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Foresighting for Strategic Oil Palm Industry Planning

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ABSTRACT

Knowledge of long term outcome possibilities of events is crucial for business and general planning. Previous method of seeing into the future has generally been the statistical forecasting technique. Forecasting technique is only able to see too short into the future and therefore is less useful for strategic planning. Foresighting is a relatively new technique of seeing further into the future and therefore would be more useful for business planning. It is a multidisciplinary approach which first identifies industry key drivers through information gathering from focus group studies. The value addition of this technique is the delivery of breakthrough in thinking. This paper discusses the disadvantages of traditional forecasting and introduces the alternative method of foresighting. With this method, businesses, industries and other sectors of the economy would be able to see 10 or more years into the future and accordingly adjust the present plans to suit the organisational vision.

Keywords: Innovation, technology, research projects, foresighting, palm oil.

INTRODUCTION

The Malaysian oil palm industry has been challenged by a myriad of problems in the past. Fluctuating product prices have fraught the industry with a number of problems since its first major commercial venture during the 1960s. Prices have plunged below cost a number of times and had rebounded to well above cost every time. Each time the reaction of the industry had been on short-term decisions. During the last price plunge, some producers had even resorted to removing the trees to plant other crops. Some were less drastic when farms were sold at a relatively cheap price.

One of the long-term problems of the industry is the perpetually low yield of the oil palm. Ever since the quantum yield leap in the 1970s that was due to the introduction of the pollination beetles, average Fresh Fruit Bunch (FFB) yield had been averaging between 19-20 tonnes per hectare per year. The obvious strategy to improve this is to replace the present trees with high yielding varieties through constant replanting programmes. Although plantations have replanting plans, they are not properly executed due to the short-term dilemma of lack of funds during lean times and the exploitation of short-term gains during good times.

The current price of crude palm oil (CPO) had increased to near RM3,000 per tonne while the cost of production is slightly less than RM1,000. This provides the producers; mainly the upstream market with very good profit margins. This high price was to some extent linked to the recent drastic rise in the petroleum price. As a result of pursuing the fuel safety strategy by some countries such as the US and the EU, replacement of part of the fuel requirement by vegetable oil based biodiesel. CPO, being a cheaper alternative to other oils and fats as feedstock for the biodiesel manufacture had also responded in a rise in price. The interest in producing and exporting biodiesel had also attracted interests by local producers. A total of 92 biodiesel licenses were approved but only four had managed to build and operate. The industry failed to develop because CPO, the main feedstock has risen i n prices, making biodiesel manufacture uneconomic.

The change in the economics to favour biodiesel had also inflicted harm to the industry. The rise in demand for biofuel in general had caused CPO price to rise from a mere RM1400 per tonne to close to RM3,000 per tonne. Biodiesel, although is mighly correlated to the price of petroleum, which had increased to near USD100 per barrel, had not run parallel after a threshold petroleum price. The price of biodiesel had lagged behind leaving the local biodiesel industry with a major problem of economics. The high price of feedstock had eroded any possible margin from the venture. In addition, the motor industry is also currently examining the more environmental friendly second generation fuel such as hydrogen fuel to run cars. Hence the rise in CPO price had benefited the upstream producers and hurt the downstream market.

Had the industry stakeholders react to not only the short-run market events but also consider long term expectations, such problems as described above may have been minimized. Hence an

analysis of long term trends in various aspects of the industry, markets and technology will be able to assist the industry and the government to install strategies that would benefit the industry both in the short and long run. This can be done through accounting for the changes in the economy of the competitors, other linked industries as well as the politics involved in governing the direction of the industry. All these changes would impinge on the various sub-sectors of the oil palm economy. The socio-economics of the smallholders, the structural change in the oil palm conglomerates, entry into the oil palm industry of new producing countries and the expansion in palm oil production of the land and labour-rich Indonesia. This paper discusses some results from an on-going research on the "The Malaysian Oil Palm Industry: Strategic Repositioning Through Foresighting Future Scenario".

OBJECTIVES

The main objective of this research is to attempt to paint scenarios of the oil palm industry in 25 years from now, i.e. by the year 2030-35 and beyond. In order to achieve this objective, a number of sub-objectives were pursued. These are:

i. The size of oil palm production area then,
ii. The production technology scenario,
iii. The productivity of the oil palm,
iv. The range of products scenario,
v. The level of mechanization and labour utilization,
vi. The status of various sub-sectors i.e. plantations, smallholders, mid-stream and downstream markets,
vii. Consumer behaviour with respect to palm oil consumption,
viii. Product mix between food, fuel and other non-food uses and
ix. Trade in palm oil.

STUDY APPROACH

The objective of this study as outlined above is mainly to predict the medium and long term future of the Malaysian oil palm industry. However the future is not predictable or predetermined. But the future can be influenced by present choices and actions (Amara (1981)). In other words, however uncertain it may be, we can to a large extent shape the future.

Future Unpredictability

Although popular perception is that the future will become more predictable as foresighting methods improve, experts involved in futures studies and foresighting have developed a perspective of the future as inherently "contingent;" i.e., not able to be directly determined by current conditions – regardless of how much more detailed and rigorous any foresighting method becomes.

Support for this argument is both empirical and theoretical (Central Planning Bureau, 1992). On the empirical perspective, evaluations of past efforts at long-term forecasting reveal that these efforts consistently have had very poor accuracy rates. Furthermore, accuracy tends to decrease with the forecast time horizon.

On the theoretical side, mathematical and other experts have deduced that human history acts like a complex, dynamic system that does not behave in a deterministic fashion. This means that, there is no ultimate "equation" for the future that we can reasonably expect to define and evaluate. While some elements of the future may be predetermined (such as the demographic truth that the children of today will become adults in the future), others are by their nature uncertain.

While the future is unpredictable, there is still evidence that systematic attempts to gain perspective on the present and on possible future states can be useful. In order to better deal with the contingent nature of the future, most futurists have adopted a two-part approach to foresighting. On the one hand, futurists attempt to better define which elements of the future are somewhat predetermined and which are not. Thus, for example, futurists have determined that short-term forecasts of very specific technology developments can be somewhat accurate; while long-term forecasts of general social conditions cannot. On the other hand, futurists focus on expanding people's mental models so that they can better interpret any future condition that may arise. Both of these approaches will be reflected in the foresighting methods detailed in the following section.

There is a wide body of literature on future studies and on foresighting methodologies available both from traditional sources as well as from the World Wide Web. However, the vast majority of this literature focuses either on providing descriptions and critiques of various methodologies, or on reporting the "newsworthy" results derived from the use of a particular methodology (e.g., the "10 new technologies of 2010", etc.). By contrast, very little information is available that details the actual experiences organizations have in conducting foresighting activities. Clearly, the success of any foresighting program will rest not only on the specific method being used, but also on the details of how the program is conducted. These implementation details are particularly relevant to an organization such as DOE that is interested in beginning such an activity for the first time.

Shaping the world into one we want to live in means being aware of the future, however uncertain it may be. Although we are unable to predict the future, the methods that are employed to study the future are useful in helping us to identify potential risks and opportunities in relation to the outcome of science and technology, so that policymakers may be able to develop strategies to manage our future better.

Strategic foresight is a fairly recent attempt to differentiate "futurology" from "futures studies" It arises from the premise that: Strategic foresight can also be practiced at three different levels (Marina Skumanich & Michelle Silbernagel 1997)

a. Pragmatic foresight - "Carrying out tomorrows' business better" (Hamel & Prahalad, 2004);
b. Progressive foresight - "Going beyond conventional thinking and practices and reformulating processes, products, and services using quite different assumptions";
c. Civilisational foresight - "Seeks to understand the aspects of the next civilisation - the one that lies beyond the current impasse, the prevailing hegemony of techno/industrial/capitalist interests" (Slaughter (2004) p .217).

Two approaches to futures studies that are especially focused at those last two levels of strategic foresight are Critical Futures and Integral Futures.

Strategic Foresight Defined

Foresight has been defined simply as a combination of forecasting with insight. Foresight is developed by applying forecasting methodology to the insight. Strategic foresight relates to foresight of strategic issues. Thus, strategic foresight can be developed by scientific study. It is not about intuition or guess work. The difference between strategic foresight and futurology is that strategic foresight provides alternative scenarios for the future. Futurology attempts to provide a definitive picture of the future.

Various definitions of 'Foresight' have been proposed, but the one that provides the best description is: "Foresight involves systematic attempts to look into the longer-term future of science, technology, the economy, the environment and society with a view to identifying the emerging generic technologies and the underpinning areas of strategic research likely to yield the greatest economic and social benefits."

There are a number of implications of this definition:

a) the attempts to look into the future must be systematic to come under the heading of 'Foresight';
b) these attempts must be concerned with the longer-term, typically 10 years and possibly 5-30 years;
c) 'Foresight' is a process rather than a set of techniques and involves consultation and interaction between the scientific community, research users and policymakers;
d) one focus is on the prompt identification of emerging generic technologies, i.e. technologies whose exploitation will yield benefits for several sectors of the economy or society. Such technologies are still at a pre-competitive stage and can be targeted for selective funding to ensure rapid development;
e) another focus is on strategic research, i.e. basic research carried out with the expectation that it will produce a broad base of knowledge likely to form the background to the solution of recognized current or future practical problems;
f) attention must be given to the likely social benefits (and disbenefits) of new technologies and not just their impact on industry and the economy. It is important to stress that Foresight is not the same as technology forecasting which assumes that there is an unique future. It is then the task of the forecaster to predict, as accurately as possible, what this will be. By contrast, Foresight is concerned not so mu ch to predict the details and timing of specific developments as to outline the range of possible futures which emerge from alternative sets of assumptions about emerging trends and opportunities. Exactly which one is arrived at depends upon the

> choices made in the present. Foresight offers the chance to shape the future though wise decision making.

Foresighting can be used to refer to very different kinds of analyses ranging from short-term, focused analyses of specific sectors to longer-term, broader assessments of social, economic or technological change. Foresighting can also include more "normative" assessments of how to reach a future state that is considered desirable (e.g., what will have to happen to allow a certain future state to occur).

Foresighting is generally considered to be distinct from two related concepts: forecasting and strategic vision-setting (ASTEC, 1994). While both foresighting and forecasting involve trying to assess future conditions based on the present, the latter term also includes the connotation of predictability: as the forecasting method becomes more and more developed, it is expected to become more and more accurate in predicting future states. By contrast, a strong theme in foresighting is that large aspects of the future cannot be predicted, and so "accuracy" becomes a less meaningful concept in relation to foresighting.

Similarly, while both foresighting and strategic vision-setting can involve trying to define a desirable future, there are some significant differences between them. Strategic vision-setting puts an emphasis on defining the internal interests and preferences of an organization; foresighting maintains an emphasis on external, objective events that may or may not support the desired future. As a result, foresighting is more encompassing and usually less value-driven than strategic vision-setting. However, foresighting findings are often used to inform the creation of strategic visions.

Foresighting and Forecasting

The future is unpredictable. Forecasts, which rely on mathematical relationships and few variables is inaccurate for long term predictions. While forecasting requires methodologies, generated by computers or otherwise, insight requires deep understanding of the subject concerned. Building scenarios of future state of the palm oil industry may indicate possible market conditions in the future. Experts, defined as a person/s that have extraordinary knowledge of particular subjects such as the direction of technological development may be able to guide the researchers to the possible palm oil industry scenarios. This can be assisted by technological scanning of present states and possible breakthroughs. This can be augmented with modelling, which study the relationship of key variables to indicate the future.

Foresighting is the effort to assess future conditions based on current conditions and trends. Implicit in the term foresighting is the notion that the future is uncertain and not directly predictable, so the focus is more on general conditions rather than specific events.

According to one definition, foresighting is:

> "a process by which one comes to a fuller understanding of the forces shaping the long-term future which should be taken into account in policy formulation, planning and decision-making. Foresight involves qualitative and quantitative means for monitoring clues and indicators of evolving trends and developments and is best and most useful when directly linked to the analysis of policy implications…." (Martin and Irvin, 1989).

Science and technology are vital to our society, economy and environment. They lead to wealth creation and improvement of the quality of life. Successful exploitation of technology has become critical to achieving economic competitiveness. However, we live in a world which is changing rapidly and where global environmental issues, such as climate change resulting from increasing emissions of greenhouse gasses or pollution of the oceans, are emerging as threats to our progress. To cope with these changes, our science and technology systems must be able to respond and change, either by adapting existing technologies or developing and applying new ones. The value of Foresight is that it provides a structured opportunity to look ahead and consider the role that may be required of science and technology in the future.

METHODOLOGY

There are literally dozens of methods for performing foresighting, ranging from "back of the envelope" approaches to highly structured methods. Experts often group foresighting methods into different categories according to various attributes.

This section will examine six major categories of foresighting methods and discusses their attributes and weaknesses. The first two categories – expert opinion and scenario building – emphasize human participation in the foresighting process. The second two categories – modeling and

morphological analysis – emphasize the use of computer models or other analytic tools to provide analysis of future states. The third two categories – scanning/monitoring and trend extrapolation – emphasize the degree to which conditions of the future are based on conditions of the present.

It should be noted that boundaries between the categories are not necessarily firm, and that methods can merge from one category into the next. For example, scanning present conditions can merge into trend extrapolation, while trend extrapolation can merge into modeling. Methods can also be combined; for example, modeling and scenario building can be combined, with models being used as the basis for scenarios.

Expert Opinion

Expert opinion can be defined as the assertion of the future "derived from information and logic by an individual who has extraordinary familiarity with the subject at hand" (Millet, 1991, p. 43). While such a definition includes intuition theory as well as the "hunches" of a "futurist guru" there is a more structured expert opinion-based method that has long been used for foresighting: the Delphi method. The Delphi method calls upon a number of experts on the technology under investigation, asking them when they expect a certain important breakthrough to occur or other such questions (Wissema, 1982). The method follows a protocol of questioning which gives the experts objective feedback from the groups responses to a first round of questions, and then asks them the same questions again. This pattern is repeated until a general consensus of the outcome is developed.

Using expert opinion has the obvious weakness of being idiosyncratic, there being no way to evaluate and compare the various approaches and perspectives of the "experts" in question. While the Delphi method seeks to make the process of soliciting expert opinion more structured, it is subject to a further, more practical problem: to perform the method requires a great deal of time and effort. Moreover, while there is care given to maintain objectivity in the questioning, there is no control over the time and consideration taken by the participants in answering the questions. Ultimately, the quality of the Delphi method, and of all expert opinion methods, is fundamentally based on the quality, experience, and knowledge of the participants.

Scenarios

Scenarios are descriptions of a possible future through the development of a logical flow of "cause and effect" steps toward the outcome. The term "scenario" originated from theater as an outline of the plot, sequencing the action in the order of its development (Porter, 1991). For foresighting, scenarios are outlines of the future, based on some schematic descriptions of certain key variables. Scenarios can be developed through "brainstorming" (relying in this case solely on expert opinion), or can be based on a computer model of how certain key variables might interact through time. Scenarios are distinct from many of the other methods because they do not suggest a single future but several possible futures, depending on how strongly the variables are allowed to influence each other. Other foresighting methods that follow the general principle of the scenario method include simulations and relevance trees. Simulations are game-like methods in which various events are played out. Relevance trees follow a process in which the participants imagine a given future state, and then work back through all the conditions that would need to occur to result in that state.

The scenario method has the advantage of being multi-dimensional, since it allows for as many variables to be considered as desired. This method also avoids the problem of trying to specifically predict the future, since the method outlines several "options" for the future. However, scenarios are still subject to the biases or idiosyncrasies of the experts used to brainstorm the future, as well as the limitations of any computer model used.

Modelling

Modelling involves the use of formal analytic techniques to develop pictures of the future. In this context, modelling can be defined as any foresighting that uses some sort of equation to relate variables together, along with some estimation of what the variables will be in the future. A famous example of this type of foresighting is the system dynamics model used to support the Club of Rome's "limits to growth" analysis, now known as WORLD3. In the WORLD3 model, a general relationship is specified between various key variables such as world population, industrial output, pollution, resource availability, and food production. As these variables are changed and allowed to evolve in time, a picture of the future is developed.

One advantage of modeling is that it forces the participants to systematically and explicitly consider the interaction of key variables that lead to future conditions. However, a disadvantage is that models are necessarily unable to reflect all the complexity and contingencies of the real world, so that at best they can only provide thought experiments about the future, although often they are mistaken for providing certainty.

Morphological Analysis

Morphological analysis is a foresighting method that creates a list of all of the possible combinations of the characteristics or "shapes" of a given object (e.g., a new material) in order to determine different categories of application or effect. This method is another lateral thinking method for identifying future possibilities. For example, even though cardboard was developed as a material for packaging, a morphological analysis would evaluate that given its strength, density, and other properties it could also be used for sound insulation, heat insulation, and other applications (Wissema, 1982).

The limitation of morphological analysis is that while it examines the possible applications and developments of an object, it cannot address the likelihood of these futures based on current realities, such as funding resources or markets.

Scanning/Monitoring

Although monitoring is more generally thought of as a method to assess current conditions rather than future states, systematic monitoring of current events for precursors of breakthroughs can serve as an "early warning" system to eventual developments in the future (Martino, 1983). Monitoring is the examination of current data using a system that includes four steps: collecting, screening, evaluating, and threshold setting. When taken together, these steps allow the analyst to extract the meaningful "signals" from otherwise irrelevant events. Some examples of scanning and monitoring include patent analysis, research and development funding analysis, and business licensing tracking. Monitoring can also simply involve a close examination of current conditions: consumer demands, existing infrastructure, demographic trends, and so forth.

The limitation of monitoring is that it gives little indication of the time frame for any future development. It also does not necessarily clarify how different, disparate conditions might affect each other.

Trend Extrapolation

Trend extrapolation is the simplest form of foresighting (Millet, 1991). This method is based on an assumption that patterns in the past will continue into the future. To perform this method, information is collected about a variable over time, and then extrapolated to some point in the future. This analysis can be either qualitative or quantitative. In the most simple form, trend extrapolation can be based on linear or other straightforward projections. Other foresighting methods that are more elegant variations of simple trend extrapolation (and that can be considered a subset of modeling) include system dynamics, s-curves, regression analysis, and substitution analysis. All of these methods hold a common assumption that the future will follow some pattern based on the past.

This method has two major weaknesses. First, it is often a fallacy to assume that the future will follow the pattern of the past. While people often make such assumptions due to a lack of better information, any picture of the future that is developed on this basis can be inaccurate. The second weakness of this method is that it typically provides information on only a single variable. Especially in current world conditions, it is rare for any variable to act independently. More often, the influence of outside forces can dramatically alter the future of any one event or condition.

The DELPHI Method

The objective of most Delphi applications is the reliable and creative exploration of ideas or the production of suitable information for decision making. The Delphi Method is based on a structured process for collecting and distilling knowledge from a group of experts by means of a series of questionnaires interspersed with controlled opinion feedback (Adler and Ziglio, 1996). According to Helmer (1977) Delphi represents a useful communication device among a group of experts and thus facilitates the formation of a group judgement. Wissema (1982) underlines the importance of the Delphi Method as a monovariable exploration technique for technology forecasting. He further states that the Delphi method has been developed in order to make discussion between experts possible

without permitting a certain social interactive behavior as happens during a normal group discussion and hampers opinion forming. Baldwin (1975) asserts that lacking full scientific knowledge, decision-makers have to rely on their own intuition or on expert opinion. The Delphi method has been widely used to generate forecasts in technology, education, and other fields (Cornish, 1977).

RESULTS AND DISCUSSION

In the Malaysian palm oil industry, we can identify five main drivers. These are:

i. Productivity Enhancement
ii. Mechanisation and automation
iii. Downstream Value Added Products
iv. Research, Development and Commercialisation, and
v. Market Development and Sustainability Issues.

For each of the above drivers, we called industry stakeholders consisting of heads of concerned government agencies, captains of industry, researchers and industry consultants. They are assembled in a hotel for three days to discuss on the prepared topics posed to them. This focussed groups are provided with a moderator whose function is to lead the discussions. The discussions details are recorded both on tape and written report. At the end of the sessions, a representative of the groups presented the outcome of the discussions.

Productivity Enhancement

The productivity of the oil palm has been long discussed as a perpetual problem of the industry. The oil palm fresh fruit bunch (FFB) yield that is a popular measure of oil palm productivity have lingered around a long term average of 18 tonnes per hectare per year. Many opined that this can be upgraded to 35 tonnes per hectare per year, a quantum leap of 95 percent. This target has been based on reports that certain fields in the private sector plantations were reported to have achieved.

The reason for the relatively low productivity is due to the relatively low yields in certain sub-sectors. As shown in Table 1, the productivity by smallholders is only about 15 tonnes per hectare while having an area share of more than 20 percent. This have a pulling effect on the yield of the entire oil palm sector.

TABLE 1: Oil Palm Productivity By Various Sub-Sectors

Market Development and Sustainability IssuesYear	Smallholders (t/ha/yr)	Estates (t/ha/yr)	
2008	FELDA	14.52	20.18
	FELCRA	16.37	
	RISDA	13.77	
	Independent	15.44	

Source: MPOB 2009

The group charted out a number of actions for the industry to arrive at such productivity level. They are:

a. Improve planting materials
b. Recommend replanting
c. Eradicate the Ganoderma disease
d. Improve milling (oil extraction) technique)
e. Enhance labour productivity
f. Improve fertilizer application
g. Enhance smallholders' Productivity

Many of the actions suggested are ongoing. However, the worrying factor is the leap in productivity by more than 90 percent is to some, overly ambitious. With the dynamism of the oil palm crop in terms of the age mix, a leap in productivity would be close to impossible. The aim of 35 tonnes per hectare per year is more wishful thinking rather than an achievable result. The age mix of palms would remain the

same on the long term. If replanting were done, the best would be on a 4-5 percent of area per year and the average national yield would remain the same, albeit weather conditions. Hence we do not expect oil palm yield to improve well above 20 tonnes per hectare in the next 20 years.

Mechanisation and automation

The future of the Malaysian oil palm industry currently relies heavily on foreign labour, mainly Indonesians. It is estimated that this sector employs more than 75 percent of its required from foreign sources. This can be attributed to the relatively small population and hence small workforce of Malaysia. Being considered as a difficult, dirty and dangerous (3D) job, the local workforce avoids it.
An obvious solution is to replace labour with machines. However, most of the plantation work that can be replaced by machines has been done.

One of the most labour demanding work in the oil palm plantation is the fruit harvesting. Machines have been developed but none is able to challenge the efficiency and economy of the human labour. The group suggested a number of future actions in order to resolve this problem. They are:

To reinforce research and development on mechanization – funds and expertise

To revolutionise the harvesting machine with multi-purpose functions
(semi-processing of FFB and pruning)

a. To revolutionise the mechanised planting and loose fruit collection
b. To encourage SMIs for local machinery fabrication and assembling
c. To explore nano-technology in the fertiliser formulation
d. Tax exemption for imported machineries and parts
e. To simplify process for tax exemption
f. To realign the 'guest worker' recruitment policy in relation to foreign revenue
g. generation sectors
h. To encourage cattle integration for weeding
i. To create early interest among students in agriculture

These suggestions have not really addressed machines as a replacement of human labour in harvesting and collection of oil palm fruits. It emphasised on attracting local labour into the industry. With Indonesia expanding its own oil palm industry, it is also fast absorbing labour. The scenario for the Malaysian oil palm industry will be short of labour in the future.

Downstream Value Added Products

Value addition through downstream processing of palm oil is viewed as an opportunity for higher income from the industry. Palm oil has generally been sold refined, i.e. it has undergone a basic processing. With such processing, the palm oil has been divided into its product fractions, palm olein and palm stearin. Palm olein is the liquid part of the oil and is often used for food frying and other food applications. The palm stearin is the semi solid part that often goes into margarine manufacture.
Palm oil can also be processed into oleochemicals and other products. It has been said that one of every 10 products in the supermarkets contains palm oil.

With the new interest in sustainability, the price of palm oil has coupled with petroleum. This is because, edible oils like palm oil is seen as a sustainable replacement of petroleum products in replacing diesel fuel in motor vehicles. More processing of palm oil can enhance revenue earning from palm oil. A number of ways to enable this strategy have been suggested. These are:

a. Enhance development and marketing of oleochemicals
b. Develop biodiesel as a price stabilizer
c. Exploit phytonutrients in palm oil
d. Develop and enhance marketing of specialty fats
e. Utilize biomass for economic purposes.

Research, Development and Commercialisation

The process of research and development which must be taken up to the commercialisation stage must be enhanced. The group recommended that:

a. Research and development be enhanced
b. Research results should be commercialised quickly. Only about 30 percent of the research results have been commercialised
c. Implement biodiesel plan
d. Innovation in oil palm production and processing.

Market Development and Sustainability Issues

A number of marketing issues have lately surfaced that provided negative impacts on palm oil marketing. The main issues are the Green House Gas (GHG) gas emissions and sustainability of forests. With the country being in short supply of land and opening forest land being infeasible due to the environmental issues raised by various non-governmental organisations, land expansion in oil palm would be limited. Market access would depend on how the industry handles the environmental issues. One move forward is the production which is in line with the Roundtable for Sustainable Palm Oil (RSPO) standard.

CONCLUSSIONS

Given the discussions, the scenario for Malaysian palm oil in the future is that there will only be a small increase in production. Productivity will not increase substantially from the 18-20 tonnes per hectare of oil palm fruits. Labour would remain a problem in production and therefore labour cost would increase. Petroleum prices are also expected to increase which would in turn increase the cost of palm oil production further. Many inputs for the oil palm cultivation and processing are products of the petroleum industry. However, with the petroleum price increase, more edible oils will be diverted to fuel use causing prices to increase as well. In the near term (5 years) prices are forecast at RM3200-3500 per tonne. In 20 years, prices could reach RM4000-5000 per tonne.