Agrisoft Systems

NEWSLETTER

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Message from the Management

The challenges of internationalization

Dear Customers and Friends,

Over the past years, the Agrisoft Systems user base has grown to include companies from all major oil palm growing areas of the world, from Latin America over Africa and South East Asia to Oceania. While this is of course a source of great satisfaction for us, trying to design software to fit these diverse regions does provide many challenges for our design team.

From the first versions of OMP, the software has provided numerous options that allow users to customize the software to the specific requirements of their plantation. At the most basic level, the modularity of the program provided by the various add-ins and extension programs allows uses to pick and choose which features they want to use. The next obvious example contains the large number of pick-up lists in OMP where users can customize things such as fertilizers, pest names, field upkeep ratings, scoring criteria for nutrient deficiencies and much more. Various settings give users the power to control the most important calculations, for example whether blocks marked as out of yield should be excluded when calculating yields at higher spatial levels. Even at a more detailed level, it is always a challenge to give users the option to customize the way that data is presented for analysis, for example with options to include/exclude certain sections on reports or by choosing which data series should be compared on charts.

The need for flexibility is particularly evident in the two newest OMP add-ins, OMP Fertilizer Planner and OMP Field Survey. There are many different approaches to oil palm fertilization, which are variously suited to different soils, climates, planting materials etc. Therefore, trying to build any program with a fixed, hardcoded fer-

Agrisoft Systems
NEWSLETTER
Jan.— Mar. 2018

Message from the Management

tilization formula would have been doomed to fail. The highly flexible approach built into the basic design of the OMP Fertilizer Planner has been the crucial factor allowing it to be successfully used in very different plantations all over the world. Similar arguments hold for the OMP Field Survey app. While there are of course some parameters that most if not all plantations will be interested in surveying (for example, pruning status, harvesting crop losses or fruit quality), every plantation has its own individual challenges which require specific handling (for example, pests or diseases particular to that region). With the possibility of freely defining questions, survey types and even data analysis expressions, OMP Field Survey can be completely customized to survey exactly what you need in your plantation.

One major topic related to internationalization that is not yet handled in OMP is multi-language support. In the last few months we have been working hard on rectifying this situation by adding support for Bahasa Indonesia and Spanish. Building (and maintaining!) a multi-language user interface in a program as large as the OMP suite is obviously a massive task. What makes this particularly challenging is the fact that translation has to be embedded in the given layout of forms and reports, making this a much harder task than “simply” translating a long text. Another technical difficulty is posed by the fact that OMP supports user-defined captions for the spatial levels (called “Block”, “Field”, “Division” and “Estate” by default), which must be integrated into the translated texts in such a way as to respect the grammatical rules of each language. Despite these difficulties, we are making good progress and are aiming to include Spanish and Indonesian language support for OMP-DBMS and the OMP Field Survey app with the next OMP release.

The following section of this newsletter contains an article co-written with Dr. Thomas Fairhurst of Tropical Crop Consultants Limited (TCCL), in which we take a look at the importance of the concept of “relative agronomic efficiency” in fertilizer recommendations. As usual, the newsletter concludes with a “What’s new” section, which gives an overview of the different things we are working on.

Yours sincerely,

Max Kerstan

Agrisoft Systems
NEWSLETTER
Jan.— Mar. 2018

Feature

Taking into account the relative agronomic effectiveness and application costs of fertilizers

Thomas Fairhurst[1] and Max Kerstan[2]

The oil palm is mainly cultivated on low fertility status acid (pH 5–6), and strongly acid (pH 4–5), soils in the humid tropics. Whilst soluble phosphorus (P) sources (e.g. triple super phosphate (TSP), diammonium phosphate (DAP), SP36) are used to correct pronounced P deficiency, particularly in young palms, finely ground reactive phosphate rock (RRP) is commonly used as a P fertilizer to maintain P status in mature palms.

The nutrients Acontained in different types of phosphorus (P) fertilizers undergo varied chemical and physical processes before P becomes available for palm uptake. For example, P is released slowly from the rock phosphate after it reacts with acidity in the soil, whereas P from soluble fertilizers (e.g. TSP, DAP) is released rapidly and is available immediately for plant uptake. It is important to keep in mind that these differences affect both the *timing* of nutrient release from the fertilizer material, but also the overall *amount* required. For example, when applying P, a relatively immobile nutrient, as rock phosphate, it is possible that nutrients fail to reach the oil palm root zone (≤40 cm from the soil surface) and some of the fertilizer may be lost due to surface water wash and run-off. Clearly, it is important to take account of these processes, as well as the fertilizer chemical nutrient composition, when estimating the capacity of different fertilizer materials to supply nutrients to the palm.

Relative agronomic effectiveness (RAE) is a term used to evaluate or 'rate' the effectiveness of a particular RRP by comparison with TSP, a standard and fully soluble P fertilizer source. Because RRP sources differ in their reactivity with the soil, it is important to assess the RAE of candidate RRP sources as part of the fertilizer selection process. RAE is assessed in experiments that compare the yield of crops grown with the same amount of P (P_2O_5/ha) applied in the form of TSP and different sources of RRP. If experimental data is not available, literature values can be used as the basis for rating different fertilizer P sources.

If the RAE of a particular RRP is 80%, this implies that the crop yield will be 80% of the yield obtained with the same amount of P applied as TSP. Thus, 100/80 or 1.25 times the amount of TSP must be applied as RRP to reach the same yield.

Three P fertilizer sources are compared in the following hypothetical example (Table 1). We can draw two interesting conclusions from this hypothetical example:

1. RRP 2 has a larger total P2O5 content than RRP 1 but lower RAE. It is therefore more costly to use than either RRP 1 or TSP.
2. The least costly fertilizer source is RRP 1 ($ 131/ha) but 1.9 times more material must be transported to the plantation and spread in the field by comparison with TSP.

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[3] All other nutrients are applied in sufficient amounts.

Agrisoft Systems
NEWSLETTER
Jan.— Mar. 2018

Feature

P fertilizer	Purchase price and effective cost				Amount required			Cost
	Cost	P content	RAE	Effective cost	kg/palm	kg/ha	Relative amount	$/ha
	$/t	P_2O_5%	%	$/t available P_2O_5				
TSP	460	46	100	1,000	2.2	311	1	143
RRP 1	220	30	75	978	4.4	636	2.0	140
RRP 2	220	32	60	1,146	5.2	745	2.4	164
Column	a	b	c	d	e	f	g	h
Formula	-	-	-	a ÷ (b/100 x c/100)	1 ÷ (b/100 x c/100)	e x 143	f ÷ 311	f x a ÷1,000

Table 1. Comparison of the amount required and cost of two sources of rock phosphate and TSP (nutrient target 1 kg/palm P_2O_5, planting density 143 palm/ha).

The first observation illustrates how important it is to take into account the relative agronomic effi -ciency when choosing fertilizers. Without taking into account the RAE, it would be tempting to dis -card RRP 1 in favor of RRP 2 because the total nutrient content (% P2O5) of RRP2 is greater at an identical price to RRP 1. This would be a mistake since, in this example, RRP 1 is more cost-effective due to its higher RAE.

The second observation leads us to another important point: when trying to choose the most cost-effective source of fertilizers for a given nutrient target, it is important to take into account the transport (both to the plantation fertilizer store and from the store to the field) and application costs in addition to the material cost. Clearly, precise transportation and application costs depend on factors such as distance from field to storehouse or field topography, and will differ from block to block. However, for most purposes it is sufficient to work with average transport and application costs ($/t fertilizer).

We will now investigate how these factors affect the overall cost of fertilization for the three types of P fertilizer discussed in our previous example (Table 2). The cost of applying powdery RRP is

P fertilizer	Fertilizer cost				Amount required		Overall cost
	Purchase		Transport	Application	kg/palm	kg/ha	$/ha
	$/t	$/t available P_2O_5	$/t	$/t			
TSP	460	1,000	20	10	2.2	311	152
RRP 1	220	978	20	15	4.2	636	162
RRP 2	220	1,146	20	15	5.2	745	190

Table 2. Taking into account transportation and application costs

Feature

Inorganic fertilizer: Costs, accuracies and bounds of available fertilizers

Fertilizer	Costs			Amount	
	Price	Transport	Application	Round to	Minimum total
	$/t	$/t	$/t	kg/p	t
RRP 1	220.00	20.00	15.00	0.50	0
RRP 2	220.00	20.00	15.00	0.50	0
TSP	460.00	20.00	10.00	0.50	0

Figure 1: Example of OMP Fertilizer Planner settings

often greater than granular TSP fertilizer. In this example, the larger amounts of fertilizer material required (kg/ha) for RRP 1 actually leads to a higher overall cost in $/ha compared to TSP, even though the effective material cost ($/t available nutrient) after taking RAE into account is lower.

The OMP Fertilizer Planner (OMP-FP) provides the means to take all the factors described here into account, simplifying the process of identifying the most cost-effective source of fertilizers to implement the nutrient targets. The result of evaluating an OMP-FP scenario with the fertilizer settings displayed in figure 1 and a very basic nutrient ruleset, (i.e. a single nutrient dose of 1 kg/p P2O5, applied to all blocks) is shown in figure 2. As expected from our discussion above, OMP-FP has calculated that TSP is the most cost-effective fertilizer.

In our simple example, involving only straight fertilizers and the same nutrient target for every block, choosing the most cost-effective fertilizer source may appear to be a trivial calculation. However, the problem becomes complicated to solve when we include compound fertilizers and a more complicated set of nutrient targets, where each block may have different nutrient targets (with different ratios between nutrients). The OMP-FP includes a powerful non-linear optimization routine, custom-built to handle this problem, even for complex fertilizers and nutrient targets. In fact, OMP-FP goes a step further and is also capable of taking into account side conditions such as a maximum or minimum fertilizer order conditions.

The same principles regarding the importance of the RAE apply to the comparison of Mg containing fertilizers, where kieserite can be used as the 'standard fertilizer' (25% MgO, RAE 100%) and compared with dolomite and other compound fertilizers containing Mg. Similarly, it is possible to take into account likely volatilization losses from N sources (e.g. urea). Whilst urea's N content is high (46% N) volatilization losses may be as great as 30% and the RAE% would therefore be 70%.

These calculations show that preparing fertilizer recommendations (kg nutrient/palm) is only the first step of the process. It is also equally important to assess the effectiveness of available fertilizer materials and choose the most cost-effective fertilizers, after taking into account cost (material, transport, storage), nutrient content and effectiveness.

Yearly overview

Group by: Estate Subgroup by: Fertilizer name Restrict to fertilizer: Unrestricted Program: ☑ Mature ☑ Immature

Estate	Fertilizer	Yearly recommendations			Yearly costs		
		t	kg/p	t/ha	$	$/p	$/ha
Agrisoft Demo Estate	TSP	3,164.6	2.00	0.25	1,550,668	0.98	122.01

Figure 2: Sample result of simple OMP Fertilizer Planner scenario

Agrisoft Systems
NEWSLETTER
Jan.— Mar. 2018

From the developers desk

A selection of the on-going developments and plans which are part of our constant efforts to continue to improve Agrisoft products.

OMP Plantation

- Multi-language support for Spanish and Bahasa Indonesia
- New layout for print reports
- Consistent handling for form print out reports, including right-click filter from the form
- OMP-GIS for 64 bit MapInfo
- Improved „Monthly Dashboard“ report
- RAE field for nitrogen fertilizer

OMP Field Survey medium term plans

- Multi-language support for Spanish and Bahasa Indonesia
- Support for scanning NFC chips
- iOS support
- Print reports for raw and aggregated re-sults
- User-definable “thresholds” for surveyed parameters
- New reports focusing on blocks where thresholds are exceeded
- New reports for development of survey parameters over time

Long-term plans

- Migration of back-end database to SQL Server
- Tools to export/import data from SQL Server into a compact format for easy file-sharing
- Integration of daily production recording (OMP-HRR add-in) and crop budgeting into main OMP application
- Integration of new field work module as developed in BMP
- Cloud based data storage and web re-porting