Oil for thought: A look at palm oil, kernel oil and palm kernel cake

When we talk about soy bean, most of us are aware that there is oil and meal that is produced, traded and used in different ways. When it comes to oil palm, many only know about its prominent product, crude palm oil, when the plant has much more to offer than that. In fact, Alonso-Alanso-Fradejas and colleagues (2015) applied the flex crop concept when studying oil palm (Figure 1). According to Borras and colleagues (2014), flex crops and commodities are those with multiple uses that are considered to be flexibly inter-changed, and the value of flex crops is related to the versatility of its derived commodities in volatile markets. Borras and colleagues (2014) argue that flex crops reduce uncertainty in a single crop sector through diversification of the product portfolio. This in turn may place investors in a position to react to changing prices for one or more of the different products from a single flex crop.

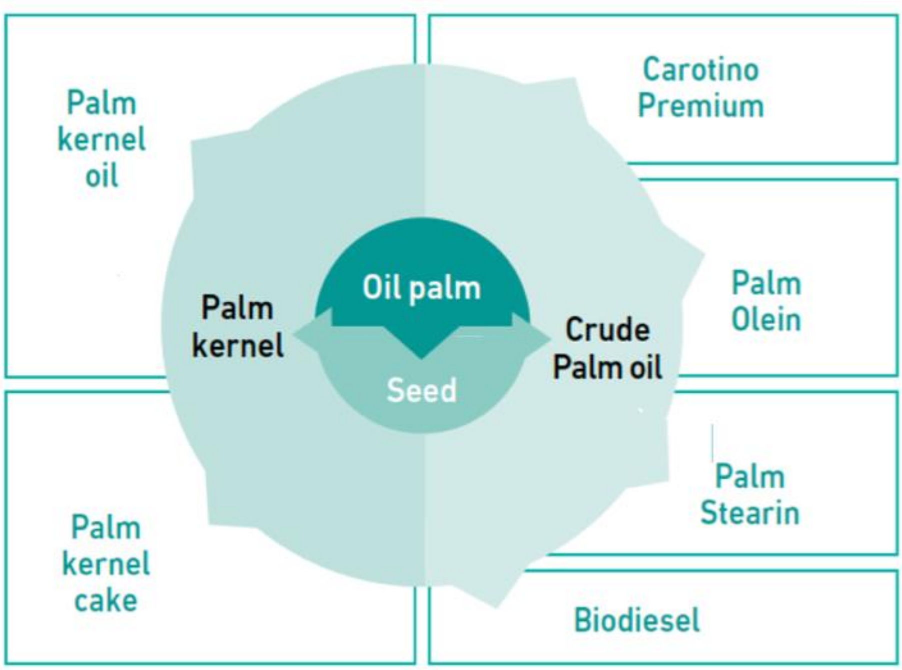

Figure 1: Modified from Alonso-Fradejas and colleagues (2015)

In this column, we have a look at crude palm oil (CPO) and palm kernel oil (PKO). The market dynamics for these two commodities have changed significantly during the last few years. Since early 2014, PKO has traded above the 1,000 USD per ton mark, while CPO has remained below that ceiling, and the premium at which PKO is traded has increased (see Figure 2). Let's assume one hectare of oil palm produces about 20 t/ha fresh fruit bunches on average in Malaysia. At 20% oil extraction rate, that gives us about 4 t/ha CPO, or more or less, USD2,800/ha. The same 20 t/ha fresh fruit bunches generate, at 4% kernel extraction rate, about 0.8 t/ha palm kernels. The kernel crusher plant turns these, at 45% oil exchange rate, into 0.36 t/ha PKO, generating USD432/ha at current prices of

USD1,200/t PKO. Additionally, the process produces about 0.4 t/ha palm kernel cake (PKC) that at USD200/t may add another USD80/ha for a total of USD3,312/ha. The value of PKC for animal nutrition is lower than that of soy meal (Alimon 2004 and Oladokun *et al.,* 2016). At the same time, technological advances make it possible to replace more soy meal with PKC in feed mixtures (Sinurat *et al.,* 2014; Fadil *et al.*, 2014). Given the much higher productivity and cost efficiency of oil palm compared to soy (Cash Crop Report 2009), this could have a significant positive impact on land use requirements to supply the ever growing demand for animal feeds.

The question has come up whether it is worth breeding oil palms that will give more kernel (Corley and Tinker 2016; Hartley 1988). Recently, palms have been identified that could be used for breeding to increase kernel extension rate to more than 9%, doubling the PKO and PKC yield. Of course, CPO will likely decrease. At this time, it is difficult to estimate how much such reduction may be. The question remains to be answered whether this will be better for business, sustainable oil production for human consumption, animal feed stock production and growing industrial uses.

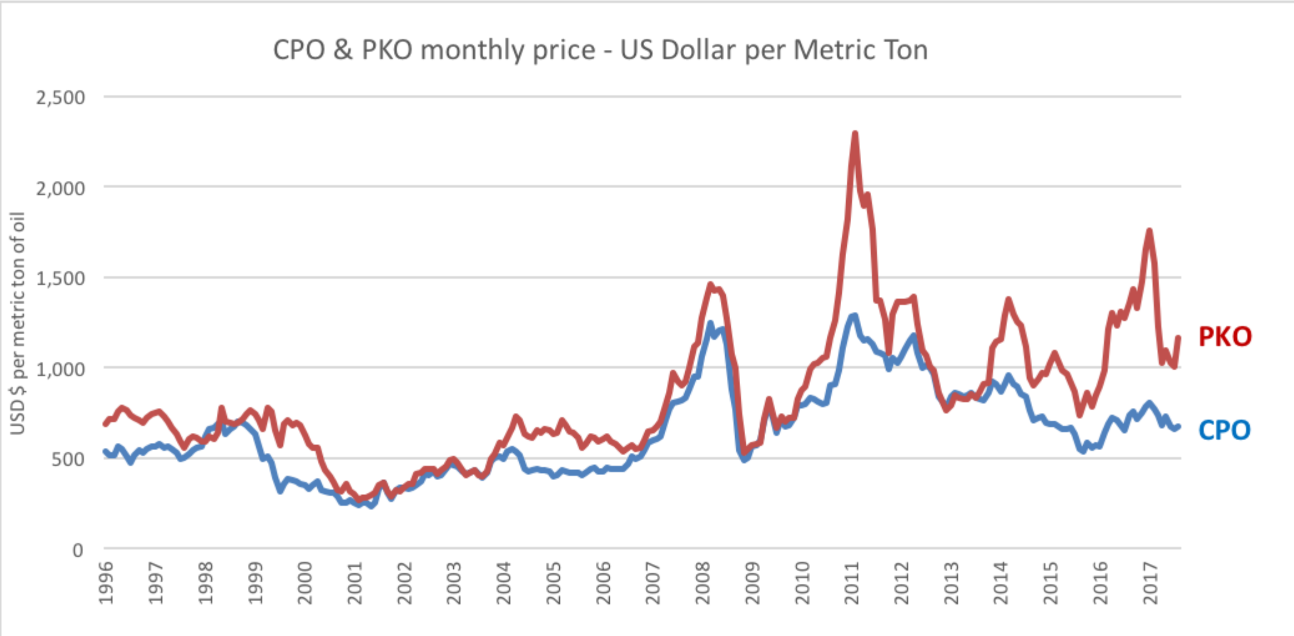

Figure 2: Prices of CPO and PKO in monthly basis per metric ton of oil respectively

Crop nutrition may also be used to influence the ratio between the proportions of palm kernels and mesocarp in a fruit bunch. Prabowo and Foster (1998) showed that potassium fertilizer significantly increased kernel to fruit bunch ratios in 3 out of 6 trials, while magnesium fertilizer reduced them. Furthermore, the few reported nutrient removals of palm kernels, as the source of PKO and PKC seem to be higher than those of the mesocarp that is processed to produce CPO. Corley and Tinker (2016) cite Kok and colleagues (2011) and give approximate mineral contents of palm kernels as 3050 mg magnesium per kg dry weight, up to 7500 mg/kg potassium, and 6500 to 7000 mg/kg phosphorus. Rui Li and colleagues (2012) indicated lower values for palm kernel produced in China. They found 1564 mg/kg magnesium, 5098 mg/kg potassium, and 4000 mg/kg phosphorus, while the corresponding values in mesocarp were only 853 mg/kg magnesium, 3264 mg/kg potassium, and 300 mg/kg phosphorus. Prabowo and Foster (2006) also found higher values for phosphorus and nitrogen in the kernel of tenera palms (0.354%, 1.72%) than corresponding values in the mesocarp (0.065%, 0.62%). Their values for magnesium and potassium were however similar in palm kernels and mesocarp, and more research remains to be done on the issue.

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