

Assessing Differences in the Perception and Awareness of Food Science and Technology amongst High School Learners in the Five Districts of the Limpopo Province of South Africa

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KEYWORDS Food Science and Technology. High Schools. Learners. Awareness. Food Security. District

ABSTRACT Scarcity of food scientists in developing countries is a global and emerging critical problem requiring efforts to address global food security. The perception and awareness of Food Science and Technology (FST) amongst the majority of high school learners (HSL) in Limpopo province was low at about 25 percent. The present study covered 1,539 high schools in all the five districts of Limpopo. A structured questionnaire was used to capture information from the HSL. The results show that there are significant differences in the awareness and knowledge of FST among the districts. Awareness in Sekhukhune district is 46 percent, while that in the other districts ranges from 18 percent to 25 percent. If developing continents, like Africa, are to overcome food insecurity, deliberate efforts need to be made to ascertain that FST, as a discipline, receives the proper image and boost in enrolment.

INTRODUCTION

Food Science and Technology (FST) is a relatively “new” study concerned with all technical aspects of foods, from harvesting or slaughtering, to cooking and consumption. It is one of the life sciences considered distinct from the field of nutrition. It is a highly interdisciplinary applied science with sub-disciplines covering the following areas: food safety, microbiology, biotechnology, preservation, engineering, chemistry, packaging, physics and technology among others. Food Technology is the application of food science to the selection, preservation, processing, packaging, distribution, and use of safe, nutritious, and wholesome food (Heldman 2006). The youth in developing countries need to understand the FST discipline as part of the strategies in tackling food insecurity in the continent. Moreover, the skills crisis confronting agro-processing initiatives in many municipalities in South Africa (Davids and Esau 2012) is evident in the shortage of food professionals in the province. Rural development in most African countries is at a crossroad as there are many small-scale food processing projects and indigenous food technologies in the villages that require the technical assistance of food product

development specialists, food scientists and food engineers. Under the technical skills clusters, the food technology occupation has been identified as one in demand (scarce skill) in South Africa according to the 2006 skills audit and workplace skills plans, and annual reports of 2006 and 2007 (WRSETA 2008).

Important as FST is, (Floros et al. 2010) food scientists are very few especially in Africa, hence the need to nurture future food professionals. High school learners hear little or nothing about this discipline. Knowing that the proportion of high school learners who are aware of FST in the Limpopo province is low (Jideani et al. 2012), this research seeks to find out whether this knowledge and awareness for the discipline amongst them is the same among the five districts in the Limpopo province of South Africa, or not.

METHODOLOGY

Study Location: Limpopo Province

The Limpopo province, situated at the doorstep of Africa, is the link between South Africa and the countries in southern Africa and covers a land size of 123,910 km²; accounting for 10.2 percent of the country's total land area (StatsSA 2003). This province shares international borders with three countries, namely: Botswana on

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the west; Zimbabwe to the north; and Mozambique on the east. On its southern flank, the province shares borders with Gauteng (Fig. 1). The province consists of four regions: Capricorn region, Bushveld region, Soutpanberg region and the Valley of the Olifants. The province comprises of five districts: Sekhukhune, Capricorn, Waterberg, Mopani, and Vhembe. Sekhukhune and Capricorn are in the southern part of the province and are found in the Capricorn region. Mopani and Bohlabela are in the east and situated in the Valley of Olifants region. Vhembe is found in the Soutpansberg region and is in the north, while Waterberg is found in the Bushveld region and is in the western part of Limpopo province. The Mokopane area in the province is one of South Africa's richest agricultural areas producing wheat, tobacco, cotton, cattle, maize, peanuts and citrus. The Vhembe district produces fruits and vegetables. Majority of the population resides in rural areas in comparison to the national average of 50 percent. However due to its rural make-up, conditions are sub-standard compared to the rest of

the country with the exception of the Eastern Cape Province (Gyekye and Akinboade 2001).

Study Material

A survey was conducted as earlier described (Jideani et al. 2012) among high schools randomly sampled in the province. One of the questionnaires was designed to capture information from the high school learners on their perception and awareness of Food Science and Technology (FST) as well as other basic demographic information. The questions addressed the data requirements in the study. A three-stage sampling including stratified random by municipalities and learners were used to select the schools. Learners from grades 10, 11 and 12 were selected and interviewed. These three grades correspond to the final three years in the high schools of South Africa. Over 4,036 learners were involved. Data collection was by overt access, which explained to the participants, through a consent letter, what the exercise was about and how they had a choice of whether or not to

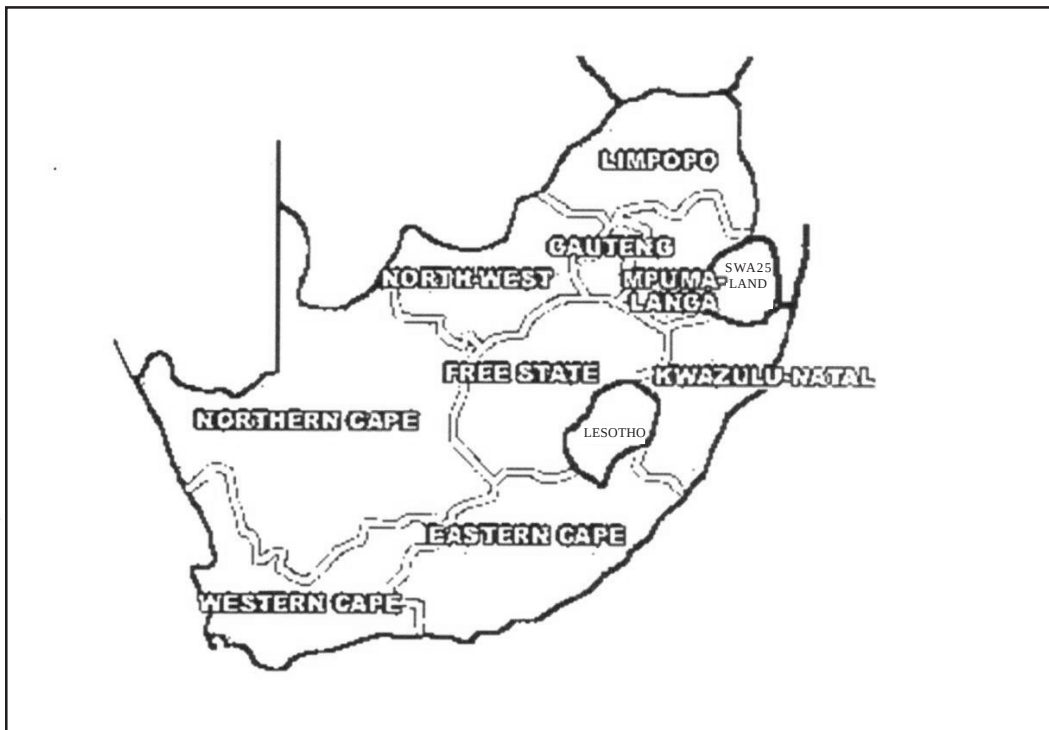


Fig. 1. Map of South Africa showing the location of Limpopo province.
Source: www.fatfisherman.com/links_geo/africa/south_africa.html

participate (Denzin and Lincoln 1998). Only learners that gave their consent were used in the study. In all the five districts, there was no dissent from the learners. The self-administered questionnaires were given to them to complete. Some of the variables in the questionnaire included:

- ♦ Have you heard about FST?
- ♦ Nutrition and FST are the same
- ♦ Graduates in FST work in hotels; in restaurants; in manufacturing companies
- ♦ Subject combination to study FST
- ♦ Would want to study FST?
- ♦ Would your parent allow you to study FST?
- ♦ Would you want more enlightenment?

The data collected was both quantitative and qualitative. It was used in computing the perception and awareness as well as other indicators relating to the knowledge regarding FST. The data was analysed using SPSS version 19.

RESULTS

The results presented in the tables summarise how the knowledge and awareness amongst high school learners (HSL) is distributed in the five districts of the Limpopo province. Out of the 4,036 learners interviewed, 2,190 representing 54.2 percent of them were females and 1,850 were males. The demographic information of the respondents' (HSL) gender and grades are shown in Table 1. The percent proportion by gender (female: male) for each district is as follows:

Table 1: Demographic data (%) on respondents from the districts in Limpopo province

<i>District/ Gender</i>	<i>Female</i>	<i>Male</i>	<i>Total</i>
Capricorn	57.3	42.7	100
Mopani	52.3	47.7	100
Sekhukhune	52.4	47.6	100
Vhembe	56.6	43.4	100
Waterberg	49.7	51.3	100
Limpopo	54.2	45.8	100
$\chi^2 = 14.568,$		$p = 0.015$	
<i>District/ Grades</i>	<i>10</i>	<i>11</i>	<i>12</i>
Capricorn	0.6	69.7	29.7
Mopani	53.9	46.1	-
Sekhukhune	22.9	42.6	34.5
Vhembe	53.3	46.1	0.7
Waterberg	47.9	36.5	15.6
Limpopo	42.3	46.7	11.0
$\chi^2 = 231.387,$		$p = 0.000$	

Grades 10, 11 and 12 are the last three years at the senior secondary school.

lowers: Capricorn (57.3:42.7), Mopani (52.3:47.7), Sekhukhune (52.4:47.6), Vhembe (56.6:43.4), and Waterberg (49.7:51.3). With the exception of Waterberg, the proportions of female learners were more compared to males. There were more respondents from grades 10 and 11 captured in the study than those in grade 12.

Table 2 shows FST awareness and likeness indicators amongst learners in each district. The proportions of HSL who are aware of FST as a discipline at the university level of education are as follows: Capricorn 18.4 percent, Mopani 18.8 percent, Sekhukhune 46.3 percent, Vhembe 25.5 percent and Waterberg 23.1 percent. The awareness rate for the entire province is 25.5 percent. Equally Table 2 shows that the rating of respondents' knowledge of FST is similar in the five districts. The proportion of HSL that answered in the affirmative for the desire to study FST as a discipline was more than the proportion that answered in the negative in each of the five districts. Apparently, the results showed that a high proportion of HSL in each district opted for more enlightenment on the discipline FST.

Table 3 shows the high school learners' understanding of FST with respect to related discipline as well as employment opportunities. The proportions of HSL who are aware but think that FST and Nutrition are the same are: Capricorn 47.5 percent, Mopani 64.3 percent, Sekhukhune 52.2 percent, Vhembe 64.3 percent and Waterberg 51.8 percent. Again from Table 3, it is evident that more HSL think that FST and Nutrition are the same. The proportion of HSL who are aware but think that FST and Consumer Science are the same are as follows: Capricorn 38.8 percent, Mopani 51.2 percent, Sekhukhune 34.5 percent, Vhembe 42.8 percent and Waterberg 36.6 percent. For the entire Limpopo province the proportion is 41.2 percent. Concerning the job opportunities for FST graduates, the proportions of the HSL who are aware of FST but say that the graduates of FST work in hotels are as follows: Capricorn 54.8 percent, Mopani 71.9 percent, Sekhukhune 38.6 percent, Vhembe 60.9 percent and Waterberg 62.1 percent. The proportion for the entire Limpopo province is 58 percent. The proportions who say that graduates of FST work in restaurants are as follows: Capricorn 45.7 percent, Mopani 60.7 percent, Sekhukhune 37.6 percent, Vhembe 50.4 percent and Waterberg 49.1 percent. The proportion for the province is also 49.1 percent. The propor-

Table 2: FST awareness and likeness indicators by districts¹

Indicator/ Districts	Response (%)		Total (%)
<i>Aware of FST?</i>	<i>Yes</i>	<i>No</i>	
Capricorn	18.4	81.6	100
Mopani	18.8	81.2	100
Sekhukhune	46.3	53.7	100
Vhembe	25.5	74.5	100
Waterberg	23.1	76.9	100
Limpopo	25.5	74.5	100
$\chi^2 = 135.894,$			$p = 0.000$
<i>Rating of Knowledge About FST</i>	<i>No/ not much</i>	<i>Some/ much</i>	
Capricorn	66.6	33.4	100
Mopani	45.9	54.1	100
Sekhukhune	34.2	65.8	100
Vhembe	47.5	52.5	100
Waterberg	48.4	51.6	100
Limpopo	48.2	51.8	100
$\chi^2 = 38.692,$			$p = 0.000$
<i>Would You Want To Study FST?</i>	<i>Yes</i>	<i>No</i>	
Capricorn	69.0	31.0	100
Mopani	67.7	32.3	100
Sekhukhune	78.3	21.7	100
Vhembe	54.6	45.4	100
Waterberg	65.5	34.5	100
Limpopo	63.2	36.8	100
$\chi^2 = 108.901,$			$p = 0.000$
<i>Would Your Parents Support Your Choice of FST?</i>	<i>Yes</i>	<i>No</i>	
Capricorn	55.0	45.0	100
Mopani	58.9	41.1	100
Sekhukhune	68.8	31.2	100
Vhembe	47.3	52.7	100
Waterberg	68.9	31.1	100
Limpopo	56.0	44.0	100
$\chi^2 = 198.632,$			$p = 0.000$
<i>Need for More Enlightenment on FST</i>	<i>Yes</i>	<i>No</i>	
Capricorn	85.8	14.2	100
Mopani	84.0	16.0	100
Sekhukhune	88.7	11.3	100
Vhembe	71.5	28.5	100
Waterberg	85.9	14.1	100
Limpopo	80.0	20.0	100
$\chi^2 = 113.488,$			$p = 0.000$

¹FST = Food Science and Technology

tions of those aware of FST but who say that graduates of FST work in hospitals are: Capri-

corn 40.5 percent, Mopani 47.1 percent, Sekhukhune 42.6 percent, Vhembe 48.4 percent and Waterberg 67.5 percent while the whole province is 49.6 percent. For Manufacturing Companies (MC), the proportions who say that graduates of FST work in MCs are as follows: Capricorn 89.3 percent, Mopani 72.4 percent, Sekhukhune 90.1 percent, Vhembe 85.3 percent and Waterberg 85.9 percent while the whole province is 84.5 percent. In Table 4, the count for a “yes” or “no” response largely varied in each district for the question: graduates of FST work in manufacturing companies. Other than that there was not much variation for other awareness indicators.

Table 4 shows proper knowledge of FST, Nutrition and Consumer Science and job opportunities in the five districts. Table 5 shows proper knowledge of FST based on gender and grade. The results show that 25 percent of the grade 10 learners are aware of FST while 75 percent are not. The proportions of grade 10 learners who are aware at the district level are: Capricorn 25 percent, Mopani 18.2 percent, Sekhukhune 66.3 percent, Vhembe 22.7 percent and Waterberg 7.5 percent. The proportions of the HSL who are aware in grade 11 at the district level are 18.7 percent in Capricorn, 19.4 percent in Mopani, 42.5 percent in Sekhukhune, 23.5 percent in Vhembe and 24.0 percent in Waterberg. For grade 12, proportion of those who are aware at the provincial level is 30.5 percent, which can be distributed among the districts as follows: 16.2 percent in Capricorn, 38.0 percent in Sekhukhune, 4.5 percent in Vhembe and 37.9 percent in Waterberg. Sekhukhune district has a higher proportion of learners in the grades 10, 11 and 12 who are aware of FST compared to the other districts.

DISCUSSION

It is evident that there were more female learners in senior secondary schools than males, in the districts (Table 1). The study focused on high schools teaching science-related subjects. The present result reveals that in four out of the five districts, there are more female learners opting for science-related subjects than their male counterparts. This could explain the higher proportion of female students enrolled for FST courses at the University of Venda and similarly across other universities in the region. The result also indicates that the number of respondents from Vhembe district far outnumber re-

Table 3: Learners understanding of FST by districts in Limpopo province¹

Variable/ indicator	Yes (%)	No (%)	Total (%)
<i>Nutrition and FST are the Same</i>			
Capricorn	47.5	52.5	100
Mopani	64.3	35.7	100
Sekhukhune	52.2	47.8	100
Vhembe	64.3	35.7	100
Waterberg	51.8	48.2	100
Limpopo	58.5	41.5	100
$\chi^2 = 20.284, \quad p = 0.000$			
<i>Consumer Science and FST Are the Same</i>			
Capricorn	38.8	61.2	100
Mopani	51.2	48.8	100
Sekhukhune	34.5	65.5	100
Vhembe	42.8	57.2	100
Waterberg	36.6	63.4	100
Limpopo	41.2	58.8	100
$\chi^2 = 14.290, \quad p = 0.000$			
<i>Graduates of FST Work at Hotels</i>			
Capricorn	54.8	45.2	100
Mopani	71.9	28.1	100
Sekhukhune	38.6	61.4	100
Vhembe	60.9	39.1	100
Waterberg	62.1	37.9	100
Limpopo	58.0	42.0	100
$\chi^2 = 47.656, \quad p = 0.000$			
<i>Graduates of FST Work in Restaurants</i>			
Capricorn	45.7	54.3	100
Mopani	60.7	39.3	100
Sekhukhune	37.6	62.4	100
Vhembe	50.4	49.6	100
Waterberg	49.1	50.9	100
Limpopo	49.1	50.9	100
$\chi^2 = 20.432, \quad p = 0.000$			
<i>Graduates of FST Work at Hospitals</i>			
Capricorn	40.5	59.5	100
Mopani	47.1	52.9	100
Sekhukhune	42.6	57.4	100
Vhembe	48.4	51.6	100
Waterberg	67.5	32.5	100
Limpopo	49.6	50.4	100
$\chi^2 = 28.836, \quad p = 0.000$			
<i>Graduates of FST Work in Manufacturing Companies</i>			
Capricorn	89.3	10.7	100
Mopani	72.4	27.6	100
Sekhukhune	90.1	9.9	100
Vhembe	85.3	14.7	100
Waterberg	85.9	14.1	100
Limpopo	84.5	15.5	100
$\chi^2 = 25.917, \quad p = 0.000$			

¹FST = Food Science and Technology

spondents from the other districts. The reason could be attributed to the proximity of the district to the affiliation of the authors, the population of the district and of the high schools and that it has more food industries (Table 6) than other districts.

In the province, an overwhelming majority (75%) (Weighted values) is not aware of the FST discipline and have not heard about it (Table 2). For the district level, the proportions of awareness amongst the HSL range from 18.4 percent in Mopani to 46.3 percent in Sekhukhune. The high level of awareness in Sekhukhune district could be due to the higher proportion of learners (Table 1) in grade 12 (34.5%) compared to the other four districts. It is expected that learners in the last grade (12) of senior secondary school will be more knowledgeable than those in lower grades. The awareness rate for the entire province is 25 percent (weighted value). This level of awareness is rather very low considering the need of Food Scientists and Technologists as well as the increasing number of small, medium and large scale food industries (Table 6) in the province. The number of these food industries is more than in the initial report by Nesamvuni et al. (2003). FST is among the scarce skill professions in South Africa; hence awareness creation for the discipline is one of the strategies to mitigate lack of manpower in the profession. Senior secondary school learners from the study location and beyond should be made aware that excellent job opportunities exist in the food processing industry.

Almost half of those who are aware still do not know much about the FST discipline (Tables 2 and 3). Some of them think that FST is the same as Nutrition or the same as Consumer Science. For learners who have heard about FST, 58.5 percent say that FST and Nutrition are the same while only 41.5 percent say otherwise (Table 3). Thus, only 10.6 percent of respondents in the province have the right knowledge about the difference between FST and Nutrition (Table 4). The proportion of HSL who know the distinction between, Nutrition and FST, range from 6.7 percent in Mopani to 22.1 percent in Sekhukhune. In contrast, for those who are aware of FST 41.2 percent say that FST and Consumer Science are the same in the province. Thus, again, only 14.9 percent of the learners have sound knowledge and right perception of the difference between FST and Consumer Science

Table 4: Proper knowledge and perception about FST, Nutrition, Consumer Science and job opportunities by district¹

Indicator/ Districts	Response (%)		Total (%)
Nutrition and FST are the Same			
	Correct	Wrong	
Capricorn	9.7	90.3	100
Mopani	6.7	93.7	100
Sekhukhune	22.1	77.9	100
Vhembe	9.0	91.0	100
Waterberg	11.1	88.9	100
Limpopo	10.6	89.4	100
$\chi^2 = 23.766,$		$p = 0.000$	
Consumer Science and FST are the Same			
Capricorn	11.3	88.7	100
Mopani	9.2	90.8	100
Sekhukhune	30.3	69.7	100
Vhembe	14.5	85.5	100
Waterberg	14.7	85.3	100
Limpopo	14.9	85.1	100
$\chi^2 = 17.766,$		$p = 0.028$	
Graduates of FST Work at Hotels			
Capricorn	8.3	91.7	100
Mopani	5.3	94.7	100
Sekhukhune	28.4	71.6	100
Vhembe	10.0	90.0	100
Waterberg	8.8	91.2	100
Limpopo	10.7	89.3	100
$\chi^2 = 43.463,$		$p = 0.000$	
Graduates of FST Work in Restaurants			
Capricorn	10.0	90.0	100
Mopani	7.4	92.6	100
Sekhukhune	28.9	71.1	100
Vhembe	12.7	87.3	100
Waterberg	11.8	88.2	100
Limpopo	13.0	87.0	100
$\chi^2 = 22.387,$		$p = 0.000$	
Graduates of FST Work At Hospitals			
Capricorn	11.0	89.0	100
Mopani	10.0	90.0	100
Sekhukhune	26.6	73.4	100
Vhembe	13.2	86.8	100
Waterberg	7.5	92.5	100
Limpopo	12.9	87.1	100
$\chi^2 = 26.381,$		$p = 0.000$	
Graduates of FST Work in Manufacturing Companies			
Capricorn	16.4	83.3	100
Mopani	13.6	86.4	100
Sekhukhune	41.7	58.3	100
Vhembe	21.8	78.2	100
Waterberg	19.8	80.2	100
Limpopo	21.5	78.5	100
$\chi^2 = 29.309,$		$p = 0.000$	

¹FST = Food Science and Technology

(Table 4). At the district level, those who can distinguish between FST and Consumer Science range from 9.2 percent in Mopani to 30.3 percent in Sekhukhune (Table 4). The Mopani district is relatively far from the provincial headquarter having better educational facilities, hence this remoteness could contribute to the low level of awareness that is revealed from the data obtained in this study. It is apparent from the results that the learners are not taught about disciplines like FST at senior high school levels. This fact was alluded to in the presentation made by Turner (2008).

The learners' knowledge of where food scientists and food technologists work is equally startling. About 50 percent of those who were aware of FST said that graduates of the discipline work in hospitals, with the same proportion saying that graduates of the programme work in restaurants and a further 58 percent say that graduates of the program work in hotels (Table 3). At the district level, those who have proper knowledge about job opportunities for graduates of FST range from as low as 5.3 percent in Mopani district to 41.7 percent in Sekhukhune district. Again the reason for the high level of awareness about job opportunities in Sekhukhune district could be due to the proportion of learners (Table 1) in grade 12 (34.5%) that was higher here than the other districts.

These observations prove that there are significant differences in the awareness, knowledge and perception among HSLs in the five districts, with Sekhukhune having better knowledge than the others. Mopani district, seemingly, has the least knowledge about FST as a discipline. These observations are startling because Mopani is comparatively more urban than Sekhukhune, which is more rural. One would have expected that the observations about awareness and sound knowledge of FST would lean towards Capricorn district, which is the provincial capital district, and Mopani, which has the second largest city in the province, Tzaneen. Generally, there were statistically significant differences among the grades for the awareness indicators. This makes it imperative for learners especially those in the senior grades to be sensitized so that they can transmit the awareness to their "juniors".

The learners in senior secondary school grades 10-12, sit the nationally set and moderated matriculation examinations, or an approved

Table 5: Proper knowledge and perception about FST based on gender and grade by district¹

Districts	Indicator	Correct (%)		Wrong (%)		Total (%)
		Female	Male	Female	Male	
Capricorn	Gender:	10.5	7.9	89.5	92.1	100
Mopani		9.8	9.0	90.2	91.0	100
Sekhukhune		24.3	22.0	75.7	78.0	100
Vhembe		14.4	11.1	85.6	88.9	100
Waterberg		11.5	11.6	88.5	88.4	100
Limpopo		13.8	11.7	86.2	88.3	100
$\chi^2 = 23.706$ (F), 25.917 (M), $p = 0.000$						
Grade 10						
Capricorn		25.0		75.0		100
Mopani		18.2		81.8		100
Sekhukhune		66.3		33.7		100
Vhembe		27.7		72.3		100
Waterberg		7.5		92.5		100
Limpopo		42.6		57.4		100
$\chi^2 = 832.102$, $p = 0.000$						
Grade 11						
Capricorn		18.7		81.3		100
Mopani		19.4		80.6		100
Sekhukhune		42.5		57.5		100
Vhembe		23.5		76.5		100
Waterberg		24.0		76.0		100
Limpopo		43.1		56.9		100
$\chi^2 = 231.387$, $p = 0.000$						
Grade 12						
Capricorn		16.2		83.8		100
Mopani		-		-		100
Sekhukhune		38.0		62.0		100
Vhembe		-		-		100
Waterberg		37.9		62.1		100
Limpopo		30.7		69.3		100
$\chi^2 = 135.894$, $p = 0.000$						

¹FST = Food Science and Technology. Grades 10, 11 and 12 are the last three years in senior secondary school. F = Female, M = Male.

alternative such as the Independent Examinations Board (IEB) test series, to obtain the National Senior Certificate (NSC) at the end of grade 12 (http://southafrica.usembassy.gov/root/pdfs/study_sa_profile_rev100630.pdf). Regarding learners in grade 12, it has been said “they have to make several stressful decisions during their last year at school, and many aren’t able to access concise and accurate information to make choices that will have an extended impact on their lives”. This is reflective of the data obtained in the present study showing low percentage of FST awareness. Under the technical skills clusters, food technology occupations

have been identified as an occupation in demand (scarce skill) in South Africa according to the 2006 skills audit and workplace skills plans, and annual reports of 2006 and 2007 (WRSETA 2008). Intervention strategies are therefore needed to increase the number of learners opting for this profession in order to de-categorize it as a scarce skill in the country. Scarcity of food scientists and technologists in developing countries is a global and emerging critical problem requiring the attention of academia, industry and policy makers in order to address global food security. There was a forecast on the shortage of graduates with food, agricultural and natural

Table 6: Small, medium and large scale food industries in districts of Limpopo province¹

<i>District/ Name of company</i>	<i>Location</i>	<i>Product</i>
<i>Vhembe</i>		
Valley farms	Levubu	Fruits concentrates
Dinnermates	Makhado	Meat products
Big six foods (not achaar)	Shayandima	Fruits and vegetables processing
Levubu Bemarking B.K	Levubu	Vegetables processing
Sasko bakery	Shayandima	Baked products
NTK	Shayandima	Cereal processing
Zoutpansberg milling	Makhado	Cereal processing
Thohoyandou producer cooperative	Shayandima	Oil and fats
Levubu dried fruits (not canners)	Levubu	Fruits and vegetables
Tiger brands (not mills)	Musina	Vegetables
Mpak	Musina	Fruit and vegetable processing
Giants canning (Pty) Ltd now Rhodes food group		Dzanani Vegetables processing
Royal macadamia	Levubu	Macadamia nuts
Green farm	Levubu	Macadamia nuts
Zetmac	Levubu	Macadamia nuts
Limpopo dairies	Makhado	Milk and dairy products
<i>Mopani</i>		
Bonanza dried fruits cc.		Fruits drying
Sasko Ga-kgapane bakery	Mojajiskloof	Baking
Peppardew Tzaneen (Pty) Ltd.	Tzaneen	Vegetable processing
Tiger brands	Mojajiskloof	Vegetables processing
Big five manufacturing	Tzaneen	Vegetables processing
Sunbake	Tzaneen	Baking
Granor passi	Tzaneen	Fruits processing
Miami canners	Letsetele	Fruit and vegetable processing
Malati dairies	Tzaneen	Milk and dairy products
Bavaria packers	Hoedspruit	Fruits drying
Westvalia	Tzaneen	Fruits processing
Bushvalley	Tzaneen	Meat processing
Letaba citrus processors	Tzaneen	Fruits concentrates
<i>Capricorn</i>		
Granor passi	Polokwane	Fruits processing
Sunbake	Polokwane	Baking
SASKO (Pty) Ltd.	Polokwane	Milling and Baking
United national breweries	Polokwane	Sorghum beer
Enterprise	Polokwane	Meat products
Coca-cola	Polokwane	Carbonated non-alcoholic beverages
South African breweries	Polokwane	Alcoholic beverages (Clear beer/cider)
Tiger milling	Polokwane	Milling
Hygienic dairy	Polokwane	Milk and dairy products
<i>Waterberg</i>		
Ellisras suiwel (EDMS)	Ellisras	Dairy products processing
Nedan oil mills (Pty) Ltd	Mokopane	Fats/oil and legume processing
Ayos foods	Mokopane	Legume processing
Variety holdings (Pty) Ltd.	Thabazimbi	Processing of chilies
Moordrift dairy	Mokopane	Milk and dairy
<i>Sekhukhune</i>		
Beer Investments (Pty) Ltd	Lebuwakgomo	Sorghum brewery

Source: 'Adopted from Nesamvuni et al. (2003) and updated by the authors.

resources degree in 2010 (BLS 2010). The UK food and drink sector skills council in 2006 warned of a serious shortage of food scientists and technologists (FSTs) employed in the food processing industry, with one in four vacancies for FST positions classed as 'hard-to-fill' (Nex-net 2009).

Surveys of this nature have been used to fine-tune Food Science (Bohlscheid and Clark 2012) in developed countries and to create awareness. Such studies are of importance in developing countries where issues of food security require urgent attention. By 2050, the world's population will reach nine billion. It has been

said by Ruff (2012) that the world may be getting smaller, but it's also getting more crowded, and it will take the next generation of food scientists to figure how to feed the world of the future. With the current trend showing the influx of people to the urban cities, mostly youths, future food scientists and technologists will emerge from our rural communities. Lack of motivation for high school learners stagnate enrolment in higher institutions. Therefore, there is the need to create awareness of such interdisciplinary careers such as Food Science and Technology, not just to the high or senior school learners but also to the public. Hence our recommendations from the study are:

- (1) Since female learners constitute greater number of respondents in this study, there are many in rural areas and it is believed that a significant number do not finish school. NGOs, government/municipalities at district and circuit levels dealing with this problem would help to combat poverty and improve health and well-being in such communities;
- (2) A necessary intervention would be for departments/faculties/schools in universities to link up with high schools through school outreach programmes aimed at creating awareness about the various need-driven disciplines; and
- (3) Since we the scientists, educators, farmers, regulators, manufacturers, distributors, and consumers are all in this together, accelerating education of learners is our collective responsibility.

CONCLUSION

The foregoing results point to statistical differences amongst the districts in all the variables tested as seen by the chi-square values, and the p-values, which are almost all equal to zero. It can be concluded that knowledge and awareness of Food Science and Technology (FST) amongst high school learners (HSL) differs from one district to another and the differences are statistically significant. In the HSL's own assessment concerning their knowledge about FST, they gave ratings from 33.4 percent in Capricorn to 65.8 percent in Sekhukhune, a difference which again is significant. As to the question of whether they would want to study FST, about 63 percent of the HSL responded positively, and the proportion ranges from 54.6

percent in Vhembe to 78.3 percent in Sekhukhune, giving a statistical significant result, $p\text{-value} = .000$. The proportion of HSL who want more enlightenment on FST ranges from 71.5 percent in Vhembe to 88.7 percent in Sekhukhune. For students who are aware 42.9 percent are in grade 10, and 44.3 percent and 12.8 percent are in grade 11 and 12 respectively. There are statistical significant differences among the grades for most of the variables. This makes it imperative for learners especially those in the senior grades to be sensitized so that they can transmit the awareness to their successors and also make a better choice in their own careers in light of the job opportunities in the agro-processing industry in the province.

ACKNOWLEDGMENTS

The authors acknowledge the University of Venda Niche Area Research Grant (Project No. SA/10/FST/001) that supported this work; and the Provincial Head, Department of Education Limpopo Province in granting permission to carry out the study.

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