

## RESULTS AND DISCUSSION

### 4.1 INTRODUCTION

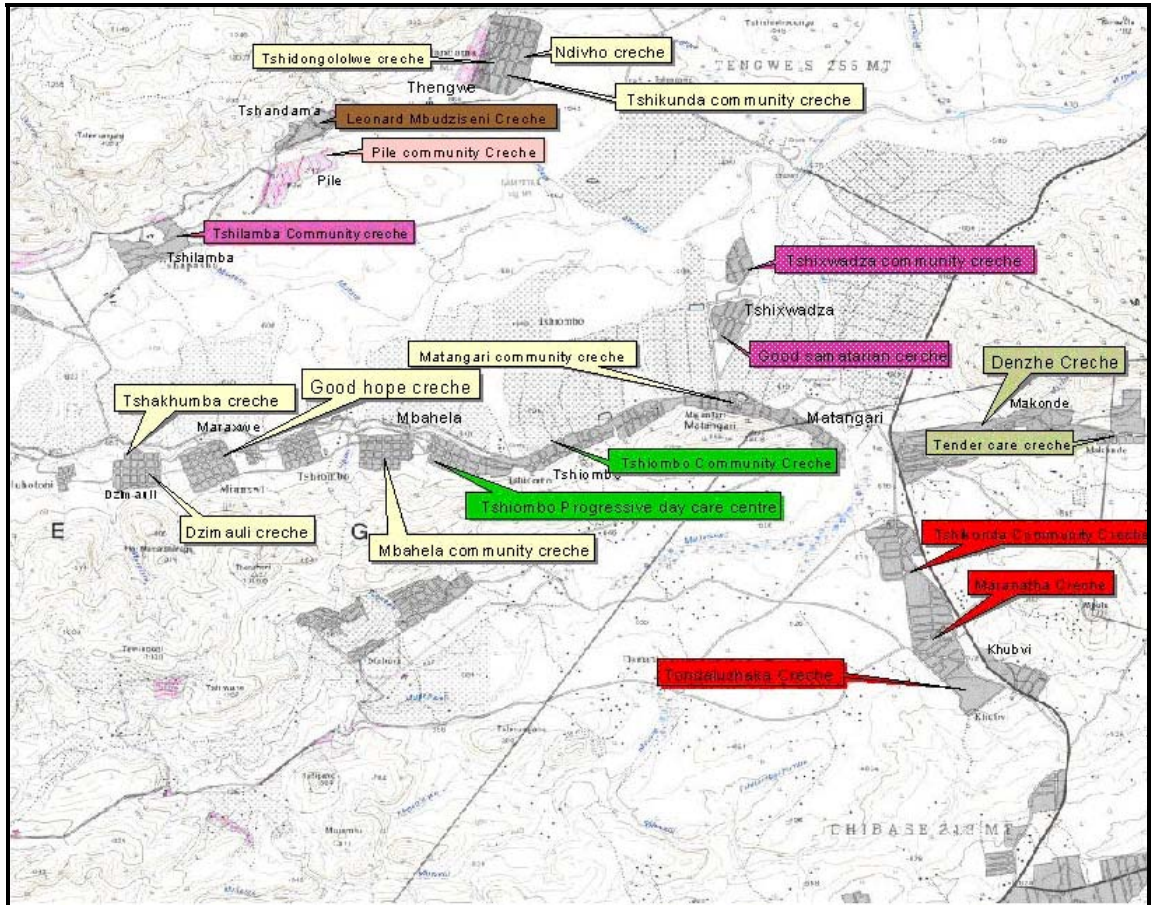
This chapter presents the results and discussion of the results collected during the various phases of the study. The analysis of the results is based on the research aim and objectives as outlined in chapter 3, par 3.4, and is divided into three phases structured according to the triple-A-cycle. Phase one (pre-intervention) focuses on the results obtained from the data collected during the month of April 2007 and was used to provide baseline information for the *situational assessment and analysis*. First a demographic profile of caregivers and the children at the selected crèches is presented as the basis of the discussion of the phase one results; and second, information about the nutrition strategies used by caregivers to improve the application of the food-based dietary guideline “*eat plenty of vegetables and fruits everyday*” is provided.

Phase one results served as guideline as to how phase two should be carried out. Phase two (intervention) is the *action* part which elucidates the developed and implemented nutrition strategies that were part of the respondents’ training. Phase three (post-intervention) data was collected in September 2007 and its results concerned a *re-assessment* of the implemented nutrition strategies. The findings are therefore presented and discussed in line with the specific research aim and objectives.

### 4.2 DESCRIPTION OF THE STUDY AREA

The study was undertaken in the Thulamela municipal area of Vhembe district in Limpopo province, South Africa. Rural and semi-rural areas characterise the Thulamela municipality. A total of 20 crèches with a population of 100 caregivers were included in the study (see Figure 4.1). The number of caregivers in each of these crèches ranged from four to six. According to the Limpopo Department of Education (Tshilamba and Mutshindudi Circuits), all the crèches were controlled by both the Department of Education and the Department of

Health. Only seven of the crèches were owned and subsidised by these departments while the rest were privately owned and funded solely by their own resources. Just six of these crèches had proper buildings and facilities and the rest operated in small community-built structures or in churches. Children in all the crèches were given meals on a daily basis.



**FIGURE 4.1: MAP OF THE STUDY AREA**

The results of the study will be presented in three phases following the triple-A cycle process.

### 4.3 PHASE ONE

In accordance with the objectives set for phase one, a situational assessment and analysis was conducted at the crèches to determine dietary diversity, the availability and accessibility of vitamin A-rich vegetables and fruit, the utilisation of vegetables and fruit, as well as the caregivers' current nutrition knowledge of an application of the food-based dietary guideline

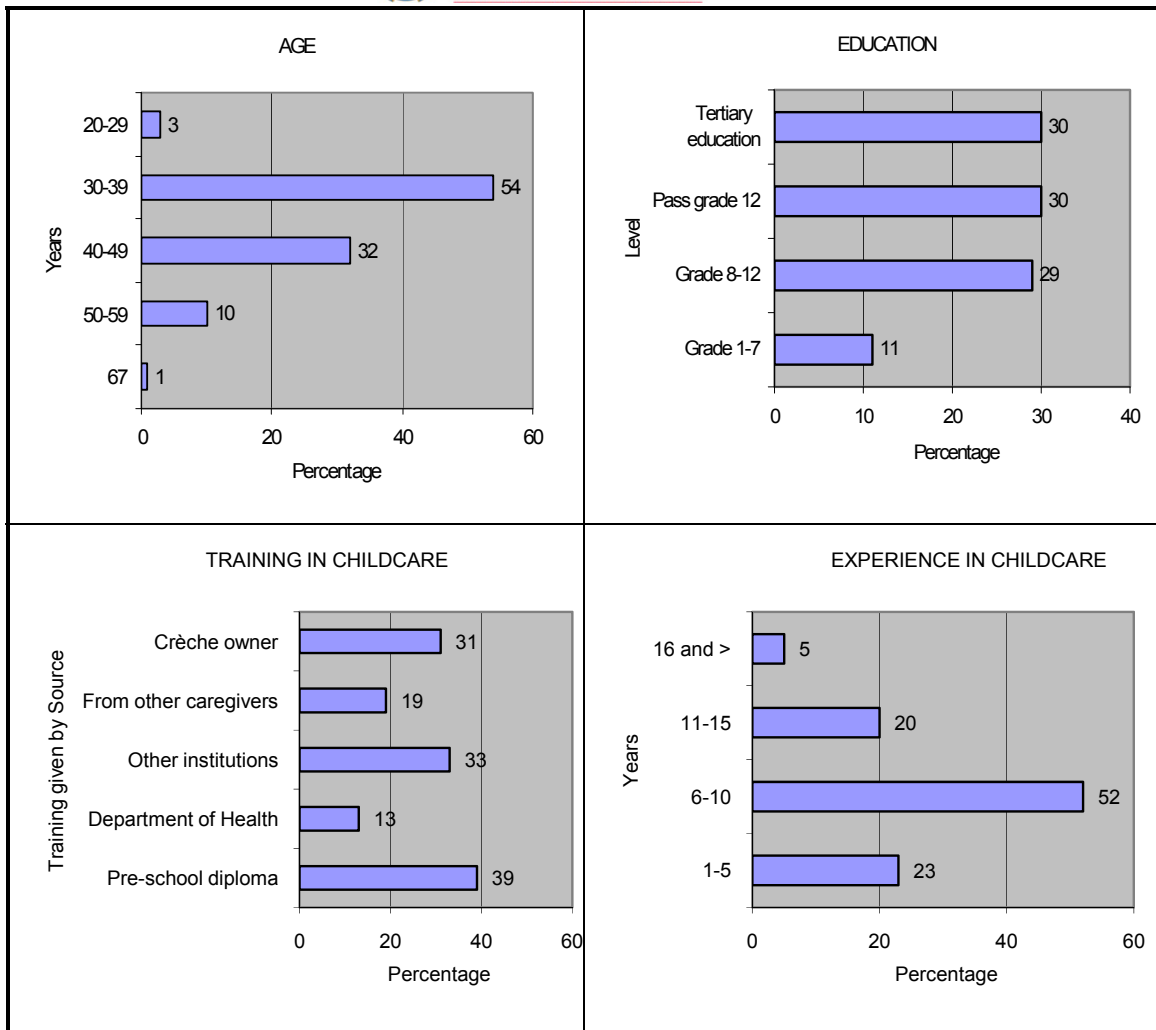
*“eat plenty of vegetables and fruits everyday”*. Since only 100 respondents participated in this study, the frequency of the responses to the questions will be reported in actual numbers and, where applicable, in percentages. In cases where the numbers of the respondents who answered the question do not add up to 100, it means that there were some missing responses. The results are presented and discussed in the sections that follow.

#### **4.3.1 Demographic profile**

The demographic profile of the caregivers and children at the crèches includes variables that give a relevant indication of the participants' characteristics.

##### **4.3.1.1 Demographic profile of the caregivers**

All the respondents (n=100) in this study were females which strongly supports the general belief that women are habitually held responsible for childcare. Figure 4.2 presents the demographic profile of the caregivers with reference to their age, educational background, training and experiences in childcare.



**FIGURE 4.2: DEMOGRAPHIC PROFILE OF CAREGIVERS (n=100)**

The age distribution of the respondents is seen from Figure 4.2. The ages ranged between 21 and 67 years. The majority (54%) of the respondents were between 30 and 39 years of the age. Thirty-two per cent were between 40 and 49 years old whereas 10% were between 50 and 59 years old. Three per cent of the respondents were between the ages of 20 and 29 and one per cent was a 67 year old respondent.

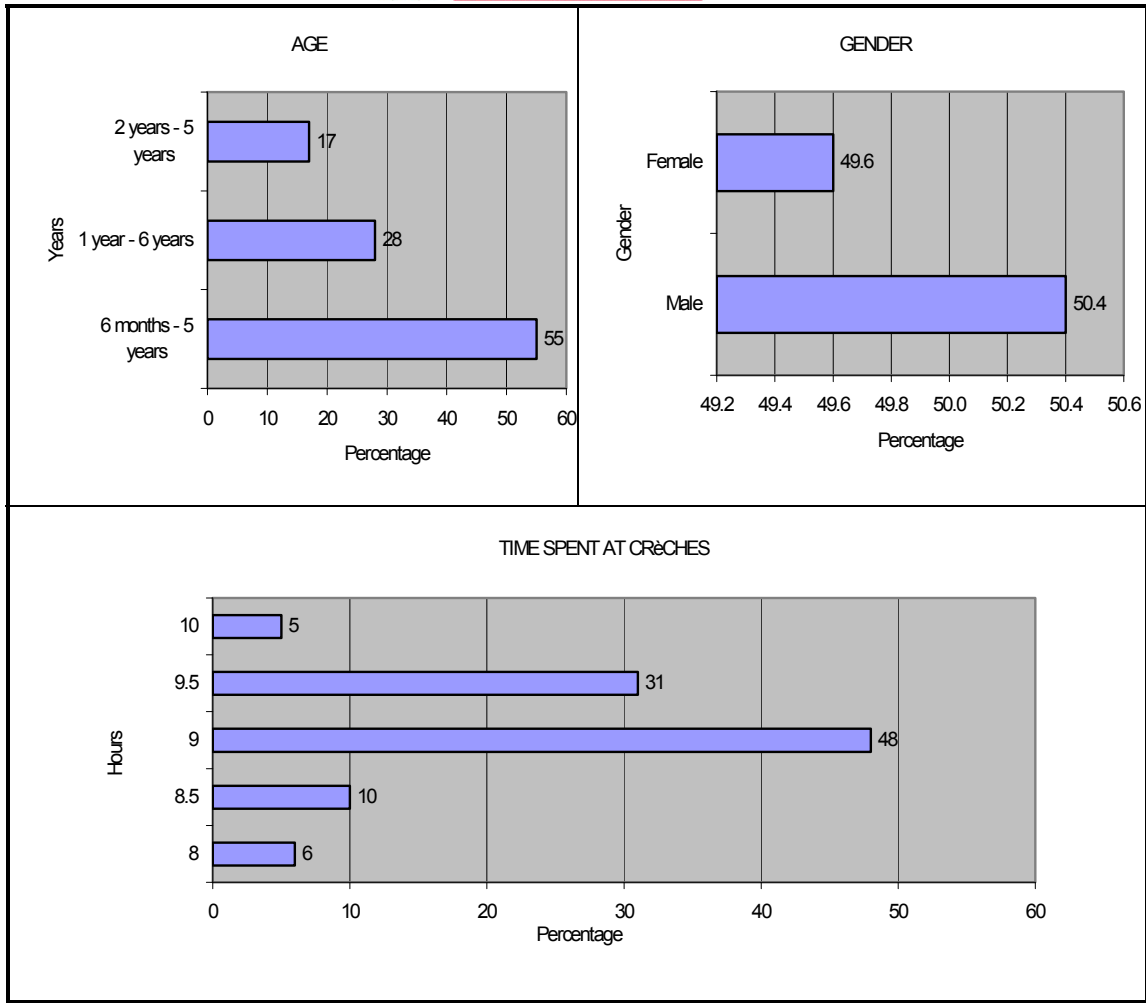
For the purpose of this research the caregivers' educational background was identified. To describe the respondents' educational background their educational level was categorised as follows: grade 1-7; grade 8-11; passed grade 12; and as having had some tertiary education. The results clearly indicate that although 40% of the respondents had lower than a grade 12 level of education, the majority of the respondents (60%) had moderate to high level of education as 30% had grade 12 and yet another (30%) had above grade 12 education (tertiary education) (see Figure 4.2).

The respondents also had to indicate if they had had childcare training. As reflected in Figure 4.2, 39% of the respondents had pre-school teaching diplomas, 19% had learnt about childcare from other caregivers, while 31% were trained by the owners of the crèche and 13% had been trained by the Department of Health. Another 33% indicated that they had been trained by various other institutions such as the Department of Education and some non-governmental organisations.

The caregivers' experience in childcare was of significance in this study. The assumption here was that the more experienced the caregivers were the better they would be able to take care of the children. Knowing that children dislike vegetables, experienced caregivers would know how to best feed the children including persuading them to eat vegetables. The results indicated that the respondents' experience varied between one and twenty five years as clearly reflected in Figure 4.2.

#### **4.3.1.2 Demographic profile of children**

Crèche children's demographic information in terms of age and gender, and the time they spend at crèche each day were important aspects for this study to depict the situation of the crèches (see Figure 4.3).



**FIGURE 4.3: DEMOGRAPHIC PROFILE OF CHILDREN AT CRECHES (n=100)**

Children from both gender groups were fairly equally represented in the crèches. Of the total of 988 children from all the twenty crèches that participated in this study 498 (50.4%) were males and 490 (49.6%) were females. Findings by Pietersen *et al.* (2002) led to the general comment that about 21% of all South African children under the age of six years attend crèches which seems true for this study area too. The ages of children attending the selected crèches ranged from six months to six years and different ages for entry were indicated by the survey participants. The majority (55%) of the respondents indicated that they cared for children between the ages of six months and five years, and 28% cared for children between one and six years whereas 17% cared for children between the ages of two and five years. These results, as depicted in Figure 4.3 confirm that children were attending crèches from a very young age.

The length of time children spent at the crèche during the day is of utmost importance. It might be possibly assumed in this study that the longer the children stay at the crèche, the more reliant they would be on the caregivers to provide them with adequate meals and snacks while they are there. The findings revealed that crèches operated between 6.30 and 17.30 for five working days each week. The time spent differed from crèche to crèche ranging between eight and ten hours a day. The majority of the respondents (48%) indicated that children spent nine hours at crèches, followed by 31% who showed that they spent nine and half hours (see Figure 4.3). It can be concluded that a striking majority of the children are at crèche for nine or more hours a day and all children are there for at least eight hours a day. This scenario could then raise a concern about the importance of nutritional knowledge and menu planning skills of caregivers employed at crèches.

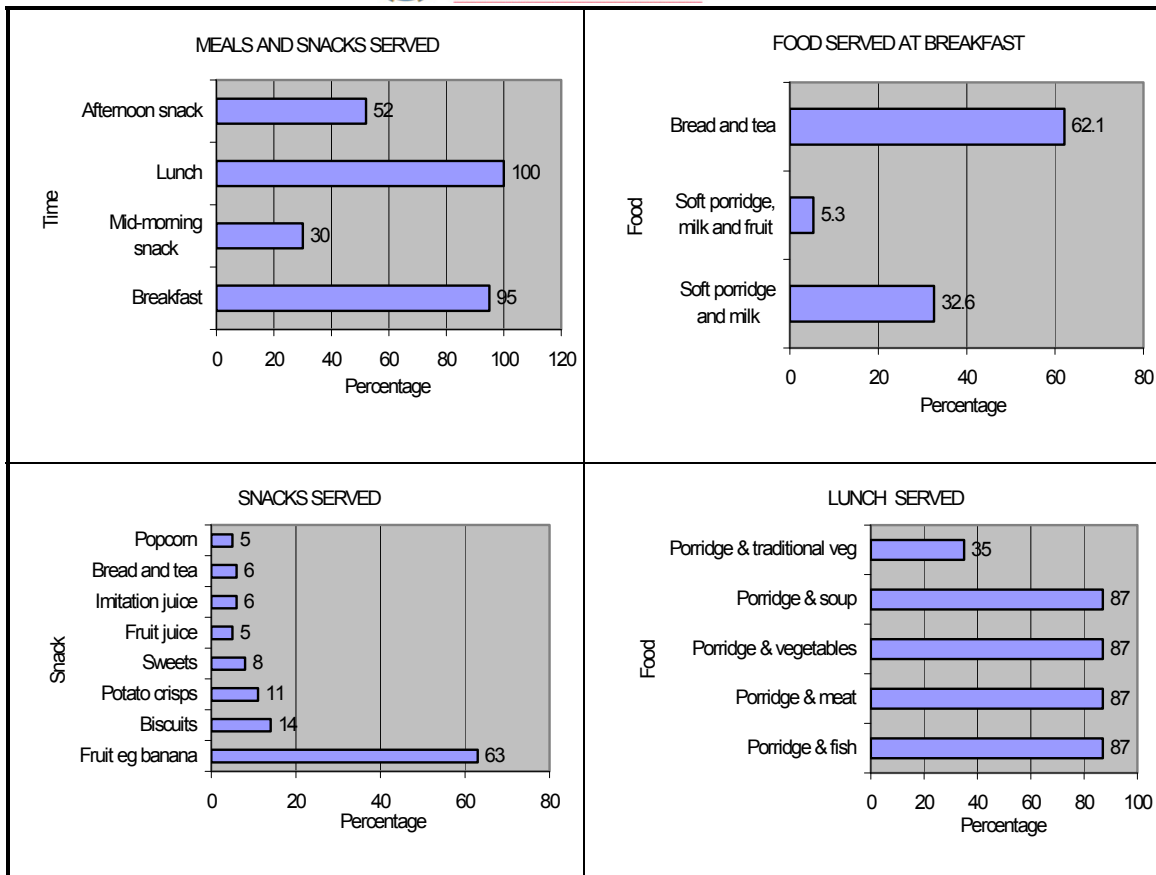
### **4.3.2 Assessment and analysis of the nutrition strategies**

#### **4.3.2.1 Dietary diversity**

This section gives the results related to the composition and variety of the meals which were served to children at crèches.

##### **(i) Meals and snacks served to children at crèches**

Figure 4.4 shows the meals, foods and snacks which were served to children.



**FIGURE 4.4: MEALS AND SNACKS SERVED TO CHILDREN (n=100)**

As reflected in Figure 4.4 all the respondents (100%) served lunch for the children. Breakfast was the first meal of the day and it was provided by the majority (95%) of the respondents. While only 30% offered a morning snack, 52% of the respondents indicated that they served an afternoon snack.

It was observed that only one crèche representing 5% of the respondents did not give the children breakfast. It can thus be presumed that these respondents assumed that children would have had breakfast at home before they came to the crèche as they started their day as late as eight o'clock. Though some respondents served morning and afternoon snacks, it was observed that it was actually not a daily practice. Through observation it was noted that the actual meals that were regularly served to children were only breakfast and lunch. Overall a conclusion could be drawn that the time gap between lunch and supper requires that an additional snack should definitely be provided.



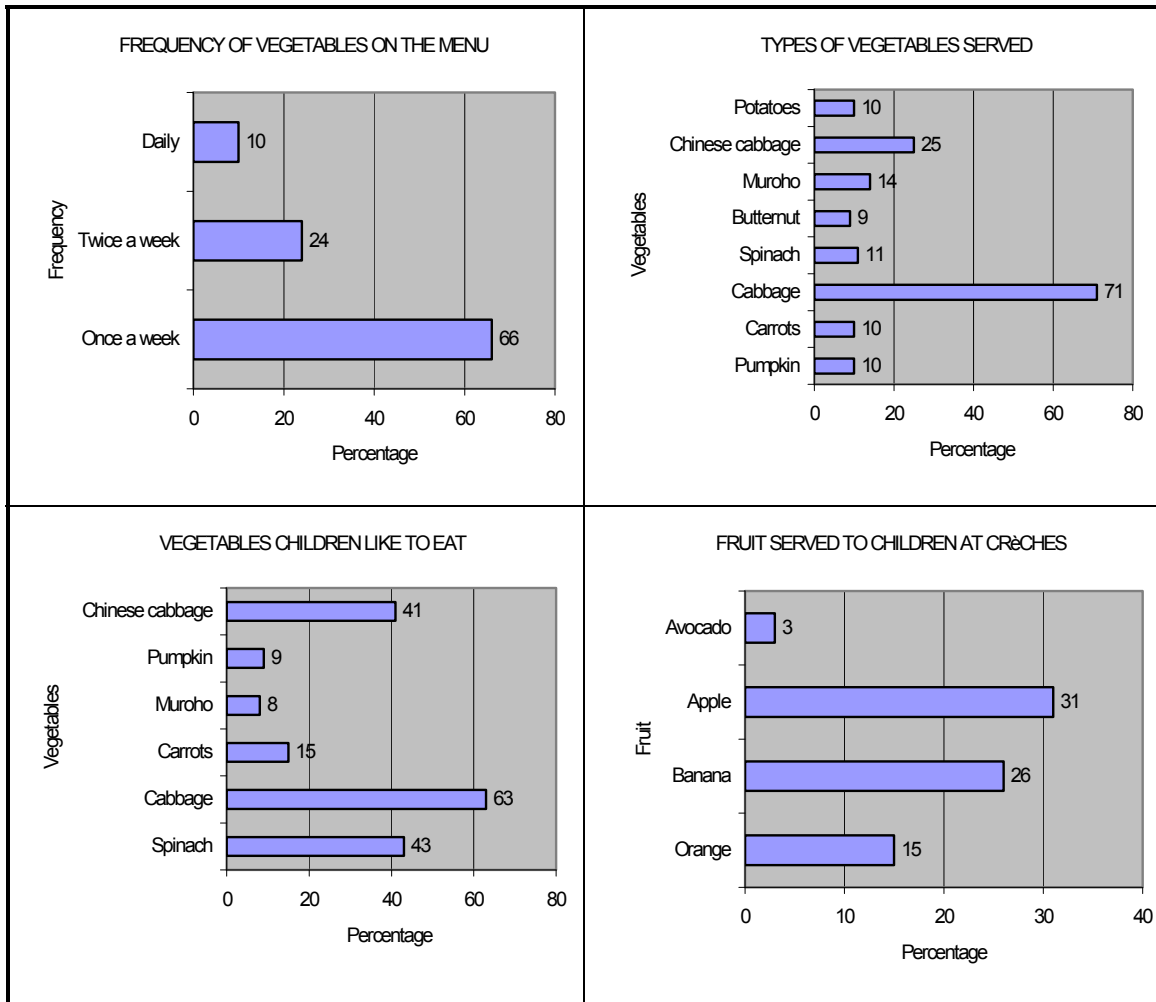
- ***Foods served to children for breakfast*** indicated to be similar at the different crèches with the majority (62.1%) of the respondents serving bread and tea. Some respondents (32.6%) indicated that they served soft porridge and milk, whereas less than six per cent (5.3%) served fruit in conjunction with soft porridge and milk (see Figure 4.4). Results revealed that the respondents very seldom gave different types of foods for breakfast. Through observation, it was realised that the children were given the same kind of food every day. It was also noticed that some of those who said that they served fruit at breakfast were not doing so on a daily basis. Observation also revealed that those who reported that they served soft porridge and milk were sometimes omitting the milk. These findings reveal that the breakfast meals lacked diversity.
- ***Food served to children for lunch*** varied from crèche to crèche. The majority (87%) of the respondents indicated that maize meal porridge was served as a basic food with either meat/fish/cultivated vegetables or soup as an accompaniment. Thirty five per cent reported that they also served indigenous vegetables when they were available. Although different foods were provided at different days of the week, it was observed that the food served at lunch reflected limited variety in that only one accompaniment was served at a meal. For example, if children were served porridge and meat, no other food was served. A further observation was that maize meal porridge was accompanied by sour milk for lunch at some crèches.
- ***Snacks and drinks served to children at crèches***  
The respondents had to specify the snacks they served to children at crèches. The results as depicted on Figure 4.4 revealed that various snacks, ranging from sweets to fruit, were served to children at crèches. Although the majority (63%) of the respondents indicated that fruit was served as a snack, it was obvious that unhealthy snacks such as sweets (8%), potato chips (11%), biscuits (14%), popcorn (5%) and imitation juice (6%) were served to children. Nevertheless, with the exception of 8% of the respondents who indicated that they were not serving snacks to the children, 5% indicated that they were serving 100% fruit juice and 6% were offering bread and tea.

Observation results showed that some of the snacks mentioned such as sweets, popcorn, potato chips and biscuits, were actually not served to children at all. The respondents just mentioned them in order to impress the researcher. This indicates that the respondents had misconceptions about the health value of the snacks. They considered these snacks to be

healthy and of high status. It was also observed that fruit as a snack was not really served on a daily basis, but only occasionally when there were surpluses. In some crèches there was evidence that some children brought their own snacks such as fruit, yoghurt, biscuits, sweets, potato chips, imitation fruit juices and popcorn from home. Another observation was that bread and tea was only served at breakfast and not as snacks and no 100% fruit juices were served to children at the crèches.

**(ii) Frequency of vegetables and fruit consumption**

In order to determine dietary diversity, it was important to assess the consumption of vegetables and fruit (particularly vitamin A-rich vegetables and fruit). Figure 4.5 indicates how frequently vegetables were on the menu, the kind of vegetables and fruit served and the kind of vegetables crèche children liked.



**FIGURE 4.5: CONSUMPTION OF VEGETABLES AND FRUIT (n=100)**

### ***Frequency of vegetables on the menu***

Figure 4.5 reflects that the majority of the respondents (66%) served vegetables only once a week followed by 24% who did so twice a week. Only 10% served vegetables on a daily basis. It was observed that the frequency of serving vegetables to children was influenced by having a vegetable garden at the crèche. The respondents who served vegetables on a daily basis were those who had vegetable gardens at their crèches. These results are reason for concern, because, as indicated by Vorster *et al.* (2001:2) vegetables and fruit are foods that must be eaten on a daily basis because they contain nutrients that are good for health. From the results it can thus be concluded that children at crèches were not served enough vegetables.

These findings substantiate Bere and Klepp's (2005) finding that most children eat less vegetables and fruit than is recommended. Similarly, Love and Sayed (2001:24) indicate that a considerable number of children do not meet the South African food-based dietary guideline of consuming five portions of vegetables and fruit every day. It is therefore important for this study to acknowledge that the dietary guideline '*eat plenty of vegetables and fruits everyday*' should form the core of nutrition information aimed to educate and motivate caregivers in order to improve the daily consumption of vegetables and fruit by children. Furthermore the promotion of locally available and consumed foods should be the core initiative (Department of Health, 2004:7; Vorster *et al.*, 2001:2).

The respondents were also asked to report how frequently indigenous vegetables were on the menu. The majority (70%) of respondents said that indigenous vegetables were served once a week. It was observed that the availability of these vegetables depended mostly on their seasonality. When in season they were served to children as a supplement to cultivated vegetables. On the other hand, observation results revealed that indigenous vegetables were not a regular part of the children's diet at crèches as they were not even part of the menus.

### ***Types of vegetables served***

Figure 4.5 illustrates the kinds of vegetables the children were served. The majority (71%) of the respondents favoured cabbage. A possible reason for the popularity of cabbage could be attributed to its affordability, familiarity and year-round availability. This question was also meant to assess the variety of vegetables and availability of vitamin A-rich vegetables. The findings revealed that only a few respondents served vitamin A-rich vegetables such as spinach (11%), pumpkin (10%), carrots (10%), butternut (9%), *muroho* (14%) and Chinese

cabbage (25%) to the children. Although serving yellow sweet potatoes could have been an option from this category, not one respondent chose to place it on the menu.

From these results it could be concluded that the meals served to children at crèches lacked vitamin A-rich vegetables. These results corroborate with those of Faber *et al.* (2001), who maintain that half of South Africa’s children consume less than half of the required amount of vitamin A. A limited number (14%) of the respondents served indigenous vegetables like *muroho*. The reason for the low intake of indigenous vegetables could be ascribed to the exclusive promotion of cultivated vegetables and fruit which resulted in indigenous vegetables being regarded as inferior, although many are nutritionally superior (Mauder & Meaker, 2007:402).

Lastly, the respondents had to indicate whether the vegetables were served cooked or raw. With the exception of five per cent who served raw carrots, results showed that the majority of the respondents served cooked instead of raw vegetables to the children.

***Vegetables children liked eat***

The respondents had to indicate if children liked the vegetables (both indigenous and cultivated) they were served at the crèche. Table 4.1 shows the children’s liking for vegetables. Generally the majority of the respondents (73) perceived that the children liked the cultivated vegetables whereas 27 said that they only liked these vegetables sometimes (see Table 4.1).

**TABLE 4.1: CHILDREN’S LIKING FOR VEGETABLES AS PERCEIVED BY RESPONDENTS (n=100)**

RESPONSES	CULTIVATED VEGETABLES	INDIGENOUS VEGETABLE
	FREQUENCY	FREQUENCY
Yes	73	53
No	0	32
Sometimes	27	15

The respondents were also asked to explain why they thought children did or did not like to eat the vegetables served at the crèche. Most of the respondents (73) indicated that children who liked the vegetables finished their servings and sometimes they even asked for more. Those who indicated that children sometimes liked the vegetables thought that it depended on how the vegetables were cooked as well as the children’s familiarity with the vegetable. This confirms Bere and Klepp’s (2005) postulation that acceptability and preferences of children have shown to be strong correlates of vegetables and fruit intake.

In terms of the indigenous vegetables, 53 respondents reported that their children ate these vegetables, while 32 indicated that children did not like eating indigenous vegetables and 15 said that children sometimes liked indigenous vegetables (see Table 4.1). Another follow-up question was posed to verify why the children did not like eating indigenous vegetables. The respondents gave the following reasons:

- They just refused to eat.
- Children did not like the taste of indigenous vegetables.
- Indigenous vegetables are not included in the menu.
- It was dependent on the type of vegetable and also the way in which it had been cooked.
- Children only liked those vegetable that they were accustomed to.
- Children's parents do not want their children to eat indigenous vegetables.

It was realised that the reason why parents did not want their children eating indigenous vegetables was that they regarded these vegetables as inferior and of low status. Some even saw them as animal fodder or weeds and they insisted that their children should not be given such vegetables. They even threatened that if their children were served these vegetables they would remove them from the crèche and register them at other crèches that do not serve indigenous vegetables. These results substantiate the claim made by Kepe (2008) and Faber *et al.* (2007:411) that promoting dark green leaf vegetables may be difficult because many people may regard traditional food crops as being inferior.

As was proposed by Faber *et al.* (2007:411), lack of popularity and unfamiliarity were also given as possible reasons for the low consumption of indigenous vegetables. This finding also confirms the viewpoints documented by Kepe (2008), Maunder and Meaker (2007:403) and Faber and Wenhold (2007:397), that there is an observed lower level of knowledge and esteem regarding traditional plants especially among the younger generation. However, barriers such as unavailability due to seasonal fluctuations were also seen as a cause of the low consumption of indigenous vegetables.

Overall the results show that the majority of the respondents indicated that children at crèches liked to eat the vegetables they were served. To confirm this, the respondents had to identify the vegetables that children liked to eat. The results showed that the majority (63%) of the respondents said that cabbage was indeed the favourite vegetable, followed by spinach (43%) and then Chinese cabbage (41%). Vegetables such as carrots (15%), pumpkin (9%) and *muroho* (8%) were not popular among the children (see Figure 4.5).

Although the respondents named cabbage as the vegetable children liked most, it was observed that cabbage was the vegetable that the respondents liked to prepare for the children. Another explanation was that cabbage was the children's parents' preference.

### ***Types of Fruit served***

To determine if children were served fruit, and whether it was rich in vitamin A, the respondents had to specify the kind of fruit that they gave the children. The fruits most commonly served by the majority of the respondents (31%) were apples, followed by bananas (26%), then oranges (15%) and the least served were avocado pears (3%) (see Figure 4.5). Apples and bananas were predominant because they were easily and cheaply acquired. It was, however, surprising to find that avocados, which were in season at the time of data collection, and are rich sources of vitamin A, were not provided as often as one would expect.

It is apparent from the results that some vitamin A-rich fruit such as mangoes and paw-paws were not served to the children at all. Although these fruits were not in season at the time of data collection, it was observed that even when they were in season, they were not included in the menu. When in season mangoes grow in the home gardens and this was given as the reason why the respondents did not give them to children at the crèche even though they are found in abundance in the area. The crèche staff believed that children would eat these fruit at their homes since almost every household has a mango tree or even several in their yards. These results uphold the FAO (1997a:55) statement that although micronutrient rich foods may be available they are often not consumed in sufficient quantities. Looking at the number (25) of the missing responses, it shows that some respondents were not giving fruit to children at all (see Figure 4.5).

Based on these findings it could be concluded that there is a general lack of dietary diversity and a dislike of indigenous vegetables which resulted in a limited intake of vitamin A-rich vegetables by children at the crèches. This study therefore aims to ensure dietary diversity by increasing availability and accessibility through promoting the production, gathering and consumption of vitamin A-rich vegetables and fruit, as advocated by Helen Keller International (2003b).

#### **4.3.2.2 Availability and accessibility of vegetables and fruit**

The availability of vegetables and fruit at crèches was determined by the presence of vegetable gardens and, if vegetables were planted and fruit trees were growing, whether

vegetables and fruit were being gathered and, if so, where were these vegetables and fruit usually gathered.

**(i) Availability of vegetable gardens at crèches**

The respondents had to indicate whether they had vegetable gardens at the crèches. In cases where the respondents did not have gardens, they were required to provide reason(s) why. As mentioned in par. 4.2, each crèche had between four and six caregivers. This means that certain number of the respondents who answered yes to having vegetable gardens did not necessarily mean having their own specific garden but were referring to one garden in a particular crèche. Results showed that only 39 respondents from seven crèches cultivated gardens at the crèches whereas 61 (from 13 crèches) indicated that they did not have vegetable gardens. This was confirmed by the observation that most of the crèches did not have vegetable gardens and, what was also noticeable was that, although some crèches had vegetable gardens, very few were producing enough vegetables to feed the children at their crèches.

Another observation was that most of the crèches that had vegetable gardens were forced to do so because they were funded by the Department of Health and their officials wanted to see a vegetable garden whenever they visited the crèche. However, even though there were gardens at these crèches they were not flourishing. Thus the majority of the respondents reported not having their own supply of vegetables and fruit which meant that most of the vegetables that were served to children at crèches were purchased.

The reasons for not having vegetable gardens varied from crèche to crèche and they were:

- No space (18)
- No water (34)
- Not knowing how to make a garden (22)
- No fence (15)
- No person to take care of the garden (41)
- The gardener is careless and lazy (6)
- Working on a hired facility (9)
- No funds (4)

It is to be noted that, besides the reasons mentioned above, gardening activities were also hampered by insufficient gardening tools and equipment as well as the fact that roaming livestock destroyed the crops because of unfenced yards. Faber *et al.* (2007:116) found

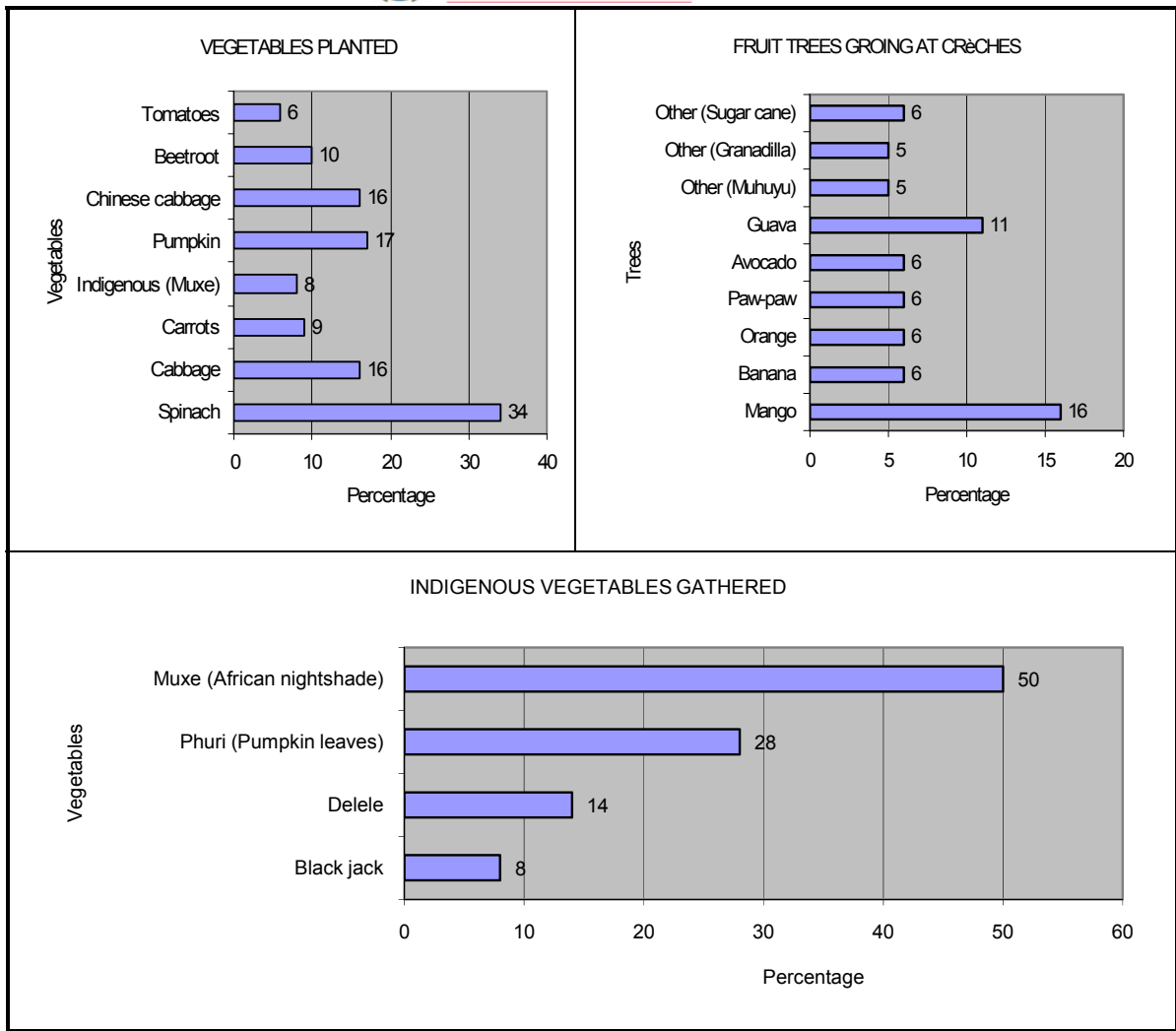
similar circumstances in their study. At the same time it was also noticed that some of the reasons mentioned could be attributed to a general lack of interest as well as knowledge about the importance of having a vegetable garden. Such findings clearly emphasise the need for basic training on gardening practice.

To further assess the availability and accessibility of vegetables and fruit, the respondents had to indicate the kinds of fruit trees that were grown, the kind of vegetables planted and indigenous vegetables gathered.

### ***Kinds of vegetables available at crèche gardens***

Availability of vegetables was determined by the respondents' indication of the vegetables that they planted in their gardens. Many (34%) of the respondents chose to plant spinach; while 17% chose to plant pumpkin; 16% Chinese cabbage; and another 16% cabbage. Ten per cent of the respondents planted beetroot; 9% carrots; 8% indigenous vegetables, namely *muxe* and at least 6% planted tomatoes. It was gratifying to find that, except for cabbage, most of the vegetables that were grown were rich in vitamin A. Although the yellow/orange sweet potato was one of the options in the questionnaire no respondent mentioned planting these vegetables (see Figure 4.6).





**FIGURE 4.6: AVAILABILITY AND ACCESSIBILITY OF VEGETABLES AND FRUIT (n=100)**

#### ***Fruit trees available at crèches***

The majority of the respondents (66%) indicated that they did not have fruit trees while 34% did have fruit trees at their crèches. To substantiate these results the respondents had to actually name the kind of fruit trees that were growing in their crèche yards. Sixteen per cent had mango trees, followed by 11% who had guava trees and then 6% had avocado trees. Another 6% had paw-paw, orange, banana and sugar cane while 5% had *muhuyu* (wild fig tree) and another 5% had granadilla plants (see Figure 4.6). It is evident from the results that fruit trees at the crèches were limited.

Although not all the crèches had fruit trees, observation results confirmed that these kinds of trees were found at some crèche sites. To substantiate these results photographs of sugar cane and fruit trees were taken at different crèches (see Figure 4.7).



**FIGURE 4.7 FRUIT TREES AT THE CRECHE**

**(ii) Gathering of indigenous vegetables and fruit**

The respondents had to state whether they gathered indigenous vegetables and fruit, to mention their types and the locations where they were gathered.

***Accessibility of indigenous vegetables***

If they gathered indigenous vegetables the respondents were merely required to answer yes or no. Seventy respondents said they did gather indigenous vegetables whereas 30 did not. To support this, the respondents had to specify the type of vegetables that they gathered. The results, as presented in Figure 4.6, show that 50% of the caregivers gathered *muxe* (African nightshade). It is worth noting that *muxe* was in fact being gathered by the majority of the respondents because *muxe* is one of the indigenous vegetables that is rich in vitamin A (Maunder & Meaker, 2007:403; Faber *et al.*, 2006:28; Weinberger & Msuya, 2004; Louw, 2001; McLaren & Frigg, 1997).

The results also showed that 28% of the respondents gathered *phuri* (pumpkin leaves), 14% *delele* (jute mallow) and 8% gathered black jack (see Figure 4.6). Although these vegetables were being gathered by the minority it was encouraging because they are rich in beta-carotene. However it was disappointing that amaranth, which is known to be rich in vitamin A (Weinberger & Msuya, 2004), was not gathered at all. This confirms the statement made by Mnkeni, Masika and Maphaha (2007) who maintain that amaranth vegetables are highly nutritious, but in many parts of South Africa they are hardly utilised as food.

The respondents identified several locations where they usually found indigenous vegetables. The most common were the fields, the open-market, the backyard and the supermarket. The respondents could make use of any one of the mentioned locations that were applicable. The majority of the respondents (53) gathered indigenous vegetables from the fields. The fields here are where villagers usually grow their seasonal crops such as mealies (maize), or where they practise agricultural activities. Twenty eight respondents procured these vegetables from the open market (a place where local stallholders sell their food products); whereas 20 gathered them in their backyards; and six bought them from the supermarket.

From these results it can be concluded that some of the indigenous vegetables that the respondents listed (see Figure 4.6) as being gathered, were not only gathered but were also cultivated or domesticated indigenous vegetables and these could be found being sold at the local markets and at the fields. For example, it was observed that *muxe*, *phuri* and *delele* were very popular at the open markets. The findings corroborate with Jansen Van Ransburg *et al.* (2007:318) who purport that African people obtain leafy vegetables in different ways. They may be harvested from the wild or from fallow and ploughed fields or they may be cultivated plant species that are used as leafy vegetables.

It was confirmed through observation that the majority of indigenous plants occur naturally in the study area as wild plants. Although some of these vegetables are still growing wild and are harvested as wild plants, others such as *muxe* and *phuri* are being domesticated. Observing the availability of indigenous vegetables showed that a variety of indigenous vegetables were available but the type was dependent on the season. Though these vegetables are highly seasonal, when they were in season respondents included them in the meals they were providing. Overall the respondents confirmed that they were giving indigenous vegetables to children once a week.

### ***Accessibility of indigenous fruit***

In terms of gathering indigenous fruit, the results revealed that only 14 respondents were doing so. With regard to the kind of fruit gathered, 5% of the respondents collected *mahuyu* (figs); another 5% gathered *pfuka* whereas four per cent picked the *mazwilu* (wild medlar). Most of these fruit came from the crèche yard where they were growing. It was observed that the crèches that had indigenous fruit trees were those situated in the mountainous areas. However, during fieldwork it was noticed that the fruit from these trees was not served to children as part of their daily meals at the crèche, nor were they listed in the menus. When the fruit was in season it was usually eaten as a snack by the children who just picked the

fruit whenever they felt like it especially when they were playing outside. The children enjoyed their sweet taste.

From the results it can be said that indigenous fruit was hard to get as they were neither grown in the crèche yards nor sold at the market. Seasonality was also a factor that affected the availability and accessibility of fruit. This contributed to the lack of fruit in the children's diets. The researcher was unable to find out about the vitamin A content of these fruits. Figure 4.8 shows one of the indigenous fruit trees (*muhuyu*) growing at one of the crèches.



**FIGURE 4.8 A MUHUYU (WILD FIGTREE) BEARING FRUIT**

The results reveal low availability of vegetables and fruit especially the indigenous varieties. Nevertheless from the findings it can be concluded that there is potential for improving the availability and accessibility of vegetables and fruit. Effort is needed to improve the frequency of vegetable consumption through increased production as well as the gathering and cultivation of indigenous vegetables at crèches. Moreover the general intake of vegetables and fruit could be enhanced if caregivers were to use the commodities appropriately.

#### **4.3.2.3 Utilisation of vegetables and fruit**

One of the sub-objectives formulated for phase one deals with the utilisation of vegetables and fruit. For the purpose of this study utilisation of food was defined as the proper use of food from its natural state in terms of cooking, storage and preservation. To determine how the available vegetables and fruit were utilised the respondents were questioned on menu planning and food preparation as well their purchasing, storage and preservation practices.

**(i) Menu planning and training**

To investigate the issue of the utilisation of vegetables and fruit data was collected concerning menu planning and on how the caregivers decided what to serve the children on a daily basis. They also had to indicate if they had been trained on how to plan a menu and how their training took place. The results are reflected in Table 4.2.

**TABLE 4.2: MENU PLANNING AS PART OF UTILISATION (n=100)**

WHO DECIDES WHAT TO SERVE TO CHILDREN		TRAINING IN MENU PLANNING		HOW RESPONDENTS WERE TRAINED	
REPOSSES	NUMBER	RESPONSES	NUMBER	RESPONSES	NUMBER
Followed own written menu	62	Yes	45	Attended workshops	66
The manager of the crèche decides	8			Trained at a cooking school	16
Follow menu from the Dept of Health	25	No	55	Trained by the Dept of Health	14
Cooks decide	5			Trained while doing pre-school diploma	2
				Learnt from other caregivers	2

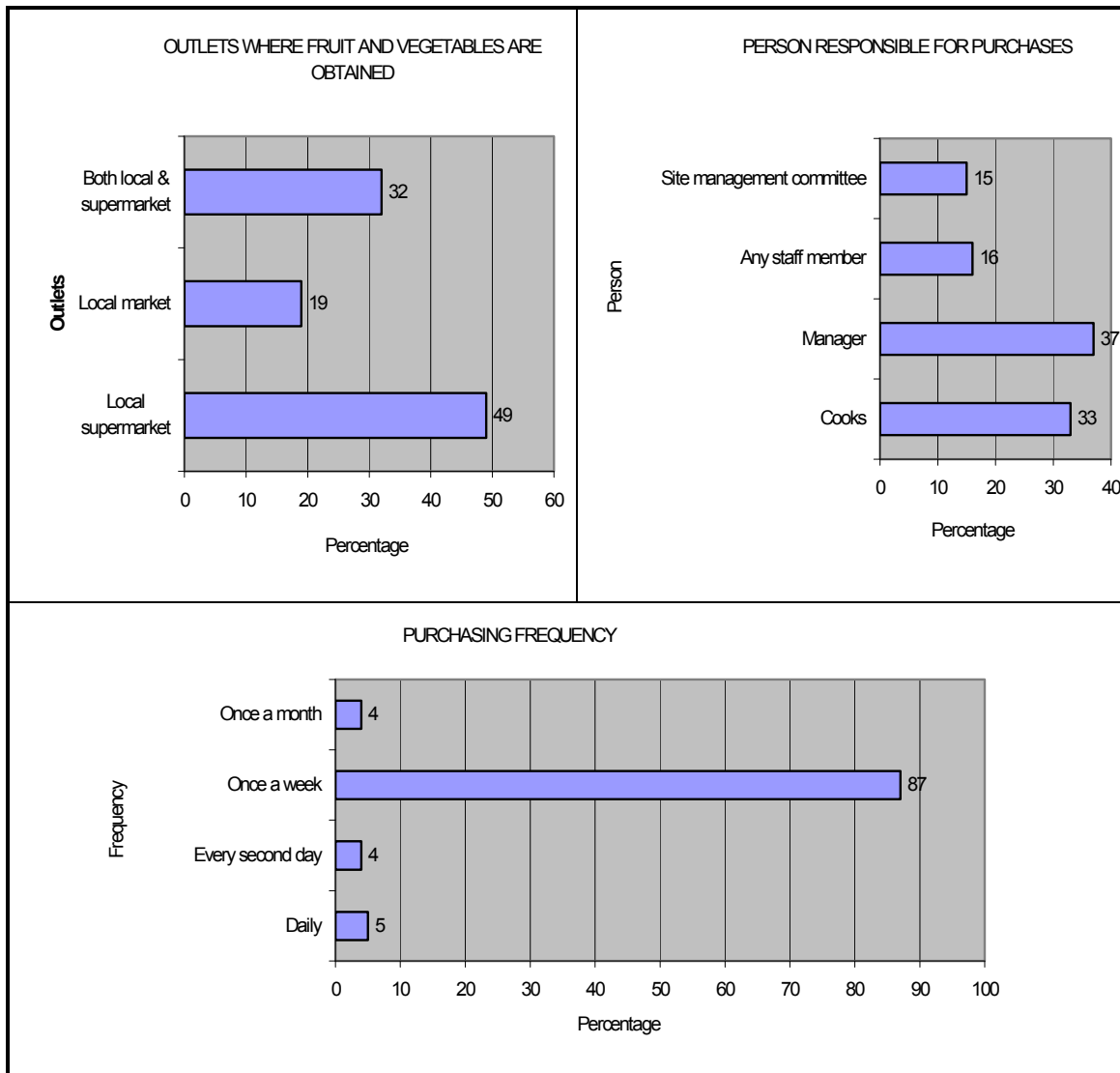
The majority of the respondents (62) followed their own written menu, whereas eight respondents indicated that the manager of the crèche decides what to cook and 25 followed the menu supplied by the Department of Health. Five respondents indicated that the cooks decide what to prepare. The cooks were caregivers themselves who took turns to prepare children's meals. Observation results revealed that, although the majority of the respondents had written menus, they were seldom used. Another observation was that the written menus remained the same throughout the year without being changed nor was attention paid to encouraging the use of a variety of dishes. These menus were not balanced except for those that were supplied by the Department of Health and these accommodated the use of a variety of different foods.

In some cases the menus from the Department of Health were not used as such but were only kept on display to impress officials from the Department of Health should they come to monitor the work being done in crèches, in which case they would want to see the menus. This practice was only seen in some of the crèches that were funded by the Department of Health. It was only done out of apprehension that if they were not following the model menus provided, the Department of Health might withdraw the subsidies paid to these crèches claiming that they were not complying with the regulations. The crèches that were privately owned felt at liberty to use their own menus, although the Department of Health encouraged them to use the menus which they supplied.

In terms of training only 45 respondents indicated that they had been trained for menu planning. In an open-ended question the respondents were asked to indicate how they were trained and the results show that the majority of the respondents (66) had attended some training workshops and only two respondents had not received any formal training (see Table 4.2).

**(ii) Purchasing**

As part of the investigation into the utilisation of vegetables and fruit, data was also collected on frequency of purchase, persons responsible for the purchasing and where vegetables and fruit were obtained. The results are summarised in Figure 4.9.



**FIGURE 4.9: UTILISATION OF VEGETABLES AND FRUIT (n=100)**

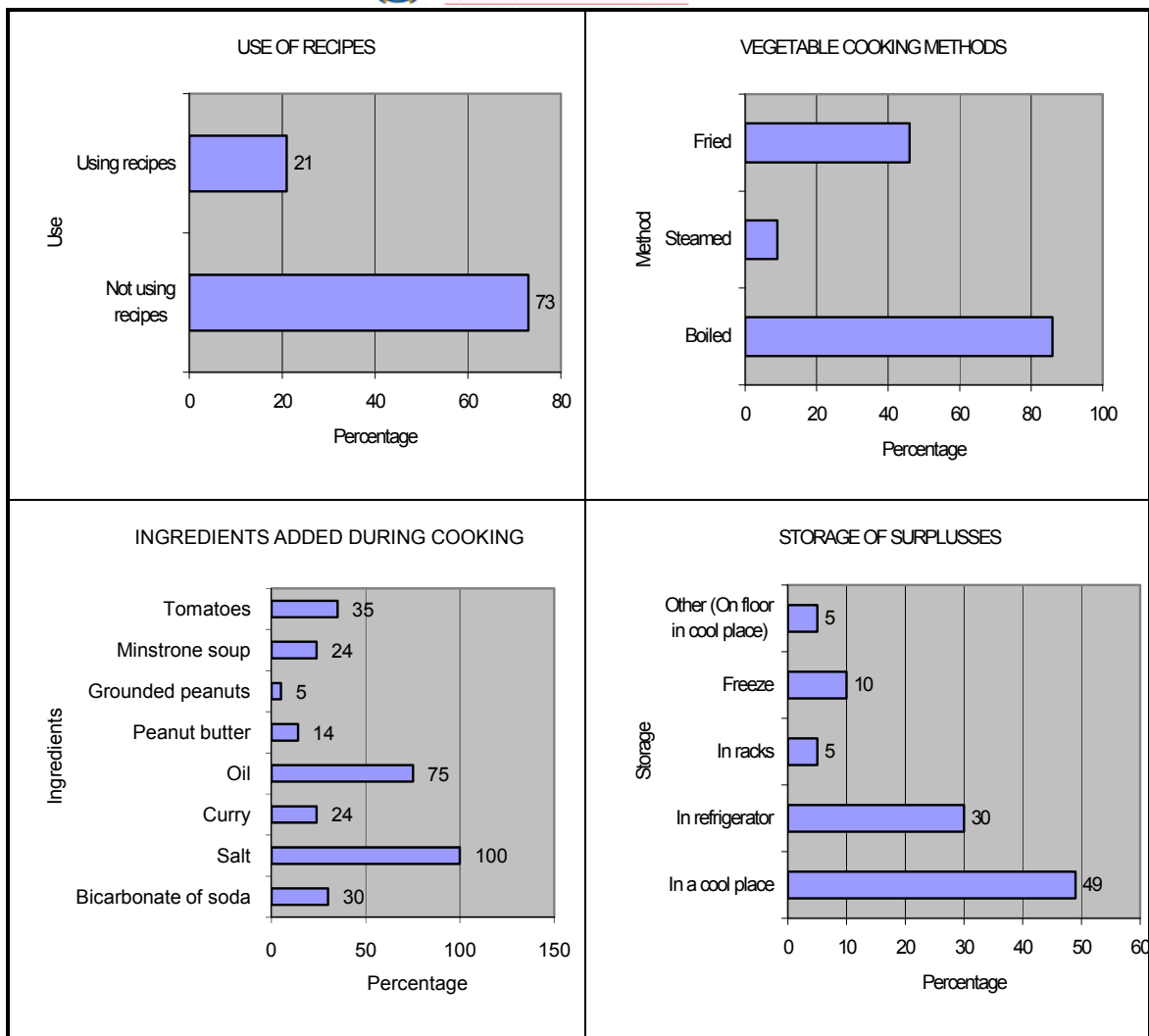
Figure 4.9 illustrates that 33% of the respondents indicated that the cooks were responsible for buying the vegetables and fruit, 37% said that the manager was responsible, whereas 16% reported that any staff member could buy the food. Another 15% cited the site management committee as responsible for buying the vegetables and fruit.

In terms of purchasing frequency, only 5% of the respondents indicated that they bought vegetables on a daily basis. The majority (87%) of the respondents did so once a week, while four per cent did the buying once a month. Another 4% of the respondents bought vegetables and fruit every second day (see Figure 4.9). With regard to where they procured vegetables and fruit 49% went to the local market whereas 19% shopped at the supermarket and 32% got their supplies at both the local market and the supermarket (see Figure 4.9).

Though the information differed from crèche to crèche, the choice and purchase of vegetables and fruit were the sole responsibility of the respondents themselves. This enabled them to buy the kind of vegetables and fruit that they could afford and were able to cook. The findings revealed that not one respondent used fruit or vegetables from their own gardens.

### **(iii) Preparation of the vegetables and fruit**

Data on vegetable preparation was collected through questions regarding the use of recipes, how vegetables were cooked and what was added to vegetables during the cooking process. The results are reflected in Figure 4.10.



**FIGURE 4.10: FOOD PREPARATION PRACTICES (n=100)**

The majority (73%) of the respondents did not use written recipes when cooking, only 21% did (see Figure 4.10). Although some respondents chose more than one option, the results show that only three methods were used for cooking vegetables at the crèches. Forty six per cent of the respondents indicated that they fried vegetables, while 9% steamed them and 86% boiled their vegetables. Although respondent were given an open option, 'other', no one made use of it as the options supplied covered their desired responses.

In another question the respondents were asked about the use of additives in cooking. Figure 4.10 shows the various kinds of ingredients that were added to vegetables during cooking. All the respondents (100%) added salt to the vegetables. Other additives such as oil, bicarbonate of soda, curry, peanut butter, pounded peanuts, minestrone soup and tomatoes were used. Except for bicarbonate of soda which was mentioned by 30% and curry



by 24%, the other ingredients such as oil or margarine, peanut butter, pounded peanuts and tomatoes contributed to the nutrition value of the dish. Although only 30% of the caregivers mentioned using bicarbonate of soda, when observing the cooking process it was seen to be a very common practice. It seemed that the respondents already knew that bicarbonate of soda destroys the nutrients in vegetables, but chose to use it because it softens and preserves the green colour of vegetables.

It was found that a large percentage (75%) of the respondents add oil to the vegetables, which is necessary for the absorption of vitamin A by the body. However, through observation it was noticed that oil was only added to cultivated vegetables such as cabbage and spinach and it was never added to indigenous vegetables. Another observation was that tomatoes were added to almost all the vegetable dishes in conjunction with the other ingredients and, in accord with cultural culinary practice, pounded peanuts and peanut butter were only added to indigenous vegetables.

The respondents were asked what they did with excess water once the vegetables were cooked. Eighteen of the respondents threw any excess water away and 10 respondents stated that excess water was served as gravy. Thirty respondents indicated that they added excess water to the children's porridge, while 16 said that after cooking the vegetables no water was left.

#### **(iv) Storage and preservation of vegetables and fruit**

To determine the nature of storage facilities for vegetables and fruit the respondents had to indicate how they stored the raw surpluses and cooked leftovers. From the purchasing frequency of vegetables (see Figure 4.9) it is clear that proper storage facilities would be required to store the surpluses to prevent deterioration.

The respondents had to indicate the storage methods they were using for their surplus vegetables and fruit. The results are reflected in Figure 4.10. Almost half (49%) of the respondents stored their surpluses in a cool place, whereas 30% used a refrigerator and 10% used freezers. Five per cent used vegetable racks, and another 5% put their vegetables on the floor in a cool place. However, generally surplus stock was not a problem as the respondents indicated that they had no surpluses.

In terms of storing the cooked leftovers, some respondents (34%) indicated that they had no leftovers, 37% indicated that they stored their leftovers in the refrigerator, while 11% froze the leftovers and 5% put them in containers. Although it seems as though leftovers were

stored in one way or the other, there were 13% of the respondents who said that they threw leftovers away.

With regard to preserving vegetables and fruit, the respondents were asked whether they did this and how. The majority of the respondents (99) indicated that they did not preserve fruit or vegetables. There was one missing response and, as a result, it can be concluded that none of respondents preserved vegetables.

In general, the results show inadequate knowledge and skills regarding menu planning, food preservation and storage techniques. The respondents also show incorrect food preparation methods such as the addition of bicarbonate of soda and throwing away excess water. As suggested by Krige and Senekal (1997:22), knowledge of appropriate food preparation practices should be available so that food can be handled and cooked in a manner that will prevent nutrient losses, so it is important that the correct ways of food utilisation should be encouraged.

#### **4.3.2.4 Nutrition knowledge**

This section presents the results of the respondents' current knowledge about the application of the food-based dietary guideline that places special emphasis on vitamin A-rich vegetables and fruit. Thus the caregivers' current knowledge of vitamin A, vitamin A-rich vegetables and fruit, and the importance of children eating vegetables and fruit rich in vitamin A are assessed. The caregivers were asked questions about the children's consumption of vegetables and fruit and what could happen to them if they do not eat them. Caregivers were also required to report on the number of vegetables and fruit portions, and their size, that children should consume daily. In addition their knowledge of vegetables and fruit that are rich source of vitamin A, and their view of the importance of vitamin A for the health of children, was tested.

##### **(i) Children's consumption of vegetables and fruit**

In response to whether children should eat vegetables and fruit, the majority of the respondents (93) agreed that children should be served vegetables and fruit. Only seven respondents said that eating vegetables and fruit was at times adequate and no-one thought that children should not eat vegetables and fruit (see Table 4.3).

**TABLE 4.3: KNOWLEDGE ON VEGETABLES AND FRUIT CONSUMPTION AND THE IMPORTANCE OF VITAMIN A (n=100)**

QUESTION	RESPONSE	FREQUENCY
Should children eat vegetables and fruit?	Yes	93
	No	0
	Sometimes	7
What is the best form of vegetable to serve to children, if available?	Frozen	0
	Tinned	7
	Fresh	93
What will happen if children do not eat vegetables and fruit?	They will have poor health	78
	They are at risk of disease	67
	Growth faltering	44
	Weak immune system	17
	Increased early childhood deaths	4
	Lack of vital nutrients	34
Why is Vitamin A important?	Prevent growth faltering	26
	Increase resistance to diseases	52
	Prevent eye diseases and blindness	23
	Decrease child mortality	15

The respondents were also given the opportunity to indicate the best way of serving available vegetables to children. They had to choose the best option between, frozen, fresh and tinned vegetables. The responses are reflected in Table 4.3. It was found that the majority of the respondents (93) already knew that fresh vegetables are better than processed vegetables. Only seven respondents suggested that children should be served tinned vegetables and no respondent chose frozen vegetables as an answer.

The respondents were also asked to indicate why the consumption of vegetables and fruit during childhood is to be encouraged. Primarily the respondents showed little knowledge and they stated more general health than nutrition-based reasons, and specified as: to build the body, to prevent diseases, to prevent weight loss, for strength, for growth and for good health, to mention but a few.

In another open-ended question the respondents were asked to mention what would happen if children did not eat vegetables and fruit. Due to the fact that the respondents came up with so many reasons, the responses were grouped together and then categorised to give more meaningful information (see Table 4.3). Despite the fact that the majority of the respondents (93) already knew that children should be served vegetables and fruit, they showed little understanding with regard to what could happen if they never ate them. Some respondents did not know exactly what would happen if children did not eat vegetables and fruit.

The majority (78) revealed general knowledge such as indicating that children will have poor health, though there were 67 who claimed that the children would be at risk of contracting diseases. Important reasons such as growth faltering, the development of a weak immune system and a lack of vital nutrients were mentioned by some, but these were in the minority (see Table 4.3).

The respondents were also asked to describe the size of the portion of vegetables and fruit they served to the children. The portion sizes differed from crèche to crèche as well as from child to child according to their age.

### ***Fruit portions***

Although the caregivers who did respond to the question on the portion size of fruit indicated that they served either a whole, a half or mashed fruit to the children depending on their age, a large number of respondents did not answer this question. For example, 61 respondents ignored the serving of fruit to children aged six to ten months which could mean that the majority of respondents did not serve fruit to children of this age. It was observed that in most crèches the children aged six months to one year were not served fruit at all.

It was also seen that, when children were served fruit at crèches, all the children from the age of two to six years old were given one whole fruit irrespective of their age. For example, if they were eating apples all the children would be given a whole apple yet the younger children were unable to finish the fruit which they were served. It would thus be better if these children were served softer fruits as suggested by Faber *et al.* (2006) who maintain that fruit for younger children should be mashed for easy digestion.

### ***Vegetable portions***

Results show that respondents used serving spoons, tablespoons as well as cups to measure the helping of vegetables served to children. Children could be served a quarter, half or a full cup of vegetables depending on their age. Older children were served larger portions such as two serving spoons whereas younger children were served less vegetables such as one or half a serving spoon. However, children who demanded some more vegetables were given a second serving as the caregivers did not consider it to be overeating. Results also showed that at some crèches children were not served vegetables at all. For example 32 respondents were not serving vegetables to the six months old children and ten were not serving vegetables to the one year old children.

Through observation, it was revealed that all the children were served the same amount (large portions) of vegetables irrespective of their age and it seemed that, caregivers were giving children as much food as possible. Photographs of plates filled with porridge and cooked vegetables were taken at some crèches during lunch time to give an idea of the quantity being served. Figure 4.11 shows the portion size (one cup) of vegetables that was served to a 3 year old child in one of the crèches in this study.



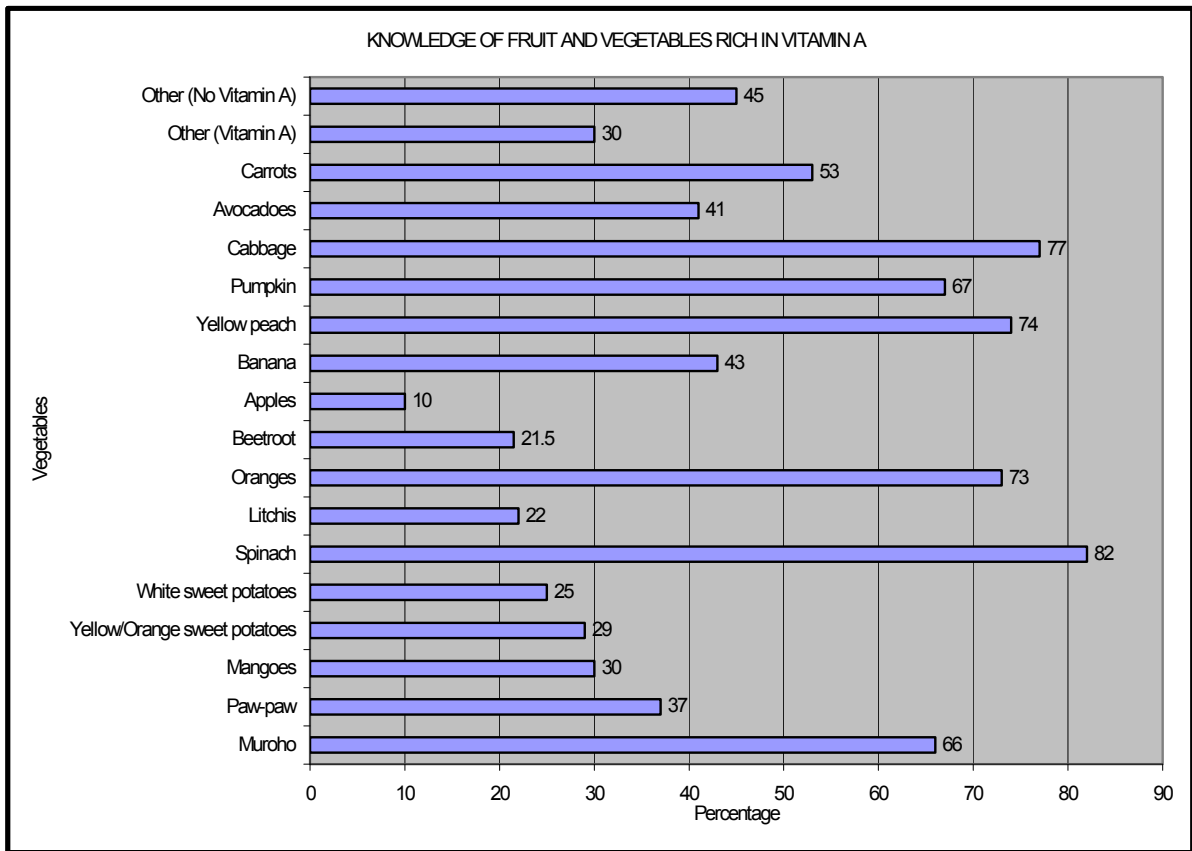
**FIGURE 4.11: CHILDREN BEING SERVED PORRIDGE AND SPINACH AT THE CRÈCHE**

**(ii) The importance of vitamin A to children**

The findings of why vitamin A is important to children are summarised in Table 4.3. The results show that the respondents had limited knowledge of the importance of vitamin A to children. Though 52 of the respondents knew that vitamin A increases resistance to certain diseases, only 26 knew that vitamin A could prevent growth faltering, 23 knew that vitamin A can prevent eye diseases and blindness and only 15 knew that vitamin A could decrease child mortality. These results were also confirmed by the game used as a data collection method as the highest score was two out of five.

**(iii) Knowledge of vegetables and fruit rich in vitamin A**

The respondents' knowledge about vitamin A-rich vegetables and fruit was assessed by letting them choose from a list of vegetables and fruit. They had to indicate which vegetables and fruit were rich in vitamin A. The respondents were also encouraged to mention some *other* fruit or vegetables which were not on the list. To simplify analysis and reporting responses on the *other* option, related responses were reduced to categories according to those that were rich in vitamin A and those that were not rich in vitamin A. Figure 4.12 represents the respondents' knowledge of vitamin A-rich vegetables and fruit.



**FIGURE 4.12: KNOWLEDGE OF VEGETABLES AND FRUIT RICH IN VITAMIN A (n=100)**

The results as reflected on Figure 4.12 show that some respondents knew that certain vegetables and fruit contain vitamin A. For example, 82% chose spinach, 74% yellow peach, 67% pumpkin, 66% *muroho* and 53% carrots which are rich in vitamin A. A small percentage (29%) of the respondents knew that yellow/orange sweet potatoes and mangoes (30%) are rich in vitamin A. Only 30% of the respondents had added other vegetables and fruit that are rich in vitamin A and 45% had added others that are not rich in vitamin A.

Looking at the number of respondents who chose vegetables and fruit that are not rich in vitamin A, it is concluded that the respondents' knowledge of vitamin A-rich vegetables and fruit was lacking. The game was also used to assess the respondents' knowledge of vegetables and fruit rich in vitamin A. The results of the game showed that the respondents had little knowledge of vegetables and fruit rich in vitamin A as the majority scored one and two out of five. The lower game scores could mean that the respondents were just guessing when choosing vegetables and fruit rich in vitamin A.

From these results it is evident that caregivers need to have knowledge about vitamin A-rich vegetables and fruit as emphasised by Engle *et al.* (1997:24) and Krige and Senekal (1997:22) who maintain that caregivers at crèches should have at least a basic knowledge of nutrition to enable them to help improve the well-being of children in their care. Vitamin A has been recognised as a critical factor in children's health and survival. Young children need vitamin A because it plays the most important overall function in the body's immune system as well as affecting vision and eye health (Faber *et al.*, 2006:27; Reddy, 1999). It is therefore important to create an awareness of the importance of vitamin A nutrition through nutrition education and promotion (Engle *et al.*, 1997:24; Krige & Senekal, 1997:22), as recommended in this study.

#### **4.3.2.5 Summary**

The assessment made from the information gathered in phase one revealed a general lack of knowledge of nutrition and an absence of appropriate information about vitamin A and vitamin A-rich vegetables and fruit in particular, as well as evidence of a lack of dietary variety and presenting meals low in vitamin A. A lack of menu planning skills, poor food utilisation as well as low availability of vegetables and fruit at crèches (very few had flourishing vegetable gardens) was evident. These results are clearly similar to findings in other studies (Pietersen *et al.*, 2002:5; Maunder & Meaker, 2007:403) which maintain that children's consumption of vegetables and fruit rich in vitamin A is still very low. The findings can also be linked to the applied UNICEF framework given in Figure 2.1 which depicts amongst other factors, that an inadequate dietary intake of vitamin A precursors, caused by a food intake low in vitamin A precursors, as well as poor availability, inappropriate food preparation and inadequate knowledge about vitamin A-rich diets, are the immediate and major causes of vitamin A deficiency in young children (Van Lieshout *et al.*, 2004:6).

The food-based dietary guideline "*eat plenty of vegetables and fruits everyday*" is the principal focus of this study. It is important that strategies to improve the application of this dietary guideline be developed and implemented. The first priority should therefore be on the development and implementation of nutrition and food-based strategies that would ensure access and availability, as well as optimal consumption of vegetables and fruit by crèche children. In similar vein to the work of Sharma and Nagar (2006:141) it was deemed important in this study to provide caregivers with proper knowledge and specific education related to childcare practices that would reduce the incidence of faulty feeding and to promote practices that would contribute to positive growth and development.

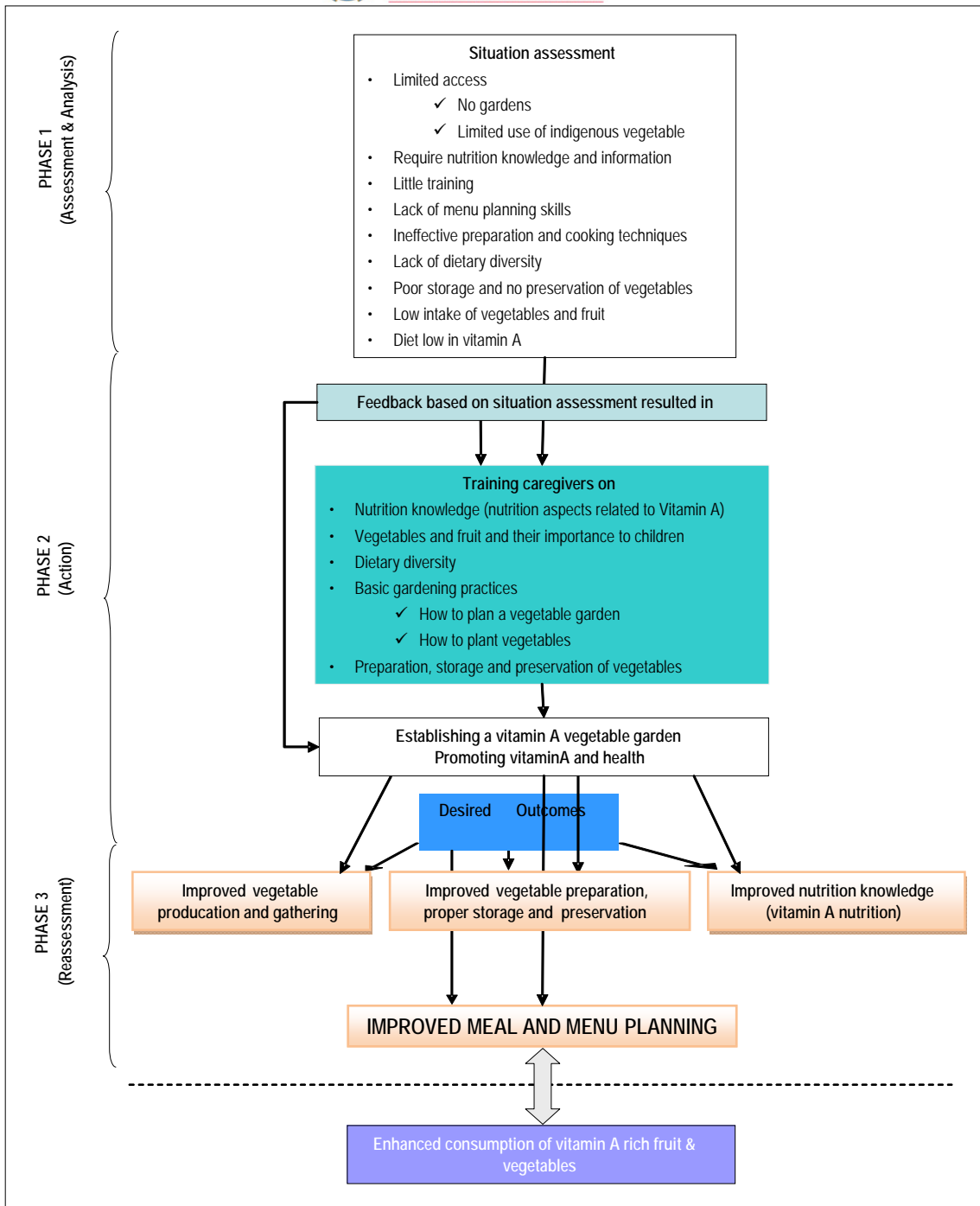
Phase two of this study was therefore an action-based phase, to engage caregivers in developing the various nutrition strategies to improve access and availability and enhance the consumption of vitamin A-rich vegetables and fruit by crèche children.

#### **4.4 PHASE TWO**

Phase two can be regarded as the action part of the triple-A cycle, the intervention phase, that is based on the findings of phase one. This second phase addresses the objectives which involve the development and implementation of nutrition strategies. The main aim was to enhance availability, access and proper utilisation of vitamin A-rich vegetables and fruit by crèche caregivers. Therefore the interventions focused mainly on nutrition awareness with particular attention being paid to enhancing knowledge about vitamin A, the cultivation of vitamin A-rich vegetables and fruit, dietary diversity, menu planning and food preparation as well as the importance of proper storage and the preservation of vegetables.

In phase two the recommendations by Labadarios *et al.* (1999) were followed. According to them nutritional aspects are often neglected, and it is important to address these aspects through education, gardening and correct utilisation of foods through training the caregivers. All caregivers were exposed to training on gardening activities regardless of whether they had a garden at the crèche or not. They were trained in skills related to cultivation, processing and preparation of vegetables and fruit. They received nutrition education to increase their knowledge of the link between vegetables and fruit consumption and health, as well as the importance of vitamin A in the diet of children. Based on the baseline information, Figure 4.13 represents the steps that were followed and the activities that were carried out when implementing the nutrition strategies. It also highlights the desired outcomes of the action phase.





**FIGURE 4.13: IMPLEMENTING THE NUTRITION STRATEGIES**

**4.4.1 Nutrition strategies**

In this study nutrition strategies refer to food-based approaches used to improve the application by crèche caregivers of the food-based dietary guideline “eat plenty of vegetables

and fruits everyday’ in order to enhance the consumption of vitamin A-rich vegetables and fruit by the children in their care. These strategies involve nutrition education, the promotion of fruit and vegetable consumption and training on fruit and vegetable production, as well as menu planning, proper storage, preparation and preservation of vegetables and fruit.

#### 4.4.1.1 Nutrition education and training

This phase focused on increasing caregivers’ nutrition knowledge and awareness of vitamin A-rich vegetables and fruit. Cultivation and proper utilisation of vegetables and fruit were promoted in order to enhance their access and availability to the crèches and ultimately to improve their consumption by the children. Table 4.4 indicates the topics covered concerning caregivers’ education and training.

**TABLE 4.4: NUTRITION EDUCATION AND TRAINING**

TOPIC	EMPHASIS ON
Basic education concerning vitamin A and the consumption of vegetables and fruit	<ul style="list-style-type: none"> <li>• Importance of vegetables and fruit to children</li> <li>• What is vitamin A?</li> <li>• The functions of vitamin A and its importance to children</li> <li>• Vitamin A deficiency (causes, warning signs and symptoms)</li> <li>• Identification of vegetables and fruit rich in vitamin A</li> <li>• Gathering of indigenous vegetables and their value in the diet</li> </ul>
Preparation of vegetables for maximum nutrient retention	<ul style="list-style-type: none"> <li>• Grating vegetables such as carrots</li> <li>• Avoid soaking and overcooking vegetables</li> <li>• Washing vegetables before cutting</li> <li>• Cook in only a little water</li> <li>• Addition of oil to enhance vitamin A absorption</li> <li>• Add excess cooking water to soups or children’s porridge</li> <li>• Avoid bicarbonate of soda</li> <li>• Chop vegetables to enhance absorption of vitamin A</li> </ul>
Strategies to improve consumption of vegetables and fruit	<ul style="list-style-type: none"> <li>• Adding ingredients such as oil and soup to vegetables</li> <li>• Making salads</li> <li>• Giving fruit as a snack</li> <li>• Mashing vegetables for small children</li> </ul>
Cultivation of vitamin A-rich vegetables and fruit and vegetable gathering	<ul style="list-style-type: none"> <li>• Soil preparation, fertilisation, planting and sowing dates</li> <li>• Plant spacing, irrigation, weeding</li> <li>• Maintenance, disease management and pest control</li> <li>• Harvesting</li> </ul>
The importance of a crèche garden as a source of vitamin A-rich vegetables and fruit	<ul style="list-style-type: none"> <li>• Year- round availability</li> <li>• Direct access and availability</li> </ul>
Dietary diversity and menu planning	<ul style="list-style-type: none"> <li>• Include a variety of vegetables and fruit in a week’s menu</li> <li>• Planning a colourful menu by including different vegetables and fruit</li> <li>• Quick recipe ideas</li> </ul>
Preservation techniques and proper storage	<ul style="list-style-type: none"> <li>• Drying</li> <li>• Refrigeration</li> <li>• Freezing</li> <li>• Use of closed containers</li> </ul>

Simple, inexpensive education materials such as posters, charts, pamphlets and calendars were used to aid nutrition education and the general training of the caregivers. To facilitate and enhance understanding and to ensure enduring nutrition knowledge, caregivers were given posters and calendars from the Agricultural Research Council (ARC) to keep at their crèches. These posters and calendars illustrated vitamin A-rich vegetables on the front and on the back vegetable cultivation is explained. These education materials were a great help as they facilitated the exposition of vitamin A nutrition. Copies of the eleven South African food-based dietary guidelines were also distributed to all the caregivers. Caregivers also received Vitamin A recipes that were obtained from the ARC (see Addendum F). It was believed that these recipes would help the caregivers add variety to the children's meals.

The outcomes for the training of caregivers were formulated:

- To establish vegetable gardens for year round availability
- To improve vegetable production and gathering
- To improve vegetable preparation, proper storage and preservation
- To improve nutrition knowledge (vitamin A nutrition)
- To improve meal and menu planning skills
- To contribute to an increased daily consumption of vegetables and fruit (vitamin A-rich in particular).

Not only did the study provide awareness of the importance of vitamin A nor did it just increase the caregivers' skills with regard to the proper utilisation of vegetables, but it also enhanced year-round availability by promoting the cultivation and gathering of vitamin A-rich vegetables and fruit by crèche caregivers.

#### **4.4.1.2 Promoting the production and gathering of vegetables and fruit**

The production of yellow/orange fleshed fruit such as paw-paws and mangoes as well as vegetables such as carrots, pumpkin and sweet potatoes was promoted. The production of dark green leafy vegetables whether with high vitamin A content such as spinach or having low vitamin A content such as Chinese cabbage was considered important in this study and therefore it was encouraged. The researcher undertook to provide the caregivers with sweet potato cuttings obtained from the ARC. The caregivers were also persuaded to grow indigenous vegetables such as *muxe* (African nightshade) in their crèche gardens. Gathering indigenous vegetables was emphasised and their consumption, whenever they were in season, was advocated.

#### 4.4.1.3 Cultivation of vegetables and fruit

The training course addressed the theoretical and practical aspects regarding vegetable production. Aspects such as soil preparation, fertilisation, planting and sowing dates, plant spacing, irrigation, weeding, maintenance, disease management and pest control as well as harvesting were included in the training sessions as recommended by Faber *et al.* (2006:117). Caregivers were trained on how to plant vitamin A-rich foods such as carrots, pumpkins, orange-fleshed sweet potatoes and spinach, and were encouraged to plant these vegetables at the crèches in addition to other existing crops. To facilitate vegetable production gardening manuals obtained from the ARC were used (see Addendum E). The manual used, and distributed to the caregivers, illustrated soil preparation, planting vegetables, the application of fertilisers, watering, weeding, pest control and harvesting.

Fruit trees such as mangoes, paw-paws and bananas were also planted at the crèches. At some crèches the gardening project was appreciated as fun. The children were taught about the importance of eating vegetables and were asked to bring plants from home to grow their own vegetables at the crèche. This practice succeeded as the children and caregivers brought plants such as spinach and Chinese cabbage, as well as paw-paw and mango trees, for planting at the crèches. The gardens were therefore established at various crèches with vegetables such as spinach, muxe, carrots, pumpkins, orange-fleshed sweet potatoes and green beans and the gardens were monitored regularly. Knowing that the researcher would return to see the developments, the caregivers wanted to excel in order to impress the researcher. They worked very hard to ensure that their gardens flourished. It was exciting for the researcher to experience that the caregivers were very positive about developing the gardens. The photographs (Figure 4.14) bear evidence of some vegetable gardens that were established, improved or resuscitated at different crèches.



**FIGURE 4.14: NEWLY ESTABLISHED, IMPROVED AND RESUSCITATED CRECHE GARDENS**

It was observed that the caregivers had a positive attitude towards implementing the strategies provided as guidance. This was seen when caregivers engaged in developing vegetable gardens even though some conditions were not that conducive. For example 34 respondents had no water, 15 had no fence and 41 had no gardener to help them. However, the caregivers were eager and willing to have their own vegetable gardens although they had various expectations from the researcher for improving their circumstances. These included providing funds, fencing, water provision from boreholes and seeds.

#### 4.4.2 Summary

The implementation of the nutrition strategies was based on the applied framework which focused on vitamin A status as adapted from UNICEF's model (Figure 2.1). This model indicates that an adequate dietary intake of food rich in vitamin A precursors, enhanced by appropriate food preparation, year-round access and availability as well as adequate knowledge about and information on vitamin A-rich diets could lead to improved consumption

of vitamin A-rich foods, and hence vitamin A status. This in turn could lead to good health, sustained growth and development of the children attending the crèche. It was therefore important to implement the gardening strategies because yellow/orange-fleshed vegetables and fruit, orange roots and dark green leafy vegetables are the main sources of pro-vitamin A (Faber *et al.*, 2006:28; Louw, 2001; McLaren & Frigg, 1997). Promotion of indigenous green leafy vegetables such as *muxe*, *phuri* and Chinese cabbage was done following the guidelines set by Maunder and Meaker (2007:403), who regard these vegetables as good sources of pro-vitamin A.

The effect of the implemented strategies on the dietary intake of vitamin A-rich vegetables and fruit was reassessed in phase three of the study.

## **4.5 PHASE THREE**

Reassessment was done in order to measure the change that the intervention (gardening, nutrition education and training) had made in the application of the food-based dietary guideline. Phase three was therefore undertaken mainly to see if the intervention was successful. It also helped the researcher determine the extent to which the research objectives had been achieved. The same pattern as applied in phase one was followed when reporting phase three's results. The findings are therefore presented in a manner in which the differences between phases one and three are highlighted and the status of statistical significance was given where applicable. The statistical procedures will be fully explained the first time they are mentioned and thereafter reference will only be made to the procedure described.

### **4.5.1 Reassessment of the nutrition strategies**

#### **4.5.1.1 Dietary diversity**

Dietary diversity (Ruel, 2003:3911) is recognised by nutritionists as a key element of high quality diets that ensure adequate intake of essential nutrients and promote good health. As dietary diversity was recommended in phase two, the respondents were reassessed on how they were addressing this issue of introducing a variety of food in the children's diets at crèches and the results are as follows:

**(i) Meals and snacks served to children at crèches**

Table 4.5 gives a comparison of phase one and phase three results about the types of meals which were served to children at the crèches. Analysis of the results is thus made and the differences discussed.

**TABLE 4.5: A COMPARISON OF MEALS SERVED IN PHASES ONE AND THREE (n=100)**

MEALS SERVED	FREQUENCIES	
	PHASE ONE	PHASE THREE
Breakfast	95	95
Morning snack	30	36
Lunch	100	100
Afternoon snack	52	84

In both phases all the respondents served lunch and the majority also served breakfast. In comparison with phase one, phase three results showed an increase in the number of caregivers who were now serving snacks. An increase in the number of caregivers serving a snack would contribute to children being served a variety of food as well as an increased intake of vegetables and fruit.

To reflect on the changes, two-way frequency tables were used to summarise the number of respondents who reported that they served morning and afternoon snacks (see Tables 4.6 and 4.7). The rows represent phase one while the columns represent phase three. The “yes” and “no” refers to whether they served the snack or not. To determine whether a significant change from phase one to phase three took place, McNemar’s tests were performed and the results are found in Addendum H.

**TABLE 4.6: PHASE ONE AND THREE MORNING SNACK (n=100)**

PHASE ONE	PHASE THREE		
	Morning snack served (NO)	Morning snack served (YES)	Total
Morning snack served (NO)	64	6	70
Morning snack served (YES)	0	30	30
Total	64	36	100

Table 4.6 illustrates that in phase one only 30 respondents served morning snacks and 70 did not serve morning snacks. In phase three 36 respondents served morning snacks and 64 did not serve morning snacks. The table further indicates that of the 70 respondents who were not serving a morning snack in phase one, 64 were still not serving this snack while six



respondents had changed and were serving a morning snack in phase three. Furthermore, the results indicate that in phase three there were no respondents (0) who changed from serving to not serving the morning snack. McNemar's test indicated a statistically significant change or difference ( $p\text{-value} < 0.05$ ) between phase one and phase three as there was an increase in the number of caregivers who were serving a morning snack.

**TABLE 4.7: PHASE ONE AND THREE AFTERNOON SNACK (n=100)**

PHASE ONE	PHASE THREE		
	Afternoon snack served (NO)	Afternoon snack served (YES)	Total
Afternoon snack served (NO)	15	33	48
Afternoon snack served (YES)	1	51	52
Total	16	84	100

With regard to the afternoon snack (Table 4.7), phase three results show a higher intake of afternoon snacks as compared to phase one results. Phase three scores increased from 52 to 84 in the number of respondents who were serving an afternoon snack. McNemar's test results indicate a significant change in the number of respondents who were serving afternoon snacks ( $p\text{-value} < 0.05$ ). It can be concluded that intervention was successful in changing from not serving to serving more afternoon snack, the same also holds true for the morning snack ( $p\text{-value} < 0.05$ ) (see Addendum H).

One of the objectives of this study was to investigate if there was an improvement in the application of the food-based dietary guideline by the caregivers. Based on these reported results, it can be concluded that a significant increase in the number of respondents serving afternoon and morning snacks to children had occurred in phase three. This point to positive results of nutrition education in the improved application of the food-based dietary guideline regarding the importance of vegetables and fruit in the daily diet, through improving the type of meals given to children at crèches. The results showed a greatly increased consumption of afternoon snacks (see Table 4.7) compared to the morning snack (see Table 4.6). Taking into consideration the time children spend at the crèche each day, a late afternoon snack is recommended. It is assumed that adjustment in the meals given might increase dietary diversity, enhance the nutritional value of meals served to children and could contribute to increasing the daily intake of vegetables and fruit by children.



**Food served to children for breakfast**

The same types of foods were served at both phases. However, a change could be seen in phase three results where a larger number (70 versus 5) of the respondents were serving fruit to children at breakfast either with soft porridge and milk or with bread and tea (see Table 4.8).

**TABLE 4.8: FOOD SERVED TO CHILDREN FOR BREAKFAST (n=100)**

BREAKFAST MEAL SERVED	FREQUENCIES	
	PHASE ONE	PHASE THREE
Soft porridge and milk	31	30
Soft porridge, milk and fruit	5	45
Bread and tea	57	0
Bread and tea and fruit	0	25

According to the results it seems that bread and tea were served by the majority (57) in phase one and replaced by other healthier options that included fruit in phase three (see Table 4.8). It could thus be concluded that the increased intake of fruit at breakfast would more than likely contribute to achieving the dietary guideline “eat plenty of vegetables and fruits everyday” and perhaps lead to an increased intake of pro-vitamin A foods among the children. The more fruit children eat daily the higher their intake of pro-vitamin A. It could thus be assumed that children who were served a breakfast that included a fruit were able to improve their vitamin A intake.

**Food served to children for lunch**

A change in the food that was served for lunch in phase three was noticeable. Along-side meat, fish and soup, 90 as opposed to 35 respondents were including indigenous vegetables. All the respondents (100 versus 87) indicated that they provided cultivated vegetables (see Table 4.9). This was also stated in their menus. Observation results showed that sweet potato leaves were mixed with other traditional green leaves and cooked together. The gardening project resulted in an increased intake of dark green leafy vegetables. However, seasonal variations in the availability of these vegetables were still observed. This corroborates the findings by Faber *et al.* (2006:118).

**TABLE 4.9: FOOD SERVED TO CHILDREN FOR LUNCH (n=100)**

LUNCH SERVED	FREQUENCIES	
	PHASE ONE	PHASE THREE
Porridge with either meat/ fish/ soup	87	87
Porridge with cultivated vegetables	87	100
Porridge with indigenous vegetable	35	90

There was a notable increase in the number of caregivers who were serving indigenous vegetables to the children. This signifies an improvement in the caregivers' knowledge of the nutritional value of indigenous vegetables. As highlighted by Maunder and Meaker (2007:403) and Weinberger and Msuya (2004) this in turn complemented the nutritional value of basic staple foods at crèches and at the same time increased the consumption of vitamin A-rich vegetables by children.

***Snacks and drinks served to children at crèches***

Table 4.10 reflects a comparison of the snacks that were served to children before and after the intervention.

**TABLE 4.10: SNACKS SERVED TO CHILDREN (n=100)**

SNACKS SERVED	FREQUENCIES	
	PHASE ONE	PHASE THREE
Fruit e.g. banana	63	100
Potato chips	11	0
Sweets	8	0
Biscuits	14	0
Other	30	0

Unhealthy snacks such as sweets, popcorn, imitation juice, biscuits and chips which were served to children in phase one were no longer served in phase three. All the respondents (100) indicated that they were only serving fruit to children as snacks. Observation results revealed that respondents who planted sweet potatoes sometimes served it as a snack. The caregivers cooked the sweet potatoes and then sliced them, giving the slices to the children (see Figure 4.15).



**FIGURE 4.15: SLICED COOKED SWEET POTATOES GIVEN TO CHILDREN AS SNACKS**

It is concluded that most of the respondents understood that it was important to serve healthy snacks such as fruit to children as this also contributed to the application of the dietary guideline “*eat plenty of vegetables and fruits everyday*”. However, it was also noted that, at some crèches, children were still bringing their own snacks such as yoghurt, fruit juice and fruit. No children were seen with unhealthy snacks such as potato chips, popcorn and sweets as happened during phase one. This might mean that parents were also aware of the importance of giving healthy snacks to their children.

These findings suggest that nutrition education succeeded in increasing the respondents’ awareness of healthy, nutritious diets. It also shows that food production has made a significant contribution to the availability of vitamin A-rich vegetables and fruit at crèches. Consequently giving the children more nutritious snacks such as fruit, in turn, improved the children’s consumption of vegetables and fruit and at the same time reduced the intake of fat and sugar from the unhealthy snacks such as sweets and potato chips. These results substantiate the work of Ruel (2003:3911s) who purports that a healthy, high quality diet should contain a limited amount of fat and sugar but also many servings of vegetables and fruit. It was observed that in terms of beverages, the consumption of tea was high during breakfast. In contrast to phase one where the respondents had mentioned serving 100% fruit juices and imitation juices, in phase three no other beverages were being served to the children.

**(ii) Frequency of vegetables and fruit consumption**

As the main purpose of this study was to improve the application of the dietary guideline “*eat plenty of vegetables and fruits everyday*”, it was important to consider the frequency of vegetable consumption. It was also important to ensure an increased daily consumption of

vegetables and fruit (both cultivated and indigenous vegetables) in order to enhance the vitamin A intake of crèche children.

### ***Frequency of vegetables on the menus***

Table 4.11 reflects a comparison of how often children were served vegetables before and after the intervention.

**TABLE 4.11: THE FREQUENCY OF VEGETABLES ON THE MENU (n=100)**

HOW OFTEN ARE CHILDREN SERVED VEGETABLES	FREQUENCIES	
	PHASE ONE	PHASE THREE
Once per week	66	0
Twice per week	24	0
Three times per week	0	15
Four times per week	0	75
Daily	10	10

Although only 10 respondents had vegetables on the menus on a daily basis, an increase in the weekly consumption of vegetables is noted. The majority (75) of the respondents were serving vegetables to the children four times a week. It is remarkable to find that in phase three no respondents (as opposed to 66 previously) were serving vegetables only once a week.

There was improvement in the serving of indigenous vegetables to the children in that this was done far more frequently. The majority of the respondents (62) indicated that they served indigenous vegetables three times per week when they were available, 23 served them four times per week, whereas only two served them once a week in phase one. It is recognised that with the cultivated indigenous vegetables like *muxe* seasonality is still a limiting factor when considering the availability of these vegetables. However, the results are notable in that the progress is principally due to the efforts of the caregivers who sought to increase the availability of less expensive locally produced or gathered vegetables, and promote their inclusion in the menus throughout the week for as long as they were in season.

The respondents reported greater use being made of vegetables on the weekly menu despite the popular views that indigenous vegetables have a low status and were not to be actually served to children in this form as found by Faber *et al.* (2007:411). However, there was slight evidence of change in phase three as indigenous vegetables were also included on the menu. These results give the impression that caregivers were becoming aware of the

importance of eating vegetables and fruit every day, consequently showing an understanding of the value of indigenous vegetables in children’s diet.

The results also showed the contribution made by the vegetable gardens to the availability of vegetables. It could thus be concluded that an increase in the supply of vegetables, through vegetable garden production resulted in increased weekly consumption of vegetables. Moreover, the gardening strategy showed that locally produced vegetables could provide the caregivers with direct access to foods rich in vitamin A, making a valuable contribution to the intake of vitamin A-rich vegetables by children which is what Faber *et al.* (2006:24-26) recommend.

### ***Types of vegetables served***

This study focused on the consumption of vitamin A-rich vegetables and fruit by crèche children. The respondents were asked to specify the type of vegetables they served to children. They also had to indicate whether the vegetables were served raw or cooked for the sake of adding variety to the diet. Phase one results were therefore compared with the phase three results in order to identify if there were changes (see Table 4.12).

**TABLE 4.12: VEGETABLES SERVED TO CHILDREN IN PHASE ONE AND THREE (n=100)**

TYPE OF VEGETABLE	PHASE ONE RESPONSES		PHASE THREE RESPONSES	
	RAW	COOKED	RAW	COOKED
Pumpkin	0	10	0	30
Carrots	5	10	49	89
Yellow sweet potatoes	0	0	0	11
Cabbage	0	71	18	91
Spinach	0	11	0	100
Butternut	0	9	0	14
Muroho (indigenous vegetable)	0	14	0	25
Chinese cabbage	0	25	0	50
Potatoes	0	10	0	0

Cooked and raw vegetables were not seen separately but were grouped together. The reason for this strategy was to check if the respondents were serving the vegetables in different ways. The results from both phase one and phase three showed that a variety of vegetables were on offer and the majority of the respondents served them cooked rather than as raw vegetables. Change happened in phase three as the number of respondents serving raw carrots had increased from 5 to 49, and from zero to 18 in the case of raw cabbage. Although the number of the respondents who served cabbage in phase three

increased from 71 to 91, it is clear that more vitamin A-rich vegetables were being given to the children in phase three than in phase one (see Table 4.12).

As reflected in Table 4.12, 89 respondents, instead of 10, served cooked carrots, 30 instead of 10, served cooked pumpkin and 11 served yellow fleshed sweet potatoes which previously no one was serving. The consumption of spinach was highest in phase three with all the respondents (100) serving it whereas before only eleven did. There was also an increase in the number (25 against 14) of the respondents serving *muroho* and more caregivers were serving Chinese cabbage, an increase from 25 to 50. A general increase in the consumption of dark green as well as yellow vegetables was observed in phase three.

Two-way tables of analysis were used to demonstrate the difference between phase one and phase three results. Each vegetable served was analysed and compared separately to see if there was a significant improvement in the number of respondents who served a particular vegetable to the children in phase three. The tables indicated the extent of change by showing the number of respondents who changed and those who remained not serving the vegetable. For example, Table 4.13 below shows that only 10 respondents served carrots in phase one. However, phase three results showed that 89 instead of 10 respondents now did serve carrots. This means that of the 90 respondents who were not serving carrots in phase one, 79 changed to serving this vegetable and only 11 remained not serving carrots.

To determine if the changes was statistical significant, McNemar’s test was performed and indicated a significant change ( $p\text{-value} < 0.05$ ). Table 4.13 gives amongst others carrot as an example, however the same holds for butternut, *muroho* and pumpkin ( $p\text{-value} < 0.05$ ) (see Addendum H).

**TABLE 4.13: THE DIFFERENCE OF CARROTS SERVED IN PHASE ONE AND THREE (n=100)**

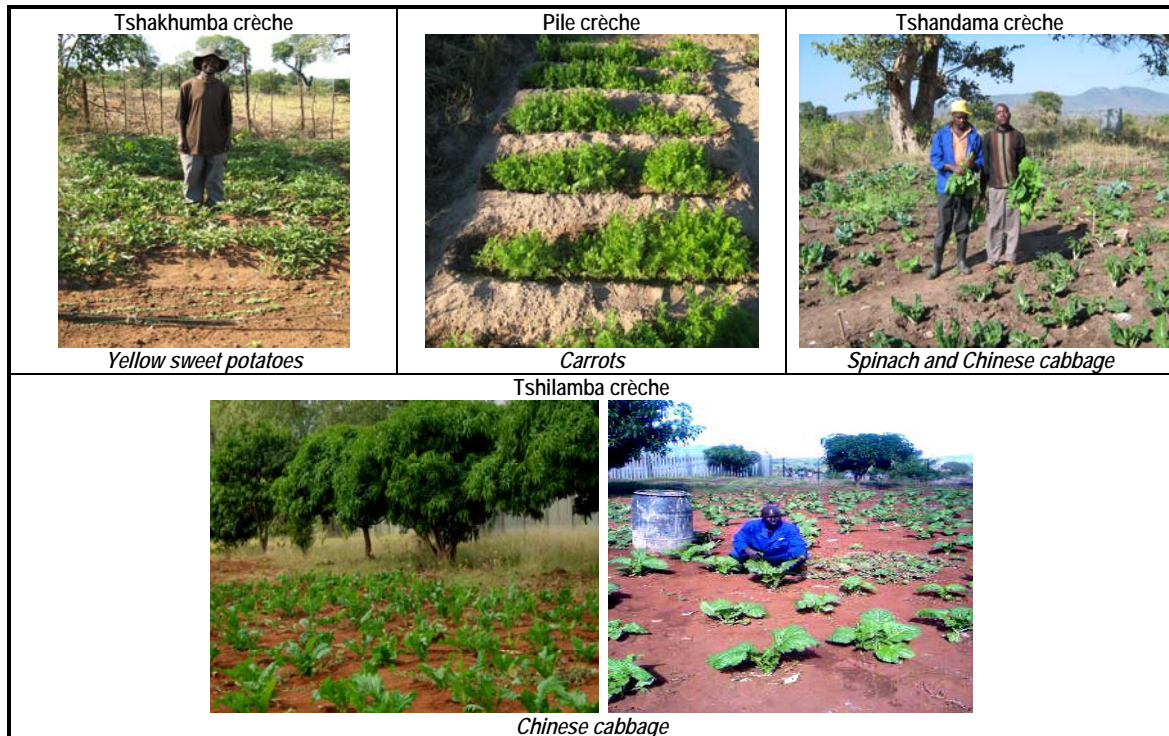
PHASE ONE	PHASE THREE		
	Carrots served (NO)	Carrots served (YES)	Total
Carrots served (NO)	11	79	90
Carrots served (YES)	0	10	10
Total	11	89	100

Statistics for Table 4.13

McNemar's Test	
Statistic (S)	79
DF	1
Pr > S	<.0001



From these results it can be concluded that there was a significant improvement in the number of the respondents who were serving vitamin A-rich vegetables in phase three and this was seen to be so during site visits to the crèches. It was also noted that the number of the respondents serving vitamin A-rich vegetable had increased as a result of the availability of these vegetables in crèche gardens. Figure 4.16 shows the vegetable gardens at different crèches.



**FIGURE 4.16: VITAMIN A VEGETABLE GARDENS AT CRECHES**

It is clear that crèche gardens played a role in vegetable consumption. This is in line with studies done by others (Helen Keller International, 2003a; Ruel & Levin, 2000; Engelberger *et al.*, 2003; Cervinkas & Lotfi, 1996) who maintain that a strong nutrition education component together with the production of yellow and dark green vegetables may not only provide direct access and increased year-round availability of vitamin A-rich vegetables and fruit but also improves the consumption of beta-carotene by children.

In comparison with phase one, phase three results showed a greater acceptance of cultivated vegetables where all the respondents indicated that children enjoyed the vegetables served to them. No respondent reported that the children only liked the vegetables they were served sometimes (see Table 4.14).

**TABLE 4.14: CHILDREN’S LIKING OF VEGETABLES (n=100)**

RESPONSES	CULTIVATED VEGETABLES		INDIGENOUS VEGETABLES	
	PHASE ONE	PHASE THREE	PHASE ONE	PHASE THREE
<i>Yes</i>	73	100	53	82
<i>No</i>	0	0	32	8
<i>Sometimes</i>	27	0	15	10

Table 4.14 reflects an increase in the children liking indigenous vegetables in phase three from 53 to 82. Only eight instead of 32 indicated that their children did not like these vegetables while 10 respondents indicated that children only liked to eat indigenous vegetables sometimes.

In response to the question why children liked vegetables, the respondents intimated that the ways in which vegetables were cooked explained why children liked the vegetables more in phase three than in phase one. They were now adding soup or meat stock to some vegetable dishes which increased the children’s appreciation for both cultivated and indigenous vegetables more. This was confirmed by watching the children enjoy the vegetables that were cooked like this. Figure 4.17 shows the photographs of crèche children really enjoying their lunch of porridge and spinach to which minestrone soup was added to enhance the flavour.



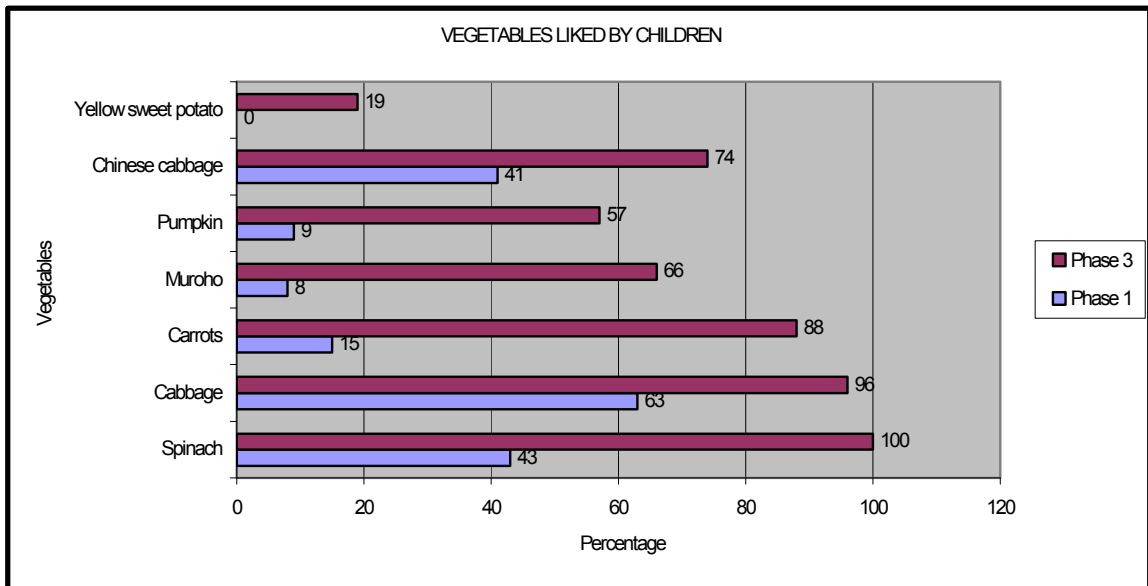
**FIGURE 4.17: CHILDREN ENJOYING PORRIDGE WITH SPINACH FROM THE CRÈCHE GARDEN**

In terms of eating indigenous vegetables, results in phase three showed that no respondents reported that the children refused to eat or that they did not like the taste of indigenous vegetables. Although the results signify an improvement in the consumption of indigenous vegetables, there were some respondents who still maintained that their children were not eating these vegetables because parents did not want their children to eat them.



### Vegetables children liked to eat

The respondents were asked to specify the vegetables that their children liked to eat. In phase one cabbage was the most popular vegetable (63%). Although cabbage was still enjoyed by most (96%) in phase three, there was a higher preference for spinach (100%), followed by carrots (88%), Chinese cabbage (74%), *muroho* (66%), pumpkin (57%) and yellow sweet-potato (19%). In comparison with phase one, phase three results shows improvement in children liking both cultivated and indigenous vegetables, amongst which were vegetables particularly rich in vitamin A (see Figure 4.18).



**FIGURE 4.18: VEGETABLES LIKED BY CHILDREN**

The extent of change in children’s liking of these vegetables in phase three was further tested to determine if it was statistically significant. McNemar’s test demonstrated a positive statistical significant change ( $p\text{-value} < 0.05$ ) in the percentage of the respondents who recorded the children’s liking of vegetables (see Addendum H). Table 4.15 shows that the increase in children’s liking of vegetables in phase three is significant by indicating the  $p$ -values of each.

**TABLE 4.15: VEGETABLES LIKED BY CHILDREN (n=100)**

VEGETABLES LIKED BY CHILDREN	PHASE ONE FREQUENCY	PHASE THREE FREQUENCY	P-VALUE
Pumpkin	9	57	0.0001
Muroho	8	66	0.0001
Carrots	15	88	0.0001
Cabbage	63	96	0.0001
Spinach	43	100	0.0001

These results confirmed that respondents were preparing vegetables in phase three in a way that appealed to the children more. For example, children enjoyed the vegetables to which minestrone soup had been added. From the results it can be said that through gardening and adapting preparation methods, there was a higher consumption of dark green leaves and yellow/orange fleshed vegetables by crèche children in phase three. The conclusion can thus be drawn that nutrition education, in conjunction with vegetable gardening activities, not only resulted in an increase in the overall accessibility and availability of vitamin A-rich vegetables but also improved crèche children's consumption of vegetables.

#### ***Types of fruit served***

The same kinds of fruit (namely, banana, apples, oranges and avocados) were served to children in phase three as in phase one. However, there was an increase in the number of respondents who served fruit to children in phase three. Contrary to the situation in phase one where the majority served apples, in phase three the majority (85) of the respondents served bananas. This could be that bananas were readily accessible and are available in the area all the year round. Though there was an increase (to 65 from 15) in the number of respondents who served oranges in phase three, their availability was also affected by seasonality. The findings also revealed that the number of caregivers who served avocados increased from 3 to 51 and those who served apples also increased from 31 to 59 (see Table 4.16).

**TABLE 4.16: FRUIT SERVED TO CHILDREN AT CRECHES (n=100)**

TYPE OF FRUIT SERVED	PHASE ONE RESPONSES	PHASE THREE RESPONSES
Orange	15	65
Banana	26	85
Apple	31	59
Avocado	3	51

The observation on fruit consumption showed that a variety of fruit was available; however, the kind of fruit consumed was dependent on the season. Fruit high in vitamin A such as

mangoes, paw-paws and peaches can be grown easily by crèches and during a good season fruit is abundant and obtained easily from households or cheaply at the local market. However, results showed that these fruit were not served to the children in both phases. The reason for not serving peaches and paw-paws could be limited availability as well as seasonality. But mangoes were not served because caregivers still believe that children could eat mangoes from home as almost every household has mango trees in their yards.

#### 4.5.1.2 Availability and accessibility of vegetables and fruit

##### (i) Availability of vegetable gardens at crèches

There was an increase (from 39 to 89) in the number of the respondents who had vegetable gardens in phase three, which means that the respondents who did not have vegetable gardens at their crèches in phase one were now having them (see Table 4.17).

**TABLE 4.17: AVAILABILITY OF VEGETABLE GARDENS AT CRÈCHES (n=100)**

AVAILABILITY OF A GARDEN	PHASE ONE RESPONSES	PHASE THREE RESPONSES
Yes	39	89
No	61	10

These results implies an increase in the presence of vegetable gardens at crèches which is very important in this study because it would consequently contribute to increased accessibility of vegetables as well as the consumption thereof by crèche children. Only 10 respondents indicated that they did not have gardens and, as observed, these were the respondents who did not have water supply. The reasons for not having vegetable gardens declined, as reasons such as lazy gardener, no space, no funds and not knowing how to make or take care of the garden were not given in the later questionnaire. However there were some few respondents (10) who reported the absence of a fence and lack of water as reasons for not having vegetable gardens.

Although not all the newly established vegetable gardens flourished, the results reflect that the respondents had gained knowledge and skills on how to cultivate vegetables. It was observed that those who operated from a hired facility, such as the church, were also establishing vegetable gardens. Therefore the decline in the number of respondents who did not have a vegetable garden can be attributed to the training they received in phase two. The observation made was that, out of the 20 crèches in this study, only 3 crèches remained without vegetable gardens.

### ***Kinds of vegetables and fruit trees available at crèche gardens***

Table 4.18 illustrates the kind of fruit trees and vegetables that were planted at different crèches in phase one and three. The results showed that in phase three there was an increase in the number of the respondents who planted vegetables. The number of the respondents who planted spinach increased from 34 to 90 followed by Chinese cabbage (90), then carrots (86) and pumpkin (84). It was remarkable to see that some vitamin A-rich vegetables such as yellow sweet potatoes, green beans and *muxe* that were not cultivated in phase one were now being planted by the majority of respondents. For instance 79 respondents planted *muxe*, 20 green beans and 63 planted yellow sweet potatoes. Of the vegetables that were cultivated all, except for cabbage, tomatoes and beetroot, are rich in vitamin A. These results are considered important as it could contribute to improving the application of a dietary guideline “*eat plenty of vegetables and fruits everyday*”.

**TABLE 4.18: VEGETABLES AND FRUIT TREES THAT WERE PLANTED (n=100)**

VEGETABLES PLANTED	RESPONSES		FRUIT TREES PLANTED	RESPONSES	
	PHASE 1	PHASE 3		PHASE 1	PHASE 3
Spinach	34	90	Mango	16	76
Chinese cabbage	18	90	Banana	6	43
Cabbage	16	32	Orange	6	6
Yellow sweet potatoes	0	63	Paw-paw	6	38
<i>Muxe</i> (African Night shade)	0	73	Avocado	6	80
Green beans	0	20	Guava	11	17
Carrots	9	86	Peaches	0	4
Pumpkin	17	84	Other ( <i>Muhuyu</i> )	5	5
Other (Tomatoes)	6	6	Other (Granadilla)	5	11
Other (Beetroot)	6	6	Other (Sugar-cane)	6	6

As opposed to phase one, in phase three all the crèches had fruit trees in their yards. To confirm the availability of fruit trees the respondents had to indicate the fruit trees that were planted at their crèches by choosing from a list of fruit trees that was provided. It was remarkable to see an increase in the number of respondents who now had vitamin A-rich fruit trees (see Table 4.18). Although there was an increase in the number of respondents having fruit trees, it will take a while before these fruits can be served to children. Meanwhile the respondents relied on buying from the local market.

Vegetable gardens were observed at different stages of production. The respondents were observed when they prepared their gardens for cultivation, when the vegetables were planted, while they were growing and when they were harvested ready for the children to eat. The photographs below of newly established vegetable gardens were taken at different crèches and they provide evidence to the existence of vegetable gardens. However, it was

observed that shortage of water and fencing were the limiting factors in some of these gardens.



**FIGURE 4.19: NEWLY ESTABLISHED VEGETABLE GARDENS**

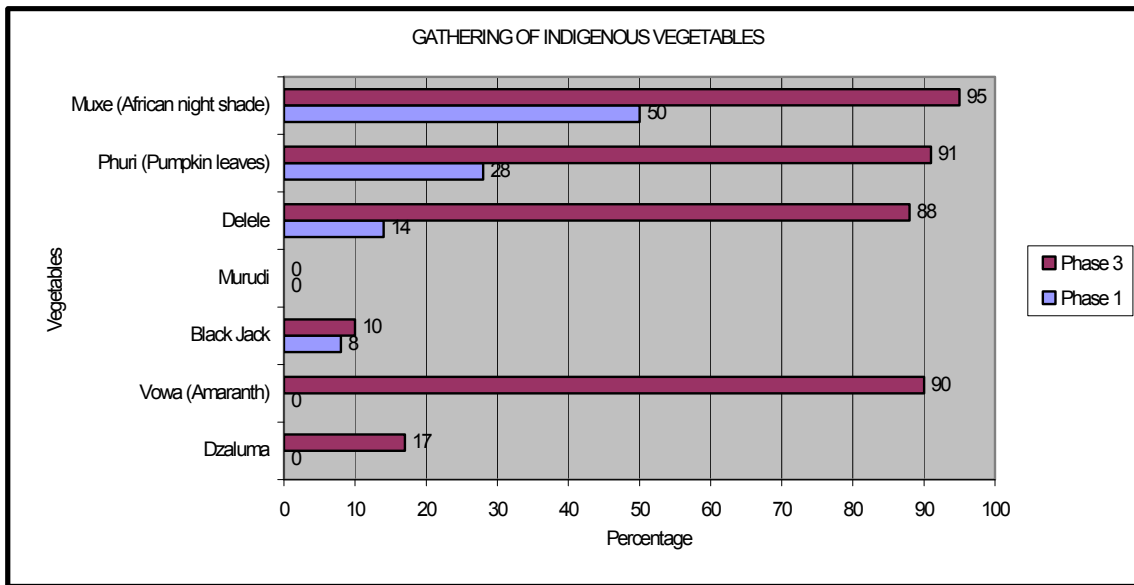
**(ii) Gathering of indigenous vegetables and fruit**

***Accessibility of indigenous vegetables***

Gathering vitamin A-rich indigenous vegetables as an alternative to cultivated vegetables was emphasised in phase two of the study. Results from phase three show an increase in the number of the respondents (from 70 to 96) who gathered indigenous vegetables. Even though these vegetables are highly seasonal, results reveal that when they were in season caregivers gathered and prepared them for the children. That indigenous vegetables were gathered was confirmed through scrutiny of the written menus. Results showed that only four respondents had not gathered indigenous vegetables during phase three.

With regard to indigenous vegetables gathered, phase three results show an increase in the number of the respondents who gathered a particular type of indigenous vegetable. For example, change is evident as 95% versus 50% gathered *muxe*, 91% *phuri* and 88% *delele* (jute mallow) whereas before the percentages were 50%, 28% and 14% respectively. The

results show considerable improvement in that some vitamin A-rich indigenous vegetables such as *dzaluma* (17%) and amaranth (90%) which were not gathered in phase one but were gathered in phase three (see Figure 4.20).



**FIGURE 4.20: GATHERING OF INDIGENOUS VEGETABLE (n=100)**

The results in Figure 4.20 indicate an increase in the number of the respondents who gathered indigenous vegetables. Two-way tables were used to compare the results of phases one and three to illustrate the differences between them and McNemar’s test (see Addendum H) was used to determine if the change was statistically significant or not. The change was considered significant as the results showed evidence of a statistically significant change ( $p\text{-value} < 0.05$ ) to vegetables such as *delele*, *muroho* and *muxe*. However, some results showed no statistical significance ( $p\text{-value} > 0.05$ ), as for black jack (see Table 4.19).

**TABLE 4.19: THE GATHERING OF INDIGENOUS VEGETABLES (n=100)**

VEGETABLES	PHASE ONE RESPONSES	PHASE THREE RESPONSES	P-VALUE
Muxe	50	95	0.0001
Phuri (muroho)	28	91	0.0001
Delele	14	88	0.0001
Black jack	8	10	0.5271

An increase in the number of respondents gathering indigenous vegetables suggests that the crèche children were eating vitamin A-rich indigenous vegetables and what was encouraging was the observation that these changes were also supported by an increase in the frequency



of intake of these vegetables. Table 4.20 details these results and draws attention to the location of production.

**TABLE 4.20: PLACES WHERE TRADITIONAL VEGETABLES WERE OBTAINED (n=100)**

PLACE	PHASE ONE	PHASE THREE
Backyard	20	85
Bush	0	6
Field	53	90
Supermarket	6	0
Open market	28	75

There was an increase in the number of respondents who obtained vegetables from the crèche's backyard, the fields and or bought at the open market. Those who gathered from the bush increased from zero to six. The number of those who bought from the supermarket dropped from six to zero (see Table 4.20). This proves that the respondents were opting for cheaper ways of getting indigenous vegetables.

Observations showed that the respondents who recorded that they gathered the vegetables from the fields were gathering those that grow naturally as weeds adjacent to other cultivated crops. Those who indicated obtaining from backyards were referring to vegetables that grow naturally or to domesticated indigenous vegetables such as *muxe*. It was also observed that while the majority of all cultivated vegetables could be purchased from the market, the majority of indigenous vegetables were gathered from fields or the backyards. However it was seen that not all indigenous vegetables served at crèches were gathered but also bought from the open market.

#### ***Accessibility of indigenous fruit***

Phase three revealed that very few respondents engaged in gathering indigenous fruit. As opposed to phase one, six instead of five respondents indicated that they gathered *mahuyu* (wild figs). No respondent stipulated gathering fruit such as *pfuka* and *mazwilu* as was being done prior to the phase one survey. The fact that the number of the respondents gathering indigenous fruit in phase three was less than the earlier period was not surprising as these fruits are hard to get. Beside the fact that they are scarce and highly seasonal, another reason for not gathering them could be that these fruits were not promoted enough as a result of lack of knowledge about their nutritional value. From observation these fruits were seen to still not being part of the more recent menus. It was also observed that the scarcity of these fruits was due to environmental deterioration as a result of deforestation.

Unavailability of seeds and seedlings also contributed to scarcity of these fruits as they could not be planted. These results uphold the ideas of Nebel *et al.* (2006:341) and Grivetti and Ogle (2000:31) who maintain that there is a decline in the knowledge and use of wild plants.

#### **4.5.1.3 Utilisation of vegetables and fruit rich in vitamin A**

The respondents were required to indicate how they were preparing, storing and preserving vegetables. They also had to explain how they were planning their menus.

##### **(i) Menu planning**

Phase three results showed an increase in the number of respondents (83 versus 62) who were following their own written menus. There was a decline from 25 to 17 respondents who followed the menu compiled by the Department of Health. In contrast to phase one, paying attention to menu planning practices revealed that the respondents had gained knowledge as their menus included a variety of foods. The main improvement noticed was that fruit or vegetables were part of every meal. This is in line with Barker *et al.* (2005:51), who suggest that a week's menu must be planned to ensure the inclusion of a variety of vegetables and fruit and that it must provide interesting combinations of different flavours, textures and colours. The progress made with regard to menu planning was as a result of the respondents' training during the intervention phase of the study. Thus the respondents no longer relied on the Department of Health to provide them with a written menu.

Phase three results showed that all the respondents were trained on how to plan a menu and prepare food which was not the case during the first survey. In terms of who trained them, the results did not differ in the two phases. However, 80 respondents chose the *other* option and indicated that they had been trained by the researcher.

##### **(ii) Purchasing**

As in phase one the responsibility of choosing and purchasing food rested with the respondents themselves and they could get what was planned on the menus or had the authority to adapt it to accommodate supply. In terms of obtaining the vegetables the results showed that the respondents generally bought from the local market and supermarket as well as using vegetables from the crèche gardens. Initially only 11 respondents used vegetables from the crèche gardens but phase three results showed that 51 respondents used their own produce. A change in terms of using their own produce was evident in phase three.



To determine if the change was statistically significant the results of the two phases were presented on a two-way frequency table (see Table 4.21) and McNemar's test was applied. The results were proven to have been statistically significant ( $p$  value $<0.05$ ) (see Addendum H).

**TABLE 4.21: PHASE ONE AND THREE USE OF OWN VEGETABLES (n=100)**

PHASE ONE	PHASE THREE		
	Use own produce (NO)	Use own produce (YES)	Total
Use own produce (NO)	49	40	89
Use own produce (YES)	0	11	11
Total	49	51	100

There was an increase in the number of caregivers who were using vegetables from the crèche gardens. This was also verified by an increase in the number of respondents who indicated that they were buying vegetables only once a month because they were also using vegetables from their gardens (see Table 4.22).

**TABLE 4.22: FREQUENCY OF PURCHASING VEGETABLES AND FRUIT (n=100)**

VEGETABLES	PHASE ONE FREQUENCY OF RESPONSES	PHASE THREE FREQUENCY OF RESPONSES
Daily	5	0
Every second day	4	20
Once a week	87	32
Once a month	4	48

Using their own vegetables contributed to stretching the crèche budget and even, more importantly, improving the consumption of vitamin A-rich vegetables and fruit by crèche children. These results substantiate the findings by Faber *et al.* (2006:24-26) who aver that advocacy, information, education and training are important when encouraging increased consumption of vitamin A-rich food. It can thus be said that the implemented nutrition strategy of food production was bearing some fruit in this study area.

### **(iii) Preparation of vegetables and fruit**

The respondents were also taught how to prepare vegetables. For example, they were taught that they should wash vegetables before cutting them up because washing vegetables after cutting resulted in certain nutrients leaching into the water. On watching the respondents engaging in food preparation it was clear that they were opting for healthier practices when preparing vegetables. For example they would wash vegetables such as

spinach and Chinese cabbage before cutting. The photograph below (Figure 4.21) shows a caregiver washing spinach from the crèche garden.



**FIGURE 4.21: A CAREGIVER PREPARING SPINACH BEFORE COOKING**

The researcher shares the opinion of Faber *et al.* (2006:24-26) that introducing caregivers to food preparation techniques, providing them with nutrition information and encouraging the adoption of more healthy dietary habits can be beneficial for the health of children.

Phase three results showed that all respondents specified boiling, steaming and frying as the methods they used to cook vegetables as was the case in phase one and no other cooking methods were used. However, from observation it was noticed that cooking methods were dependent on the type of vegetable being cooked. For example, Chinese cabbage, sweet potatoes and *muxe* were boiled while cabbage and sweet potato leaves were fried. Although the respondents mentioned steaming as one of the methods that they used, this method was not actually seen in practice and it was concluded that this method was not really applied in practice.

Respondents were given vitamin A recipes during the intervention phase. As a result of this intervention, in phase three there was an increase (83) in the number of caregivers who were using recipes when preparing the vegetables. In phase three only 17 were not using recipes whereas in phase one as many as 73 respondents were not doing so.

As was happening in phase one, additive ingredients were used to enhance the flavour of the vegetable dishes but, as a result of nutrition education and training, phase three results reflected an improvement in the types of additives that were used (see Table 4.23). For example, there was a decrease (from 30 to zero) in the use of bicarbonate of soda. There was a noticeable increase in the use of additives that improved the nutritional value of

vegetables, such as the addition of oil to vegetables as a method that is known to enhance the absorption of vitamin A by the body.

**TABLE 4.23: ADDITIVES ADDED TO THE VEGETABLES (n=100)**

WHAT WAS ADDED	PHASE ONE RESPONSES	PHASE THREE RESPONSES
Bicarbonate of soda	30	0
Salt	100	100
Curry	24	0
Oil	75	100
Peanut butter	14	35
Grounded peanuts	5	42
Minestrone soup	24	80
Tomatoes	35	55

Regarding the use of additives, McNemar's statistical tests were applied to the raw data to determine the statistical significant of the difference. Results showed no statistical significant changes ( $p\text{-value} > 0.05$ ) (see Addendum H).

The respondents had to indicate what they were doing with the excess cooking water. In contrast to phase one not one respondent suggested throwing it away. All the respondents disclosed that they were using the excess water either in soups or adding it to the children's porridge. This implies that the respondents now knew that throwing excess cooking water away means throwing away the valuable nutrients that had dissolved in the water.

#### **(iv) Storage of vegetables and fruit**

Change was evident in phase three regarding the manner in which the respondents were storing their surpluses. As reflected in Table 4.24, 69 versus 49 respondents indicated that they were storing the vegetables in cool places, 50 versus 30 were using a refrigerator and six were blanching and drying the vegetables and then storing them as dried vegetables for future use. In phase three vegetables were not frozen or stored on the floor as was done in phase one. However, 26 respondents pointed out that they still never had a surplus and 5 were using vegetable racks.

**TABLE 4.24: STORING SURPLUSES AND LEFTOVERS (n=100)**

STORING OF SURPLUSES	PHASE ONE RESPONSES	PHASE THREE RESPONSES
In cool place	49	69
In refrigerator	30	50
In racks	5	5
In freezer	10	0
Other (on floor in cool place	13	0
No surpluses	26	26
STORING OF LEFTOVERS	PHASE ONE RESPONSES	PHASE THREE RESPONSES
Freeze	11	11
In refrigerator	37	58
In containers	5	0
Throw away	19	0
No leftovers	34	31

With regard to storing leftovers phase three results showed that 11 respondents were still freezing the leftovers. On the other hand, 58 were using the refrigerator whereas before only 37 respondents were doing this. The number of respondents with no leftovers dropped and not one was throwing leftovers away or using containers to store them (see Table 4.24). Following the suggestion by Faber *et al.* (2006:31) that it is better not to store cooked vegetables but to use them all, it is recommended in this study that the caregivers should buy or harvest just enough for complete use for one meal.

**(v) Preservation of vegetables and fruit**

Preserving vegetables was an important issue in this study as it could help to ensure the availability of vegetables in off-season times. Phase three results showed that 36 respondents instead of zero in phase one were drying vegetables when they were plentiful. Though the number of those who were preserving vegetables was still considered low, it was considerable, as it was something that had not been done before or recorded as a method for storing vegetables in phase one.

These findings reveal that, after training the caregivers about the importance of preserving vegetables, some respondents applied the strategy and this contributed to extending the availability of vegetables all year round. No other method of preserving vegetables was used. Observation showed that only the respondents who had large vegetable gardens at their crèches were preserving the vegetables. It was noticed that vegetables such as spinach, *muxe*, and Chinese cabbage were preserved. These vegetables were first blanched, placed on a flat corrugated iron sheet and then put in the sun to dry. As the drying of vegetables was a new practice for caregivers, the dried vegetables were cooked and served to see if children

would prefer them. The following photograph (Figure 4.22) shows a plate of cooked dried spinach to which tomatoes were added as served to children at one of the crèches.



**FIGURE 4.22: COOKED DRIED SPINACH**

#### **4.5.1.4 Nutrition knowledge**

The respondents were also reassessed on their nutrition knowledge. Their knowledge of vitamin A and vitamin A-rich vegetables and fruit, the importance of fruit and vegetable consumption by children as well as the importance of vitamin A to children were reassessed.

##### **(i) Children's consumption of vegetables and fruit**

The results show that in phase three all the respondents (100 opposed to 93 previously) agreed that children should eat vegetables and fruit. Moreover, they agreed that, if they were available, fresh vegetables were the best choice for the preparation of meals for the children. Not one respondent in phase three felt that children should only eat vegetables and fruit sometimes, nor did anyone say that tinned vegetables were the best way of eating vegetables (see Table 4.25). These results suggest that nutrition education and training of the caregivers in phase two contributed to their awareness of the importance of eating fresh vegetables, and perhaps of the consequences of not eating vegetables and fruit every day.

With regard to why children should be encouraged to eat vegetables and fruit, the respondents in phase one reflected only general knowledge about the issue. They gave vague or non-specific reasons as to why the consumption of vegetables should be encouraged during childhood. Furthermore they showed little understanding and awareness of what the consequences could be if children did not eat vegetables and fruit regularly. In phase three, results showed that most of the respondents had some specific knowledge as

they gave more nutrition-related than general health reasons (see Table 4.25), when answering this question.

**TABLE 4.25: KNOWLEDGE OF THE IMPORTANCE OF VITAMIN A AND VEGETABLES AND FRUIT CONSUMPTION (n=100)**

QUESTION	RESPONSE	FREQUENCIES	
		PHASE ONE	PHASE THREE
Should children eat vegetables and fruit?	Yes	93	100
	No	0	0
	Sometimes	7	0
If available, what is the best form of vegetable to give to children?	Frozen	0	0
	Tinned	7	0
	Fresh	93	100
What will happen if children do not eat vegetables and fruit?	They will have poor health	78	0
	They are at risk of disease	67	100
	Poor growth and development (Growth faltering)	44	23
	Weak immune system	17	57
	Increased early childhood deaths	4	63
	Lack of vital nutrients(nutrient deficiency)	34	81
Why is Vitamin A important?	Prevent growth faltering	26	99
	Increase resistance to diseases	52	100
	Prevent eye diseases and blindness	23	100
	Decrease child mortality	15	98

As is apparent from the data presented in Table 4.25, phase three results signify an increase in the number of respondents who knew what could happen if children did not eat vegetables and fruit. Caregivers' knowledge certainly changed for the better as is evident in phase three results that show that all the respondents (100) identified that children who did not eat vegetables and fruit were at risk with regard to the possibility of contracting diseases. In the phase one survey only 67 were aware of this. It was remarkable to realize that general health reasons such as poor health that were mentioned by the majority (78) in phase one were not given as a response in phase three. Further statistical tests were performed to see if there was significant improvement in the respondents' knowledge of what could happen if children did not eat vegetables and fruit. A two-way frequency table was used to illustrate the difference in the respondents' knowledge level between phase one and phase three results.

The responses were analysed separately before and after the intervention to determine whether there was a change in the respondents' knowledge of specific consequences of not eating vegetables and fruit. These are given in Table 4.26 which shows the responses to the question of whether not eating vegetables and fruit could cause nutrient deficiency. The change in the respondents' knowledge is illustrated by indicating the number of those who knew (yes) and those who did not know (no) that not eating vegetables and fruit could result in lack of vital nutrients in the body.

Confirming this trend are the results on this issue in phase one where only 34 respondents knew that not eating vegetables and fruit could result in nutrient deficiency, but in phase three 81 respondents knew. A positive change is evident in phase three in that, out of the 66 who did not know in phase one, phase three showed that 54 changed from not knowing to knowing and only 12 remained not knowing. Of the 34 who knew in phase one, only seven changed from knowing to not knowing and 27 remain saying they know that not eating vegetables and fruit could result in nutrient deficiency. McNemar's test showed a statistically significant difference ( $p\text{-value} < 0.05$ ) between phase one and phase three (see Addendum H). Thus it is clear that the caregivers seemed to have gained knowledge about the importance of eating vegetables and fruit, thus providing evidence of the success of the nutrition education programme implemented in phase two.

**TABLE 4.26: NOT EATING VEGETABLES AND FRUIT AND NUTRIENT DEFICIENCY (n=100)**

PHASE ONE	PHASE THREE		
	Will cause nutrient deficiency (NO)	Will cause nutrient deficiency (YES)	Total
Will cause nutrient deficiency (NO)	12	54	66
Will cause nutrient deficiency (YES)	7	27	34
Total	19	81	100

Although there were positive changes in the respondents' knowledge in phase three, unfavourable results were also identified. There was a statistically significant difference ( $p\text{-value} < 0.05$ ) in the number of respondents who indicated that the growth of children who did not eat vegetables and fruit would not falter (see Addendum H). But it was, however, disappointing to see that the difference (an increase from 56 to 77) was in a negative direction, which of course was contrary to the dominant trend of the positive effect of the training intervention. The results showed that 27 of the respondents who indicated in phase one that children's growth would be affected negatively if they did not eat vegetables and fruit changed to saying that children's growth will not be affected (see Table 4.27).

**TABLE 4.27: NOT EATING VEGETABLES AND FRUIT AND GROWTH FALTERING (n=100)**

PHASE ONE	PHASE THREE		
	Growth will be affected (NO)	Growth will be affected (YES)	Total
Growth will be affected (NO)	50	6	56
Growth will be affected (YES)	27	17	44
Total	77	23	100



### ***Fruit portions***

Though the portion size of a helping of fruit and/or vegetables was not actually measured, changes were evident in the size of the portion of fruit served to the children in phase three. Phase three results revealed that different portion sizes were served to children according to their age. As opposed to phase one, younger children were served smaller fruit portions and older children were served a bigger portion. For example, the one year old children who were served a whole fruit that they could hardly finish were now served half a fruit instead, as recorded in phase three. The three year olds who were served half a fruit were now served the whole fruit. It is evident from the results that the number of respondents who initially indicated that they were not serving fruit to children decreased from 43 to only 6. In phase one only 10 respondents instead of 30 indicated that they were not serving fruit to the children aged six to ten month old. Another 28 respondents working with the six year olds said they were not serving fruit to these children but this situation changed and all caregivers were serving fruit to these children in phase three.

There was also a decrease in the number of missing responses, which could mean that more respondents were serving fruit to the children. For example, there were 61 missing responses in phase one regarding the question of serving fruit to the six to ten month olds, and there were not any in phase three. Judging by the number of respondents who responded to this question in phase three, it can be assumed that there was an increase in the number of children who were served fruit at the crèches.

### ***Vegetable portions***

The portion sizes of vegetables served to children at crèches were all the same as in phase one. However, there was an increase in the number of respondents (32 versus 2) who were serving vegetable soup to the six month old children. Not one respondent reported not serving vegetables to children at all. The number of those who were not serving vegetables dropped from 42 to zero. Through observation the researcher realised that even though all the respondents had indicated that they were serving vegetables to the children, at times during the visits at crèches, some respondents were still not serving vegetables to younger children, the six to ten months age group.

Generally as was the case in phase one, children were served bigger food portions and they were expected to finish their plate of food no matter how big the portion was. The photograph below (Figure 4.23) bears evidence of the portion size of vegetable that was served to children in one of the crèches in this study.





**FIGURE 4.23: THREE YEAR OLD CHILDREN EATING PORRIDGE AND SPINACH AT THE CRÈCHE**

**(ii) The importance of vitamin A to children**

The results provide evidence of an improvement in the respondents' knowledge of the importance of vitamin A to children. Compared to phase one, phase three results as reflected in Table 4.25 show that 99 versus 26 respondents knew that vitamin A can prevent growth faltering, while 98 instead of 15 responded that vitamin A can decrease child mortality and all (100) versus 23 knew that vitamin A could prevent eye diseases. All the respondents versus only 52 previously indicated that vitamin A increases resistance to disease. Overall phase three results provide evidence that the majority of the respondents knew the importance of vitamin A to children. These significant findings could be ascribed to the nutrition education that the respondents received in phase two of the study.

The game was also used to re-assess the respondents' nutrition knowledge. In terms of the importance of vitamin A and the symptoms related to vitamin A deficiency, the respondents could give three to four correct answers instead of one out of five as happened during phase one. This confirms that there was an improvement in the respondents' knowledge in phase three.

**(iii) Knowledge of vegetables and fruit rich in vitamin A**

Figure 4.24 illustrates a comparison between phase one and phase three results regarding the respondents' knowledge of vitamin A-rich vegetables and fruit. As a result of nutrition education the respondents' knowledge of vitamin A-rich vegetables and fruit had improved considerably in phase three. The respondents were able to associate all the green, yellow- and orange-coloured vegetables and fruit with vitamin A. There was a decrease in the

number of the respondents who chose the vegetables and fruit which are poor in vitamin A. Therefore all the respondents knew that yellow/orange sweet potatoes, mangoes, *muroho*, carrots, pumpkin, avocados, spinach and paw-paw are rich in vitamin A. The respondents did not list white sweet potatoes, beetroot and litchi as containing vitamin A, nor did any respondent mention vegetables and fruit that are not rich in vitamin A in the *other* option.

In phase three, all the respondents only named vegetables and fruit that are rich in vitamin A in the *other* option. The absence of the respondents who mentioned other vegetables that are not rich in vitamin A suggests that nutrition education has contributed beneficially to the caregivers' knowledge of vitamin A-rich vegetables and fruit. From the results it is evident that the respondents had gained more knowledge with regard to vegetables and fruit rich in vitamin A and the change is noteworthy. Although the majority of the respondents showed an improvement in their knowledge of vitamin A-rich vegetables and fruit there were respondents who still chose fruit or vegetables that are not rich in vitamin A such as oranges (25) and cabbage (11) (See Figure 4.24).

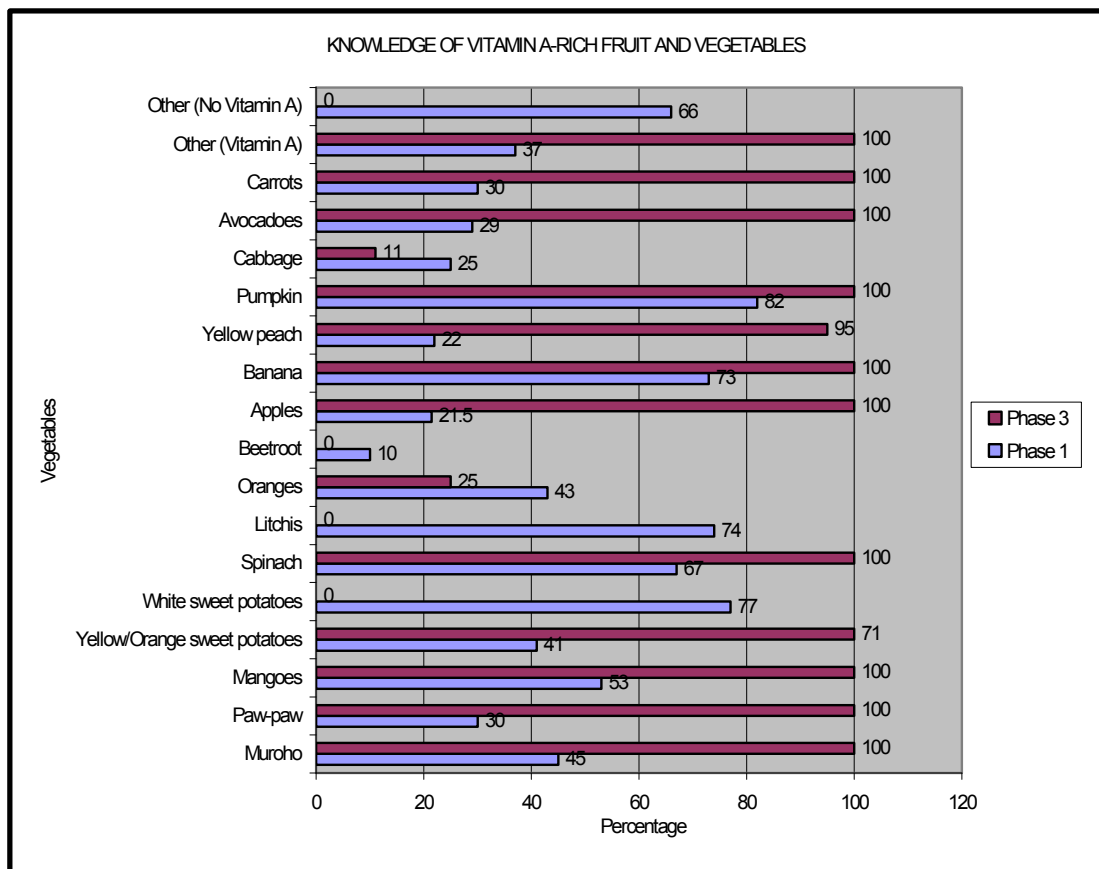


FIGURE 4.24: KNOWLEDGE OF VITAMIN A-RICH VEGETABLES AND FRUIT (n=100)

McNemar’s test was performed to determine if the change was significant. The results were found to be statistically significant ( $p$  value $<0.05$ ) (See addendum H). Table 4.28 shows the difference in the respondents’ knowledge of vitamin A-rich vegetables and fruit and the  $p$ -values thereof.

**TABLE 4.28: KNOWLEDGE OF VITAMIN A-RICH VEGETABLES (n=100)**

VEGETABLES	KNOWLEDGE OF VITAMIN A-RICH VEGETABLES		
	PHASE ONE RESPONSES	PHASE THREE RESPONSES	P-VALUE
Carrots	30	100	0.0455
Spinach	67	100	0.0046
Muroho	45	100	0.0001
Yellow sweet potatoes	41	100	0.0001

The results of the game played as a means to collecting data also confirmed an increase in the nutrition knowledge of the respondents as they were giving more correct answers to the same questions that were asked in phase one. The highest score was four out of five and some respondents scored five out of five. With regard to the question on the colour of vitamin A-rich vegetables and fruit, the caregivers were scoring better in phase three than they were in phase one and the majority were relating yellow and dark green colour with vegetables rich in vitamin A. From these results, it can be concluded that the nutrition education improved the respondents’ knowledge of vitamin A-rich vegetables and fruit. The fact that there was an improvement in the caregivers’ knowledge supports the views of Krige and Senekal (1997:22) and Engle *et al.* (1997:24) who maintain that caregivers at crèches should have enough knowledge of nutrition to enable them to help improve the growth and well-being of children in their care.

#### **4.5.1.5 Relationship between caregivers’ educational background and their nutrition knowledge**

Literature indicated that lack of knowledge of optimal dietary practice is one of the primary causes of vitamin A deficiency and other nutritional problems facing preschool children (Faber *et al.*, 2001; Vorster *et al.*, 2001; Ruel & Levin, 2000). The authors also cited that the situation could be worsened if the children’s mothers were not educated. As caregivers replace mothers at crèches it was therefore considered important to look at the relation between the caregivers’ education level and their nutrition knowledge in phase one so that efforts could be made to increase nutrition awareness in phase two of the study. The relationship was again reassessed in phase three to see if there were changes in the respondents’ nutrition awareness after the intervention.

The Kruskal Wallis test, a non-parametric one-way analysis of variance, was used to test the relationship between the nutrition knowledge of caregivers and their education level in both phase one and phase three. The chi-square test was therefore performed to compare the caregivers' score according to their education level. This was done by comparing the difference between the scores of respondents within the different education levels. Phase three results were thus compared with phase one results to see if there were changes in the respondents' nutrition knowledge and if the changes were statistically significant.

In terms of why should the consumption of vegetables and fruit be encouraged during childhood, phase one results showed a statistical significant difference ( $p\text{-value} < 0.05$ ) in the scores of the respondents with different levels of education. The respondents with grade 1-11 scored significantly lower than those with matriculation and tertiary education. Phase three results showed no statistically significant difference in the respondents' scores ( $p\text{-value} > 0.05$ ). This means that in phase three the respondents with grade 1-11 scored the same as those with matriculation and tertiary education.

In phase one there was a statistically significant difference ( $p\text{-value} < 0.05$ ) in the scores of the respondents with different level of education regarding knowledge of why vitamin A is important to children. Change is evident in phase three where there was no statistically significant difference ( $p\text{-value} > 0.05$ ) in the respondents' scores. In phase one the respondents with grade 1-11 scored lower than those with matriculation and tertiary education whereas in phase three all the respondents with different education levels scored the same. The results showed that the higher the education level achieved by respondents the more aware and knowledgeable they were about nutrition (vitamin A nutrition in particular).

Statistical tests were also done to test the relationship between the respondents' educational background and knowledge of vitamin A-rich vegetables and fruit. No relationship was found as the results showed no statistically significant difference ( $p\text{-value} > 0.05$ ) in the scores of the respondents at different levels of education in both phase one and phase three.

Overall, in phase one there is a statistically significant relationship between the respondents' education level and their nutritional knowledge. This indicates that the respondents with a higher level of education had better nutrition knowledge and understanding of vitamin A than those with low education level. This strongly suggests the need for an effective nutrition education to improve the caregivers' nutrition knowledge.

Phase three results differed from phase one results as there appeared to be no evidence of a statistically significant relationship between the respondents' various education levels and their nutritional knowledge. The difference in the respondent's knowledge in phase three could be linked to the nutrition education and training that the respondents received during phase two of the study. It can thus be concluded that the changes in the respondents' knowledge in phase three indicate the effectiveness of nutrition education and training, which then commends the importance of education for the caregivers.

#### **4.5.1.6 Summary**

Overall there was a positive direction of change which supports the assumption by Goosen and Klugman (1996:20) that increasing women's (in this case the caregivers') access to necessary resources improve the effectiveness of micronutrient interventions. In this study the necessary resource skills related to nutrition knowledge, accessibility and availability (gardening and gathering expertise) and the proper utilisation of vitamin A-rich vegetables and fruit. Thus nutritional benefits in phase three were not only statistically noteworthy but were also fundamental. Improved frequency of vegetables consumption and intake of vitamin A-rich vegetables that was evident in phase three can be attributed to increased availability of yellow and dark-green leafy vegetables such as spinach, pumpkin leaves, amaranth, *muxe*, Chinese cabbage sweet potato leaves, carrots, orange sweet potatoes and pumpkin in the crèche children's diets. Therefore the reassessment results showed that the gardening strategy that was linked to nutrition education appeared to have resulted in improved knowledge regarding vitamin A, improved dietary diversity, increased access and availability of vitamin A-rich vegetables and fruit and most probably enhanced the dietary intake of vitamin A of the 6 month to 6 year old children at the crèches.

The next chapter will deal with the conclusion and recommendations of the study.

## CONCLUSIONS AND RECOMMENDATIONS

### 5.1 INTRODUCTION

This chapter presents the concluding remarks in terms of the research findings. Based on these conclusions, recommendations are made. The chapter also has an evaluation of the study that could help future researchers.

The aim of this study was to develop and implement nutrition strategies that would improve the application of the food-based dietary guideline “*eat plenty of vegetables and fruits everyday*” to ensure increased availability, sustained access and subsequent consumption of vitamin A-rich vegetables and fruit. This would in turn address the prevalence of vitamin A deficiency which is one of the major problems facing South African children today. The research, in setting out to address this problem in the study area, followed the triple-A cycle of assessment, analysis and action. The study proceeded progressively, starting with a situational analysis (phase one), then the introduction of an improvement action-based task geared to the limitations identified in phase one (phase two), followed by a reassessment of improvements made (phase three). A fundamental intention of this study was to use a participatory process - action research that engaged caregivers in developing and implementing nutrition strategies.

This chapter provides the final conclusions, discusses the contribution the study has made and its limitations, and finally, makes recommendations and suggestions for further research. It reflects on the various aspects that were discussed in the preceding chapters that relate to the development and implementation of the nutrition strategies to be applied by crèche caregivers in order to enhance the consumption of vitamin A-rich vegetables and fruit by crèche children. These will be in accordance with the objectives set for this research (as stated in chapter 3, par.3.4) and discussed according to the three phases of the research process as presented in the preceding chapters.

## 5.2 PHASE ONE REVIEWED

Phase one was a baseline study that addressed the first objective of the study concerning dietary diversity with regard to the consumption of vitamin A-rich vegetables and fruit, their availability, extent of utilisation and the caregivers' knowledge of nutrition. The conclusions are presented below.

### 5.2.1 Demographic profile

Selected demographic information about the caregivers and the children was collected. That females are responsible for child care, is traditionally acknowledged in all cultures, and in this study, the crèche caregivers were adult females whose experience in this role ranged from six to ten years. Their educational background could be regarded as generally low since 61% of the research participants did not have a diploma in preschool education. It could be concluded that further training is required so that these respondents would have sufficient knowledge, and all the skills, needed to care for all aspects of crèche children's well-being. The demographic profile of the children attending the crèches under investigation showed that there were both male and female children and their ages were from six months to six years. A particular finding is that, on average, these children spend nine hours a day at the crèche, a finding similar to the study by Pietersen *et al.* (2002). This means that, for the largest part of their day, every day of the week, these children are totally dependent on the caregivers to give them proper and nutrient-rich food in their diets.

### 5.2.2 Dietary diversity

The situation assessment showed that the diet of the children at the crèches comprised a limited number of food items, and therefore lacked variety. Generally, the children were served a distinctly cereal-based diet, with maize meal porridge being the staple food. There was a low consumption of vegetables and fruit, and the meals, in general, were deficient in vitamin A.

The children's meal pattern generally consisted of two meals a day (breakfast and lunch) with one or no snack between them. All the caregivers in the sample served lunch and the majority (95) served breakfast. However, these meals lacked variety as the same types of foods were on offer every day. Unhealthy foods such as sweets, biscuits, popcorn and chips



were given as snacks while healthy snacks such as fruit were occasionally served to children. It was observed that fruit was handed out as a snack only when there were surpluses.

There was a low consumption of vegetables by crèche children as the majority (65) of the respondents only served vegetables once a week, with cultivated vegetables being provided more than indigenous vegetables. With the exception of five respondents who indicated that they served raw carrots, cooked vegetables were far more common. This was a cause of concern as it contributed to the lack of variety in the meals served to crèche children.

Several other significant observations were made. Clearly there was seasonal variation in the serving of dark-green vegetables such as Chinese cabbage, *miroho*, and spinach as these were only served when they were available. As a result, the majority of the respondents (71) provided cabbage because it was easily accessible and affordable. Although some respondents indicated that they served pumpkin and butternut, it was observed that children's meals lacked yellow and orange vegetables. Generally, children's meals were deficient in fruit as only a small minority of the respondents indicated that they served fruit. Fruit were not served on a daily basis and the fruits most commonly given to the children were bananas and apples that are not rich in vitamin A. It was disappointing to realise that mangoes, which grow abundantly in the area and are very rich in vitamin A, were not served at all, as not one respondent even mentioned it as a fruit served to their children. The same situation applies to avocados which were served by only three respondents (see Figure 4.5).

It can thus be concluded that the low consumption of vegetables and fruit (including yellow and orange vegetables and fruit), as well as not serving fruit at snack time, led to a low intake of beta-carotene-rich food by crèche children. In view of the fact that most of the children spend long hours (8-10 hours) at the crèche and they arrive early without having had breakfast, it is particularly important that they receive adequate meals at the crèches. Therefore there was a need to increase availability and accessibility of vegetables and fruit, and to include more vitamin A-rich vegetables and fruit in the children's diets.

### **5.2.3 Availability and access to vitamin A-rich vegetables and fruit**

For the purpose of this study food availability means that the food is available in the children's environment, that is, at the crèche. Unavailability and lack of access to vitamin A-rich foods was a major concern that was observed from the beginning of the survey during

the implementation of phase one. Accessibility and the type of fruit and vegetable obtainable were dependent on the existence of gardens, the particular season of the year as well as the purchasing capacity of the crèche.

### **5.2.3.1 Gardening**

For various reasons (such as those given in chapter 4, par.4.4.2.1), 61 respondents did not have vegetable gardens at their crèches. Some crèches experienced major obstacles to growing vegetables which included the cost of fencing, no access to planting materials or seeds, limited land and an inadequate supply of water. However, some obstacles, such as limited land, could have been overcome if the respondents had been better informed about vegetable gardening, because only a small plot is actually needed for cultivating enough vegetables to meet daily requirements. Engelberger *et al.* (2003:311) validate that this is true.

It was noteworthy that those who had vegetable gardens at their crèches were planting vitamin A-rich crops, namely pumpkin, spinach, Chinese cabbage, *muxe* and carrots but the quantity produced was too low for consumption by all the children. Therefore most of the caregivers relied on purchasing vegetables. The majority of caregivers (66) had no fruit trees growing in the crèche yards. Although 34 respondents indicated having fruit trees, all the fruit served to children was bought at the supermarkets or open markets. Vitamin A-rich fruit trees such as mango, paw-paw and avocado were available at some crèches, even though these fruits were not served to the children. The results posed a need to train caregivers on gardening and to educate them about the importance of having a vegetable garden.

### **5.2.3.2 Gathering of indigenous vegetables and fruit**

The majority (70) of the respondents gathered and served indigenous vegetables such as jute mallow, *phuri*, African-nightshade and black jack to the children. Although the backyard and the fields were mentioned as places where these vegetables were gathered, it was observed that some vegetables, such as African-nightshade and *phuri*, were cultivated at the crèche gardens and also obtained from the supermarket or open market. Therefore these vegetables were not solely gathered but also bought. Indigenous vegetables were used as a substitute for cultivated vegetables and the frequency of their consumption, which was usually once a week was based on their availability. However, the children did not like these vegetables (see Figure 4.4). An unacceptable taste, unfamiliarity and low prestige value explained why this was so.

As a result of the diminishing popularity of indigenous fruit, only the respondents who had these fruit trees in their yards allowed the children to eat them. Lack of knowledge about the importance of indigenous vegetables and fruit contributed to a decline in their use. Thus the availability and accessibility of indigenous fruit was low. This contributed to a decreased consumption of fruit by children at crèches. Such findings illustrated the potential for education to make use of what is available and growing in the natural environment that could lead to increased production of vitamin A-rich vegetables and fruit.

## **5.2.4 Utilisation**

Utilisation includes menu planning, food preparation, food storage and preservation. Caregivers displayed inadequate knowledge of the proper utilisation of vegetables and fruit in phase one.

### **5.2.4.1 Menu planning**

It was clear that the respondents had not had training in menu planning. Although written menus were available, they were not followed as set out. The food prepared was based on what was available and not on what was on the menu. The respondents did not seem to understand the reason for having written menus because these menus remained the same for the whole year. They even included fruit or vegetables which were out of season. Some menus included foods that were never served to the children, whereas some just indicated the type of meal and not the food included in that meal. Lack of training, coupled with the respondents' low level of education, affected their ability to use recipes. These findings necessitated the need for education and training in menu planning.

### **5.2.4.2 Food preparation**

A small number of respondents were adding ingredients that enhanced the nutritional value of certain vegetable dishes. Ingredients such as pondered groundnuts (peanuts), oil and minestrone soup mix were used. Although oil was added to enhance the taste of vegetables, this was a preferred practice as it aids the absorption of vitamin A by the body. Results revealed that the respondents were preparing and handling vegetables in such a manner that they lost valuable nutrients through prolonged cooking, throwing away cooking water, the addition of bicarbonate of soda, boiling in too much water and the habit of soaking vegetables. It was therefore necessary that the respondents should be made aware of the appropriate preparation and processing methods for vegetables.

#### 5.2.4.3 Storage and preservation of food

It was noticed that storage facilities were poor in that the majority of the respondents had no refrigerators or freezers to store surpluses or leftovers. Though some respondents were buying just enough to use, others were throwing the leftovers away because of a shortage of storage space. It was disappointing to realise that not one respondent was preserving vegetables, not even those with vegetable gardens. Consequently it was realised that there was a need to make the caregivers aware of techniques to preserve pro-vitamin A-rich vegetables in order to improve their keeping quality, and to ensure that they had an adequate supply during seasons of lower availability. Such a strategy would increase their year-round availability. This suggestion is supported by Schalau (2001) who purports that the preservation of surplus vegetables and fruit could reduce seasonal variations in the availability of vitamin A-rich foods by making it possible to have vegetables and fruit available in the off-season. It is also suggested by Barker *et al.* (2005:51) that, preservation techniques should be practical and easily applied at the crèche level to increase the children's everyday consumption of vegetables and fruit.

#### 5.2.5 Nutrition knowledge

The respondents' nutrition knowledge was seen to be inadequate during phase one of this research investigation. Although the majority knew that children should eat vegetables and fruit, they displayed little knowledge as to what could happen if children did not eat these foods. Regarding the importance of vegetables and fruit consumption during childhood, and the importance of vitamin A to children, they cited ordinary health reasons, based on common understanding and general knowledge that vegetables and fruit are good for health because they contain vitamins.

In line with the findings by Maunder and Meaker (2007:403) and Faber and Wenhold (2007:397) there was a lower level of knowledge and lack of esteem for indigenous plants. This underscored the urgent need to emphasise the nutritional value of indigenous vegetables, and the importance of nutrition education in this connection.

The respondents did not seem to know that the portion sizes of vegetables and fruit served to children should be controlled. The findings revealed that there was no portion control at all and the respondents did not really care about measurements. Although they said that portion sizes of vegetables and fruit served to children were measured, the portions were far too large for children as they believed in giving more generous helpings.

Though it is important to control the size of helpings, the way in which vegetable portions were dished up for the children in this study, could perhaps be condoned, and even supported and optimistically be encouraged, taking into account Faber *et al.* (2006:248)'s opinion that, to promote more vegetables and fruit in the diet of children, caregivers should give them double the normal servings of vegetables.

The results from phase one showed a significant association between the caregivers' educational level and their nutrition knowledge, which revealed in this question that the respondents with grade 11 and lower, scored significantly lower than those with matriculation and tertiary education. These results confirmed that there was a need for nutrition education and training for the caregivers as far as food provision for the children in their care was concerned.

### **5.3 PHASE TWO REVIEWED**

The lack of knowledge of vitamin A, the absence of variety in meals presented, poor availability and accessibility of vitamin A-rich vegetables and fruit were factors identified in phase one that led to the development and implementation of nutrition strategies that could improve the application of the food-based dietary guideline "*eat plenty of vegetables and fruits everyday*" by crèche caregivers. Nutrition strategies focused on food-based activities and involved:

- nutrition education on vitamin A and the value of indigenous vegetables and fruit;
- training in gardening through demonstration; and
- training in menu planning, food preparation, proper storage and preservation.

Nutrition education, training and gardening demonstration provided the caregivers with the knowledge and skills they needed to enhance the consumption of vitamin A-rich vegetables and fruit by crèche children.

#### **5.3.1 Nutrition education**

Nutrition education was found to be an essential component of this study that aimed to increase caregivers' knowledge about vitamin A and awareness of ensuring that the issue of the availability and accessibility of vitamin A-rich vegetables and fruit was addressed, in

order to improve the consumption of these foods by young children attending crèches. Nutrition education focused mainly on the identification of vitamin A-rich vegetables and fruit and its importance for children's health, as well as being alert to the symptoms of vitamin A deficiency (Faber *et al.*, 2006:117). This led to an emphasis on dietary diversity, food preparation methods, preservation techniques and the importance of a vegetable garden as a source of vitamin A-rich foods. Although it was important to provide nutrition education to the caregivers, the educational level of some respondents was found to be a barrier for grasping some of the higher level nutrition information. A low literacy level too resulted in reduced access to educational materials about nutrition.

### **5.3.2 Gardening**

The study did not only provide nutrition education but also increased the caregivers' skills in vegetable cultivation. Following Faber *et al.* (2006:24-26)'s recommendations and gardening manuals, caregivers were trained on how to establish and maintain vegetable gardens. They received some gardening support and were encouraged to cultivate vegetables such as carrots, spinach, pumpkin, *muxe*, Chinese cabbage and a new variety of beta-carotene rich sweet potatoes.

Realising the importance of these vegetables for children's health, caregivers were very positive about vegetable gardening. This resulted in the establishment of new vegetable gardens and the resuscitation of existing ones at the crèches. Caregivers in many crèches were thus planting vitamin A-rich vegetables as well as fruit trees, such as avocado, paw-paw and mango trees. The intervention was well received by the caregivers who showed some interest and were totally engaged in the gardening project.

### **5.3.3 Gathering of indigenous vegetables and fruit**

Furthermore the training contributed to the use of vitamin A-rich indigenous vegetables by crèche caregivers. The respondents were informed about the nutritional benefits of indigenous vegetables. They were also made aware of vitamin A-rich indigenous vegetables such as *vowa*, *delele* and *muxe*. Gathering, cultivation and the use of indigenous vegetables and fruit were encouraged. Their inclusion in the menu, as well as their consumption by children, while in season, was also emphasised.

#### 5.3.4 Menu planning and food preparation

The respondents were trained in menu planning, proper food storage, vegetable preparation and the preservation of vegetables for sustainability. Practices such as the grating of carrots, the addition of oil or fat, washing vegetables before cutting, cooking in little water for a short time, adding cooking water to children's porridge and the mashing of vegetables for small children were all promoted. Caregivers were also encouraged to sun-dry vegetables such as spinach, Chinese cabbage, *muxe* and pumpkin leaves while they were in season or when plentiful, for future use.

### 5.4 PHASE THREE REVIEWED

In phase three the reassessment of the intervention strategies to improve the crèche caregivers' application of the food-based dietary guideline "*eat plenty of vegetables and fruits everyday*" was undertaken to determine if there was an improvement in the application of this dietary guideline. This was once again determined through the assessment and analysis of dietary diversity, availability, accessibility and utilisation of vitamin A-rich vegetables and fruit in the crèches. These aspects serves as an indication of the success of the intervention applied in phase two.

#### 5.4.1 Dietary diversity

Almost the same types of foods, as was the case in phase one, were served. However, valuable changes in the dietary composition of the meals were noticed. The majority of the respondents now served fruit at breakfast. There was an increase in the number of respondents who were serving raw cabbage to the children at lunch, alongside meat and porridge. This added to increased variety in meals served at crèches. The results also demonstrated an increase in the weekly vegetable consumption at crèches as the majority of the respondents were serving vegetables four times a week. It can thus be concluded that increased frequency of vegetable consumption would increase the crèche children's intake of beta-carotene.

There was an improvement from 52 to 84 respondents who offered afternoon snacks, thereby increasing the regularity of serving food to the children. Taking into account the length of time that children spend at the crèche, it is important to serve a snack in the



afternoon. Furthermore, this practice creates the opportunity for better food diversity, which implies more intakes of vitamin A-rich foods, particularly vegetables and fruit.

Consumption data showed that the children were eating an increased amount of dark green vegetables such as spinach, Chinese cabbage, African nightshade and *muroho*. Dark green vegetables are important sources of beta-carotene. When in season they were being frequently consumed by children. Although there was an improvement in the consumption of vitamin A-rich vegetables, the consumption of yellow/orange vegetables was still low, well below the amount that would be considered as adequate.

Healthier snacks, such as fruit were being served, and no mention was made about other snacks. These results are noteworthy, as they contribute positively to the nutritional adequacy of meals served at crèches in that it increased the crèche children's intake of fruit. Seasonal variation in the availability of fruit was observed as an important factor that contributed to better access to fruit at crèches. Contrary to the situation in phase one, the consumption of fruits such as avocados, was high during the winter season and this is important as they provide vitamin A.

Although the findings revealed substantial improvement in the consumption of fruit in phase three, some vitamin A-rich fruit such as mangoes and paw-paw, which are plentiful in the area, were not given to the children. Mangoes were not considered an important fruit that the crèche should provide as children could get them at home. The consumption of indigenous fruit was low. This was not solely as a result of seasonality, but was also due to scarcity and lack of popularity of this commodity.

It can be concluded that nutrition education and the demonstration of gardening practices in phase two resulted in an improved intake of vegetables and fruit. Variety was also added to the diet of the children and consequently the intake of vitamin A-rich vegetables increased.

#### **5.4.2 Availability and access to vitamin A-rich vegetables and fruit**

Re-assessment of the nutrition strategies was done to determine the extent of change in the availability and accessibility of vitamin A-rich vegetables and fruit.

#### 5.4.2.1 Gardening

The presence of gardens at crèches had improved as the number of the respondents who indicated that they had vegetable gardens had increased from 39 to 89. In actual fact all except three crèches had vegetable gardens in phase three. This resulted in more vegetables being eaten more frequently in different crèches which, in turn, led to improved application of the food-based dietary guideline “*eat plenty of vegetables and fruits everyday*”. This was also confirmed by an increase in the number of respondents who indicated that they were buying vegetables only once a month because they were also using vegetables from the crèche gardens.

The gardens provided direct access to fresh vegetables and also contributed to increased dietary diversity as more vitamin A-rich vegetables were being planted. This implies an increase in the consumption of vitamin A-rich vegetables by crèche children. Though all the respondents reported that they had fruit trees at their crèches, it did not mean that children were necessarily being served fruit from the crèche gardens as the trees had just been planted and were still too small to bear fruit. However, this implies that, in future, caregivers could be serving the children vitamin A-rich fruit from their own gardens.

Although the time span of the study was of short duration, the gardening project nevertheless yielded positive results, despite the relatively short period. Such success justifies the importance of training, advocacy, information and education, and endorses the point made by Faber *et al.* (2006:24-26) that this is so. It can therefore be concluded that the establishment of vitamin A-rich fruit and vegetable gardens at crèches contributes to an increase in crèche children’s consumption of green leafy vegetables.

#### 5.4.2.2 Gathering of indigenous vegetables and fruit

Although the results showed an increase in the number of the respondents (96) who were gathering indigenous vegetables, generally the consumption of these vegetables was low. The indigenous vegetables that were regularly consumed were those that were cultivated, like *muxe* that could be bought from the local market. It was observed that indigenous vegetables were not necessarily gathered even though they might be in season. These findings agree with Grivetti and Ogle (2000:31) as well as Weinberger and Swai (2006:87) who uphold that the habit of collecting non-cultivated plants is declining. As humans become more focused on domesticated cultivars, and pay less attention to indigenous species, the skills and knowledge needed to identify, collect and prepare indigenous foods are also declining.

It would, however, be wrong to believe that indigenous vegetables are purely subsistence crops for poor consumers, because indigenous vegetables may offer good opportunities to increase vitamin A intake amongst children. This is also maintained by other scholars in their studies (Faber *et al.*, 2007:411; Grivetti & Ogle, 2000:31-32, 39-41; Weinberger & Swai, 2006:87).

### **5.4.3 Utilisation**

As is highlighted by Faber and Van Jaarsveld (2007), the potential contribution of plant foods to vitamin A status depends on the retention of pro-vitamin A carotenoids after storage, preparation and processing. It was therefore anticipated that caregivers would display adequate knowledge of proper food utilisation during the phase three investigation.

#### **5.4.3.1 Menu planning**

It was important for caregivers to have menu planning skills so that they would know what to include in the children's meals. Although all the respondents indicated that they had been trained in menu planning, it was clear that their menu planning skills and knowledge of food preparation techniques improved after they had been exposed to the training offered as part of the research study. This was evident from the written menus which now began to show dietary diversity. An increase in the use of vitamin A-rich vegetables in particular was clearly noticeable as these foods were more frequently included in the written menus. Moreover, what appeared on the menus was what was actually being offered to the children, which was not the case in phase one where what was served did not match the prepared written menus. Another positive observation was an increase in the number of respondents who were using recipes, and this can definitely be ascribed to the training received by the caregivers in phase two.

#### **5.4.3.2 Food preparation**

The results from phase three showed an improvement in the preparation of the vegetables. Clearly the children's increased enjoyment of eating vegetables can be attributed to this, as properly prepared and cooked vegetables taste good and are more palatable. Additionally, the frequency of consumption of vitamin A-rich vegetables and fruit in comparison to what was observed in phase one, had now become adequate, meeting desired expectations. This study shows that using different ways to prepare the vegetables, such as the addition of

ingredients to enhance flavour, contributed to the increased consumption of vegetables thus concurring with similar findings by Faber *et al.* (2006:29).

#### **5.4.3.3 Storage and preservation of food**

Although various methods of food preservation were introduced to the respondents, disappointingly only a small number (32) of caregivers were sun-drying cooked green leaves when these were plentiful, such as spinach and Chinese cabbage. The reason for not preserving vegetables was partly due to the fact that, since only a small area was available for cultivation, just enough vegetables as were required for immediate consumption, were produced – there was no surplus. Another reason could be that the parents would not have liked their children being served dried vegetables as these were regarded as having low status and associated with poverty. The majority (58) of the respondents was also using the refrigerator to store leftovers and none were throwing leftovers away. These are gratifying results.

#### **5.4.4 Nutrition knowledge**

There was a marked positive change for the better in the caregivers' level of nutrition knowledge in phase three. The respondents' familiarity with the symptoms of vitamin A deficiency had improved and the number of respondents who knew that vitamin A could prevent growth faltering had increased from 26 to 99. More respondents knew that children who do not eat vegetables and fruit are at risk of contracting specific diseases. Contrary to the situation in phase one, the majority of the respondents related green and yellow/orange vegetables and fruit to vitamin A. It can be concluded that the caregivers' increased knowledge of vitamin A would hopefully improve the crèche children's consumption of vitamin A-rich vegetables and fruit. This would support Kumar-Range's *et al.* (1997) notion that caregivers' nutrition knowledge is important for the nutritional well-being of children.

Caregivers' access to nutrition information could therefore raise the level of children's nutrition status (Kumar-Range *et al.*, 1997) through improving the nutritional value of meals served, particularly that of vitamin A. Accordingly, nutrition awareness had benefited the respondents and, in turn, would contribute to better health for the children in their care, as more vegetables and fruit would probably be served at the crèche meals. Although a small percentage of caregivers still had little knowledge and understanding of vitamin A and the consumption of vegetables and fruit from a scientific point of view, it can be concluded that the study was successful in improving the caregivers' knowledge and, what is important,

better practices related to vitamin A intake would be in force. The results associated with this study concur with the work of Faber and Van Jaarsveld (2007) who also indicated that training is a successful way of improving the knowledge, awareness, attitude and practices of caregivers regarding the importance of vitamin A in the diets of crèche children.

Consequently, participation in this study gave caregivers greater insight and knowledge and develop their skills on how to:

- increase the production, availability and access to vegetables and fruit;
- increase the consumption of these foods by crèche children; and
- enhance the availability of foods rich in precursors of vitamin A in the diet, through proper storage and preservation techniques.

Overall, a well-founded conclusion could be drawn that states that the introduction and application of the food-based dietary guideline that encourages the daily eating of vegetables and fruit, not only increased the caregivers' realisation of the value of vitamin A-rich vegetables and fruit, but also led to increased consumption of these foods by crèche children.

## **5.5 RECOMMENDATIONS**

Based on the above findings and conclusions, the following recommendations are made to crèche caregivers, health workers, programme planners, policy makers and future researchers.

### **5.5.1 Recommendations to caregivers**

Caregivers are advised:

- to consider the guideline *“eat plenty of fruit and vegetable everyday”* and regard its implementation as a necessity in the lives of the children in their care, realising that it can be achieved in the following ways:
  - having either a vegetable or a fruit as part of every meal served at the crèche;
  - using different vegetables and fruit regularly to add variety to the diet;
  - including plenty of vegetables and fruit when they are affordable, available and accessible;

- establishing vegetable gardens and introducing indigenous vegetables as crops;
  - increasing the consumption of indigenous vegetables by including them in the menu; and
  - improving preparation methods to enhance their taste and natural flavour, thereby increasing the consumption of vegetables.
- to ensure year-round availability and accessibility of vitamin A-rich vegetables and fruit. Caregivers should preserve vegetables when they are plentiful so that they are available when they are out of season.
  - to enhance availability of vitamin A-rich vegetables and fruit in children's diets, caregivers should include:
    - more yellow/orange vegetables and fruit as they are high in vitamin A; and
    - vitamin A-rich indigenous vegetables and fruit in children's meals.

### **5.5.2 Recommendations to health workers and programme planners**

As the consumption of *muroho* is low, eating it should be encouraged and promoted. Health workers should enhance indigenous knowledge of indigenous plants. More emphasis should be placed on neglected indigenous vegetables so that they form part of the daily food intake. Indigenous vegetables and fruit should be supported as a culturally acceptable and affordable alternative to cultivated vegetables and fruit. Increasing fruit and vegetable intake should be a priority when planning strategies to overcome vitamin A deficiency. For the success of this type of intervention an effective management programme should be developed. This includes the evaluation and monitoring of the vegetable garden programme.

Furthermore, a vitamin A promotion programme should be integrated with other programmes concerned with the health and well-being of children such as school-feeding programmes and school gardening projects. Special attention should be given to the education of caregivers and nutrition knowledge should be improved. Equally important is training that focuses on the South African Food-based Dietary Guidelines. Educational material should take low literacy levels into account and be available in a language that caregivers understand. Programme planners should therefore create opportunities to increase the caregivers' contribution to children's nutrition status through education, sensitising them on the issue in a comprehensible manner using various promotional strategies.

### **5.5.3 Recommendations to policy makers**

Emerging nutrition policies should ensure that everyone, including the less privileged, has the opportunity to have access to a diet that meets the dietary guidelines formalised by government, particularly as far as a diet high in vegetables and fruit is concerned. Policy-makers should prioritise local food production when placing it on the agenda of local and national food policies in order to sustain the use of indigenous vegetables. It is thus important that nutrition policy-makers take note of the results of this study.

### **5.5.4 Recommendations for future research**

This study has demonstrated that a food-based intervention can contribute to the improvement of vitamin A intake, and that continued intervention at this level of early childhood care, has merit. In accord with the context of this particular study, it is recommended that this specific food-based dietary guideline that has been applied to improving the consumption of vitamin A by crèche children should be extended for further research that would focus on:

- the sustainability of implemented nutrition strategies;
- undertaking more action research particularly in the application of other food-based dietary guidelines;
- replicating this study in other crèches in the Thulamela municipal area could yield significant gains for the entire community, and it could benefit the caregivers as well as the children, by ensuring continuation of the nutrition strategies already implemented; and
- the nutritional potential of indigenous vegetables and their health benefits should be considered when formulating future interventions.

## **5.6 EVALUATION OF THE STUDY**

Although an overview of the reliability and validity of the study has already been given (chapter 3, par 4.12) it was considered valuable for the purpose of this study to evaluate the research objectively. This was done mainly to assess the validity and reliability of the methods of data collection and the usefulness of the data to the research. The achievement



of the objectives set out for the research and the benefits of the study to the caregivers too, are evaluated.

### **5.6.1 Reliability and validity**

The reliability of an empirical study can produce difficulties with replication as the results may differ if the research were to be repeated at a later stage with a different sample of respondents. To overcome this problem, the reliability of this study was further enhanced by the use of the theoretical model from the planning stage of the study. Various techniques of data collection that complemented each other were used, and consequently served as cross-validation to ensure the reliability and enhance validity of the study (see 3.12.1 and 3.12.2).

### **5.6.2 Data collection methods and their usefulness to the research**

The questionnaires, the game devised and regular observation at the participating crèches proved to be the correct methods of data collection for this study, as they provided the information that was required to meet the objectives of the study. The game was useful in gathering data regarding nutrition information and knowledge about vitamin A-rich vegetables and fruit. The data collected was easy to process, and the results of the final analysis and interpretation of the information gathered proved that the methods of data collection were worthy instruments. To combat the risk of error, data was collected under the same conditions for all the participating crèches in both phases of data collection.

### **5.6.3 Achievement of the objectives of the study**

It is clear from the interpretation and discussion of the results and the conclusions reached that the objectives set out for this study (chapter 3, par. 3.4) were effectively realised. However, the objectives relating to the utilisation of vegetables and fruit, particularly with regard to their preservation, also the accessibility and availability of indigenous fruit were minimally achieved.

### **5.6.4 Benefit to caregivers and the children**

Training and skill development supported the empowerment of caregivers and in the process, built a sense of achievement and self-worth, instilling confidence. Combining the

cultivation of gardens that produced vitamin A-rich vegetables and fruit with nutrition education ensured that caregivers had a better understanding of vitamin A nutrition. The process was an investment in that the training that the caregivers received, allowed them to develop food-based nutrition strategies. It can be reasonably presumed that the skills they learnt, and used, would most likely stay with them, to be used again and again. Similarly, the training received in the cultivation, preservation and preparation of vegetables could presumably be useful over the long term and could, in fact, even be transferable amongst caregivers.

The participatory research process used ensured that the intervention was responsive to the participants' needs and proved to be acceptable to them as they were very positive and eager to learn. This suggests that such interventions might be more sustainable than those that would be brought into the community from the outside or even sold to the community. The nutrition strategies proved to be successful as the consumption of vegetables and fruit increased significantly, affording a greater opportunity for an improved vitamin A intake.

#### **5.6.5 The success of the study**

The establishment of vegetable gardens and the production of vitamin A-rich vegetables contributed significantly to the success of this study. Consistent with the findings from earlier studies as documented in relevant literature sources, the experience of caregivers at the selected crèches in the Thulamela municipal area, points to the real potential of gardening and education interventions that would improve the availability and consumption of vitamin A-rich foods as recorded in the work of other scholars like Smitasiri and Dhanamitta (1999) and English and Badcock (1998) found in other settings.

As a result of the training done there was a definite change for the better in the respondents' menu planning skills and vegetable preparation techniques. In this study, the researcher not only used her own knowledge and skills, but also relied on collaboration with a multidisciplinary collegial team. This meant bringing together the technical and disciplinary expertise that rested in different institutions as well as drawing on the skills of the researcher. Such an approach was applied in this study where the Agricultural Research Council assisted with gardening training and there was a partnership agreement (a friendly contact) with the Department of Health that contributed to providing information about vitamin A.

## 5.7 THE SIGNIFICANCE OF THE STUDY

To apply a food-based dietary guideline is possible. Considering available resources, this study has suggested that it was the value of building on existing knowledge and practices that led to the development and implementation of the nutrition strategies it proposed. It was this approach that contributed significantly to the success of the intervention and supports the viewpoint of Faber *et al.* (2006:15-16) who maintain that people are more likely to adopt a new or improved practice when the change is linked with comfortable or at least familiar practices. Baseline data of the sample suggested that an existing level of knowledge and experience was present and there was a sense of readiness to accept change that would serve as fertile ground on which to build the innovation. Thus the relatively short time needed to achieve beneficial results in this particular study could be attributed, in part, to the fact that the researcher built on what already existed. However, it also showed that even people with a low level of literacy can be taught nutrition principles.

## 5.8 LIMITATIONS OF THE STUDY

- Broad generalisations should be made cautiously for, the following reasons:
  - convenience sampling was used and, to some extent this technique limits the applicability of generalisation of the findings.
  - a limited number of crèches in the study area were involved in the investigation and
  - the time span of the study was limited to a few months and the results of such a study do not fully capture the long-term effects of the intervention.
- Constraints were present, such as being unable to go back to the crèches now that the research project has been completed, could hamper the sustainability of the gardens of some crèches, especially those that have just started. A lack of monitoring and evaluation of the established gardens could lead to these gardens ceasing to exist.

## 5.9 CONCLUDING REMARKS

The study has shown the success that well-designed nutrition strategies can achieve, resulting in a significant increase in the consumption of vegetables and fruit. It can therefore be concluded that vegetable gardening, coupled with nutrition education, is positively associated with the dietary guideline *“eat plenty of vegetables and fruits everyday”*. If implemented, it would, in turn, increase the consumption of vitamin A-rich vegetables and fruit and thereby decrease the risk of vitamin A deficiency. That is, to provide for vitamin A, children’s diets should include regular consumption of a variety of yellow/orange-fleshed and dark-green vegetables and fruit. This study demonstrated that a focus on vegetable production alone would not yield the nutritional benefit, but a combination of activities focusing on nutrition education, production and utilisation of food could improve the application of the food-based dietary guideline *“eat plenty of vegetables and fruits everyday”* by crèche caregivers.

The fact that the intervention yielded consistently positive results within a relatively short period of time, should help dispel the belief that this type of intervention takes a long time before it shows results. This study provides evidence that food-based intervention can work in a short time. The improvements in the respondents’ knowledge in phase three indicate the effectiveness of the nutrition strategies developed in phase two of the study. But the question of sustainability of the gardens is a big concern. The gardens might have initially flourished because the respondents knew that the researcher would come back to assess the gardens. Yet it is strongly suggested in this study that a follow-up research endeavour could help to ensure the sustainability of the achieved outcomes.

In conclusion, the findings of this study confirm that it is one thing to recommend eating plenty of vegetables and fruit every day, but the challenge lies in demonstrating its application in practice in communities with limited natural and human resources. Therefore, increasing fruit and vegetable intake is still the best overall advice that can be given to caregivers. If these can happen in Thulamela, why not in other rural areas worldwide?