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Implications of Livelihood Strategies on Household Dietary Diversity in the Eastern Cape Province of South Africa

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ABSTRACT Two hundred (200) households were randomly selected in Tsolwani and Nkonkobe Local Municipalities in the Eastern Cape Province of South Africa to determine their dietary diversity using the Household Dietary Diversity Indicator Guide. The highest proportion of respondents (60%) practised agriculture, with thirty-one percent specialising in livestock production, twenty-one percent in both crop and livestock, and eight percent in crop production only. The mean frequency of meals consumed daily by the participants was significantly higher for households practising mixed farming systems ($p<0.05$). The Household Dietary Diversity Scores (HDDS) for participants was 5.16. The higher the score, the more a household is food secure in terms of a balanced diet. HDDS was significantly higher for farmers practising integrated farming (5.97±2.416), than households practising non-agricultural activities as the main livelihood strategy (4.65±1.919) ($p<0.05$). Mixed farming systems should therefore be prioritised if South Africa is to reduce the growing incidences of malnutrition.

INTRODUCTION

Generally, South Africa at a macro level is regarded as a food secure country (Masipa 2017 citing FAO) (placed 40th among 105 countries within the Global Food Security Index) in terms of it being able to produce enough staple foods and/or being capable to import food when necessary so as to satisfy the population's basic food and nutrition requirements (FAO 1996). Hart et al. (2009), De Cock et al. (2013) and Mkhawani et al. (2016) reinforce the notion that South Africa is a food secure country at a nationwide level, while this may not be the case when it comes to households in underdeveloped rural areas. Difficulties in accessing food and the incidence of poverty are widespread challenges in underdeveloped rural areas of South Africa, and underprivileged households are continuously facing difficulties to purchase food. Food insecure households often have restricted or undefined access to adequate amounts (physical and economic) of nutritional and safe food in socially reasonable means, not having to resort to generous food aid programs, scavenging, stealing, or other uncommon surviving tactics to enable the members of the household to live an active plus a healthier life (FAO 1996; Meyers et al. 2005; Osei et al. 2010).

Within the Millennium Development Goals (MDGs) initiated by the United Nations (UN), global leaders had dedicated to halving the number of hungry persons before the year 2015. The MDGs expired in 2015 and a recent estimate indicates underperformance, especially in Southern Africa, with regard to the achievement of goal number 1 (Muchenje and Mukumbo 2015). Approximately twenty percent of South African households had insufficient food access, as indicated in the 2009 Statistics South Africa's gen-

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eral household survey (Du Toit 2011). Recent research findings by the Shisana et al. (2013) reveal that only about forty-six percent of the total population in South Africa can be regarded as food secure. About twenty-six percent of the people in South Africa are reported to be severely food insecure or at risk of food deprivation (Misselhorn and Hendriks 2017). Shisana et al. (2013) further revealed that those at risk of hunger resided in informal settlements around urban areas (about 36%) and those in underdeveloped rural areas account for about thirty-three percent. The situation is depicted as even worse, especially in provinces that are predominantly rural such as the Eastern Cape Province where approximately thirty-six percent of the province's populace is argued to be food insecure and about thirty-two percent at risk of hunger (Du Toit 2011). About thirty percent of households in South Africa receive one or more of the different types of government social grants, with above sixty percent in the poverty-stricken provinces such as the Eastern Cape and Limpopo, of which these grants account for more than forty percent of household incomes (Devereux and Waidler 2017). According to Govender et al. (2017), such poor households which are largely reliant on government social grants may find themselves in a position where they cannot afford a well-balanced diet.

In the Sustainable Development Goals (SDGs) set by the UN, hunger and food insecurity is closely connected with an increase in agricultural production. Funk et al. (2008), Welch (2008) and Boedecker et al. (2014) also link food security with agricultural production. Goal 2 of the (SDGs) highlights the need for the world to eradicate hunger, attain improved food and nutrition security through sustainable agriculture. Boedecker et al. (2014) reported that a balanced nutrition requires crop biodiversity, with a mix of both staple crops and lesser-known crops that are superior in terms of their micronutrient content. Integrated farming systems contribute to the reduction of micronutrient deficiency (Ruel and Alderman 2013; Uddin et al. 2015; Bhaskar et al. 2017). A relative comparison between a mixed farming system with both aquaculture alongside rice cultivation and monoculture systems shows high income differences of between seven and sixty-five percent (Ruel and Alderman 2013). Diversified farming systems support a range of income streams which in turn can increase household's resilience to shocks that have damaging effects on food and nutrition status.

The incidence of food insecurity among households in South Africa is largely defined by the ability to grow food, food-buying power by households, and numerous socio-economic attributes that have either a direct or indirect effect (Lokosang et al. 2011). However, given the versatile condition of food insecurity, the various factors influencing it vary across different areas and social groups (Cheema and Abbas 2016). Past assessments of agricultural interventions demonstrate that income could possibly increase but with no improvement in the status of nutrition of households (von Braun and Kennedy 1994). Emerging evidence, however, disputes this by research that further discerns household farming systems as important in food security (Ruel and Alderman 2013). However, increasing the nutrient production of farming systems for food security has unfortunately never been the goal of agriculture, it has always aimed to maximise production while minimising cost (Keding et al. 2013). There is considerable information on the association concerning agriculture and food security, but little understanding of how the rural poor communities are the most food insecure yet they are well situated to practice all forms of agriculture. Agriculture has a marginal effect on food security in a wide range of areas, like resilience and income certainty (Ruel and Alderman 2013).

Objectives

The challenges posed by food insecurity in underdeveloped areas in South Africa, especially the threefold problem of malnutrition (under nutrition, micronutrient shortage, and over nutrition leading to overweight and/or obesity) underscore the need for broadened perspectives on the links between household food systems and food security. The limited evidence on nutrition-sensitive livelihood systems makes it difficult for agriculture and other relevant policies to take account of their potential impact on nutrition. The relationship with regard to household food insecurity, nutrition and numerous determinants of food security in the Eastern Cape Province is still not yet well understood. This paper is thus aimed at exploring how the main means by which households acquire food

have an impact on the nutritional status of households as estimated by both the frequency of meals consumed daily and household dietary diversity, so as to better understand the level of rural food insecurity. The results in this paper are therefore relevant and important in formulating policies and strategies that enhance household dietary diversity in pro-poor rural populations of South Africa and other developing areas.

METHODOLOGY

Study Area

The study area included Tsolwani and Nkonkobe Local Municipalities in the Eastern Cape, one of the poorest provinces of South Africa. Tsolwana Municipality includes two semi-urban areas (Tarkastad and Hofmeyr), formerly Transitional Local Councils (TLCs), and the rural Ntabethemba Transitional Regional Council (TRC). Tsolwana is spread over an area of about 6 000km² with a density of approximately six (6) people/km² (Tsolwana Local Municipality Integrated Development Plan (IDP) 2010). The coverage of the local area of jurisdiction is equivalent to approximately sixteen percent of the Chris Hani District Municipality. The Tsolwana Local Municipality's populace was projected to be 32 511 according to the 2001 census statistics. A greater proportion of households in Tsolwana are poor and indigent. Approximately eighty-three percent of households, according to Statistics South Africa (2012a), receive a total income of equal to or less than R1 600 per month. The main economic activity in Tsolwana Local Municipality is farming and the two towns, namely Tarkastad and Hofmeyr, are bordered by commercial farms. Certain areas of the municipality in Tarkastad are engaged in crop production while some concentrate largely in livestock production with an increasing shift towards game farming.

Nkonkobe covers an area of approximately 3 725,32ha, namely the former magisterial districts of Alice, Balfour, Hogsback, Fort Beaufort, Middledrift and Seymour. It comprises of 21 wards and 41 municipal councils. The projected population of Nkonkobe Local Municipality is about 160 311 people, with some residing on farms and others on dispersed settlements. Most of the Nkonkobe inhabitants are found in rural areas and only about nineteen percent live in the urban settlements (Alice and Fort Beaufort). The Nkonkobe Local Municipality's racial composition is largely (about 96%) African, with Coloureds and Whites combined accounting for only four percent of the population. The unemployment and poverty rates for Nkonkobe are high, estimated at about sixty-eight and seventy-one percent respectively, with a higher dependency ratio of 2.56 (Nkonkobe Local Municipality IDP 2005). Farming, particularly livestock production, is the major economic activity in Nkonkobe.

Sampling Procedure

The study employed a multi-stage sampling technique. The Eastern Cape Province consists of eight district municipalities of which Chris Hani and Amatole District Municipalities were randomly chosen. Subsequently, one local municipality was randomly picked from each district; that is Tsolwani in Chris Hani and Nkonkobe in Amatole. The two local municipalities were chosen from different administrations, implying that they provided different support services to households, and are most likely to result in different household food security levels. One hundred respondents were randomly selected from each Local Municipality. Individuals who were responsible for food preparation in the households were chosen as respondents and interviewed at their homestead by competent enumerators under the supervision of the main researchers. In instances where individuals responsible for food preparation were not present, someone who was a grown-up and ate in the household was asked to become the respondent.

Data Collection

As a guide for data collection, a Household Dietary Diversity Indicator Guide for Measurement of Household Food Access version 2 was used. Data was collected in October 2013, a week before the households received social grants. In all the selected villages, the majority of households were hypothesised to depend on government social grants for their living. This period of data collection is largely the time when the majority of rural inhabitants of South Africa experience greatest food shortages. Data on household food consumption was gathered using the

24-hours recall period. A shorter reference period results in more accurate information due to perfect recall (Swindale and Bilinsky 2006). First, the researchers had to determine if the preceding 24-hour period was "unusual" or "normal" for a household under study. In the case that the period was an unusual occasion, for example a funeral gathering or party, or when a large proportion of household members were not present, another day was scheduled. If rescheduling to another day was unlikely, then an alternative household was chosen. Household Dietary Diversity Score data was obtained from the respondents through asking them twelve yes or no questions.

The respondents were advised to indicate the food groups eaten by the members of the household at home, or the food groups consumed outside of the home by other members of the household but prepared at home. Those food groups eaten outside of the home by household members not prepared in the home were not considered. Although this could translate to underestimating the dietary diversity of individuals within the household (those who might, for instance, obtain food outside of the home), HDDS specifically in this study was intended to estimate the household dietary diversity, on average, between all members.

Data Analysis

Descriptive statistics such as frequency, percentages and measures of central tendency (means and standard deviations) were employed to describe the general characteristics of the interviewed households. Additionally, ANOVA analysis were computed to establish whether statistically-significant differences were present between households acquiring food from different sources. In estimating food security at household level, scholars in South Africa employ several methods guided by the aim and purpose of their respective studies. According to Labadarios et al. (2011), the "National Food Consumption Survey (NFCS), Food Insecurity and Vulnerability Information and Mapping System (FIVIMS), General Household Survey (GHS), Income and Expenditure Survey (IES), Community Survey (CS), South African Social Attitudes Survey (SASAS), and the Labour Force Survey (LFS) are some of the national surveys conducted to assess food security status in the country." Different approaches produce differing results owing to the versatile nature of food security. However, for the purpose of this paper, the HDDS was used due to its simplicity. It gives the frequency of various food groups eaten over a 24-hour recall period. In this paper, the number of various food groups eaten by the members of the household is computed, instead of the number of different foods consumed.

Given that a household ate, for instance, on a regular basis of four various food groups suggests that the household's diet provides diversity in both macro- and micronutrients. This would be a much significant pointer compared to assuming that a household ate four different foods, that which could all be in one food group, for example cereals (Swindale and Bilinsky 2006). For this paper, the 12 food groups used to estimate the HDDS[1] include: cereals, fish and seafood, root and tubers, pulses/legumes/nuts, vegetables, milk and milk products, fruits, oil/fats, meat, poultry, offal, sugar/honey, eggs and miscellaneous. The Household Dietary Diversity Score was then estimated by adding the number of food groups ate by each household. The mean HDDS for the study was calculated by summing HDDS for all households, divided by the total number of the interviewed households. Households were categorised into two terciles, low and high dietary diversity - the determination of these classes is described in detail in literature (Dewey et al. 2006; Labadarios et al. 2011). For regression and further analyses, household's dietary was defined according to terciles; households with mean dietary diversity of <4 representing low dietary diversity and those with a mean dietary diversity of >4 representing high dietary diversity. Terciles from previous studies were used because there are currently no international guidelines or recommendations on which to base cut-offs for "low" or "high" diversity (Dewey et al. 2006).

RESULTS AND DISCUSSION

Household Characteristics

The majority of the interviewees were females (67%), this may be attributed to the precondition of Household Dietary Diversity Surveys that the interview is directed to the person who is mostly involved in food preparation, as in this case, the African culture women are the ones

who are mostly involved with food preparation in households. The remaining thirty-three percent of the interviewees were males. This trend where females dominated the interviewees was observed in both local municipalities as shown in Table 1.

Table 1: Household socio-economic characteristics

Variable	*Nkonkobe (%)*	*Tsolwani (%)*	*Aggregate (%)*
Gender			
Male	31	34	33
Female	69	66	67
Marital Status			
Married	43	51	48
Single	40	21	29
Divorced	1	2	2
Widowed	16	26	21
Age			
<16	0	0	0
16-29	6	3	4
30-50	30	30	30
51-60	28	25	27
>60	36	42	39
Level of Education			
Not educated	9	21	15
Informal	7	8	8
Grade 0-7	57	42	50
Grade 8-12	26	27	25
Tertiary	1	2	2
Employment status			
Unemployed	98	96	97
Employed	2	4	3

Source: Survey data (2013)

A greater proportion (43% and 51%) of the interviewees in both Nkonkobe and Tsolwani Local Municipalities were married. As indicated in Table 1, the female household head is the one that is most involved in cooking in the African society. On aggregate, a marginal number of the interviewees (2%) were divorcees. Twenty-one percent (21%) on aggregate of the interviewees were widows and this number is quite large and can be attributed to diseases such as HIV/AIDS that have taken the lives of many in developing countries due to lack of anti-retroviral drugs at right place and time. In addition, most of the people residing in rural areas have limited access to HIV testing facilities, resulting in most not knowing their status on time (Akullian et al. 2016). Among the surveyed households, the mean family size was 5 members and ranged between 1 to 15 members. A large family size suggests more pressure on household food requirements (Abdullah et al. 2017).

Interviewees aged above 60 years dominated in both municipalities and this may be attributed to the youths migrating to urban areas in search of greener pastures which may include employment opportunities as well as better education facilities (Collinson et al. 2016). In the surveyed rural areas of the two municipalities, there were no industries or processing plants. The major source of employment was government through its community development programs.

Although considerable effort has been made in South Africa post-democracy in 1994, schools in rural areas are difficult to access, and physical conditions are often inadequate (Gardiner 2017). As a result, people in rural areas tend to leave school earlier than their urban counterparts. Educational attainment in the study area was relatively high with only fifteen percent on aggregate of the interviewees being uneducated. The majority of the interviewees, fifty-two percent and forty-two percent in Nkonkobe and Tsolwani Local Municipalities respectively had primary education, and this is far below the figures reported in the General Household Survey Series for 2012 (Statistics South Africa 2012b). The problem of rural inhabitants not attaining education is expected to lessen significantly over the years, with improvements taking place in education in rural areas (Nkhori 2004). However, focus ought to be directed in ensuring improved access to secondary and tertiary levels of education as most of the respondents had only attained primary education. Results further revealed that the prevailing heads of households were the elderly. However, it is expected that the youths of today would have significantly acquired more than basic education by the time they become heads of households in the future because of improving access to education currently compared to the past. According to Cohen et al. (1999), Schnepf (2013), Asghar and Muhammad (2013) and Abdullah et al. (2017), the level of education has important implications on food choices, consumption pattern and food budgeting.

Formal employment opportunities are very minimal in rural areas of South Africa (Wilkinson et al. 2017) and this was confirmed in this paper as more than ninety-five percent of the interviewees were unemployed. The high unemployment rate in the two municipalities may also be attributed to the lack of skills among the old people due to racial laws that limited them from

accessing education in the past. The monthly household income for the interviewed households ranged from zero to ZAR[2]1 600, and on average each household earned ZAR1 631.52. However, households in Tsolwani earned more income (ZAR1 703.52) than households in Nkonkobe who earned an average of ZAR1 541.00 per month. Off-farm and farm income received by a household is a crucial aspect in determining the food security status of a household (Muche and Tadele 2015) as it can be used to strengthen the agricultural activities in terms of buying inputs, and income is normally used as a proxy to measure access to food.

Main Means by Which Households Acquire Food

Table 2 shows the proportion of households practising different forms of agricultural activities as the means by which households acquire food. As reported in literature (Hebnick and Lent 2007), the highest proportion of respondents (more than 60%) has some form of agricultural practice. Results of the study show that thirty-one, twenty-one and eight percent of the interviewed households specialised in livestock production, practised both crop and livestock production, and specialised only in crop production respectively as illustrated in Table 2. The domination of livestock production among agricultural activities practiced in the study areas is congruent with literature that the Eastern Cape Province is dominated by livestock production as opposed to crop production (Mapiye et al. 2007; Musemwa et al. 2007; Muchenje et al. 2008; Statistics South Africa 2016). The results suggest a scenario where most households seem to be deriving a proportion of food from their own food production, with food purchases playing a supplementary role.

Table 2: Main means by which households acquire food

Main means by which household acquire food	*Aggregate (%)*
Specialise in livestock production	31
Specialise in crop production	8
Practise both crop and livestock production	21
Not involved in any agricultural activities	40
Total	100

Source: Survey data (2013)

Approximately forty percent of the respondents do not practise any form of agriculture and thus depended on food purchases for their survival. The high proportion could be attributed to many factors like large-scale farm abandonment in the Eastern Cape Province reported by Shackelton et al. (2013), lack of agricultural inputs, jointly with low marginal returns to participating in agricultural activities, and ultimately poor yields that may not be attractive due to climatic factors (Hebnick and Lent 2007; Ali et al. 2017). The Eastern Cape Province experiences extreme weather conditions ranging from snow, floods, drought to excessive heat - this makes small-scale crop production unfeasible as it relies more on climatic conditions (Hebnick and Lent 2007).

Research that seeks to understand the link between the main source of food for households and the status of household food security should assess the true contribution of a household's main source of food to the frequency of meals consumed daily. Table 3 provides the mean and standard deviation of meals consumed daily and the output of the ANOVA analysis and whether we have a statistically-significant difference between households acquiring food from different sources (at 95% Confidence Interval (CI)) for each group categorised as livestock farmers, vegetable/crop farmers, mixed farming activities and non-agricultural activities.

The grouped average for meals consumed per day by the participants was 2.57 meals per day. When split according to households' major source of food and ranked according to the mean number of meals per day, households with integrated farming systems (Livestock/Crop) as the major source of food consume the highest number of meals per day (2.79) followed by vegetable-crop farmers (2.62), livestock owners (2.51) and those practicing non-agricultural activities (2.49) as the main source of livelihood. It appears that the number of meals consumed per day decreases as we move across the cohorts in that order. There was an observed statistically-significant difference in the meals consumed per day between households practising mixed farming systems as the main source of food relative to otherwise ($p<0.05$). Integrated farming system remains an important practice and is a significant influencer of food security (Uddin et al. 2015; Bhaskar et al. 2017). The researchers found no consumption differences in terms of meals

consumed per day between households with vegetable-crop farming systems, livestock farming and non-agricultural activities as the main sources of food, indicating relative equality in meals consumed per day across these cohorts (see Table 3).

Although slightly less than three meals per day, the participants' eating habits closely reflect the traditional three meals per day arrangement by approximation (that is breakfast, lunch, and supper), which exhibit common eating habits (La Bounty et al. 2011; Saronga et al. 2016). However, the presented averages might be higher than normal as La Bounty et al. (2011) found that the exclusion of meals consisting of fewer than or equivalent to 70 kcals (mainly comprising of tea, coffee, or diet beverages) from similar analyses decreases the number of meals consumed per day.

Results show that households practicing any form of agriculture are more likely to consume close to three meals per day, however, this was less likely for purely livestock farmers or those practising non-agricultural activities. A clear distinction emerged between households practicing integrated farming and those that practice the other activities, with the former participants consuming a higher number of meals per day (Table 3). Practising mixed farming system increases the number of meals consumed daily as compared to other sources of food. This therefore reflects that a mixed farming system has stronger influence on food availability and stability. Meat, vegetable relishes and crops are an integral and essential element in most diets of South Africans, thus their availability at household level influences the frequency of meal consumption.

Themes shared across the entire respondents and seemingly characterizing the experience of informants were drawn from the interviews. The respondents repeatedly referred to ideas associated with availability and stability of food supplies as the main determinants of the frequency of meals consumed per day. However, several prior studies, mostly from developed countries and some urban setting, have described households eating habits in terms of frequency of meals consumed per day as derived by many factors; categorised as tradition and modern factors. According to La Bounty et al. (2011) and Visser (2015) in the traditional world, households eat meals collectively and in a predictable manner, depending on household food preferences, dietary awareness, food availability, time constraints with regard to food preparation and in exceptional cases, when the household has a member on treatment and thus is expected to eat at specified times. In the industrialized world, the frequency of meals is influenced by cultural/social norms and personal beliefs about a person's health or body composition (La Bounty et al. 2011). For some households, eating becomes a highly personalized matter of choice in which what, when and how frequently individual household members eat is driven less and less by the choices of their families, co-workers and friends, and more and more by impulse, personal taste and favourite nutrition memes (Visser 2015).

A number of studies explore the health effects of frequency of meals per day and the scientific debate is still somewhat equivocal, marred with various conclusions with some proposed linkages being inconclusive. Some scientists have theorized that the distribution of meals

Table 3: Comparison of mean values for number of meals consumed per day by households

Main activity		*Mean*	*SD*	*Between group difference P-value*
Integrated farming systems (Livestock/Crop)	Main source of food	2.79	0.485	0.009*
	Otherwise	2.51	0.584	
Vegetable/Crop farmers	Main source of food	2.62	0.506	0.753
	Otherwise	2.57	0.550	
Livestock owners	Main source of food	2.51	0.582	0.360
	Otherwise	2.60	0.592	
Non-agricultural activities	Main source of food	2.49	0.535	0.146
	Otherwise	2.62	0.549	
Aggregate sample		2.57		

Source: Survey data (2013)

throughout the day has direct implication on the increase of reduction of obesity, blood pressure, type-2 diabetes and heart diseases. There is need for more studies on the frequency of meals consumed daily and the health effects on which to base responsible food security interventions in South Africa.

Data for household consumption of different food groups, the proportion of farming households and non-farming households, are given in Table 4. The major diet component consumed by many participants in the investigated communities is starch, mainly composed of *samp, pap* and bread (86.7%) followed by a diet made up of coffee, tea and condiments (55.1%) and thirdly by oil/fat or butter (54.1%). There was no observed significant difference among farming households and non-farming households' consumption of these food groups.

When combined, it emerged that more than half the households consume hot tea mostly during the day. The least consumed food groups are fish and sea food (45.7%) followed by cheese, yogurt, milk or other milk products (41.7%) and fruits (18.4%). Potatoes/any roots/tubers and vegetables were consumed by less than a quarter of the households. The rest of the food groups have an average consumption rate of 39.8 percent and a range of 22.8 to 50.6 percent. These results show a similar trend in terms of commonly-consumed foods as those found by Nel and Casey (2003) following their analyses of secondary data of dietary surveys in South Africa. In descending order, the frequency of daily consumption and average amounts reported by Nel and Casey (2003) was as follows: maize porridge (78%/848 g), white sugar (77%/27 g), tea (68%/456 g), brown bread (55%/165 g), white bread (28%/163 g), non-dairy creamer (25%/6 g), brick margarine (21%/19 g), chicken meat (19%/111 g), full-cream milk (19%/204 g) and green leaves (17%/182 g). The observed trend in consumption among the investigated communities does not indicate any change in the diet component of South Africans, although the current information represents micro trends of two geographical locations. Farming households consume more beans, peas/nuts than non-farming households and the difference is significant ($p = 0.069$). This is likely to imply that the consumption of own produce in the form of beans, peas and nuts significantly differentiate the two groups' consumption patterns.

The key food ingredients that contribute to most participants' diets are starch, high energy or high fat foods, these signify the highest level of unhealthy food consumption (Reddy and Katan 2004). Households in lower income group usually have a limited number of food items in their monthly shopping baskets. Higher overall energy intake was also reported by Nel and Casey (2003). African countries are commendable for their healthiest diets (Williams and Ayemon 1998), however this is seemingly not the issue in South Africa. There are, however, many reasons for the observed consumption trends in literature, especially the consumption of energy-dense diets and fats. According to Drewnowski

Table 4: Comparison of food groups consumed in 24 hour preceding survey, by household's main economic activity categorised as agriculture and non-agricultural

Food groups	*Farming households*	*Non-farming households*	*All households*	*P-value*
Cereal or any other locally-available grain for example *samp, pap,* bread	88.4	84.1	86.7	0.436
Oil, fat or butter	49.5	58.7	54.1	0.254
Coffee, tea and condiments	43.2	50.8	55.1	0.346
Potatoes or any roots or tubers,	15.8	22.2	53.2	0.306
Meat, poultry or offal	48.4	54.0	50.6	0.495
Vegetables	22.1	23.8	46.2	0.803
Sugar or honey	6.3	4.8	40.5	0.680
Eggs	21.1	25.4	23.3	0.524
Beans, peas or nuts	35.8	22.2	22.8	0.069**
Fruits	14.3	22.5	18.4	0.296
Cheese, yogurt, milk or other milk products	35.8	47.6	41.7	0.138
Fish or any seafood	42.6	48.7	45.7	0.451

Source: Survey data (2013)
** Denotes significant at 10% level

and Darmon (2005), households with limited resources select these foods because they are inexpensive and tasty. In rural South Africa, per capita consumption of non-basic foods essential for growth and health that include meat, fish, fruit, oil, and vegetables falls short in terms of the recommended levels. In addition, Moore et al. (2008) highlighted that a dietary pattern is influenced by factors related to the local food environment. Moore et al. (2008) indicated that households residing in areas with the lowest-ranked food settings are less likely to have healthy diets than those in the best-ranked food settings. Fresh vegetables and fruits are not only more expensive (on a per calorie basis) than are fats and sweets, but they are also more likely to be unavailable in low-income neighbourhoods.

The most commonly-consumed foods reported by the households are linked to obesity and over-nutrition, already reported as common nutritional disorders in high-income countries and sharply increasing in low- to middle-income countries (Tappy and D'Alessio 2006; Muchenje and Mukumbo 2015). An important piece of knowledge highlighted by Kim et al. (2015) on household food dietary practice is that when a household experiences a food product in daily life, they view it as key to their diet, with limited attention to other available nutritious foods. The results of this paper imply that for urgent improvements in diets and healthy foods in South Africa, there is a need to embrace strategies aimed at improving nutritional education in addition to the availability, accessibility and consumption of health foods, including vegetables and fruits. The promotion of home gardens would be key to improving the dietary diversity and micronutrient status of households (Puett et al. 2014; Birdi and Shah 2016). Actions in multiple domains are essential to help households achieve optimal diets and thus reduce the growing incidence of malnutrition.

Household Dietary Diversity Score (HDDS)

HDDS for all the interviewed households ranged from 1 to 12. The mean score for the two municipalities was 5. The higher the score, the more a household is food secure in terms of a balanced diet, for example an average of 5 food groups suggests that their diets provide some diversity for both macro- and micro-nutrients.

Table 5: Frequencies of household dietary diversity scores

HDDS	*Agricultural households (%)*
1	0.6
2	1.9
3	22.2
4	28.5
5	19
6	1.3
7	5.1
8	8.2
9	9.5
10	0.6
11	2.5
12	0.6

Source: Survey data (2013)

If scores below four (<4) are considered low dietary diversity and scores higher than or equal to four (>4) are deemed high dietary diversity, the sample can be divided into households with high and low dietary diversity. In this regard, the majority (61%) of the households fall into the high dietary diversity category and only thirty-nine percent of the households fall into the low dietary diversity category (Table 5). After obtaining a similar mean HDDS, the researchers compared the dietary diversity of households according to the main activity by which each household acquires food and their respective farming system.

Table 6 shows the household dietary diversity detailed by the main activity by which households acquire food categorised as agricultural activity and non-agricultural.

Table 6: Household dietary diversity scores by the main activity by which the household acquire food

HDDS	*Agricultural households (%)*	*Non-agricultural households (%)*
1	1.6	-
2	-	3.2
3	27	18.9
4	30.2	27.9
5	23.8	15.8
6	1.6	1.1
7	4.8	5.3
8	4.8	10.5
9	3.2	13.7
10	1.6	-
11	1.6	3.2
12	-	1.1

Source: Survey data (2013)

Households' dietary diversity is always defined according to terciles: households with mean dietary diversity of <4 representing low dietary diversity and those with a mean dietary diversity of >4 representing high dietary diversity (Table 7). These terciles are defined further in literature (Swindale and Bilinsky 2006; Labadarios et al. 2011). For both agricultural and non-agriculture households, density estimates from observation of frequency show a unimodal frequency and skewness with higher frequency for mean dietary diversity of 3, 4 to 5. A lower tail for higher average dietary diversity implies that participant households' consumption of most foods fall short of the recommended dietary diversity for both categories. However, a slightly higher proportion of non-agricultural households relative to agricultural households consume diverse diets in the range of 7 to 9. None of the agricultural households have a dietary diversity score of 12.

Table 7: Food consumption patterns of high dietary diversity households compared with low dietary diversity households

Food groups	*1 to 3*	*4 to 12*
Cereal or any other locally available grain such as *samp*, *pap*, bread	76.9	89.9
Oil, fat or butter	43.6	52.9
Coffee, tea and condiments	25.6	22.7
Potatoes or any roots or tubers	5.1	58.8
Meat, poultry or offal	27.7	28.6
Vegetables	10.3	37
Sugar or honey		7.6
Eggs	7.7	27.7
Beans, peas or nuts	10.3	37
Fruits	64.1	93.3
Cheese, yogurt, milk or other milk products	12.8	49.6
Fish or any seafood	17.9	62.7

Source: Survey data (2013)

Low marginal differences were observed for oil, fat or butter; coffee, tea and condiments; and cereal, with higher marginal differences observed for all the other food groups. A more diversified diet is highly correlated with the high consumption of potatoes or any roots or tubers; fish or any sea food; cheese, yogurt or milk; and vegetables as shown by the marginal difference between high dietary diversity households and low dietary diversity households.

The group mean HDDS was 5.16, the highest mean HDDS was for households practising integrated farming as their main source of food (Table 8). The highest prevalence of poor dietary diversity was found among households with non-agricultural activities as the major source of food has the least HDDS of 4.65. The latter group constituted the highest proportion of the respondents.

Table 8: Food security indicator in relation to the main means by which households acquire food

	Mean	*Std. deviation*
Non-agricultural		
HDDS	4.65	1.919
Meals/day	2.49	+0.535
Integrated Farming System		
HDDS	5.97	2.416
Meals/day	2.79	0.485
Livestock Ownership		
HDDS	5.67	2.487
Meals/day	2.51	0.582
Vegetable/Crop Production		
HDDS	5.85	2.672
Meals/day	2.62	0.506

Source: Survey data (2013)

There was a statistically-significant difference between group mean household dietary diversity for households with different activities as the main source of livelihood ($p = 0.0046$) (Table 9). A Tukey post-hoc test revealed that the household dietary diversity was significantly ($p<0.05$) higher for farmers who practised integrated farming (5.97±2.416), than households practising non-agricultural activities as main activities (4.65±1.919). There were no statistically-significant differences between all the other groups. The investigated households' dietary diversity is largely influenced by purchases of food.

CONCLUSION

This paper analysed the dietary diversity of households in the Eastern Cape Province of South Africa. Results reveal that households who practiced non-agricultural activities as their main source of food had the least household dietary diversity scores compared to those who practiced agriculture. Furthermore, results showed that the mean frequency of meals consumed daily by the participants was significantly higher for those households that practised mixed farming. A household with a higher score

Table 9: Multiple comparisons of HDDS and main means by which household acquire food

(I) Source	*(J) Source*	*Mean HDDS difference (I-J)*	*Std. error*	*P-value*
Vegetable Production	Livestock production	0.18	0.692	1.000
	Integrated farming system	-0.12	0.722	0.801
	Non-agricultural activities only	1.20	0.672	0.391
Livestock Production	Vegetable production	-0.18	0.692	1.000
	Integrated farming system	-0.30	0.512	0.539
	Non-agricultural activities only	1.02	0.438	0.834
Integrated Farming System	Vegetable production	0.12	0.722	0.801
	Livestock production	0.30	0.512	0.539
	Non-agricultural activities only	1.32	0.484	0.046*
Non-agricultural Activities only	Vegetable production	-1.20	0.672	0.391
	Livestock production	-1.02	0.438	0.834
	Integrated farming system	-1.32	0.484	0.046*

Source: Survey data (2013)

is deemed to be food secure in terms of a balanced diet. However, the major diet component consumed by most households in the investigated communities was mainly composed of starch foods, implying an urgent need to improve the nutritional status, accessibility and consumption of health foods among households.

RECOMMENDATIONS

The findings imply that the South African social welfare system on its own cannot be sufficient in solving the problem of malnutrition. Therefore, the social welfare system should be complemented with an aggressive own-food production program which includes the promotion of home gardens, livestock improvement programs and integrated farming systems as they contribute significantly to household diets. The own-food production program should, however, be supplemented by strategies that make own-food production attractive for all, particularly young people, to counter the effect of rural-urban migration.

The promotion of own-food production can be done through the availing of starter packs to households. One such program was implemented in Malawi where it resulted in a significant increase in household food production, both during the period of free inputs and in subsequent years. The extension of such a program to households in South Africa could result in the households venturing into the production of their own food, thereby minimising the government-dependency syndrome currently affecting some citizens of South Africa. For the starter-pack strategy to work, households require a massive own-food production training program - this can be done through the existing government extension officers as well as private extension services. Training can also be enhanced through an extensive social media, radio and television extension campaign, and also through roadshows. Other essential services may include packaging agricultural inputs for sale in small quantities, inputs for work programs and subsiding agricultural inputs.

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NOTES

1. Food groups as used in the "Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide VERSION 2" adapted from Swindale and Bilinsky (2006).
2. ZAR – South African Rand

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