BUSINESS PLAN FOR THE PRODUCTION OF FRUCTO-OLIGOSACCHARIDE

NURUL HASLIN BINTI ADNAN

MASTER OF CHEMICAL ENGUNEERING WITH ENTREPRENEURSHIP

UNIVERSITI MALAYSIA PAHANG

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NURUL HASLIN BINTI ADNAN

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for the award of the degree of
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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of Master Chemical Engineering.

Signature
Name of Supervisor: ASSOC.PROF. DR. MIMI SAKINAH BINTI ABDUL MUNAIM
Position: ASSOC.PROF.
Date:

STUDENT'S DECLARATION

I confirm that the material in this dissertation is not copied from any published work or material, unless it is clearly identified as such and a full source reference given; is not a paraphrase or abstract of any published work or material, unless it is clearly identified as such and a full source reference given. I confirm that, other than where indicated above, this dissertation is my own work.

Signature
Name: NURUL HASLIN BINTI ADNAN
Id Number: KKE12013
Date:

To my lovely parents, Zakiah binti Waly Mohamad and Adnan bin Saari.

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I am Nurul Haslin binti Adnan. This thesis is made due to the requirement as a partial fulfilment of Master coursework programme in Chemical Engineering with Entrepreneurship course. The study had been carried out during the third semester at Faculty of Chemical and Natural Resources Engineering in Universiti Malaysia Pahang. This thesis contains 4,510 words excluding the tables, figures and references.

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EXECUTIVE SUMMARY

NAH KEE ENTERPRISE is a new establishes manufacturing company that produces fructo-oligosaccharide (FOS). This is the first company in Malaysia that produces FOS biologically but not in Asia. Since now, all the FOS are imported from other country and distributed to the local market. This company produces FOS through biological reaction which used commercial enzyme. This company is specialized in Chemical Engineering (Biotechnology). This company is located at Gebeng Industrial Area, Pahang. It is a company which manufactures and at the same time also find markets for the products.

The mission of the company is to become a leader in the production of FOS in Malaysia in term of quality and price. The company used resource from agricultural harvest which is abundance in Malaysia. Therefore, the required raw materials can be obtain from small holder farmer which known as Italicize Small and Medium Size Industry (SMSI). Hence, the product can be sell at the lower price compared to competitors. The vision of the company is to produce the best quality of FOS with lowest price. The FOS is produced in a food grade which is maximum 80% purity so that it is safe to be consumed by the consumer. Not only that, the FOS also consisted of nutritional value.

The objectives of the company are to produce the best quality of FOS in Malaysia, to become a leading company that producing FOS in term of quality and quantity, to achieve customer satisfactory and gain customer trustworthy. The company management team combines position management, operation, marketing and support teams. Our growth forecasts are predicted to increase by 15 % each year. The net income is expected to reach MYR 293,530 in year 5. An initial investment of 1 million and loan of 2 million from bank are use for start-up expenses. Our company is predicted to start make payment for the loan on the second year and expected to completely pay all the loans on year 6.

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CHAPTER 1

INDUSTRIAL OVERVIEW

1.0 INTRODUCTION

NAH KEE ENTERPRISE is a new establishes manufacturing company that produces fructo-oligosaccharide (FOS). This is the first company in Malaysia that produces FOS biologically from coconut sugar. Since now, almost all the demand of FOS are imported from other country and distributed to the local market. This company will produce FOS through biological reaction by using commercial enzyme. The company management team combines position management, operation, and also marketing and support teams.

1.1 PRODUCT OVERVIEW

The main product from this company is fructo-oligosaccharide (FOS). This product is produced based on the customer request either in powder or liquid form. The products are then commercialized as end product which is sweetener and intermediate product. It is produced from the enzymatic conversion of coconut sugar which catalyzed by fructosyltransferase in a batch reactor. Commonly, these oligosaccharides compounds are extracted from naturally occurring sugar and present in trace amount in natural food products such as onion, asparagus, wheat, banana, tomato and honey.

1.2 MARKET OVERVIEW

Potential customers of this product are mostly come from food companies that used oligosaccharide as its ingredient especially for the company that produced food for health and medication. In addition, this product is less expensive compared to other commercialized oligosaccharides that already existed in market because the raw material can be obtain directly from small holder farmers in lower price.

Increasing consumer awareness in nutrition value and food fortification for healthcare has created the demand for functional/healthy minimally processed fresh food, organic food and natural food flavors from plants and seafood. Since the fructo-oligosaccharide also has potential value for health purpose, then it is suitable to be used as food ingredients in almost all of the types of food products such as acidophilus milk, baby foods, beverages, biscuits, cakes, confectionery, cookies, crackers, flavor/unflavored milk, hard candy, ice creams, jams and jellies, muffins, ready-to-eat cereals, sorbet and sherbet, soup, and yogurt. These types of foods are comprised in the processed food and beverages sector of food industry.

According to the Malaysian Industry Development Authority (MIDA), it is estimated that the present global retail sales in food products are worth around US$3.5 trillion, and are expected to grow at an annual rate of 4.8 per cent to US$6.4 trillion by 2020. The total sale value of processed food and beverages products increases by 24.5% to RM 22.4 billion in 2008 from RM 18 billion in 2007. This remarkable rise is mainly due to an increase in domestic consumption and exports. Processed food which recorded substantial high sales figures are manufacture of condensed, powdered and evaporated milk with RM4.1 billion, cocoa products (RM3.8 billion) and vegetables, animal oils and fats (RM1.3 billion)

1.3 RESOURCES AND MATERIALS

The existing manufacture of fructo-oligosaccharide is either from sucrose by transfructosylation process or from inulin by controlled enzymatic hydrolysis (Noormazlinah, 2010). On the other hand, this fructo-oligosaccharide is produced from coconut sugar by transfructosylation. Therefore, it helps to reduce the production cost of fructo-oligosaccharide about 50 % as it used Malaysia natural harvest (coconut sugar) as raw material.

CHAPTER 2

MARKET ANALYSIS

2.1 MARKET AND COMPETITION

The target market for this fructo-oligossacharide is functional food which includes the processed food and beverages sectors of food industry.

Possible competitors are identified and categorized as:

- Microbial production of fructo-oligossacharide from different natural resources such as tomato, honey, onion, banana, stevia and wheat. (e.g. Pure Circle Sdn. Bhd)
- Chemically synthesized of fructo-oligossacharide from the process of acid hydrolysis of inulin.

Functional food products are non-homogeneous food category; it is expanded to all segments of the food and drink market. Functional foods are predominantly found in the dairy, confectionery, soft drinks, bakery and baby food market. The markets for functional food are very large and growing steadily worldwide, intensely competitive and many new products are launched continuously. From a report entitled "Consumer Trends: Functional Foods" released by Agri-Food Trade Service in 2009, researchers state the annual growth rate for functional foods are about 8% to 14%, but the exact size is difficult to measure, and the global market size is estimated from USD7 billion to USD167 billion (Lau et al., 2012).

2.2 TARGET/SEGMENTED MARKET

2.2.1 Domestic

The target market for fructo-oligosaccdahride is functional food which comprised of process foods and beverages subsector which has total 5,565 companies in Malaysia. The general food and beverage market in Malaysia is estimated at RM30 billion. Due to lack of information available for functional foods in Malaysia, it can be assumed that Malaysia has an attractive functional food and beverage niche from its large food and beverage market. Trade sources estimated functional foods consist about 40 per cent of total processed and retail packed food and drinks markets (Lau et al., 2012).

The significant segments include infant and other milk formulas, dairy-based drinks, energy drinks, sport drinks, fruit juices, drinks with Asian herbs, cereals, energy bars, biscuits, baked products, and eggs with Omega-3. These segments are mainly local produced functional products, imported ASEAN-content products, mostly from Thailand or small percentage from the developed countries such as Australia, USA or Europe. Imports from developed countries are very small and can only be found in exclusive retailers because of its expensive prices. As functional products are highly diversified, market segments are very fragmented which makes it difficult to estimate the overall market size from market observations or trade estimates (Lau et al., 2012).

Functional foods and drinks surface in the local market during 1990s when local producers and ASEAN-based multinational food companies competed to introduce new product lines to create new niches, capitalising on the emerging health trends at that time and market expansion These companies include Nestlé, Danone, Unilever, Kellogg, and Quaker Oats. Today, healthy living is an increasingly important part of the food market and food marketing (Lau et al., 2012).

According to the Economic and Social Development Department, the average consumption of sweeteners is in Malaysia is approximately 800,000 tonnes annually which is 66,667 tonnes monthly. This fructo-oligossacharide is expected to penetrate at least 0.0225% from the total beverages and processed food markets and expected to increase by 15% annually.

2.2.2 International

This company is expected to expand its business by exporting the product which is fructo-oligosaccharide to other countries. It is expected to grab a small segment of global share market. It is expected to penetrate the high demanding country for fructo-oliggosaccharide such as North America, South America, Japan, Eastern Asia, and Western Europe.

Due to the attractiveness of functional foods, this industry is highly concentrated and dominated by large companies. It is often perceived by stakeholders that functional foods could improve margins, provide untapped market and attract customer loyalty. However, it is also generally characterised by high rate of failure for new products, often due to insufficient market research, and consumers' complexity and market conditions. The challenges facing functional foods are the development, marketing and consumers. These are high cost of marketing which often exceed product development costs, low consumer awareness of health effects and knowledge of newly developed functional ingredients, and regulatory barriers (Lau et al., 2012).

Consumer surveys and other market studies in the US and Europe indicate the general success factors for marketing of conventional foods are valid for functional foods. These factors are tasty products, convenience, product variety and different packaging volumes. The functional ingredients are regarded as added value, but do not determines the choice of products by itself, thus the base-product for functional foods should convey healthy image and avoid medical or clinical perspective. Although functional foods possess unique nutritional characteristics and health benefits, functional foods still compete with conventional foods for market share and shelf space in retails (Lau et al., 2012).

2.2.3 Market Growth

Malaysia has a sizeable and rapidly growing food service market today. Sources from the trade estimate the food service market today is valued between US$ 4.9 billion to US$ 5.5 billion today. The food service market has been growing at a rapid average rate of around 6.5% per annum over the past five years. They indicated that this market is likely to grow at between 7%-10% per annum over the next three to five years (The German Chamber Network. 2010).

According to the Malaysian Industry Development Authority (MIDA), it is estimated that the present global retail sales in food products are worth around US$3.5 trillion, and are expected to grow at an annual rate of 4.8 per cent to US$6.4 trillion by 2020. The total sale value of processed food and beverages products increased by 24.5% to RM 22.4 billion in 2008 from RM 18 billion in 2007. This remarkable rise is mainly due to an increase in domestic consumption and exports (The German Chamber Network, 2012).

According to Lau et al. (2012), Malaysians tends to consume less processed food products than consumers of developed countries. An increasing trend towards consumption of processed foods is seen among young consumer group age below 40 years who seek convenience. These consumers are better educated, informed and receptive towards new products compared to older consumers.

Furthermore, (Lau et al., 2012) also reveals in their findings that Malaysian consumers generally prefer the fortified version to regular product, if a choice was given, but only on the condition that the price difference between the products is not apparent and similar in quality. It is further revealed most Malaysian consumers are usually not aware they are purchasing functional foods, as functional foods are not labelled as “functional”. Most functional products are not well differentiated and usually marketed as conventional foods and part of the wider marketing, advertising and market segmentation of manufacturers. Local functional products or imported ones are commonly distributed via retail channels.

As the people become more conscious about eating nutritional and health foods increases, the demand will continually to growth. This is because the numbers of people who consume food contain health and nutritional values will increases. The annual revenue for this company is expected to be US$ 607,196 (MYR 2 million) and it is expected to grow 15% for every years.

2.3 BUSINESS MODEL

There are two business models that are going to be proposed in this project:

- To develop and produce the fructo-oligosaccharide
- To license the method as a process to fructo-oligossacharide production companies and fructo-oligossacharide producers.

CHAPTER 3

COMPANY DESCRIPTION

3.0 NATURE OF BUSINESS

Since this company make a product from raw materials and sell it as end as well as intermediate product, then the company's nature of business are most likely to be manufacturing and marketing.

3.1 MANAGEMENT TEAM

Management team of the company consist several categories such as position management, operation and also marketing and support. Each team are responsible for the continuity and also the success of the business.

3.1.1 Position Management

CEO : responsible as a director, decision maker, leader, manager and executor
: involve the press and the rest of the outside world

General Manager : manage through subordinate manager
: provided strategic direction for the whole company.

Commercial Manager : determines the rules and practices of how a business will be ran, getting into the technical procedures of the business.

3.1.2 Operation

Engineer	: expert adviser and representative of the client when administrating the contract but is required to act independently, fairly and impartially as a professional engineer.
	: required to act solely on behalf of the client to order variations and to provide directions that require subsequent decision by the specification
Technician	: involved in both the assembly and the testing of various goods or services before they are implemented for internal use or marketed to the general public.
	: make sure the product is working exactly as it was envisioned, and is free of any defects or other factors that could cause distress for any consumer purchasing the finished product.
Team Leader	: undertake the responsibility of completing the set targets by coordinating with his team members
	: distributes work among the members of the team based on their talent and abilities
General Assistant	: assist either a team leader by performing the clerical tasks needed for the team to complete the job

3.1.3 Marketing & Support

Marketing & Sale	: involves researching, packaging and presenting products and services to consumers
Office Management	: provide input to management on the development of policies and procedures
	: provide paralegal support, and may draft correspondence for management, schedule appointments, etc.
Administration	: associated with Finance, Personnel and management information systems services

3.2 MARKET STRATEGY

Market strategy is a careful planning in order to ensure the successful of a business. Every business needs to have a detail market strategy of its product. This is to make sure that the demand of the product can be fulfilled and also to maintain the product requirements.

3.2.1 Product

a) The performance of this fructo-oligossacharide is comparable with the competitors' fructo-oligossacharide which produced from microbial production and it is better than the chemically produced fructo-oligosaccharide. This product is produced in food grade and can be sold either as the end product (powder) or as intermediate product (liquid form).

3.2.2 Price

a) The price for this fructo-oligosaccharide is expected to be fair and reasonable. The average market price of fructo-oligosaccharide is in the range of US $6,630-6,930 (MYR19,890-20,790) per ton. The produced fructo-oligosaccharide is expected to be less than the stated market price. The price is expected to be in the range between US $6-21 (MYR 18-63) per kilogram.

3.2.3 Place

a) The suitable place for this company to operate is the Gebeng Industrial Area, Pahang. This location is considered strategic due to its location which is in the middle between Perak and Selangor where almost all the targeted market located.

3.2.4 Promotion

a) The product will be promoted in many ways. We can create sample size of product and offer feedback or positive response to the potential customers and especially to those with credibility in the related industry such as experts and professionals whose feedback will have more effect on convincing customers to try. Local media outlets

such as newspapers and news programs can be a good medium to spread the word about the new product. This product can also be promoted via internet as it is the most widely used media for information and also communication.

CHAPTER 4

OPERATION DESCRIPTION

4.1 PRODUCT DESCRIPTIONS

This product had variety of application other than food formulation. FOS can be used in control of diabetes because 20 g of FOS would decrease basal hepatic glucose production in healthy subjects without any effects on insulin stimulated glucose metabolism. Application of FOS as prebiotic can stimulate the growth and/activity of potentially health-enhancing intestinal bacteria.

FOS can also be applied as dietary fibre. It is also known to prevent the colonization of human gut by pathogenic microorganisms due to it characteristics which encourage the growth of beneficial bacteria. Thus, helps in defence functions. Study with inulin and FOS shown that reduction of chemically induced aberrant crypts and prevention of colon cancer. These explain the anticancerous effect of FOS.

The FOS is produce via enzymatic reaction which is safer than the chemically produce FOS. The production of the FOS in this company does not use any chemicals in order to ensure the safety of user's health and also user satisfactory. The performance of this FOS is comparable with the competitors' fructo-oligossacharide which produced from microbial production and it is better than the chemically produced fructo-oligosaccharide. This product is produced in food grade which is 70-75 % purity and can be sold either as the end product (powder) or as intermediate product (liquid form). The production process of the FOS is summarized in the figure below.

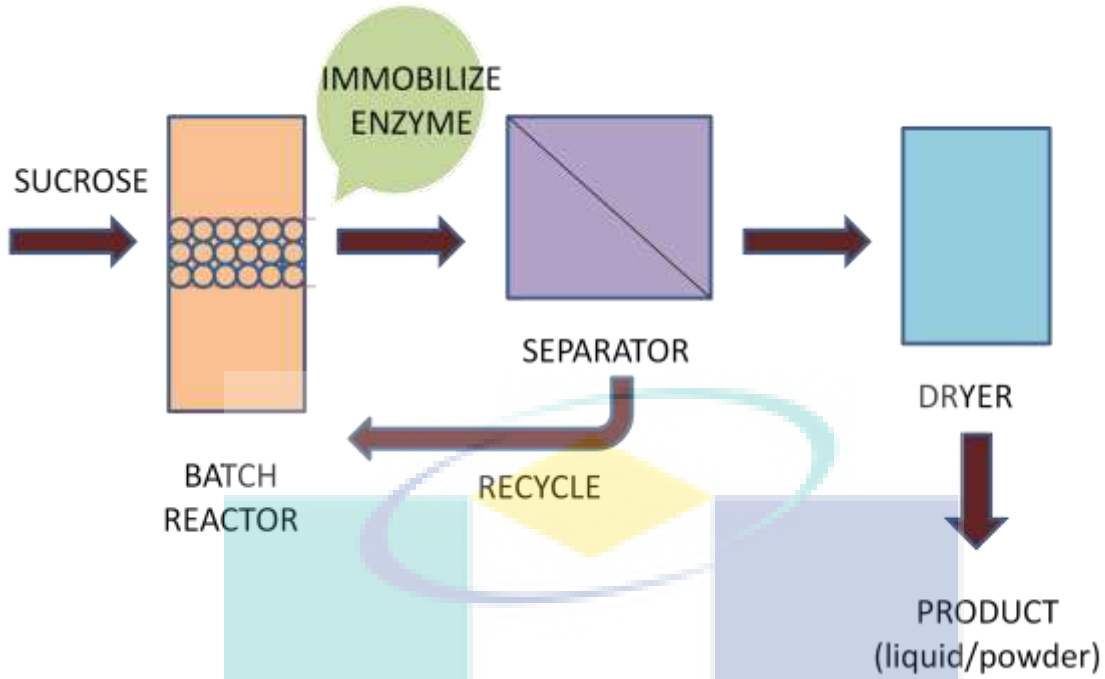

Figure 4.1: Production process of FOS

This FOS can be commercialised in both liquid and powder form. The liquid form is used by the food company as one of the ingredient in food formulation such as baby food, biscuits, confectionary, ice cream and etc. FOS powder can be commercialised as the end product such as sweetener for diabetic patients.

4.2 PROCESS DESCRIPTIONS

Lean principles aim to minimize all forms of waste, from sources as varied as material defects to worker ergonomics. Many sources of waste are easy to identify and correct, such as a machine that is out of adjustment, producing a high volume of defects. Other forms of waste include environmental conditions that impede worker efficiency. Better lighting may help a worker read production instructions; moving a file cabinet might eliminate wasted time for a clerk (Shak,2013).

Beyond simply reducing costs and improving efficiency, lean production techniques introduce systems and develop skills within staff that support changes in the workplace that new sales create. Space saved on warehousing may be used to add new product lines. The same is true of time savings. The staff can also absorb new work and react quickly to changes

in client demand. Producing work quickly, in short iterations, without waste and delivered on time enhances advantage over competition.

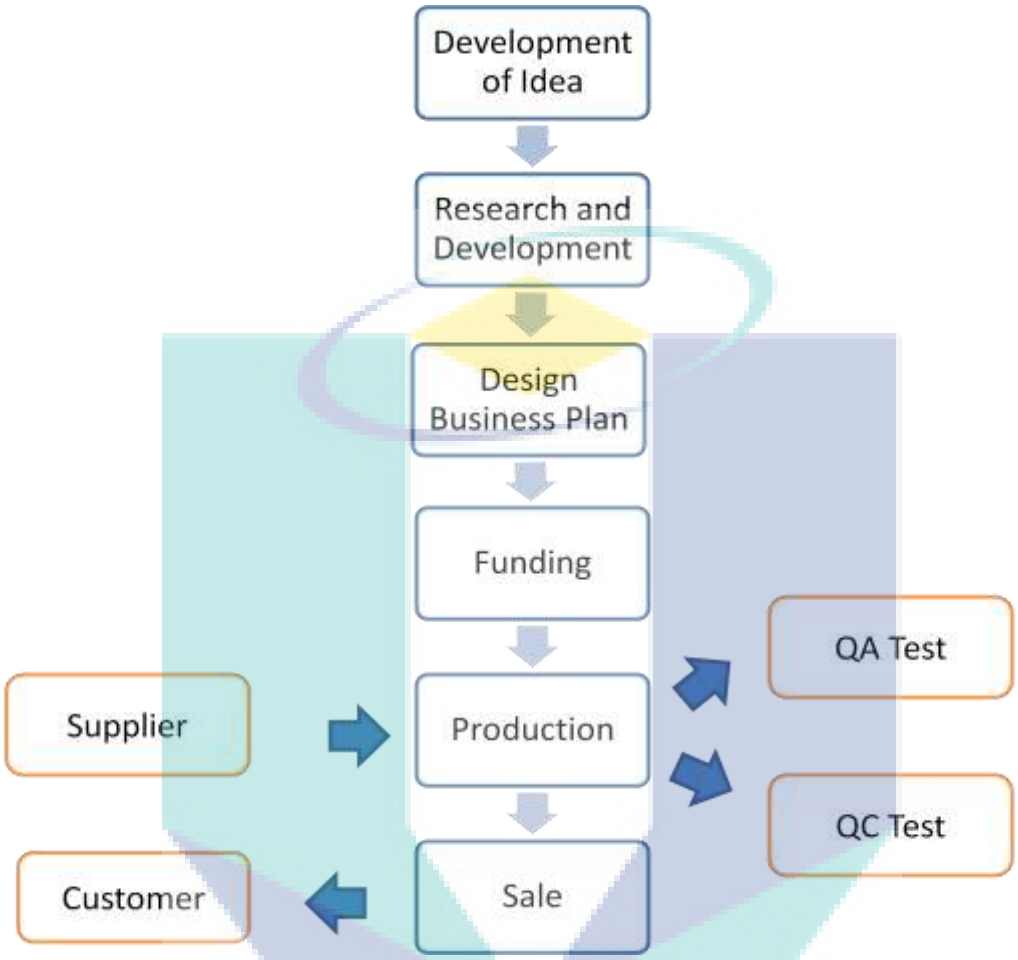

Figure 4.2: Operation process of company

4.3 Operating strategy

- Make production of FOS based on amount order by customers.
- Quality first

CHAPTER 5

FINANCIALS

5.1 FINANCIAL STATEMENTS

The company had prepared the following financial statements for five year projected period of sale projection, profit and loss statement, cash flow statement and balance sheet. Start-up expenses are also included in the financial statement. The payback period of the company is expected to be in 3.91 years. The payback period is calculated shown as below using data obtain in Table 1.

Payback period = 3+ [1,388,491/1,522,799] = 3.91 years

Table 5.1: Cumulative cash flow

Cash flow	Cumulative cash flow
-	(3,000,000.00)
478,197.00	(2,521,803.00)
1,133,312.00	(1,388,491.00)
1,522,799.00	134,308.00
1,956,188.00	2,090,496.00
2,652,561.00	4,743,057.00

Based on the financial statement, the company requires MYR 3million to start a business. The company is require to make a loan MYR 2 million from the Bank Negara since the owners will invest in the company for MYR 1 million. The company make payment on the yearly basis with amount MYR 0.4 million. The company starts to make payment on the second year and is predicted to completely pay the entire loan on the sixth year of operation. The sale projection of the company is expected to increase by 15 % every year and the sale revenue of the products is approximately MYR 3 million on the first year of production followed by MYR 4.14 million, MYR4.761million, MYR 5.475 million, MYR 6.296 million on the next consecutive year. The product is selling at MYR 20 per unit and predicted to sell for 15,000 units at the first year of production as shown in Appendix A.

In the projected loss and profit statement, the net profit of the company is obtained from deduction of sale revenue with the total expenses and tax. The total expensed include payroll expenses which are 8% from the salaries pay to the workers, interest which is 6% from the loan amount, insurance which is 20% per year from MYR100 000 insurance cover, and many other as shown in the Appendix B.

Cash flow statement show the amount of money needed to buy equipment and land at the start-up of the business. Ending cash balance at the start up is zero because all the money is used to buy the necessary equipment and balance of used money will be saved as contingency fund. This is to provide alternative source of money which will be needed in the first production to buy raw materials. The cash flow at the end of the year remains positive for the five years as shown in Appendix C.

Start-up expenses is a non-recurring costs associated with setting up a business such as accountant's fees, legal fees, registration charges as well as advertising, promotional activities and employed training or pre-opening expenses as shown in Appendix E. Then, the balance sheet is calculated from the cash flow to see the balance amount of money between total assets and total liabilities and owner equity. Balance sheet can also be assumed as the summation of money in and money out as shown in Appendix D.

5.2 FINANCIAL RATIO

A sustainable business and mission requires effective planning and financial management. Ratio analysis is a useful management tool that will improve your understanding of financial results and trends over time, and provide key indicators of organizational performance. Managers will use ratio analysis to pinpoint strengths and weaknesses from which strategies and initiatives can be formed. Funders may use ratio analysis to measure your results against other organizations or make judgments concerning management effectiveness and mission impact.

The financial ratios that had been calculated in this study are shown in Table 5.2.

Table 5.2: Financial ratio

Financial ratio	Year 1	Year 2	Year 3	Year 4	Year 5
Indicator of solvency					
Debt to equity	2.40	0.87	0.51	0.26	0.09
Assets to equity	3.40	1.87	1.51	1.26	1.09
Debt ratio	0.71	0.46	0.34	0.21	0.08
Times interest earned	14.33	19.78	28.43	52.31	75.19
Indicator of liquidity					
Net wkg cap'l (,000 OMITTED)	208.20	1209.81	1582.77	1947.44	3006.80
Working capital to assets	0.06	-0.10	0.09	0.26	0.53
Current ratio	1.52	5.03	8.91	20.47	#DIV/0!
Quick ratio	1.45	4.92	8.72	21.69	#DIV/0!
Dividend payout	0.00	0.00	0.00	0.00	0.00
Indicator of assets management					
Days sales outstanding	45.63	124.83	51.88	47.08	61.19
Inventory turnover	42.68	51.22	4.27	51.22	51.22
Days sales in inventory	8.55	7.13	85.52	7.13	7.13
Asset turnover	0.61	0.71	0.80	0.87	0.89
Equity turnover	2.07	1.32	1.21	1.10	0.97
Working capital turnover	9.94	2.39	2.10	1.96	1.46
Indicator of profitability					
Return on sales	0.00	0.41	0.17	0.19	0.25

Return on total assets	0.00	0.29	0.14	0.17	0.22
Return on equity	0.00	0.78	0.29	0.30	0.34
Operating return	0.00	0.42	0.19	0.24	0.31
Gross margin	0.38	0.39	0.95	0.39	0.39

CHAPTER 6

RISK ANALYSIS

6.1 CRITICAL RISK

There several number of factors that could influence the success of FOS production. The important risks can be classified into industry risk, market risk, operation risk, social and economic risk and also health and safety risk.

6.2 OPERATION RISK

Risks:

- There is little room for mistakes as minimal stock is kept for re-working faulty product
- Production is very reliant on suppliers and if stock is not delivered on time, the whole production schedule can be delayed

Contingency plan:

- Always supervised the operation so that any mistake can be recognised earlier and make countermeasure.
- The raw materials can also be purchased from e-market or purchased the commercialised sucrose in market which takes shorter time.

6.3 Health and Safety Risk

Risk:

- Consumer's suspicious attitude towards possible harmful effect of functional foods due to its ingredient

Contingency:

- Briefly explain to the consumer about the origin of the product (raw material)
- Advertised about the health benefits when using the products

CHAPTER 7

CONCLUSIONS

As a conclusion, this company has the required potential to be a successful business. This is because it is the first local company that produced fructo-oligosaccharide from coconut sugar. Moreover, this product has medicinal and nutritional value as it is produced biologically from natural resources. Not only that, the production cost of FOS is lower so the price of the FOS can be cheaper than the competitors.

Furthermore, the increasing number of people who become conscious about healthy foods will contribute to the increasing demands of the products. This is because the products consist of abundance of healthy and nutritional value. The products are commonly used in the food and beverages and also process food sector of food industry.

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