

# **Nutrition Guide for MFF Football Players**

**May 2020**

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# **Chapter 1: An Introduction to Sports Nutrition**

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## ***Learning objectives:***

*By the end of the chapter, the learner will be able to:*

- Comprehend the importance of good nutrition for optimum sports performance, good health and wellness of the body*
  - Describe the different nutrients needed by the body*
  - Comprehend the benefit of each nutrient to the body*
  - Categorize food into different food groups*
  - Follow the Eatwell Guide in making daily food choices*
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It is crucial that the football players consume an optimally balanced diet designed to meet the demands of various sporting activities. An adequate diet containing the right nutrients in the right quantities can boost athletic performance of the footballers, as well as maximize recovery after training, competition or even injury [1]. Additionally, good nutrition can support growth and ensure optimal development in young footballers. However, it is not uncommon for the footballers to consume diets similar to those of the general public and fail to meet the recommended nutrient intake to enhance the chance of winning [2]. Hence, this booklet is specially designed to educate the Myanmar football players on the latest dietary guidelines for footballers, and give step-by-step instructions on how to follow those guidelines properly. The aim of our work is to provide an efficient tool that allows the Myanmar football players to practice nutritional self-care.

### **1.1. Six Major Nutrients**

Our body requires adequate amount of nutrients to produce energy, to build different parts of the body and to maintain proper body functions. Nutrients are substances found in food, and they can be categorized into six major groups:

- Carbohydrates
- Lipids (fats)
- Proteins
- Vitamins
- Minerals
- Water

Carbohydrates are the major source of energy, and simple carbohydrates such as sweets and sugary drinks can provide instant energy boost for the footballers. Proper intake of carbohydrates can optimize the body's energy store, improve stamina and football performance [3]. Examples

of carbohydrates include rice, noodles, bread and starchy vegetables such as potato, corn, peas and lentils.

Lipids, commonly known as fats, provide an additional energy source and help build the cell membranes. They are also a source of fat-soluble vitamins A, D, E, and K. However, fats should not compose the major part of football diet. Football players are advised to consume less than 30 percent of daily total energy intake as fats [3]. Examples of good dietary fat sources include avocado, vegetable oil, various nuts and seeds.

Proteins are crucial for optimal football performance, and play a significant role in a football diet. Amino acids from proteins are responsible for muscle regeneration after intense physical activities, growth stimulation and regulation of body metabolism [4]. Some good sources of proteins for football players include lean meat, fish, egg, milk, beans and lentils.

Vitamins and minerals do not provide energy, but play an important role in energy production. They are also needed for improved bone strength, transport of oxygen in the body, transmission of nerve impulses and many other functions [5]. Micronutrients deficiency negatively affects football performance, and can even lead to severe health problem if left untreated. Vitamins and minerals are abundant in dairy products, colorful fruits and vegetables.

Adequate hydration is important for replacing sweat loss and improving sports performance. Football players should maintain adequate water and fluid intake throughout the day, especially in hot climate. Proper fluid intake can improve endurance and delay onset of fatigue in football players during a competitive game [6].

## 1.2 Seven Food Groups

The Healthy Eating Manual for Myanmar People recommends a balanced diet comprised of foods from the seven food groups to achieve adequate intake of the six major nutrients [7]:

- Grains and starchy vegetables
- Vegetables
- Fruits
- Milk and dairy products
- Meat, poultry, fish and seafood, eggs and beans
- Seeds, nuts and oil
- Sweets

### 1.2.1 Grains and starchy vegetables

Grains and starchy vegetables are a rich source of carbohydrate. Some common starchy vegetables are sweet potatoes, yams, potatoes and corns. Grain products include any food made from rice, wheat, oats, barley or other cereal grains. Some examples are rice, bread, noodle, pasta, breakfast cereal, oatmeal, etc. Rice is the most commonly consumed grain in Myanmar. It is a rich carbohydrate source with 7 percent of protein.

### 1.2.2 Vegetables

Vegetables are rich in vitamins and minerals. Examples of vegetables include green vegetables such as Moringa, Chinese cabbage, morning glory and spinach; colorful vegetables such as pumpkin, radish, carrot, eggplant, tomato, okra and calabash.

### 1.2.3 Fruits

Fruits are also a rich source of vitamins and minerals. Football players are advised to consume colorful fruits such as watermelon, mango, orange, banana, pineapple, avocado, apple and berries daily.



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#### 1.2.4 Milk and dairy products

Milk and dairy products are rich in protein and calcium, an important mineral to promote bone strength in football players. Cheese, yogurt, butter and margarines are some examples of dairy products.

#### 1.2.5 Meat, poultry, fish and seafood, eggs and beans

Animal proteins from meat, poultry, fish and eggs contain nine essential amino acids needed by the body. Fish also provide good dietary fats such as omega 3 and other essential fatty acids. Plant proteins do not contain all nine essential amino acids, but they are rich in dietary fibers. Sources of plant proteins include beans, pulses, lentils, etc. Football players should consume a diet containing both animal and plant protein sources to maximize health benefits.

#### 1.2.6 Seeds, nuts and oil

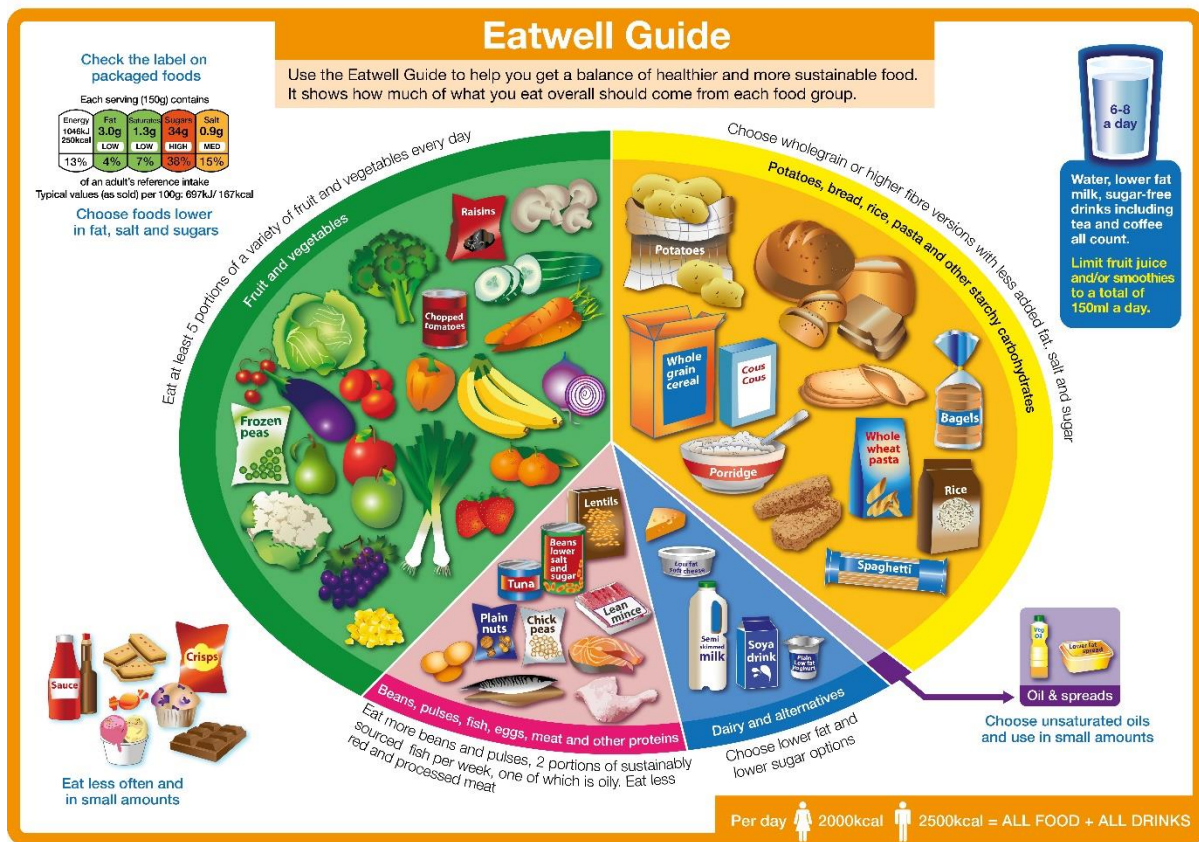
Seeds, nuts and oil are rich sources of dietary fats. A diet for football players should contain adequate amount of fats from good dietary fat sources: vegetable oils such as olive oil, soybean oil and sunflower oil; seeds such as sunflower seeds, pumpkin seeds and sesame; and nuts such as cashews, peanuts and almonds.

#### 1.2.7 Sweets

Sweets such as sugar, candy and jaggery can provide quick energy boost for the football players during training and match. However, excessive intake of sweetened foods can lead to weight gain and other health problems. Although football players can enjoy sweet treats, they should be mindful of their sugar intake throughout the day. Football players should also be aware that most sweet desserts are high in bad dietary fats.

### 1.3 The Eatwell Guide

The Eatwell Guide shows how much food from each food group should be consumed to achieve 'a healthy, balanced diet' [8]. The Eatwell Guide is intended for the general public, but it is included in this booklet to educate the football players on a balanced diet. Football players can follow the diet recommended in the Eatwell Guide on a normal day without intense trainings or match. Specific dietary guidelines for football players on a training or match day will be discussed in the following chapter.



(To translate into Burmese)

## References

1. Academy of Nutrition and Dietetics; American College of Sport Medicine; Dietitians of Canada. Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and Athletic Performance. *J. Acad. Nutr. Diet.* **2016**, 116, 501–528.
2. =:LKyhtgrfqa q34567-aruaana Bonnici, D., Greig, M., Akubat, I., Sparks, S., Bentley, D. and Mc Naughton, L. (2019). Nutrition in Soccer: A Brief Review of the Issues and Solutions. *Journal of Science in Sport and Exercise*, [online] 1(1), pp.3-12. Available at: [https://www.researchgate.net/publication/333730717\\_Nutrition\\_in\\_Soccer\\_A\\_Brief\\_Review\\_of\\_the\\_Issues\\_and\\_Solutions](https://www.researchgate.net/publication/333730717_Nutrition_in_Soccer_A_Brief_Review_of_the_Issues_and_Solutions) [Accessed 13 Jan. 2020].
3. Mohs.gov.mm. (2020). *MINISTRY OF HEALTH AND SPORTS*. [online] Available at: <https://www.mohs.gov.mm/Main/content/publication/list?pagenumber=1&pagesize=9> [Accessed 15 Jan. 2020].
4. nhs.uk. (2020). *The Eatwell Guide*. [online] Available at: <https://www.nhs.uk/live-well/eat-well/the-eatwell-guide/> [Accessed 15 Jan. 2020].
5. Ono, M., Kennedy, E., Reeves, S. and Cronin, L. (2012). Nutrition and culture in professional football. A mixed method approach. *Appetite*, [online] 58(1), pp.98-104. Available at: <https://www.sciencedirect.com/science/article/abs/pii/S0195666311006039> [Accessed 12 Jan. 2020].
6. Singh, M. (2004). Role of micronutrients for physical growth and mental development. *The Indian Journal of Pediatrics*, [online] 71(1), pp.59-62. Available at: <https://link.springer.com/article/10.1007/BF02725658> [Accessed 15 Jan. 2020].
7. Wolfe, R. (2006). Skeletal Muscle Protein Metabolism and Resistance Exercise. *The Journal of Nutrition*, 136(2), pp.525S-528S.
8. www.fifa.com. (2020). *FIFA - FIFA.com*. [online] Available at: <http://www.fifa.com/> [Accessed 15 Jan. 2020].



## **Chapter 2: Understanding the macronutrients and fluid requirements**

In this chapter, we will learn the details of macronutrient and fluid requirements of football players.

### **2.1 Carbohydrate**

Carbohydrates are the major source of energy, and compose a significant portion of an athlete's meal. Football players should be aware of the types and amount of carbohydrates they should consume depending on the intensity and the time of their exercise regimens to obtain maximum nutritional benefits.

Guidelines recommend the football players should consume 7 to 10 g per kg BM of nutrient-rich complex carbohydrate foods daily [1], which amounts to 60-70% of total daily calorie intake [2]. Complex carbohydrate foods typically have low to moderate glycemic index, and are rich in micronutrients and fibers.

#### **2.1.1 Types of carbohydrate based on the glycemic index values**

The glycemic index (GI) is the ranking of carbohydrates based on their effects on blood glucose levels. Low GI carbohydrates are more slowly digested and absorbed compared to their higher GI counterparts, and hence, carbohydrate foods with lower GI values can energize the football players for a longer duration. On the contrary, carbohydrates with higher GI values can give an instant energy boost that last for a comparably shorter period of time. GI value less than 55 is classified as low, 56-69 as medium and above 70 as high [3]. The glycemic index values of common carbohydrate foods are shown in the table below: [4]

<b>Food item</b>	<b>Glycemic Index (GI)</b>
Rye bread (whole grain)	68
White and whole meal wheat bread	100
Spaghetti	67
Barley	36
White rice	81
Sweet corn	80
All bran	74
Corn flakes	121
Porridge oats	89
Digestive biscuits	82
Plain crackers	100
Potato (boiled)	80
Potato (mashed)	98
Sweet potato	70
Yam	74
Baked beans (canned)	70
Chick peas (canned)	60
Kidney beans (canned)	74
Lentils (green, dried)	36
Apple	52
Orange	59
Orange juice	71
Glucose	138
Ice cream	69
Skim milk	46

- Glycemic index values of carbohydrate foods not included in this list are included in the tables in Appendix. OR check with the nutrition team.

### 2.1.2 Carbohydrate requirement before training or match

Football players are recommended to ingest easily digestible high-carbohydrate meals 3 to 4 hours before the physical exercise [5]. However, some studies say the potential effects of high GI-pre exercise meals on sports performance is ambiguous, although the high-GI meals can promote more muscle glycogen. These studies suggest to consume mostly complex carbohydrates (lower GI meals) before training or match to promote endurance [6, 7].

Hence, it is advisable for the football players to work out the pre-match diet regimen best suited for themselves. However, keep in mind that complex carbohydrates (lower GI values) are nutrient rich, can provide long term health benefits and promote endurance, while the simple carbohydrates (higher GI values) are beneficial to get quick energy boost, replenish glycogen storage quickly and less prone to gastrointestinal irritation.

Football players are advised to load carbohydrates before match as follows:

Time of event	Pre-match meal plan
Morning events	<ul style="list-style-type: none"> <li>• Eat a high-carbohydrate meal the night before</li> <li>• Eat a light breakfast or snack in the early morning (low fat, higher GI meals)</li> </ul>
Afternoon events	<ul style="list-style-type: none"> <li>• Eat a high-carbohydrate meal both the night before and breakfast</li> <li>• Eat a light lunch (low fat, higher GI meals)</li> </ul>
Evening events	<ul style="list-style-type: none"> <li>• Eat a high-carbohydrate breakfast and lunch</li> <li>• Eat a light meal or snack before event (low fat, higher GI meals)</li> </ul>

Pre-match/ training carbohydrate recommendations are as follows [7]:

Timing	Carbohydrate intake
Daily intake	7-10 and up to 12g/ kg BM
3-4 hour before kick-off	1-4g/ kg BM
1 hour before kick-off	25-30g

### 2.1.3 Carbohydrate requirement during training or match

Football players can consume high GI carbohydrate snacks, fruit juice or sports drink during the halftime interval or rest period in prolong training sessions. Sports drinks containing 6-8% of carbohydrate are recommended if the training session lasts longer than one hour.

During-match/ training carbohydrate recommendation is as follows [7]:

Timing	Carbohydrate intake
During match (focus on halftime)	30-60g of carbohydrate per hour

#### 2.1.4 Carbohydrate requirement after training or match

It is important for the football players to replenish the glycogen storage after training or match. Football players are advised to consume high carbohydrate meals in the first hours following the training or match. Moderate to high-GI carbohydrate foods are recommended as post-training/ match meals to boost the glycogen stores quickly [7].

Post-match/ training carbohydrate recommendations are as follows:

Timing	Carbohydrate intake
Within 15 minutes of training/ match	1g/ kg BM
Up until 4 hours after training/ match	1.0-2.4g / kg BM

## 2.2 Protein

Protein is important to build and repair muscles after intense physical activities. It also provides additional energy source during a football match. It is advisable to consume 20 to 25 g of high quality protein shortly after training to promote protein synthesis and muscle tissue remodeling.

Football players are recommended to consume between 1.3 and 1.75g of protein per kg BM daily, and up to 2g/ kg BM during intense trainings or football match. The daily intakes can be divided into 0.25- 0.4 g/ kg/ meal and 0.55g/ kg before sleep [7].

Examples of good protein source includes lean meat, eggs, fish, low-fat milk and dairy products, green-leafy vegetables, cereals, legumes and lentils, soy milk, tofu, nuts and seeds, etc. Some protein sources, especially meat, are high in saturated fat (bad fat) and thus, lean cuts of meat are preferred. Additionally, meals should be prepared with minimum added fat or oil.

Football players do not need to focus on protein intake during training or match. Recommendations for protein intake before and after training/ match are given below [7]:

Timing	Protein intake
Daily intake	1.3- 1.75g up to 2g/ kg BM
3- 4 hours before kick-off	1g/ kg BM
Within 15 minutes of training/ match	20- 40g high quality protein containing 2- 3g of leucine
Up until 4 hours after training/ match	0.3g/ kg BM

## 2.3 Lipid

Although fat is not an important energy source in a football player's diet, it is still required for maintaining normal bodily functions such as regulation of body heat. It is also essential for low-intensity exercise and recovery after high-intensity training or match as omega 3-rich fatty foods can reduce muscle soreness and swelling [8].

Football players are recommended to consume less than 30% of daily total energy intake as fat, and only 7% of which should be saturated fat (bad fat) [7]. Hence, a football player's diet should contain ample amount of unsaturated fat (good fat) while keeping the amount of saturated fat (bad fat) minimum.

Examples of the good and bad fats are as follows:

<b>Good fats</b>	<b>Bad fats</b>
Oily fish	Baked pastries (cookies, cakes, doughnuts, etc.)
Salmon	Packaged snack foods (crackers, chips, etc.)
Mackerel	Fried foods (fried chicken, French fries, etc.)
Sardines	Margarine, vegetable shortening
Avocados	Red meat (beef, pork, goat)
Cheese (not processed cheese)	Chicken skin
Whole eggs	Butter, cream
Nuts and seeds	Ice cream (full-fat)
Olive, canola, peanut, soybean and sesame oils	Lard
Full-fat yogurt, soy milk	Coconut and palm oil
Peanut butter	Oily gravy

## 2.4 Fluid requirement

Drinking enough fluid is crucial in preventing dehydration, enhancing athletic performance and preventing heat related illness in football players. Fluid losses in football players can be due to:

1. Environmental conditions such as temperature and humidity
2. The intensity of exercise
3. The duration exercise and heat exposure
4. The clothing worn by the football players
5. The individual sweat rate of football players

Football players should adjust their daily fluid intake based on the above factors. In normal daily life, thirst is a determining indicator of fluid deficit in the body, but it is not a reliable indicator in keeping the body adequately hydrated during exercise. Hence, the football players should make a habit of drinking enough fluid throughout the day routinely.

An easy method to ensure adequate fluid intake is to carefully monitor the body mass changes over a session of exercise or football match. The change in body mass is the difference between pre- and post-exercise body mass. Each gram of body mass loss is equal to 1 ml of fluid loss in the body.

Football players should also keep in mind that water is not a good choice for rehydration after and during training/ match that lasts longer than one hour. In such cases, isotonic sports drinks are recommended.

The guidelines on fluid requirements for the football players are as follows [5, 7]:

<b>Timing</b>	<b>Fluid requirements</b>
Daily intake	Adjust to the intensity of physical activities
2 hours before kick-off	6- 8 mL/ kg BM
15 minutes before kick-off	300- 600 mL
During training/ match	Routine ingestion based on individual fluid losses, intensity and environment of training/ match

Up until 4 hours after training/ match	Fluid with electrolytes replacement- 150% of BM losses
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In conclusion, it is advisable for the football players to test and decide the diet and fluid regimens that work best for them during their normal training periods. However, these experiments should not be done on the match day when the diet and fluid intake should be as routine as possible.

## References:

1. Hawley, J., Tipton, K. and Millard-Stafford, M., 2006. Promoting training adaptations through nutritional interventions. *Journal of Sports Sciences*, [online] 24(7), pp.709-721. Available at: <[https://www.researchgate.net/publication/7015997\\_Promoting\\_training\\_adaptation\\_through\\_nutritional\\_interventions](https://www.researchgate.net/publication/7015997_Promoting_training_adaptation_through_nutritional_interventions)> [Accessed 16 May 2020].
2. www.fifa.com. (2020). *FIFA - FIFA.com*. [online] Available at: <http://www.fifa.com/> [Accessed 15 Jan. 2020]
3. Atkinson, F., Foster-Powell, K. and Brand-Miller, J., 2008. International Tables of Glycemic Index and Glycemic Load Values: 2008. *Diabetes Care*, [online] 31(12), pp.2281-2283. Available at: <<https://care.diabetesjournals.org/content/31/12/2281>> [Accessed 16 May 2020].
4. Caballero, B., Trugo, L. and Finglas, P., 2003. *Encyclopedia Of Food Sciences And Nutrition*. 2nd ed. San Diego, Calif.: Academic.
5. FC Barcelona Medical Department and The Gatorade Sports Science Institute, 2016. *FC Barcelona Sports Nutrition Guide*. Barcelona: FC Barcelona, pp.11-12.
6. Hulton, A., Gregson, W., Maclaren, D. and Doran, D., 2012. Effects of GI Meals on Intermittent Exercise. *International Journal of Sports Medicine*, 33(09), pp.756-762.
7. Caruana Bonnici, D., Greig, M., Akubat, I., Sparks, S., Bentley, D. and Mc Naughton, L., 2019. Nutrition in Soccer: A Brief Review of the Issues and Solutions. *Journal of Science in Sport and Exercise*, 1(1), pp.3-12.
8. Burke, K., Ebelhar, J. and Weiss, E., 2009. The Effect Of Omega-3 Fatty Acid Supplementation On The Inflammatory Response To Eccentric Strength Exercise. *Medicine & Science in Sports & Exercise*, 41, p.185.

### **Chapter 3: Determining Protein-Energy Requirement**

We have discussed the recommendations for macronutrient intake of football players in Chapter 2. In this chapter, we will learn how to apply these recommendations to achieve maximum nutritional benefits.

#### **3.1 Energy and Calories**

Our body needs energy to maintain vital bodily functions and to perform daily activities. The energy needs of an individual depend on age, gender, physique and the level of physical activity [6]. Football players require more energy than the general population due to high energy demand of intense trainings and competitive games. Therefore, they should be able to estimate their daily energy expenditure in order to meet the recommended energy intake. Consumption of more nutrients than the body needs (calorie surplus) can result in unwanted weight gain and likewise, consumption of less nutrients than the body needs (calorie deficit) can lead to low energy level in athletes.

In nutrition, energy is measured by a unit of food energy called kilocalorie (kcal), more commonly known as calorie. In order to estimate the daily energy requirement of a football player, we first need to estimate the player's resting energy expenditure (REE) by using Harris-Benedict equation.

For male football players:

$$\text{REE} = 66.47 + 13.75 \times \text{Weight (kg)} + 5 \times \text{Height (cm)} - 6.76 \times \text{Age (yr)}$$

For female football players:

$$\text{REE} = 655.10 + 9.56 \times \text{Weight (kg)} + 1.85 \times \text{Height (cm)} - 4.68 \times \text{Age (yr)}$$

The resultant value is then multiplied by physical activity factor to estimate the total energy expenditure (TEE) of athletes.

$$\text{TEE} = \text{REE} \times \text{physical activity factor}$$

Table 1. Physical Activity Factors [2]

Category	Example	Physical Activity Factor
Sedentary to light activity	Walking or yoga	1.4-1.69
Moderate activity	Fitness classes, weight lifting, running or cycling	1.7-1.99
Vigorous activity	Endurance and elite athletes	2.0-2.4 or higher for elite athletes

A 2006 study conducted by Bangsbo et al. reports that the average energy expenditure of a single match/ training session is approximately 1000-1500 kcal [1]. Hence, young athletes are generally recommended to consume 45 kcal per 1 kg of fat free mass (lean body mass) a day [5].

### 3.2 Sample calculation

Sithu is a 20-year-old professional football player. His current weight is 61 kg and height is 5 feet 9 inches (175.3 cm). He trains 4 hours a day. His training sessions include moderate to high intensity exercises. Calculate the total daily energy expenditure (TEE) of Sithu.

Firstly, we calculate the resting energy expenditure (REE) of Sithu using Harris-Benedict equation.

$$\begin{aligned}\text{REE} &= 66.47 + 13.75 \times \text{Weight (kg)} + 5 \times \text{Height (cm)} - 6.76 \times \text{Age (yr)} \\ &= 66.47 + (13.75 \times 61) + (5 \times 175.3) - (6.76 \times 20) \\ &= 1646.52 \text{ kcal}\end{aligned}$$

Total energy expenditure of Sithu can be obtained by multiplying his REE value and the physical activity factor. Considering the intensity of his trainings, his physical activity factor is assumed as 2.

$$\begin{aligned}\text{TEE} &= \text{REE} \times \text{physical activity factor} \\ &= 1646.52 \times 2 \\ &= 3293.02 \\ &\cong 3300 \text{ kcal}\end{aligned}$$

According to the calculation, Sithu needs to consume approximately 3300 kcal per day to meet his daily recommended energy intake.

### 3.3 Determining macronutrient requirements

Based on the above calculations, daily recommended energy intake of Sithu is estimate 3,300 kcal. According to FIFA guidelines, a football athlete should consume 55-65% of the total energy intake as carbohydrate, 12-15% as protein and less than 30% as fat daily [6].

#### 3.3.1 Determining the protein intake

The Australian Institute of Sports recommends the daily protein intake of a football player should be between 1.3 and 1.75g/ kg. The daily intake should be increased up to 2g/kg of body weight on the day of intense training [3].

Hence, 1.8g per kilogram of body weight is recommended for Sithu considering the intensity of his training. Sithu's current body weight is 61 kg. The daily protein intake of Sithu is:



$$\begin{aligned}
 \text{Daily Protein Intake} &= \text{Recommended Protein Intake (g)} \times \text{Body Weight (kg)} \\
 &= 1.8 \times 61 \\
 &= 109.8 \text{ g} \\
 &\cong 110 \text{ g of protein per day}
 \end{aligned}$$

As mentioned in Chapter 2, one gram of protein provides 4 kcal of energy. 110 g of protein will provide 440 kcal of energy. In other words, the energy from protein (440 kcal) contributes 13 percent of Sithu's total energy requirement (3,300 kcal) which falls within the FIFA's recommended daily protein intake of 12-15%.

### 3.3.2 Determining the carbohydrate intake

A study done by Burke L. et al., recommends a daily carbohydrate intake of 7-10g/ kg body weight, and up to a maximum of 12g/ kg for periods of intensive training [4]. As mentioned earlier, FIFA recommends the percentage of daily carbohydrate intake should be between 55-65% of total energy intake.

Hence, recommended daily carbohydrate intake of Sithu is calculated as 8g per kg of body weight per day.

$$\begin{aligned}
 \text{Daily CHO Intake} &= \text{Recommended CHO Intake (g)} \times \text{Body Weight (kg)} \\
 &= 8 \times 61 \\
 &= 488 \text{ g of carbohydrate per day}
 \end{aligned}$$

Similar to protein, one gram of carbohydrate provides 4 kcal of energy. 488g of carbohydrate will provide 1,952 kcal of energy- 59 percent of Sithu's recommended total energy intake (3,300 kcal).

### 3.3.3 Determining the fat intake

According to FIFA guidelines, football athletes should consume fat less than 30% of total energy intake. Based on the above calculations, Sithu will receive 13 percent of the total energy from protein and 59 percent from carbohydrate. Hence, the remaining 28 percent of total energy will come from fat.

Chapter 2 mentions one gram of fat provides 9 kcal of energy. 28 percent of Sithu's total energy intake (3,300 kcal) is 924 kcal ( $3,300 \times 0.28$ ). In other words, Sithu needs to consume approximate 102 g of fat ( $924 \div 9$ ).

However, the athletes should be aware that fat, especially in the form of cooking oil, is already included in carbohydrate and protein food such as chicken curry or French fries. Hence, the athletes do not need to actively consume high fat food to meet the recommended fat intake. Although consumption of good dietary fat sources such as nuts should be encouraged, the athletes should consume the least amount of food high in bad dietary fat such as deep-fried food.

In conclusion, the football players should focus mainly on their carbohydrate and protein intake while keeping their fat intake to a minimum.

#### References:

1. Bangsbo, J., Mohr, M. and Krstrup, P. (2006). Physical and metabolic demands of training and match-play in the elite football player. *Journal of Sports Sciences*, [online] 24(7), pp.665-674. Available at: <https://www.tandfonline.com/doi/abs/10.1080/02640410500482529> [Accessed 26 Feb. 2020].
2. Bytowski, J. (2017). Fueling for Performance. *Sports Health: A Multidisciplinary Approach*, [online] 10(1), pp.47-53. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5753973/> [Accessed 26 Feb. 2020].
3. Burke L, Bell L, Cort M, Cox G, Farthing L, Greenaway B, et al. Current concepts in sports nutrition. Australian Institute of Sport; 2016. p. 1–56.
4. Burke LM, Loucks AB, Broad N. Energy and carbohydrate for training and recovery. *J Sports Sci.* 2006;24(7):675–85
5. Loucks, A., Kiens, B. and Wright, H. (2011). Energy availability in athletes. *Journal of Sports Sciences*, [online] 29(sup1), pp.S7-S15. Available at: [https://www.researchgate.net/publication/51525435\\_Energy\\_availability\\_in\\_athletes](https://www.researchgate.net/publication/51525435_Energy_availability_in_athletes) [Accessed 26 Feb. 2020].
6. www.fifa.com. (2020). *FIFA - FIFA.com*. [online] Available at: <http://www.fifa.com/> [Accessed 15 Jan. 2020].

## **Chapter 4: Determining Daily Food Requirement**

Based on the calculations done in Chapter 3, we know Sithu needs to consume approximate 110g (440 kcal) of protein and 488g (1,952 kcal) of carbohydrate per day. In this chapter, we will learn how to convert the amount of protein and carbohydrate in grams into the common household measurements using the food exchange lists.

### **4.1 Understanding the food exchange lists**

The food exchange lists provide an easy way to keep track of the calorie and protein intakes, as well as to plan a simple menu for the football players. The foods we eat daily are categorized into six food groups. 'Group 1 includes cereals, potatoes etc., Group 2 fruits, Group 3 seafood, meat, eggs, soybean products etc., Group 4 milk and milk products, Group 5 oils, fats, and food high in fat, and Group 6 vegetables' [3].

In food exchange lists, each food item is expressed by a 'unit.' One unit of a food item provides approximate 80kcal of energy. The table below shows the amount of carbohydrate, protein and lipid in grams per unit (80 kcal) of food in each food group.

Table 1. Food Classification Table

		Average amount of nutrients per unit (80 kcal)		
Food class	Food type	Carbohydrate (gr)	Protein (gr)	Lipid (gr)
<b>Foods which mainly contain carbohydrates</b>				
Group 1	Cereals, Potatoes, Vegetables high in carbohydrates, nuts and seeds, Beans (not including soybeans)	18	2	0
Group 2	Fruits	20	0	0
<b>Foods which mainly contain protein</b>				
Group 3	Seafood, Meats, Eggs, cheeses, Soybeans and soybean products	0	9	5
Group 4	Milk and dairy products (not including cheeses)	6	4	5
<b>Foods which mainly contain lipid</b>				
Group 5	Oils and fats, Oily and fatty foods	0	0	9
<b>Foods which mainly contain vitamins and minerals</b>				
Group 6	Vegetables (not including some vegetables high in carbohydrates), Sea weed, Mushrooms	13	5	1

## 4.2 Using the food exchange lists

In order to use the food exchange lists, we first need to convert the recommended daily intakes in calorie (kcal) into units of foods. As mentioned before, one unit of food provides 80 kcal of energy. Hence, the total amount of daily intake (kcal) is divided by 80 to get the number of food units needed in a day.

Recommended daily carbohydrate intake of Sithu =  $1952 \text{ kcal} \div 80$

$$= 24.4$$

$$= 24 \text{ units of carbohydrate a day}$$

Football players should consume 2 units of vegetables a day to ensure adequate intake of vitamins, fibers and minerals. *Refer to Chapter 2 for vegetable intake on match day.*

Hence, we will add the extra 2 units of vegetables and the total carbohydrate units Sithu should consume is 26 units a day.

If we do the same with protein intake, then the food unit for protein rich food is:

Initial calculation of daily protein intake of Sithu =  $440 \text{ kcal} \div 80$

$$= 5.5$$

$$= 6 \text{ units of protein a day}$$

However, the protein food also contains fat and carbohydrate, and hence 6 units of protein is not the final answer. We need to consider the calorie of fat and carbohydrate but we can use 6 units of protein as the basic unit for our final calculations.

As shown in the food classification table, group 3 and 4 foods (rich in protein) also contain 5 g of fat in one food unit. Likewise, group 4 food (milk and dairy products) contain 6 g of carbohydrate. Hence, the calorie of the fat and carbohydrate should be combined with the calorie of protein before converting into units of food.

Since we are using 6 units of protein as a base for further calculations, we will take it as Sithu needs 6 units of protein.

Football players should consume 3 units of milk and dairy products a day. 3 units of group 4 food will contain  $3 \times 5 \text{ g}$  of fat (15 g) and  $3 \times 6 \text{ g}$  of carbohydrate (18 g). So, the extra calorie from Group 4 food is:

Extra calorie from fat and carbohydrate (Group 4) = Calorie of fat + Calorie of carbohydrate

$$= (15 \times 9) + (18 \times 4)$$

$$= 135 + 72$$

$$= 207 \text{ kcal}$$

The other 3 units of protein food will come from Group 3. Hence, the extra calorie from Group 3 food is:

$$\begin{aligned}\text{Extra calorie from fat (Group 3)} &= 3 \times 5 \text{ g of fat} \\ &= 15 \text{ g of fat} \times 9 \\ &= 135 \text{ kcal}\end{aligned}$$

Finally, we will calculate the actual recommended units of protein food as follows:

$$\begin{aligned}\text{Recommended daily protein intake of Sithu} &= (440 + 207 + 135) \text{ kcal} \div 80 \\ &= 9.775 \\ &= 10 \text{ units of protein a day}\end{aligned}$$

*Remember that 3 units of Group 4 food is recommended, and hence the extra calorie to add up is fixed at 207 for all the football players. Thus, if a football player (not Sithu) needs 5 units of protein in the initial calculation of the units of protein food, then the extra calorie to add in the final calculation would be:*

$$\begin{aligned}\text{Initial protein units} &= 5 \text{ units} \\ &= 3 \text{ units from Group 4 food (always fixed)} + 2 \text{ units from Group 3 food} \\ &= 207 \text{ kcal (always fixed)} + \text{extra calorie from Group 3 food} \\ &= 207 \text{ kcal} + ((2 \times 5 \text{ g of fat}) \times 9 \text{ kcal}) \\ &= 207 + 90 \text{ kcal} \\ &= 297 \text{ kcal}\end{aligned}$$

#### 4.2.1 Distributing units of carbohydrate over meals

Next, we need to distribute the units of carbohydrates over breakfast, lunch, dinner and snacks. However, we have to consider the hours of training before we plan the menu. Sithu trains for 2 hours in the morning and 2 hours in the evening. Hence, carbohydrate requirements based on Sithu's training regimen are as follows [1]: (Refer to Chapter 2 for specific guidelines on carbohydrate requirements)

Carbohydrate targets g/ kg BM/ day	Amount of Carbohydrate (gr)	Amount of Carbohydrate (kcal)	Amount of Carbohydrate (unit)
Pre-training snack (1-4g 1-4hr before training)	61 gr (1g/ kg BM)	244 kcal	3 units
During training	30 gr (15g per hr)	120 kcal	1.5 units
Post-training snack (1-1.2g in the 4h post exercise)	61 gr (1g/ kg BM)	244 kcal	3 units

Sithu needs a total of 26 units of carbohydrates a day. Now, we will distribute 26 units over meals. Remember that the units of carbohydrate should be distributed more or less evenly over breakfast, lunch and dinner.

Amount	Pre- trainin g snack (6:30 am)	Trainin g (7:30- 9:30 am)	Breakf ast (9:40 am)	Lunch (12:00 pm)	Pre- training Snack (2:30 pm)	Trainin g (4:00- 6:00 pm)	Post- trainin g snack (6: 15 pm)	Dinner (7:30 pm)	Sup per (9: 30 pm)	Total
<b>Unit</b>	<b>3</b>	<b>1.5</b>	<b>4</b>	<b>5</b>	<b>3</b>	<b>1.5</b>	<b>2</b>	<b>5</b>	<b>1</b>	<b>26</b>
Food group	1	Sport drink 100 plus	1(3) 2(0.5) 6(0.5)	1(3.5) 2(0.5) 6(1)	1	Sport drink 100 plus	1	1(4.5) 6(0.5)	1	
Total Kcal	240	125	320	400	240	125	160	400	80	2090
<b>Carb (gr)</b>	<b>54</b>	<b>31</b>	<b>70.5</b>	<b>86</b>	<b>54</b>	<b>31</b>	<b>36</b>	<b>87.5</b>	<b>18</b>	<b>468</b>
Protein (gr)	6	0	8.5	12	6	0	4	11.5	2	50
Fat (gr)	0	0	0.5	1	0	0	0	0.5	0	2

- 1 unit of vegetables (Group 6) is 300 grams (2 cups). The football players should consume 2 units of vegetables and 1 unit of fruits (Group 2) a day.

#### 4.2.2 Distributing units of protein food over meals

Sithu is recommended to eat 10 units of protein a day. As mentioned in Chapter 2, it is recommended to consume 20-25g of high quality protein immediately after training [2]. Units of protein intake is distributed over meals as follows: (Refer to Chapter 2 for specific guidelines on protein requirements)

Amount	Pre-training snack (6:30 am)	Training (7:30-9:30 am)	Breakfast (9:40 am)	Lunch (12:00 pm)	Pre-training Snack (2:30 pm)	Training (4:00-6:00 pm)	Post-training snack (6:15 pm)	Dinner (7:30 pm)	Supper (9:30 pm)	Total
<b>Unit</b>	<b>1.5</b>	<b>X</b>	<b>1.5</b>	<b>1.5</b>	<b>0.5</b>	<b>X</b>	<b>1.5</b>	<b>2</b>	<b>1.5</b>	<b>10</b>
Food group	4	X	3	3	3	X	3	3	4	
Total Kcal	120	X	120	120	40	X	120	160	120	800
<b>Protein (gr)</b>	<b>6</b>	<b>X</b>	<b>13.5</b>	<b>13.5</b>	<b>4.5</b>	<b>X</b>	<b>13.5</b>	<b>18</b>	<b>6</b>	<b>75</b>
Carb (gr)	9	X	0	0	0	X	0	0	9	18
Fat (gr)	7.5	X	7.5	7.5	2.5	X	7.5	10	7.5	50

#### 4.3 The Food Exchange Lists

We have distributed the units of different food groups over the meals and snacks. Now, we will convert these food units into the amount of food in household measurement.

Sithu's breakfast consists of 3 units of Group 1 food, 0.5 units of Group 2 food, 0.5 unit of Group 6 food, and 1.5 units of Group 3 food. We will convert these units into the actual amount of food using the food exchange tables below. ***Please remember food cannot be exchanged between the food groups.***

For example, Sithu needs 3 units of Group 1 food for breakfast. The foods that can be exchanged for Group 1 are shown in the Group 1 table, and these foods can be exchanged with each other. Hence, Sithu can eat 3 units of cooked rice (1.5 bowl) or 2 units of cooked rice (1 bowl) with 1 unit of white bread (half a slice).

#### 4.3.1 Food rich in carbohydrate

Group 1: Cereals, potatoes, vegetables high in carbohydrates, nuts and seeds, beans (not including soybeans)

The amount of each food item shown in the table below equals to one exchange unit of food.

One unit of food contains:

Energy = 80 kcal

Carbohydrate = 18 g

Protein = 2 g

Fat = 0 g

Food items	1 unit (gr)	Measure	Notes
Cooked rice	50	Half a small bowl	
Cooked brown rice	50	Half a small bowl	
Uncooked rice	25		
Uncooked brown rice	25		
Uncooked glutinous rice	25		
French bread	30		
Soft French bread roll	25		
White bread	30	About half a slice of a 6-slice loaf	
Rye bread	30	About half a slice of a 6-slice loaf	
Raisin bread	30	About half a slice of a 6-slice loaf	
Croissants	20		High in fat
Udon (boiled)	80	1/3 ball	
Udon (raw)	30		
Udon (dried)	20		
Buckwheat noodle (boiled)	60		
Buckwheat noodle (raw)	30		
Buckwheat noodle (dried)	20		
Thin wheat noodle (boiled)	60		
Thin wheat noodle (dried)	20		
Wheat noodle (boiled)	60		
Wheat noodle (dried)	20		
Spaghetti (boiled)	50		
Spaghetti (dried)	20		
Macaroni (boiled)	50		
Macaroni (dried)	20		
Chinese noodle (steamed)	40		Stir-fried noodle
Chinese noodle (boiled)	50		
Chinese noodle (raw)	30		
Chinese noodle (dried)	20		
Starch noodle (dried)	20		
Rice noodle (dried)	20		
Rice vermicelli (dried)	20		
Corn flakes	20		
Crackers	20		
Oatmeal (dried)	20	3- 3.5 tablespoons	
Potato starch	20	2 tablespoons	Same for other types of starch



Wheat flour	20	2 tablespoons	
Nonglutinous rice flour	20	2 tablespoons	
Glutinous rice flour	20	2 tablespoons	
Buckwheat flour	20	2 tablespoons	
Bread crumbs	20	2 tablespoons	
Taro	140	3, medium	With peel 170 gr
Potatoes	110	1, medium	With peel 120 gr
Chinese Yam	70		With peel 80 gr
Sweet potatoes	60		With peel 70 gr
East Indian lotus root	120		With peel 150 gr
Sweet corn (canned)	100		
Maize	90	½ medium	On the cob 130 gr
Japanese pumpkin	160		
Chestnuts	50	4, medium	With peel 70 gr
Ginkgo nuts	40	25- 30	Unshelled 55 gr
Sweet roasted chestnuts	40	4- 7	With peel 50 gr
Green peas*	90		
Broad beans*	70	15- 20	With peel 90 gr
Broad beans (dried)	25		
Red mung beans (boiled)	60		Without sugar
Red mung beans (dried)	25		
Kidney beans (boiled)	60		Without sugar
Kidney beans (dried)	25		
Peas (boiled)	60		Without sugar
Peas (dried)	25		
Cowpeas (boiled)	60		Without sugar
Cowpeas (dried)	25		

\*Small quantities (15 gr or less) of green peas or broad beans may be exchanged for Group 6 vegetables.

### Group 2: Fruits

The amount of each food item shown in the table below equals to one exchange unit of food.

One unit of food contains:

Energy = 80 kcal

Carbohydrate = 20 g

Protein = 0 g

Fat = 0 g

Food items	1 unit (gr)	Weight including peel and core (gr)	Measure
Strawberries	250	260	
Chinese pears	200	240	½, large
Chinese plums	200	220	
Melons	200	400	½, medium
Nectarines	200	240	2, medium
Papayas	200	310	½
Peaches	200	240	1, large
Watermelons	200	330	
Mandarins	200	310	
Pummelos	200	400	
Oranges	200	330	
Lemons	150	160	2, medium
Apples	150	180	½, medium
Blueberries	150	150	
Common pear	150	180	
Figs	150	180	3, medium
Grapes	150	180	10- 15 grapes
American cherries	100		
Persimmons	150	170	1, medium
Kiwifruit	150	180	2, small
Lychees	150	210	
Mangos	150	230	1/2., medium
Pineapple	150	270	
Prunes; European plums	150	160	
Bananas	100	170	1, medium

- Dried fruits and canned fruits contain few vitamins and a lot of sugar (eat sparingly).

#### 4.3.2 Food rich in protein

Group 3: Fish, shellfish, squid, octopus, shrimp, crab, meats and processed meats, eggs, cheese, soybeans and soybean products

The amount of each food item shown in the table below equals to one exchange unit of food.

One unit of food contains:

Energy = 80 kcal

Carbohydrate = 0 g

Protein = 9 g

Fat = 5 g

Food items	1 unit (gr)	Measure	Notes
Codfish	100	1 slice, large	
Croaker	100	1, medium	With head, bones and internal organs 250 gr
Kingklip	100	1 slice, large	
Grunt	60	1/2	With head, bones and internal organs 110 gr
Mullet	60	1 slice, small	
Salmon	60	2/3 slice, medium	
Sea bream	60	1 slice, small	With head, bones and internal organs 120 gr
Trout	60	1 slice, small	
Tuna (lean meat)	60	1 slice, small	
Carp	40		
Conger eel	40		With head, bones and internal organs 60 gr
Herring	40	¼, medium	With head, bones and internal organs 70 gr
Mackerel	40		
Sardines	40		With head, bones and internal organs 80 gr
Sardines (canned)	20		
Silver pomfret	40	½ slice	With head, bones and internal organs 70 gr
Hairtail	30		
Tuna (fatty meat)	30	1/3 slice, medium	
Yellowtail	30	1/3 slice, medium	
Short-necked clams	260		With shell 650 gr
Freshwater clams	160		With shell 640 gr
Oysters	140		With shell 560 gr
Scallops	120		
Cockles	100		
Crab	120		With shell 400 gr
Shrimp	100		With head, shell and tail 200 gr
Squid	100		With shell and internal organs 130 gr

Cuttlefish	120		
Spiny lobster	80		With head, shell and tail 270 gr
Tiger prawn	80		With head, shell and tail 180 gr
Black tiger shrimp	100		
Beef chuck, round, fillet, rump	40		
Beef ground meat	40		
Beef chuck loin, sirloin	30		Without fat
Pork fillet, inside ham	60		Without fat
Pork ground meat	40		
Pork shoulder, butt, outside ham, loin	40		Without fat
Chicken meat	60		Without skin
Chicken meat	40		With skin
Chicken meat	70		With skin, with bone
Chicken gizzard	80		
Liver (beef, pork, chicken)	60		
Mutton shoulder, loin	30		
Mutton leg	40		
Boneless ham, pressed ham, chopped ham	60		
Loin ham	40		
Roast beef	40		
Roast pork	40		
Shoulder bacon	40		Bacon belongs to Group 5
Sausage	30		Dry sausage (salami) and liver sausage belong to List 5
Shoulder ham, bone-in ham	30		
Chicken egg	50	1	Include more than 5 g of fat per unit
Egg white	160		Of 1 egg 35 gr
Egg yolk	20		Of 1 egg 15 gr
Quail egg	50	5- 7	1 egg about 10 gr; Include more than 5 g of fat per unit
Cottage cheese	80		
Cheese spread	20		Include more than 5 g of fat per unit
Natural cheese	20		Include more than 5 g of fat per unit
Processed cheese	20		Include more than 5 g of fat per unit
Soy-milk	180		
Regular tofu	100		
Green soybeans (boiled)	60		With shell 140 gr
Deep fried tofu	60		
Boiled soybeans	40	3 tablespoons	

Fried tofu	40	1/3 piece	1 piece, medium 60- 100 gr
Thin slice of deep fried tofu	20		1 piece 20- 40 gr
Soybean flour	20	3 tablespoons	Without sugar
Soybeans (dry)	20	2 tablespoons	
Tofu skin (dry)	20		
Tofu skin (wet)	30		

- Fat should be removed as much as possible when cooking the meat or left when eating.
- Soy-milk soft drinks are high in sugar.

Group 4: Milk and dairy products (not including cheeses)

The amount of each food item shown in the table below equals to one exchange unit of food.

One unit of food contains:

Energy = 80 kcal

Carbohydrate = 6 g

Protein = 4 g

Fat = 5 g

Food items	1 unit (gr)	Measure	Notes
Skim milk	240 (ml)		
Regular milk	120 (ml)		180 ml is about 1.5 units, 200 ml is about 1.7 units
Processed milk low-fat	160 (ml)		200 ml is 1.3 units
Processed milk whole	100 (ml)		
Yogurt (skimmed, sweetened)	120 (gr)		High in sugar
Yogurt drinks	120 (gr)		High in sugar
Yogurt (whole milk, non-sugar)	120 (gr)		180 gr is 1.5 units
Evaporated milk	60 (gr)		
Skim milk powder	20 (gr)	3 tablespoons	
Whole milk powder	20 (gr)	3 tablespoons	Includes more than 5 gr of fat per unit

#### 4.3.3 Food rich in oil and fats

##### Group 5: Oils and fats, oily and fatty foods

The amount of each food item shown in the table below equals to one exchange unit of food.

One unit of food contains:

Energy = 80 kcal

Carbohydrate = 0 g

Protein = 0 g

Fat = 9 g

Food items	1 unit (gr)	Measure	Notes
Salad dressing	20	2 small tablespoons	
Butter	10		
Lard	10	1 small tablespoon	
Pork separable fat	10	1 small tablespoon	
Margarine	10		
Mayonnaise	10	1 small tablespoon	
Shortening	10	1 small tablespoon	
Beef fat	10	1 small tablespoon	
Beef separable fat	10	1 small tablespoon	
Vegetable oils	10	1 small tablespoon	Soy bean oil, blended oil, sesame oil, olive oil, etc.
Avocado	40	¼, large	
Bacon	20		1 slice 15- 20 gr. Shoulder bacon belongs to Group 3
Belly (beef/ pork)	20		
Cream	20		Milk fat, milk fat + vegetable fat, vegetable fat
Cream cheese	20		
Liver paste	20		
Liver sausage	20		
Rib loin (beef)	20		
Almonds	15		
Pistachio nuts	15		
Chicken skin	15		
Peanuts	15		
Peanut butter	15		
Salami sausage (dry)	15		
Sesame seeds	15	2 tablespoons	
Walnuts	10		

- All deep fried food, including deep fried vegetables, are high in bad fat, and should be consumed sparingly.
- Food written in green contain good fat.

#### 4.3.4 Food rich in vitamins and minerals

Group 6: Vegetables (not including some vegetables high in carbohydrates), sea weed and mushrooms

One unit of food in Group 6 contains:

Energy = 80 kcal      Carbohydrate = 13 g      Protein = 5 g      Fat = 1 g

One unit = 300 gram of various vegetables

One unit (300 gr) of vegetables should consist of various coloured vegetables (refer to the colourful vegetables section in Chapter 1). At least one-third of all vegetables you consume should be dark coloured (green or yellow) vegetables.

Sea weed and mushroom are usually eaten in small amount on a daily basis and they contain few calories. Hence, they do not need to be counted when measuring the units of Group 6 food. (Only weigh the vegetables)

#### 4.3.5 Seasonings and Table Luxuries

Seasonings and foods considered as table luxuries do not have much nutritional value but they are high in calorie (energy). The daily allowance of seasonings is 0.5 units.

One unit of each item gives 80 kcal of energy.

##### Seasonings

Food	1 unit (gr)	Measure
Tomato ketchup	60	1 tablespoon 0.3 units 18 gr
Honey	25	1 teaspoon 0.3 units 7 gr
Sugar	20	1 teaspoon 0.15 units 3 gr
Salad dressing, mayonnaise	10	1 small tablespoon

*Table luxuries: Alcoholic beverages, soft drinks, ice cream, canned fruits, confectionery etc.*

Food	1 unit (ml)	Measure
Beer	200	1 bottle (large) 633ml, (medium)500ml, (small)330ml, Can (regular)350ml, (small)250ml, (tall)500ml
Beer (low-malt beer)	180	
Stout beer	120	
Wine	100	1 glass 60ml
Sake; rice wine	70	1 cup 180ml
Plum liquor	50	
Whiskey	30	
Vodka	30	
Gin	30	
Brandy	30	
Rum	30	
Liqueur	25	
Sports drinks	330	1 can 200-350ml
Soft drinks: cola, cider, fruit drinks (without fruit juice), etc.	200	1 can 200- 350 ml
Fruit juice (natural fruit juice)	200	
Fruit juice (50- 30% natural fruit juice)	160	1 can 200 ml
Milk drinks: lacto coffee, lacto fruit juice, etc.	140	1 pack 180 or 250 ml
Soy-milk soft drinks	130	1 pack 180 ml
Sweet fermented rice drink	80	
Lactic acid drink (pasteurized milk product)	40	
Food	1 unit (gr)	Measure
Ice cream	40	
Sherbet	60	
Soft ice cream	50	
Canned fruits: apricots, cherries, pineapples, loquats, mandarin, peaches, pears, apples	100	
Dried fruits: apricots, persimmons, bananas, grapes	30	
Jam: apricot, strawberry, marmalade	30	
Jam: blueberry, apple, low- sugar jam	40	
Boiled beans: kidney beans, green peas, broad beans, hulled bread beans (all cooked with sugar and salt)	30	
Beanjam bun	30	



Custard cream bun	30	
Jam bun	30	
Cornet with chocolate cream	30	
Danish pastry	20	
Pancakes	30	
Rice crackers	20	
Orange jelly	100	
Custard pudding	60	
Sponge cake	25	
Fried donut cookies	15	
Candy	20	
Cream puff	35	
Shortcake	25	
Apple pie	25	
Rice cake stuffed with sweetened bean jam	35	
Chocolate (include more than 5 gr of fat per unit)	15	
Doughnuts	20	
Bean jam pancake	30	
Biscuit	20	
Potato chips (include more than 5 gr of fat per unit)	15	
Corn snacks (include more than 5 gr of fat per unit)	15	
Sweetened bean paste	25	
Boiled red mung bean (canned)	35	With sugar

## 4.4 Sample Daily Menu for Sithu

### 4.4.1 Sample food units, calorie and macronutrients distribution table for Sithu

Meal	Taken every meal (food unit)			Distributed over the day (food unit)					Total
	Gp- 1	Gp- 3	Gp- 6	Gp- 5	Sport drink	Seasonings	Gp- 2	Gp- 4	
Pre-training snack	3							1.5	
Training snack					1.5				
Breakfast	3	1.5	0.5	0.3		0.2	0.5		
Lunch	3.5	1.5	1	0.4		0.1	0.5		
Pre-training snack	3	0.5							
Training snack					1.5				
Post-training snack	2	1.5							
Dinner	4.5	2	0.5	0.3		0.2			
Supper	1							1.5	
Total units	20	7	2	1	3	0.5	1	3	37.5
Total kcal	1600	560	160	80	250	40	80	240	3010
Total carbohydrate (gr)	360	0	26	0	62	-	20	18	486
Total protein (gr)	40	63	10	0	0	-	0	12	125
Total fat (gr)	0	35	2	9	0	-	0	15	61

- It is recommended to consume only 1 unit of Group 5 food (oily and fatty food) a day. The group 5 food in this sample unit is the cooking oil.
- It is recommended to consume only 0.5 unit of seasonings a day. The seasoning used in this sample menu are sugar and curry paste.
- In chapter 3, we calculated the daily requirements of Sithu as: 3,300 kcal, 110g of protein, 488g of carbohydrate and approximate 102g of fat. You will notice that the actual amounts of calories and grams of macronutrients in the table above are slightly different from the calculated amount.
- ***Please don't forget to count the extra food/ food ingredient (not included in the menu) you consume over the day, since extra calorie intake can result in weight gain. Keeping track of weight status is highly recommended for this reason.***

#### 4.4.2 Sample Menu Plan for Sithu

Meal	Food	Unit	Gram	Measurement
Pre-training snack (6:30 am)	Sweet Potatoes with peels (boiled)	2	140	
	Croissant	1	20	
	Yogurt (non-sugar)	1.5	180	
Training snack (7:30- 9:30 am)	100 Plus sports drink (non-carbonated)	1.5	500 ml	1 bottle
Breakfast (9:40 am)	White rice	3	150	1.5 bowl
	Chicken with skin, with bones (curry)	1.5	105	
	Stir-fried mixed vegetables	0.5	150	1 cup
	Fresh watermelon	0.5	100	
	Vegetable oil (in cooking)	0.3	3	1 teaspoon
	Sugar (in cooking)	0.1	2	
	Curry paste (in cooking)	0.1	4	
Lunch (12:00 pm)	White rice	3	150	1.5 bowl
	Green peas (boiled)	0.5	45	
	Mackerel (grilled)	1.5	60	
	Mixed-vegetables salad (steamed)	1	300	2 cup
	Fresh papayas	0.5	100	
	Olive oil (in salad)	0.3	3	1 teaspoon
	Sesame seeds (in salad)	0.1	1.5	
	Sugar (in cooking)	0.1	2	
Pre-training snack (2:30 pm)	Chinese noodle (soup)	2	100	
	Egg (in noodle soup)	0.5	25	Half an egg
	Ginkgo nuts (in soup)	1	40	25- 30, pcs
Training snack (4:00- 6:00 pm)	100 Plus sports drink (non-carbonated)	1.5	500 ml	1 bottle
Post-training snack (6:15 pm)	Mashed-potatoes	2	220	2, medium
	Egg (boiled)	1	50	1, egg
	Cheese (in mashed-potatoes)	0.5	10	
Dinner (7:30 pm)	Spaghetti with mushroom (no need to weigh mushroom)	3	150	
	Maize (steamed, without cob)	1.5	135	1, medium
	Beef balls (in spaghetti)	2	80	
	Raw mixed vegetables salad	0.5	160	2 cup
	Olive oil (in salad)	0.3	3	1 teaspoon
	Salad dressing	0.2	4	
Supper (9: 30 pm)	White bread	1	30	½ slice
	Regular milk	1.5	180 ml	1 glass

- Soup can be taken with each meals. Soups served at MFF contain very little amount of vegetables and meat, and no need to be counted. Please count the amount of vegetables and meat in the soup if the amounts are substantial.

## 4.5 Chapter Summary

Calculations for carbohydrate food:

Step 1: Find the units of carbohydrate food = Total calories of carbohydrate  $\div$  80

Step 2: Distribute the units of carbohydrate across the meals (2 units of Group 6 vegetables and 1 unit of Group 2 fruits should be fixed)

Step 3: Use the food exchange list to decide which food in each carbohydrate group to consume

Calculations for protein food:

Step 1: Find the initial units of protein food = Total calories of protein  $\div$  80

Step 2: Find the extra calorie from carbohydrate and fat of the protein food groups (Group 3 and 4). *3 units of Group 4 milk/ dairy should be fixed.*

Step 3: Find the final units of protein food = (Total calories of protein + Extra calorie)  $\div$  80

Step 4: Distribute the units of protein across the meals

Step 5: Use the food exchange list to decide which food in each protein group to consume.

## References:

1. Burke, L., Hawley, J., Wong, S. and Jeukendrup, A., 2011. Carbohydrates for training and competition. *Journal of Sports Sciences*, [online] 29(sup1), pp.S17-S27. Available at: <[https://shapeamerica.tandfonline.com/doi/full/10.1080/02640414.2011.585473#.XqVwt5lS\\_IU](https://shapeamerica.tandfonline.com/doi/full/10.1080/02640414.2011.585473#.XqVwt5lS_IU)> [Accessed 26 April 2020].
2. FC Barcelona Medical Department and The Gatorade Sports Science Institute, 2016. *FC Barcelona Sports Nutrition Guide*. Barcelona: FC Barcelona, p.30.
3. Japan Diabetes Society. (2003). *Food Exchange Lists: Dietary Guidance For Persons With Diabetes*. 6th ed. Tokyo, Japan: Bunkodo Co., Ltd., p.7.