

**MARKET SEGMENTATION AND CONSUMER WILLINGNESS TO PAY  
FOR HIGH FIBRE PRODUCTS: THE CASE OF JOHANNESBURG AND  
THE SURROUNDING AREAS, SOUTH AFRICA.**

**by**

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## DECLARATION

I declare that **MARKET SEGMENTATION AND CONSUMER WILLINGNESS TO PAY FOR HIGH FIBRE PRODUCTS: THE CASE OF JOHANNESBURG AND THE SOURROUNDING AREAS, SOUTH AFRICA** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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## ABSTRACT

A survey was conducted in Johannesburg and its surrounding areas to evaluate Consumer's Willingness To Pay (WTP) higher prices for goods qualified as high fibre food products available on the market. Breakfast cereal, seed and health bread, and fibre enriched yoghurt were the research main focus. Contingent Valuation Method was selected to evaluate WTP. The study also described the market segmentation. Socio-economic characteristics and consumer perceptions on high fibre food products were analysed to determine their influence on Willingness To Pay. Findings indicated that, out of a sample of 179 respondents, 113 respondents (63%) were recorded willing to pay higher prices for breakfast cereal; 120 respondents (67%) were willing to pay higher prices for seed and health bread; 87 respondents (49%) were willing to pay higher prices for yoghurt. The market was segmented into income groups of less than R5000; R5 000 to R 10000; R10 000 to R 25 000; and above R 25 000. Results showed that willingness to pay for higher prices increased with increase in income but decreased with increase in premium percentages. Out of a total sample of 179 respondents, 72 % acknowledged that dietary fibre is good for their health and only 1.7 % described the trend as "fashion". The remaining 26.3% covered respondents who had a neutral opinion or did not respond to the question. The study's first hypothesised that health risk perceptions affected consumers' willingness to pay was confirmed. The second hypothesis was that regulatory programmes on high fibre products affected consumers' willingness to buy. Results showed that more than 50% of respondents claimed to regularly check the label. Gender, marital status, and income did not seem to have an influence on willingness to buy for any of the selected products.

## **Summary**

Functional foods constitute a growing focus for research, product development and consumer interest in recent years. This study investigated the factors that affect willingness to pay for high fibre food on the market as well as respondents' attitude towards the purchase of these products. The results indicated that those consumers in the high income group were more health conscious than their low income counterparts and willing to pay for high fibre products. The results showed that health risk perceptions as well as regulatory programmes affected consumers' willingness to pay. The results also showed that at low percentage prices consumers were willing to pay for high fibre products. Gender and marital status did not seem to have an influence on willingness to buy for any of the selected products. Findings of the study could encourage food manufacturers to carry on with developments of functional foods since willingness to pay increased with increase in income.

### **Key terms:**

Consumer; willingness to pay; dietary fibre; food products; functional foods; product development; price; market segmentation; breakfast cereal; bread; yoghurt; health risk perceptions; regulatory programmes; health claim; food manufacturing.

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Functional foods constitute a rapidly growing focus for research, product development and consumer interest as well as regulatory efforts in recent years (IUFoST, 2009). Foods that contain prebiotics such as dietary fibres are parts of these and are being of special interest to today's consumers (Panesar *et al.*, 2009). Apart from their proven physiological importance in human body, fibres play a very important role in food processing for their technological functionality in fat binding, viscosity regulation, water holding, texturizing, fermentive, chelating and gel forming capacity (Borderias *et al.*, 2005). The South African consumer has not been excluded from this worldwide market trend and the local food industry is continually developing products with health benefits. In this study, consumer demand is determined by the amount of a product that a consumer is willing to buy at a certain price (Erasmus *et al.*, 2001). The demand of high fibre products is said here to mainly depend on price, and consumers' socio-economic characteristics which include income. When considering the law of demand, the willingness to pay a price premium for a product decreases as the price premium increases (Aryal *et al.*, 2009). In a recently published study on bread, Ginon *et al.*, (2009) stated that consumers are ready to pay more for a product that is labelled source of fibre. Sensory aspect in addition to nutritional claim is however an important attributes to underline. Thunstrom and Rauser (2009), confirmed the above statement on sensory characteristics by concluding that some consumers may prefer taste over nutrition for some products and prefer nutrition to taste for other products. A number of studies

have been conducted on consumer's willingness to pay for healthy, nutritious and value-added food products specifically on Genetically Modified and organic food worldwide. In general, food choice is influenced by many interrelated factors and it can be described as a complex human behaviour (Visser, 2007).

## **1.2 Study area**

The research focused on consumption of high fibre breakfast cereals, health / seed bread and fibre-enriched yoghurt within Johannesburg and its surroundings areas. The area was divided as shown in Figure 2. Of the total sample of 179 respondents, 34.1% formed the North West area; 29.1% the East Rand; 15.6% the South West; and 21.2% the inner city.

## **1.3 Problem statement**

The South African food industry has, the past years, successfully introduced fibre-enriched products on the market and more and more innovative products are being developed to date to complement the already naturally declared high fibre products range available within the market. The growing awareness of the relationship between diet and health has led to an increasing demand for such food products that support health beyond providing basic nutrition. The situation has broadened the average consumer's food choices today more than in the past (Gil *et al.*, 2001). This tendency has brought with it the concept of functional foods, in which the stress has shifted from seeking to ensure food supplies to identifying the potentialities of food as promoters of physical and mental health, seeking to reduce the risk of chronic disorders (Borderias *et al.*, 2005). In a study done in Europe on consumers' perceptions of food's healthiness, and how their likelihood to buy could be affected,

researchers found that consumer response to health claims varies by country (Saba *et al.*, 2009). The study investigated high fibre food products and determined factors that affect their market in Johannesburg and its surrounding areas as well as consumers' attitudes towards high fibre food products in general.

#### **1.4 Research objectives**

Carrying out his study enabled the understanding of high fibre food products market, and the socio-economic characteristics of target consumers. The findings of the study will be useful for food manufacturers in terms of development and promotion of nutritional enrichments of novel, innovative products. The main objective of this study was to observe consumers; and willingness to pay for different high fibre products available in the Johannesburg domestic market. The hypotheses tested were as follows:

H0<sub>1</sub>: Health risk perceptions affect consumers' WTP for high fibre products;

H0<sub>2</sub>: Consumers acknowledge high fibre food products as important part of their diet.

#### **1.5 Data collection and methodology**

##### **1.5.1 Data collection**

A questionnaire was designed to implement a contingent valuation (CV) survey method. Data was gathered during the period of December 2009 to February 2010. The questionnaire was in the English language. Direct interviews and e-mail interviews were simultaneously conducted on 179 main purchasers of households in Johannesburg and its surroundings where the study was done. Initially 250 copies of the questionnaire were printed. The challenge in house-to-house calling was that most households were not sure about their security. For this reason, e-mail interviews were

introduced. Drafts of the questionnaire were sent to the supervisor for corrections before final approval. Data collected was then transferred into the Statistical Package for Social Sciences (SPSS V17.0) software for analysis.

## **1.5.2 Methodology**

### **1.5.2.1 Introduction**

Consumer Willingness to Pay (WTP) for high fibre products was measured using the Contingent Valuation method (CV). In recent years, CV methods have been used to elicit consumers' willingness to pay for non-biotech foods as some consumers have avoided the consumption of foods made from biotech ingredients (Lin *et al.*, 2006). CV methods have also been applied to agro-food marketing with special contributions to the analysis of purchase behaviour in food retailers (Molla-Bauza *et al.*, 2005). The dichotomous choice format which the study used provided respondents with some thresholds value and asked them if they were willing to pay that amount (Kaneko & Chern, 2005). In this study, 5%, 10%, 15% and 20% above current market price were offered and respondents were asked to choose the maximum they were willing to pay for the specific products they regularly bought. This way, there was no chance of getting biased results since respondents had to answer once and had only one choice per product.

### **1.5.2.2 Research design**

Contingent Valuation method quantifies the value consumers give to a product by associating that value with the amount of money they are willing to pay (Lupin *et al.*, 2008). There are two main approaches to the CV method: single-bonded conventional method where respondents are asked only one dichotomous choice question with a

“no” or a “yes”. In the second approach called double-bounded, respondents are offered an initial price premium that they have to accept or reject then offered a premium or a discount if “yes” or “no” is chosen (Markosyan *et al.*, 2007). Some researchers, Yoo & Yang (2001), who studied tap water quality in Korea, and Li *et al.*, (2004), in a study on consumer’s response on genetically modified beef, stated possible drawbacks of the double-bounded models biases observations during sample collection. They pointed out the inconsistency that may occur between consumers’ first and second bids. Double-bounded models are, however, claimed to improve the statistical efficiency of single- bounded models obtained by analysing follow-ups data. This study followed the double-bounded procedures applied by Lupin *et al.*, (2008) and several other researchers in studies on genetically modified and organic foods such as Gil *et al.*,(2001), Cranfield & Magnusson (2003), Grimsrud *et al.*,(2004), Kaneko & Chern (2005), and Engel (2008). Results obtained from the above studies have confirmed that double-bounded procedure’s efficiency outweighs its potential bias problems. The difference between this study and other studies is that respondents who said they bought high fibre products and were willing to pay more than the current market price for one or more of the selected products were given a set of increases for each product. They then had to choose the maximum amount they are willing to pay for a specific product. In order to obtain the parameter estimates for the selected products, a Logistic Regression model was applied. Logistic regression (Logit analysis) is a multivariate technique used to study the relationship between a dichotomous dependent variable and one or more independent variables (Molla-Bauza *et al.*, 2005). Assuming that willingness to pay for a product is function of income, price, and socio-economic characteristics; the initial model was given as:

$$WPT_{ij} = \alpha + \beta_1 P_{jk} + \beta_2 Y_i + \beta_3 \pi_i + F(Z_i) \quad (1)$$

Where:

$WTP_{ij}$  = Whether  $i$  consumer's willingness to pay for product  $j$  or not;

$\beta_i$  = Coefficients to be estimated;

$P_{jk}$  = High fibre price premium charged for  $j$  product;

$Y_i$  = Household income level of  $i$  respondent;

$\pi_i$  = Quality attributes perceptions of  $i$  respondent;

$Z_i$  = Socio-economic characteristics of respondent  $i$ .

$\alpha$  = Constant

Equation (1) was estimated by the Maximum Likelihood method. The estimated parameters for selected products equation were obtained by using the Statistical Package for Social Sciences (SPSS version 17.0, 2009).

After estimating the Logit Models and in order to calculate the average consumers' WTP for each selected product, the estimated parameters were included in the expression (2). It equalled the average WTP, calculated as the area below the logit functions estimated by equation (1) truncated at the maximum price premium price calculated in accordance with prices collected in the sampled stores. The average WTP for each product was calculated as:

$$\overline{WTP}_j = H + \frac{1}{\beta_1} \ln \left[ \frac{1 + \exp\{-(d + \beta_1 H)\}}{1 + \exp(-d)} \right] \quad (2)$$

Where:

- $\overline{WTP}_j$  = Average high fibre product WTP for  $j$  product;
- $\beta_i$  = Coefficients estimated;
- $H_i$  = Maximum high fibre product price premium ( $P_j$ ) for  $j$  product;
- $-d$  =  $WPT_{ij} = \alpha + \beta_i P_{jk} + \beta_2 Y_i + \beta_3 \pi_i + F(Z_i)$  as mentioned in (1);
- $j$  = Selected products.

Research on WTP for organic food in Argentina (Lupin *et al.*, 2008) mentioned that truncated does not significantly affect the WTP estimates if  $H$  is large. Also WTP were assumed to be strictly positive hence the expression (2) was obtained by integrating:

$$E(WTP) = \int_0^H \left[ 1 + \exp(\alpha + \beta_i P_j + \beta_2 Y_i + \beta_3 \pi + \beta_4 Z_i) \right]^{-1} dp$$

### 1.5.2.3 Development of questionnaire

The questionnaire used in the study consisted of three main parts. The first part covered respondents' household characteristics. This part of the questionnaire was used for market segmentation. The market was segmented into four groups: Low income, average, above average and high-income groups. Once the segmentation was done, the different groups were characterised according to consumers' socio-economic status (household size, age, gender, education level, employment status and income). The second part of the questionnaire covered consumers' attitudes towards high fibre products. In this section, both respondents who regularly bought and those who did not buy were taken into consideration. The third section consisted of the dichotomous choice questions (DC). The first part of the DC questionnaire involved all respondents. They were asked whether or not they were willing to pay more than the market price for one or more of the selected products. Prices were increased by

5%, 10%, 15% and 20% above market prices. These were offered only to those who had shown interest and were willing to pay more for one or more of the selected range. Market segmentation was defined in this study as a process of dividing a total market into market segments or target market of consumers with common needs or characteristics (Strydom, 2004). Income was the main variable used for this purpose.

## **1.6 Study limitations**

The study focused on Johannesburg area only and therefore the findings can not be generalised to the whole South Africa. There was also limited information on fibre consumption within the area of Johannesburg available. The study could therefore not do follow-ups on previous studies done specifically on high fibre food products. Future research on evaluating factors that lead consumers to their choice of specific high fibre food products would enhance the results that would be of direct use to the manufacturing sector.

## **1.7 Chapter outline**

Following the introduction, chapter 2 covers the literature review. In this chapter, previous studies done on willingness to pay are discussed. Regression results are recorded and discussed in chapter 3. Conclusions and recommendations form the last part of the study in chapter 4.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

Prior to 1965, fibre was referred to as roughage or bulk and was measured as crude fibre. It is only in the past twenty-five to thirty years that fibre, now called Dietary fibre, has been given the scientific importance (Chawla & Patil, 2010). Fibre was first described as the skeletal remains of plant cell walls that are resistant to hydrolysis by the digestive enzymes of man (Phillips & Williams, 2000). These include cellulose, hemicelluloses, pectin, and lignin that are present in a variety of foods such as cereals and legumes among others (IUFoST, 2009). Nowadays, however, the definition is broader, including not only non-edible parts of vegetables but also fibres from animal origin whose molecular structure is similar to that of plant cellulose (Borderias *et al.*, 2005). Dietary fibre are said to be resistant to the enzymes of the human and animal gastrointestinal tract. Through their physical properties, soluble and non-soluble fibres exert their action by increasing digested mass and holding water in the stomach and small intestine, leading to relief of constipation (Phillips & Williams, 2000). The American Dietetic Association supports the position that consumers should have adequate amounts of dietary fibre from a variety of plant foods. The recommended intakes of 20-35g/day for healthy adults and 5g/day for children are not being met because intakes of good sources of dietary fibre, fruits, vegetables, whole and high-fibre grain products, and legumes are low (Marlett *et al.*; 2002). The European Food Safety Authority panel on dietetic products, nutrition and allergies was asked to give an opinion on dietary fibre intake. The role of bowel function was used as suitable

criterion for establishing an adequate fibre intake. Based on the evidence on bowel function, the panel considered dietary fibre intake of 25g per day to be adequate for normal laxation in adults confirming the American Dietetic Association statement. There was, however, limited evidence to set adequate intakes for children. The panel suggested that adequate intake for dietary fibre for children should be based on that of adults with adjustment for energy intake (EFSA, 2010). In her study on characterisation of dietary fibre properties to optimise the effects of human metabolism, Ulmius (2011) found that, on average, women showed a more pronounced glucose lowering response than men when rye bran was used. This was considered an indication that different amounts of dietary fibre should be recommended for men and women. The definition of dietary fibre and methods of analysing have been subjects of intense debate and research. A demand of a global definition has risen and the legislation on food labelling, nutrition and health claims is also asking for a uniform definition of dietary fibre (Raninen *et al.*, 2011)

**Table 1.1 Different dietary fibre definitions**

American Association of Cereal Chemists (AACC, 2000)
Dietary fibre is the edible parts of plants or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine. It includes polysaccharides, oligosaccharides, lignin, and associated plant substances. Dietary fibres promote beneficial physiological effects including laxation, and/or blood cholesterol attenuation, and/or blood glucose attenuation
Institute of medicine (IOM, 2002)
Dietary fibre consists of non-digestible carbohydrate and lignin that are intrinsic and intact in plants. Functional fibre consists of isolated, non-digestible carbohydrates that have beneficial physiological effects in humans. Total fibre is the sum of dietary fibre and functional fibre.
Codex Alimentarius Commission (CAC, 2006)
Dietary fibre means carbohydrate polymers with a degree of polymerisation not lower than 3, which are neither digested nor absorbed in the small intestine. A degree of polymerisation not lower than 3 is intended to exclude mono- and disaccharides. It is not intended to reflect the average degree of polymerisation of a mixture.  Dietary fibre consists of one or more of: <ul style="list-style-type: none"><li>• edible carbohydrate polymers naturally occurring in the food as consumed,</li><li>• carbohydrate polymers, which have been obtained from food raw material by physical, enzymatic, or chemical means,</li><li>• synthetic carbohydrate polymers.</li></ul> Dietary fibre generally has properties such as: <ul style="list-style-type: none"><li>• Decrease intestinal transit time and increase stool bulk</li><li>• Fermentable by colonic micro flora</li><li>• Reduce blood total and/or LDL cholesterol levels</li><li>• Reduce insulin levels</li></ul>

**Source: AIB International Technical bulletin (February 2009)**

## **2.2 Attributes and characteristics of dietary fibre**

Dietary fibre includes cellulose and lignin, hemicellulose, pectins, gums, and other polysaccharides and oligosaccharides associated with plants. It is conventionally classified in two categories according to their water solubility: insoluble dietary fibre such as cellulose and lignin and soluble dietary fibre such as pentosane, pectin and gums (Chawla & Patil, 2010). Water-soluble fibre generally consists of non-starch polysaccharides, mainly beta-glucans and arabinoxylan. It produces a viscous solution. Soluble fibre inhibits passing of the chyme through the intestines, hampers the stomach discharge, reduces the absorption of glucose and sterols in the intestines, and decreases serum cholesterol, blood glucose, and the content of insulin in human body. The water-insoluble fibre consists of non-starch polysaccharides and is not fermented in the large intestine (Havrlentova *et al.*, 2011) Through their physical properties, soluble and non-soluble fibres exert their action by increasing digested mass and holding water in the stomach and small intestine, leading to relief of constipation (Phillips & Williams, 2000). Foods high in soluble fibre include oat bran, oatmeal, beans, peas, rice bran, barley, citrus fruits, strawberries and apple pulp. Food high in insoluble fibre include whole wheat bread, wheat cereal, wheat bran, rye, rice, barley, apple skin, beet, carrots, Brussels sprouts, turnip, cauliflower and cabbage (Dahm *et al.*, 2010). Rye bran has been reported to lowering glucose levels whilst oat bran lowers insulin concentrations. The lowering effects is reportedly related to fibre source, the amount of soluble and insoluble fibre and pre-processing of the fibre (Ulmius, 2011)

**Table 2.2 Fibre content of whole grain**

<b>Grain</b>	<b>% Fibre</b>	<b>Total Dietary Fibre / serving</b>
Kamut Grain	19.2	3.1
Bulgur	18.3	2.9
Barley	17.3	2.8
Barley pearled	15.6	2.5
Amaranth	15.2	2.4
Rye	14.6	2.3
Triticale	14.6	2.3
Wheat	12.2	2.0
Oats	10.6	1.7
Buckwheat	10.0	1.6
Sorghum	9.0	1.4
Millet	8.5	1.4
Corn	7.3	1.2
Wild Rice	6.2	1.0
Brown rice	3.5	0.6

**Source: AIB International Technical bulletin (February 2009)**

### **2.3 Overview on previous studies**

During the thirty second session of the Codex Alimentarius Commission in Rome, dietary fibre was re-defined and described as one of three categories of carbohydrate polymers; carbohydrate polymers obtained from food raw material by physical, enzymatic or chemical means; and systematic carbohydrate polymers (FAO/HWO, 2009). Dietary fibre is increasingly being linked to health benefits. The beneficial properties of dietary fibre have been associated with their significant role in human physiological function such as reduction in cholesterol level and blood pressure, prevention of gastro-intestinal problems, and protection against several cancers have been reported (Chawla & Patil, 2010). Dietary fibre is also documented to lower risk of heart disease and diabetes (Mehta, 2009). This has been explained by the viscous

effects of soluble fibre which can reduce or delay the absorption of carbohydrates and fat in the small intestine, resulting in lower blood concentrations of glucose, insulin and cholesterol (Ulmius, 2011). A fibre-rich meal is processed more slowly, promoting earlier satiety and is frequently less caloric in fat and sugars. These characteristics are attributes of a dietary pattern to treat and prevent obesity (Marlett *et al.*, 2002). In a study done in Australia on bread, researchers found that bread enriched with lupin kernel flour reduced blood pressure and boosted heart health (Lee *et al.*, 2009). Researchers from the National Institute of Environmental Medicine in Sweden in collaboration with the National Public Health Institute in Finland and the National Cancer Institute in USA determined the relationship between dietary fibre and risk of stroke in male smokers. Findings suggested a beneficial effect of the consumption of fruits, vegetables and cereals on stroke risks (Larsson *et al.*, 2009). People who eat whole grains tend to have less of the type of fat associated with heart health and diabetes risk than those who eat more refined grains (McKeown, *et al.*, 2009). To examine the association between dietary fibre intake and colorectal cancer risk Dahm *et al.*, conducted a study in the United Kingdom in 2010. The results showed that intakes of absolute fibre were statistically significantly inversely associated with the risks of colorectal and colon cancer. Researchers from the University of Mediterranee in France have examined the relationship between the source or type of dietary fibre intake and cardiovascular disease risk factors in adults men and women. Their findings suggested that the highest total dietary fibre and non-soluble dietary fibre intakes were associated with a significantly lower risk of overweight and elevated blood pressure in both sexes (Lairon *et al.*, 2005). The American Diabetes Association released an article on a study done on the association between dietary fibre and inflammation, hepatic function in older men. Findings of

the study also confirmed that dietary fibre is associated with reduced diabetes risk (Wannamethee *et al.*, 2009). According to Bijkerk *et al.*, 2009, adding soluble fibre to the diet improves symptoms associated with irritable bowel syndrome (IBS). In a study led at the University of Minnesota in the United States of America, researchers found that beta-glucan significantly reduced total and LDL cholesterol in subjects with elevated cholesterol levels. Based on a model intestinal fermentation, this fibre was fermentable. Thus it can lower serum lipids in a high risk population and may improve colon health (Queenan *et al.*, 2007). In a recent study conducted by the National Cancer Institute in Maryland in the United State of America, it has been found that fibre intake lowered the risk of death from cardiovascular infections, and respiratory diseases by 24 percent to 56 percent in men and by 34 percent to 59 percent in women (Park *et al.*, 2011). A study led in Japan showed that higher intake of both soluble and insoluble dietary fibre, especially from fruit and cereal sources, may contribute to the prevention of coronary heart disease in Japanese men and women (Ehab *et al.*, 2010). Eating a high-fibre breakfast from rye has been found to increase feelings of satiety and leads to reduced food intake later in the day. This decreases chances of obesity (Isaksson *et al.*, 2009). Preliminary findings on fibre-enriched pasta from the Laboratory of experimental Biochemistry in Bari, Italy, suggested that consumption of fibre-enriched pasta produced significant increases in levels of gut peptides linked to the emptying of the stomach and ease the rise in blood sugar levels after eating compared to consumption of the control pasta (Russo *et al.*, 2011). Danone research findings led in America suggested that formula enriched with fibre may protect healthy infants from allergy. The study results showed significant reduction in the incidence of atopic dermatitis in low-risk children (Gruber *et al.*, 2010). The department of epidemiology at the University of Washington have

conducted a study on dietary fibre intake in early pregnancy and risks of preeclampsia. Results suggested that higher total fibre intake may attenuate pregnancy-associated preeclampsia (Qiu *et al.*, 2008). In China, research done on four hundred and thirty-eight cases with primary breast cancer suggested that consumption of total dietary fibre and fibre from vegetable and fruit sources was inversely associated with breast cancer risk (Zhang *et al.*, 2011).

Dietary fibre is also beneficial to food manufacturers. Dietary fibre are used in the food industry to fortify foods products, increase their dietary content resulting in healthy products, low in calorie, cholesterol and fat. They also play a functional role by improving food products texture, physical and structural properties of hydration, oil holding capacity, viscosity, sensory characteristics, and shelf-life (Elleuch *et al.*, 2010). Food and beverage companies have recognised the role that an increase in dietary fibre could play in the promotion of new products. In their study, Bogue & Troy's objectives were to understand consumers' attitudes towards fibre products, to assess the role of fibre in the diet gain an insight into the impact of health claims on willingness to purchase healthy food and to explore consumers' view on a beta-glucan enriched food product or beverage. Findings of the study suggested that consumers generally had a positive attitude towards fibre-enriched food products. They claimed fibre-enriched products healthy and familiar. However, consumers showed a high level of mistrust towards health claims although health claims attracted them to the specific product (Bogue & Troy, 2008). Dietary fibre can be added in bakery products to improve texture. The fibre will influence water absorption during formation of the dough and batter (Mahta, 2009). In a study on ice-cream, Soukoulis *et al.*, 2008, found that dietary fibres controlled crystallization and re-crystallisation in ice creams and therefore offered new formulation possibilities to product developers.

Substituting partially hydrogenated vegetable fat, used as flavour fixative agent in snacks, with fibre increases the dietary fibre content of the finished product sevenfold with similar overall acceptability and these results in production of a healthy snack (Capriles *et al.*, 2009). It has been found that yoghurt enriched with edible fibre obtained from the non-edible part of asparagus increased the consistency of the yoghurt (Sanz *et al.*, 2008). Dietary fibre guar gum was successfully incorporated in low fat yak milk with improved body, texture and juiciness (Kandeepan & Sangma, 2010). Muffins containing an orange-based dietary fibre were developed to determine chemical composition, starch digestibility, Glycaemia Index and sensory characteristics. Results showed low fat and high fibre contents, a decrease in Glyceamic Index but no difference in other attributes when compared with the control muffin. These findings proved that the addition of fibre can be an alternative for people who require low glyceamic response (Romero-Lopez *et al.*, 2011). Researchers from the faculty of Land, food and leisure at the University of Plymouth in the United Kingdom studied the nutritional and physicochemical characteristics of dietary fibre enriched pasta. Results showed that the added fibre influenced the cooking and textural characteristics of both raw and cooked pasta. Glucose release was said to be significantly reduced by the addition of soluble dietary fibre (Tudorica *et al.*, 2001). Development of dietary fibre-enriched foods results in obtaining products with good functional properties but can cause problems in technological properties. With this in mind, the effect of dietary fibre on technological quality of pasta was studied by replacing a portion of wheat flour with four types of dietary fibres. The one type improved the overall quality of the final product, the second fibre only improved the product texture, the third improved cooking characteristics and the fourth negatively affected the end product characteristics. These results proved that

pasta can be developed with good cooking quality and improved nutritional characteristics by adding a combination of appropriate dietary fibres (Bustos *et al.*, (2011)). The effect of grape antioxidant dietary fibre on the prevention of lipid oxidation in minced fish was evaluated by researchers in Spain. The study findings suggested that addition of red grape fibre delayed lipid oxidation in minced horse mackerel muscle during the first three months of frozen storage (Sanchez-Alfonso *et al.*, 2005). As dietary fibre describes a wide variety range of non-digestible carbohydrate with different biochemical and biophysical properties, different sources and type of dietary fibre have different functionality in food products as well as different consequences to human physiology (Brownlee, 2009).

In this study, consumers' attitudes, perceptions and willingness to purchase high fibre products were defined using dichotomous choice questions. This method has been used by a number of researchers. Lupin *et al.*, (2008) has done a survey on consumers' willingness to purchase organic food in Argentina. The results were that, informed consumers were willing to pay price premiums for organic products. Lack of store availability reliable regulatory system to control quality risks rather than price seemed to be the reason of the constraint consumption of organic products in Argentina. Prior to this study, Lupin and other researchers evaluated consumers' perceptions of food quality attributes and their incidence available organic foods. Results showed that 67% were worried about their health, 79% take care in meals, 57% perceived the high risk of hormones and pesticides in food, and 91% are used to read labels before purchasing (Lupin *et al.*, 2006). Gil *et al.*, (2000) and Molla-Bauza *et al.*, (2005) conducted a similar study in Spain and found that some consumers were willing to pay a premium for organic food depending on their lifestyles and attitudes towards environment issues. Both Lupin and Molla-Bauza conclusions stated a

positive consumer willingness to pay a premium, but producer's challenge remained in the high prices of organic products compared to conventional products. Molla-Bauza's concluding results on wine emphasised that consumers who were willing to pay these premiums were mostly concerned about environmental issues and less about health. However, most of those respondents who were willing to pay high prices came from the healthy life style group. The University of Alberta in Canada conducted a research on willingness to pay for organic wheat bread. Findings of the study showed that in the absence of taste information, willingness to pay was greater when environmental information was given than willingness to pay when health information was given. Once sensory information was given, willingness to pay with health information was twice that of the environment. Health claims seemed to be taken into consideration only when the product was tasted (Boxall *et al.*, 2009). Recently in Turkey, consumers' willingness to pay extra money for organically raised chicken meat rather than conventionally raised chicken meat was evaluated. Findings of the study revealed that 81% of the respondents would be willing to pay a premium for organically raised chicken meat. Results also showed that willingness to pay was related to household income, education level of household head and monthly chicken meat consumption (Gunduz and Bayramoglu, 2011). Munene (2006) from the Department of Agricultural Economics and Agribusiness at the University of Louisiana analysed consumer attitudes and their willingness to pay for functional foods. Beliefs about the link between nutrition and health, concern about chronic diseases, current purchasing and consumption patterns, and attitude towards functional foods were factors that were found to have significantly affected the respondents' willingness to pay a premium for functional foods. Prathiraja and Ariyawardana (2003) of the University of Peradeniya in Sri Lanka have found that

consumers use nutritional labelling when making a purchasing decision because of their health consciousness. Findings of their study on the impact of nutritional labelling on consumer buying behaviour showed that the majority of respondents were willing to pay more money for the nutritional information on food items. Results of a study on white bread enriched with fibre, suggested that consumers were ready to pay more for bread labelled source of fibre on a single purchase. The study, however, underlined the importance of sensory characteristics such as taste and appearance but questioned whether the same consumers will be willing to pay more for regular, repeated purchases (Ginon *et al.*, 2009). In a similar type of study in Switzerland, consumer willingness to pay for breakfast cereals, hard bread and potato products, study results suggested that consumers who preferred nutrition over taste for some ingredient in a specific product may prefer taste over nutrition for other products (Rausser & Thunstrom, 2009). In 2005, Lyly *et al.*, researchers from the technical research centre of Finland, France and Sweden worked on factors that influence consumers' willingness to use beverages and ready-to-eat frozen soups containing oat beta glucan in 2005. The results showed that after tasting, the price consumers were willing to pay for beverages and soups decreased. Taste of the products strongly affected the willingness to pay. Health claim gave a significant but small added value. Ares *et al* (2008) also studied the effect on sensory properties and consumers' acceptability. The effect of the addition of a functional fibre on sensory characteristics and consumers' acceptability of milk puddings was determined. Using different concentrations (between 0 and 4%), researchers discovered that higher concentrations caused changes in the sensory characteristics of milk puddings. Concentration of 1.4% was estimated as the maximum as the maximum concentration that does not significantly modify consumers' overall acceptability. Consumers who would buy

milk desserts containing 1.4% fibre was estimated as 71%. Concentrations above 1.4% were said to cause a rough after feel and floury taste. In a study on pesticide free food products at the University of Guelph in Canada, Magnusson and Cranfield (2003) used Contingent Valuation survey to determine if Canadian consumers were willing to pay more for pesticide free food products. Sixty five percent of respondents were willing to pay a 1 to 10% premium relative to conventional food product. Five percent were willing to pay more than a 20% premium. Boccaletti and Moro conducted a survey in Italy to measure consumer willingness to pay for genetically modified food products. Their findings suggested that 46% of the respondents had a positive attitude towards GM foods and only 27.5% rated a negative attitude. All respondents based their responses on health and environmental issues. 39.5% showed an neutral response towards GM and traditional food products if quality and prices were held the same, and another 22 % said they would consume GM foods even if the price was slightly higher (5%). Willingness to pay was mainly affected by income and information (Boccaletti & Moro, 2000)

## **2.4 Conclusion**

Dietary fibre is defined by different sources and an overview on the relevant literature on past studies was discussed in this chapter. In order to evaluate consumers' willingness to purchase, the Contingent Valuation (CV) method was selected. Results and discussion follow in chapter 3.

## **CHAPTER 3**

### **RESULTS AND DISCUSSION**

#### **3.1 Survey response rate**

The three products focused on form the main categories currently found within the Johannesburg shelves holding the majority of high fibre products market share. The research focused on breakfast cereals, bread and yoghurt. The number of questionnaires given out was 250. This was done by combining electronic and direct interviews. Of the 250 questionnaires, 179 copies were considered having complete information and counted for 71%. The other 29% of the questionnaires had important data missing or were returned without information. They were hence removed from the sample. The study only used questionnaires without missing data.

## 3.2 Descriptive statistics of variables used in the analysis

**Table 3.1: Seed and health bread**

		<b>Yes 67%</b>	<b>No 33%</b>	<b>Total 100%</b>
Household size ( <i>HHS</i> )	1 to 2	75.8	24.2	100
	2 to 4	67.6	32.4	100
	4 to 6	59.0	41.0	100
	> 6	28.6	71.4	100
Age group ( <i>Age</i> )	Less than 25	45.8	54.2	100
	25 to 35	68.0	32.0	100
	35 to 60	75.0	25.0	100
	> 60	66.7	33.3	100
Gender ( <i>Gen</i> )	Female	65.7	34.3	100
	Male	69.0	31.0	100
Education ( <i>Educ</i> )	No formal school	40.0	60	100
	High School	72.1	27.9	100
	University	65.5	34.5	100
Employment status ( <i>Empl</i> )	Full time	69.5	30.5	100
	Part-time	56.3	43.8	100
	Unemployed	63.6	36.4	100
	Student	50.0	50.0	100
	Other	100	0.00	100
Income ( <i>Inc</i> )	Less than R5000	56.1	43.9	100
	R5000 to R10000	59.2	40.8	100
	R10000 to R25000	74.3	25.7	100
	More than 25000	86.7	13.3	100

N=179

Although willingness to pay for seed and health bread at higher price seemed have been recorded positive, it is shown in Table 3.1 that the response percentages decreased with increase in household size and decrease in the age variables. Results show that HHS (1-2) had a 75.8 % positive response; HHS (2-4) 67.6 percent; HHS (4-6) 59 %; HHS of more than 6 only had 28.6 % positive responses. The age group had shown an increase in percentage from Less than 25 years, 45.8 percent Yes responses, (25-35) years, 68.0 %; (35-60) years, 75 %; followed by a decrease on the more than 60 years group of 66.7 %. Negative response is also recorded from the “No formal / primary school” group with 60 % respondents saying “No” to the willingness

to buy question. 86.7 % positive responses were recorded from the more than R25 000 income group.

**Table 3.2: High fibre breakfast cereal**

		<b>Yes 63%</b>	<b>No 37%</b>	<b>Total 100%</b>
Household size	1 to 2	71.0	29.0	100
	2 to 4	63.4	36.6	100
	4 to 6	51.3	48.7	100
	> 6	57.1	42.9	100
Age group	Less than 25	62.5	37.5	100
	25 to 35	61.3	39.0	100
	35 to 60	69.2	30.8	100
	> 60	33.3	66.7	100
Gender	Female	64.8	35.2	100
	Male	61.3	39.0	100
Education	No formal school	40.0	60.0	100
	High School	65.6	34.4	100
	University	62.8	37.2	100
	Full time	66.0	34.0	100
Employment status	Part-time	43.8	56.3	100
	Unemployed	45.5	54.5	100
	Student	80.0	20.0	100
	Other	0.00	100	100
Income	Less than R5000	58.5	41.5	100
	R5000 to R10000	59.2	40.8	100
	R10000 to R25000	67.1	32.9	100
	More than 25000	73.3	26.7	100

N=179

As shown in Table 3.2 above, positive responses across specific variables of the socio-economic group were recorded with an exception on the level of education and employment status. From the “no formal school” or primary school level, 60% of respondents said “no” to the willingness to buy breakfast cereal at higher price question. The rest of the group responded positively in general. Similar observation is seen for the part-time and unemployed variables where 56.3% and 54.5% respectively said “no” to the question. The percentage increased significantly with increase in income with 73% of the R25 000 responding with “yes” and 58.5% of the R5000 group also responding positively. Willingness to buy at higher price tended to

decrease with increase in household size. For HHS (1-2), 71% responded “yes”, whereas HHS (2-4) and HHS (4 to 6) results were recorded as 63.4% and 51.3% respectively. Age, gender and marital status did not seem to be significantly important for this product.

**Table 3.3: Fibre-enriched yoghurt**

Variables		Yes 49%	No 51%	Total 100%
Household size	1 to 2	46.8	53.2	100
	2 to 4	49.3	50.7	100
	4 to 6	51.3	48.7	100
	> 6	42.9	57.1	100
Age group	Less than 25	37.5	62.5	100
	25 to 35	51.0	49.0	100
	35 to 60	51.9	48.1	100
	> 60	0.00	100	100
Gender	Female	48.1	51.9	100
	Male	49.3	50.7	100
Education	No formal school	40.0	60.0	100
	High School	52.5	47.5	100
	University	46.9	53.1	100
Employment status	Full time	48.9	51.1	100
	Part-time	62.5	37.5	100
	Unemployed	45.5	54.5	100
	Student	30.0	70.0	100
	Other	0.00	100	100
Income	Less than R5000	53.7	46.3	100
	R5000 to R10000	49.0	51.0	100
	R10000 to R25000	44.3	55.7	100
	More than 25000	53.3	46.7	100

N=179

The difference in Willingness to buy yoghurt at higher prices did not seem to be very significant among respondents who said “yes” and those who said “no” for most variables as shown in Table 3.3. Within the Willingness to buy yoghurt at higher prices, HHS (1-2) counted for 34.6% ; HHS (2-4),39.7%; HHS (4-6),21.8% and HHS of more than six counted 3.9% of the total sample. Age (25-35) counted for 55.9% of the total sample with 58.6% responding as “yes” on the willingness to buy question. The total percentage within willingness to buy yoghurt at higher price resulted in

48.6% “yes” and 51.4% “no” responses. Similarities in responses were observed with the gender variable. 48.1% female responded “yes” to fiber enriched yoghurt and 49.3% counted “yes” for male. Female contributed 60.3% of the total sample. Respondents with a university level of education represented 63.1%, high school counted for 34.1%, and no formal school or primary school 2.8%. High school results were the highest with 52.5% “yes” to willingness to buy fiber enriched yoghurt at high price. Only 46.9% of respondents with a university level of education responded positively. 78.8% of respondents were full time employed , 8.9% part-time, 6.1% unemployed , 5.6% student and 0.6% formed the “other” category. Part-time respondents had a 62.5% “yes” response on the willingness to buy question and only 48.9% of fulltime respondents said “yes”. The willingness to buy positive reaction increased with increase in income. The highest and lowest income groups were recorded the highest result counting for 53.3% and 53.7% positive responses, respectively. R10000-R25000 was the most representative with 39.1% of the total sample. Of this group 44.3% responded positively on fiber enriched yoghurt.

**Table 3.4: Percentage results of the market segmentation using income**

		<R500	R5000 to R10000	R10000 to R25000	>25000
Cereal	Yes	58.5	59.2	67.1	73.3
	No	41.5	40.8	32.9	26.7
Bread	Yes	56.1	59.2	74.3	86.7
	No	43.9	40.8	25.7	13.3
Yoghurt	Yes	53.7	49.0	44.3	53.3
	No	46.3	51.0	55.7	46.7

N=179

Results in Table 3.4 show that willingness to pay for breakfast cereal and bread increased with increase in income in general. An interesting observation is noted on yoghurt where the two extremes, income of below R500 and income above R25 000 seemed to have similar results. The middle groups responses, (R 5 000 - R10 000) and (R10 000 - R25 000) were also similar.

**Table 3.5: Perceptions and attitudes towards high fibre food products**

Definition	Name	Mean	Standard Dev	Min	Max
Have you heard of high fibre products? 1=yes; 2=no	Hfibprod	1.10	0.302	1	2
Belief in product goodness 1= yes; 2=no 3=No response	Prodgood	1.22	0.500	1	3
Product health claim 1=true; 2=not true 3=neutral 4= No response	Heaclai	2.02	1.003	1	4
Fibre dietary importance 1=Very important; 2= Not important; 3=Neutral 4=No response	Dtimport	1.56	0.900	1	4
General product perception 1= It is fashion; 2=Good for my health 3=Neutral 4=No response	Genprodperc	2.37	0.725	1	4

N=179

The sample majority claimed to have heard of high fibre food products, believed in the goodness and acknowledged their dietary importance as shown in Table 3.5. Although most respondents said fibre products are good for their health, results in Results in Table 3.5 show that respondents were not sure whether the selected products health claim was true or not.

**Table 3.6: Food purchasing behavior**

Definition	Name	Mean	Standard Dev	Min	Max
Buying frequency 1=often; 2=not so often 3=Never	Buyfreq	1.60	0.657	1	3
Monthly food spending 1=R500 or <; 2=R500-R1000 3=R1000-2000; 4=> R2000 5=No response	Mfspend	2.59	1.004	1	5
Product price worthiness 1=Worth the price; 2= not worth the price; 3= neutral	Pricworth	2.10	0.949	1	3
Label checking frequency 1=all the time; 2=sometimes; 3= never	Labcheck	2.16	0.712	1	3
Products often brought 1=High fibre cereal; 2=seed and health bread; 3=Fibre-enriched yoghurt 4=Any available 5=More than one 6=I do not buy fibre products 7=No response	Prodbought	3.65	2.043	1	7

N=179

In the above results (Table 3.6), it is shown that the representative sample often bought high fibre products. Monthly spending on food in general ranged from R500 to just above R 1000 on average. The study also found that, although respondents did not think high fibre products were worth the price and they did not frequently check labels, they often bought the selected products used for the study.

**Table 3.7: Variables affecting buying decision**

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<b>Definition</b>	<b>Name</b>	<b>Mean</b>	<b>Standard Dev</b>	<b>Min</b>	<b>Max</b>
Price effect on decision to buy 1=Effective; 2=not effective; 3=neutral	Priceff	1.42	0.579	1	3
Fibre content effect on decision to buy 1=Effective; 2=not effective; 3=neutral	Conteff	1.98	0.790	1	4
Brand name effect on decision to buy 1=Effective; 2=not effective; 3=neutral	Braneff	1.66	0.735	1	3
Taste effect on buying decision 1=Effective; 2=Not effective 3=Neutral; 4=No response	Tasteff	1.91	0.882	1	4

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N=179

Table 3.7 shows that price, fibre content, brand name and taste affected buying decisions of the representative sample.

### 3.3 Results of the regression analysis

**Table 3.8: Definitions and summary statistics of variables used for health and seed bread**

Definition	Characteristics	Mean	Min	Max
Home language ( <i>Lang</i> ) 1=English; 2=Afrikaans; 3=Other	Socio-econ	2.14	1	3
Label checking frequency ( <i>Labcheck</i> ) 1=all the time; 2=sometimes; 3= never	Knowledge	2.16	1	3
Willing to buy fibre ( <i>WTByog</i> ) enriched yoghurt at higher price 1=yes; 2=no	Health risk	1.51	1	2
Willing to buy breakfast ( <i>WTBbreakc</i> ) cereal at higher price 1=yes; 2=n	Health risk	1.37	1	2
Maximum percentage to ( <i>Maxperbread</i> ) pay for seed &health bread 1=5%; 2=10%; 3=15%; 4=20%5=above 20%; 6=I don't buy it 7= No response	Socio-econ	4.55	1	7

N=179

**Table 3.9: Health and seed bread Logit regression results**

Variable	Estimated Coefficient	SE	Wald	Significance Level	Exp $\beta$
Lang	0.870***	0.258	11.354	0.001	2.386
Labcheck	0.729**	0.323	5.077	0.024	2.072
WTBbreakc	1.803***	0.462	15.236	0.000	6.067
WTByog	1.605***	0.489	10.766	0.001	4.977
Maxperbread	0.228***	0.087	6.801	0.009	1.256
Constant	-10.545	1.536	47.110	0.000	0.000

*Summary statistics:*

Number of observation	= 179
-2 Log likelihood ratio	= 135.831
Cox & Snell R Square	= 0.399
Nagelkerke R Square	= 0.555
Percentage correctly classified	= 83.2

P- values are for slopes...\*\*\*P<0.01; \*\*P<0.05 and P<0.10=Significant at 1%,5% and 10% probability level respectively

The above results show that the model observed outcome for seed and health bread was 83.2 %. All variables were positively correlated to the willingness to buy with significance levels of 1% (Table 3.9). Willingness to buy breakfast cereal had the strongest significance level (0.000), followed by language and willingness to buy yoghurt (0.001), maximum percentage to pay for bread (0.009) and label checking (0.024). Variables willingness to buy both breakfast cereal and yoghurt had the strongest correlation with willingness to buy bread with estimated coefficients of 1.803 and 1.605 respectively.

**Table 3.10: Definitions and summary statistics of variables used for high fiber breakfast cereal**

Definition	Characteristic	Mean	Min	Max
Age group ( <i>Age</i> ) 1=<25; 2=25-35; 3=35-60; 4=>60	Socio-econ	2.19	1	4
Home language ( <i>Lang</i> ) 1=English; 2=Afrikaans; 3=Other	Socio-econ	2.14	1	3
Employment status ( <i>Empl</i> ) 1=Full time; 2=Part-time 3=Unemployed; 4=Student; 5=Retired; 6= Other	Socio-econ	1.41	1	6
Have you heard of ( <i>Hfibprod</i> ) high fibre products? 1=yes; 2=no	Knowledge	1.10	1	2
Fibre dietary importance ( <i>Dtimport</i> ) 1=Very important; 2= Not important; 3=Neutral 4=No response	Health risk	1.56	1	4
Belief in product goodness ( <i>Prodgood</i> ) 1= yes; 2=no 3=No response	Health risk	1.22	1	3
Generally willing to buy ( <i>WTBmarpric</i> ) at current market price 1=yes; 2=no;	Socio-economic	1.84	1	2
Willing to buy seed and ( <i>WTBbread</i> ) health bread at higher price 1=yes; 2=no	Health risk	1.33	1	2
Willing to buy fibre ( <i>WTByog</i> ) enriched yoghurt at higher price 1=yes; 2=no	Health risk	1.51	1	2
Maximum percentage to ( <i>Maxperbreakc</i> ) pay for breakfast cereal 1=5%; 2=10%; 3=15%; 4=20%5=above 20%; 6=I don't buy it 7= No response	Socio-econ	4.42	1	7
Maximum percentage to ( <i>Maxperyog</i> ) pay for enriched yoghurt 1=5%; 2=10%; 3=15%; 4=20%5=above 20%; 6=I don't buy it 7= No response	Socio-econ	5.08	1	7

N=179

**Table 3.11: High fibre breakfast cereal Logit regression results**

Variable	Estimated Coefficient	SE	Wald	Significance Level	Exp $\beta$
Age group	0.855**	0.397	4.634	0.031	2.352
Lang	-0.652**	0.315	4.291	0.038	0.521
Empl	0.522	0.287	3.309	0.690	1.685
Hfibprod	2.938***	0.989	8.834	0.003	18.882
Dtimport	0.745***	0.288	6.668	0.010	2.106
Prodgood	1.028*	0.603	2.903	0.088	2.795
WTBbread	1.924***	0.608	10.021	0.002	6.848
WTBmarpric	1.107***	0.289	14.668	0.000	3.026
WTByog	2.342***	0.676	11.999	0.001	10.398
Maxperbreakc	0.513***	0.171	8.966	0.003	1.671
Maxperygog	-0.557***	0.188	8.774	0.003	0.573
Constant	-15.612	2.844	30.140	0.000	0.000

*Summary statistics:*

Number of observation	= 179
-2 Log likelihood ratio	= 108.922
Cox & Snell R Square	= 0.507
Nagelkerke R Square	= 0.693
Percentage correctly classified	= 88.3

P- values are for slopes...\*\*\*P<0.01; \*\*P<0.05 and P<0.10=Significant at 1%,5% and 10% probability level respectively

The above results indicate that the model used predicted the observed outcome for breakfast cereal as 88.3% (Table 3.11). Significance levels for breakfast cereal vary from 0.000 to 0.690. Although the employment variable was positively correlated to willingness to buy, it showed a significance level above 10% (0.690). The variable “Hfibprod” had the highest estimated coefficient (2.938) and significantly affected willingness to buy (0.003). Maximum percentage to pay for yoghurt and breakfast cereal, willingness to buy yoghurt and bread, willingness to buy at current market

price, importance of dietary fibre, and knowledge of high fibre products had a significance level of 1%. The age group and language variables had a significance level of 5%, and product goodness, 10%.

**Table 3.12: Definitions and summary statistics of variables used for fibre-enriched yoghurt**

Definition	Characteristics	Mean	Min	Max
House hold size ( <i>HHS</i> ) 1=1 to2; 2=2 to 4; 3=4 to 6; 4=>6	Socio-econ	1.95	1	4
Have you heard of ( <i>Hfibprod</i> ) high fibre products? 1=yes; 2=no	Knowledge	1.10	1	2
Willing to buy seed and ( <i>WTBbread</i> ) health bread at higher price 1=yes; 2=no	Socio-econ	1.33	1	2
Willing to buy breakfast ( <i>WTBbreakc</i> ) cereal at higher price 1=yes; 2=no	Health risk	1.37	1	2
Maximum percentage to ( <i>Maxperyog</i> ) pay for enriched yoghurt 1=5%; 2=10%; 3=15%; 4=20%5=above 20%; 6=I don't buy it 7= No response	Socio-econ	5.08	1	7

N=179

**Table 3.13: Fibre-enriched yoghurt Logit regression results**

Variable	Estimated Coefficient	SE	Wald	Significance Level	Exp $\beta$
HHS	-0.570**	0.243	5.497	0.019	0.565
Hfibprod	-2.310***	0.715	10.453	0.001	0.099
WTBbreakc	2.158***	0.514	17.631	0.000	8.653
WTBbread	1.792***	0.510	12.316	0.000	5.999
Maxperyog	0.254***	0.082	9.627	0.002	1.289
Constant	-2.721	0.892	9.310	0.002	0.066

*Summary statistics:*

Number of observation	= 179
-2 Log likelihood ratio	= 172.925
Cox & Snell R Square	= 0.343
Nagelkerke R Square	= 0.475
Percentage correctly classified	= 76.0

P- values are for slopes... \*\*\*P<0.01; \*\*P<0.05 and P<0.10=Significant at 1%,5% and 10% probability level respectively

Household size and knowledge of high fibre products were observed to be negatively correlated to willingness to pay for fibre-enriched products. The knowledge of high fibre products, represented by the variable “ Hfibprod” also showed a negative correlation with an estimated coefficient of -2.310 (Table 3.13). Whereas willingness to buy both breakfast cereal and bread as well as maximum percentage to pay for fibre-enriched yoghurt showed a positive correlation. Variable willingness to buy breakfast cereal had the highest estimated coefficient of 2.158. All variables were recorded with a 1% significance level. Willingness to buy breakfast cereal and bread were the most significant (0.000), showing a strong correlation between the three selected products. The result above show that the model observed outcome was 76.0%.

### **3.4 Conclusion**

All five variables mentioned in Table 3.8, namely, home language maximum percentage to pay for the product as well as willingness to pay high prices for both breakfast cereal and yoghurt, label checking, home language, highly affected willingness to buy high fibre seed and health bread.

Willingness to buy at current market price was positively correlated to willingness to buy breakfast cereal. This observation confirmed that respondents who were not willing to buy at current market price were not likely to buy the selected products. Language and maximum price to pay for yoghurt were recorded negatively correlated to breakfast cereal whereas, age group, employment status, knowledge, importance, product goodness, willingness to buy both bread and yoghurt, maximum price to pay for breakfast cereal were positively correlated to willingness to pay.

It is shown in Table 3.13 that the maximum percentage to pay for fibre-enriched yoghurt followed by the willingness to pay for both cereal and bread, and knowledge of high fibre food products were variables that strongly affected willingness to pay. Household size was recorded to have the least effect on willingness to buy fibre-enriched yoghurt. Knowledge of high fibre food products was also recorded as variable influencing willingness to buy fibre-enriched yoghurt as shown in Table 3.12. Response percentages decreased with increase in household size and increased with income as indicated in Table 3.1.

Results also confirmed the study's hypotheses that:

H0<sub>1</sub>: Health risk perceptions affect consumers' WTP for high fibre products;

H0<sub>2</sub>: Consumers acknowledge high fibre food products as important part of their diet.

Table 3.10 indicates that respondents believed in high fibre food products goodness and importance in diet. The overall positive response on willingness to buy high fibre food products is evident that respondents' health risk perceptions affected their choices. This is illustrated in Table 3.7 where the variable fibre content is shown to affect buying decision.

## CHAPTER 4

### CONCLUSIONS AND RECOMMENDATIONS

#### 4.1. Main findings

##### 4.1.1 Main source of fibre in diet.

Within a sample of N=179, 34 % of respondents claimed to get their fibre from a various source; 25% get theirs from breakfast cereal; 17.9% from seed and health bread; and only 1.7% get theirs' from fibre enriched yoghurt. 0.6% of the total sample did not buy specifically the products listed on the questionnaire and had the option “other” as source of fibre in their diet. The remaining 20.1% did not respond to the question or do no buy high fibre food products at all. This is seen in Figure 2 in Appendix B.

##### 4.1.2 Maximum percentage to pay for breakfast cereal

As shown in Figure 4 in Appendix B, the number of positive responses decreased with increase in offered premium. With 25% of the total sample counting for the highest number on 5% premium, followed by 16.2% for 10% premium, 3.9% for the 15% premium, 3.4% for 20% premium and only 1.1% agreed to be willing to buy the product at a premium above 20%. 8.5% said they do not buy high fibre breakfast cereals and 43% did not respond to the question because they either do not buy high fibre products in general or they were not willing to spend more than what the product current price is on the market. There is a significant gap between the 10% and 15% premium in this case and almost no gape between 15% and 20% was recorded.

#### **4.1.3 Maximum percentage to pay for seed and health bread**

Seed and health bread graph shows a remarkable decrease in willingness to buy with increase in premium. Compared to breakfast cereal, the gap between 15% and 20% is very significant as shown in Figure 5 in Appendix B. With 15% premium counting for 8.5% willingness to pay and only 2.2% of total sample willing to pay 20% premium. 7.8% of respondents do not buy the product and 45.8% do not buy high fibre products at all for one reason or another.

#### **4.1.4 Maximum percentage to pay for fibre-enriched yoghurt**

In this case as well the decrease in willingness is recorded with the number of those willing to buy at 5% higher than market price being equal to the number of respondents who claimed that they do not buy the product. 49.2% of total sample said they either do not buy the product or do not buy high fibre products in general. This is represented in Figure 3 in Appendix B.

#### **4.1.5 Health risk and attitudes towards high fibre food products**

The majority of the representative sample claimed to have heard of high fibre food products and acknowledged their importance in diet. However, when asked if the selected products did what they claimed, respondent were not sure whether the health claim was true or not.

#### **4.1.6 General product perception**

The majority of respondents (72.6%) acknowledged the goodness of high fibre products, and their importance in diet as shown in Figure 6 in the Appendix. The remaining 23.4% was divided between respondents who did not know much about high fibre products and those who had a neutral feeling about the trend.

#### **4.1.7 Market segmentation**

The market was segmented using the income variable. From the total sample, 22.9 % represented the < R5000 income group; 27.4 % formed the R 5000 – R10 000 group; 39.1% represented the R 10 000 – R 25 000 group; 8.4 % covered the more than R25 000 group. The remaining 2.2 % did not respond to the question. Results in Table 3.4 show that willingness to pay for breakfast cereal and bread increased with increase in income in general. An interesting observation is noted on yoghurt where the two extremes, income of below R500 and income above R25 000 seemed to have similar results. The middle groups responses, (R 5 000 - R10 000) and (R10 000 - R25 000) were also similar.

#### **4.2 Recommendations**

The objective of the study was to determine factors that affect high fibre food market as well as respondents' attitude towards these products and their affordability. Three commonly consumed high fibre products were selected for this purpose. Findings of the study encourage food manufacturers to carry on with developments of functional foods. Although results on willingness to pay increased with increase in income, results in Table 3.4 show that even low income consumers had a positive attitude towards high fibre food products by majority. As shown in Figure 2 in Appendix B, a significant part of the sample claimed to get their dietary fibre daily requirements from various sources. This is evident that new products developers have opportunities to enrich a variety of food products with fibre. The challenge will be cost implications. For all selected products, between 16.3% and 23.5% of respondents were willing to pay only 5% more than the current market price. Respondents who

were not willing to pay higher prices ranged from 43.6 % to 49.2%. Respondents claimed in Table 3.7, that price and brand name affected their buying decision more than the quantity of fibre present in the product or taste. Further research on finding means to overcome the cost challenge need to be conducted. The study recommends that nutritionists, food scientists and technologists, and other health institutions educate local consumers on safety and regulations of manufactured, fibre-enriched food products. As reported in Table 3.5, despite the fact that consumers believed in the importance of dietary fibre , they were not sure whether the health claim on the selected products was true or not.

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# **APPENDIX**

**APPENDICE A: QUESTIONNAIRE FORMATTED FOR THE STUDY**

QUESTIONNAIRE REFERENCE NUMBER

--	--	--	--	--

INTERVIEWER'S NAME:.....  
RESPONDENT AREA OF RESIDENCE:.....  
DATE OF INTERVIEW:.....  
COMMENTS:.....

1. How many people live in your house?  
1 to 2                      2 to 4                      4 to 6                      More than 6
2. What is your gender:  
Male                      Female
3. Which category describes your age (in years)  
Less than 25              25 – 35                      35-60                      More than 60
4. What is your marital status?  
Married                      Divorced/Separated  
Never married              Widowed
5. What is your home language?  
English                      Afrikaans                      Other
6. What is your religion?  
Christian                      Islam                      Other  
Judaism                      No religion
7. What is your highest level of education?  
No formal School or Primary school              High School                      University
8. What is your employment status?  
Full time                      Part time                      Unemployed                      Student  
Retired
9. Which range will better describe your income/wages per month?  
Less than R5.000                      R5.000- R10.000                      R10.000-25.000  
More than R25.000
10. Which of the following describe you best: I am  
South African Citizen                      From outside Africa  
From the SADC region                      Other part of Africa

11. Have you heard about high fiber (fiber-enriched) food products?  
 Yes No
12. How often do you buy high fiber products?  
 Very often Not so often Never
13. How much approximately do you spend on food in general per month?  
 R500 or less R500 - 1000  
 R1000 - 2000 More than R2000
14. Do you look on a product label to check how much fiber it contains before you buy it?  
 All the time Sometimes Never
15. How important do you think fiber is for your diet?  
 Very important Not important I do not mind
16. Which one of these products do you often buy?  
 High fiber breakfast cereal I will buy any product available  
 Whole seed&health bread I get fiber from my cooked meals and fruits  
 Fiber enriched yoghurt More than one of the above  
 I do not buy the above products. I prefer and only buy (Please specify)  
 .....
17. Does price affect your decision to buy high fiber products?  
 Yes, it does.  
 I would like to buy but I can't afford.  
 No, I am willing to pay more.
18. Does the product fiber content affect your decision to buy?  
 Not at all Yes, it does I don't mind
19. Does the product brand name affect your decision to buy high fiber products?  
 Not at all. I will buy the product as long as it contains high amounts of fiber.  
 Yes, it does. I would only buy my favorite brand.  
 I don't mind.
20. Do high fiber products do what they claim?  
 Most definitely Not, they don't May be, I am not sure
21. Do high fiber product taste affect your decision to buy?  
 Not at all Yes, definitely I don't mind
22. Are high fiber products worth the price?  
 Most definitely No, they are not May be, I am not sure
23. Do you believe in the goodness of high fiber food product?  
 Yes No
24. Which statement most describes your choice?

I will not buy a product high in fiber if I had an alternative choice with no fiber  
I will rather buy a product with high fiber content  
I will buy high fiber products if I could afford it  
I will not buy high fiber products

25. Although I know that a box of low fiber breakfast cereal cost lower than a box of high fiber breakfast cereal, I am willing to pay a higher price for the high fiber breakfast cereal.

YES NO

26. Although I know that a no fiber, seed added loaf of bread cost lower than whole-Wheat / health & seed added loaf; I am willing to pay a higher price for whole-Wheat health & seed loaf.

YES NO

27. Although I know that low fiber yoghurt price is lower than fiber-added yoghurt, I am willing to pay a high price for a fiber enriched yoghurt.

YES NO

28. I am generally willing to pay higher prices for high fiber products.

YES NO

29. I do not buy the above products. I prefer and only buy (Please specify)

.....

30. I will buy high fiber products only if they have the same price or are cheaper than low fiber products.

I agree I do not agree

31. If you do not agree with question 30, please answer the next question:

The maximum amount I am willing to spend on:

High fiber breakfast cereal is: 5% higher than current market price.  
10 % higher than current market price.  
15% higher than current market price.  
20 % higher than current market price.  
I am willing to pay more than 20%.  
I do not buy high fiber breakfast cereal

(Please give reasons).....

Whole-wheat / health & seed bread is: 5% higher than current market price  
10 % higher than current market price.  
15% higher than current market price.  
20 % higher than current market price.  
I am willing to pay more than 20%.  
I do not buy health and seed bread

(Please give reasons).....

Fiber-enriched yoghurt is:

- 5% higher than current market price.
- 10 % higher than current market price.
- 15% higher than current market price.
- 20 % higher than current market price.
- I am willing to pay more than 20%.
- I do not buy fiber-enriched yoghurt

(Please give reasons).....

32. I am willing to pay more for high fiber product because:

- It is fashion
- Fiber is good for my health
- I don't know

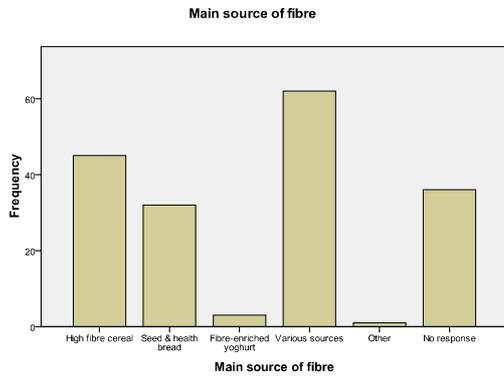
33. I would not buy fiber enriched products and will only buy products naturally rich in fiber because:

I am concerned about the effect of industrial manufacturing of dietary fiber on the environment.

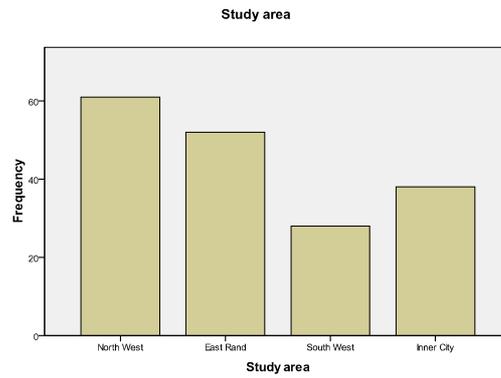
I do not think dietary fiber manufacturing would affect the environment in any way.

I do not know much about environmental issues.

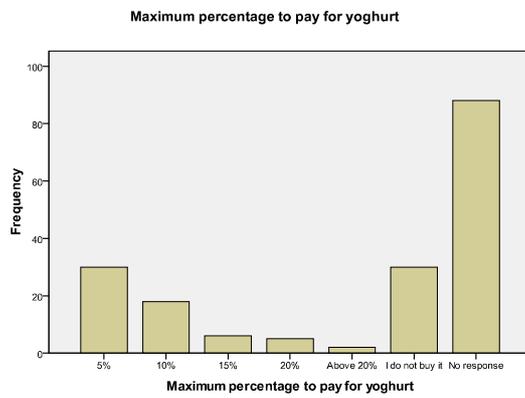
## APPENDICE B: FIGURES



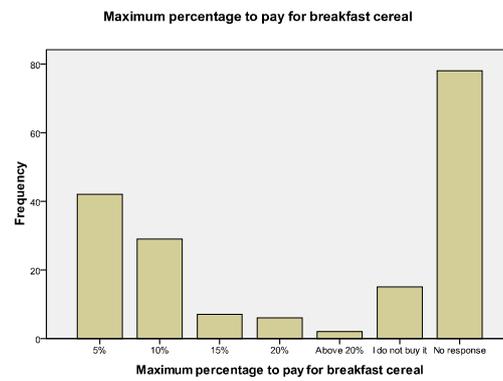
**Figure 1**



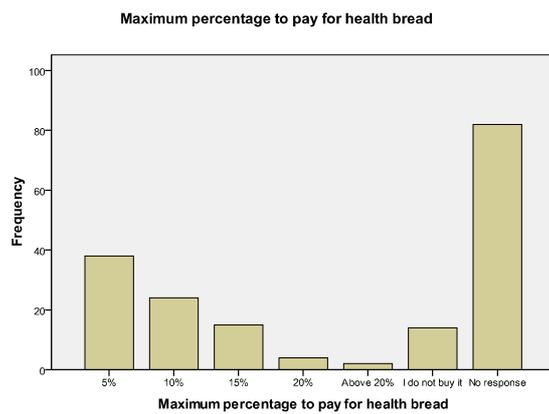
**Figure 2**



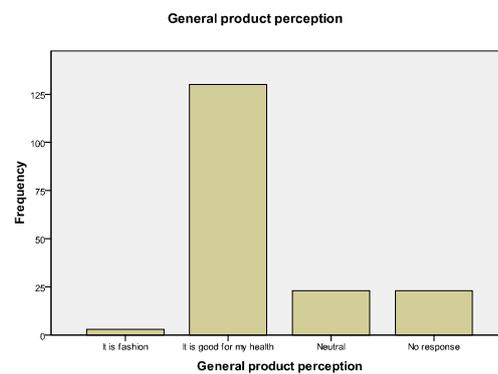
**Figure 3**



**Figure 4**



**Figure 5**



**Figure 6**