

Full Length Research Paper

An investigation into the factors affecting food availability, choices and nutritional adequacy of smallholder farming households under irrigation and dryland farming in Vhembe district of Limpopo, province, South Africa

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The aim of this study was to investigate the food availability, food choices and nutritional adequacy of household food in the study area. Both primary and secondary data were used in this study. The primary data was collected by using a pre-tested questionnaire administered to selected farmers in the study area and focus group discussion methods. A probability sampling method (that is, pure or simple random sampling technique) was used to select the respondents. From a total population of 3,236 small-scale irrigators in Vhembe District, 147 respondents who happened to be irrigation farmers were randomly selected while 43 dry-land farmers were selected adjacent to the selected irrigators. This study revealed that the type of carbohydrate food eaten most is the maize meal (pap) which is eaten seven times in a week by a large majority of the respondents (about 60%) out of 190 respondents, while very few eat other carbohydrate foods and only less than 1% eat oat meal few times in a week. This could be because maize meal (pap) is the staple food eaten in the Vhembe district. The study revealed that household food security depends on a nutritionally adequate and safe food supply at the household level and for each individual; a fair degree of stability in the food availability to the household both during the year and from year to year; and access of each family member to sufficient food to meet nutritional requirements. There is no significant difference in the type of food eaten between the irrigation and dry-land farmer households. Social factors and cultural practices in most countries have a very great influence on what people eat, on how they prepare food, their feeding practices and type of food they prefer. The likelihood of food security increases when farmers increase agricultural output and have access to a piece of land on the irrigation project. Therefore, with concerted support from government, and all stakeholders, food security can be enhanced at the household levels. Also, education and extension training are essential for farmers so that they are able to adopt new technologies. The study suggests that households that need to be targeted for food aid are those with large families, and those without access to irrigation projects. Also, to be included are those families with few assets, and those without access to agricultural land and implements.

Key words: Food groups, food security, nutritionally adequate food, coping strategy.

INTRODUCTION

Food insecurity and poverty are locked into the same destructive cycle (Oni et al., 2011). Poverty is the leading

cause of food insecurity, and food insecurity is a major contributor to the continuity of poverty. A growing number

of studies indicate that food insecurity, hunger and poverty coexist in South Africa (May and Woolard, 2007; HSRC, 2004; Pauw and Mncube, 2007). However, there are very few studies in South Africa that empirically estimate the extent of food insecurity and household vulnerability, and which describe the coping strategies employed by rural households (Hendricks and Lyne, 2009). Most of these studies have shown that there are many factors that are involved in enhancing food security such as irrigation, land quality, incomes, size of household, wealth of farmers and land size. So far, it has been shown that smallholder irrigation has a number of benefits which include crop diversification, better incomes, good nutrition and employment opportunities to local people and the farmer can achieve household food security (Makombe and Meinzen-Dick, 1993). Agricultural growth offers possibilities for reducing risks of food shortages at all levels, increasing overall supply of food, creating economic opportunities for vulnerable people and improving dietary diversity and the quality of food consumed by farm households (Lyne et al., 2009). In South Africa, food security is not a failure of agriculture to produce sufficient food at the national level, but a complex failure of households to access guaranteed sufficient food (Baker, 2004).

Food insecurity and malnutrition are highest in provinces with large rural populations, such as KwaZulu-Natal, Limpopo, Eastern Cape and the Free State (Department of Agriculture, 2007). The demands of the colonial and apartheid eras for male labour in urban areas resulted in the erosion of the fundamentally agrarian existence of Black Africans, and a subsequent increased reliance on non-farm and non-rural incomes. There is a greater reliance on purchased food as opposed to own-produced food which exposes vulnerable households to the adverse effects of price fluctuations (Stats, 2004). For example, the 17% inflation on food prices between 2001 and 2002 had a disproportionate and devastating impact on the living standards of the predominantly rural ultra-poor, which spent more than 50% of their income on food (Stats, 2004).

The outlook for the food security of many developing nations is a cause for serious concern. Widespread denudation and accelerated erosion diminish the productivity of both cultivated and grazed rain-fed lands (Oni et al., 2011). Semi-arid regions are especially vulnerable to climatic instability and frequent droughts. At the same time, depletion and pollution of limited freshwater resources and competing demands for water - among neighbouring states as well as, between different sectors within each state - constrain further expansion of irrigation (Oni et al., 2011).

The problem of food security is exacerbated by the

rapid growth of population and hence, the demand for food (FAO, 1997). In fact, the prices of foodstuffs in the world market have recently begun to rise. Beyond that looms the spectre of a fundamental change in climate (a consequence of the enhanced greenhouse effect), that may increase the severity and variability of weather and thus disrupt established systems of production (FAO, 1997). Such a change could require expensive investments in modifying existing systems and establishing new ones. All these problems are particularly acute on the continent of Africa, parts of which are already in the throes of a severe population-environment crisis. The population of sub-Saharan Africa, now nearing 600 million is projected to double by the year 2020 (FAO, 1997). Therefore, a much greater effort must be made first by the region also by the international community to assist the African nations in the difficult task of improving their prospects for food security.

In the State of Food Insecurity (2001), food security was defined as "a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2002). The international community has accepted these increasingly broad statements of common goals and implied responsibilities. But the practical response has been to focus on narrower, simpler objectives around which to organise international and national public action. The declared primary objective in international development policy discourse is increasingly the reduction and elimination of poverty. The 1996 WFS guided this direction of policy by targeting the primary objective of international action on food security at halving the number of hungry or undernourished people by 2015 (Oni et al., 2011).

Essentially, food security can be described as a phenomenon relating to individuals. It is the nutritional status of the individual household member that is the ultimate focus, and the risk of that adequate status not being achieved or becoming undermined. The latter risk describes the vulnerability of individuals in this context.

Food insecurity is a "limited or uncertain availability of nutritionally adequate and safe foods, limited or uncertain ability to acquire acceptable food in socially acceptable ways" (Oni et al., 2011). Food insecurity and hunger are also conditions resulting from financial resource constraint. Hunger is the uneasy or painfully sensation caused by lack of food or the recurrent and involuntary lack of access to food. Hunger may produce malnutrition over time. Hunger is a potential, although, not necessarily, consequence of food insecurity (FAO, 1996).

Given the number of closely related terms, it is worth noting how some of the definitions vary. 'Hunger', sometimes used synonymously with food insecurity in popular language, is technically defined as an 'uncomfortable or painful sensation caused by a lack of food. Hunger can be experienced temporarily by people who are not food insecure, as well as by those who are

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(DFID, 2003). Malnutrition here refers to under-nutrition or a nutritional status significantly (at least two standard deviations) below expected levels.

Household food security accounts for the consumption levels of all members of a household population (Oni et al., 2011). Farm household production and food security analysis at the household level requires understanding of the household's ability to either produce enough food or generate enough income to purchase food. Policies and measures, which have been implemented by most countries to ensure food security, include encouraging increased agricultural production to maintain food self-sufficiency (Kandoole and Msukwa, 1992). Rohrbach (1989) interprets food self-sufficiency as the ability of a country to meet all its staple food requirements through domestic production. In relation to crop production, a household is regarded as self-sufficient if it produces enough for its needs (Masomera, 1998). Food security has been widely accepted to mean the ability of individuals located in specified geographical boundaries to meet staple food needs on a year round basis from their own enterprise production or through purchases from domestic markets (Amin, 1989). Thus, there are two sides to the food security equation: food availability and food access (Rukuni and Bernsten, 1988). Many households simply lack the means to secure consistent access to food which will allow them to lead active and healthy lives. This study assessed food security status at household levels. It looked at the ability of the household to produce its own food to meet its food requirements.

Recent estimates of the FAO showed that the number of undernourished people increased from 848 million to 923 million from 2003/2005 to 2007, largely owing to the food price crisis (FAO, 2008). The number of undernourished increased even further in 2008 as prices continued to rise and the financial crisis hit high levels due to the global economic melt-down. Food price hikes have also raised micronutrient deficiencies, with negative consequences for nutrition and health, such as impaired cognitive development, lower resistance to disease, and increased risks for both mothers and children during childbirth (Oni et al., 2011).

In Bangladesh, for example, a 50% increase in the price of food is estimated to raise the prevalence of iron deficiency among women and children by 25% (Bouis, 2008). Because good nutrition is crucial both for children's physical and cognitive development and for their productivity and earnings as adults and the adverse consequences of this price shock could continue even after the shock ends. Food insecurity can be a key source of conflict and with increasing food and general living costs, people have turned to the streets in protest. Social and political unrest has occurred in 61 countries since the beginning of 2007, with some experiencing multiple occurrences and a high degree of violence (Von Braun, 2008). Although, this unrest has occurred mostly in countries with low performance in governance, other

countries have also been affected.

South Africa is a net agricultural exporter with an agri-food and seafood trade surplus of \$2 billion (Berry, 2007). In 2005, the country exported \$5.4 billion of agri-food and seafood. Agricultural products made up 8% of South Africa's total exports. South Africa is the world's top exporter of avocado, tangerine, and ostrich products. It is also ranked as the world's second largest exporter of grapefruit, third for plums and pears, and fourth for table grapes. Other major export commodities include wine, citrus, sugar, grapes, maize, fruit juice, wool, and deciduous fruit (Berry, 2007). Projections indicate that should current production trends hold, domestic wheat production would be outstripped by domestic consumption by nearly 60% in 2010 and by over 100% in 2020 (Limpopo Department of Agriculture, 2002). Maize and beef is expected to increase by about 130% if production trends continue. The demand for poultry products has already outstripped domestic production by an estimated 22% in 2000, and is expected to increase to 92% in 2010 and to 192% in 2020 (Limpopo Department of Agriculture, 2002).

The erratic fluctuations in the value of the Rand have also underlined the close relationship between macro-economic or economy-wide factors and food security in South Africa. The tariff policy is also significant, and needs to be constantly examined in the light of its effects on national food security policies. Lowered tariffs on poultry products from the USA in the late 1990s caused a severe crisis in the South African poultry industry. South African consumers, on the other hand, enjoyed more affordable poultry products. In order to appease both producer and consumer interests, the Government intervened to raise tariffs on US poultry to a level, acceptable to both sides (Limpopo Department of Agriculture, 2002).

The target goal of the Integrated Food Security Strategy (IFSS) is to reduce the number of food-insecure households by half by 2015. One of the strategic objectives to reach this target is "to increase domestic food production by providing support services to farmers". The Department of Agriculture (DoA) has the responsibility to provide every citizen access to available food on a sustainable basis. To this effect, the DoA is to support the 244,000 food parcel beneficiaries to make use of the "Starter Packs for Food Production" for their own benefit (Department of Agriculture, 2006).

The food bank programme under South Africa Social Security Agency (SASSA) has been able to feed 1,900 people monthly in KwaZulu-Natal since 2006 from donated food parcels (SASSA, 2008). It also has to support individual and community gardens to support school nutrition and health care projects. Though it does not include support programmes for vulnerable people over the full spectrum of agriculture to enhance environmental sustainability and nutrition security (Department of Agriculture, 2007).

Household nutritional impact

In general, in analysing the possible nutritional impacts on household and individual behaviour in response to high food prices, coping strategies can be classified as being either food-based or non-food based (Oni et al., 2011). The definition by Snel and Staring (2001: 4) captures the broad notion of coping strategies, namely as 'all the strategically selected acts that individuals and households in a poor socio-economic position use to restrict their expenses or earn some extra income to enable them to pay for the basic necessities (food, clothing, shelter) and not fall too far below their society's level of welfare'. This definition is based on the assumption that despite limited resources, the households are asset managers with freedom of choice in relation to their actions. The first in the food-based coping strategies is the sudden loss in purchasing power which may result in changes in the quantity, quality and/or diversity of food items consumed. For example, an increase in the price of imported rice in West Africa might force households to switch to cheaper domestic rice or other starchy staples, such as locally produced sorghum or millet (Oni et al., 2011). Low income households with little or no choice to reduce the diversity of their diets will respond by simply having less meal per day and reducing non-food expenditure.

Non-food based coping strategies may include a reduction in expenditure on health care and education and seeking other sources of income to offset the loss in purchasing power (Hendricks and Lyne, 2009). The most important is the extent to which households and individuals are affected which depends considerably on their consumption behaviour and income status before the price shock sets in. As nutritional problems among children and adults are likely to worsen substantially if high food prices persist, immediate action should be taken to mitigate negative effects. For appropriate policy and programme responses to be implemented, a clear understanding of the individual country specific is essential, as the nutritional impact of coping mechanisms will vary considerably in different settings and among different population groups.

MATERIALS AND METHODS

Data types and sources and collection

The secondary data was collected from various government official reports which included Department of Health Services, Department of Agriculture, the Agricultural Service Centres in Thohoyandou, Makhado, Musina and Mutale; Statistics South Africa 2000 to 2008 census reports and mid-year estimates; private and public institutions including local farmers' organisation in the district; policy documents; journals, research papers on the internet and related books in the University of Venda's library and other sources. Primary data was collected using a pre-tested questionnaire administered among selected farmers in the study area.

Sampling procedures

A probability sampling method involving simple random sampling technique was used to select the respondents. Vhembe district has a total of 3,236 small-scale irrigators (Oni et al., 2011). A desired sample of 147 respondents who happened to be irrigators was randomly selected using simple random sampling techniques while 43 non-irrigators of dry-land farmers were selected adjacent to the selected irrigators. The data collection tool was the questionnaire which was designed and used to obtain the required data needs of the study. The questions were designed in such a way as to avoid ambiguity, sensitivity and provocativeness. The questionnaire included both open-ended and close-ended questions. Data was collected from September to October, 2009. Face-to-face interview method between the researcher together with the enumerators and the respondents was used to administer the questionnaires.

Data analysis

A combination of both qualitative and quantitative design methods was used. 190 respondents were interviewed about what type of food they ate in the last one week and the number of times such foods were eaten in the household. Regression analysis was used to determine the frequency of the consumption of the food group in the household in the last one week and also to identify a set of household characteristics that best estimates household consumption of the various food items. The number of households in each category of food group consumption was compared with the food pyramid to determine whether the household meet their dietary requirements and on the basis of this determine whether they are food secured or not.

RESULTS AND DISCUSSION

In this study, a total of 143 were irrigating farmers while 47 were dry-land farmers. The gender breakdown revealed that about 52% of the irrigators were males while 48% were females and 49% of the dry-land farmers were males while 51% were females. Households derive utility from the consumption of foods through the satisfaction found in a set of taste characteristics as well as, the health effects of the nutrients consumed. As was highlighted in Table 1, vegetables contributed about 35.6% of total income in irrigation farming as compared with 46.3% in dry-land farming. Livestock income was very low as farmers sold their livestock only in time of pressing financial needs and animals were not usually kept for commercial purposes by farmers in the study area.

Foods can be classified into a number of broad categories: Carbohydrates or grains and cereal group. The body needs 6 to 11 servings of these every day (CNPP, 2005). In fruit group, each person requires 2 to 4 servings on a daily basis. In the vegetable group, each person needs 3 to 5 servings of these daily, while in milk and dairy group, an individual requires 2 to 3 servings per day. In the meat, fish and egg group, each person needs 2 to 3 servings daily. Fat and oil maybe found in all other food groups and are used sparingly (CNPP, 2005). Table 2 shows the difference in food consumption of food group

Table 1. Distribution of total household income category of farmers (R000,000 for the 2008-2009).

Income sources	Irrigation				Dry-land			
	N	Amount (R)	Average amount	%	N	Amount (R)	Average amount	%
Maize	81	2,044,087	25,235	64.02	10	52,030	5,203	50
Vegetables*	48	1,135,651	23,659	35.9	7	48,110	6,872	46.3
Livestock**	4	2,300	575	0.08	5	3,900	780	3.7
Total	133	3,182,038	23,925	100	22	104,040	4,729	100

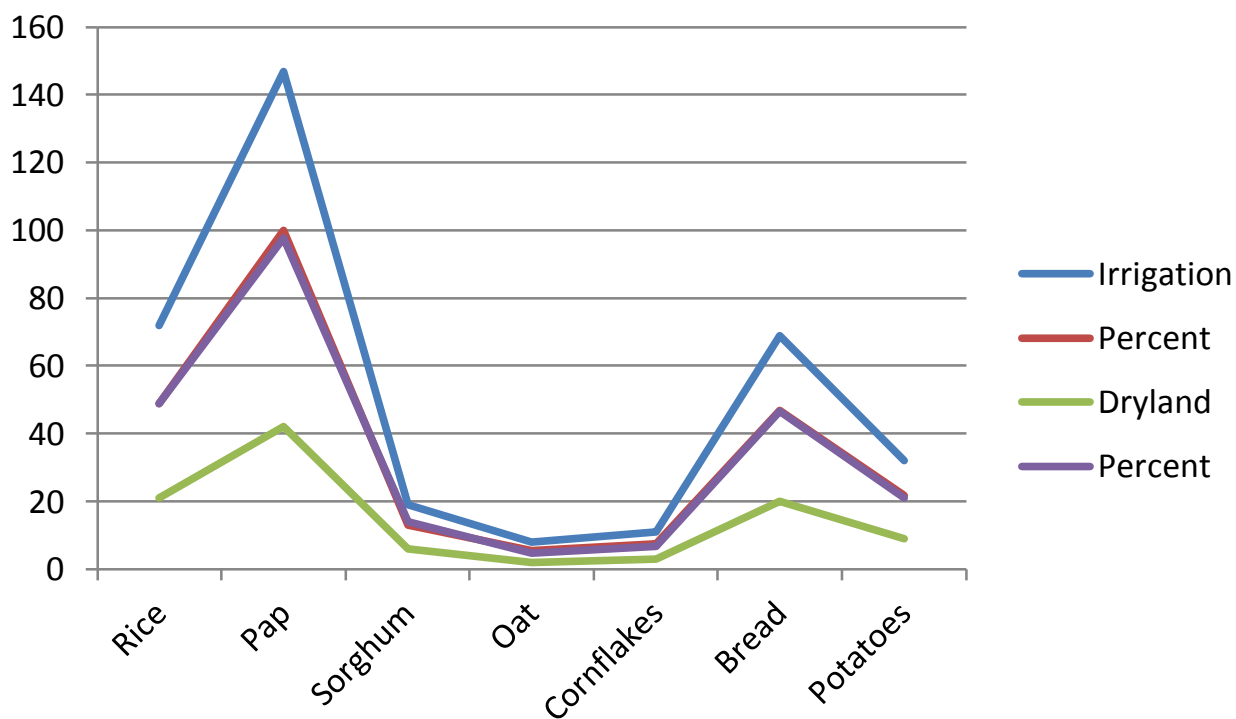
* Vegetable – include tomatoes, onions, spinach, cabbage, etc; ** Livestock – include cattle, goats, sheep, chickens, donkeys, etc.

Table 2. Difference in food intake between irrigation and dry-land farmers.

Food group	Food type	Irrigation	Percent	Dry-land	Percent
Carbohydrate	Rice	72	48.9	21	48.8
	Pap (maize porridge)	147	100	42	97.7
	Sorghum	19	12.9	6	13.9
	Oat	8	5.4	2	4.6
	Cornflakes	11	7.5	3	6.7
	Bread	69	46.9	20	46.5
	Potatoes	32	21.7	9	20.9
Vegetables	Carrots	57	38.7	17	39.5
	Cabbage	118	80.3	35	81.4
	Pumpkin	64	43.5	24	55.8
	Onion	90	61.2	26	60.1
	Tomatoes	77	52.3	23	53.4
	Pepper	43	29.2	12	27.9
	Lettuce	26	17.7	8	18.6
	Spinach	47	31.9	14	9.5
	Butternut	24	16.3	7	16.2
	Cucumber	17	11.6	5	11.6
	Muchina	45	30.6	13	30.2
	Beetroot	19	12.9	5	11.6
	Fruits	Banana	92	62.6	27
Mango		50	34	14	32.5
Orange		52	35.4	15	34.8
Pawpaw		45	30.6	13	30.2
Pineapple		16	10.9	5	11.6
Apple		31	21.1	9	20.9
Avocado		18	12.2	5	11.2
Peach		6	4.1	2	4.6
Litchis		7	4.8	2	4.6
Watermelon		4	2.7	1	2.3
Grape		3	2.0	1	2.3
Guava	65	44.2	19	44.1	
Milk and milk products	Fresh milk	63	42.9	19	44.1
	Cheese	42	28.6	12	27.9
	Butter	32	21.8	9	20.9
	Yoghurt	5	3.4	2	4.6
	Canned milk	6	4.1	2	4.6

Table 2. Countd.

	Chicken	120	81.6	35	81.3
	Beef	102	69.4	30	69.7
	Mutton	39	26.5	12	27.9
	Turkey	23	15.6	7	16.2
	Fish	52	35.2	15	34.8
Meat and legumes	Chicken head/feet	78	53.1	23	53.4
	Chicken intestine	52	35.4	15	35.3
	Chicken heart	46	31.3	14	32.5
	Eggs	41	27.8	12	27.9
	Beans	22	14.9	6	13.9
	Groundnuts	17	11.6	5	11.2
	Polony	7	4.8	2	4.6

**Figure 1.** Difference in carbohydrate food intake between irrigation and dry-land farmers.

by households in both irrigated and dry-land farming. This table indicated that Carbohydrate food group was eaten by highest number of households with a slight difference in the irrigated and dry-land farming. The percentage of different types of food eaten by the households was also shown.

Vegetables and fruits are planted by the farmers but they are not consumed more frequently like carbohydrate food group (Figure 1). This may be due to the social or cultural factors. Other reason may be due to the fact that most of the farmers are aiming at maximizing their profit from produce and could hardly take out produce for

home consumption.

Starches are the main source of carbohydrate in cereals such as, rice, maize, bread, and wheat (King and Burgess, 2000). Carbohydrate is the major staple food of the farmers in the study area. This is the food the body uses for energy. The amount of energy that people need to get from their food in order to keep healthy and active varies. To find out the total daily energy needs, you need to know the type of activity and the time that people spend on each.

This study revealed that the type of carbohydrate food eaten most is the maize meal (pap) which is eaten seven

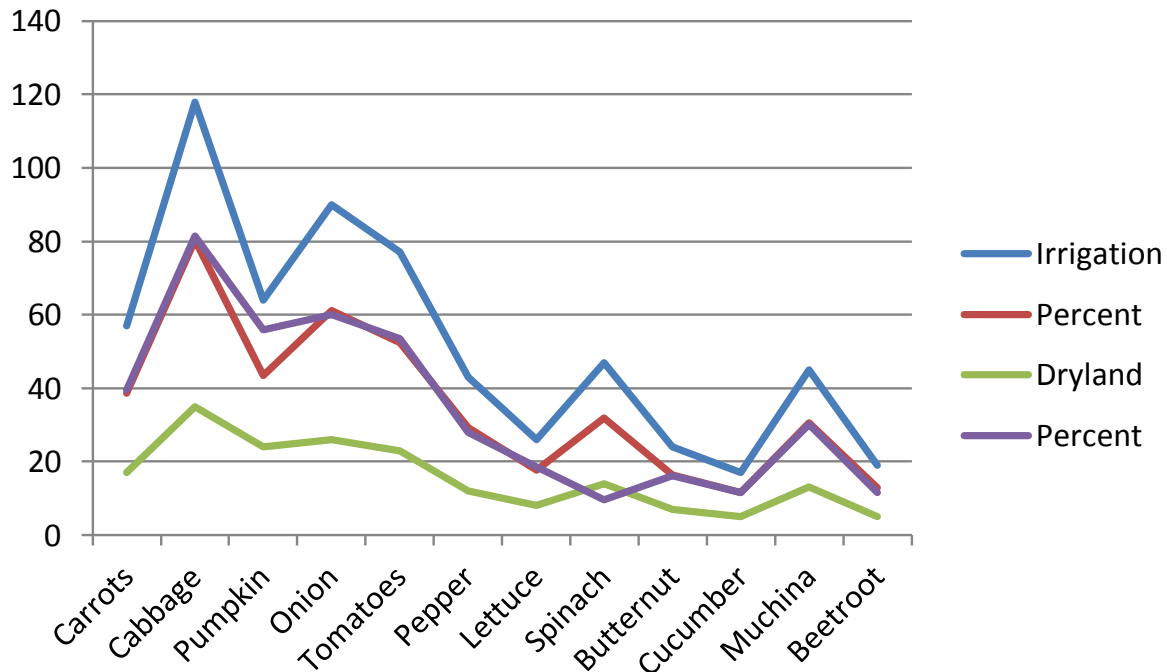


Figure 2. Difference in vegetables food intake between irrigation and dry-land farmers.

times in a week by a large majority of the respondents (about 100% in the irrigation farming and about 97% in the dry-land farming), while very few eat other carbohydrate foods and only less than 1% eat oat meal few times in a week in both irrigated and dry-land farming. There is no distinguishable difference in the carbohydrate food frequencies eaten among irrigation and dry-land farmers in the study area. This could be because maize meal (pap) is the staple food eaten in the Vhembe district. Over-consumption, taking in many more calories than required, is often accompanied by a deficiency in vitamins and minerals. Enrichment of this food with other food groups like vegetables and fruits, with important minerals and vitamins is important as many of the farmers need to understand issues about balanced diet so as to stay healthy.

Vegetables are nearly all rich in carotene and vitamin C and contain significant amounts of calcium, iron and other minerals (Latham, 1997). Lots of leafy vegetables are a very good source. An increase in the consumption of green leaves and other vegetables could play a major part in reducing vitamin A deficiency, which is often prevalent in children, and could contribute to lessening the prevalence of iron deficiency anaemia in all segments of the population but especially in women of child-bearing age (Latham, 1997).

This study revealed that a high percentage of farmers eat vegetables at least two to four times per week (Figure 2). There is a slight difference in the vegetable food frequencies eaten among irrigation and dry-land farmers in the study area. About 37% eat vegetables only once

per week while a small percentage did not eat vegetables at all. This may be because vegetables like muchina, tomatoes, pepper and onions, etc cannot be eaten alone except along with other food items and once those supporting food are not eaten then vegetables are abandoned.

The main nutritive value of fruits is their content of vitamin C, which is often high. Fruits (except the avocado and a few others) contain very little fat or protein and usually no starch (Latham, 1997). Most experts agree that a person should eat at least three fruit servings a day (CNPP, 2005). One fruit serving should be a citrus fruit such as oranges to ensure an adequate supply of vitamin C. Fruits are also a great source of beta carotene, Vitamin A, and fibre. Figure 3 shows that bananas were eaten by about 42% at least once per week even though it is always in season, while other fruits were eaten sparingly or not at all. A wide variety of fruits grows wild or cultivated in Vhembe. The variety available at any time in a given area depends on the climate, the local tastes for fruit, the species cultivated and the season (Latham, 1997). Fruits like watermelon are eaten by less than 1% of the farmers once a week. There is a slight much difference in the fruits food frequencies eaten among irrigation and dry-land farmers in the study area. This may be because only few farmers plant the crop and they are strictly for commercial purpose. Fruit and vegetables contain so many protective nutrients, they should be eaten in large quantities and everyone should try and eat five or more serving a day (CNPP, 2005). Typical examples of fruits to be eaten are apple, orange, half a

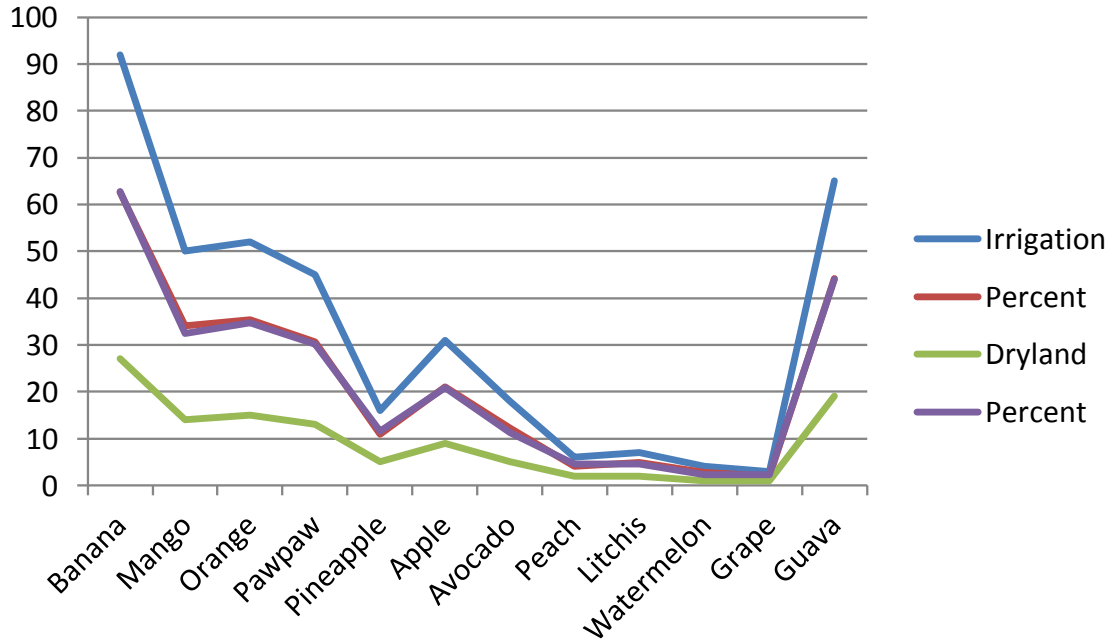


Figure 3. Difference in fruits food intake between irrigation and dry-land farmers.

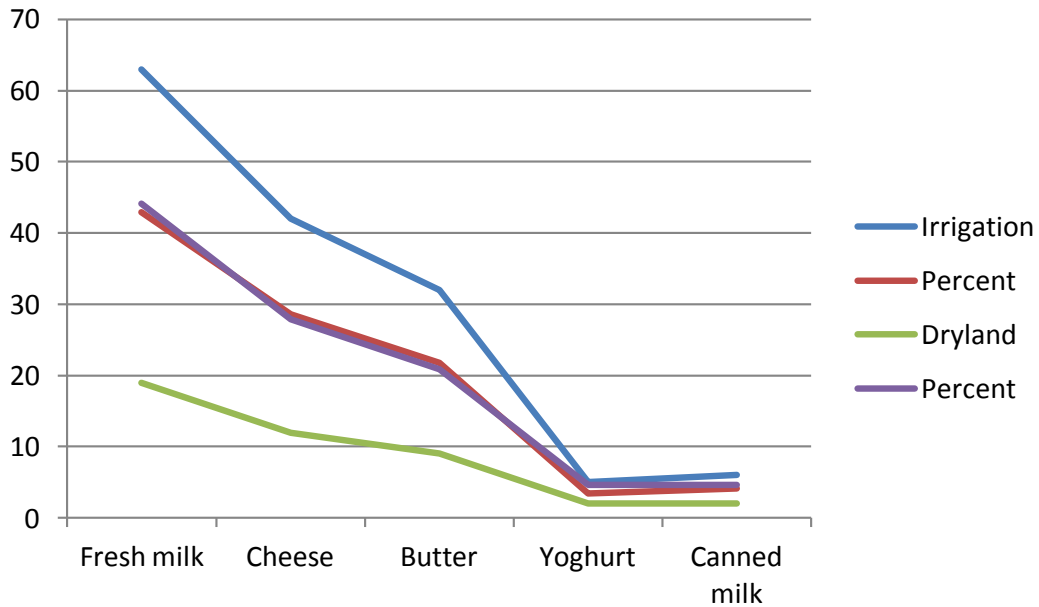


Figure 4. Difference in milk and milk products food intake between irrigation and dry-land farmers.

cup of grated carrots, a green salad and drinking a glass of fruit juice to obtain those vital five serving a day. Many are not enlightened about the importance of eating more of this food group even though they sometimes have them in abundance.

Animal milk and other dairy products are highly nutritious and can play an important part in human diets for both children and adults (Latham, 1997). Milk and dairy food group consists of milk and milk products,

yoghurts, and cheeses. Yoghurt is pasteurized milk cultured by special bacteria (yoghurt cultures). This is what gives yoghurt its creamy texture. It contains B vitamins and minerals.

Figure 4 shows that only about 1% of the farmers drink fresh milk one to three times per week while only a little proportion drink fresh milk seven times per week. There is slight difference in the milk and milk product food frequencies eaten among irrigation and dry-land farmers

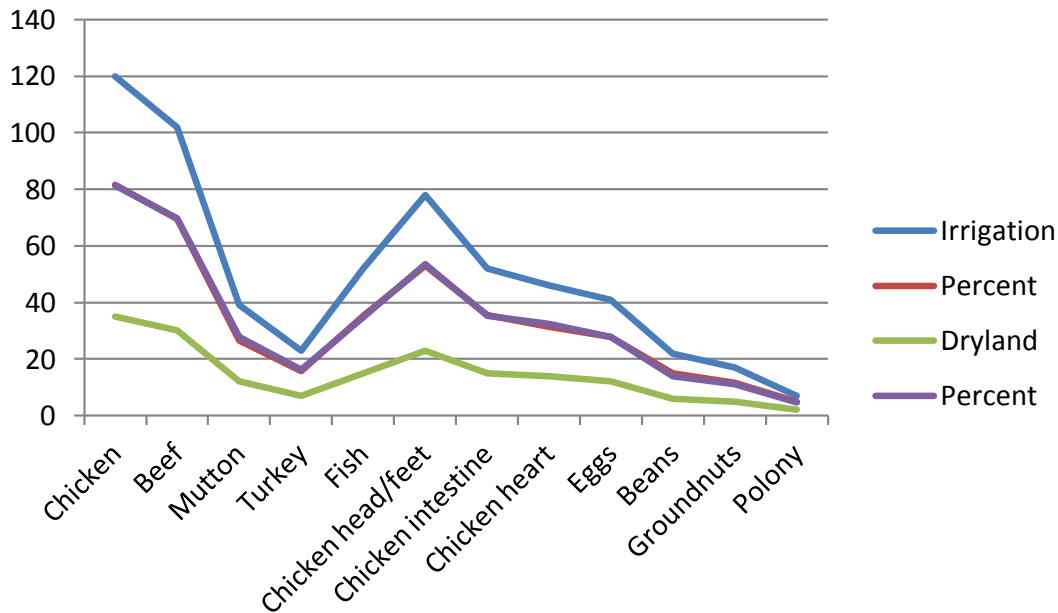


Figure 5. Difference in meat and legumes food intake between irrigation and dry-land farmers.

in the study area. On the average, the study showed that milk and milk products were not used by the majority of the farmers. This may be due to insufficient fund earned by these farmers. Although, a good source of vitamins and minerals but poverty may be one of the reasons why many households seldom use milk and milk products in their daily diet. Other reason may be the long distances of farm to the shop where these commodities are sold and also the milk products are expensive. Also, many of these products need to be kept in a cool environment like fridge which may not be available in most of the homes of these farmers.

Foods of animal origin are not essential for an adequate diet, but they are a useful complement to most diets, especially, to those in developing countries that are based mainly on a carbohydrate-rich staple food such as a cereal or root crop (Latham, 1997). Meat contains about 19% protein of essential quality and iron that is well absorbed (Latham, 1997). Figure 5 shows that only a few farmers are consuming meat and legumes at least once or twice a week. There is a slight difference in the meat and legume food frequencies eaten among irrigation and dry-land farmers in the study area. This is mainly due to financial capabilities of the farmers. Chicken, head and feet are the most commonly eaten in this food group. Those with livestock are not eaten from their animals as they prefer to sell them in order to have money for other commodities or to meet other responsibilities. Micronutrient and/or protein deficiency is present in a very large group of malnourished people (Malnutrition Matters, 2009). They either do not receive adequate amounts of vitamins and minerals (micronutrients), or the correct proportion of protein in their diets. This can have

very debilitating effects on people and societies. The health symptoms may not be immediately visible to either the individuals themselves or to health workers, or they take years to manifest. The result is lost productivity, and a great increase in health care costs which negatively affect other government attempts to improve the quality of life - aside from the enormous social cost.

It was observed that large percentage of farmers in the study area meet the requirements for food serving frequency per day for carbohydrate food group but they failed to meet these requirements in other food groups (fruit, vegetable, milk and dairy products, meat and legumes). They are choosing food based on the availability, in terms of sufficient quantity and variety of good-quality and safe food; and the accessibility, in terms of economic issues, physical infrastructure and consumer preferences. Availability of certain food like fruits and vegetables depend on the seasons of the year. Other foods like milk and dairy products, meat and legumes depend on the farmers' purchasing power.

Household size always has an influence on the food security status of households. In this study, 52.1% of the households had between 1 to 5 household members; while only 5.8% of household had more than 10 household members. Comparing the family sizes in the irrigation and dry-land farming, the family size was 58.9 and 39.4% respectively for family size of between 1 and 5 while it was 4.8 and 7.6% respectively for family size of more than 10 (Table 3). Increasing family size tends to provide households with the required labour for agricultural production, while on the other hand, large families had a lot of pressure on food consumption as compared with the large labour it contributes to agricultural

Table 3. Household size.

Characteristics	Irrigators		Dry-land	
	Number	Percentage (%)	Number	Percentage (%)
1-5	73	58.9	26	39.4
6-10	45	36.3	35	53.0
More than 10	6	4.8	5	7.6

agricultural production (Paddy, 2003).

A very high income was generated from tree crops (mangos, oranges and litchis, etc) from few farmers that produce them. Many of the tree crops were produced by irrigation farmers and they realized as high as R200, 000 or more annually from their produce. This study revealed that irrigation farmers have more disposable income than dry-land farmers because their produce contributes a higher percent of total income realized.

A study by Kassa et al. (2002) found that households who own livestock have a better chance of being food secured. When there is crop failure due to frequent dry spells, livestock can reduce food shocks in time of crop failure or unforeseen events. Sale of livestock can enhance food security in rural areas and the level of one's resources is very important to combat food shortages. Insight from the analysis shows that most of the income from livestock sales was from dry-land farming. Cattles were sold to purchase food, pay school fees and other household expenses. Although, the vast majority of the respondents were farmers, a substantial number of these smallholders were food insecure. Slightly more than half of the households had to borrow money or food or accepted help from friends and relatives to cope with consumption shocks. Slightly less than half (49.7%) sold productive assets or reduced consumption to cope with income shocks. The majority of the farmers on irrigation projects were less dependent on consumption-smoothing strategies than non-irrigating farmers. The evidence shows that vulnerability to consumption shocks reduces as per capita crop income increases (Wolfe and Frangillo, 2001).

Household food security depends on a nutritionally adequate and safe food supply, at the household level and for each individual, a fair degree of stability in the food availability to the household both during the year and from year to year; and access of each family member to sufficient food to meet nutritional requirements (Latham, 1997). It is also important that the available food be both safe and of good quality. Social factors and cultural practices in most countries have a very great influence on what people eat, on how they prepare food, their feeding practices and the type of foods they prefer.

Modern man and especially, modern, Western man, is faced with a bewildering number of foods to choose from. Compared to our ancestors and rural people in Africa, people living in South African cities have so many

different foods to choose from, that is quite understandable that they get confused. However, the basic food groups as shown in the food pyramid have remained the same, only the variety in each group has expanded dramatically (CNPP, 2005). The key to a healthy balanced diet is not to ban or omit any food or food groups but to balance what you eat by consuming a variety of foods from each food group in the right proportions for good health (Hunter, 2011). Table 4 shows the recommended dietary guidelines based the USDA food groups (Sacks et al., 2009).

It was observed that when production goes beyond subsistence requirements, agricultural growth does drive food consumption demand and leads to beneficial dietary changes. Incentives to increase production and education on food group will help farmers make the right food choices and improve their quality of life. Nutrition should be part of the agricultural extension programme to cause a paradigm shift in the eating habit of the farmers. The stakeholders should invest in collaborative learning and knowledge development for sustainable food security through the strengthening of the agriculture, rural development and food security networking and collaborative work with external partners.

Increased productions of food for own consumption and market has helped to reduce the need for coping strategies. Most of the households in dry-land farming were engaged in more erosive-coping strategies than did irrigation farming households. Adopting erosive-coping strategies undermines future resilience. Agricultural production for markets reduced consumption expenditure and helped households to accumulate cash savings or invest in assets. These assets buffered households from income shocks.

The potential for local, demand-led economic growth means an increase in household income that generates proportionally greater expenditure on non-farm goods and services. Increased demand for locally produced goods and services could help to mobilise underused resources thereby, creating additional income opportunities and local economic growth. However, increased production is limited by factors such as insecure land tenure, poor infrastructure and missing markets for credit and insurance. Farmers could reduce their subsidy dependence by marketing larger volumes. Such expansion would be facilitated by land improvements and land transactions, both of which are consumed

Table 4. Recommended dietary guidelines based on the USDA Food group pyramid.

S/N	Food group and number of servings	Examples of foods (based on food consumption patterns recorded) that can be consumed to form a nutritious and balanced diet
1	Carbohydrate and cereal group, 6-11 servings	Rice, maize porridge, spaghetti, bread, oats, macaroni, potatoes, cornflakes, sorghum, maize sample
2	Vegetable group, 3-5 servings	Pumpkin, carrots, spinach, cabbage, beetroot, pumpkin, lettuce, spinach, cucumber, Chinese cabbage, peas, vegetable salad, indigenous vegetables commonly consumed in the area e.g. muxe, amaranth, okra, pumpkin leaf, bean leaf, delele
3	Fruit group, 2-4 servings	Oranges, pawpaw, apple, mango, pineapple, banana, avocado, litchis, watermelon, grapes, guavas.
4	Milk and dairy products, 2-3 servings	Fresh milk, yoghurt, cheese, butter. amasi.
5	Meat and Legume group, 2-3 servings	Fish, mutton, sardines, beef, poultry, eggs, beans, groundnuts indigenous foods commonly consumed in the area e.g. Mopani worm, flying ants
6	Fats, oils. Use sparingly	Cheese, butter

by insecure land tenure. In addition, the studies recognise that growth requires farmers to invest in tangible and intangible assets such as storage facilities, transport and an empowerment label.

Conclusion

Improved nutrition is clearly a positive externality for increased agricultural production in rural areas of South Africa. However, the scale of agricultural production strongly determines the magnitude of these nutritional benefits. To have a significant impact on the food security and nutritional status of rural populations, agricultural production must develop beyond the subsistence level. While production for home consumption increases the availability of vegetables and micronutrient intake, the income 'savings' derived from home production seems to have more positive influences on the nutritional status of rural productions. Income replacement leads to increased purchases of energy-dense foods as fats, oils and meat.

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