**CONCEPT PAPER**

**PROPOSAL TO BUILT A DI-AMMONIUM PHOSPHATE (DAP) PLANT IN MALAYSIA UNDER THE COLLABORATION OF D8 FERTILIZER ASSOCIATION (D8FA)**

1. **INTRODUCTION**

Malaysia being a member countries of Developing Eight (D8) organization under the collaboration of private driven initiative for fertilizer sector which are now promoting the establishment of a joint management body of D8 Fertilizer Association (D8FA), is taking the initiative to built a Di-Ammonium Phosphate (DAP) plant which is a [joint venture](http://en.wikipedia.org/wiki/Joint_venture)between the D8 member countries. The DAP plant proposed will engage fertilizer stakeholders from private sector entity of D8FA, which at present is initiating a comprehensive business plan for further cooperation and starting business-to-business (B2B) collaboration among the D-8 countries. The DAP plant will be located in Malaysia and the construction of the plant will be initiated by Malaysian National Farmers Organization (NAFAS) with the support of Malaysian Government under the portfolio of Malaysian Ministry of Agriculture and Agro Based Industry (MOA). The constructions of the proposed DAP plant on joint venture basis under D8FA is anticipated will be a good start on further economic cooperation among the D-8 member countries for fertilizer sector.

1. **RATIONALE**

The global phosphate fertilizers demand continues to look positive. It is increasing due to the growing world population and increasing food demand. The global demand for phosphate fertilizers is projected to grow by 3.2% annually, from 2013 to 2018[[1]](#footnote-1). Global shipments of the leading phosphate products are forecast to climb-up to a record 63 to 74 million tons from 2013 to 2018[[2]](#footnote-2).

Over the past five decades, most of the growth in the global fertilizers demand came from developing countries, especially from Asia. Fertilizer demand in Asia which comprise major countries such as China, India, Indonesia, Pakistan, Bangladesh, Thailand, Vietnam, Japan, Philippines, South Korea and Malaysia has mainly been influenced by the changing and interconnected aspects such as economic growth, population, growth of agriculture sector, government policies, prices and production. The increasing population of the Asian economy alone, along with the growing food grain production in different countries would drive the growth of global fertilizer industry.

Asia accounts for almost 50.0% to 60.0% of the total world nutrient use and about 40.0% of the world's crop land[[3]](#footnote-3). The Asian fertilizer industry has majorly been driven by Chinese and Indian economy during 2006 and ongoing, and these two countries remained the leading producers of fertilizer with a contribution of 55.5% and 29.3% in the overall consumption of Asian fertilizer industry respectively. In India, it is estimated that destocking of wholesale and retail inventories likely will total about 2.3 million tons for the fertilizer year that ends March 31, 2014. As a result, it is projected that Indian Di-Ammonium Phosphate (DAP) imports will rebound from an estimated 3.6 million tons this year to 5 to 6 million tons in 2014-15[[4]](#footnote-4).

Therefore, there will be a tremendous global fertilizers demand for DAP and other processed phosphate fertilizers such as Mono-Ammonium Phosphate (MAP), Triple Super Phosphate (TSP), Single Super Phosphate (SSP), Super Phosphate (SP) and Calcium Phosphate (CP).

1. **PROJECT DESCRIPTION**

**3.1. Background of NAFAS**

Malaysian National Farmers Organization, with the abbreviation known as NAFAS, is one of the most reputable major suppliers of fertilizer to the Malaysian fertilizers industry that contribute the country's economic prosperity in agriculture sector. The fertilizers that supplied by NAFAS, mainly straight and compound fertilizers to the farmers of paddy cultivation areas, are parallel to the Malaysian Government aspirations on the National Food Security Policy, where fertilizers are imported, manufactured, transported and distributed through the widely scattered organized branches of State and Area Farmers Organization (PPN and PPK) which are located in every 14 states and 276 districts in Peninsular and East Malaysia. Now, there are 827,000 farmers registered under the shelter of NAFAS throughout Malaysia. NAFAS has 10 subsidiary companies that maneuver NAFAS commercial businesses in agriculture, mostly for the Malaysian Government, MOA. Malaysian NPK Fertilizers Sdn. Bhd. (MNFSB), an NPK compound plant under the collaboration with Malaysian Petroleum Nasional (PETRONAS) is one of the subsidiaries that functioned as the manufacturer for ordinary and premium NPK compound fertilizers, to be distributed to the farmers throughout Malaysia. The plant which is located at Gurun, Kedah, could produced the capacity approximately 300,000 metric tones (MT) annually. Therefore, through the experience and skilful manpower, both technically and economically, NAFAS is certainly capable to manage and govern this new D8 project.

**3.2 D8 DAP Plant Proposal and Approval by Malaysian Minister of MOA**

The proposal on the idea to built a DAP Plant under the collaboration of D8FA has been presented by Malaysia during the 3rd Ad Hoc Meeting To Consider The Formation Of D-8 Fertilizer Association (D-8 FA), 9th October 2014, Kuala Lumpur, Malaysia. Following to the event, a full report and a resolution on the essence of the meeting has been submitted to the Malaysian MOA. Under the resolution dated 06 November 2014 (Our Ref: NBKSB/D2-6(14).14), The Minister of Malaysian Ministry of Agriculture and Agro Based Industry (MOA) has in principle, approved the construction of the D8 DAP Plant proposalproject under the collaboration of D8FA to be proceeded ahead.

NAFAS being the private driven representative in D8FA for Malaysia, is a government agency which plays an important role in Malaysia. NAFAS imported, manufactured, transported and distributed the fertilizers throughout the country for the consumption of the Malaysian national farmers. NAFAS has its own NPK compound plant in Gurun, Kedah, which produces 300,000MT of compound fertilizers annually. Hence, with the establishment of NAFAS in the fertilizer industry domestically and globally, and with extensive experience of more than 40 years in the domestic and global trend of supply and demand of fertilizers, and throughout the experience and skilful manpower, both technically and economically, NAFAS is certainly capable to manage and govern this new D8 DAP plant project.

**3.3 D8 DAP Plant Site Location**

The D8 DAP plant project shall be located at Samalaju Industrial Park (Samalaju), Bintulu, Sarawak, East Malaysia. Samalaju is a totally green field site launched in 2008. Located at the north western part of Sarawak Corridor of Renewable Energy (SCORE) in Sarawak, East Malaysia, on the South China Sea. All basic infrastructure comprising roads, water, emergency, health and education services, telecommunications, police and government housing will be established within the industrial park. Road, drinking and wastewater infrastructure will be built in stages with completion of key stages projected to be by the end of 2014. Police, Fire and health services will be developed concurrently with completion targeted to be end 2014. The investors involved in Samalaju are in Manganese processing, Aluminium smelting and silicone substrate manufacturing. Other investors from both the international and domestic markets have indicated serious interest in investing in Samalaju and are waiting for more infrastructure to be completed before commencing construction of their plants. A constant supply of inexpensive electricity is required for these operators and their energy requirements will be sourced from the Bakun hydroelectric dam. Energy efficiency offered by SCORE will provide these companies with a competitive edge in world markets. By 2020, the phase one (1) projects outlined above will create over 5,450 jobs. The phase two (2) projects to be implemented once further infrastructure projects are completed will create over 4,300 jobs in 2020. Phase three (3) of the Samalaju node will develop downstream activities to further strengthen Samalaju’s position. As of third quarter of 2012, fifteen (15) potential investors from areas such as Silicone, Manganese, Aluminium and Titanium processing have been identified and discussions are ongoing. It is projected that these projects will create 6,480 jobs. Samalaju also features a deep draught port that can handle dry bulk, liquids and general cargo. Samalaju may be declared as a Special Industrial Zone in the near future[[5]](#footnote-5).

**3.4 D8 DAP Plant Source of Raw Materials is Ready in Sarawak**

Phosphorus is an essential base nutrient for animal and plant growth and is widely used in food, feed and fertilizer products[[6]](#footnote-6). **The source of raw materials for D8 Dap plant, will be supplied from one of the biggest domestic investor in Samalaju, Sarawak.** The supplier is investing a new Integrated Phosphate Complex plant with an annual production capacity of some 500,000 MT of phosphate for food and animal feed grade. This Integrated Phosphate Complex would help to reduce imports of phosphate products and to expand the production of 'halal' animal feed and fertilizers in the country, paving the way for export-oriented downstream industries, going forward. The supplier’s plant will be the first Integrated Phosphate Complex in Southeast Asia (SEA) and the first non-metal or alloy-based plant in the Samalaju Industrial Park. They have signed a Power Purchase Agreement (PPA) Term Sheet with Sarawak Energy, via its wholly-owned subsidiary company for the supply of 150 MW of power[[7]](#footnote-7). At the moment, NAFAS has established a reputable business relationship with this supplier by having a joint venture for the supplies of Sulphuric Acid in Peninsular Malaysia. NAFAS Sulphuric Acid consumption is for production of NPK compound fertilizer in Gurun, while the supplier Sulphuric Acid consumption is for production of 30,000MT inorganic feed phosphates in Ipoh, both in Peninsular Malaysia. By having collaboration between these two companies on the import of Sulphuric Acid, both parties managed to reduce the cost of importation by sharing the same vessel and storage facilities. NAFAS has carried out few meetings and discussions with the supplier on the set-up of D8 DAP plant in Samalaju. The meetings have discussed on NAFAS intention to utilize the source of raw materials of Phosphoric Acid and Ammonia supply from the supplier’s Integrated Phosphate Complex plant in Samalaju. Under the business proposal, the supplier will concentrate on the production 500,000MT of phosphate for food and animal feed, while NAFAS under its collaboration with D8 Fertilizer Association (D8FA), will focus on the production of 250,000MT DAP and certain tonnage of NPK compound, mainly for NAFAS domestic supplies and exports to D8 countries and SEA region. Other than Phosphoric Acid, the source of Ammonia will be supplied by the supplier through the coal by-product of processed 900,000 MT of coke. It has been discussed and negotiated that in order to produce 250,000 MT of DAP, it is estimated the total source of raw materials required for Phosphoric Acid is 116,250 MT and Ammonia is 69,687 MT, by which the supplier is capable of producing it as by-product for NAFAS proposed D8 DAP plant.

**4.0 D8 DAP PLANT DESCRIPTION**

The D8 DAP plant project will be located nearby besides the supplier’s Integrated Phosphate Complex plant in Samalaju. It will require approximately 25 acres (10.11 hectares) area for the plant, raw materials, final products storage and future expansion plant. The proposed D8 DAP plant project will be designed as Semi-True Compound type to produce 200,000 to 250,000 MT per annum of DAP and several other formulation of granulated products as compound fertilizers, with average daily production of approximately 600-750 MT per day. It will be based on 22 working hours per day, with allowance of 2 hours per day for cleaning and adjustment. The different grades of the granulated fertilizer will be produced with the granulation process developed based on the use of Pipe Reactors (PR) installed into granulator. The plant is designed with flexibility to use Solid Granulation Process and PR. It could process independently or combining both, depending on the DAP, phosphates fertilizer and NPK to be produced. The neutralization of liquid Ammonia and Phosphoric Acid takes place in a PR and equipment of small dimensions fitted within the granulator when using PR process. The final required for N:P ratio is reached in the Granulator by injection of additional Ammonia into the solids bed, through a specially designed Ammonization System. The system allows great operational flexibility for different formulations, enhanced control of operational parameters, high reaction efficiency, reduced ammonia emissions to the scrubber system, and the efficient use of the reaction heat to obtain slurry with a very low water content, which results in lower recycle rates. The joint operation of both systems (PR and Solid Granulation) provides a better control of the granulation temperature and granules size, which is a key factor when producing high nutrient content formulations. The advantages of PR process over conventional process is that it could increase production capacity, saves energy and improved product quality. The raw materials flow from MPAS to D8 DAP Plant is shown in **Graphic 1.0** below.

*Graphic 1.0 : MPAS Raw Material Flow to D8 DAP Plant*

Imported

1. Muriate of Potash, K2O
2. Kieserite, MgO

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C:\Users\saharudin\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\UV1HA8XJ\MC900150783[1].wmf

From MPAS

1. Phosphoric Acid, P205
2. Ammonia, NH3

**Raw Materials supply direct from**

**Phosphate Integrated Complex**

* **USD 330.0 Millions**
* **500,000MT Food & Feed Grade Phosphate**
* **900,000MT Coke for Ammonia**

**D8 DAP Plant**

* **USD 78.0 Millions**
* **200,000MT DAP**
* **50,000MT NPK**

Solid Granulation Process and Pipe Reactor (PR)

**4.1** **Estimated Breakdown of Formulation**

Breakdown of formulations and capacity of production to be produced by D8 DAP plant are estimated as follows;

*Table 1.0 : D8 DAP Plant Estimated Breakdown of Formulation*

|  |  |
| --- | --- |
| **Formulation** | **Volume, MT** |
| DAP 18 : 46 | 200,000 |
| P1 (17.5 : 15.5 : 10) | 27,000 |
| P3 (17 : 3 : 25 : 2 MgO) | 16,000 |
| Others | 7,000 |
| **Total Production (MT) per annum** | **250,000** |

**4.2 NAFAS and Malaysia Domestic Consumption of DAP and NPK Fertilizers**

From the breakdown above, 30,000MT of the DAP will be supplied to NAFAS plant, MNFSB in Gurun, which is producing few formulations of NPK compound for distribution to the farmers in Peninsular Malaysia. It is also estimated that 15,000MT of DAP will be supplied for the consumption of Malaysian local market. While the P1 and P3 formulations, 27,000MT and 16,000MT respectively, total 43,000MT is for NAFAS distribution to the farmers in East Malaysia (Sabah & Sarawak). Therefore, out of 250,000MT total production, 73,000MT will be uplifted by for Malaysian farmers’ consumption under NAFAS, 15,000MT is for Malaysian local market, and the balance of 162,000MT is mainly for export to D8 countries and SEA region.

* 1. **Estimated Cost of Investment**

As shown in **Table 2.0** below, the total cost of investment for D8 DAP plant Samalaju project is estimated to be RM 245.736 Million (USD78,000,000). However, total cost of investment is subject to changes in foreign exchange rate, interest rate, and any other factors such as changing in plant designs that may lower or increase the actual estimation. The breakdown of project cost for D8 DAP project is estimated as follows;

*Table 2.0: D8 DAP Plant Estimated Cost of Investment*

|  |  |
| --- | --- |
| **Project Cost** | **Cost, RM,**  **(at forex rate, USD1 = RM3.1515)** |
| Licence Fee | 3,520,000 |
| Project Management Consultant | 3,670,000 |
| Interest During Construction | 11,611,000 |
| Land and Site Preparation | 18,424,000 |
| DFS, BEDP, EIA | 3,369,000 |
| EPCC | 205,143,000 |
| **Total Cost, RM (USD)** | RM 245,736,000  **(USD78,000,000)** |

*Abbreviation and meaning;*

*BEDP - Basic Engineering Design Package*

*DFS - Definitive Feasibility Study*

*EIA - Environmental Impact Analysis*

*EPCC - Engineering, Procurement, Construction and Commissioning*

* 1. **D8 Member Countries Proposed Shareholders for D8 DAP Plant**

As shown in **Table 3.0** below, the proposed distribution of share for the D8 DAP plant is 51% for Malaysia and 49% for D8 member countries.

*Table 3.0: D8 DAP Plant Shareholders Distribution*

|  |  |
| --- | --- |
| D-8 Countries  Shareholder | Distribution  of Share (%) |
| 1. Malaysia | **51 %**  **(USD39,780,000)** |
| 2. Bangladesh | **49 %**  **(USD38,220,000)**  **[Inclusive Sarawak State Government]** |
| 3. Egypt |
| 4. Indonesia |
| 5. Iran |
| 6. Nigeria |
| 7. Pakistan |
| 8. Turkey |
| **Total Estimated Investment USD78,000,000** | |

**4.5 Investors Return on Investment (ROI)**

The D8 DAP plant cost of investment would be funded via a mixture of shareholders’ equity and long-term bank-funded debt. At the moment, there are few local banks have shown their interest in financing the long term fund such as EXIM Bank, Agro Bank, Maybank and CIMB bank. Initially, the capital structure proposed could be 70% loan and 30% equity or 50% loan and 50% equity. Under this two (2) capital structure, the Internal Rate of Return (IRR) could be 11.5% or 7.26% respectively which calculated payback within 5 or 6 years respectively on equity. The details on the equity and long-term bank-funded debt will be arranged soon after the proposal agreed by the D8 member countries.

* 1. **D8 Member Countries Proposed Directorship for D8 DAP Plant**

The D8 member countries proposed directorship for D8 DAP Plant is as shown in **Table 4.0** below. The number of D8 countries director is only offered subject to the countries which invest in the D8 DAP Plant.

*Table 4.0: D8 DAP Plant Directorship*

|  |  |
| --- | --- |
| D8 Countries Shareholder | No. of Director |
|
| 1. Malaysia | 3 |
| 2. Bangladesh | 1 |
| 3. Egypt | 1 |
| 4. Indonesia | 1 |
| 5. Iran | 1 |
| 6. Nigeria | 1 |
| 7. Pakistan | 1 |
| 8. Turkey | 1 |
| **Total of Directors** | **10** |

**4.7 D8 DAP Plant Project Execution**

The execution of the project is estimated to be accomplished within three (3) years commence 2015 until 2017. The summary of the project execution is as shown in **Table 5.0** below;

*Table 5.0: D8 DAP Plant Project Execution*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ID | Task Name | | 2015 | 2016 | 2017 |
| 1 | **Milestone** | |  |  |  |
| 2 | **Board approval on DFS** | |  |  |  |
| 3 | **Selection of PMC and licensor** | |  |  |  |
| 4 |  | Contracting strategy |  |  |  |
| 5 |  | Board approval on contracting strategy |  |  |  |
| 6 |  | ITB preparation and propose vendor |  |  |  |
| 7 |  | ITB briefing and issuance |  |  |  |
| 8 |  | ITB submission and closing date |  |  |  |
| 9 |  | Tender evaluation and technical criteria approval |  |  |  |
| 10 |  | Evaluation |  |  |  |
| 11 |  | Tender evaluation and commercial criteria approval |  |  |  |
| 12 |  | Evaluation |  |  |  |
| 13 |  | Tender board approval |  |  |  |
| 14 |  | Tender award |  |  |  |
| 15 | **PMC and licensor execution phase** | |  |  |  |
| 16 |  | BED verification |  |  |  |
| 17 |  | Final BEDP and ITB preparation |  |  |  |
| 18 |  | Preparation of ITB to EPCC contractor |  |  |  |
| 19 | **Selection of EPCC contractor # 2** | |  |  |  |
| 20 |  | ITB preparation and propose bidders |  |  |  |
| 21 |  | TC board approval |  |  |  |
| 22 |  | ITB briefing and issuance |  |  |  |
| 23 |  | ITB submission and closing date |  |  |  |
| 24 |  | Tender evaluation and technical criteria approval |  |  |  |
| 25 |  | Evaluation |  |  |  |
| 26 |  | Tender evaluation and commercial criteria approval |  |  |  |
| 27 |  | Evaluation |  |  |  |
| 28 |  | TC board approval |  |  |  |
| 29 |  | Tender award |  |  |  |
| 30 | **EPCC execution phase** | |  |  |  |
| 31 |  | Detail design preparation |  |  |  |
| 32 |  | Start site preparation |  |  |  |
| 33 |  | Start piling |  |  |  |
| 34 |  | Start mechanical works including procurement |  |  |  |
| 35 |  | Start electrical works including procurement |  |  |  |
| 36 |  | Start instrument works including procurement |  |  |  |
| 37 |  | Construction works |  |  |  |
| 38 |  | Mechanical completion |  |  |  |
| 39 |  | Electrical completion |  |  |  |
| 40 |  | Instrument completion |  |  |  |
| 41 |  | Construction completion |  |  |  |
| 42 |  | Initial acceptance |  |  |  |
| 43 | **Operation** | |  |  |  |
| 44 |  | Start up, test run and commissioning |  |  |  |
| 45 |  | Project close |  |  |  |
| 46 |  | Operation commence |  |  |  |

*Abbreviation and meaning;*

*BED - Basic Engineering Design*

*BEDP - Basic Engineering Design Package*

*DFS - Definitive Feasibility Study*

*EPCC - Engineering, Procurement, Construction and Commissioning*

*PMC - Project Management Consultant*

*EIS - Environmental Impact Study*

*ITB - Invitation To Bid*

*TC - Tender Committee*

**5. CONCLUSION**

With the support of Malaysian Government, which has been principally approved by the Minister under the portfolio of Malaysian Ministry of Agriculture and Agro Based Industry (MOA), Malaysia greatly anticipate the proposal will get the support and agreement from all the D8 member countries on participation of the joint venture investments. There have been few factors considered under this proposal which are highly important for the praiseworthy D8 member countries to digest, comprehend and eventually to agree on the decision for the investment. Factors such as the strategic plant location which is only 2 km away where fertilizers will be transported by conveyor belt to the port, the source of raw materials in the form of phosphoric acid and ammonia direct from the neighbouring Integrated Phosphate Complex supplier, on FOB basis; with no import and no additional vessel and operational charges, neither CFR nor CPT, the economical energy power supplies from 2,400 megawatts (MW) Bakun Hydroelectric Dam, the economical land price for multiple industrial purposes, the extensive deep draught port facilities that can handle dry bulk, liquids and general cargo, the basic infrastructures such as strategic port location that could access for export to Southeast Asia (SEA), Asia Pacific and South Asia such as Thailand, Cambodia, Vietnam, Myanmar, Indonesia, Filipina, South Korea, Japan, China, India, Pakistan and Bangladesh, couple with the complete infrastructure comprising roads, water, emergency, health, education services, telecommunications, fire, police and residential, together with the wastewater substructure and the moderate size plant design at reasonably investment cost, are indeed probably the best offer that the D8 member countries should not declined. The D8 DAP Plant must be considered as an opportunity for the joint venture among D8 member countries to be materialized. The D8 DAP Plant project under the collaboration of D8 member countries should be materialized being the first project under D8 working group of fertilizer and D8FA. Malaysia believe the proposal on the D8 DAP Plant will be the first interpretation to the initiative on the D8 intention to develop joint investment programs in the field of fertilizer by encouraging and supporting investors from private sector. This proposal also parallel to Malaysia intention earlier in Abuja, Nigeria on the significance on locating the D8FA headquarters in Kuala Lumpur.

END

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