This is because educated people have high prospects of finding jobs more especially in the current crippling global economy (NCES, 2021).

Regarding dietary diversity, education impacts positively on dietary diversity (Magaji et al., 2020). Farmers with high level of education have a better understanding of nutrition (Rajendran et al., 2017) and the health advantages of a well-balanced diet. As a result, their diet is likely to be diverse than those with low levels of education (Jebessa et al., 2019).

ii. Age of household head

The age of household head impacts positively on food security (Muche & Tadele, 2015) and dietary diversity (Jebessa et al., 2019). Older farmers have more knowledge and experience of farming activities. This has positively affected food production and, subsequently, improve income to use on food items (Jebessa et al., 2019; Muche & Tadele, 2015).

iii. Gender of household head

Women's food production capacity is affected by gender inequalities which prohibit them from accessing productive resources and services, including land (UN, 2012). The study conducted in the Kingdom of Eswatini by Kuwenyi et al. (2014) demonstrated that the likelihood of being food insecure is higher when the households are headed by females as compared to males. On the other side, involvement of females in decision-making pertaining to household procurements has been shown to be significantly correlated with a higher dietary diversity (Obayelu & Idowu, 2019). Females are considered as wardens of household food production, purchasing and processing (Botreau & Cohen, 2019).

iv. Household size

Household size implies the number of family members living and providing themselves jointly within a household (SSA, 2016). A Household with many family members has a high prevalence of food insecurity (Dodd et al., 2020). Household size is negatively connected with food security (SSA, 2019b; Tiwasing et al., 2018). Likewise, it is negatively correlated with dietary diversity (Obayelu & Osho, 2020). In a household with many members, the head of household is forced to feed more people with limited resources. Such household is likely to have a low dietary diversity (Cordero-Ahiman et al., 2021) and be food insecure (Oduniyi & Tekana, 2020).

v. Household income

A study by Nkomoki et al. (2019) proved that household income impact positively on household food security. Likewise, it is having a positive relationship with household dietary diversity (Iftikhar et al., 2020). An increment in income of the household influences its ability to produce or buy more food and subsequently, its food security and dietary diversity also improves (Jebessa et al., 2019; Jeyarajah, 2018).

vi. Marital status

When the head of the households is married, such household has high likelihood of being food secure, unlike when the head is unmarried (Obayelu & Osho, 2020). Similarly, married couples could combine resources and able to adopt diversified diets for their household. Hence, achieving high dietary diversity (Obayelu & Idowu, 2019). This is

supported by Aboaba et al. (2020) who asserted that wedded heads of households are matured and take the responsibility of providing for their families.

2.11. Impact of small-scale agriculture to food security

Small-scale farmers refer to those farmers with limited resources operating on land smaller than five hectares and grow crops for their own consumption and sometimes sell the surplus produce. The concept of “small-scale farmers” is regularly used the same with “smallholder farmers”. There is a dominance of small-scale farmers in rural areas (DAFF, 2012). There is enough proof that comprehensive agricultural development gives a valuable means of food security, lessening poverty and speed up economic growth (Dixon et al., 2001). Small-scale farmers produce close to four-fifths of the food that feed the population in Asia and sub-Saharan Africa region (FAO, 2012a). The agricultural sector ensures a nation of food security and contributes to economic growth, national income, foreign exchange earnings, and employment creation, alleviates poverty and a means of living for numerous individuals in most emerging nations (World Bank, 2008).

According to Mmbengwa et al. (2015), the greatest potentials of achievement in the practice of smallholder farming system to create employment and improve food security in impoverished parts of South Africa. Kirsten and van Zyl (1998) are of the view that there is enough substantiation that small-scale farming has the power to create jobs and generate income in rural areas. However, the main socio-economic problem, South Africa is facing, as a nation is to find ways of assisting the greater number of rural people to establish sustainable rural livelihoods.

Agriculture remains the key income source for the poor in the world. Many poor individuals, including the extremely poverty-stricken in the world, are located overwhelmingly in rural areas. Their livelihood is linked to agriculture since farming is the utmost efficient approach to fight rural poverty and food insecurity (World Bank, 2008). The size of most farm holdings in Africa is below two hectares. Such farms are operated by small-scale farmers who take farming as their main economic activity. However, the lack of capital assets restricts them from increasing farming production, food security and revenue. Regardless of these problems, smallholders participate substantially to growth of economy in the rural societies and perform a most important part concerning the

preservation of biological assets (Kamara et al., 2019). The livelihood of most rural people is depended on smallholder farming. Smallholder farming contributes to household food security (DAFF, 2012). However, their productivity is still low (Musyoka, 2020). Therefore, the productivity of smallholder farmers needs to be increased considerably to realise food security in the long term (DAFF, 2012). Besides to increase productivity, the accessibility to high quality inputs like technology will also have a significant effect on smallholder agriculture sustainability and subsequent, food security (Musyoka, 2020).

Farming plays an important part in lessening poverty and food insecurity. As highlighted in a report by World Bank (2008), farming is the best alternative for stimulating growth, defeating poverty, and boosting food security. Growth in agricultural production is essential for accelerating growth in other segments of the economy. According to Moyo (2016), smallholder farming contributes positively to livelihoods of rural people via its influence on food security and incomes of household. Kargbo et al. (2017) back this opinion and indicate that smallholder farming has a positive influence towards lessening poverty contributes to increased food production, livelihoods and economy. According to Garvelink et al. (2012), small-scale agriculture is a fundamental hub for investment to sustain comprehensive poverty eradication and food security in the African continent.

There is a high potential of small-scale farming in improving food security by ensuring food availability through production. Increased food production contributes into reduction in food prices, in particular for staples. This is advantageous to the vulnerable individuals who have to buy in most of their food (Wiggins & Keats, 2013). Apart from reducing food prices, smallholder agriculture creates employment opportunities and improves household income. This income is in turn used to access value-added food that could not be easily produced by smallholder farmers (Bongiwa & Obi, 2015). As indicated under section 2.8.5, there is positive correlation between household income and household food security (Nkomoki et al., 2019). Thus, household income improves household food security by influencing the power to buy more food (Jeyarajah, 2018).

Furthermore, several studies proved that smallholder agriculture also contributes to food accessibility. For instance, a study by Sibhatu and Qaim (2017) conducted in Ethiopia

showed that calorie-dense staple foods, such as cereals consumed by the households came from subsistence production. This is also confirmed by Pradhan et al. (2018) who noted that home food production leads to improve access to vegetables and subsequently increases dietary diversity. According to Algert et al. (2016) home food production contributes to food security by providing access to fresh produce and increasing consumption of vegetables and more nutritious diet.

2.12. Participation of women in agriculture

Most women source their livelihood from smallholder agriculture. Over 50% of the agricultural workforce is comprised of women and they have more chances to work in the agricultural sector as compared to other sectors (Gollin, 2014). About 80% of the smallholder farmers in Africa are women (Garvelink et al., 2012). Women often manage complex households and engage in many livelihood activities. They participate in crop and livestock farming, processing and cooking food, employed in the farming or other business in rural areas (FAO, 2011). However due to gender inequalities, land in addition to other productive resources and services are still not accessed by women (UN, 2012). If women could get same opportunities to productive resources as men, their produces could rise by 20-30%. This could save a population of 100-150 million individuals from hunger and poverty (FAO, 2012a). Therefore, there is a need to ensure gender equality to overcome the challenges women face (Garvelink et al., 2012).

A national survey of smallholder agriculture is yet to be conducted in South Africa and this is due to lack of a comprehensive frame which is geo-referenced. In 2018, Statistics South Africa signed a Memorandum of Understanding with the Department of Agriculture, Forestry and Fisheries (DAFF), and based on this Memorandum of Understanding, DAFF has to develop a farmers' register, which will focus mainly on smallholder farmers. This register will in future be used to conduct a comprehensive survey/ census of smallholder agriculture (SSA, 2020a).

In 2018, women owning commercial farms were 8 114, which is about one out of five farmers in South Africa. The Free State (1 594) and Western Cape (1 331) have higher number of women farmers than other provinces. Up to 158 615 women were employed

full-time, which is 34.4% of the total full-time farm workers. The Western Cape (n=39 545) and KwaZulu-Natal (n=27 162) have better representation of female employees than other provinces (SSA, 2020a).

The government in South Africa has designed rules that enable the growth and participation of women in the mainstream economy. For example, the Broad-Based Black Economic Empowerment requires companies to include women in their supply and distribution chains (Dti, 2014). Additionally, most government support programmes have quotas for women. For instance, the Co-operatives Incentive Scheme supports co-operatives owned by historical disadvantaged individuals (black people, women, youth, people living with disabilities) (DSBD, 2019). The PKM programme has the vulnerable household producer subcategory of subsistence farmers. This subcategory also supports women, disabled persons, households headed by children and farm workers who have interest to improve their food security status through food crop production (DARDLEA, 2019). Therefore, the proportion of women participating in government supported agricultural programmes targeting smallholder farmers in South Africa has been rising (Nesamvuni et al., 2016). It is not just the increasing numbers of women participating in smallholder agriculture. A remarkable success in tackling the issues of inaccessibility of land and food insecurity has been achieved in Mpumalanga Province through the 1hh1Ha programme. Through this programme, a greater number of women had acquired land and the households headed by some of these women were food secure (Ngomane & Sebola, 2019).

2.13. Support given by government to smallholder agriculture

Smallholder farmers need basic support with services like accessibility to agricultural production inputs, infrastructure, extension, research, and markets (Baloyi, 2010). Several international studies show that government support to smallholder agriculture contributes to jobs creation, income generation, food security and poverty reduction. For example, in Bangladesh, the “One House One Farm” (OHOF) project has a positive and significant consequence on creation of jobs and income by smallholder farmers. The OHOF has been designed exclusively to relieve poverty and increase food security of the underprivileged agro-processing families in Bangladesh (Jannat et al., 2017).

Furthermore, the Growth Enhancement Support Scheme (GESS) impacted positively on the income of cassava and maize farmers. It also improved the level of food security and reduced poverty levels of these farmers in Nigeria (Adenegan et al., 2018). The GESS subsidy allows small-scale farmers to buy production supplies at reasonable prices, at their convenient time and place (Grow Africa, 2016). In addition, the GESS impacted positively on level of production, income levels and food security status of rural farming households (Ahmed et al., 2016). Excellent results in improving food security and lessening poverty been achieved in Brazil through the Fomento programme. This is a government run social programme targeting smallholder farmers. This programme significantly contributed to lessening the level of poverty from 51.45% in 2002 to 29.1% in 2011 while incomes of family farmers increased by 50% during the same period in rural areas (Ambler et al., 2015). The approach of implementation, objectives, and targeted beneficiaries of the above-mentioned government support programmes does not differ with the PKM programme being implemented in the Mpumalanga Province, South Africa.

As alluded in section 1.1, various agricultural related programmes to eradicate poverty and assure food security are initiated at various spheres of government in South Africa. Examples of such programmes include the Homestead Food Garden (HFG), Fetsa Tlala Food Production Initiative, PKM, One household One Hectare (1hh1Ha) and One Household Two Dairy Cows (1hh2DC), to mention a few.

The HFG programme was initiated in 1997 to alleviate food insecurity, hunger, and malnutrition in vulnerable households headed by women, youth, unemployed and military veterans. The programme assists beneficiaries with garden tools, production inputs and training on gardening (DACE, 2006). The HFG programme significantly improved the well-being of the farmers by increasing their harvest and net income (Bahta & Tlalang, 2018). As stated in section 1.1, the PKM programme was initiated by the Mpumalanga Provincial Government in 2005. The overall objective of programme is to assist peasant farmers and poor households to utilise the under-utilised pieces of land to produce sufficient food to realise household food security. The PKM programme supports the beneficiaries with production resources, tractors for tilling the land, basic infrastructure for production and extension and advisory services (DARDLA, 2011).

The Fetsa Tlala Food Production Initiative was also endorsed by government in 2013 to address the food security challenges. Through this initiative, the government's aim is to assist smallholder producers in communal areas and land reform farms to bring into production put at one million hectares (DAFF, 2014). Furthermore, the Department of Rural Development and Land Reform introduced the 1hh1Ha and 1hh2DC programme in 2016 to facilitate rural livelihood development in accordance with the plan of Agri-Parks. This programme aims to reduce food insecurity and poverty in rural areas. The programme supports small-scale farmers, farmworkers, restitution claimants, farm dwellers and labour tenants with resources to enable them to produce food for household consumption (DRDLR, 2017).

2.14. Challenges faced by small-scale farmers

Small-scale farmers have different challenges that affect their growth and ability to effectively contribute to food security when compared to their commercial counterparts. They encounter challenges such as lack of physical infrastructure, marketing challenges, lack of human capital, inaccessible land, transportation challenges and shortage of production resources. These challenges are discussed: -

i. Lack of physical infrastructure

Most smallholder farmers lack key infrastructure as such as post-harvest storage and processing facilities which has a negative effect on access to formal markets due to loss of quality of the produce. Since quality is more important to the buyers (Baloyi, 2010). Farmers' produce is lost through spoilage after harvesting due to lack of the above-mentioned infrastructure (Khapayi & Celliers, 2016). Additionally, in rural areas, the transportation networks are not accessible by small-scale farmers (Matlou, 2018). Poor roads, for instance, hamper the transportation of inputs to farms and produce from farms to markets (DAFF, 2012). Therefore, the availability of proper roads linking farmers to markets can significantly lower costs of production and transportation. The farmers' capacity to access production supplies and sell produce improves, thereby improving profit margins (Makombe et al., 2010).

ii. Marketing challenges

Lack of reliable markets is another key challenge faced by small-scale farmers (DAFF, 2012). The majority of smallholder farmers are incapable of meeting legislation and quality certification standards such as the Good Agricultural Practises which are prerequisites to most formal markets (FAO, 2015; Khapayi & Celliers, 2016). As a result, most small-scale farmers sell at farm gates and receive low prices for their produce (Mutero et al., 2016).

iii. Lack of human capital

Most smallholder farmers have low level of education (Hayat & Bacha, 2019). This could be a challenge to accessing and applying the latest developments and innovations. Furthermore, most smallholder farmers are incapable of meeting the quality benchmarks regulated by fresh produce markets and food processors due to insufficient knowledge when it comes to marketing and financial administration (DAFF, 2012). Insufficient knowledge relating to farming also affects their productivity (Musyoka, 2020).

iv. Lack of access to credit

These farmers are not capable to access loans from financial institutions due to high surety conditions and lending rates assumed due to the risk associated with farming (FAO, 2015). Factors such as household income, capital structure and family net worth have a positive effect on consideration of credit of small-scale farmers (Chisasa, 2019). Smallholders must have funds to purchase production resources that are needed to increase productivity (FAO, 2015). Therefore, the inaccessible credits negatively affect the productivity of small-scale farmers (Chisasa, 2019).

v. Transportation challenges

Shortage of transport is another key challenge that affects most smallholder farmers in delivering their products to the markets (Mutero et al., 2016). The availability of transport affects the quality of the produce to be supplied. The produce gets delivered late to markets if the transport is not reliable. In a situation where storage facilities are not available to the farmers, late delivery can result in deterioration of the quality of the produce and make the producer appear undependable to the customer (Khapayi & Celliers, 2016).

vi. Lack of production resources

Farmers need production resources like capital, land, water and labour (DAFF, 2012). Inaccessibility to such production resources prevents small-scale farmers from supplying adequate stock to satisfy the market. This leads to income and competitiveness losses (FAO, 2015).

2.15. The Phezukomkhono Mlimi Programme

As stated under section 1.1, the Masibuyele Emasimini programme was launched by the Mpumalanga Provincial Government during the 2005/06 financial year. The programme was introduced to assist peasant farmers and poor households in rural areas of the Mpumalanga Province to utilise the fallow land to produce sufficient food to realise food security (DARDLA, 2011). The Masibuyele Emasimini programme was renamed Phezukomkhono Mlimi (PKM) programme in the 2017/18 financial year (DARDLEA, 2019).

The PKM programme's policy on food security of 2019 identifies the main objectives of the programme (DARDLEA, 2019). The objectives include:

- Improve household food security through optimised food crop production.
- Improve household income through selling of surplus produce.
- Create job opportunities and generate income across the agricultural value chain such production, agro-processing, marketing and operations on farms supported by the programme.

2.15.1. PKM programme services

The different categories of beneficiaries of the PKM programme require different services, support packages and the mechanisms through which services are offered (DARDLA, 2013). The DARDLA (2011), DARDLA (2013) and DARDLEA (2019) identified different assistances offered to beneficiaries through the PKM programme, which include: -

i. Production inputs support

The PKM programme assists vulnerable households, subsistence and smallholder producers with production inputs such as seeds, fertilisers and chemicals free of charge

(DARDLEA, 2019). Similar programmes in various countries support small-scale farmers with production inputs. As mentioned under section 2.13, the GESS subsidy allows small-scale farmers to buy production supplies at reasonable prices, at their convenient time and place (Grow Africa, 2016). The GESS impacted positively on the income of cassava and maize farmers. It also improved the level of food security and reduced poverty levels of these farmers in Nigeria (Adenegan et al., 2018). The e-wallet fertiliser subsidy scheme has significantly improved the farm output. The figures of fertiliser procurements by the farmers involved in the scheme also improved considerably. The high production created by this scheme in Nigeria can assist to lessen food insecurity levels (Alabi & Adams, 2020). The fertiliser subsidy scheme in Odisha, India also supports farmers with subsidized fertilisers (Kumar, 2017).

ii. Extension and advisory support

The extension and advisory support are offered to subsistence, smallholder and commercial farmers free of charge to maximise production and ensuring sustainable use of natural resources (DARDLEA, 2019). Extension services improves farmers' productivity (GFRAS, 2012; IFPRI, 2020), knowledge, productivity and income (GFRAS, 2012). Extension and advisory services perform a fundamental function intensifying food security and improving living conditions rural areas and supporting farming as a mechanism for economic growth (IFPRI, 2020). Access to extension services is positive correlated with food security (Ijatuyi et al., 2018). The provision of extension services is a priority to government (GFRAS, 2012).

iii. Infrastructural support

The PKM programmes provides infrastructural support such as fencing material, water tanks, drilling of boreholes and irrigation infrastructure (DARDLA, 2013). Subsequently to the rollout of the CRDP, the PKM programme started the construction maize milling facilities in eight deeply rural municipalities of the Mpumalanga Province. The aim of constructing the maize milling facilities was to give household access to storage and milling facilities to ensure food security as well as creation of jobs (DARDLA, 2010b).

The grain milling facilities have been constructed and fully equipped (DARDLA, 2013) yet non-operational (Shongwe, 2020). According to Manjunath and Kannan (2017) infrastructure availability index and infrastructure utilisation index contribute positively on

agricultural productivity and growth. Infrastructure utilisation has more effect on productivity growth as compared to infrastructure availability. Additionally, the joint effect of infrastructure availability and utilisation produce a greater impact on agricultural productivity. Table 2.1 shows the location of the nine maize mills in the Mpumalanga province. The Nkomazi Local Municipality has two mills i.e., Mbuzini and Magogeni, while the other municipalities have one mill each. A total of nine (9) maize mills were constructed across the Mpumalanga Province.

Table 2.1: Identification of maize mills constructed with the support of PKM Programme in Mpumalanga Province

District Municipality	Local Municipality	Number of mills	Location of Mill
Ehlanzeni	Nkomazi	2	Mbuzini; Magogeni
	Bushbuckridge	1	Mkhuhlu
	Thaba Chuewu	1	Matibidi
Gert Sibande	Chief Albert Luthuli	1	Dundonald
	Pixley Ka Isaka Seme	1	Daggakraal
	Mkhondo	1	Driefontein
Nkangala	Dr JS Moroka	1	Nokaneng
	Thembisile Hani	1	Sybrandskraal

Source: (DARDLA , 2013)

iv. Mechanisation support

This involves the provision of machinery (tractors, combine harvesters and equipment) for land preparation, harvesting and processing. The work performed by tractors such as ripping, ploughing, farrowing, planting, disking, spraying and slashing are high in demand (DARDLA, 2013). Several governments in the Sub-Saharan African region have commenced supporting agricultural mechanisation during the previous years, giving more concentration on tractors to assist in producing more crops. They normally improve mechanisation by providing more subsidised tractors for sharing by members of the public, the establishment of tractor assembly plants and public or public-private tractor hire schemes (Sims et al., 2016). Mechanisation allows prudent application of farming inputs such as chemicals, fertilisers, seeds and irrigation water in order to capitalize on production at least cost (Ndubuisi, 2019).

The mechanisation service is regarded as the main pillar of the PKM programme (DARDLEA, 2019) as it decreases drudgery of human and draught animals in farming activities and improves the quality of work and products (Sims et al., 2016). The mechanisation support was offered to beneficiaries free of charge over the past years (DARDLA, 2011; DARDLA 2013). Recently due to budgetary constraints other categories of beneficiaries with the exemption of vulnerable and subsistence producers need to contribute fees for fuel and lubrication when requiring assistance with mechanisation service (DARDLEA, 2019). Table 2.2 demonstrates that the PKM programme have undergone several configurations in implementation, with different entities in charge of the mechanisation service since its inception. It is evident from Table 2.2 that every phase of implementation was associated with challenges.

Table 2.2: Implementation phases of the PKM programme

Implementation phase	Financial year	Entity in charge of mechanisation service	Implementation challenges identified by DARDLEA
Phase 1	2005/06 till 2007/08	Primary co-operatives	<ul style="list-style-type: none"> ▪ The programme was still piloted and lacked clear implementation guidelines. ▪ The programme was limited to maize production excluding other food crops which are essential in ensuring food security. ▪ The programme did not cover basic infrastructure such as irrigation and fencing. ▪ Monopolisation of tractors limited access by the poor and tractors became under-utilised or abused by certain individuals with the co-operatives.
Phase 2	2008/09 till 2012/13	External contracted service providers	<ul style="list-style-type: none"> ▪ Insufficient number of tractors and implements. ▪ Insufficiency of internal personnel to monitor the programme. ▪ Running the mechanisation service through service providers appeared to too expensive and the DARDLEA recorded financial accruals since 2008. ▪ Absence of trustworthy reference records such as number of hectares to be planted in each municipality.
Phase 3	2013/14	Secondary co-operatives	<ul style="list-style-type: none"> ▪ Monopolisation of tractors limited access by the poor and tractors became under-utilised or abused by certain individuals with the co-operatives.
Phase 4	2014/15 till 2017/18	DARDLEA	<ul style="list-style-type: none"> ▪ Shortage of personnel and fleet specialists e.g., mechanics. ▪ High costs of repairs and maintenance. ▪ High rate of major breakage, DARDLEA's extension officers not qualified to manage tractors and implements.
Phase 5	2018/19 to date	Co-operatives and individual farmers	<ul style="list-style-type: none"> ▪ See Chapter 4, section 4.3.2.

2.16. Summary of the chapter

This chapter reviewed literature on all the pillars of food security and several standardised measurement tools of household food security. It also presented food security statistics on global, regional and domestic levels. It highlighted the social and demographic factors connected with food security and dietary diversity. It also covered aspects such as impact of small-scale farming in food security, participation of women in agriculture, support given by government to smallholder agriculture, challenges faced by small-scale farmers and PKM programme.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction

This chapter presents the research methodology applied to realise the aim and objectives of this study. Under this section, the study design and research method employed in the present study is discussed. This chapter also includes the population, study sample and sampling methods, data collection and data analysis that were followed. Ethical considerations are also presented in this chapter.

3.2. The study area

The study was done in the Nkomazi Local Municipality (NKLM) located within Ehlanzeni District Municipality (EDM) in the Mpumalanga Province. The NKLM is mainly rural with agriculture as one of the main economic activities (NKLM, 2016). The municipality has a high unemployment rate (34.2%), high number of households involved in agricultural activities (SSA, 2011) and high poverty rate (50.0%) (MPT, 2015).

The Mpumalanga Province is positioned in the north-eastern part of South Africa. It connects borders with the Kingdom of Eswatini and Mozambique to the southern and eastern sides respectively. Within South Africa, it borders provinces such Limpopo to the north, Gauteng to the west, Free State and KwaZulu-Natal to the south (MPG, 2019).

Mpumalanga Province has a surface area of 76 495km² and it is resident to 4 335 964 people. This makes Mpumalanga Province the sixth most populated province in South Africa (SSA, 2011). The province has a poverty rate of 52.1% (SSA, 2014) and a high rate of unemployment of 33.5% (SSA, 2021). Regarding farming activities, the province consists of commercial, subsistence and emerging farmers farming both livestock and crops (SSA, 2016). The province is wealthy in coal resources and is residence to the main power stations generating electricity from coal in South Africa. The EMalahleni Local Municipality is the largest producer of coal in Africa and has South Africa's second factory after Sasolburg that produces oil from coal (MPG, 2019).

Figure 3.1 indicates the locality of NKLM. The municipality (NKLM) is situated to the eastern side of the EDM in the Mpumalanga Province, South Africa. It is tactically positioned and shares borders with Mozambique and the Kingdom of Eswatini. The NKLM is flanked by Mozambique on the eastern part and the Kingdom of Eswatini on the

southern part. It also demarcated by the Kruger National Park on the northern side and the City of Mbombela on the western side. The R570 and R571 are the only two roads connecting the NKLM with Kingdom of Eswatini while the major national road (N4) and railway line connect it with Mozambique. It has two land ports of entry to the Kingdom of Eswatini (i.e., Mananga and Matsamo border gate), while Mozambique is accessible via the Lebombo border gate in Komatipoort. It is the undersized of four municipalities within the EDM with a land surface of 4 787 km², making up 17% of EDM's geographical area (Yes Media CC, 2019).

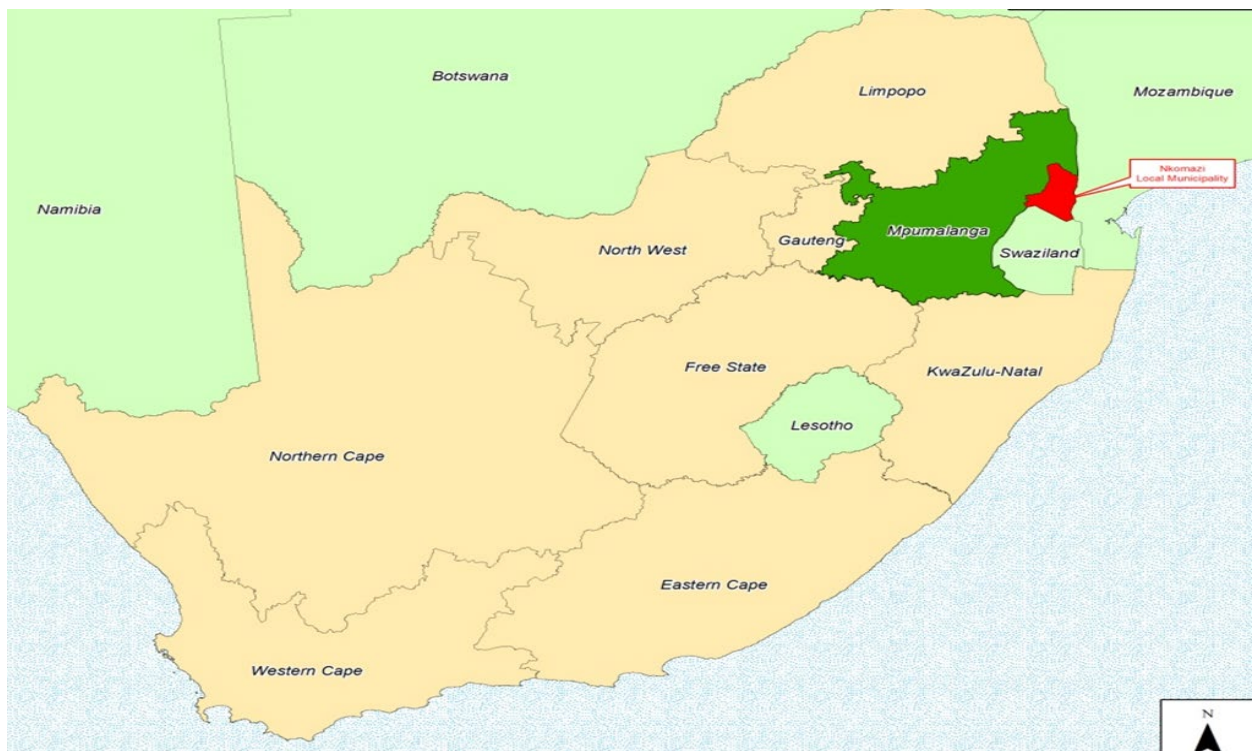


Figure 3.1: Map of the Study Area (Nkomazi Local Municipality) (Source: (NKLM, 2016))

Agriculture, mining and tourism are the key economic segments that significantly add to the wealth of the NKLM (NKLM, 2016). Agriculture in the NKLM involves production of vegetables, sugar cane, bananas, citrus and sub-tropical fruit such as litchis, mangoes and papaya produced under irrigation as well maize and cotton under dry land. There is also cattle and game farming. A considerable positive effect on productivity under irrigation is made possible by stabilisation of three main rivers. The Crocodile River is supported through the Kwena Dam, the Lomati River supported via the Maguga Dam while the Komati River is sustained using the Driekoppies Dam. These three dams supply a total of 741 800 000 cubic metres of water (van Niekerk, 2015).

3.3. Research design and method

Research designs are systems for gathering, scrutinizing, explaining and presenting information in study inquiries (Creswell & Plano Clark, 2011). This study applied a mixed methods research approach. Mixed method is a research method involving gathering, analysing and interpreting both quantitative and qualitative data in one study (Creswell, 2014). Research design determines the research questions, sample size and sampling techniques, type of instruments administered, and data analysis methods (Onwuegbuzie & Leech, 2006).

According to Creswell (2014) a mixed method is preferred because of the potential to employ qualitative and quantitative research simultaneously and thus easing the limitations of the separate methods. The mixed methods have an advantage of getting a broader understanding about research problems/questions. When used together, quantitative, and qualitative research supplement one another and provide a more understanding of the research problem as opposed to when individual methods are employed.

In the present study, the qualitative and quantitative data were required to quantify and give in-depth explanations of the problems or the objectives relating to the challenges and types of assistance received by beneficiaries of PKM Programme. This necessitated adoption of the mixed methods in order to get a comprehensive information about the problem from both the beneficiaries and coordinators of the programme.

The study applied the concurrent triangulation design, which is one of six key mixed methods models identified by Creswell (2014). This design applies the qualitative and quantitative approaches simultaneously in one programme of inquiry and the outcomes from the two databases are juxtaposed to find out whether there are similarities, differences or some mix (Creswell, 2014; Doyle et al., 2019). The concurrent triangulation design according to Doyle et al. (2019) is also termed the convergent design. The concurrent triangulation design tackles one main research question and it is applied mostly, even though not entirely, while the researcher searches for full comprehension of experiences (Doyle, 2015).

The concurrent triangulation design allows collection of quantitative and qualitative data to happen simultaneously, but the data stays discrete, and the results of a single part are

not determined by the results of other part (Creswell & Plano Clark, 2011). This mixed methods model was preferred in this study because of the potential it has to lead into well-founded and supported findings. In this study, the mixing was done in the results section. The results of the two data sets were compared side by side in the results section. This side by side mixing is common in published papers that employed the mixed approaches, where quantitative statistical results are presented first and thereafter qualitative findings that substantiate or disprove the quantitative findings are presented or discussed (Creswell, 2014).

3.4. Population

A population is all members of groups that possess the features that a researcher wants to investigate. The unit of analysis might be an individual, set, association, state, item, or any other body that the researcher seeks to derive scientific conclusions about (Bhattacharjee, 2012). However, target or focus population means the full group to which the generalization of the findings is based (Leedy & Ormrod, 2021). The present study had two target populations namely, the agricultural households benefiting from the PKM programme and officials from the DARDLEA are overseeing the functioning of the PKM programme in the province. On the other hand, the study or accessible population is a subcategory of the target or focus population from which the researchers extract their sample on which they base their conclusions (Kumar, 2020).

The present study had three study populations namely, the agricultural households that benefitted from the PKM programme during the 2018/19 production season in the NKLM of the Mpumalanga Province. The second study population consisted of all the members of the co-operative who were managing the mechanisation service in the NKLM. The third study population included all the officials from the DARDLEA overseeing the functioning of the PKM programme in the NKLM and coordinators of the programme in Ehlanzeni District office.

3.5. Sample and sampling

A sample is described as a representative fragment of the study population (Bhattacharjee, 2012). Sampling refers to the mathematical procedure of choosing a small quantity of respondents from a more significant set (the target or focus population)

to turn into the base for assessing the frequency of information of interest such that the conclusions of the studied elements can be overgeneralised to the population from which they were taken, without any bias (Bhattacharjee, 2012; Kumar, 2020; Trochim, 2000). In this study sampling of the participants was done in three phases: sampling of the agricultural households, sampling of focus group discussion and sampling of the key informants.

3.5.1. Sampling of the agricultural household

Although 543 agricultural households were supported by the PKM programme in the study area during the 2018/19 production season. This study focused only on household heads listed in the records of DARDLEA as beneficiaries of the programme during the aforementioned season. Furthermore, only household heads who were involved in food preparation or were available and ate the food cooked in the household during the past 24 hours were targeted as the respondents in accordance with the guidelines of calculating HDDS (Swindale & Bilinsky, 2006). Therefore, only 355 participants consented to participate in the study, and satisfied the inclusion criteria for this study. This was considered a large sample for purposes of this study. Kothari (2004) argues that enough large sample size provides a high confidence interval. According to Kumar (2020), results established upon bigger samples have more certainty, reliability and precision than those established from smaller ones.

3.5.2. Selection of focus group discussion

One focus group discussion was conducted with members of one agricultural co-operative that had signed a Service Level Agreement with DARDLEA to manage the mechanisation service in the NKLM. Members of the co-operative were preferred because they were considered to have relevant experience as both farmers and overseers of the mechanisation service offered by the programme. The focus group discussion was conducted with all 10 members of the co-operative that were involved in overseeing the implementation of the mechanisation service of the PKM programme in the study area. All members of the co-operative who took part in the focus group discussion were excluded from the agricultural household survey or questionnaires. The reason for the exclusion was to avoid biasing the results by their participation in more than one data collection tool of the same study.

3.5.3. Selection of key informants for schedule interviews

Key informants in this study included District PKM Coordinators and agricultural advisors overseeing the programme in the study area. Both (n=2) District PKM Coordinators participated in the study. From the 12 Agricultural Advisors, only seven (n=7) Agricultural Advisors were involved in the study. The final number of Agricultural Advisors interviewed was determined at the point where saturation was reached (i.e., interviews were conducted until saturation was reached after interviewing seven (n=7) Agricultural Advisors).

The figures of key informants represent the current organogram of officials from the DARDLEA involved with the programme in the NKLM. The choosing of the key informants was established on guidelines by Burger and Silima (2006) for sampling, which recommends a sample size as the proportion of the total population. Based on these guiding principles, 100% sample is recommended in a population consisting of 20 items and an 80% sample is advised for a population consisting of 30 items (which gives a sample of 24 items). The researcher adopted the Burger and Silima (2006) guidelines for sampling and hence selected all District PKM Coordinators (100%; n=2) and interviewing 12 Agricultural Advisors overseeing the PKM programme in the study area. These key informants had been directly involved in running the PKM programme for a long time. Meanwhile, the Agricultural Advisors and District Coordinators were administrators of the programme on the ground, and had been in contact with the beneficiaries, and had acquired extensive understanding about the programme.

3.6. Data collection instruments

Three data collection instruments were used in the study. These included focus group discussions, interviews with key informants and questionnaire. The focus group discussion was utilised to gather qualitative data from the members of the agricultural co-operative that had signed a Service Level Agreement with the DARDLEA to manage the mechanisation service in the NKLM. The schedule interviews were also used to collect data from DARDLEA's officials overseeing the implementation of the PKM programme in the study area. The questionnaire was utilised to gather both quantitative and qualitative data from the agricultural households. The questions in the focus group discussions, interview schedule and questionnaire were directed by the research questions and objectives of this study.

3.6.1. Focus group discussions

A listing of open-ended questions was developed and used for the focus group discussions (Appendix B). The focus group discussions were led by the investigator in accordance with the guidelines for focus groups as indicated by Nyumba et al. (2018). As mentioned under section 3.5.2, focus group discussions were held with the members of the agricultural co-operative that had signed a Service Level Agreement with the DARDLEA to manage the mechanisation service in the NKLM. The focus group discussion was directed through probing questions of unlimited-response questions. The probing questions included questions about the types of assistance received and challenges experienced with PKM Programme, administration of the physical assets i.e., tractors in their possession and costs of providing the different classes of mechanisation or land preparation to beneficiaries. The focus group discussion was intended to answer Objective V.

3.6.2. Interviews with key informants

An interview guide (Appendix C) comprising of unstructured questions was developed and used for this activity. The researcher conducted schedule interviews with the chosen key informants from the DARDLEA to collect qualitative data as the second activity of this study. Interviews with key informants were used to gather information on the types of assistance provided and challenges encountered through the PKM programme and the proposed suggestions on the improvement of the programme. The key informant interviews were intended to answer Objective V and VI.

3.6.3. Administration of questionnaire

The questionnaire (Appendix A1) was administered to agricultural households as the last activity of this study. The data collected was intended to achieve Objective I to V. The questionnaire comprised of both closed and open-ended questions and included the following sections: The first section was based on questions that needed demographic information. Section B comprised aspects such as farming enterprise, farming experience, size of farming land, produce storage facilities and farm income. Section C was based on the challenges and types of assistance received by beneficiaries of PKM programme. Section D focussed on the strategies applied by households to cope with food shortages. Section E was based on questions linked to the assessment of food security. Food security was measured using three instruments namely: Food Security Index, HFIAS, and HDDS.

i. Computation of the Food Security Index

As stated under section 2.5, the Food Security Index (FSI) uses two approaches i.e., household's food expenditure and household's food consumption pattern to assess the economic accessibility of food by households. The first approach measures the household gross production and purchases overtime to determine whether there is an upward or downward change in food stock in the household. The latter uses a recollecting process for household's food intake and convert into calorie content for the entire household (Maxwell, 1996). In this study, the household expenditure approach was applied to examine food security.

ii. Household Food Insecurity Access Scale

As indicated under section 2.5, the HFIAS is used to determine the household experience of food insecurity (access) over the preceding 30 days. The HFIAS supplemented the results of the FSI by investigating access to food component or pillar of food security to realise the first objective of this study. The standardised HFIAS questionnaire, which is concentrated on nine specific questions about worry, availability of and accessibility to foods for the household during the preceding 30 days was used. The HFIAS tool was also utilised by posing the nine fixed questions relating to food accessibility as indicated in Appendix A1 section 42(a) of the questionnaire (Coates et al., 2007).

iii. Household Dietary Diversity Score

The study also brought in the HDDS tool as a supplement to answer the first objective. As explained under section 2.5, HDDS measures mainly food accessibility. The HDDS shows accessibility to variety of quality diets (Kennedy et al., 2010) and it is also an alternate indicator of nutritional adequacy in the household (Sarkar, 2014; Torheim et al., 2004). Nutritional adequacy is defined as the attainment of recommended intake of energy and other essential nutrients (Sarkar, 2014). According to Torheim et al. (2004), it is essential to assess the contribution of the numerous food groups to the nutrient richness of the diet in the household. It is grounded on calling to mind the food groups that a household has eaten over the past 24 hours (Kennedy et al., 2010). The study adopted the HDDS tool from Swindale and Bilinsky (2006). It is calculated based on a set of 12 food groups, which included cereals, tubers, vegetables, fruits, meat, eggs, fish, beans, dairy products, fats/oils, sugar/honey, and condiments. As recommended (Smith & Subandoro, 2007; Swindale & Bilinsky, 2006), food eaten elsewhere, that was not cooked in the household was excluded.

3.7. Pilot study

Polit and Beck (2004) describe the purpose of conducting a pilot study as being to test whether questions can be easily answered as structured in the questionnaire. The survey questionnaire used in this study was piloted in January 2020 before it was rolled out to the targeted population. This was done to establish whether questions were understandable and would illicit the expected response from the respondents. It was run on a small number of 25 participants who were not involved with the main study. Hence, the results of the pilot study are not part of this study. Thereafter, the tool was adjusted guided by the responses from the pilot study. For instance, some of the questions were rephrased for easy understanding by respondents.

3.8. Main data collection process

The data was collected between 01 February 2020 to 24 March 2020. The process of collecting data was conducted as follows: -

3.8.1. Focus group discussions

The first activity of this study was focus group discussions as explained under section 3.6.1. Only one focus group discussion was organised with the members of the agricultural co-operative that had signed a Service Level Agreement with the DARDLEA to manage the mechanisation service in the NKLM. The focus group discussion session was led by the researcher. The session took place at the Tonga offices of the DARDLEA and was attended by all 10 members of the co-operative that were involved in overseeing the implementation of the mechanisation service of the PKM programme in the study area. Tonga offices were chosen as a venue due to its accessibility and availability of hall for hosting meetings. The focus group discussions were presented in SiSwati. This is a home language for all the members who contributed to the focus group discussion. The responses were interpreted into English and recorded in the notebook by the researcher. The focus group discussions session lasted approximately two hours as recommended by Polit and Beck (2004).

3.8.2. Collection of data: key informants

Interviews with key informants were the second activity of the data collection process. The interviews took place at Tonga offices for the Agricultural advisors and Ehlanzeni District office for the PKM District Co-ordinators. Appointments were made with the

informants on dates and times convenient to them. Each interview took less than an hour to complete. The interviews were led by the researcher. English was used as a language of communication during the interviews. A voice recorder was not used and hence the responses were recorded in the notebook.

3.8.3. Collection of data: survey questionnaire

Trained enumerators were employed to collect survey data from the 355 agricultural households who were involved in the study. The four enumerators were selected based on educational qualifications in the field of agriculture. All the enumerators had the minimum qualification: National Diploma in Agriculture (Crop production) and one of them had also graduated with a Bachelor of Agricultural Management. The selection of enumerators with a background in agriculture helped to avoid non-responses since the enumerators could explain questions to minimise misunderstandings. As a result, information could still be gathered by the enumerator even when the respondent is not literate. A version of the questionnaire translated into SiSwati language (Appendix A2) was always available with the enumerator during the administration of the questionnaire. This was done to ensure uniform translation. The questionnaire was translated by a language practitioner accredited by the South African Translators' Institute.

The data collectors or enumerators were trained to execute their task competently by explaining the nature and scope of the research. The enumerators were also trained on ethical issues that needed to be observed during the data collection phase. According to Kothari (2004), enumerators must be intellectual and be capable to cross-examine to get the veracity. Most of all, they must be faithful, diligent and must have leniency and perseverance.

Although enumerators were responsible for collecting survey data. The researcher also assisted in cases where the central venues had too many respondents who came to participate in the study. This was done to speed up the process and to avoid keeping the participants waiting for a long-time to complete the structured interview.

The survey was the last data collection process which was done in the different villages of the NKLM. The participants were invited to a central venue in their respective villages to participate in the survey. The interviews lasted for less than an hour. Other arrangements were made to meet agricultural households who were willing to be part of

the study but could not make it to the central venue due to prior commitments. The arrangement involved meeting those individuals at their homesteads or farms.

3.9. Data analysis

In this study, both qualitative and quantitative data analysis techniques were adopted. These are discussed in the sections that follow below.

i. Qualitative data analysis

The qualitative data from the survey, focus group discussions and interviews with key informants were recorded and important ideas were open coded and clustered into themes to enable qualitative analysis. According to Nishishiba et al. (2014), this technique of qualitative data analysis is termed thematic analysis. Strauss and Corbin (1990), cited in Bhattacharjee (2012) define open coding as a procedure meant for isolating concepts or significant points that are covered in word-based data, which are potentially associated to the phenomenon of interest.

ii. Quantitative data analysis

Quantitative data was recorded in Micro Soft Excel by the four data capturers. The data was thereafter double-checked for discrepancies and mistakes, which were corrected by two people. The Statistical Package for Social Science (SPSS version 25) programme was used in analysing the quantitative data. Descriptive statistics are essential instruments to report study findings distinctly and briefly. Descriptive statistics assist to match and compare various classifications of sample units regarding the preferred characters to derive certain significant inferences. In the present study, descriptive statistics were computed, and the results presented in tables and graphs. The respective specific objectives of the study were analysed as follows: -

3.9.1. Objective I: To determine the household food security status of the households benefitting from the PKM programme

Descriptive statistics was used to summarise data into frequencies presented in tables. The Food Security Index (FSI), Household Food Insecurity Access Scale (HFIAS) and Household Dietary Diversity Score (HDDS) were utilised to determine the food security status of the households.

a) Food Security Index

The SPSS (version 25) was utilised to analyse the data. Descriptive statistics and FSI were utilised to realise the objectives of the study. The households were categorised into food secured and food insecure by applying the FSI as described by Omotayo and Ganiyu (2017). The equation for FSI is given as:

$$FSI = \frac{\text{Per capita food expenditure for each household}}{\text{Mean per capita food expenditure of all households}} \dots\dots\dots (1)$$

Where: FSI = Food Security Index

If FSI for a household is ≥ 1 , then the given household was classified as food secured. But if $FSI < 1$, for a given household, then the household in question was classified as being food insecure.

A household with a per capita monthly food expenditure exceeding or equivalent to two-thirds of the mean per capita food expenditure was regarded as food secure. Conversely, if a household has a per capita food expenditure that is less than two-thirds of the mean per capita monthly food expenditure, it was regarded as a food insecure (Omonona & Agoi, 2007). The FSI was used to classify households in the study sample as either food secure (Coded = 1 or food insecure (coded = 0).

Additionally, based on the FSI, the extent or level of food security of the sampled households was computed by adjusting the Foster Greer Thorbecke (FGT) index, which is generally utilised in poverty literature. Abo and Kuma (2015) similarly used the adapted version of the FGT index of poverty measure to describe the food insecurity gap, food surplus gap and the headcount ratio of food security. The food insecurity gap (P) determines the distance by which households that are food insecure sit below the food security line. The food surplus gap (S) determines the magnitude by which households that are food secure lie above the food security line. The headcount ratio (H) quantifies the proportion of households that are food insecure/secure. The equations for estimating the food insecurity gap index, food surplus gap index and the headcount ratio of food security of the households are given as:

$$\text{Food insecurity gap index (P)} = \frac{1}{q} \sum_{i=1}^q G_i \quad \text{where } G_i = \left[\frac{z - y_i}{z} \right] \dots\dots\dots (2)$$

$$\text{Food surplus gap index (S)} = \frac{1}{R} \sum_{i=1}^R G_i \quad \text{where } G_i = \left[\frac{y_i - z}{z} \right] \dots\dots\dots (3)$$

$$\text{Headcount index (H}_{fi}) = \frac{q}{N} \dots\dots\dots (4)$$

$$\text{Headcount index (H}_{fs}) = \frac{R}{N} \dots\dots\dots (5)$$

Where q = number of food insecure households

R = number of food secure households

G_i = deficiency or surplus faced by ith households

N = total number of households in the sample

H_{fi} = headcount index for food insecure households

H_{fs} = headcount index for food secured households

Y_i = monthly per capita expenditure on food item of ith households

z = food security line (given by the two-third of the mean per capita monthly expenditure of all households)

b) Household Food Insecurity Access Scale

The standard procedure for scoring established by Coates et al.(2007) was applied as follows: ‘0’ was awarded in case the event defined by the question did not happen, ‘1’ in case it happened in the past 30 days. Regarding the happening of the event, ‘1’ was awarded in case the events rarely happened (1 or 2 times) in the preceding 30 days, ‘2’ awarded in case the events had happened sometimes (3 to 10 times) and 3 awarded in case the events had often happened (more than 10 times). Therefore, replies on the nine HFIAS questions were computed utilising the SPSS (version 25) programme to assess the four indicators of HFIAS. The four indicators assessed are 'Household Food Insecurity Access-related Conditions', 'Household Food Insecurity Access-related Domains', 'Household Food Insecurity Access Scale Score' and 'Household Food Insecurity Access Prevalence'.

i. Household Food Insecurity Access-related Conditions

The indicator shows the proportion of households that replied positively to each of the nine standardised questions, regardless of the frequency of the happening. Thus, they calculate the proportion of households facing the condition at any level of severity (Coates et al., 2007). This indicator was computed as follows: -

Households experiencing food insecurity condition at any time during 30 days recall period	=	$\frac{\text{No. of households experienced food insecurity condition directed by each question}}{\text{Total number of households responding to each question}} \times 100$
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The figures acquired above was further broke down to investigate the occurrence (i.e., rarely, sometimes and often) of experience of food insecurity access related conditions throughout the investigated households. For example, households that sometimes faced food insecurity, directed by specific questions, were worked out as follows: -

Households, which sometimes Experience food insecurity condition	=	Number of households, which sometimes experienced food insecurity condition as directed by each question	_____	X 100
		Total number of households responding to each question		

ii. Household food insecurity access-related domains

Based on the nine HFIAS questions, the households were categorised into three domains: (i) judgements of uncertainty or anxiety about food supplies in the household (addressed by question 1); (ii) feelings that household food is of insufficient quality and food type preference (addressed by question 2–4); and (iii) insufficient food intake and its physical consequences (addressed by questions 5–9). Proportion of households facing any of the condition at any level of severity in each domain. For instance, proportion of households with insufficient food quality was worked out as:

Households experiencing any of the conditions at any level of severity in each domain	=	Number of households with positive response to Q2 or Q3 or Q4	_____	x100
		Total number of households responding to Q2 or Q3 or Q4		

Where Q = represent the relevant question.

iii. Household Food Insecurity Access Scale Score

HFIAS score was determined for the respectively household by adding the codes for each frequency of occurrence question. The HFIAS score denote the level in which a household is in a state of food secure and/or insecure for the past 30 days. The HFIAS score vary from 0 to 27. The greater the score the more food insecurity (access) is experienced by the household. The lesser the score, the less food insecurity (access) a household experienced. This indicator was computed as follows: -

Total HFIAS (0 – 27) = Q1 + Q2 + Q3 + Q4 + Q5 + Q6 + Q7 + Q8 + Q9 (6)

The Average HFIAS Score was worked out as follows; -

Average HFIAS Score = $\frac{\text{Sum of HFIAS Scores in the sample}}{\text{Sample size}}$

iv. Household Food Insecurity Access Prevalence (Categories)

After applying the standard procedure for scoring explained under section 3.9.1(b). The replies on the nine HFIAS questions were computed using the SPSS (version 25) to

generate the food security score that ranges from 0 to 27. Households with greater score are more susceptible to food insecurity. Households with lower score experience less food insecurity. As a result, food secure households had a score of 0-1, those with a score of 2 and higher were classified as food insecure. The food insecure category was further broken down, whereby households with score 2-7 were classified as mildly food insecure, those with a score of 8-14 were moderately food insecure while severely food insecure households had a score of 15-27 (Coates et al., 2007).

c) Household Dietary Diversity Score

The quantity of various food groups consumed was computed, instead of the number of various foods consumed to show the quality diet better. The HDDS was computed based on a fixed of 12 food groups, which included cereals, tubers, vegetables, fruits, meat, eggs, fish, beans, dairy products, fats/oils, sugar/honey, and condiments. As previous studies (Cheteni et al., 2020; Sarkar, 2014) indicated, during analysis values for individual food group were given the code “0” in case none of the food in the food group was eaten in the household over the past 24 hours’ recollection period; or “1” in case the food was eaten in the household over the past 24 hours’ recollection period. As recommended (Smith & Subandoro, 2007; Swindale & Bilinsky, 2006), food eaten elsewhere, that was not cooked in the household was excluded. The HDDS ranged from '0' to '12'. A household that was severely food insecure had a HDDS of '0', while a food secure household had a HDDS of '12'. The HDDS summed up the quantity of food groups eaten by members of the household. The HDDS was computed as follows:

HDDS (0-12) = cereals + tubers + vegetables + fruits + meat+ eggs + fish + beans + dairy products + fats/oils + sugar/honey + condiments.

i.e., $HDDS(0 - 12) = SUM (A,B,C,D,E,F,G,H,I,J,K,L) \dots \dots \dots (7)$

Then, Average HDDS = $\frac{\text{Total (HDDS)}}{\text{Total number of households}}$

As recommended by Swindale and Bilinsky (2006), the HDDS were classified into three levels (i.e., low HDDS for households that consumed up to three different food groups, medium HDDS for those consumed 4 to 5 different food groups and high HDDS that consumed six or more food groups.

3.9.2. Objective II: To identify factors associated with food security among the agricultural households benefitting from the PKM programme.

To achieve the second objective, the Probit Regression model was fitted to the data to determine the factors that were significantly associated with food security. The probit and logit models are both generalized linear models. They can be used in exact same situation when attempting to model a dichotomous dependent variable; and they provide same overall results (Albright, 2015). The equation for the probit model is specified as:

$$Y = W_0 + W_i X_i + \varepsilon \dots \dots \dots (8)$$

Where: Y_i = Household food security status (food secure households =1, food insecure households =0). From the Food Security Index measured above, households with scores equal to or more than 1 were classified as food secure (1); while those households with scores of less than 1 were classified as food insecure (0).

W_0 = is the intercept

W_i =represents the parameters to be estimated.

X_i = represents the sets of independent or explanatory variable (socio-economic factors).

ε = is an independent distributed error term.

i = (1, 2, 3.....n)

The probit model was preferred because of the dichotomous nature of the dependent variable. In this study, Y^* = Household food security status (food secure households =1, food insecure households =0). Then the definite model is specified as:

$$Y^* = W_0 + W_1 X_1 + W_2 X_2 + W_3 X_3 + W_4 X_4 + W_5 X_5 + W_6 X_6 + W_7 X_7 + W_8 X_8 + W_9 X_9 + W_{10} X_{10} + W_{11} X_{11} + W_{12} X_{12} + W_{13} X_{13} + W_{14} X_{14} + \varepsilon \dots \dots \dots (9)$$

Table 3.1 presents the dependent variable, explanatory/independent variables (X_i) and priory expected signs of independent variables specified as socio-economic factors affecting household food security.

Table 3.1: Definition of the independent variables used in the probit model

Variable	Description	Expected effect
Y _i	Household food security status (food secure households =1, food insecure households =0).	
X ₁ = Age of Household Head	Number of years (continuous)	Positive
X ₂ = Gender	(Dummy; Male =1, Female=0).	Positive
X ₃ = Marital status	Dummy; Married =1, Otherwise =0.	Positive
X ₄ = Marital type	Dummy; polygamous marriage =1, Otherwise =0	Negative
X ₅ = Size of household	Number (continuous)	Negative
X ₆ = Dependency Ratio	Number (continuous)	Negative
X ₇ = Level of education attained	Years of formal education (continuous)	Positive
X ₈ = Years of farming experience	Number of years (continuous)	Positive
X ₉ = Access to extension services	Dummy; Yes =1, Otherwise =0	Positive
X ₁₀ =Received Mechanisation assistance	Dummy; Yes =1, Otherwise =0	Positive
X ₁₁ =Received support with production inputs	Dummy; Yes =1, Otherwise =0	Positive
X ₁₂ =Received infrastructure support	Dummy; Yes =1, Otherwise =0	Positive
X ₁₃ = Annual farm income	Annual farm income in Rands (continuous)	Positive
X ₁₄ = Received training	Dummy; Yes=1, Otherwise= 0	Positive
X ₁₅ = Engage in Non-Farm activities	Dummy; Yes=1, Otherwise= 0	Positive

3.9.3. Objective III: To identify the factors associated with dietary diversity among agricultural households supported by the PKM programme

The ordered logit regression models were used to realise objective III of this study. The HDDS formulated in section 3.9.1(c) were converted into an ordinal categorical variable (0=Low; 1=Medium; 2=High HDDS). The marital status variable was reclassified as described by Subramanian et al. (2001) into a dichotomous variable (0 = otherwise and 1 = married) by collapsing the original categories (single, divorced, or widowed) into otherwise (coded 0), while the original category (married) remained, and (coded 1). The ordered logistic regression model was fitted to the data to identify the factors significantly associated with dietary diversity among the respondents. According to Green (2008), the equation of the ordered logit model regression is specified as:

$$Y^* = \sum_{k=1}^k \beta_k X_k + \varepsilon \dots \dots \dots (10)$$

Where Y^* = is unobserved

X_k = is a vector of independent variables,

β = Coefficients to be estimated, and

ε = A random error term.

From the above model, the observed or defined categorical variable Y_i is determined as follows.

$y = 1$ if $y^* \leq \mu_1$

$y = 2$ if $\mu_1 < y^* \leq \mu_2$

$y = 3$ if $\mu_2 < y^* \leq \mu_3$

$y = j$ if $\mu_{j-1} < y^*$

In case y is observed in j number of ordered categories, μ 's are unknown threshold parameters differentiating the adjacent categories to be assessed with β 's, then μ_1 , μ_2 , and μ_3 represent the different levels of the household dietary diversity score to be estimated. The general form for the probability that the observed y falls into category j and the μ 's and the β s are to be estimated with an ordered logit model is:

$$Prob(y = j) = 1 - L \left(\mu_{j-1} - \sum_{k=1}^k \beta_k X_k \right) \dots \dots \dots (11)$$

Where $L(\cdot)$ represents cumulative logistic distribution.

The model building process was carried out in two phases. The first phase involved univariate analysis to identify the variables that were significantly associated with the outcome. All variables with a p-value of ≤ 0.20 in the univariate model were included in the multivariable ordinal logit model. A cut off value of 0.20 is supported by literature (Mekuria et al., 2017; Oguttu et al., 2021).

A multivariable ordinal logit regression model was fitted using the manual backward selection method. Confounding was tested in the model by checking for changes in the model coefficients and the model fit when a specific variable was removed from the model. A particular variable was considered a confounder if its removal or addition resulted in a change in the coefficient of the other variables that was greater than 10% (Kamangar, 2012). All identified confounders were retained in the model.

Multicollinearity in the final model was tested by computation of the variance inflation factor (VIF) at a cut-off value of 3 (Daoud, 2017). The VIFs of all independent variables

were less than 3, which confirmed that the model did not suffer from multicollinearity. The test for parallel lines was conducted, and the assumption of proportional odds was satisfied at $p=0.10$ (Mathew et al., 2021). Several procedures of model suitability tests were carried out to check the model fit to the data. The likelihood ratio test that is based on the -2 Log Likelihood was used to assess the goodness of fit of the model. The results of the likelihood ratio chi-square test [$\chi^2(9) = 35.13$; $p=0.00$] proved that there was a significant improvement in the fit of the model with predictor variables over the model without predictor variables (Elamir & Sadeq, 2010). Furthermore, the deviance and Pearson's chi-square test were used to check the goodness of fit of the model. The results of the Pearson's chi-square test [$\chi^2(523) = 518.56$; $p=0.55$] and the deviance test [$\chi^2(523) = 592.73$; $p=0.83$] were not significant, which suggests that the model fit the data well (Elamir & Sadeq, 2010).

3.9.4. Objective IV: To identify of the coping strategies adopted by households to deal with household food shortages

The CSI was used to identify the different groups of strategies applied by households to deal with food insecurity. These groups included consumption related strategies such as increasing short term household food availability, rationing strategies, dietary changes and decreasing number of household members (Maxwell et al., 2003). The non-consumption and irreversible strategies were added as the fifth group as recommended by Gupta et al. (2015). Descriptive statistics were used to determine the proportion of households who adopted each type of the coping strategy. The results were presented as graphs.

3.9.5. Objective V: To describe of the challenges and types of assistance received by beneficiaries of PKM Programme

The fifth objective was to describe the challenges and types of assistance received by beneficiaries of PKM Programme. Quantitative and qualitative data were collected and analysed to achieve the fifth objective. Quantitative data were analysed using descriptive statistics and results presented as frequency tables. Qualitative data was recorded wherein key points were coded, and themes were created to enable thematic analysis. Results of the quantitative analysis were presented first followed by results of the qualitative analysis (e.g., themes) that either support or oppose the quantitative results.

3.9.6. Objective VI: To develop a framework for improvement of food security status of the programme beneficiaries

The results from the agricultural household survey, focus group discussion and interviews of key informants were synthesized to develop a framework. The framework was thereafter validated by two academics from the University of South Africa to increase its face validity (Leedy and Ormrod, 2021).

3.10. Validity of findings

The quality of a research instrument used in research is determined by its validity. Validity describes how precisely a test assesses what it is supposed or meant to assess (Kumar, 2020). Internal validity refers to the accuracy of the study findings and whether the results are influenced by the independent variable and no other factors (Kumar, 2020). The researcher adhered to study protocol to ensure internal validity of the study.

External validity describes the degree to which the findings of the study can be generalized and applicable to the actual world or other settings (Devroe and Wauters, 2019). According to Devroe and Wauters (2019) constrained subject populations can restrict the extent of possible generalizability from inquiries and more replications are needed to generalize the findings with confidence when respondents are pulled from a too restricted sample or an unrepresentative sample. Therefore, to enhance the external validity in the present study, a large and representative sample of the target population was used. Furthermore, the inclusion and exclusion criteria of participants was applied to openly define the study population.

3.11. Ethical considerations

The DARDLEA was the key stakeholder in this study because it is the custodian of agriculture and the PKM programme in the province. Therefore, authorisation to carry out the study was requested from the DARDLEA (Appendix D). In addition, research ethics clearance was obtained from the Research Ethics Committee of the College of Agriculture and Environmental Science of the University of South Africa (Ref #: 2019/CAES_HREC/178) (Appendix E).

The researcher respected all rights of the participants, authorities, and administrations of the area where it was administered. The ethical considerations included matters of respecting the participants' freedom, the right to autonomy, voluntary participation,

confidentiality, anonymity (Sim and Waterfield, 2019; Alrehaili and Mutaha, 2020) and avoidance of harm (Hammersley, 2021; Leedy and Ormrod, 2021). It is a prerequisite for potential participants of a study to be completely well-informed concerning the practises and risks involved in the study. They must give consent to partake (Elman et al., 2020; Josephson and Smale, 2020). Normally, prospective participants are supplied with information concerning the study prior to data collection to assist them in deciding whether to or not to partake in the study (Bhattacharjee, 2012). Therefore, before the consent of the participants was obtained, the purpose, nature, processes, potential gains and foreseen disadvantages of participation in the study were explained to participants. The participants were granted an opportunity to ask questions where they were not clear about the study, of which further clarity was given. Those who agreed to be involved in the study were asked to fill in and sign the informed consent form (Appendix F) prior to recording their responses in the study or completing the structured questionnaires.

The norm for voluntary participation and harmlessness demands that participants are not forced into partaking, and they are not mistreated or harmed due to their partaking or non-partaking in the study (Bhattacharjee, 2012). The participants were advised of their right to not partake and right to quit the study at any time.

Anonymity basically requires that the participant stay anonymous throughout the study (Trochim, 2000). Anonymity of participants in this study was maintained by ensuring that all information and responses furnished by the participants was handled in a confidential manner. It was not necessary for the participants to give their names in the questionnaire. Furthermore, it was guaranteed that the responses furnished in the questionnaire could not be linked up with the participants. The study report submitted for publication does state the identity of the participants or respondents.

3.12. Summary of the chapter

The chapter described the study site, population, sample and sampling tools, procedure and tools used in collecting the data. It also given a discussion about the research methods adopted in this study. It covered the analytical approaches employed to realise the objectives of the study.

CHAPTER 4: RESULTS

4.1. Introduction

This chapter reports the results of the study. These results include both quantitative and qualitative data obtained as described in chapter 3. The chapter is structured as follows: demographic and socio-economic information of respondents, food security status, factors associated with food security and dietary diversity among the households, strategies applied by the households to deal with food shortages, challenges and types of assistance received by beneficiaries of the PKM programme.

4.2. Demographic and socio-economic information of the respondents

The section describes the demographic and socio-economic information of the beneficiaries (n=355) of the PKM programme who participated in this study, under the following headings:

- (i) Demographic profile of the participants,
- (ii) Socio-economic profile of the participants.

4.2.1. Demographic profile of participants

The demographic information of the beneficiaries of the PKM programme is described in **Table 4.1**. As indicated under section 3.5.1, a total of 355 beneficiaries out of a possible 543 consented to participate in the study and met the inclusion criteria. With regards to age, most participants (27.9%; n=99) were between 61 and 70 years of age; followed by 24.8% (n=88) aged between 51-60 years, 20.0% (n=71) aged between 71-79 years, 12.1% (n=43) aged 41-50 years and 8.2% (n=29) who were above 80 years of age.

As demonstrated in **Table 4.1**, most (59.4%; n=211) of the participants were females. Males made up only 40.6% (n=144) of the study population. The proportion of the respondents who were married (49.9%; n=177) was the largest followed by the widowed (32.1%; n=114), the single (12.4%; n=44) and divorced (5.6%; n= 20). With respect to household size, most households (52.4%; n=186) had 6-10 members. This was followed by households with 1-5 members (34.6%; n=123). Households with 16-20 members were the least and made up only 1.7% (n=6).

Table 4.1: Demographic information of the respondents (N=355)

Variable	Level	Frequency	Percentage
Age	22-30	10	2.8
	31-40	15	4.2
	41-50	43	12.1
	51-60	88	24.8
	61-70	99	27.9
	71-79	71	20.0
	> 80	29	8.2
Total		355	100
Gender	Male	144	40.6
	Female	211	59.4
Total		355	100
Marital status	Single	44	12.4
	Married	177	49.9
	Divorced	20	5.6
	Widowed	114	32.1
Total		355	100
Household Size	1-5 Members	123	34.6
	6-10 Members	186	52.4
	11-15 Members	40	11.3
	16-20 Members	06	1.7
Total		355	100

4.2.2. Socio-economic profile of the participants

As illustrated in **Table 4.2**, 43.7% (n=155) of the farmers had primary education followed by those with no formal education (42.0%; n=149). Farmers who had attained tertiary education were the least and made up only 4.5% (n=16). With regards to annual farm income, most households (96.2%; n=342) had annual farm income below R40 000.00. This was followed by households (2.8%; n=10) that had an annual farm income between R40 001.00 and R80 000.00 and that had an annual farm income between R80 001-R120 000.00 (0.3%; n=1). Only 0.7% (n=2) of the households had annual farm income of more than R120 000.00. The average annual farm income of the households in the study population was R 6 490.99.

As shown in **Table 4.2**, over half (60.6%; n=215) of the farmers were engaged in crop farming, while just under 40% (39.4%; n=140) of the respondents were engaged on mixed farming (both crops and livestock). Nearly half (47.9%; n=170) of the respondents had farming experience of greater than 21 years. This was followed by 17.5% (n=62) respondents with farming experience of 6 and 10 years. The least (7.9%; n=28) had been farming for 11-15 years.

The majority of participants (60.3%; n=214) in this study operated on less than three hectares (ha) of land. This was followed by 27.9% (n=99) of the respondents operated on 3-5 ha and 8.5% (n=30) who worked on 5-10 ha. Only 3.5 % (n=12) of the households in this study had greater than 10 hectares.

Table 4.2: The Socio-economic profile of participants (N=355)

Variable	Level	Frequency	Percentage
Education level	No formal education	149	42.0
	Less than grade 12 education	155	43.7
	Grade 12/matric certificate	35	9.9
	Tertiary education	16	4.5
Total		355	100
Annual Farm Income	< R40 000	342	96.2
	R40001-R80000	10	2.8
	R80001-R120000	01	0.3
	>R120000	02	0.7
Total		355	100
Type of farming enterprise	crops	215	60.6
	Livestock	0	0.0
	Mixed farming	140	39.4
Total		355	100
Farming Experience	1-5 Years	56	15.8
	6-10 Years	62	17.5
	11-15 Years	28	7.9
	16-20 Years	39	11.0
	> 21 Years	170	47.9
Total		355	100
Farm size	< 3 Hectare	214	60.3
	3-5 Hectares	99	27.9
	5-10 Hectares	30	8.5
	>10 Hectares	12	3.5
Total		355	100

4.3. Household food security status of the households benefiting from the PKM programme

As stated in chapter 1 under section 1.10, these instruments only measured food accessibility pillar of food security.

4.3.1. Determination of household food security status using the Food Security Index

The study applied the FSI which is computed as per capita food expenditure for the i^{th} household divided by two-thirds (2/3) of the mean per capital food expenditure of all

households to find the food security status of the agricultural households. Households with a FSI (F1) greater or equal to one were measured food secured. Conversely, households with a FSI (F1) less than one were measured food insecure.

As indicated in **Table 4.3**, the monthly mean per capita food expenditure for all the households was R 1 581.07 and the two-third mean per capital food expenditure for all the households was R 1 054.05. Slightly over half of the participants (52.4%; n=186) had a FSI of greater or equal to one while just under half (47.6%, n=169) of the households had a FSI of less than one. Consequently, while more than half (52.4%; n=186) of the agricultural households were food secure, 47.6% (n=169) of the households were counted food insecure in the study area. Furthermore, the food surplus and food insecurity gap index were 0.17 and 0.23, respectively.

Table 4.3: Food security status of the respondents produced from Food Security Index (N=355)

Food Security Status	F	%	Head Count Ratio (H)	Food Security Surplus / Gap	MPCHHF E*	Two-Third MPCHHFE**
Food secure	186	52.4	0.52	0.17		
Food insecure	169	47.6	0.48	0.23		
Total	355	100	1.00		R 1 581.07	R 1 054.05

Note: *Mean per capita monthly household food expenditure, ** Food security line

4.3.2. Determination of food security status using Household Food Insecurity Access Scale

This subsection reports the direct experience of food insecurity by households in the preceding 30 days of the study based on the HFIAS. As mentioned under section 3.9.1(b), the nine standardised HFIAS questions were applied to assess the four indicators of household food insecurity access. The indicators were assessed to better comprehend the features of, and alterations in household food insecurity (access) among the households. The four indicators are 'Household Food Insecurity Access-related Conditions', 'Household Food Insecurity Access-related Domains', 'Household Food Insecurity Access Scale Score' and 'Household Food Insecurity Access Prevalence'.

i. Household food insecurity access-related conditions

The indicator reports the proportion of households that experienced any of the nine-food insecurity access-related conditions indicated by HFIAS irrespective of the frequency of

experience through the 30 days' recollection time. As shown in **Table 4.4**, the questions go along with a sequence that starts with worry concerning food accessibility, a cut in the quality of food, a cut in the quantity of food, and lastly get to bed hungry and spend the entire day and night with no food (in the 30 days prior data collection).

These findings reported here revealed that 36.1% (n=128) of the households worried about not having enough food. The figures of the households that responded positively to unable to eat preferred food (62.5%; n=222), eat limited kinds of foods (66.2%; n=235), eat food they really did not want (70.1%; n=249), eat smaller quantity of food (59.7%; n=212) and eat fewer meals in a day (61.4%; n=218) due to limited resources in the households were very high. Furthermore, the proportion of households that did not have food of any kind to eat in household, went to bed hungry and spent the entire day and night with no food were 29.0% (n=103), 18.9% (n=67) and 16.6% (n=59) respectively.

Table 4.4: Distribution of respondents based on the replies to the nine standardised HFIAS questions (N=355)

HFIAS Questions	No	Yes
	F (%)	F (%)
Worry about not having enough food	227 (63.9)	128 (36.1)
Unable to eat preferred food	133 (37.5)	222 (62.5)
Eat just a limited kind of food	120 (33.8)	235 (66.2)
Eat food really do not want	106 (29.9)	249 (70.1)
Eat smaller quantity of food	143 (40.3)	212 (59.7)
Eat fewer meals in a day	137 (38.6)	218 (61.4)
No food of any kind to eat in household	252 (71.0)	103 (29.0)
Go to sleep hungry at night	288 (81.1)	67 (18.9)
Go a whole day and night without food	296 (83.4)	59 (16.6)

ii. Household food insecurity access-related domains

Based on the nine experience items, the households were categorised into three (3) major domains based on their characteristic similarities: (i) feelings of uncertainty or anxiety concerning the household food stocks (described by item 1); (ii) perceptions that household food is of insufficient quality and food type preference (described by items 2–4); and (iii) insufficient food intake and its physical consequences (described by items 5–9). As shown in **Figure 4.1**, based on these categories, majority of households (62.5%; n=222) experienced insufficient food quality. This was followed by 59.7% (n=212) of the households that had insufficient food intake and its physical consequences domain. The least number of participants (36.1%; n=128) in this study reported that they had anxiety and uncertainty concerning food stock (Figure. 4.1).

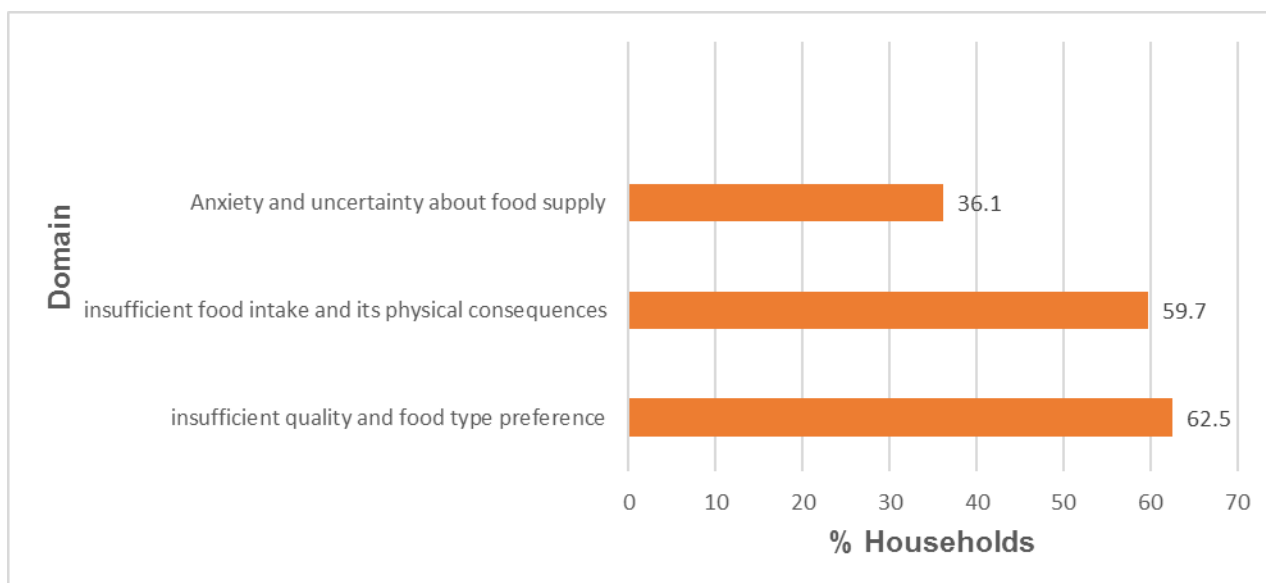


Figure 4.1: Distribution of households by Experience Food Insecurity Access-related Domains (N =355)
 NB: Percentages add up to more than 100% because multiple responses were permitted

iii. Household Food Insecurity Access Scale Score

The HFIAS score was thereafter determined for every household by the addition of the codes for every frequency-of-occurrence question. This score denotes the level of food insecurity of the household through the past 30 days. The replies for individually question were given the code 0 in case a household did not experience food insecurity, coded 1 in case a household had rarely experienced food insecurity, coded 2 in case a household had sometimes experienced food insecurity and coded 3 if a household had often experienced food insecurity. As indicated in section 3.9.1. (b), a HFIAS score vary from 0 to 27. Higher HFIAS score means that the household experience more food insecurity. A household with lower score experiences less food insecurity. The households in the study had a mean score of 4.2.

iv. Household food insecurity access prevalence (categories)

Figure 4.2 indicates the food insecurity access prevalence of households. The households in the study area were classified into three categories namely food secure, mildly food insecure, and moderately food insecure, using scores of nine HFIAS questions. Most households (56.6%; n=201) in this study were categorised as mild food insecure. Slightly over fifteen percent (16.1%; n=57) of the respondents were moderately food insecure whereas over a quarter (27.3%; n=97) were food secure.

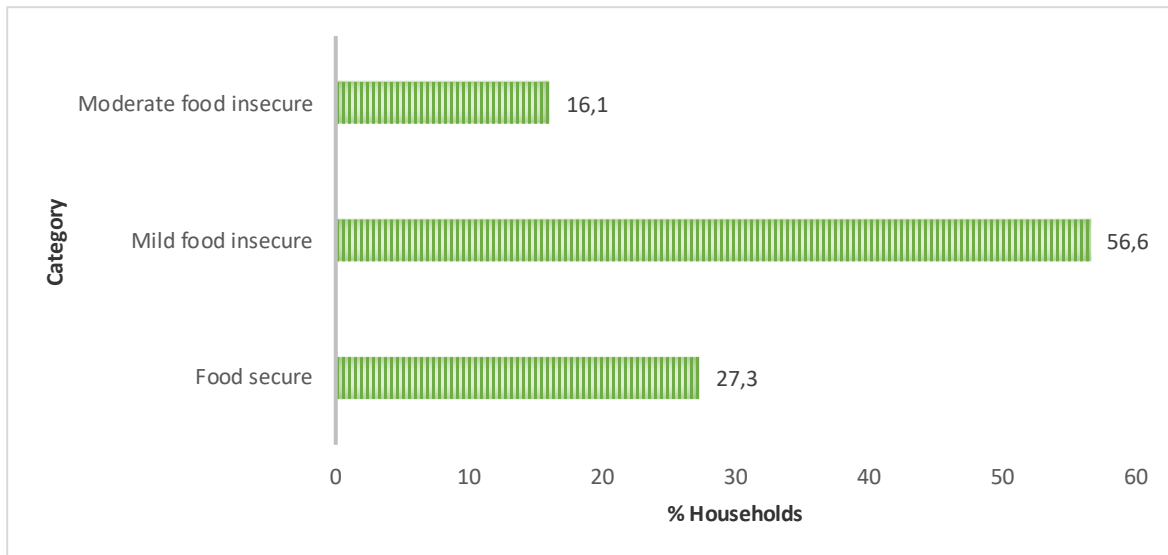


Figure 4.2: Distribution of households by food insecurity prevalence (N=355)

4.3.3. Determination of food security status using Household Dietary Diversity Score

Based on the 24-hour recollection approach, the number of households that had specific food groups in the past day are presented in **Table 4.5**. All households (100%; n=355) consumed cereals. Vegetables were consumed by 78.3% (n=278) of the households. Condiments such as tea, coffee, sauces, cool drink, and juice were the most consumed groups (consumed by 69.0%; n=245). Sugar and honey were consumed by 42.3% (n=150) households, followed by meat at 38.9% (n=138). Foods such as fruits (10.1%; n=36), fats and oils (10.1%; n=36), dairy products (8.2%; n=29); tubers (5.4%; n=19), fish (3.7%; n=13) and eggs (3.1%; n=11) were less consumed in this study.

Table 4.5: Distribution of households by food groups consumed in the preceding 24 hours (N=355)

Food type	Frequency	*Percentage (%)
A. Cereals	355	100
B. Tubers	19	5.4
C. Vegetables	278	78.3
D. Fruits	36	10.1
E. Meat	138	38.9
F. Eggs	11	3.1
G. Fish	13	3.7
H. Beans	59	16.6
I. Dairy products	29	8.2
J. Fats/Oils	36	10.1
K. Sugar and honey	150	42.3
L. Condiments	245	69.0

* NB: Percentages add up to more than 100% because multiple responses were permitted

The distribution of households based on the HDDS is indicated in **Table 4.6**. Majority (49.86%; n=177) of the household had a medium HDDS. This was followed by 40.28% (n=143) of the households that had low HDDS. Only 9.86% (n=35) of the households had a high HDDS. The mean HDDS was 3.9. This means that the households in the NKLM ate four (4) types of food groups in the 24 hours prior data collection. This also suggests that households in this study have a medium HDDS.

Table 4.6: Distribution of households by the level of household dietary diversity (N=355)

HDDS Level	Range	Frequency	%	Mean	SD
Low	1-3	143	40.28	2.6	0.51
Medium	4-5	177	49.86	4.4	0.48
High	6-12	35	9.86	5.5	0.7
Total	1-12	355	100	3.9	1.34

4.4. Factors associated with food security among the households

The results of the multivariate analysis (**Table 4.7**) indicated that marital status, level of education and annual farm income were significantly ($p < 0.05$) associated with food security among agricultural households. The marital status was statistically significant ($p = 0.020$) and positively (Coefficient=0.385) correlated with the food security status of households as was hypothesized. The level of education attained was also positively (coefficient=0.052) and significantly ($p = 0.006$) associated with food security among agricultural households. The findings reported here further revealed that the coefficient of annual farm income was positive (coefficient=0.020) and significantly ($p = 0.020$) associated with food security.

Conversely, although the age of the household head, receiving mechanisation assistance, and production input support as well as infrastructure support were positively associated with the food security status of households, the relationship was not significantly ($p > 0.05$). But variables like the dependency ratio, access to extension services, training received, engaged in non-farm activities and gender of the household head were negatively associated with the food security status of the respondents, albeit insignificant ($p > 0.05$).

Table 4.7: The adjusted coefficients of the Probit regression analysis of the factors associated with food security among agricultural households (N=355)

Variable	Coefficient	Std Error	P Value
Age	0.007	0.0071	0.303
Gender	-0.056	0.1609	0.726
Marital status	0.385	0.1652	0.020*
Marriage Type	0.216	0.2591	0.405
Level of education attained	0.052	.00188	0.006*
Household size	0.030	0.0224	0.183
Dependency ratio	-0.030	0.0750	0.626
Annual farm income	1.78	7.70	0.020*
Mechanisation assistance	0.064	0.1609	0.690
Production inputs support	0.039	0.2929	0.894
Access to extension services	-0.210	0.1641	0.201
Infrastructure support	0.117	0.2345	0.618
Training received	-0.116	0.1636	0.479
Engaged in non-farm activities	-0.050	0.1493	0.740
Constant	-1.023	0.6660	0.124
Observation number	355		
LR chi ² (15)	44.196		
Prob > chi ²	0.000		
Pseudo R ²	0.118		
Log likelihood	223.562		

Note: * 5% significant level

4.5. Factors associated with dietary diversity among the households

The results of multivariate ordered logit model (Table 4.8) revealed that the odds of having a higher dietary diversity score among households headed by respondents with no formal education was 0.20 (95%CI: 0.06-0.61) times lower than for households whose heads had tertiary education. Similarly, the odds of having a higher dietary diversity score for households with an income ≤ R3000.00 was 0.51 (OR =0.51; 95% CI: 0.31-0.85) lower than for households that had an income > R3000.00. On the other hand, the odds of having a higher dietary diversity score for households with 1-5 members, was 10.41(95%CI: 1.05-103.20) times higher than for households that had 16-20 members. Moreover, for every unit increase in the age of the household head, the odds of the household's having a higher dietary diversity score increased by 1.03 (OR=1.03; 95%CI:1.01-1.05).

Table 4.8: Ordered logit regression results of the factors correlated with dietary diversity among the households in the PKM programme (n=355)

Variable	Coefficient	Std error	Wald	p value	Odds Ratio	95% CI ^a
Level of education						
No formal education	-1.63	0.58	7.90	0.01	0.20	0.06-0.61
Less than grade 12	-0.93	0.54	2.93	0.09	0.39	0.14-1.14
Grade 12	-0.10	0.60	0.03	0.87	0.90	0.28-2.93
Tertial education	Ref					
Marital status						
Not married	-0.17	0.35	0.23	0.63	0.84	0.43-1.68
Married	Ref					
Household income						
≤ R3000	-0.67	0.26	6.59	0.01	0.51	0.31-0.85
>R3000	Ref					
Household size						
1-5 members	2.34	1.17	4.00	0.04	10.41	1.05-03.20
6-10 members	2.30	1.17	3.90	0.05	10.02	1.02-98.56
11-15 members	2.23	1.20	3.47	0.06	9.31	0.89-97.28
16-20 members	Ref					
Age in years	0.03	0.01	9.03	0.00	1.03	1.01-1.05

^a95% Confidence Interval

4.6. Coping strategies adopted by households to deal with household food shortages

In this section quantitative data is presented side-by-side with qualitative data. The coping strategies were grouped into four types of consumption strategies which included: increasing the availability of food in the household at the short term, rationing strategies, dietary changes and decreasing the number of household members as described by Maxwell et al., (2003). As recommended by Gupta et al. (2015), the non-consumption and irreversible strategy was added as the 5th strategy.

4.6.1. Increasing short term availability of food

Figure 4.3 presents short-term coping strategies that were used by participants of this study to increase food availability. As indicated in **Figure 4.3**, most (96.9%; n=344) of the households ate uncultivated and wild vegetables and fruits, and likewise the majority (96.6%; n=343) harvested immature food crops. These results were further confirmed during focus group discussions where participants stated that they resort to indigenous food and harvesting of immature food crops to moderate the effects of household food insecurity. The focus group discussions further reported that the wild vegetables were collected from fallow fields, and that some emerge as weeds or volunteer crops in the backyard gardens and planted fields.

The results reported here also show that 60.8% (n=215) of the households consumed seed reserves. This finding was confirmed by the key informants, who stated that agricultural households have a habit of consuming seed reserves for crops such as groundnuts, jugo beans and dry beans contrary to the prescription of the PKM programme that requires them to use the seed reserves for planting. As a result, it was observed that a few agricultural households had planted the above-mentioned seeds even though they had been provided as part of the programme.

Slightly over 40% (42.3%; n=150) of the households employed purchasing of food on credit as a coping mechanism. Focus group discussions arrived at a similar conclusion, noting that to deal with short-term unavailability of food, households buy food on credit from food shops run by foreign nationals. This interest-free debt is paid after receiving social grant pay-outs.

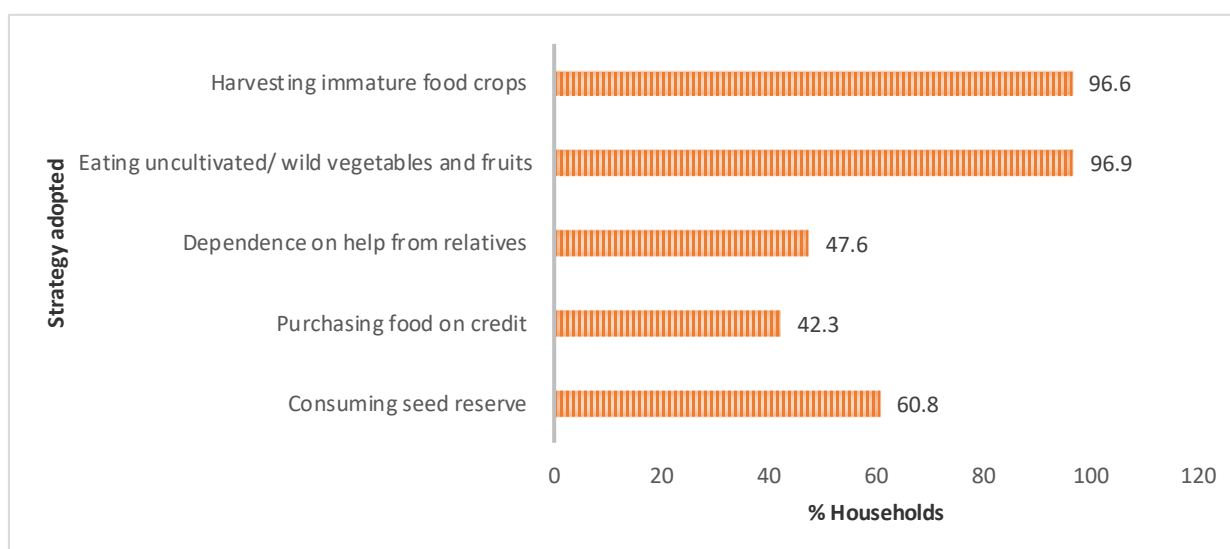


Figure 4.3: Increasing short term availability of food (N=355)
 NB: Percentages add up to more than 100% because multiple responses were permitted

4.6.2. Rationing strategies

In this study, household also used rationing strategies in times of food shortages and results are presented in **Figure 4.4**. Majority of the households (60%; n=213) let children to eat first, while 55% (n=198) limited food consumption amongst adults to allow children to eat. The third most common (52.7%; n=187) rationing strategy adopted by the respondents, included limiting portion sizes. Skipping of meals was another strategy but was employed but was adopted by only 38.3% (n=135) of the participants. Skipping meals, the whole day was the least employed (24.5%; n=87) rationing strategy.



Figure 4.4: Rationing strategies adopted by households (N=355)
 NB: Percentages add up to more than 100% because multiple responses were permitted

4.6.3. Dietary changes

The results of dietary changes as a strategy to cope with unavailability of food are presented in **Figure 4.5**. Buying less expensive food was the most adopted strategy (79.4%; n=281), followed by consumption of unconventional food when facing food shortages (68.7%; n=243).

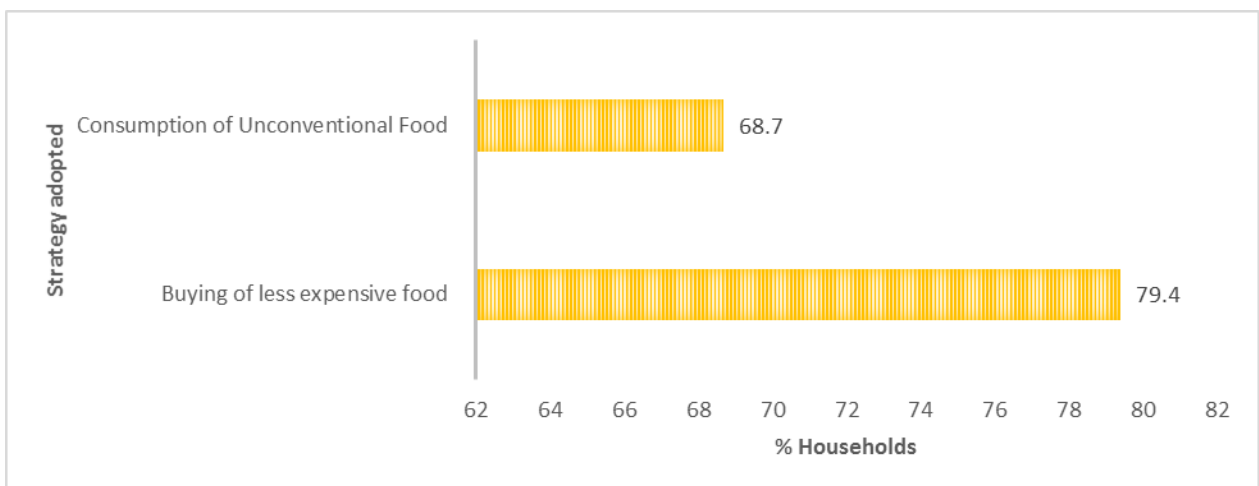


Figure 4.5: Dietary changes strategies adopted by households (N=355)
 NB: Percentages add up to more than 100% because multiple responses were permitted

4.6.4. Decreasing the number of people present in the household

The respondents in this study also reported that they used the strategy of decreasing the number of people present in the household to cope with food insecurity (**Figure 4.6**). These coping strategies were adopted by few households. Above a quarter (28.7%;

n=102) of the households resorted to migration to search jobs. Very few households (3.4%; n=12) withdrew children from school during times of food insecurity.

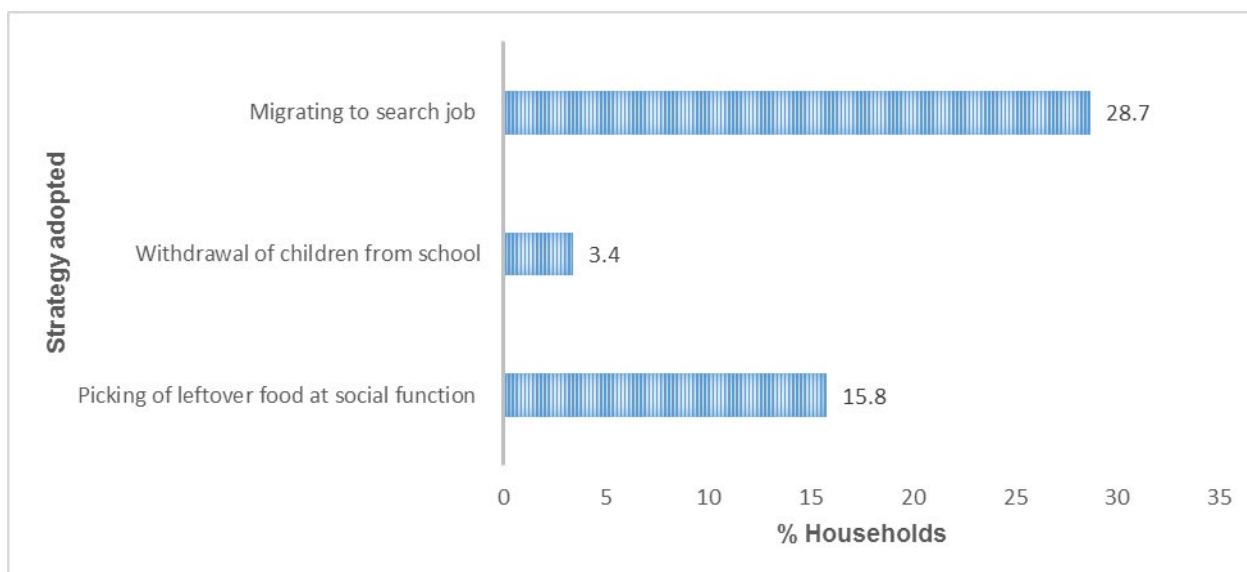


Figure 4.6: The various strategies related to decreasing number of people in the households that were adopted by the households (N=355)

4.6.5. Non-consumption and irreversible coping strategies

During critical times of food shortages, households chose irreversible strategies that may cause permanent changes as shown in **Figure 4.7**. More than one-third (37.7%; n=133) reported to have resorted to seeking off-farm employment during times of food insecurity. While 31.0% (n=110) households resorted to borrowing money to buy food. Selling livestock to raise money to buy food was adopted by 25.9% (n=91) of the households.

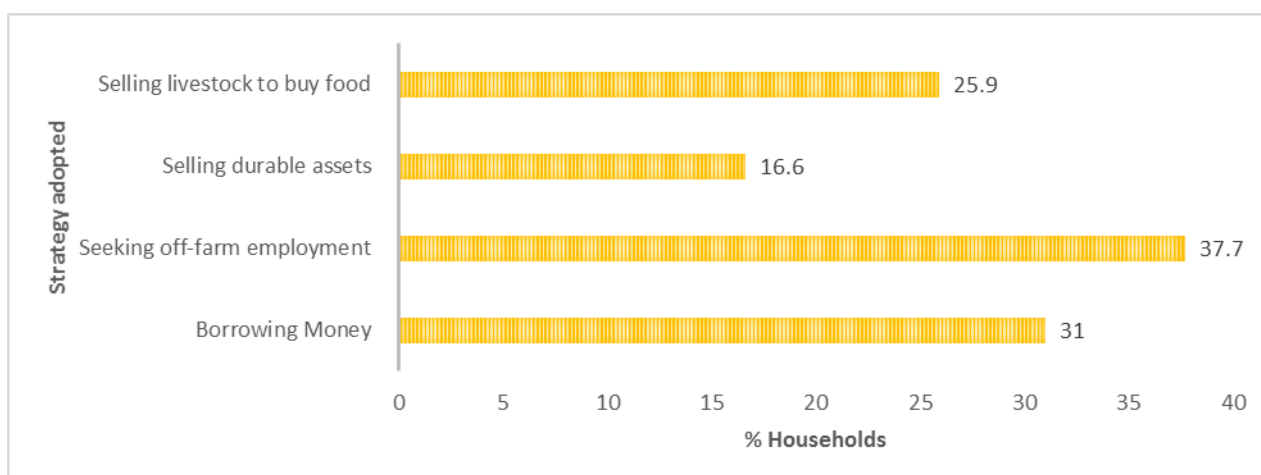


Figure 4.7: Non-consumption and irreversible coping strategies adopted by households (N=355)
NB: Percentages add up to more than 100% because multiple responses were permitted

4.7. Assistance received and challenges encountered by beneficiaries of PKM programme

Under this section, the types of assistance received, and challenges faced by the households benefiting from the PKM programme in the NKLM are described. To achieve this objective, both quantitative and qualitative data are presented.

4.7.1. Assistance received by beneficiaries of PKM programme

Table 4.9 summarises the types of assistance received by the beneficiaries of the PKM programme in the study area during the 2018/19 production season. The results showed that the PKM programme assisted farmers with mechanisation service, agricultural inputs, infrastructure support and extension and advisory services. These results are consistent with the results obtained from both the focus group and key informants.

a) Assistance with mechanisation service

As shown in **Table 4.9**, 70.1% (n=249) of the agricultural households received assistance in the form of mechanisation service. This was confirmed during the focus group discussions, in which, it was stated that subsistence farmers received mechanisation services free of charge, while smallholder and commercial farmers pay a fee that is used for fuel and lubrication when the same services are offered to them. Key informants also stated that the DARDLEA allocates tractors and implements to co-operatives, irrigation schemes and individual farmers to support resource poor farmers in need of mechanisation services with or without fuel provided by the government. The DARDLEA also provided drivers and tractor mechanics. In addition, it was indicated that the DARDLEA determines prices to charge other farmers for ploughing, which is not the case with the subsistence and vulnerable household producers. For example, it was revealed that other farmers were charged R450/ha and the money used by co-operatives that manage the mechanisation service that includes maintenance, repair and fuelling the tractors.

b) Infrastructure support

Infrastructure was received by the least (11.8%; n=42) of respondents (**Table 4.9**). The kind of assistance received in this regard included fencing of fields, boreholes and irrigation infrastructure. The key informants confirmed this and attributed the limited infrastructural support from PKM to the fact that there are other programmes such as the CASP and Land Care Programme which deal specifically with infrastructure support.

Table 4.9: Distribution of households according to types of assistance received from PKM programme (N=355)

Type of assistance received	Frequency	Percentage (%)
Mechanisation service	249	70.1
Infrastructure support	42	11.8
Extension and advisory services	261	73.5
Production Inputs	330	93
Total	882*	248.4*

NB: *Percentages add up to more than 100% because multiple responses were permitted

c) Extension and advisory support

According to results reported here, 73.5% (n=261) respondents were supported with extension and advisory services during the 2018/19 production season (**Table 4.9**). Regarding the number of visits from agricultural advisors, 52.7% (n=203) participants indicated that they had received three (n=3) visits during the 2018/19 production season, while 12.4% (n=44) participants had received between 4-5 visits. Only 3.9% (n=14) received more than 7 visits (**Table 4.10**).

On the other hand, up to 26.5% (n=94) of the respondents specified that they had no visits from agricultural advisors in the same production season. The key informants were also of the same view but confirmed that the poor access to these services was due to the shortage of government subsidised and state-owned vehicles which limit extension and advisory support of the PKM programme. The key informants further revealed that agricultural advisors are understaffed with a high number of clients to attend, and that the extension-to-farmer ratio was very low.

Table 4.10: Distribution of households based on the number of visits by agricultural advisors during 2018/19 production season (N=355)

Number of visits	Frequency	Percentage (%)
No visit	94	26.5
Less than 3 visits	203	57.2
4-6 visits	44	12.4
More than 7 visits	14	3.9
Total	355	100

d) Assistance with production inputs

The PKM programme also supported farmers by providing them with production supplies such as seeds, fertilisers, and chemicals (**Table 4.9**). Majority of the participants (93.0%; n=330) received production inputs from the PKM programme. This information

corroborated by results obtained from the deliberations with both focus group and key informants. In terms of the type of the production inputs received, 91.8% (n=326) and 62.3% (n=321) respondents received seeds and fertilisers (**Table 4.11**). The least number of respondents 16.3% (n=58) received agrochemicals.

Table 4.11: Distribution of households by the types of production inputs received from the PKM programme (N=355)

Production inputs support	Frequency	Percentage (%)
Seeds	326	91.8
Fertilisers	321	62.3
Chemicals	58	16.3
Total	705*	170.4*

Note: * Percentages add up to more than 100% because multiple responses were permitted

4.7.2. Challenges faced by beneficiaries of PKM programme

Under this section, the challenges experienced by beneficiaries of the PKM programme are presented. The respondents indicate that they encounter several challenges, which are discussed below.

a) Availability and operationalisation of storage, packing and milling facilities

Accessibility to storage facilities and type of storage facilities that were available to the respondents are presented in **Table 4.12**. Twenty percent (21.4%; n=26) of the beneficiaries had no access to storage facilities. However, majority of the respondents 74.9% (n=266) store produce in their houses. Very few of households had access to on-farm storage (2.3%; n=8), used storage facilities owned by a co-operative (1.1%; n=4) and public storage facilities (0.3%; n=1). The focus group discussions indicated that storage facilities used in the houses are mainly sacks, drums and traditional structures. These facilities in the houses do not meet the required standards and results to loss of produce.

In terms of the type of the storage facility used, very few (3.7%; n=13) respondents had access to modern storage facilities such as pack house, warehouse etc (**Table 4.12**). Most households stored their produce such as grain in sacks and /or open drums (44.8%; n=159) followed local traditional structures (17.7%; n=63) and airtight drums (9.9%; n=35). Information from focus group discussions confirmed these findings, by showing that although the DARDLEA had completed the construction of maize mills at Mbuzini

and Magogeni in 2010 and 2018 respectively. However, the two mills were still non-operational. This is despite the fact that the two maize mills have been equipped with silos which can store up to 50 tons of grains. It also transpired during the focus group discussions that respondents had to illegally travel across the borderline to the neighbouring villages of the Kingdom of Eswatini to have their maize milled due to non-operational of the two maize mills constructed within the study area.

Table 4.12: Distribution of respondents based on accessibility and type of storage method (N=355)

Access to storage facilities	Frequency	Percentage
Location/ownership of storage facility		
No access to storage facilities	76	21.4
On farm	8	2.3
In house	266	74.9
Co-operative	4	1.1
Public	1	0.3
Total	355	100
Type of storage method used		
No access to storage	76	21.4
Locally traditional structure	63	17.7
Modern storage e.g., pack house, warehouse	13	3.7
Sacks / open drum	159	44.8
Airtight drum	35	9.9
Other	9	2.5
Total	355	100

b) Marketing challenges

Forty four percent (43.7%; n=155) of the respondents in this study did not have access to markets. Of the households that managed to sell their produce, 21.1% (n=75) sold to their neighbours, while 19.2% (n=68) sold at the village markets. Only 0.6% (n=2) sold their harvest to formal markets. Households that sold their produce by the roadside accounted for 6.5% (n=23) and those that sold at the nearest village markets accounted for 6.2% (n=22) (**Table 4.13**). The focus group discussions had similar findings. It was observed in the latter that the Mpumalanga Provincial Government in 2017 had planned for farmers to market their products to the Government Nutrition Programme (GNP) via the Mpumalanga Economic Development Agency.

Table 4.13 also shows that the households studied encountered several challenges relating marketing. These included poor transport infrastructure, shortage of transport to the market, long distances to markets and lack of marketing facilities. Eighteen percent

(17.5%; n=62) of the households stated that they had challenges related to poor transport infrastructure, while 26.8% (n=95) faced challenges related to shortage of transport to take the products to the markets. Furthermore, 22.8% (n=81) households indicated that the distance to the markets is too long while 44.8% (n=159) reported lack of marketing facilities to sell their produce. The focus group also noted that farmers had no marketing facilities such as pack house, cold-rooms close to them. The agricultural hub located at Mkhuhlu is far and not reachable due to lack of transport and high transportation costs.

Table 4.13: Distribution of respondents according to type of markets accessed and challenges encountered (N=355)

Market access and challenges	Frequency	Percentage (%)
Markets accessed		
Did not sell / No market access	155	43.7
village market	68	19.2
roadside	23	6.5
nearest village market	22	6.2
neighbours	75	21.1
hawkers	10	2.8
others e.g., retailers	2	0.6
Total	355	100.0
Challenges encountered		
Poor transport infrastructure	62	17.5
Lack of transport to the market	95	26.8
Low prices	98	27.6
No formal Market	135	38.0
Long distance to market	81	22.8
Low demand	63	17.7
Other e.g., lack of marketing facilities	159	44.8
Total	693*	195.2*

Note: * Percentages add up to more than 100% because multiple responses were permitted

c) Late delivery, insufficient and poor quality of production inputs

Although a very high number of households (93.0%; n=330) in the study were assisted with agricultural production inputs by the PKM programme (**Table 4.9**); there were challenges associated with the timing of delivery of these production inputs. For example, agricultural production inputs were reportedly distributed late leading to delays in planting during the season. It was also revealed that the seeds provided by the PKM programme tend not to be adequate, which forces several farmers to share the few packages that are supplied. The key informants also noted that the production inputs are usually not enough to cover all targeted beneficiaries, which makes the distribution of the limited inputs a challenge. Lastly, results from the survey as well as focus group discussions indicated

that although the PKM programme provides high quality seeds for crop such as maize, dry beans, groundnuts and jago beans; the vegetables seeds are often of poor quality, characterised by poor germination rate and sometimes grow to produce a malformed crop.

d) Limited number of tractors and implements for mechanisation

The survey results showed that the tractors arrived late during the 2018/19 summer planting season. Focus group discussions confirmed these findings, noting that the number of tractors and implements were inadequate, and that the land preparation process was often interrupted by break down of tractors. Key informants indicated that DARDLEA does not have enough fleet, and as a result, private tractors are usually hired to supplement DARDLEA's fleet during the times such as the summer production season, when the demand of the mechanisation service is high.

4.8. Summary of the chapter

The majority of the participants were old, females and had low educational levels, limited access to arable land and had low levels of farm income. The level of food insecurity amongst agricultural households in the study area was very high; double the national and provincial household food insecurity. The studied households had a medium HDDS. The marital status, level of education and annual farm income were significantly correlated with food security among agricultural households in the NKLM. The age of the household head, education level attained by the household head and annual farm income were positively and significantly associated with higher HDDS in the NKLM. Most of the studied households adopted strategies of increasing short-term food availability and dietary changes such as eating uncultivated, wild vegetables and fruits harvesting immature food crop, buying of less expensive food and consumption of unconventional food.

CHAPTER 5: DISCUSSION OF THE RESULTS

5.1. Introduction

The preceding chapter detailed the quantitative and qualitative results obtained from the beneficiaries of PKM programme in NKLM. The focus was on the socio-demographic details, food security status, factors connected with food security and household dietary diversity, strategies applied by households to deal with food shortages, assistance received, and challenges experienced by participants in the PKM programme. The present chapter concentrates on the analysis and discussion of the results obtained in the preceding chapter. The chapter also presents and discusses the proposed framework for improvement of food security status of the beneficiaries of the PKM programme.

5.2. The social economic status and demographic profile of the respondents

The socio-economic and the demographic profile of the agricultural households are discussed under the following subheadings:

- (i) Demographic profile of the participants,
- (ii) Socio-economic profile of the participants.

5.2.1. Demographic profile of participants

In terms of age, most of the participants of this study were elderly, aged 60 years and above. Similarly, Ijatuyi et al. (2018) in a study assessing the food security status of agricultural household in the North West Province of South Africa, observed that less than one-fifth of farmers in their study were aged over 60 years. Several reasons could explain the high proportion of older farmers in this study. Firstly, there is no stipulated retirement age in farming. Therefore, people can continue farming if they still have energy and interest to do so (Schipani, 2020). Secondly, the younger generation has little or no interest in farming (Cargill, 2015). Furthermore, when people retire from official work, they tend to retire to the rural areas. They take up farming for the rest of their lives (Rakgwale & Oguttu, 2020). These findings might negatively affect productivity and subsequently the food security status of the households. This view is supported by Omonona and Agoi (2007) who observed that food insecurity tended to be high among households headed by older people. The significantly low number of members of the younger generation who are involved in farming is a source of concern given its potentially negative effects on the

future of farming in the NKLM. In light of this, Omotayo (2018) recommends that programmes to attract the youth to take up farming are needed to ensure continuity.

The majority (59.4%; n=211) of the respondents in this study were females. The high participation of women in this programme should be encouraged because literature (Botreau & Cohen, 2019) suggests that women are mostly in charge for household food security needs due to their involvement in the production, processing, preservation and preparation of food. However, findings reported here contrast those reported by Oduniyi and Tekana (2020) who found that high figures (84%) of the farmers were males in the study on food security status of agricultural households conducted in Ngaka Modiri Molema District, South Africa. The discrepancies observed between these two studies could be because the PKM programme includes a vulnerable household producer subcategory of subsistence farmers. This subcategory caters for women, persons with disabilities, child headed households and farm workers with interest in improving their food security levels through food crop production (DARDLEA, 2019).

As it was observed in this study, Oduniyi and Tekana (2020) also found that most of the farmers in their study conducted amongst farming households were married. Marital status is known to positively impact on the extent of involvement in farming (Nwaobiala et al., 2019) and non-farm activities (Bila et al., 2015). Furthermore, the food security status of a household increases when the head of household is married (Agboola et al., 2017).

Regarding household size, the majority (52.4%; n=186) of the households were large household consisting of six to ten members. This was expected given that large household sizes are common among South African families. This finding is also confirmed by Ijatuyi et al.(2018), who noted in their study conducted among agricultural households in the North West Province that a greater proportion (59.2%) of households had five to twelve people. The low level of education observed amongst the households studied could explain the large household size. According to Debebe (2014), people with low or no education are less likely to practise family planning. The results observed in this study are a cause of concern because, it has been proven that a negative correlation exist between household size and food security (Tiwasing et al., 2018). This could be clarified by the fact that when the household size grows, the food security status of the household decreases (Sambo et al., 2017).

5.2.2. Socio-economic profile of the participants

The findings indicated that 42% (n=149) of the farmers lacked formal education with 43.7% (n=155) having less than grade 12. These findings do not only suggest that the level of education of the respondents was low but is also biased towards the aged respondents. A low level of education was also observed among agricultural households in Ngaka Modiri Molema District of South Africa, where it was observed that about two-thirds (66%) of the respondents were uneducated (Oduniyi & Tekana, 2020). The low educational levels in this study could be a legacy of the inequalities of the apartheid government which in the past prevented black people from getting opportunities to attain formal education in South Africa (Antwi & Nxumalo, 2014). The results are worrisome as low levels of education has been linked with high food insecurity status (Yahaya & Danmaigoro, 2020). For example, Antwi and Nxumalo (2014) argue that being highly educated empowers farmers to acquire skills and knowledge to help them to increase their efficiency and food security status.

The vast majority (96.2%; n=342) of the respondents had annual farm income below R40 000.00, which translates into an average annual farm income of R 6 490.99. The finding observed here differs with what was observed by Ijatuyi et al. (2018), who noted that only 34.2% of households had an annual farm income below R40 000.00 with a mean of R50 000.00 in the study conducted amongst agricultural households in the province known as the Platinum province in South Africa. Despite this, it should be mentioned that in the latter study, there were more respondents (22.4%) with tertiary education compared to the very low (4.5%; n=16) figures of respondents observed in this study. Therefore, households in the latter study were better positioned to acquire skills to improve their agricultural productivity. Moreover, household income has been proven to significantly add to the food security status (Cheteni et al., 2020; Sambo et al., 2017).

Nearly half (47.9%; n=170) of the respondents in this study had farming experience of greater than 21 years. Although this number is slightly lower than the one observed by Sambo et al. (2017), the fact that most farmers in this study had a lot of experience is encouraging. This is because a positive relationship exists between many years of farming experience and food security (Mohammed et al., 2014).

As observed in a similar study conducted in Kaduna State of Nigeria by Saleh and Mustafa (2018), in this study, most participants (60.3%; n=214) operated on less than

three hectares of land. According to Muluken (2005) an increase in area under crop farming has a considerable potential of improving food production which, eventually boosts food security. This could also explain the low farm income that was observed in this study.

5.3. Household food security status of the households benefiting from the PKM programme

As stated under in chapter 3 (cf. section 3.9.1), the food security status of the beneficiaries of PKM programme was assessed and the magnitude of household food security determined using the FSI, HFIAS and HDDS. Therefore, the next sub-sections discuss the results obtained from the techniques used to examine food security.

5.3.1. Household food security status based on Food Security Index

The results of the FSI indicate that just over half (52.4%; n=186) of agricultural households studied were food secure. The results observed here are consistent with Oduniyi and Tekana (2020) who observed that above half (54.3%) of agricultural households were food secure in Ngaka Modiri Molema District, South Africa. However, the level of 47.6% of households that were food insecurity observed in the current study is twice the average national household food insecurity rate of 20.2% (SSA, 2019a). Considering that the SSA (2019a) study was done at national level, the findings in the current study suggest that food insecurity is more severe at a local level.

The food expenditure approach measures the food accessibility dimension of food security among households, i.e., economic accessibility of food which is influenced by the affordability and expenditure on food by households. Therefore 52.4% (n=186) of the households studied were food secure and could afford the price of food relative to their income. This implies that just over half (52.4%) of the households are guaranteed of economic accessibility of food (i.e., they afford to buy from the market) in the study area at household level.

5.3.2. Food security status based on Household Food Insecurity Access Scale

The results from the HFIAS are discussed under four (4) subheadings namely: 'Household Food Insecurity Access-related Conditions', 'Household Food Insecurity

Access-related Domains', 'Household Food Insecurity Access Scale Score' and 'Household Food Insecurity Access Prevalence'.

i. Household food insecurity access-related conditions

Thirty six percent (36.1%; n=128) of the households interviewed pointed out that they worried about not having enough food. This is in accordance with the observations of the study done among farming households in West Abaya district, Ethiopia that reported that up to 38.1% of households were worried about not having enough food (Shone et al., 2017). Households with low incomes frequently worry about not having enough food and do not afford healthy diets. Such households are correlated with food insecurity and various kinds of malnutrition (FAO et al., 2021).

Over 60% of the household studied experienced food insecurity access related conditions such as unable to eat preferred, eat limited kind of foods, eat food they really did not want, eat smaller quantities of food and having less meals in a day because of limited resources in their households. The findings reported here are inconsistent with Shone et al. (2017) who noted that a low proportion (around one-third) of households experienced the five conditions mentioned above. This suggests that overall, food insecurity in the NKLM was exceeding the 38.1% that was reported by Shone et al. (2017) in West Abaya district, Ethiopia. The inconsistency between the findings of this study and that by Shone et al. (2017) could be due to the education levels, age and marital status of the respondents. The present study reported a low level of education with 42.0% (n=149) lacked formal education, most (55.2%; n=196) of the participants were over 60 years of age and 49.9% (n=177) were married. This is in contrast with the observations by Shone et al. (2017) who observed that 36.7% of the participants lacked formal education, 16.3% were aged over 60 years and 82% of the participants were married. This difference was not expected given that the level of food security is very high in South Africa as compared to Ethiopia. In fact, South Africa is a food secure nation and rated the 69th out of the 111 countries measured in terms of their food security levels. Furthermore, it surpasses all the nations in the Sub-Saharan Africa in the GFSI ratings (EIU, 2021). This finding suggests that a state could be food secure at a national level, but its households could remain food insecure, and vice versa.

In accordance with the observations by Shone et al. (2017), the present study also recorded less than one-third of households that had not had food of any kind to eat, slept hungry or had spent the entire day and night with no food.

ii. Household food insecurity access-related domains

Thirty six percent (36.1%; n=128) of the households fall within the anxiety and uncertainty about food supply domain. This implies that these households were concerned about satisfying their food requirements, represented by item 1. The results reported here are comparable with the observations by Shone et al. (2017) who reported that 38.1% of households fell within the anxiety and uncertainty domain.

Majority (62.5%; n=222) of households in the present study experienced insufficient food quality, meaning that they likely eaten less types of foods in a day or did not have the preferred types of food or consumed food they did not like because they had insufficient capital. This is contrary to what Shone et al. (2017) reported. The latter observed that 38.1% of households belonged to the insufficient food quality domain. The high proportion of households in the insufficient food quality domain, is worrisome. This is because food insufficiency relates to poor educational and psychological performance in children (Reuter et al., 2020), and poor health outcomes in adults and children (Arora, 2018; Gregory et al., 2019). Health conditions associated with insufficient food quality in adults include hypertension, hyperlipidaemia and diabetes (Gregory et al., 2019). While in children, the effects of malnutrition include stunting, marasmus and kwashiorkor (Arora, 2018).

Up to 60% (n=212) of the households in the present study fall within the insufficient food intake and its physical consequences domain. The households in this domain either slept hungry or had nothing to eat the entire day and night. These findings differ from the 34.5% of the households that fell within this domain reported by Shone et al. (2017). The relatively high prevalence of households within this domain in the present study might be due to the difference in the times when the data were collected. In the present study, the data collection process was conducted in the pre-harvest season while in the study by Shone et al. (2017) data was collected during the harvesting season. The pre-harvest season is associated with higher food access problems as compared to the harvesting season (Massawe, 2016).

iii. Household food insecurity access scale score

The households in this study had a mean HFIAS score of 4.2. This is contrary to what was expected because according to Massawe (2016) food access problems are higher at pre-harvest and lower at post-harvest. The findings reported here suggest that the households in the NKLM had less food access problems. Moreover, this was during the pre-harvest period, which means that regardless of the food insecurity access related domains discussed in the preceding section, the situation has potential to improve during the post-harvest period.

iv. Household food insecurity access prevalence (categories)

The HFIAS measurement revealed that 56.6% (n=201), 16.1% (n=57) and 27.3% (n=97) of the households could be categorised as mild food insecure, moderately food insecure and food secure respectively. The overall level of household food insecurity in the study was found to be 72.3 %. These results are consistent with the FSI reported under section 4.3.1 that shows that the food insecurity status in the present study exceeds the national figures. Furthermore, findings reported here are also higher than those of Mpumalanga Province (28.4%) reported by Statistics South Africa (SSA, 2019a). However, it is significance mentioning that the study by Statistics South Africa used a sample from the general population. The findings reported in this study suggest that the prevalence of food insecurity among farming households in the present study exceeds that of the general population. Consistent with this study, a prevalence of more than 70% food insecurity has also been observed households in rural farming' conditions in South Africa (Agboola et al., 2017) and other developing countries (Gazuma, 2018). Several reasons could explain the higher level of food insecurity observed here. Firstly, the high poverty rate in the NKLM (MPT, 2015) could be contributing to the high prevalence of food insecurity observed among the households studied. This is because evidence indicates that households with high poverty rates are positively associated with high levels of food insecurity (Sati & Vangchhia, 2017). Secondly, the level of education amongst the respondents was very low. Several authors have observed that households led by uneducated heads have higher likelihoods to be food insecure (Masahudu, 2019).

5.3.3. Food security status based on the Household Dietary Diversity Score

The results of the specific food groups consumed by the households over the 24-hour recollection period revealed that cereals were eaten by all the households. This suggests that cereals form the basis of respondents' diet. Previous studies also found the

dominance of cereals in the diet of households (Jebessa et al., 2019; Sarkar, 2014). This supports the findings reported here. Cereals are an important source of carbohydrates and have a high fibre content. The latter is an important nutrient that is necessary for the prohibition of obesity and heart disease. In addition, fibre is a source of energy (Jessimy, 2019). The high number of respondents that had consumed cereals during the reference period is encouraging as it is in line with the South African Dietary Guidelines (Schönfeldt et al., 2013).

Similar to studies done among farming households in Ecuador and Tanzania in which a proportion (>90%) of households reported to have consumed vegetables (Cordero-Ahiman et al., 2021; Rajendran et al., 2017), this study observed a high prevalence of consumption of vegetables (78.3%; n=278) among households studied. This finding was expected because all the households in this study get support from the PKM programme which promotes household food production. Studies have proven that food production at household level is connected with a high consumption of vegetables and subsequently increased dietary diversity (Pradhan et al., 2018) and improved nutrition (WHO, 2003). Vegetables consumed included dark green leafy vegetables which are full of vitamins. The higher proportion of household that consumed vegetables that are rich in Vitamin A in this study is worth noting especially because Vitamin A deficiency has been classified as an important public health problem (ASAIPA, 2017). Above two-thirds of the households consumed condiments such as tea, coffee, sauces, cool drink, and juice. This is comparable with study done in Nigeria which reported consumption of condiments by over 90% of households (Magaji et al., 2020).

According to Cordero-Ahiman et al. (2021) a high proportion (>90%) of farming households in Ecuador consumed sugar and honey as well as meat. This contrasts the findings reported here in which 42.3% (n=150) of households indicated that they had consumed sugar plus honey, and 38.9% (n=138) had consumed meat. The discrepancy observed in the consumption of these foods could be due to low-income levels of the household in this study. However, low consumption sugar diet has health benefits. This is because consumption of diets with high levels of sugar relates to the increased risk of sicknesses such as obesity, hypertension, heart disease and diabetes (WHO, 2016).

There were small figures of the respondents revealed that they had consumed food from the following groups: beans (16.6%; n=59); fruits (10.1%; n=36); fats and oils (10.1%;

n=36); dairy products (8.2%; n=29); tubers (5.4%; n=19); fish (3.7%; n=13); and eggs (3.1%; n=11). This is consistent with other studies done in Tanzania and India, which also observed that less than one-third of the households studied had consumed these food groups (Rajendran et al., 2017; Sarkar, 2014). The low consumption of fish, eggs and beans was disappointing as these food items are sources of proteins and have high nutritive value (Chardigny & Walrand, 2016). Proteins have health benefits and their deficiency in diets has been attributed to low growth and a weakened immune response (Ware, 2017). Dark yellow and orange fruits are also an important source of Vitamin A (Kennedy et al., 2010). Vitamin A improves eyesight, regulates genes, maintains healthy skin, supports the immune system and assists in the production of red blood cells (D'Ambrosio et al., 2011). These results were expected considering the low incomes levels observed in this study, and the fact that less than 40% of the respondents in this study were involved in mixed farming.

Regarding to the HDDS, the findings of the study suggest that households in the NKLM had a medium HDDS. This is consistent with the HDDS for Mpumalanga Province and the whole of South Africa, both of which according to Shisana et al. (2014), have a medium HDDS. However, the findings reported here contrast with those of recent studies done in South Africa and Ethiopia. For example, a low HDDS was observed amongst the studied households in a study executed in the Eastern Cape Province of South Africa (Cheteni et al., 2020). The household food production support offered by the PKM programme to households in this study could explain the better HDDS in the NKLM. This view is supported by findings of previous studies that have proven that household food production improves dietary diversity (Pradhan et al., 2018). In Yayu Biosphere Reserve, Ethiopia, Jebessa et al. (2019) also established a high (5.5) HDDS among the farming households. The lower HDDS observed here could be caused by the low education levels of the households in this study. This is supported by available evidence that suggests there is a positive connection between education and high dietary diversity and conversely, a negative connection with low dietary diversity (Taruvunga et al., 2013). According to Jebessa et al. (2019) heads of households who have attained formal education know the health benefits of eating a balance diet, as a result they diversify on their diet compared to their uneducated counterparts.

5.4. Factors associated with food security among the households

The marital status, level of education and annual farm income were significantly correlated with food security among agricultural households in the NKLM. A study done by Agboola et al. (2017) also observed that household food security status of a household increased if the head of the household was married. According to Aboaba et al. (2020) this could be attributed to the fact that married couples jointly assume the responsibility of supporting their families.

The significant and positive connection between the level of education of the household head and food security, suggests that education is an essential variable, which impacts on household food security. A prior study by Masahudu (2019) supported this finding, noting that households of farmers with higher education levels have higher likelihoods to be food secure. Antwi and Nxumalo (2014) also hold a view that education is social capital that improves the awareness of farmers with updated farming practices, resulting in higher yields and farm incomes. This in turn ensures food security.

In accordance with the observation by Ibok et al. (2014) and Ijatuyi et al. (2018), the annual farm income was found to be positive and significantly connected with food security in this study. This indicates that increase in income, which could be for example, from selling agricultural produce, improves the purchasing capacity of the household and subsequently the odds of households to be food secure. This is also supported by other authors who have reported that low income is a major risk factor for food insecurity (Alam et al., 2020).

The study observed a positive correlation between food security and variables like age of household head, and receiving assistance in form of mechanization, production input as well as infrastructure support. However, the associations did not reach significance. This is consistent with the findings by Aragie and Genanu (2017), who similarly observed that although production inputs such as seeds and fertilisers contributed positively to household food security, their contribution did not reach significance ($p > 0.05$).

Although the relationship between food security and variables such as gender of household head, dependency ratio, access to extension services, training received and participating in non-farm activities was negative, the relationship in all instances did not reach significance ($p > 0.05$). These findings were not expected given that Aragie and

Genanu (2017) observed a significant negative association between household size and food security. Furthermore, it is well known that an increase in the size of the household, especially by members that are unable to work, puts more pressure on food consumption in the household (Dula & Berhanu, 2019; Jeyarajah, 2018). Furthermore, it has also been reported that a rise in the dependency ratio by one member in the household, has a potential to cause a drop in the household food security status by almost 50% (Aboaba et al., 2020).

According to Aragie and Genanu (2017), the likelihood to be food secure is high among farming households partaking in non-farm income generating activities in addition to the usual farming activities as compared to those that do not partake in non-farm income generating activities. This is because, households that are involved in non-farm income generating activities have an opportunity to make extra income from these activities and are thus able to boost their purchasing power. As a result, this improves the food security status of the household. Therefore, the lack of association ($p>0.05$) between participation in non-farm income generating activities and food security status that was observed in this study was not expected. This could be due to the low numbers of respondents involved in these activities in this study.

The findings observed here showing that there was no significant relationship between both the gender of the household head and access to extension services on one hand and food security status on the other ($p>0.05$), were not anticipated. This is because according to Botreau and Cohen (2019), men are likely to have more access to livelihood assets as compared to women. Furthermore, according to Eneyew and Bekele (2012) households headed by female are at more risk to food insecurity due to restricted rights to use resources. According to Mustapha et al. (2018) access to extension service has a positive contribution to household food security. Fisher and Lewin (2013) further alluded to the fact that a single visit by an agricultural extension advisor during each production season would lower food insecurity by at least 5.2%.

5.5. Factors associated with dietary diversity of the households

Findings reported here are consistent with what other authors have observed. For example, some authors have previously reported that the age of the household head is

a significant predictor of household dietary diversity (HDD) (Megbowon & Mushunje, 2018). It has been suggested that as the head of household becomes older, he or she is likely to become more aware of their diets due to old-age-related health challenges that older people tend to experience (Sinyolo et al., 2021). In contrast with the findings of this study, other studies (Iftikhar et al., 2020; Magaji et al., 2020) have showed that age of household head is negatively correlated with higher HDDS. This view is also supported by Oduniyi and Tekana (2020) who noted that the adoption of improved farming technology tends to very low among older heads of household. Therefore, this has a negative effect on food production and, as a result, little income to spend on food items.

It was observed that households headed by household heads with no formal education were less likely to have higher HDDS. This is supported by previous studies (Megbowon & Mushunje, 2018, Taruvinga et al., 2013) that demonstrated a positive correlation between the level of education and a higher HDDS. This is because the more educated the head of the household is, the better their understanding of nutrition (Megbowon & Mushunje, 2018) and the health benefits of a well-balanced diet. As a result, they are more likely to diversify their diet as compared to farmers with less formal education or farmers who totally lack formal education (Mbwana et al., 2016 Jebessa et al., 2019). Moreover, it has been shown that the higher the formal education status attained by members of a household, the higher the likelihood of such members gaining employment (Obayelu & Osho, 2020). Being employed has been shown to positively influence the HDD (Grobler, 2015).

Consistent with previous studies [Iftikhar et al., 2020; Adewumi & Animashaun, 2014; Laskar & Rakib, 2019), this study also observed that household income was positively and significantly associated with HDD. This was expected because according to Jebessa et al. (2019) households with resources and of a higher income status can afford to diversify their diets. Several other authors also hold a similar view that the economic status of a household positively influences dietary diversity and food security (Taruvinga et al., 2013; Huluka & Wondimagegnhu, 2019; Mulugeta et al., 2018).

The household size is among various socio-demographic factors that showed significant association with household dietary diversity in this study. The odds of having a higher dietary diversity score was 10.40 times higher for households with 1-5 members than that for larger households (16-20 members). This is consistent with previous studies (Obayelu

& Osho, 2020) that observed that household size was negatively and significantly correlated with HDD.

5.6. Coping strategies used by households to help deal with food shortages

The strategies used by households that participated in the present study were categorised into four types namely: short term household food availability, rationing strategies, dietary changes and decreasing the number of household members (Maxwell et al., 2003). The non-consumption and irreversible strategy was added as the 5th strategy (Gupta et al., 2015).

5.6.1. Increasing short term availability of food

Most of the households resorted to eating uncultivated and wild vegetables and fruits (96.9%; n=344) and harvesting immature food crops (96.6%; n=343) as copying strategies. These findings are inconsistent with those reported by another study conducted in the country by Ngidi and Hendriks (2014) in the Jozini Municipality in Kwa-Zulu Natal Province. In study by Ngidi and Hendriks (2014), the authors found that 37% of the farming households gathered wild food, hunted or harvested immature crops. Apart from the difference between the data collection seasons in the two studies, a high proportion of households in this study that resorted to eating uncultivated and wild vegetables was expected. This is because most participants in this study were older people. Previous studies have showed that consumption of wild or indigenous foods is higher amongst older generation (Dweba & Mearns, 2011). Furthermore, the fact that most rural households in South Africa consume wild vegetables mainly as a relish (Lewu & Mavengahama, 2011) supports the findings observed in this study. Uncultivated and wild vegetables and fruits have been proven to significantly decrease household food insecurity (Chakona & Shackleton, 2019).

The results also revealed that 60.8% (n=215) of the households consumed seed reserves. The results were in accordance with the results by Olayiwola et al. (2017) who recorded the same proportion (60%) of households that ate seed reserves as coping strategy to deal with food shortages in Oluyole Local Government Area of Oyo State, Nigeria. Purchasing food on credit was adopted by 42.3% (n=150) of the households. Earlier studies have shown that households purchase food on credit to improve availability of food in the household (Drysdale et al., 2019; Mohiuddin et al., 2016).

5.6.2. Rationing strategies

Over half of the respondents in this study allowed children to eat first and have also limited food consumption amongst adults to allow children to eat. The results concurred with Olayiwola et al. (2017) who found food insecure households adopt strategies such as limiting consumption by adults and/or allowing children eat first to deal with food shortages. These results suggest that households prioritised child nutrition and this is commendable. Poor nutrition causes stunted growth in children (Cheteni et al., 2020). Food insecurity has lasting and life altering effects on individuals. It impedes early childhood development (Pedroso et al., 2020), affects learning progress in school children (Jyoti et al., 2005) and it is closely related with various types of malnutrition in adults and children (FAO et al., 2021; Martin & Ferris, 2007). Rationing strategies negatively affect the nutritional status and hence welfare of the family members (Gupta et al., 2015).

The third most common rationing strategy that was adopted in this study was limiting portion sizes. The use of this strategy was also observed in the study done by Drysdale et al. (2019) at iLembe District in the KwaZulu-Natal province, South Africa. Just more than one-third of the households skipped meals while skipping meals the whole days was the least used (24.5%; n=87) rationing strategy. Olayiwola et al. (2017) also noted skipping of meals in their study. However, it is essential to note that despite the fact the application of rationing strategies is connected with food insecurity, these strategies are not radical and can be reversed easy as soon as food security status improves (Maxwell & Caldwell, 2008).

5.6.3. Dietary changes

The buying of less expensive food was reported by over three-quarters (79.4%; n=281) of the households in this study. The findings are in line with Ngidi and Hendriks (2014) who found that 85.5% of their participants employed this strategy. This consistency was expected since both study sites have high levels of poverty and low levels of income among the households. This suggests that household with low incomes could not afford expensive food. This is worrying as dietary changes are often associated with cheaper, lower quality food that is high in calorie (Gupta et al., 2015).

Furthermore, the findings showed that over two-thirds (68.7%; n=243) of the study participants consume unconventional foods. Although previous studies have also proven that households consume unconventional food (Samuel et al., 2020), the results reported here were slightly higher. For example, Olayiwola et al. (2017) who observed that less than half (44%) in their study that was conducted amongst rural farming households in Oluyole Local Government Area of Nigeria utilised this strategy. The respondents in the present study were more likely to adopt this strategy due to high levels of food insecurity (72.7%) as compared to 41.3% observed by Olayiwola et al. (2017).

5.6.4. Decreasing the people present in households

The coping strategy of decreasing the people present in a household was not popular and was hence adopted by very small proportion of households in the study. For instance, only 28.7% (n=102) of the respondents resorted to migration in search of a search job. However, this is inconsistent to what was observed by Olayiwola et al. (2017), who recorded above half (53%) of the respondents in their study migrated in search of job as a coping strategy against food insecurity. The high proportion of old farmers (>61 years) in this study could explain the contradiction between the two studies. This study found that more than half of farmers (55%; n=195) were 61 years old and above, which is an inactive labour force, is therefore not likely to migrate in search of jobs.

Furthermore, few households (3.4%; n=12) in the present study withdrew children from school during times of food insecurity. This is consistent with Gupta et al. (2015) who noted as few as 2.5% of households withdrew children from school as coping mechanism against food shortages. The low proportion of households who resort to withdrawing children from school could be attributed to the provision of meals to learners in qualifying schools through the National School Nutrition Programme. The objective of the National School Nutrition Programme is to improve learning ability and accessibility of education by the provision diverse diet to learners at schools (DBE & DPME, 2016). In fact, some authors have noted that the School Feeding Programme is a key part of food aid and discourage parents from withdrawing children from schools during food crisis (Demeke et al., 2009).

5.6.5. Non-consumption and irreversible coping strategies

During the critical of food shortages, some strategies that are adopted are irreversible, and may cause permanent change (Gupta et al., 2015). These include seeking off-farm

employment, borrowing money and selling of livestock. In this study, less than half respondents adopted these strategies. For example, only one-third (37.7%; n=133) of the respondents in this study resorted to seeking off-farm employment during times of food insecurity. However, some authors are of the view that off-farm employment is a progressive strategy of coping with food shortages (Gupta et al., 2015) and has the capacity to increase household income which contributes to food security (Cheteni et al., 2020).

Nearly one-third (31.0%; n=110) of the households revealed that they resorted to borrowing money to buy food to deal with food insecurity. However, this number was lower than the one reported by Mohiuddin et al. (2016) who noted more than half (53%) of households in their study opted to borrow money to deal with food shortages. Borrowing money to buy food has been identified as being a negative strategy because money lenders charge higher interest rates making it difficult for households to service the debts (Gupta et al., 2015).

Regarding selling off livestock so as order to raise money for food, only a quarter from the current study resorted this as a strategy to deal with food shortages. This proportion was below the figure recorded by Olayiwola et al.(2017), who recorded as high as 72% of households resorted to selling livestock to buy food. The low proportion of households who adopted this coping strategy could be due to the low proportion of households that have livestock or engaged in mixed farming in this study. However, this notwithstanding, selling off livestock potentially increases household income, and therefore a positive strategy to adopt.

5.7. Types of assistance received, and challenges encountered by beneficiaries of PKM programme

This section discusses the results obtained when investigating the types of assistance received by the beneficiaries of the PKM programme and then followed by challenges encountered.

5.7.1. Types of assistance received by beneficiaries of PKM programme

Farmers require several resources for agricultural production. The findings of the present study demonstrated that the PKM programme assisted farmers with mechanisation

service, production inputs, infrastructure support, and extension and advisory services. The findings are consistent with the objectives of the PKM programme listed under section 1.2 of chapter 1 (DARDLEA, 2019). Furthermore, similar results were reported by Shabangu (2015) who assessed the effect of PKM programme on food security in the Bushbuckridge Local Municipality of the Mpumalanga Province and observed that most farmers were assisted with mechanisation service, production inputs, infrastructure support, and extension and advisory services. Access to such assistances is envisaged to contribute positively towards the household food security status of the beneficiaries by improving household food production. According to Khapayi and Celliers (2016) providing adequate farmer support to smallholder's agriculture, contributes meaningfully in rural development, commercialisation, poverty alleviation and income generation.

a) Assistance with mechanisation service

Mechanisation assistance refers to the support with implements and machinery to perform tillage, planting, cultivation, harvesting, and post harvesting activities (DARDLA, 2013) to decrease drudgery of human and draught animals in farming activities, and improve the quality of work and products (Sims et al., 2016). The high proportion of farmers who received mechanisation assistance in this study, corresponds with the findings by Masoka (2014) who reported that 68% farmers in the study done in the Nkangala District of the Mpumalanga Province received assistance with mechanisation service. In another study by Bastian et al. (2019), conducted in the Overberg and Eden Districts, South Africa concluded that the mechanisation programme impacted positive on the growth of resource poor farmers, improves production and household food security status.

In the challenges of the limited budget, to ensure that the provision of mechanisation services is not disrupted, the current PKM policy allows for certain categories of the beneficiaries to contribute funds for fuel and lubrications to facilitate provision of mechanisation. However, the subsistence and vulnerable household producers are exempted from contributing towards these items (DARDLEA, 2019). The finding of the study revealed that farmers that produce vegetables for sale are willing and committed to paying for mechanisation service offered by the PKM programme since the rates of the programme are cheaper compared to what private mechanisation service providers charge. The mechanisation service is the main pillar of the PKM programme, and it is in high demand (DARDLEA, 2019). According to Paudel et al. (2019) willingness to pay for

farm mechanisation is known to be positively influenced by factors such as group and cooperative affiliation to a co-operative and farmers' group, access to finance and credit, gender of the households and food security status of the household.

The observation of a high uptake of mechanisation in the study area is a welcome development and should be encouraged. Several studies show that farm mechanisation is an essential agricultural production input needed for smallholder farmers necessary to improve labour and land productivity in order to eradicate poverty, assure food security and improve livelihoods (Sims & Kienzle, 2016). According to Grover (2019) the aim of mechanisation in agriculture is to get more harvest from the available land. In addition, the use of machinery may decrease costs of production and it is the quickest way to achieve higher cropping intensity.

b) Infrastructure support

Infrastructure support in this study included fencing of fields, boreholes, irrigation pipes and storage, processing and marketing facilities. Although the proportion of beneficiaries that received assistance in the form of infrastructure was considered low in this study, these findings showed an improvement compared to findings by Masoka (2014) and Shabangu (2015) who observed that in their studies none of the farmers had received supported in the form of agricultural infrastructure. The low proportion of households assisted with agricultural infrastructure is worrisome. Available literature suggests that agricultural infrastructure performs a fundamental part in livelihoods of the rural people (Sati & Vangchhia, 2017). For instance, fence is a key substructure in farming. It safeguards against theft, separates grazing camps and restricts livestock on and/or off farms (Nxumalo & Antwi, 2013). As reported by Shongwe (2020), the fact that the two maize mills constructed at NKLM were not yet operational is disappointing observation. This is because the purpose of constructing these maize milling facilities was to give household access to storage and milling facilities to ensure food security as well as creation of jobs (DARDLA, 2010b). Adequate infrastructure is essential in increasing productivity. This increase in productivity, leads to reduced food prices which benefits all citizens that are net food buyers (Llanto, 2012). Lack of infrastructures significantly restricts the realisation of food security (Ijatuyi et al., 2018).

c) Extension and advisory support

Extension and advisory support were conceptualized by number of visits by agricultural advisors to the farmers. As defined by FAO (2010), extension is an approach that should enable farmers, their organisations and other role players in marketing of agricultural produce to access knowledge, information and technologies. It should also enable their contact with colleagues in education, agribusiness, research and other applicable institutions. In addition, it should support them to improve their technical, organisational and management skills and practices.

The study found that nearly three quarters (73.5%; n=261) of respondents were supported with extension and advisory services in the NKLM during the 2018/19 production season. This number of farmers that were supported with extension services was lower than that observed by Aragie and Genanu (2017). These services were received by 95.2% of the farmers in the latter study conducted in North Wollo Zone in Ethiopia.

The number of contacts with extension services was even lower in this area. A quarter of the households had no visits at all while more than half of them received less than 3 visits from agricultural advisors during the 2018/19 production season. However, these findings agree with those reported by Masoka (2014) who observed that agricultural advisors charged with overseeing the implementation of the PKM programme did not visit their farms as often as was expected. The low number of contacts with extension services observed in this study is worrisome. Previous studies show that farmers with access to extension and advisory services produce a better yield compared to those with no access to extension and advisory services (Baloch & Thapa, 2018). Agricultural extension service is rendered to boost the knowledge of households and skills needed to improve seed, crop rotation, intercropping, using drought-resistant crop, using irrigation, crop protection, harvesting, storage and marketing (Baloch & Thapa, 2018). Access to extension service has a positive contribution to household food security (Ijatuyi et al., 2018).

d) Assistance with production inputs

Production inputs assistance included seeds, fertiliser and chemicals in this study. The high number of beneficiaries that received seeds was supported by Yusuf et al. (2015) who observed that most (94.4%) of the smallholder farmers benefitted from subsidised

improved seeds and fertiliser under the Electronic Wallet Scheme introduced by the government of Nigeria. According to Langyintuo (2020) seed is a crucial and comparatively cheaper farm input yet has a high rate of return on investment in crop production. On average, improved seeds produce between 4–6 tons/ha, while the traditional unimproved seeds produce below 1 ton/ha. However, the realisation of improved production per hectare is limited amongst smallholder farmers due to lack of other production resources.

Consistent with observations by Yusuf et al. (2015), the proportion of respondents assisted with fertilisers was high. According to Yadav et al. (2000) and Roberts (2009) the use of fertilisers is essential for maintaining soil fertility and improving crop yields, thus ensuring food security. The field experiments carried out by Roberts (2009) proven that treatments with fertilisers that contain Nitrogen (N) as common element in a combination with one or all the other elements Phosphorus (P) and Potassium (K) significantly increased yield as compared to a combination without Nitrogen i.e., Phosphorus-Potassium (PK) fertilisation.

Contrary to what was expected, the proportion of farmers receiving chemicals was low, with only 16.3% (n=58) of the respondents indicating that they received agrochemicals. If agrochemicals are used properly, they have the potential to significantly influence the yield when other factors remain constant (Mabe et al., 2017). Agrochemicals increase productivity, curtail pests, and treat or control diseases and thereby enhance food security (Omari, 2014). Agrochemicals for crop production use are Plant Protection Products (PPPs). The PPPs are categorised in several groups such as insecticides, herbicides, fungicides, rodenticides fumigant and insect repellants. Pesticides are chemicals designed to kill, reduce, or repel pests (Keulemans et al., 2009). Diseases in crop farming is another constraining element that influence households' welfare by decreasing crop productivity, yield, and food production.

5.7.2. Challenges faced by beneficiaries of PKM programme

The challenges experienced by farmers receiving service from the PKM programme are discussed in the subsections that follow.

a) Availability and /or non-operational of storage, packing and milling facilities

The findings of this study indicated that most of the households in the NKLM did not have access to appropriate storage facilities. The use of sacks, metal drums and local traditional structures to store grain produce noted in this study was also observed by Thamaga-Chitja et al. (2004) who indicated that using these storage methods is common among resource poor farmers who have no access to modern storage such as silos. This is disturbing because the DARDLEA in 2010 constructed two maize mills in the study area which although equipped with silos for storing grains are not operational (DARDLA, 2013). The non-operational status of the maize mills has also been reported by Shongwe (2020). According to Masuku (2013) storage facilities perform fundamental role in assuring household food security. Therefore, if the two maize mills in the study area were to be operationalised, it is likely to help the households in the study area to avoid produce wastage and contribute positively towards household food security.

b) Marketing challenges

It has been noted in this study that most of the households did not sell or did not have access to any market. This observation indicates that most of the households in the study produce only for household consumption. Among the few households that sold their produce, they sold it to their neighbours and at village markets.

Access to retail formal markets was very low. Although less than half the respondents in this study did not have access to markets, this number was encouraging considering that one of the aims of the PKM programme is to assist farmers producing more than the household consumption requirements to access value chain (DARDLA, 2013). However, the number of beneficiaries that had access to formal markets were much lower than that was reported by Masoka (2014). In the latter study, it was found that 30% of farmers benefiting from PKM programme sold their produce to formal markets, as opposed to the 0.6% (n=2) respondents in the current study. This indicates that access to formal markets in the study area remains a main challenge among smallholder farmers. The challenge of formal market access is also substantiated by Masoka (2014) who identified lack of access to markets as one of the problems faced by farmers benefiting from the PKM programme. Other authors showed that lack of market access is one of the main challenges limiting production, and result into food losses (Mutero et al., 2016). Improved access to markets is a requirement and test for farmers' ability to graduate from

subsistence to commercial farming (Matlou, 2018). In view of this, there is a need to improve market access in the study area if farming is to be transformed so that it ceases to be predominantly subsistence.

The other marketing related challenge that households in the present study encountered included poor transport infrastructure, lack of transport to the market, long distance to markets and lack of marketing facilities. The findings by Khapayi and Celliers (2016) also identified lack of transport to the markets and poor market infrastructure amongst small-scale farmers in their study that was conducted in King William's Town, South Africa. According to Makombe et al. (2010) financing the construction and upgrades of roads connecting farmers to markets, may increase farmers' incomes and ability to buy production inputs and sell produce by reducing transportation costs.

Lastly, the lack of marketing facilities reported in this study are exacerbated by transportation costs arising from farmers having to travel long distances to markets and marketing facilities. In view of this, Shongwe (2020) confirmed that the DARDLEA had planned to investigate on the possibilities of establishing the Nkomazi Agricultural Hub in the study area during the 2020/21 financial year and construction would subsequently commence with the hope that transportation costs in the study would be reduced. According to Shongwe (2020) in areas such as Ehlanzeni and Gert Sibande Regions, where similar hubs are already operational, creation of linkage with markets has led to increased access to markets both locally and national. Furthermore, Mutero et al. (2016) is also of the same view and suggests that direct access to marketing facilities prevents exploitation of farmers by middlemen and cuts down the transportation costs. In support of this view, Makombe et al. (2010) points out that farmers require trustworthy access to markets to be capable to market their produce and buy-production inputs. Food insecurity among households decreases with a decrease in distance to the market due to savings in transportation costs.

c) Late delivery, insufficient and poor quality of production inputs

As much as most households indicated that they benefited from the PKM programme in that they were supported with production inputs, the study found that households faced various challenges associated with the timing of delivery of production inputs. For example, it was evident that production inputs were distributed too late during the production season to participants of this study. This finding concurs with Shabangu

(2015) who identified that the late delivery of production inputs as one of the challenges faced by beneficiaries of this programme at Bushbuckridge Local Municipality of the Mpumalanga Province. Late delivery of production inputs delays planting (Masoka, 2014), crop management practices and negatively affect yields and subsequently food security (Masoka, 2014; Matlou, 2018). The late delivery of production inputs noted here could be caused by poor planning and implementation and overall coordination of the programme, which could be avoided (Masoka, 2014).

Furthermore, the study established that the seeds provided by the PKM programme were inadequate and at times of poor quality. This could be contributing factor to the small areas that are planted and subsequently failing to address food insecurity reported in this study. It is therefore important that the seeds supplied to the farmers are of good quality. This is because quality or improved seeds are bred to produce high yields and quality crops while at the same time being drought tolerant, disease resistant and early maturing (Ojiewo & Pillandi, 2020). The quality of seed is essential in the production of agronomic and horticultural crops by increasing agricultural productivity (Dhliwayo, 2019). It is thus by far the efficient and most useful way of realising food security in the long run (Ojiewo & Pillandi, 2020). However, as observed in the present study and other authors (Matlou, 2018), these seeds are inaccessible to most small-scale farmers due to high prices (Dhliwayo, 2019). Therefore, while the effort made to make these seeds accessible to the beneficiaries by the programme is commendable, the fact that the seeds are inadequate and at times of poor quality is likely to negate the intended goal for the programme to supply these seeds.

d) Limited number of tractors and implements for mechanisation

The finding with respect to the inadequate number of tractors is consistent with that of Masoka (2014) who found that the tractors allocated to the farmers in each municipality can hardly meet the demand during the summer production season. This is because the demand is time and season based. A possible solution to this, is for some to start planting early or too late. However, this is not possible since most of the crops in the study area are rain fed. Therefore, this situation where available tractors are not sufficient to service the farmers is likely to lead to the programme not achieving its intended purpose.

5.8. Proposed framework for improvement of food security status of the PKM programme beneficiaries

The fifth objective of this study involved developing a framework for improving the food security status of the programme beneficiaries. The results of the study together with the literature reviewed were used to develop and propose a framework which can be used to manage the PKM programme with a view to improve the food security status of the beneficiaries. The proposed framework (**Figure 5.1**) is presented in this section.

As indicated in chapter 4 of this study, the implementation of the PKM programme faced several challenges that have an effect on the optimal performance of the programme, and these included provision of the following: mechanisation, production inputs and access to markets as well as infrastructure and facilities supporting production, storage, processing and marketing of produce. Other authors (Pradhan et al., 2018) have also observed that provision of these resources is critical in stimulating food production and subsequently improving the food security status among small-scale farmers. This view is also supported by Temple and Steyn (2016) who noted that farmers need production resources in order to produce enough quantities and quality of food. Therefore, findings of this study, and those by other authors suggest that these resources are key or fundamental in delivering an effective programme like the PKM programme, and ultimately improving the food security status of the beneficiaries. As mentioned under chapter 2, section 2.12 implementation of mechanisation, provision of production inputs and extension and advisory support were identified as the main pillars of the PKM programme (DARDLA, 2013). However, the results of the study showed that although there is effort to deal with these challenges, there is room for improvement to address issues like agricultural inputs not being sufficient, not delivered on time and not being of good quality. In view of this, there is a need for a framework to help improve the performance of the PKM programme and in turn improve food security.

The proposed framework (**Figure 5.1**) is based and adapted from the sustainable livelihood framework. According to Serrat (2017), the sustainable livelihood framework uses the views and interests of those affected to identify constraining factors and prioritise actions that create enabling environment to enhance livelihood outcomes. Therefore, the first activity for this proposed framework involved grouping the identified main elements of the PKM programme according to the livelihood assets, while the elements of food security (i.e., availability, accessibility, utilisation and stability) were regarded as livelihood

outcomes. The purpose is to show the contribution of the different elements of the PKM programme to the elements of food security.

The elements of the PKM programme were thus grouped into physical, human, financial and natural assets as suggested by Serrat (2017). Secondly, the framework proposes public-private and inter-departmental partnerships to be formulated to ensure smooth facilitation of PKM programme. This is referred to as the institutions in the framework. Thirdly, activities that need to be prioritized were also identified and their contribution explained. Lastly, the outcomes and how they could be achieved are discussed.

5.8.1. Physical assets

The tractors, implements, seeds, fertilisers, chemicals, garden tools, storage facilities and other infrastructural support provided by the PKM programme were considered as physical assets (Serrat, 2017). In this study, even though these physical assets were provided, they were usually delivered late (see *section 4.7.2*). The framework thus advocates for improvement and timeously delivery of all the necessary physical assets. This notion is supported by Masoka (2014) who recommends that the PKM programme should plan timeously to ensure proper implementation and overall coordination of the programme to avoid late distribution of mechanisation and production inputs. Late distribution of production inputs impedes planting and negatively affects yields and food security (Masoka, 2014; Matlou, 2018).

The present study also revealed that the seeds provided by the PKM programme are usually of poor quality (especially vegetables seeds). In addition, they are often not sufficient to cover all targeted beneficiaries as seen in chapter 4 (cf. *section 4.7.2*). This framework proposes that DARDLEA should procure high quality seeds directly from reputable suppliers of seeds, and not from opportunistic middlemen and entrepreneurs who can potentially take advantage of the government procurement system and not deliver inputs of the required standards. This could be achieved by DARDLEA forming partnerships the Agricultural Research Council (ARC) which in any case, is a subsidiary of the National Department of Agriculture. Furthermore, the ARC is already involved in a number of initiatives that are aimed at developing high quality seed varieties.

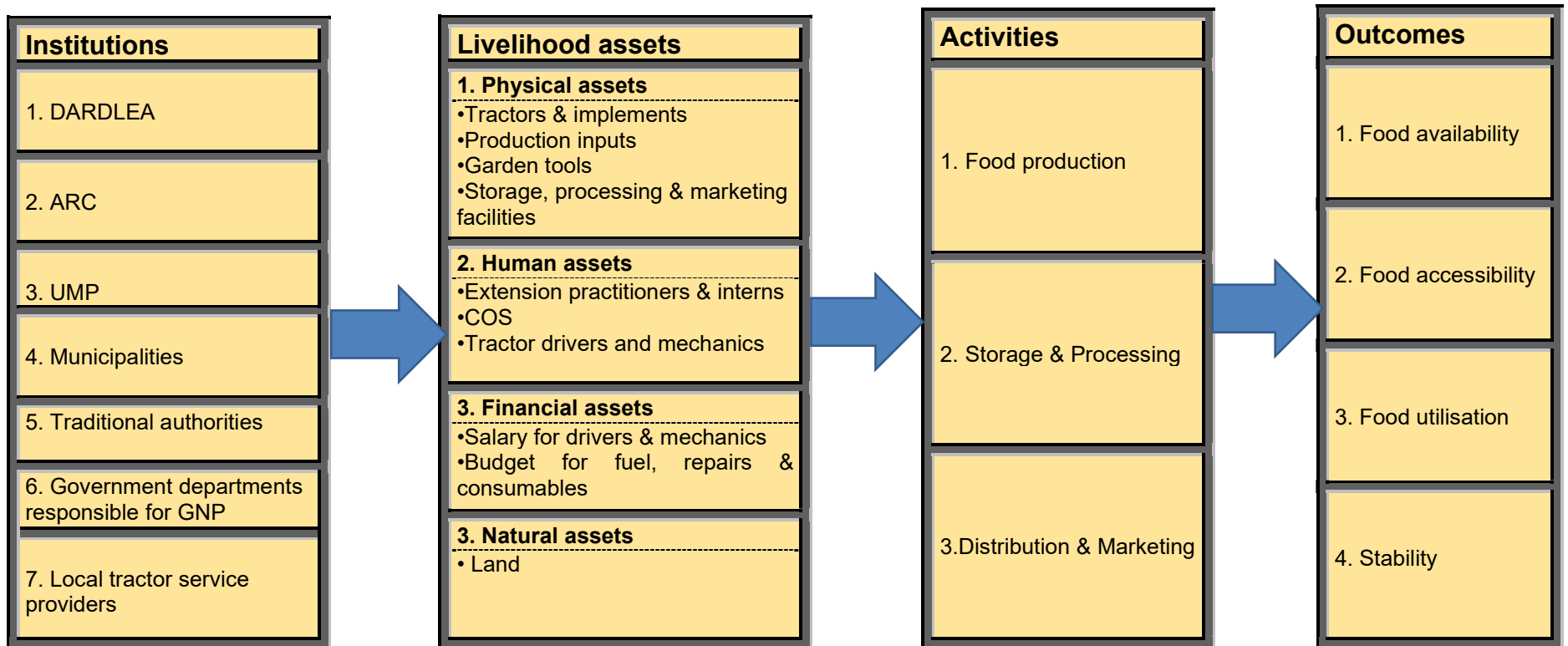


Figure 5.1: Framework for improvement of food security status of the beneficiaries of the PKM programme

The quantity of seeds to be procured should be informed by the planned hectares to be ploughed and planted in a particular season. According to Hasanuzzaman (2015), the quality of seeds play is essential in increasing yields and attaining food security. Therefore, access to quality seeds can significantly contribute to food availability, accessibility and utilisation. Increased yields will not only ensure that household are producing enough for their consumption but also have surplus which they can sell to generate income.

With regard to tractors and implements, this study revealed that the programme has a limited number of tractors and implements for mechanisation service (see *section 4.7.2*). This results into failure of the programme to meet the set targets for mechanisation service (Shabangu, 2015). The framework proposes that a sufficient number of tractors and implements for mechanisation service should be allocated to the co-operatives in their respective municipalities to meet the high demand especially during the summer production season. The programme could also consider contracting local service providers to supplement the available fleet of tractors. This has potential to help to create employment and ensure that money revolves locally and thus boosting the local economy.

Additionally, qualified mechanics should be appointed and allocated in the respective municipalities to deal with maintenance and breakdown of tractors. This will ensure that the planting programme is not adversely affected. Starting too early or too late with the planting disadvantages the farmers because most crops farmed by the households depend on rain during the summer production season (Masoka, 2014). The DARDLEA should also ensure proper maintenance of the mechanisation fleet to ensure uninterrupted service. The DARDLEA could form partnerships with local existing private businesses in tractor fleet management so that they empower the cooperatives and assist in maintenance. Poor maintenance of the government tractors was identified as another factor contributing to the failure of the PKM programme to cover planned targets (Grobler, 2016).

The framework also proposes an urgent need for capitalisation, revitalisation and full operationalisation of all the available storage and small-scale maize milling facilities in

the province. Inaccessibility of storage and processing facilities in the NKLM was identified by the participants of this study and in literature as a major hindrance to effective running of the programme (DARDLA, 2013; Shongwe, 2020). Proper food storage and processing are critical in ensuring that farmer's produce do not go to waste (Teng & Escaler, 2010). Food should properly be processed (Adeyeye, 2017) and stored (Masuku, 2013) to realise food security. According to Siebert et al. (2016) food (agro) processing simply refers to the processing of agricultural products into food for human and/or animal consumption and other uses. Regarding food availability, accessibility and utilisation by households, this framework is supported by previous authors (Kgaphola & Boshoff, 2002) who suggested that efforts to make food available and accessible will be useless if households are unable to process and/or store, prepare and consume the food in a manner that optimum nutritional benefits are gained from the food once they have produced and accessed it.

The framework (**Figure 5.1**) proposes marketing and distribution facilities as they are deemed essential in growing farm incomes and subsequently food access. The marketing and distribution facilities along with channels are essential as they provide producers an opportunity to sell the surplus produce and generate income (Rutten et al., 2011). It transpired from the results of this study that farmers benefiting from the PKM programme did not have access to formal markets (see *section 4.7.2*). Mutero et al. (2016) argue that inaccessibility of markets discourages farmers to produce more because their produce perishes. In this framework the Government Nutrition Programme (GNP) is seen as having a great potential in affording farmers direct access to markets, as suggested by (Molotja, 2019) in the proposed framework to empower community members and promote local food production. In fact, Molotja (2019) is of the view that the GNP such as school nutrition programme could create markets for smallholder farmers and subsequently support the development of rural people.

5.8.2. Human assets

The PKM programme provides support in the form of extension and advisory services (DARDLA, 2013). These services are regarded as part of human assets as they provide skills and knowledge that enable farmers to produce (Roche, 2007). The results of this study indicated that access to extension and advisory services was generally low in the

NKLM due to shortage of personnel and transport (see *section 4.7.1*). The proposed framework also advocates for improved access to extension services by appointing enough personnel to meet the extension officer to farmer ratio of 1:400 prescribed by DAFF (2011) and to adequately facilitate them with transport. This can be achieved by either provision of government subsidised or state-owned vehicles to ensure that the PKM programme is properly monitored and implemented. Moreover, access to extension services can also be improved by appointing interns and allocate them to the smallholder farmers. Partnerships can also be developed with the University of Mpumalanga (UMP) through the community engagement programme by providing expert advice to the small-scale farmers, thus increasing the number of personnel available to farmers. The provision of agricultural extension and advisory services is essential for improving the knowledge and skills base for the households that can be used to improve seed, crop rotation, intercropping, using drought-resistant crop, using irrigation, crop protection, harvesting, storage and marketing (Baloch & Thapa, 2018). Several authors support this view and have noted that access to agricultural advisory services either through long-term training programmes or short-term extension visits boosts agricultural yield (Baloch & Thapa, 2018), increases household food security (Ijatuyi et al., 2018), improves rural livelihoods and promotes farming as a mechanism for economic growth of the poor people (IFPRI, 2020). In addition to access to extension and advisory services, the DARDLEA should provide refresher classes for extension officers to improve their skills and knowledge to meet the ever-changing agricultural practices. The latter can also be achieved through partnerships with institutes of higher learning in the area like the UMP.

In addition to the improved access to advisory services, the proposed framework further suggests that a Council of Stakeholders (COS) for PKM programme be formed at village, ward and municipal level to ensure effective communication and planning as well as transparent implementation and overall co-ordination of PKM programme. The COS should comprise of farmers representatives, officials from the DARDLEA and NKLM, ward councillors and representatives of traditional leaders. The COS can address problems that arise in connection with the implementation of the PKM programme.

5.8.3 Financial assets

The mechanisation service of the PKM programme needs a budget to pay salaries for drivers and mechanics as well as the procurement of repair parts, fuel and lubrications to function. The aforementioned budgetary necessities of the mechanisation service are considered as financial assets. As mentioned in the preceding sections, to augment the budgetary needs, there is a certain category of farmers that are already paying for the service. It is envisaged that as agricultural production increased as a result of proposals made here, more farmers will soon be able to pay as their farm income increases. It is much appreciated that the programme has put farmers on the lead of managing the mechanisation service by allocating tractors and implements to individual farmers, co-operatives and commodity groups that have both interest and potential to run the fleet (DARDLEA, 2019). This will also increase the points of accessing tractors.

This framework proposes that salaries for tractor drivers and mechanics should be well budgeted throughout the year. The farmers' financial contribution to access mechanisation service rises when drivers and mechanics salaries are not catered in the budget of the programme. The best way is to employ them on an annual contractual basis through the EPWP. The framework further indicates that income as a financial asset also influence household food access. According to Temple and Steyn (2016) households need income to obtain food from the market that they cannot produce. Other authors (Riely et al., 1999) mentioned that such income may come from wages, salaries and other income generating activities. However, in the context of the PKM programme, this proposed framework insists on the farm income. This income is depended on sales of produce that come direct from the households' own production and/or have undergone either storage and/or processing or distribution and marketing producer sub-systems. It has transpired from the findings of the study that households in the NKLM had low farm income (see *section 4.2.2*). This is very worrisome as income in rural areas is normally derived from household food production. Access to such income affect the capacity of households to access the different food types (Pieters et al., 2013). In addition, several authors (Cheteni et al., 2020; Sambo et al., 2017) proved that farm income and household food security are positively connected.

5.8.4. Natural assets

Land is part of the natural asset (Serrat, 2017). It was established in the present study that the beneficiaries of the PKM programme operate on smaller size of land (see *section 4.2.2*). According to Jeminiwa et al. (2018) farm size influences the level of production. Khumalo and Sibanda (2019) are of a similar view that small plots of farming land are correlated with low yields that negatively affect household food security. The government should use the land reform programme to provide land in order to increase the farm size of participating households because land is the centre of agricultural production.

5.9. Summary of the chapter

This chapter provides a thorough discussion of the results presented in the previous chapter with adequate reference to literature to support the research findings. The findings of this study are comparable with observations by other researchers globally. The findings of the study were critically analysed and synthesised in this chapter. Furthermore, the critical analysis and synthesis of the findings of the study assisted in the presentation of the proposed framework for improvement of food security status of the PKM programme beneficiaries in this chapter. The proposed framework focused on the roles that institutions should play to ensure adequate support with livelihood assets which influence all the activities in the agricultural value chain, which on turn have an effect on the four pillars of food security as an outcome.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1. Recapitulation of the aim and objectives of the study

The aim of this study was to determine the food security status, and factors associated with food security among households benefiting from the PKM programme in the NKLM, and to assess the challenges faced by the programme. Based on the aim of the study, six objectives were formulated as follows: (i) Determine the household food security status of the households benefiting from the PKM programme (ii) identify factors that are associated with food security among the agricultural households benefitting from the programme (iii) identify factors associated with dietary diversity among the agricultural households supported by the PKM programme (iv) identify the coping strategies used by beneficiaries of the programme to deal with household food shortages, (v) describe the challenges and types of assistance received by beneficiaries of the PKM Programme and (vi) develop a framework for improvement of food security status of the programme beneficiaries.

6.2. Overview of the conclusions of the study

A general overview of the conclusions is presented in this section. The conclusion is based on the findings of the study with reference to the objectives the study set out to achieve.

6.2.1. Conclusion on the socio-demographic characteristics of the participants

The study observed that participants in the programme were predominantly from vulnerable groups such as the elderly farmers, females and participants with low education levels, large household size and low farm income. This is a positive finding which suggest that PKM programme is reaching the intended target market.

6.2.2. Conclusion on household food security status of the households benefiting from the PKM programme

The first objective of the study was to determine the food security status of the households benefiting from the PKM programme. Although food security status of the beneficiaries of PKM programme has been studied before, the present study is the first to present an

evaluation of food security status of the beneficiaries of the PKM programme using standardised tools such as the FSI, HFIAS and HDDS to measure food security. The findings of the study showed that food insecurity amongst the households studied was very high, and in fact, it was double the national (20.2%) and provincial (28.4%) household food insecurity levels. However, despite the high food insecurity in this area, it is worth noting that none of the respondents in the study qualified to be classified as being severely food insecure. Furthermore, it is worth noting that most households participating in the PKM programme had a medium HDDS, which is the same dietary diversity level of the households in the Mpumalanga Province and South Africa in general. Based on this, it thus concluded that although the PKM programme has not managed to decrease the number of food insecure households in this area, it has made a significant impact on reducing the severity of food insecurity.

It was observed that a high number of respondents in this study consumed vegetables in the reference period, which suggests that the PKM programme has had a positive impact on vegetable consumption. However, other food groups such as fruits and protein (including beans, fish, dairy and meat products) were not widely consumed in the study area. It can thus be concluded from these findings that respondents lacked information of the cheaper sources of protein, or they do not appreciate the value of these cheap sources of proteins and hence need to be encouraged to avoid risk of protein deficiency.

6.2.3. Conclusion on the factors associated with food security among the agricultural households

The major factors that were positive and significantly associated with food security in the study area were marital status, level of education and annual farm income. Therefore, these three factors should be considered when designing programmes to promote food security among these agricultural households.

6.2.4. Conclusion on the factors associated with dietary diversity among the agricultural households supported by the PKM programme

The annual farm income, age and level of education achieved of household head were significantly and positively correlated with higher HDDS. Therefore, strategies that enhance farm income and level of education should be prioritised to boost household

dietary diversity in the study area. Furthermore, agricultural training and nutrition education awareness programmes should be encouraged to provide knowledge of the importance of food and nutrition, as well as offer practical guidance on how to grow and prepare nutritious foods.

6.2.5. Conclusion on the coping strategies used by households to deal with food shortages

Two main categories of the coping strategies that were utilised by respondents when faced with food shortages were namely: increasing short-term food availability and dietary changes. The fact that majority of the respondents did not adopt severe and irreversible strategies, serves to confirm as demonstrated by the HFIAS and HDDS results, that food insecurity in the study area is not severe. In addition, based on the coping strategies adopted by the households it can be concluded that farming is an affordable and sustainable strategy for reducing food insecurity.

6.2.6. Conclusion on the challenges and types of assistance received by beneficiaries of PKM Programme

The households that participated in the PKM programme received the following assistance to help boost their agricultural output: mechanisation services, production inputs, extension and advisory services and infrastructure support. On the other hand, the same households (beneficiaries of the PKM programme), encountered the following challenges in: -

- Lack and /or non-operational of storage, packing and milling facilities.
- Lack of marketing facilities and inaccessibility of formal markets.
- Late delivery and/or insufficient and poor quality of production inputs.
- Insufficient number of tractors and implements for mechanisation.

The above factors negatively affect food production among beneficiaries of the PKM programme. These conditions lead to beneficiaries of the programme losing their harvest to wastage. These conditions in addition, compel the beneficiaries to sell their harvest below market rates to avoid spoilage due to lack of storage facilities, packing and milling facilities as well as lack of marketing facilities and inaccessibility to formal markets.

6.2.7. Conclusion on the framework for improvement of food security status of the PKM programme beneficiaries

This study borders on virgin research territory. This is the first study to propose framework for improvement of the food security status of the beneficiaries of the PKM programme. There is a need to integrate different skills and knowledge of specialists such as nutritionists, extension workers, researchers and land reform practitioners in the PKM programme for the programme to be able to realise its intended goals more efficiently. Based on the proposed framework, the key strategic elements of the programme necessary for improved impact of the programme include timeous and adequate provision of production resources and operationalisation of all the available storage and agro-processing facilities. Emphasis should be placed on these factors to address bottlenecks that hinder the realisation of the goals of the programme.

6.3. Contribution of the study to knowledge

In the Mpumalanga Province, very few studies (Grobler, 2016; Masoka, 2014; Shabangu, 2015) have investigated food security status and the challenges of beneficiaries of the PKM programme. Moreover, this is the first study to investigate the food security status of the beneficiaries of the PKM programme using the standardised tools of measuring food security. It is also the first time to identify the factors associated with food security and dietary diversity of the beneficiaries of the programme. In addition, there is no evidence of prior studies that have proposed a framework for improving the food security status of the beneficiaries of the PKM programme. Therefore, this study adds to the body of knowledge of food security status by identifying for the first-time factors correlated to food security and dietary diversity, and the challenges of the beneficiaries of the PKM programme. The findings of this study can be used to develop suitable policies and strategies to address food insecurity and low dietary diversity of the beneficiaries of the PKM programme. The findings of the study also add to improved understanding of the challenges faced by the beneficiaries of the programme, and the effect these challenges have on food production and food security. The proposed framework indicates the effect of the livelihood assets, which are part of the PKM programme together with the institutions, on the activities such as food production, storage and processing, distribution and marketing. The latter influence the elements of food security leading to improvement in the status of food security of the beneficiaries of the programme. Therefore, this study

can be used by different stakeholders such as nutritionists, extension workers, researchers and land reform specialists to develop a holistic approach to address food insecurity.

6.4. Recommendations

The following policy measures aimed at improving households' food security status in the study area are recommended:

6.4.1. Recommendations for agricultural/farming households

- Given that a large proportion of the farming community in this study was over 60 years of age, the programmes should include making agriculture more appealing to the youth to safeguard the future of agriculture and household food production in the study area.
- Taking into consideration the low consumption of protein and fruit, nutrition education programmes should also be introduced to create awareness about cheaper sources of protein such as pulses which are easier to produce than other crops. Increased awareness of such sources of protein could translate into increased interest in growing them as part of the programme, with subsequent inclusion of such sources of proteins in the diets of the beneficiaries. Mixed farming that includes rearing of poultry as part of the programme could also contribute to improved access to meat and other chicken products like eggs.
- Given that low farm income levels were a significant predictor of food insecurity in the area, there is a need for participants to diversify income sources to supplement the farm income. In light of the fact that the majority of the respondents belonged to the advanced age category, moreover with low education levels, social support grants such as the old-age grant should be maintained to help boost the levels of household or farm income.
- The positive correlation between marital status and food security, suggests that more effort to encourage participation of vulnerable groups such as widows in rural development programmes and activities are needed.
- There is a need for more effort to be put in increasing the farm size for each participating household. The rural land reform programme can help to ensure that

farmers have accessed to farms of larger size. This has potential to improve yield and household food security.

6.4.2. Recommendations for the PKM programme

Based on the proposed framework for improving the food security status of the households, the PKM programme should focus on the following:

- Timeous and adequate provision of production resources such as seeds, fertilisers, chemicals, extension services and tractors with proper implements.
- Capitalisation, revitalisation and full operationalisation of all the available storage and small-scale maize mill facilities in the province.
- Establishment of marketing facilities and assistance of farmers to access formal markets.

6.4.3. Recommendations for the development and implementation of similar interventions

- Integration of different skills and knowledge in the development and implementation of similar food security programmes is required to be able to realise the intended goals of the programme. Collaborations between different stakeholders such as nutritionists, extension workers, researchers and land reform specialists should be encouraged in order to develop a holistic approach to addressing food insecurity. For example, nutritionists could assist in the forming of nutrition sensitive gardens.

6.5. Recommendations for future research

Focusing on only agricultural households that benefitted from the PKM programme during the 2018/19 production season in the NKLM limited the scope of this study. Therefore, a broader targeted study area and a broader targeted study group would expand the horizon of this research. This could offer additional dynamics for further interrogation such as investigating the other elements food security, data collection during different seasons and comparisons between beneficiaries and non-beneficiaries. A comparative food security study between beneficiaries of the PKM programme and non-beneficiaries may go a long way towards unpacking the perceived benefits of participating in the programme especially in the absence of baseline data. Lastly, the present study showed marital

status and dietary diversity were negative correlated. In view of this, more studies are needed to help improve on understanding marital status-based barriers in achieving high household dietary diversity.

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APPENDIX A1: QUESTIONNAIRE

PART 1: AGRICULTURAL HOUSEHOLD SURVEY QUESTIONNAIRE

ANALYSIS OF THE FOOD SECURITY STATUS OF PHEZUKOMKHONO MLIMI BENEFICIARIES, NKOMAZI LOCAL MUNICIPALITY, SOUTH AFRICA
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FOR OFFICIAL USE

ENUMERATOR NAME	
DATE OF INTERVIEW	
NAME OF VILLAGE/ TOWN	
NAME OF WARD	
NAME OF MUNICIPALITY	NKOMAZI LOCAL MUNICIPALITY
NAME OF DISTRICT	EHLANZENI DISTRICT
QUESTIONNAIRE NO.	

SECTION A: DEMOGRAPHIC INFORMATION OF AGRICULTURAL HOUSEHOLD

1. **[AGE]** What is your age?

2. **[AGER]** Age range

Age Group	1. 18-21 years	1
	2. 22-30 years	2
	3. 31-40 years	3
	4. 41-50 years	4
	5. 51-60 years	5
	6. 61-70	6
	7. 71-80	7
	4. greater than 81 years	8

3. **[GEND]** Indicate your gender

1. Male	1
2. Female	2

4. **[DISA]** Are you living with disability?

1. Yes	1
2. No	2

5a. **[MS]**.What is your marital status?

1. Single	1
2. Married	2
3. Divorced	3
4. Widowed	4

5b. **[MT]**. If married, what type of marriage are you in?

1. Polygamy	1
2. Monogamy	2

6a. **[LEDU]** What is the highest level of education achieved?

1. No formal education	1
2. Less than Grade 12 education	2
3. Grade 12 / Matric certificate	3
4. Tertiary Education (Diploma, Degree etc.)	4

6b. Number of years in schooling: _____

7. **[BHHH]** Are you a breadwinner or head of the household?

1. Yes	1
2. No	2

8a. **[HHS]** What is the size of your household?

8b. **[RHHS]** Range of household size

1. 1-5	1
2. 6-10	2
3. 11-15	3
4. 16-20	4
5. Greater than 21	5

9. **[DR]** Division of inactive labour force to active labour force in the family (Dependency ratio)

$$\frac{[A+C]}{B} = \dots\dots$$

How members of the household are in the following age group

1. Less than 14 years	A=
2. 15-64 years	B=
3. More than 65 years	C=

10. **[MFEXP]**.What is the monthly food expenditure in your household?
R.....

SECTION B:

FACTORS THAT ARE CONNECTED WITH FOOD SECURITY AMONGST THE AGRICULTURAL HOUSEHOLDS BENEFITTING FROM THE ME / PKM PROGRAMME.

11. **[TFE]** What is the type of your farming enterprise?

1. Crop	1
2. Livestock	2
3. Mixed farming / Both crop and livestock farming	3

12a. **[FEXP]** What is your years of farming experience?

12b. **[REXP]** Range of years of farming experience

1. 1- 5 years	1
2. 6-10 years	2

3. 11-15 years	3
4. 16-20 years	4
5. 21 years and above	5

13. Indicate number of hectares for your farm/household

1. Less than 3 ha	1
2. between 3-5 ha	2
3. Between 5-10 ha	3
4. More than 10 ha	4

14. **[MAJC]** What are the major crops grown in your farm in the last production season?

Crop	Tick	Area planted (Ha)	Rank in terms of household consumption	Rank in terms of income generation
Maize				
Ground nuts				
Beans				
Jugo Beans				
Spinach				
Cabbage				
Potato				
Carrot				
Pepper				
Tomato				
Butternut				
Pumpkin				
Beetroot				
Onion				
Other (specify)				

15. **[FICC]** Which factors influence your choice of crops/vegetable in any production season? Please rank them in order of importance, (where 1 denotes most preferred)

Factor	Rank
[SF] Staple food	
[GY] Good yield	
[AW] Availability of water	
[CLIM] Climate	
[MAN] Easy to manage	
[MARK] Easy to market	

[OTHERF] Other (specify)	

16. **[PEST]** How did you deal with pests on your field crops during the past production season? Choose one best method applied

1. Did not take any measure	1
2. Selection of pest / disease resistant plant species/varieties	2
3. Pesticides/ Fungicides (chemicals)	3
4. Mixed/ inter cropping	4
5. Plant spacing	5
6. Other (Specify)	6

17. **[WEED]** How did you control weeds on your farm during the past production season? Choose one best method applied

1. Did not take any measure	1
2. Hand weeding	2
3. Herbicides	3
4. Use of fast emerging crop varieties	4
5. Other (specify)	5

18. **[HARV]** How did you make the decision when to harvest the crop during the past production season? Choose one best method applied

1. Maturity	1
2. Danger from theft	2
3. Market price	3
4. Other (specify)	4

19a. **[STORE]** Does your household have access to any storage facility?

1. Yes	1
2. No	2

19b. **[STOLAC]** If YES to 19a: Which are they?

1. On Farm	1
2. In House	2
3. Co-operative	3
4. Public	4

19c. **[TYPSTO]** If YES to 19a: how did you store the produce during the past production season?

1 In locally made traditional structure	1
2. In modern store e.g. silo, pack-house, warehouse etc.	2
3. In Sacks/open drum	3
4. In airtight drum	4
5. Other (specify)	5

20. **[PROT]** How did you protect your stored crops in the past production season? Choose one best method applied

1. Did not take any measure	1
2. Ashes	2
3. Pesticides/insecticides	3
4. Cow dung	4
5. Others (specify)	5

21a. **[LOSS]** Did you suffered any losses of crop in the past production season?

1. Yes	1
2. No	2

21b. **[MRL]** If yes in 21a, what are the main reasons for the loss?

- i.
- ii.
- iii.
- iv.

22a. Did you managed to sell your produce from the previous harvesting time?

1. Yes	1
2. No	2

22b. **[SELL]** If yes to 22a. Where did you sell your produce in the past production season?

1. In the village market	1
2. On the roadside	2
3. In the nearest village market	3
4. To the Neighbours	4
5. Sell to hawkers	5
6. Other (specify)	6

23. **[ENC]** What challenges did you encounter when selling your produce? **Multiple answers possible.**

1. Poor Transport Infrastructures	1
2. Lack of transport to the market	2
3. Low prices	3
4. No formal market	4
5. Low demand	5
6. Long distance to market	6
6. Others (Specify)	7

24. **[ADCH]** How did you address these challenges?

- i.
- ii.

iii.

iv.

25. **[CHAG]** What are the three main challenges you encountered when growing crops in the past season?

i.

ii.

iii.

26. **[INCOME]** what was the annual farm income over the last year? R.....

27. Are you engaged on other non-farming activities that generate income?

1. Yes	1
2. No	2
If yes, specify:	

28a. **[TRAIN]** Have you ever received training on crop production?

1. Yes	1
2. No	2

28b. **[SKILL]** If yes in 28a, specify the type of training and the organization responsible for the training

Type of training	Organisation

28c. **[BENT]** Was the training beneficial to you?

1. Yes	1
2. No	2

29. **[FUTR]** Which other areas of farming do you require training?

- a)
- b)
- c)
- d)

30. **[STOCK]** Type of livestock rearing

Livestock	Cattle	Sheep	Goats	Chickens	Chickens	Pigs	Other (specify)
				Broilers	Layers		
Numbers							

31. **[INC]**.What is the main source of income in your household?

a) Farm income [FINC]	1. Sales of produce	1
	2. Leasing of land	2
	3. Leasing of farm equipment and machinery	3
	4. Other farm income(specify)	4
b) Non-Farm Income [NFINC]	5. Social grants	5
	6. Retirement funds	6
	7. Wages	7
	8. Remittances	8
	9. Other (specify)	9

SECTION C: CHALLENGES AND TYPES OF ASSISTANCE RECEIVED BY BENEFICIARIES OF ME / PKM PROGRAMME

32a. **[EXSEV]** Do you have access to agricultural extension and advisory and services?

1. Yes	1
2. No	2
Comment:	

32b. **[EXTV]** if yes to 32a. Number of visits by Agricultural Advisors per season

1. Less than 3 visits	1
2. 4-6 visits	2
3. More than 7 visits	3
Comment:	

33a. **[TYPAME]** What type of assistance do you receive from ME / PKM Programme? **Multiple answers possible**

1. Mechanization/land preparation	1
2. Production inputs e.g. seeds, fertilisers, chemicals	2
3. Extension and advisory services	3
4. Infrastructure support e.g. fencing, boreholes, irrigation pipes etc.	4
OTHERS (Explain)	

33b. **[INPUT]** If received production inputs, what kinds of inputs? Multiple answers possible

1. Seeds	1
2. Fertilisers	2
3. Chemicals	3
4. Other (specify)	

33c. **[CHEM]** If received chemicals, what kind of chemicals? Multiple answers possible

1. Herbicides	1
2. Pesticides	2
3. Fungicides	3
4. Other (specify)	

34. **[SUFF]** Is the assistance received from ME / PKM programme sufficient to enable you produce enough for household food security and sell the surplus to the market?

1. Yes	1
2. No	2
Explain:	

35. **[SEEDQ]** Please compare the quality of seeds provide by the ME / PKM Programme with seeds that you buy from local agricultural input shops.

Aspect of ME Seeds	Yes=1, No=2	Comments
1. Pest resistant variety		
2. Disease resistant variety		
3. Improved seeds		
4. Yield/Harvest		
5. Preferred by markets		

36a. **[TEST]** Did you do soil tests in your farm in the past 3 years?

1. Yes	1
2. No	2

36b. **[FERT]**. If yes to 36a. Do the fertilisers supplied by ME / PKM Programme match with the nutrients needs of your farm as determined by soil test results?

1. Yes	1
2. No	2
Comment	

37. **[YEILD]** How would you best describe the yield in your farm when using the service aid of PKM programme?

1.Poor	1
2.Average	2
3.Good	3

38a. **[MCHAL]** What challenges / problems have you experienced with the ME / PKM Programme?

- i.
- ii.
- iii.
- iv.
- v.

38b. **[SUGG]** Please recommend possible solutions for the above challenges Or Make recommendations to improve the service of the PKM PROGRAMME.

- i.
- ii.
- iii.

SECTION D: HOUSEHOLD COPING STRATEGIES DURING FOOD SHORTAGES

39. **[OSI]** Do you have any other source of income besides farming to help you cope during food shortages

1. Yes	1
2. No	2
If yes (explain)	

40a. **[INDIG]** Do you resort to indigenous food during food shortages?

1. Yes	1
2. No	2
If yes (explain)	

40b. **[SOURCE]** If yes, where do you get it from?

1. Collected from veld	1
2. Collected from fallow cropping fields	2
3. Planted in garden or field	3
4. Other (specify)	4

41. **[COPE]** Which of the following coping strategies do you use to deal with household food shortages?

Coping strategy	Always (3)	Sometimes (2)	Never (1)
1. Borrowing Money			
2. Rationing Money			
3. Skipping Meals			
4. Consumption of Unconventional Food			
5. Limit consumption by adults to allow young children to eat			
6. Seeking off-farm employment			
7. Dependence on help from relatives			
8. Purchasing food on credit			
9. Skipping meals for whole day			
10. Buying of less expensive food			
11. Selling durable assets			
12. Eating uncultivated/ wild vegetables and fruits			
13. Allowing children to eat first			
14. Picking of leftover food at social function			
15. Consuming seed reserve			
16. Harvesting immature food crops			
17. Selling livestock to buy food			
18. Withdrawal of children from school			
19. Limit portion size at mealtime			
20. Migrating to search job			

SECTION E: HOUSEHOLD FOOD SECURITY STATUS

42a. Household Food Insecurity Access Scale (HFIAS) (Tool adopted from Coates, Swindale & Bilinsky (2007))

Now I will ask you about your access to food over the period of the last four weeks (the previous month/30 days), and how often you may have encountered problems with getting food. Your responses will be a yes or no. if, Yes then you answer the follow up questions labelled as (a) (1) and No then you skip to the following question (0).

No.	Questions	Response Options	Code
1	In the past 30 days, was there ever no food to eat of any kind in your household because of lack of resources to get food?	No=0 (skip to 2) Yes=1	
1a	How often did this happen?	1=rarely (once or twice in the past 30 days) 2=sometime (three to eight times in the past 30 days) 3=often (more than eight times in past 30 days)	
2	In the past 30 days, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	No=0 (skip to 3) Yes=1	
2a	How often did this happen?	1=rarely (once or twice in the past 30 days) 2=sometimes (three to eight times in the past 30 days). 3=often (more than eight times in past 30 days)	
3	In the past 30 days, did you or any household member have to eat a limited variety of foods due to a lack of resources?	No=0 (skip to 4) Yes=1	
3a	How often did this happen?	1=rarely (once or twice in the past 30 days) 2=sometimes (three to eight times in the past 30 days). 3=often (more than eight times in past 30 days)	
4	In the past 30 days, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	No=0 (skip to 5) Yes=1	

4a	How often did this happen?	1=rarely (once or twice in the past 30 days) 2=sometime (three to eight times in the past 30 days) 3=often (more than eight times in past 30 days)	
5	In the past 30 days, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	No=0 (skip to 6) Yes=1	
5a	How often did this happen?	1=rarely (once or twice in the past 30 days) 2=sometime (three to eight times in the past 30 days) 3=often (more than eight times in past 30 days)	
6	In the past 30 days, did you or any other household member have to eat fewer meals in a day because there was not enough food?	No=0 (skip to 7) Yes=1	
6a	How often did this happen?	1=rarely (once or twice in the past 30 days) 2=sometime (three to eight times in the past 30 days) 3=often (more than eight times in past 30 days)	
7	In the past 30 days, was there ever no food to eat of any kind in your household because of lack of resources to get food?	No=0 (skip to 8) Yes=1	
7a	How often did this happen?	1=rarely (once or twice in the past 30 days) 2=sometime (three to eight times in the past 30 days) 3=often (more than eight times in past 30 days)	
8	In the past 30 days, did you or any household member go to sleep at night hungry because there was not enough food?	No=0 (skip to 9) Yes=1	
8a	How often did this happen?	1=rarely (once or twice in the past 30 days) 2=sometime (three to eight times in the past 30 days) 3=often (more than eight times in past 30 days)	
9	In the past 30 days, did you or any household member go a whole day and	No=0 Yes=1	

	night without eating anything because there was not enough food?		
9a	How often did this happen?	1=rarely (once or twice in the past 30 days) 2=sometime (three to eight times in the past 30 days) 3=often (more than eight times in past 30 days)	

42b. Household Dietary Diversity Score (HDDS) (Tool adopted from Swindale & Bilinsky (2006))

Now I would like to ask you about the types of foods that you and anyone else in the household **ate yesterday during the day and at night**. Your responses will be a yes or no. Yes, in the instances where you ate the food type (1) and No in the instances you did not (0).

Code	Food	Yes =1 No=0	Specifics
A (Cereals)	Any bread, mabele, rice, noodles, biscuits, scones, fat cakes, other food made from millet, sorghum, maize, wheat		
B (Tubers)	Any potatoes and sweet potatoes or any foods made from roots and tubers		
C (Vegetables)	Any yellow or orange and green vegetables		
D (Fruits)	Any fruits		
E (Meat)	Any beef, pork, lamb, mutton, chicken or other birds, liver, kidney, hearts and other organ meats		
F(Eggs)	Any eggs		
G (Fish)	Any fresh fish or dried fish		
H (Beans)	Any foods made from beans, peas or lentils		
I (Dairy products)	Any dairy products: milk, yogurt, cheese,		
J (Fats/Oils)	Any foods contain fat, butter or oil		
K (Sugar/Honey)	Any sugar or honey		
L (Condiments)	Condiments: tea, coffee, sauces, cool drink, juice		

END

THANK YOU

APPENDIX A2: SISWATI TRANSLATED VERSION OF THE QUESTIONNAIRE

SIGABA 1: IMIBUTO YELUHLOLO LWETEKULIMA EMAKHAYA

LUHLATIYO LWESIMO SEKUBAKHONA KWEKUDLA KUBAZUZI
BAPHEZUKOMKHONO MLIMI, KUMASIPALA WENDZAWO WASENKOMAZI,
ENINGIZIMU AFRIKA

KUTOSETJENTISWA LIHHOSIVI KUPHELA

LIGAMA LALOBALAKO	
LUSUKU LWENCONCISWANO	
LIGAMA LEMPHAKATSI/ LIDOLOBHA	
LIGAMA LELIWADI	
LIGAMA LAMASIPALA	MASIPALA WASENKOMAZI
LIGAMA LESIGODZI	SIGODZI SASEHLANZENI
INOMBOLO YEMIBUTO.	

INCENYE A: IMININIGWANE NGEKUHLELEKA KWEMAKHAYA LALIMAKO

1. **[AGE]** Uneminyaka lemingakhi budzala?

2. **[AGER]** Luhla lweminyaka

Umkhakha webudzala	1. Iminyala lengu 18 kuya ku -21	1
	2. Iminyala lengu 22 kuya ku -30	2
	3. Iminyala lengu 31 kuya ku -40	3
	4. Iminyala lengu 41 kuya ku -50	4
	5. Iminyala lengu 51 kuya ku -60	5
	6. Iminyala lengu 61 kuya ku -70	6
	7. Iminyala lengu 71 kuya ku -80	7
	4. Ngetulu kweminyaka lengu- 81	8

3. **[GEND]** Shano kutsi ubulili buni

1. Mdvuna	1
2. Msikati	2

4. **[DISA]** Ingabe uphila nekukhubateka?

1. Yebo	1
2. Cha	2

5a. **[MS]**. Ushadile nome Awukashadi?

1. Ushadile	1
2. Awukashadi	2
3. Udivosile	3
4. Ungumfelwa	4

5b. **[MT]**. Nangabe ushadile, ukuluphi luhlobo lwemshado?

1. Sitsembu	1
2. Unemlingani munye	2

6a. **[LEDU]** Ngusiphi sigaba lesiphakeme semfundvo lowafika kuso?

1. Awufundzanga	1
2. Gcine ngaphansi kwa-Grade 12	2
3. Grade 12 / sitifiketi sa-Matric	3
4. Imfundvo Lephakeme (Diploma, Degree, nalokunye.)	4

6b. Iminyaka loyicitse esikolweni: _____

7. **[BHHS]** Nguwe lowondla umndeni nome nguwe inhloko yemndeni?

1. Yebo	1
2. Cha	2

8a. **[HHS]** Ungakanani umndeni wakini?

8b. **[RHHS]** Luhla lwebungako bemndeni

1. 1-5	1
2. 6-10	2
3. 11-15	3
4. 16-20	4
5. Ngetulu kwa 21	5

9. **[DR]** Kwehlukani swa kwalabangasebenti nalabo labasebentako emndenini (Silinganiso sekwetsembela kulabanye)

$$\frac{A+C}{B} = \dots\dots$$

Emalunga emndeni lakuletigaba teminyaka letilandzelako

1. < Iminyaka lengu-14	A=
2. Iminyaka lengu-15 kuya ku-64	B=
3. > Iminyaka lengu-65	C=

10. **[MFEXP]**. Titsini tindleko tatinyanga tonkhe tekudla kwemndeni wakho?
R.....

INCENYE B:

TICI LETIHLLOBENE NESICINISEKISO SEKUTFOLAKALA KWEKUDLA EMAKHAYA LALIMAKO LAZUZAKO ELUHLELWENI LWE-MASIBUYELE EMASIMINI.

11. **[TFE]** Nguluphi luhlobo lwekulima lolwentako?

1. Tilimo	1
2. Imfuyo	2
3. Inhlanguanisela yekulima	3

12a. **[FEXP]** Sewuneminyaka lemingakhi ulima?

12b. **[REXP]** Luhla lweminyaka yekulima

1. 1- 5 weminyaka	1
2. 6-10 weminyaka	2
3. 11-15 weminyaka	3
4. 16-20 weminyaka	4
5. Ngetulu kwa -21 weminyaka	5

13. Bonisa kutsi insimu/likhaya lakho lingemahekitha langakanani

1. Ngaphansi kwemahekitha langu-3	1
2. Emkhatsini wemahekitha langu-3 na-5	2
3. Emkhatsini wemahekitha langu-5 kuya ku-10	3
4. Ngetulu kwemahekitha langu-10	4

14. **[MAJC]** Ngutiphi tilimo letiyinhloko lobewutilimile kule sekulima lesendlulile?

Silimo	Thikha	Indzawo lelinywe (Emah ekitha)	Kukusiphi nakutiwa ngumndeni	sigaba ekudliweni	Kukusiphi nakutiwa ekungeniseni imali
Umbila					
Emantongomane					
Emabhontjisi					
Emabhontjisi i- Jugo					
Sipinashi					

Emaklabishi				
Emazambane				
Emakherotsi				
Pelepele				
Ematamatisi				
Emabhathanathi				
Ematsanga				
Ibhithiluthi				
Anyanisi				
Lokunye (shano kutsi yini)				

15. **[FICC]** Ngutiphi tici letitsintsa tilimo/tibhidvo lotikhetsako kunome ngusiphi sekulima? Sicela ufake sigaba sato kuye ngekubaluleka, (1 usho kutsi kunconotwa kakhulu)

Sici	Sigaba
[SF] Kudla lokusisekelo	
[GY] Sivuno lesihle	
[AW] Kutfolakala kwemati	
[CLIM] Simo selitulu	
[MAN] Kumelula kukunakekela	
[MARK] Kumelula kukukhangisa	
[OTHERF] Lokunye (shano kutsi yini)	

16. **[PEST]** Ulwe kanjani netilokatana kuloko lokulimile kule sekulima lesendlulile? Khetsa indlela yinye lencono loyisebentisile

1. Kute lokwentile	1
2. Kukhetsa tilokatana/luhlobo lwetilimo letimelanako netilokatana	2
3. Imitsi yetilokatana/ Kutibulala (Imitsi)	3
4. Kucuba/ kufaka tilimo letihlukahlukene ndzawonye	4
5. Tikhala emkhatsini wetilimo	5
6. Lokunye (Shano kutsi yini)	6

17. **[WEED]** Ulwe kanjani nelukhula ensimini yakho kule sekulima lesendlulile? Khetsa indlela yinye lencono loyisebentisile

1. Kute lokwentile	1
2. Kuhlakula ngetandla	2
3. Umutsi wekubulala lukhula	3
4. Kusebentisa tinhlobo tetilimo letishesha tikhule	4
5. Lokunye (Shano kutsi yini)	5

18. **[HARV]** Uncume kanjani kutsi utovuna nini kule sekulima lesendlulile? Khetsa indlela yinye lencono loyisebentisile

1. Kukhula	1
2. Ingoti yekwebiwa	2
3. Intsengo	3
4. Lokunye (shano kutsi yini)	4

19a. **[STORE]** Umndeni wakho unayo yini indzawo yekubeka?

1. Yebo	1
2. Cha	2

19b. **[STOLAC]** Nangabe uphendvule ngaYEBO ku-19a: Ngutiphi?

1. Letisensimini	1
2. Endlini	2
3. Lubanjiswano	3
4. Tempakatsi	4

19b. **[TYPSTO]** Nangabe uphendvule ngaYEBO ku-19a: Usigcine kanjani sivuno sakho kule sekulima lesendlulile?

1. Esakhiweni lotentele sona wena	1
2. Indzawo yesimodeni, njenge. lithange, inyango, indlu yekugcina sivuno (warehouse) nalokunye.	2
3. Emasakeni/emigconyeni levulekile	3
4. Emigconyeni levalisisiwe	4
5. Lokunye (shano kutsi yini)	5

20. **[PROT]** Usivikele njani sivuno sakho lesesigciniwe kule sekulima lesendlulile? Khetsa indlela yinye lencono loyisebentisile

1. Kute lokwentile	1
2. Umlotsa	2
3. Imitsi yekubulala tilokatana/netilwanyakatana	3
4. Bulongo betinkhomo	4
5. Lokunye (shano kutsi yini)	5

21a. **[LOSS]** Uke walahlekelwa yini tilimo kule sekulima lesendlulile?

1. Yebo	1
2. Cha	2

21b. **[MRL]** Nangabe uphendvule ngayebo ku-21a, ngutiphi tizatfu letiyinhloko talokulahlekelwa?

- v.
- vi.
- vii.
- viii.

22a. Ukhonile yini kutsengisa sivuno lositfole eni sekuvuna lesendlulile?

1. Yebo	1
2. Cha	2

22b. **[SELL]** Nangabe uphendvule ngayebo ku-22a. Usitsengise kuphi sivuno sakho kule sekuvuna lesendlulile?

1. Emakethe yasemphakatsini	1
2. Emgwacweni	2
3. Emakethe yasemphakatsini lesedvutane	3
4. Kubomakhelwane	4
5. Tsengisele batsengisi	5
6. Lokunye (shano kutsi yini)	6

23. **[ENC]** Ngutiphi tinkinga lotitfolile nawutsengisa lesivuno?

1. Tekutfutsa letingasito tinhle	1
2. Kuswelakala kwekwekumbamba lokuya emakethe	2
3. Kutsengiswa ngemali lephansi	3
4. Kute imakethe lehlelekile	4
5. Bancane bantfu labafuna kutsenga	5
6. Libanga lelidze kuya emakethe	6
6. Lokunye (Shano kutsi yini)	7

24. **[ADCH]** Ubhekane kanjani naletinkinga?

- v.
- vi.
- vii.

25. **[CHAG]** Ngutiphi tinkinga letintsafu letiyinhloko lohlangabetane nato nawusalima kule lesendlulile sekulima?

- iv.
- v.
- vi.

26. **[INCOME]** Kulomnyaka lowendlulile utfole malini ekulimeni? R.....

27. Ikhona yini leminywe imisebenti lengenisa imali loyentako lengasiyo yekulima?

1. Yebo	1
2. Cha	2
Nangabe imphendvulo inguyebo, shano kutsi yini	

28a. **[TRAIN]** Uke waceceshelwa yini kulima?

1. Yes	1
2. No	2

28b. **[SKILL]** Nangabe uphendvule ngayebo ku-28a, shano luhlobo lwekuceceshwa neligama lenhlangano lowaceceshwa kuyo

Luhlobo lwekuceceshwa	Inhlangano

28c. **[BENT]** Lokeceshwa kukuzuzisile yini?

1. Yebo	1
2. Cha	2

29. **[FUTR]** Ngutiphi letinye tici tekulima lodzinga kuceceshwa kuto?

- e)
- f)
- g)
- h)

30. **[STOCK]** Luhlobo lwetilwane lotifuyile

Imfuyo	Tinkhomo	Timvu	Timbuti	Tinkhukhu	Tinkhukhu	Tingulube	Lokunye (Shano kutsi yini)
				Tenyama	Temacandza		
Emanani							

31. **[INC]**. Emndenini wakho imali niyitfolo kuphi ngalokuyinhloko?

a) Imali levela emasimini [FINC]	1. Kutsengisa imikhicito	1
	2. Kurentisa umhlaba	2
	3. Kurentisa emathulusi nemishini yasemasimini	3
	4. Lenye imali yalokusemasimini (shano kutsi yini)	4
b) Imali lengaveli emasimini [NFINC]	5. Sibonelelo	5
	6. Imali yempenisheli	6
	7. Umholo	7
	8. Kubhadalwa	8
	9. Lokunye (shano kutsi yini)	9

**INCENYE C: TINKINGA KANYE NELUHLOBO LWELUSITO LOLUTFOLWE
NGULABAZUZA ELUHLELWENI LWE-MASIBUYELE EMASIMINI**

32a. **[EXSEV]** Uyakhona yini kutfola lwati kanye nelusito lwekwelulekwa lwetekulima?

1. Yebo	1
2. Cha	2
Chaza:	

32b. **[EXTV]** Nawuphendvule ngayebo ku-32a. Shano kutsi eni sekulima ngasinye uvakashelwe kangakhi Beluleki Betekulima

1. < Kayi-3	1
2. Kayi-4 kuya ku-6	2
3. > Kayi-7	3
Chaza:	

33a. **[TYPAME]** Nguluphi lusito lolutfola eLuhlelweni LweMasibuyele Emasimini? Ungafaka timphendvulo letingetulu kwaleyodvwa

1. Kusetjentiswa kwemishini/kulungiswa kwemhlaba	1
2. Tintfo tekulima, njengahlanyelo, manyolo, nemitsi	2
3. Lwati kanye nelusito lwekwelulekwa	3
4. Kusekelwa ngemphahla, njengafenisi, timbola, emaphayiphi ekunisela, nalokunye.	4
LOKUNYE (Chaza)	

33b. **[INPUT]** Nawutfole tintfo tekulima, taluphi luhlobo? Ungafaka timphendvulo letingetulu kwaleyodvwa

1. Inhlanyelo	1
2. Manyolo	2
3. Imitsi	3
4. Lokunye (shano kutsi yini)	

33c. **[CHEM]** Nawutfole imitsi, nguluphi luhlobo lwemitsi? Ungafaka timphendvulo letingetulu kwaleyodvwa

1. Imiti yekubulala lukhula	1
2. Imiti yekubulala tilokatana	2
3. Imiti yekucedza kukhuntsa	3
4. Lokunye (shano kutsi yini)	

34. **[SUFF]** Lusito lolutfole kuMasibuyele Emasimini belwenele yini kutsi lukusite ukhicite kudla lokwenele kucinisekisa kutsi umndeni wakho unekudla futsi ukhone kutsengisa loko lokusele?

1. Yebo	1
2. Cha	2
Chaza:	

35. **[SEEDQ]** Sicela ucatsanise inhlanyelo leniketwa yiMasibuyele Emasimini naleyo loyitsenga etitolo tasenzaweni letitsengisa tintfo tekulima.

Sici	Inhlanyelo leniketwa yi-ME	Inhlanyelo lotitsengela yona	Emavi
1. Inhlanyelo lemelana netilokatana (Yebo=1, Cha=2)			
2. Inhlanyelo lemelana netifo (Yebo=1, Cha=2)			
3. Inhlanyelo letfutukisiwe (Yebo=1, Cha=2)			
4. Umkhicito/Sivuno (Sikhulu=1, Siphansi=2)			
5. Lenconotwa yimakethe (Yebo=1, Cha=2)			

36a. **[TEST]** Ulwentile yini luhlolo lwemhlaba ensimini yakho kuleminyaka lengu-3 leyendlulile?

1. Yebo	1
2. Cha	2

36b. **[FERT]** Nawuphendvule ngayebo ku-36a. Manyolo loniketwa luhlelo lweMasibuyele Emasimini uyahambisana yini netidzingo tetitsako letidzinge kako ensimini yakho njengobe kusho imiphumela yeluhlolo lwemhlaba?

1. Yebo	1
2. Cha	2

37. **[YEILD]** Ungasichaza kanjani sivuno lositfolile ngelusito lweMasibuyele Emasimini?

1.Sibi	1
2.Sisemkhatsini	2
3.Sihle	3

38a. **[MCHAL]** Ngutiphi tinsayeya/tinkinga lobe nato ngaloLuhlelo LweMasibuyele Emasimini?

- vi.
- vii.
- viii.
- ix.
- x.

38b. **[SUGG]** Sicela usho kutsi ucabanga kutsi tingacatululwa kanjani letinkinga letingenhla

- iv.
- v.
- vi.
- vii.

INCENYE D: TINDLELA TEKUBHEKANA NEKUSHODA KWEKUDLA EKHAYA

39. **[OSI]** Unato yini letinye tindlela tekungenisa imali ngaphandle kwekulima letitakusita ukhone kuphila lapho kunekuswelakala kwekudla

1. Yebo	1
2. Cha	2
Nangabe uphendvule ngayebo (chaza)	

40a. **[INDIG]** Nge sekuswelakala kwekudla, ingabe ubalekela ekudleni kwesintfu?

1. Yebo	1
2. Cha	2
Nangabe uphendvule ngayebo (chaza)	

40b. **[SOURCE]** Nangabe uphendvule ngayebo, ukutfola kuphi?

1. Ukutsatsa esigangeni	1
2.Ukutsatsa emasimini lalinyiwe kodvwa angahlanyelwa	2
3. Ukuhlanyela engadzeni noma ensimini	3
4.Lokunye (Shano kutsi yini)	4

41. [COPE] Nguyiphi indlela yekuphila loyisebentisako kuze ubhekane nekuswelakala kwekudla ekhaya?

Indlela yekuphila	Njalo (1)	Ngaletinye tikhatsi (2)	Angilok otsi (3)
1. Kuboleka Imali			
2. Konga Imali			
3. Kungadli Ngaletinye Tikhatsi			
4. Kudla Kudla Lokungaketayeleki			
5. Kutsi bantfu labadzala bangadli kuze kudle bantfwana			
6. Kufuna umsebenti longasiwo wasemasimini			
7. Kwetsembela elusitweni loluvela etihlotjeni			
8. Kutsenga kudla ngesikweleti			
9. Kungadli lilanga lonkhe			
10. Kutsenga kudla lokushiphile			
11. Kutsengisa imphahla yakho lehlala lesidze			
12. Kudla tibhidvo netitselo letingalinywa/tesiganga			
13. Kuvumela bantfwana badle kucala			
14. Kutsatsa kudla lokusele emicimbini			
15. Kudla inhlanyelo lesele			
16. Kuvuna tilimo letisengakavutfwa			
17. Kutsengisa imfuyo kuze utsenge kudla			
18. Kukhipha bantfwana esikolweni			
19. Kuphakela kancane ngesikhatsi sekudla			
20. Kutfutsa uyofuna umsebenti			

SICEPHU E: SIMO SEKUTFOLAKALA KWEKUDLA EKHAYA

42a. Silinganiso sekukweselwa kwekudla ekhaya (Icashunwe ku Coates, Swindale & Bilinsky (2007))

Nyalo ngitakubuta ngendlela lodla ngayo kudla kulenyanga lephelile Kanye nalendlela lovamise ngayo kuhlambabana nebumatima kutdi utfole kudla. Impendvulo yakho kutawuba ngu yebo nobe cha.

No.	Imibuto	Timpendvulo	Ikhodi
1	Ingabe kulamalanga langu-30 landlulile kubekhona yine kweswelakala kwekudla ekhaya?	Cha=0 (Chubekela ku -2) Yebo=1	
1a	Kuvamise kwenta emahlandla lamangakhi?	1= Akukavami kakhulu (kwenteka Kanye nome kabilili ngenyanga) 2= Ngalesinye (emahlandla lamatsatfu kuya kulasiphohlongo ngenyanga) 3=Kuvame kakhulu (ngetulu kwemahlandla lasiphohlongo ngenyanga)	
2	Kulamalanga langu-30 landlulile, ingabe kwentekile yini kutsi lilunga lemndeni lingakhoni kudla kudla lelikufunako ngenca yekweswela?	Cha=0 (Chubekela ku -3) Yebo=1	
2a	Kuvamise kwenta emahlandla lamangakhi?	1= Akukavami kakhulu (kwenteka Kanye nome kabilili ngenyanga) 2= Ngalesinye (emahlandla lamatsatfu kuya kulasiphohlongo ngenyanga) 3=Kuvame kakhulu (ngetulu kwemahlandla lasiphohlongo ngenyanga)	
3	Kulamalanga langu-30 landlulile, ingabe wena noma lilunga lemndeni niphocceleke kutsi lidle kudla lekunganeli ngenca yekweswela?	Cha=0 (Chubekela ku-4) Yebo=1	
3a	Kuvamise kwenta emahlandla lamangakhi?	1= Akukavami kakhulu (kwenteka Kanye nome kabilili ngenyanga) 2= Ngalesinye (emahlandla lamatsatfu kuya kulasiphohlongo ngenyanga) 3=Kuvame kakhulu (ngetulu kwemahlandla lasiphohlongo ngenyanga)	
4	Kulamalanga langu-30 landlulile, ingabe wena noma lilunga lemndeni niphocceleke kutsi lidle kudla lengakufuni ngenca yekweswela?	Cha=0 (Chubekela ku-5) Yebo=1	
4a	Kuvamise kwenta emahlandla lamangakhi?	1= Akukavami kakhulu (kwenteka Kanye nome kabilili ngenyanga) 2= Ngalesinye (emahlandla lamatsatfu kuya kulasiphohlongo ngenyanga) 3=Kuvame kakhulu (ngetulu kwemahlandla lasiphohlongo ngenyanga)	

5	Kulamalanga langu-30 landlulile, ingabe wena noma lilunga lemndeni niphocceleke kutsi lidle kudla lokuncane kunaloku lebe ukufuna ngenca yekungabikho kwekudla?	Cha=0 (Chubekela ku-6) Yebo=1	
5a	Kuvamise kwenta emahlandla lamangakhi?	1= Akukavami kakhulu (kwenteka Kanye nome kabilili ngenyanga) 2= Ngalesinye (emahlandla lamatsatfu kuya kulasiphohlongo ngenyanga) 3=Kuvame kakhulu (ngetulu kwemahlandla lasiphohlongo ngenyanga)	
6	Kulamalanga langu-30 landlulile, ingabe wena noma lilunga lemndeni niphocceleke kutsi nidle emahlandla lamancane ngelisuku ngenca yekungabikho kwekudla?	Cha=0 (Chubekela ku-7) Yebo=1	
6a	Kuvamise kwenta emahlandla lamangakhi?	1= Akukavami kakhulu (kwenteka Kanye nome kabilili ngenyanga) 2= Ngalesinye (emahlandla lamatsatfu kuya kulasiphohlongo ngenyanga) 3=Kuvame kakhulu (ngetulu kwemahlandla lasiphohlongo ngenyanga)	
7	Kulamalanga langu-30 landlulile, kuke kwaniphelela yini kudla ekhaya?	Cha=0 (Chubekela ku-8) Yebo=1	
7a	Kuvamise kwenta emahlandla lamangakhi?	1= Akukavami kakhulu (kwenteka Kanye nome kabilili ngenyanga) 2= Ngalesinye (emahlandla lamatsatfu kuya kulasiphohlongo ngenyanga) 3=Kuvame kakhulu (ngetulu kwemahlandla lasiphohlongo ngenyanga)	
8	Kulamalanga langu-30 landlulile, ingabe wena noma lilunga lemndeni niphocceleke kutsi nilale nilambile ngenca yekungabikho kwekudla?	Cha=0 (Chubekela ku-9) Yebo=1	
8a	Kuvamise kwenta emahlandla lamangakhi?	1= Akukavami kakhulu (kwenteka Kanye nome kabilili ngenyanga) 2= Ngalesinye (emahlandla lamatsatfu kuya kulasiphohlongo ngenyanga) 3=Kuvame kakhulu (ngetulu kwemahlandla lasiphohlongo ngenyanga)	

9	Kulamalanga langu-30 landlulile, ingabe wena noma lilunga lemndeni niphocceleke kutsi ningadli busuku nemini ngenca yekungabikho kwekudla?	Cha=0 Yebo=1	
9a	Kuvamise kwenta emahlandla lamangakhi?	1= Akukavami kakhulu (kwenteka Kanye nome kabilili ngenyanga) 2= Ngalesinye (emahlandla lamatsatfu kuya kulasiphohlongo ngenyanga) 3=Kuvame kakhulu (ngetulu kwemahlandla lasiphohlongo ngenyanga)	

42b. Household Dietary Diversity Score (HDDS) (Tool adopted from Swindale & Bilinsky (2006))

Nyalo ngitakubuta ngeluhlobo lwekudla nelilidlile nemndeni wakho ekhaya itolo emini nobe ebusuku. Timpdvulo takho kuyoba ngu-yebo (1) nobe cha (0). Phendvula nga-yebo uma uludlile luhlobo lwekudla nobe cha uma ungakaludli.

Ikhodi	Kudla	Yebo =1 Cha=0	Dzalula
A (lokusatinhlavane)	Sinkhwa, emabele, liyayisi, emafethi, liphalisi nalokunyr kudla lokwakhiwe ngemabele, ummbila nakolweni		
B (lokusatimpandze)	Emazambane nabhatata nobe kudlala lokusatimpandze		
C (Tibhidvo)	Tibhidvo letimtfubi nobe letiluhlata		
D (Titselo)	Titselo		
E (Inyama)	Inyama yenkomo, yengulube, yemvu, yenkhukhu nobe sibindzi, tinso, inhitiyo nobe letinye tiffo tenyama		
F(emacandza)	Emacandza		
G (Imfishi)	lifishi nobe imfishi lelolondvolotiwe		
H (emabhintjisi)	Kudla lokusamabhontjisi		
I (lubisi)	Imikhicito yelubisi: lubisi, ishize		
J (lokusamafutsa)	Kudla lokusamafutsa		
K (Shukela / luju)	Shukela nobe luju		
L (Tinatfo)	Tinatfo: litya, likhofi, namnedi		

SIPHETFO SIYABONGA

APPENDIX B: FOCUS GROUP DISCUSSION QUESTIONS

Profile of the Focus Group

- i. Number of people: Men _____, Women _____
- ii. Characteristic of Group: _____
- iii. Location of meeting: _____
- iv. Date: _____ Start time: _____ Finish time: _____

PKM Programme

1. What role does your co-operative play during implementation of the PKM programme?
2. What type of assistance do you receive from PKM programme or your co-operative offer to beneficiaries of the programme
3. What are the challenges encountered in implementing the PKM Programme? And what can be done to address these challenges?
4. According to your opinion, does the PKM programme result in household food security among agricultural households?
5. According to your opinion, does the programme managed to meet its objectives?
6. What can be done to improve PKM programme?

Coping mechanisms

7. What copying strategies do you employee during food shortages?

INTRODUCTION: FOCUS GROUP DISCUSSION

Interviewer's Introduction

My name is **Themba Andries Sambo**. I am doing research for my doctoral studies (Ph.D.) in Agriculture at the University of South Africa. I am inviting you to participate in a study entitled **ANALYSIS OF THE FOOD SECURITY STATUS OF PHEZUKOMKHONO MLIMI BENEFICIARIES, NKOMAZI LOCAL MUNICIPALITY, SOUTH AFRICA.**

I am conducting this research to analyse the status of food security in the agricultural households benefiting from the Phezukomkhono Mlimi (PKM) programme formerly Masibuyele Emasimini (ME) programme in the Nkomazi Local Municipality. You have been invited to participate in this study as a sample of agricultural co-operatives that provide mechanization services under PKM programme. Please be assured that your involvement is voluntary, that there are no consequences if you decide not to participate, and that this will not affect, for example, your relationship with your co-operative members and funders of the programme. You are free to withdraw at any time and can do so without providing reasons. All information and responses to be provided by the participant will be treated in a confidential manner.

Thank you

Themba Sambo

APPENDIX C: KEY INFORMANT INTERVIEW QUESTIONS

Profile of the key informant

i. Gender

Male	Female
------	--------

ii. Job Title : _____

iii. No. of years involved with PKM PROGRAMME: _____

iv. Location of meeting: _____

v. Date : _____

KEY INFORMANT QUESTIONS

1. What type of assistance do beneficiaries of PKM Programme receive?
2. How are beneficiaries of PKM programme nominated to benefit?
3. What are the challenges encountered in implementing the PKM Programme? And what can be done to address these challenges?
4. What role do agricultural advisors, co-operatives and PKM committees play during implementation of the programme?
5. According to your perception, did the programme managed to meet government expectation in terms of number of hectares planned to be ploughed and planted versus actual output in the last 5 years?
6. What can be done to improve PKM programme?

INTRODUCTION: KEY INFORMANT

Interviewer's Introduction

My name is **Themba Andries Sambo**. I am doing research for my doctoral studies (Ph.D.) in Agriculture at the University of South Africa. I am inviting you to participate in a study entitled '**ANALYSIS OF THE FOOD SECURITY STATUS OF PHEZUKOMKHONO MLIMI BENEFICIARIES, NKOMAZI LOCAL MUNICIPALITY, SOUTH AFRICA.**

I am conducting this research to analyse the status of food security in the agricultural households benefiting from the Phezukomkhono Mlimi (PKM) programme formerly Masibuyele Emasimini (ME) programme in the Nkomazi Local Municipality. You have been invited to participate in this study as a sample of officials responsible for overseeing the implementation of PKM programme in the province. Please be assured that your involvement is voluntary, that there are no consequences if you decide not to participate, and that this will not affect, for example, your relationship with the beneficiaries of PKM programme, your colleagues and employer. You are free to withdraw at any time and can do so without providing reasons. All information and responses to be provided by the participant will be treated in a confidential manner.

Thank you

Themba Sambo

APPENDIX D: PERMISSION LETTER TO CONDUCT RESEARCH



Samora Machel Building, No. 7 Government Boulevard, Riverside Park, Extension 2, Mbombela, 1200,
Mpumalanga Province, Private Bag X 11219, 1200
Tel: +27 (013) 766 6067/8, Fax: +27 (013) 766 8295, Int. Tel: +27 (13) 766 6067/8, Int. Fax: +27 (13) 766 8295

Lisiko Letekulima, Kufutukiswa
Kwelindzawo Tasemakhaya, Temhlaba
Netesimondzawo

Departement van Landbou,
Landelike Ontwikkeling,
Grond en Ongewing Sake

umNyango weZelimo
UkuThuthukiswa kweeNdawo zemaKhaya,
iNarha neeNdaba zeBhoduuko

Enq: **Mpho Sekoma**
Tel.No: **013 766 6020**

12 August 2019

Mr TA Sambo
P.O Box 101
IMBUZINI
1343

Dear Mr Sambo

PERMISSION TO CONDUCT AN ACADEMIC RESEARCH: Ph.D. AGRICULTURE

1. Your letter dated 12 August 2019 refers,
2. Kindly be informed that a permission to conduct an academic Research for Ph.D. in Agriculture within the Department has been granted.

Kind Regards,

MR LS MONARENG
ACTING HEAD: AGRICULTURE, RURAL DEVELOPMENT, LAND
AND ENVIROMENTAL AFFAIRS



APPENDIX E: RESEARCH ETHICS CLEARANCE



UNISA-CAES HEALTH RESEARCH ETHICS COMMITTEE

Date: 29/11/2019

Dear Mr Tambo

NHREC Registration # : REC-170616-051
REC Reference # : 2019/CAES_HREC/178
Name : Mr TA Sambo
Student # : 47195762

**Decision: Ethics Approval from
01/12/2019 to completion**

Researcher(s): Mr TA Sambo
47195762@mylife.unisa.ac.za

Supervisor (s): Dr TP Mbombo-Dweba
mbombtp@unisa.ac.za; 011-471-2264

Prof JW Oguttu
joguttu@unisa.ac.za; 011-471-3353

Working title of research:

Empirical analysis of food security status of agricultural households in the Mpumalanga Province, South Africa

Qualification: PhD Agriculture

Thank you for the application for research ethics clearance by the Unisa-CAES Health Research Ethics Committee for the above mentioned research. Ethics approval is granted until the completion of the project, **subject to submission of yearly progress reports and further clarification. Failure to submit the progress report will lead to withdrawal of the ethics clearance until the report has been submitted.**

Due date for progress report: 30 November 2020

Please note the points below for further action:

1. The researcher indicates that he will make use of enumerators – how will they be selected? What qualifications will they be required to have to be included?
2. Can the researcher indicate what information the database of households provided by the provincial department contains? Does it only contain contact details, or is there



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other personal information as well? Similarly, what details will the list of officials contain? The researcher is requested to specify how the information will be handled to ensure that the privacy of participants are not compromised.

3. Clarification is required about the inclusion of children under 18 in the research. The questionnaire contains an option for children under the age of 18 (question 2), yet the researcher states in the risk section of the ethics application form (2.2) that children under 18 will not be included.
4. The researcher indicated that question 6.5.3 in the ethics application form which deals with de-identification of data in order to protect the privacy of participants is not applicable. Why is it not applicable to this research?
5. Objective 5 states that a framework will be developed. Can the researcher provide more detail on how this will be done, and how the framework will be tested? The researcher can address this aspect in the first progress report that will be due in one year's time.

*The **medium risk application** was **reviewed** by the UNISA-CAES Health Research Ethics Committee on 28 November 2019 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

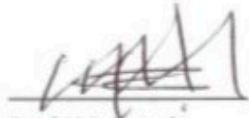
1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.

6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
7. No field work activities may continue after the expiry date. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

*The reference number **2019/CAES_HREC/178** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,

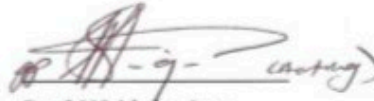


Prof MA Antwi

Chair of UNISA-CAES Health REC

E-mail: antwima@unisa.ac.za

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Prof MJ Linington

Executive Dean : CAES

E-mail: lininmj@unisa.ac.za

Tel: (011) 471-3806

APPENDIX F: INFORMED CONSENT FORM

CONSENT TO PARTICIPATE IN THIS STUDY

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the household survey questionnaire/ focus group discussion/ schedule interview (delete which is not applicable).

I have received a signed copy of the informed consent agreement.

Participant Name & Surname..... (Please print)

Participant Signature.....Date.....

Researcher's Name & Surname..... (Please print)

Researcher's signature.....Date.....

APPENDIX G: LIST OF PUBLICATIONS

- ✓ The following article was published in the Journal of Agribusiness and Rural Development and form part of research presented in this thesis

www.jard.edu.pl

<http://dx.doi.org/10.17306/J.JARD.2021.01412>

Journal of Agribusiness and Rural Development

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ANALYSIS OF FOOD SECURITY STATUS AMONG AGRICULTURAL HOUSEHOLDS IN THE NKOMAZI LOCAL MUNICIPALITY, SOUTH AFRICA

Themba Andries Sambo¹, James Wabwire Oguttu¹,
Tulisiwe Pilisiwe Mbombo-Dweba^{1,✉}

¹University of South Africa, South Africa

Abstract. The study analysed the food security status of agricultural households in Nkomazi Local Municipality, South Africa. Descriptive statistics, the food security index and multivariate analysis were used to realise the objectives of the study. The majority of respondents were females. Furthermore, respondents aged between 61 and 70 years and those who had only completed primary school education were also in the majority. Just under half of the respondents had a farming experience of more than 21 years and had large households (6-10 household members). Although most agricultural households in the study area were food secure, overall food insecurity among the respondents was very high. The marital status, education level and annual farm income of the respondents were positively and significantly associated with food security. Farming is practised mainly by older people with low levels of education. The level of food insecurity among agricultural households was approximately twice the South African national household food insecurity index. The findings of this study provide a basis for the formulation of a policy framework to help tackle the high food insecurity observed in the study area.

Keywords: agricultural households, household food security, Phezukomkhono Mlimi Programme

INTRODUCTION

Among the countries of the Southern African Developing Community (SADC) region, South Africa has a considerably high gross domestic product (WEF, 2017). It is

a net exporter of cereals (FAO, 2020) and, concurrently, is the largest importer of agricultural products (Viljoen, 2017). While South Africa is considered food secure at the national level (EIU, 2019), there are households and individuals in South Africa who experience high levels of food insecurity (Masuku et al., 2017). For example, in 2016, approximately 19.9% of households at the national level in South Africa and 22.2% in the Mpumalanga province ran out of money to buy food (SSA, 2016a). In addition, access to food in South Africa was moderately insufficient in about 15% of households, while in 5.2% of households access to food was severely inadequate.

However, in the available literature, there have been contradictory reports on food insecurity statistics. For example, according to the SSA (2019a), food insecurity was at 28.4% in the Mpumalanga province and 34.3% in the North West province. Yet, in a study by Alemuet et al. (2015), the food insecurity statistics in these two provinces were at 76% and 76%, respectively. While it can be argued that this difference can be attributed to the time difference, it is noteworthy that Statistics South Africa used the household food insecurity access scale (HFIAS), while Alem et al. (2014) used the income and expenditure survey and Wooldridge's (WCLM) estimator to determine food security. In fact, in a food security study conducted by Ijatuyi et al. (2018), using the food security index, the authors observed that 56.58% of agricultural households were food secure in the North

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- ✓ **The following manuscript is undergoing review in the Journal of Agriculture & Food Security and form part of research presented in this thesis**
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Analysis of the Dietary Diversity Status of Agricultural Households in the Nkomazi Local Municipality, South Africa

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Abstract

Background: Dietary diversity is a good alternative measure of the nutritional adequacy and food security in the household study. The present study assessed the household dietary diversity status and its determinants among agricultural households in the Nkomazi Local Municipality, South Africa.

Methods: Out of 543 households in the study area that were supported by the Phezukomkhono Mlimi programme during the 2018/19 production season, only 355 met the inclusion criteria and consented to participate in the study. The data was analysed using descriptive statistics, computation of the Household Dietary Diversity Score (HDDS) and the ordered logit regression model.

Results: Most of the respondents were elderly (56.10%) and females (59.44%). Most had low levels of education (43.66%) and low farm income (96.34%). In addition, most (65.35%) had large households. The majority (49.86%) of the households in the study area had a HDDS of 4.40, while the median HDDS in the study area was 3.90. Over the recall period, the majority of households consumed cereals (100%) and vegetable (78.31%) food types. The age of the household head, level of education of household head, household size and farm income were significantly associated ($p < 0.05$) with the HDDS.

Conclusion: Since cereals and vegetables dominated the diets of the respondents, findings of this study highlight the need for improved access to sources of protein among the respondents. Therefore, there is a need for programmes to educate respondents on the dangers of inadequate nutrition (lacking in protein). Strategies that enhance farm income and the level of education among respondents should be prioritised because of their potential to boost Household Dietary Diversity (HDD) in the study area. Collaborations between different stakeholders such as nutritionists, extension workers and researchers should be encouraged so as to develop a holistic approach to improving the HDD in the study area.

Keywords: diet, nutritional adequacy, food consumption, food groups, household dietary diversity, food security

- ✓ **Conference Presentation at the 15th International Conference of the South African Association of Family Ecology and Consumer Sciences (SAAFECES) held virtually from 10 to 12 May 2022 (Ref No: 2203).**
-

Food Accessibility and Coping Strategies of Phezukomkhono Mlimi Farming Households in the Nkomazi Municipality, South Africa.

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Abstract

Although at national level South Africa is food secure, food insecurity is still experienced at household and individual level. Approximately 20% of households and 9.3 million individuals in South Africa are considered to be food insecure (EIU, 2021; IPC, 2021; SSA, 2019). In 2005, the Mpumalanga Provincial Government introduced the Phezukomkhono Mlimi (PKM) programme to help alleviate household food insecurity by aiding farming households to enable them to produce their own food (DARDLA, 2011). Although the PKM programme has been running for more than a decade, with massive funds spent on the programme each year, few studies have attempted to investigate the extent to which the objective of improving the food security status of the beneficiaries of the programme has been realised (Masoka, 2014; Shabangu, 2015). This study evaluates food accessibility and the coping strategies adopted by farming households that are beneficiaries of the PKM programme in Nkomazi Local Municipality (NKLM).

The study targeted all 543 farming households that were enlisted to receive assistance from the PKM programme during the 2018/19 production season. Only household heads listed as beneficiaries of the programme during the season were invited to participate in the study. Out of the possible 543 household heads, 355 satisfied the inclusion criteria. The data was collected using a structured questionnaire consisting of the Household Food Insecurity Access Scale (HFIAS) and Coping Strategy Index (CSI). Descriptive statistics and multivariate analysis were used to analyse the data.

Most household heads were elderly female farmers. The majority of the participants were married and had farmland of less than three hectares in size. Most of the households had large family sizes, and the household heads generally had low formal education and farm income levels. The HFIAS results showed that 62.54% (n=222) of the households included in the study experienced insufficient food quality, 59.72% (n=212) experienced insufficient food intake and its physical consequences and 36.06% (n=128) had anxiety and uncertainty concerning food supply. The mean HFIAS score was 4.20. While 27.32% (n=97) of the households were food secure, 56.62% (n=201) and 16.13% (n=75) were mild and moderately food insecure respectively. Overall, 72.75% (n=276) of farming households experienced food inaccessibility. This could be attributed to large family sizes, and low education and farm income levels of the respondents in this study. Households with larger household sizes and low formal education and income levels are more likely to have inadequate or severe inadequate access to food (SSA, 2019).

With regard to coping strategies adopted by households, 96.90% (n=344) resorted to eating uncultivated and wild vegetables and fruits, 96.62% (n=343) adopted harvesting immature food crops, and 60.56% (n=215) resorted to consuming seed reserves. Other strategies that were commonly adopted included dietary changes during food shortages. For example, over two thirds (68.45%; n=243) of the study participants consumed unconventional food such as mopane worms and locusts, and 79.16% (n=281) bought less expensive food from available supermarkets. Households headed by widows were twice as likely to be food insecure (Adjusted Odds Ratio (AOR) =1.95; 95% Confidence Interval (CI): 1.02-3.71) when compared to those headed by married respondents. The odds of being food insecure among households headed by household heads who did not have formal education, was 10 times higher (AOR =10.07; 95% CI: 2.43-41.84) than that of households headed by individuals who had attained tertiary education. Households with many family members were more likely to be food insecure compared to households that had fewer family members (AOR=2.11; 95% CI: 1.18-3.76). If a household was headed by an individual involved in off-farm income generating activities, it was less likely (AOR=0.52; 95% CI: 0.29-0.94) to experience food insecurity compared to a household headed by respondents who did not participate in off-farm income activities.

Based on the findings of this study, it is evident that food inaccessibility is a problem. However, given that few respondents indicated that they had adopted severe and/or irreversible coping strategies is encouraging. It can thus be concluded that even though the programme has had a positive impact in terms of coping strategies, in its current state the programme has not been able to adequately address food accessibility. Policy intervention to improve access to education, family planning and off-farm income generating activities are recommended to improve food accessibility and hence food security.

Key words: Consumption, Food inaccessibility, Food inadequacy, Food security, Factors correlated with food insecurity, Hunger.

APPENDIX H: LANGUAGE EDITING CERTIFICATE



EDITING CERTIFICATE

TO WHOM IT MAY CONCERN

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Author: Themba Andries Sambo

Date: November 2021

Signed

A handwritten signature in blue ink, appearing to read "Tony Kambi Masha", is placed over a light grey rectangular background.

Dr Tony Kambi Masha (PhD in Education; D. Admin: Public Administration)

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