Agrisoft Systems
NEWSLETTER
Thirty-fourth edition, Jul.— Sep. 2020

Message from the Management

News from Agrisoft Systems

Dear Customers and Friends,

Following the release of the new OMP 10.0 in June, the last three months have been devoted to the rollout of the new version to our customers all over the world. Due to the shift to a new back-end database technology OMP 10.0 requires some additional software prerequisites that need to be installed. This meant that the upgrade and data migration process from OMP 9.3 to OMP 10.0 was somewhat different and potentially more complicated than previous version upgrades. Such a shift to a new system is always a bit of a challenge especially for IT departments in larger companies with multiple OMP users, and due to our diverse user base using various versions of Access and Windows in different countries some unforeseen challenges are to be expected. However, using remote support and tools we have been able to help out our customers with the update and iron out the smaller issues, so that now the majority of our users are successfully running the new OMP version. We expect that those who have completed the migration can look forward to future update procedures that will be much easier than previous OMP version as e.g. no manual relinking or data import is required anymore in OMP 10.

Of course, development has been ongoing alongside the OMP 10 rollout. The majority of our development team have already been busy working on new features and additions for the next update. As usual, many of these have been based on user requests and feedback. For example, we have been working to make the global filter in OMP more flexible so that users can decide for themselves, which fields should be filterable. Other changes include the addition of new block status fields for the general harvest method and water conservation measures, a BMP status field as well as various new settings and calculation options for the age calculation and OMP Fertilizer Planner. A major project apart from the existing OMP programs is the development of a new standalone OMP-GIS application. This new program will replace the existing functionalities of previous OMP-GIS versions but without requiring any host program such as MapInfo or ArcGIS. Besides this, it will add new functions such as point maps for OMP FS point data.

The main feature article in this newsletter focuses on the OMP-BBC module for crop forecasting based on black bunch counts. It explains how the various settings and configuration options work together to yield the final forecast result. By looking at real sample data from an estate using OMP-BBC we show that this provides a cheap, verifiable system for crop forecasting to a high level of accuracy. As usual, the newsletter is wrapped up with a what's new section containing a look at some of the things our dev team is working on.

With best regards,

Max Kerstan

Agrisoft Systems
NEWSLETTER
Jul.— Sep. 2020

Feature

Crop forecasts with OMP-BBC

Short-term crop forecasts on the basis of black bunch counting (BBC) can be an extremely useful tool for plantation managers. Crop forecasting can in particular help with planning of labor, milling and transport requirements and can also be used as an indicator of possible issues such as crop theft or harvesting problems if there are significant differences between forecast and actual harvests. Despite these potential advantages, BBC crop forecasts remain a contentious topic among oil palm managers due to the labor required and problems with forecast accuracy. However, as we will see in the following these issues can be brought under control by using a database system like OMP-BBC to prepare the crop forecasts and OMP Field Survey to collect data.

When using the OMP Field Survey app to collect the data, one surveyor can easily carry out the black bunch count for a 30 ha block in a day. Assuming a survey-child block system where one block in five is surveyed, this means the effective labor cost of carrying out the monthly BBC forecast is trivial at about 0.2 md/block/month. OMP-BBC and OMP-FS make it very easy to retrospectively analyze accuracy and verify that bunch counts were carried out at the right palms. This greatly helps to improve forecast accuracy as surveyors are aware that they are accountable for the quality of the results. This together with the powerful data analysis features including forecast vs actual comparisons makes crop forecasting with OMP-BBC cheap, easy and extremely useful.

In this article, we take a look at how the different assumptions and inputs that you can control in the OMP-BBC module come together to produce the final forecast result. Understanding the effect of these assumptions also makes it clear that it can be very helpful to look at some intermediate results that can contain very useful information while having a smaller margin of error than the final monthly production forecast.

The basic principle of BBC forecasting is very simple and can be summarized by the following formula:

$$t_n = b \times p \times f_n \times l \times w_n / 1000 \qquad (1)$$

$n = 1,\ldots, 4$ specifies the number of months after the black bunch count was carried out.
t_n is the output in tons in the n-th month after the black bunch count.
b is the black bunch count in black bunches per palm.
p is the number of palms in the block under consideration.
f_n is the fraction of the black bunches that are expected to be ripe n months after the count.
l is a bunch loss factor for losses between the field and the mill.
w_n is the expected bunch weight in the n-th month after the count.
Clearly, to achieve a high forecast accuracy we must strive to minimize errors in each of the four factors in the formula, which will be individually discussed below.

The number of black bunches per palm, b, is typically obtained in a straightforward manner by surveyors explicitly counting the bunches at a certain growth stage in the field. In order to maximize the accuracy of this raw data, it is important to ensure that surveyors are appropriately trained to correctly identify bunches in the

Feature

right growth stage and that pruning standards are maintained appropriately to make it easier to see the black bunches, particularly in older palms. In order to avoid excessive labor requirements, most companies avoid carrying out the black bunch counts in every block and far less every palm. Instead, it has proven effective to choose a representative subset of survey blocks and then count the black bunches at roughly every tenth palm in every tenth row. To ensure consistency between successive forecasts, it is strongly recommended to always carry out the counts at the same palms. A very effective way of carrying out these BBC surveys is to use the OMP Field Survey smartphone app. It is then possible to mark the BBC palms with certain QR code cards that can be scanned by the app to ensure that the surveyors have carried out the surveys at the right location. In OMP-BBC, for each year you can choose which of the blocks in your plantation are designated as BBC survey blocks. Black bunch count data entry then simply consists of entering the survey date, the number of palms surveyed and the total number of black bunches counted in each survey block. To each survey block you can assign a set of “child” blocks, in which no actual count is carried out and instead the black bunches per palm result from the associated survey block is used. Clearly, if you choose not to survey every block then the assignment of child blocks to survey blocks is a very important factor that can affect the accuracy of your production forecast in the child blocks. In particular, child blocks should be assigned to survey blocks with similar base characteristics (same age, soil type, planting material etc).

In OMP-BBC, the palm stand p in formula 1 is taken from the underlying OMP block data set and thus does not require any additional data entry. Nevertheless, it is obvious that an accurate palm count in each block is a requirement for an accurate BBC crop forecast.

The distribution fractions f_n are input parameters that have to be specified in OMP-BBC. If your plantation already has a historical production data set in OMP, you can base the distribution fractions on the historical monthly distribution. This distribution can be automatically copied and used in OMP-BBC, see figure 2. While the distribution calculated from the historical monthly spread is generally a good starting point, it is recommended that you review this regularly for greater accuracy. In particular, you might want to change the distribution to account for a changing

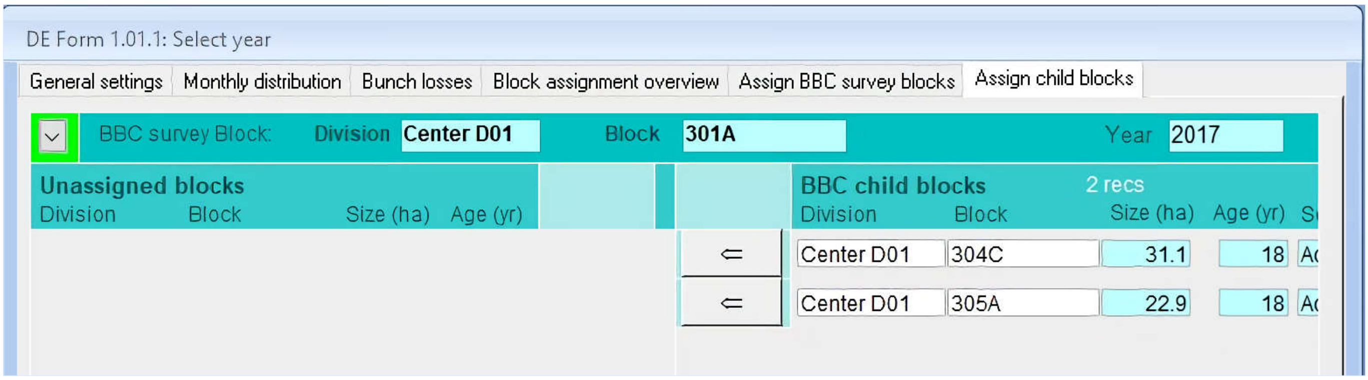
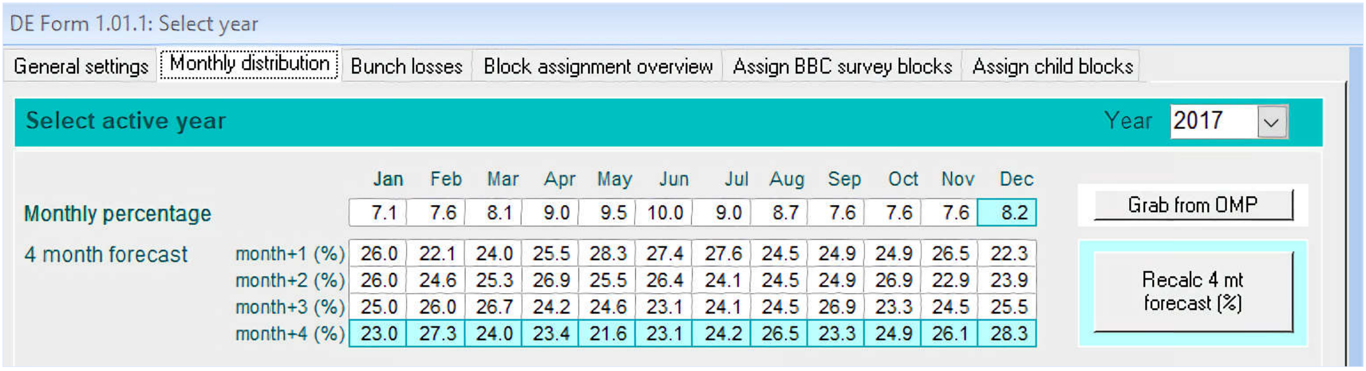


Figure 1: Assignment form for survey blocks and child blocks in OMP-BBC.

Feature


DE Form 1.01.1: Select year

General settings | Monthly distribution | Bunch losses | Block assignment overview | Assign BBC survey blocks | Assign child blocks

Select active year — Year 2017

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly percentage		7.1	7.6	8.1	9.0	9.5	10.0	9.0	8.7	7.6	7.6	7.6	8.2
4 month forecast	month+1 (%)	26.0	22.1	24.0	25.5	28.3	27.4	27.6	24.5	24.9	24.9	26.5	22.3
	month+2 (%)	26.0	24.6	25.3	26.9	25.5	26.4	24.1	24.5	24.9	26.9	22.9	23.9
	month+3 (%)	25.0	26.0	26.7	24.2	24.6	23.1	24.1	24.5	26.9	23.3	24.5	25.5
	month+4 (%)	23.0	27.3	24.0	23.4	21.6	23.1	24.2	26.5	23.3	24.9	26.1	28.3

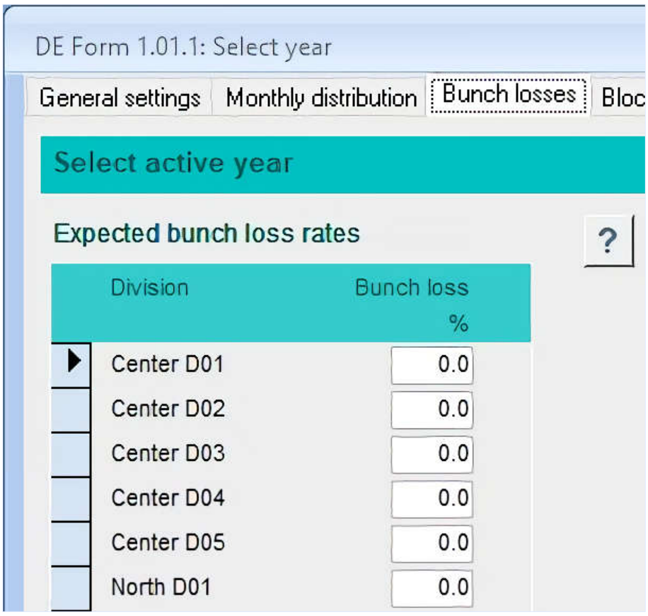
Grab from OMP

Recalc 4 mt forecast (%)

Figure 2: Form for specifying distribution of 4-month forecast.

plantation age profile or specific climatic factors like an extended drought. To avoid the uncertainty of this monthly distribution, in many cases it can make sense to look at a total forecast for the production of the next 4 months rather than an individual month's forecast. For this reason, OMP-BBC contains a number of forms and reports that show the 4-month forecasted bunches and output.

The expected bunch loss rate l can be used to account for the fact that some plantations record the actual production in OMP using the number of bunches that actually arrive at the mill, instead of the number harvested in the field. These two numbers can be different due to losses during transportation, rotting of bunches left for too long at the side of the road etc. The number of bunches directly derived from the black bunch count is clearly an estimate of the number of bunches that will actually be available to be harvested in the field. If you have significant bunch losses, and you want to forecast your production for the number of bunches that really reach the mill, you can use the new bunch loss rate setting to reduce the number of bunches accordingly. As the loss rates might be different in different parts of your plantation and may change over time, OMP 10.0 allows you to enter different bunch loss rates by division and year, see figure 3.


DE Form 1.01.1: Select year

General settings | Monthly distribution | Bunch losses | Bloc

Select active year

Expected bunch loss rates ?

Division	Bunch loss %
Center D01	0.0
Center D02	0.0
Center D03	0.0
Center D04	0.0
Center D05	0.0
North D01	0.0

Figure 3: Bunch loss rate entry form in OMP-BBC 10.0.

The final factor needed to calculate the monthly tons is the bunch weight factor, w_n. OMP 10.0 supports two fundamentally different methods for calculating this bunch weight (see figure 4). Both options have some advantages and disadvantages and it is up to you to choose which cal-

Feature

culation method is best suited for your plantation. The option “historical ABW by palm age” is the calculation that was used in OMP 9.3. Here the program uses the historical average bunch weight for the palm age of each block. All blocks with the same palm age therefore use the same bunch weight during the forecast. The advantage of this method is that it is typically averaged over a lot of data and is thus not sensitive to data entry mistakes or short term fluctuations in data. The disadvantage is that the average being calculated over all blocks and all years in your OMP database can mean that the predictions are distorted by old data. Furthermore, predicted production for the same months can change even without editing any of the BBC data explicitly, as the ABW averages are changed by new production data as time goes on. This can be slightly confusing as printing the same BBC forecast report at different times can lead to different forecasted tons.

The new option “ABW from previous month from same block plus expected monthly increase” does not rely on averages over many blocks. Instead, for each block the program looks up the actual ABW for that specific block in the month before the census (month x-1). The ABW typically increases over time as palms get older, the forecast average bunch weight for months x+1 to x+4 is then calculated by adding the expected monthly bunch weight increase on to the previous month’s value. For the monthly increase, one possibility is to enter a fixed monthly increment directly on the crop forecast settings page. Alternatively, the expected monthly increase can be calculated based on the ABW profile by palm age modulated by the expected monthly ABW growth rate entered by land class in the OMP-DBMS picker definitions. This option allows for more detailed modelling if you have strong seasonality in your ABW growth rates or large differences between different land classes. The main advantage of the new calculation option is that the ABW is always based on the most recent actual ABW data in each block, so that this is not distorted by old data or by other data from blocks in completely different parts of your es-

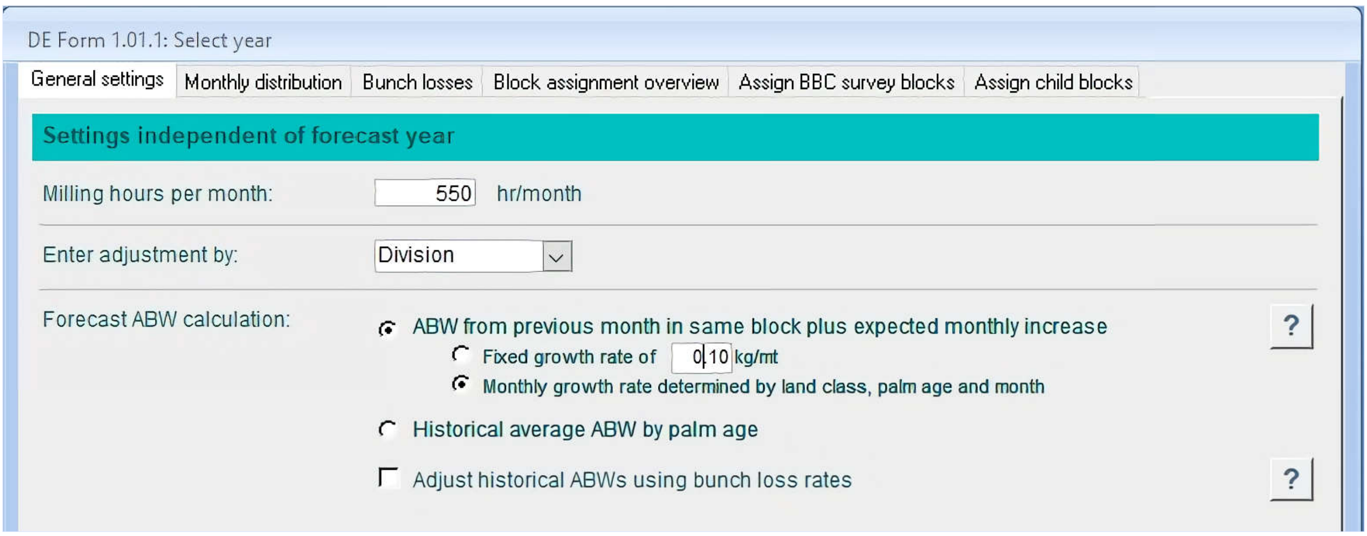


Figure 4: Bunch weight calculation settings in OMP 10.0.

Feature

tate. The main disadvantage is that it is susceptible to outliers, so a mistake in calculating the ABW in a single month in one block can throw that block's production forecast off.

As we will see below, the production forecast calculated by OMP-BBC using the various settings above can reach a high level of accuracy. Despite this, it is strongly recommended that field managers should regularly review and adjust the forecast to account for other factors that they may expect to impact the upcoming production. For example, this might include availability of harvesters, current weather conditions and weather forecasts, pest or disease outbreaks etc. To account for this, OMP-BBC allows managers to enter an adjusted forecast output value at division or field level, together with comments on the reasons for the adjustment. Making it a routine that field managers must review and adjust the forecast not only removes the potential for unrealistic forecasts due to outliers or data entry mistakes, but also increases acceptance and means the field managers cannot blame the program for an unrealistic forecast.

To illustrate the effects of different forecast options, we look at real forecast data from a plantation that uses OMP-BBC. The plantation in question has an area of about 10,000 ha and predominantly young palms between 4 and 7 years old in the time period under consideration. This real life data shows that it is indeed possible to achieve a high level of accuracy with a correctly carried out black bunch count forecasting system.

The most basic forecast quantity we can consider is the 4-month bunch forecast. This quantity depends on the fewest assumptions as it does not rely on either the monthly fractions f_n nor the bunch weights w_n in formula (1). Indeed, figure 5

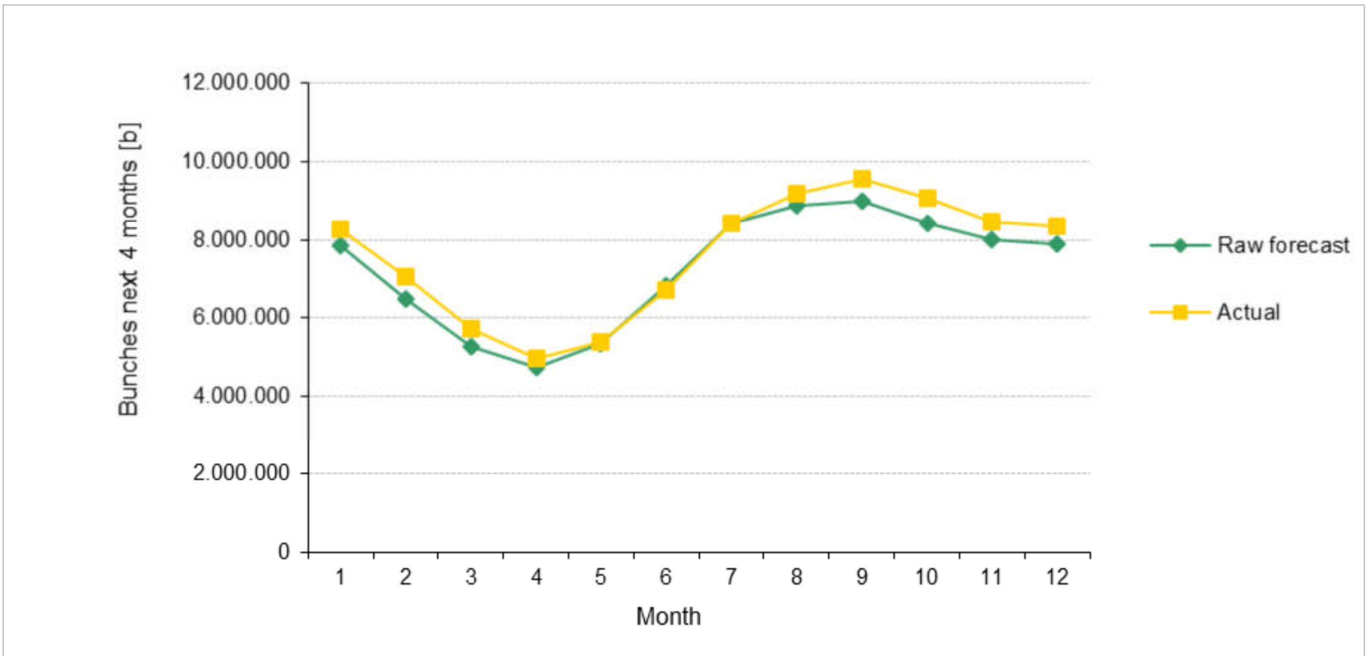


Figure 5: 4-month bunch forecast vs actual

Feature

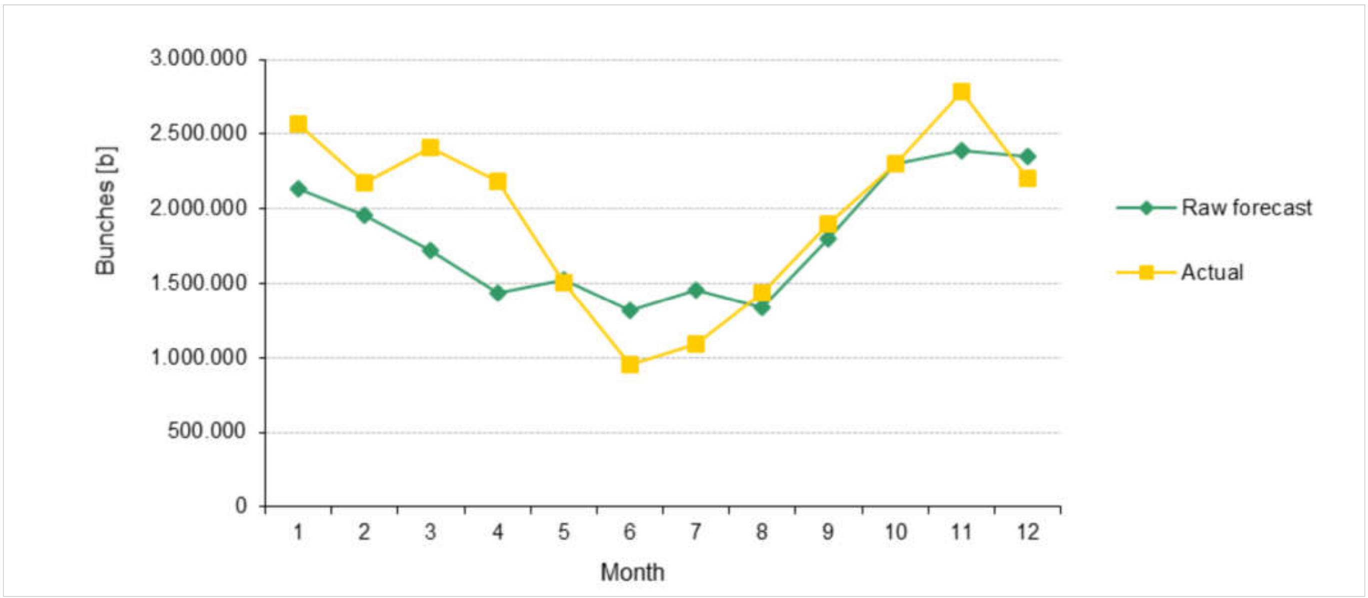


Figure 6: Monthly bunch forecast vs actual

shows a very close relationship between forecast and actual. Next let us consider the monthly bunch forecast, see figure 6. Clearly the discrepancy between forecast and actual value is much larger, however the graph suggests that this may be more due to high month-on-month fluctuations in the actual bunch harvest rather than the forecast.

Next, let us take a look at the 4-month production forecast (figure 7), which depends on the bunch weight but not the monthly distribution

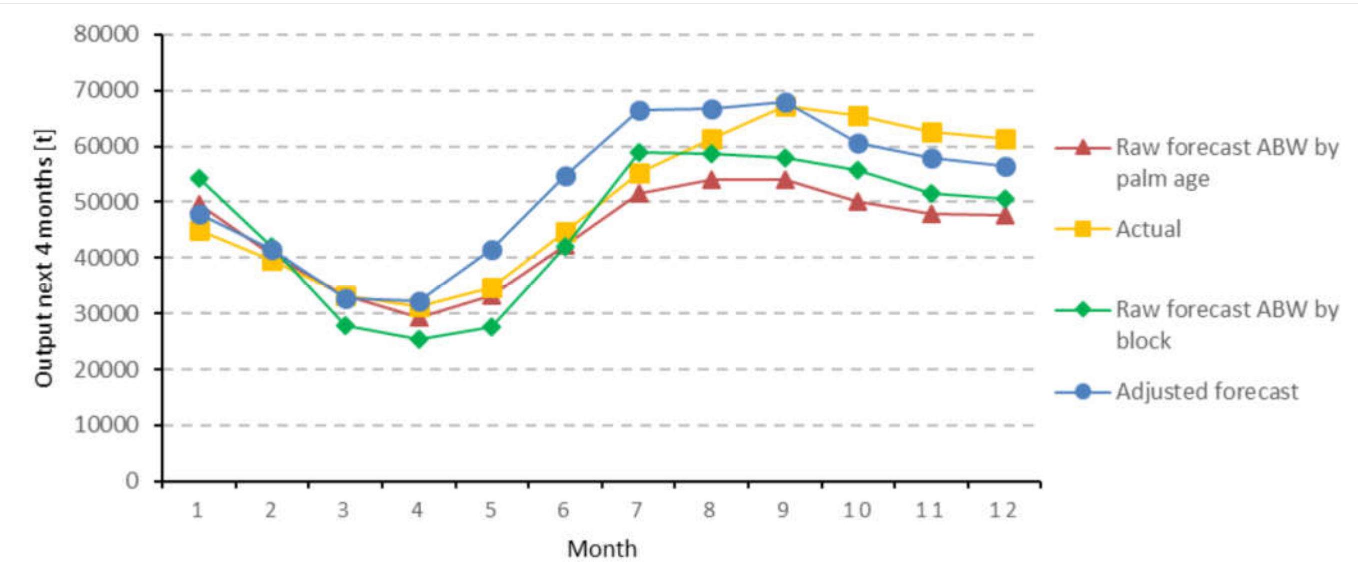


Figure 7: 4-month output forecast vs actual

Feature

Forecast method	Average difference [%]	Average absolute difference [%]
Raw, ABW by palm age	- 9.2	11.4
Raw, ABW by block	- 8.0	13.7
Adjusted	5.2	9.4

Table 1: Forecast vs actual for 4-month output

fractions. To show the effects of the different calculation settings, we have included the raw production forecast with both possible settings for the average bunch weight calculation outlined above. We also include the adjusted forecast prepared by the field managers. In general, all three forecast values are relatively close to the actual production but each forecast calculation method has time periods where it is relatively more or less accurate than the others.

To compare the different forecast methods in more detail, let us look at the average of the difference between forecast and actual in percent. As a more stringent measure of the forecast accuracy we also consider the average of the absolute value of this difference. Table 1 shows that in this instance, the manager's adjusted forecast indeed achieved the overall greatest accuracy, whereas both raw forecast calculation methods were relatively similar in their overall accuracy.

Finally, we consider the highest level of detail, namely the monthly production forecast. Again we compare raw forecasts with both ABW calculation methods, the adjusted forecast, and the actual production. Figure 8 again shows a very good general forecast accuracy for all forecast methods, with only the adjusted forecast for months 8 and 9 appearing significantly too high.

Table 2 again shows the averaged difference and absolute difference for each forecast method. While the raw forecast with the ABW by block calculation method had the highest accuracy in

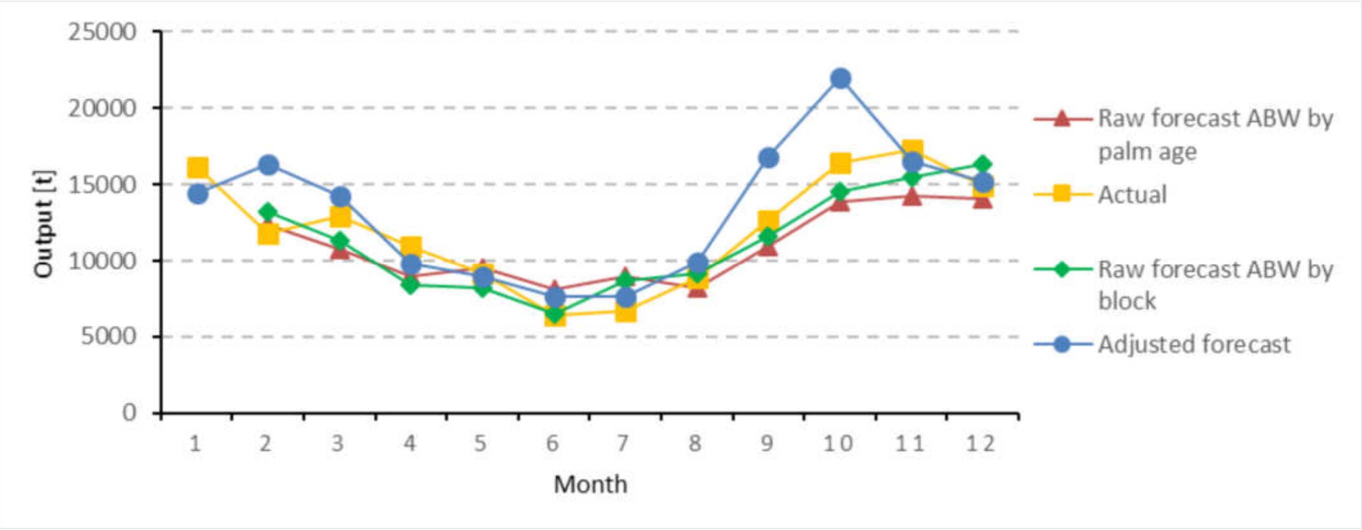


Figure 8: Monthly output forecast vs actual

Feature

Forecast method	Average difference [%]	Average absolute difference [%]
Raw, ABW by palm age	-2.3	14.9
Raw, ABW by block	- 1.8	12.0
Adjusted	11.1	15.6

Table 2: Forecast vs actual for 4-month output

this instance, all three forecast methods were again broadly similar in terms of their overall accuracy. However, the larger positive value of the average difference shows that the manager's adjustment tended to systematically overestimate the output whereas the raw forecasts fluctuated more randomly, being above or below the actual output in different months.

As outlined in this article, OMP-BBC provides a powerful application to generate production forecasts based on black bunch counts and contains various settings and options to help you customize how the forecast is calculated. The real life examples discussed in this article illustrate that neither of the two ABW calculation options is inherently more accurate than the other – and in fact even the adjusted forecast is not necessarily always more accurate than the raw forecast. We recommend that you experiment and try out some of the different options to find the best combination for your estate.

Oil palm: plantation, Sabah by Lian Pin Koh

Agrisoft Systems
NEWSLETTER
Jul.— Sep. 2020

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-GIS

- Completely new standalone thematic mapping application
- Independent of GIS host programs like ArcGIS and MapInfo
- Easy method of adding layers such as roads or rivers
- Improved handling and management of yearly base maps
- Mapping using user-defined thematic ranges for all numeric parameters
- Point maps for geo-referenced OMP Field Survey results
- Continued support for custom background layers and exporting to PDF or Google Earth
- Potential options of downloading satellite imagery including spectral imagery

OMP-DBMS

- Block-level field for general harvest method used in this block
- Flexible filtering system with option to choose fields to include in filter
- Additional block fields for water conservation measures and BMP status
- Rule-based system for maturity ages
- Add option to specify whether age in year of planting should be counted as 0 or 1
- Improved palm census recording
- Nutrient application vs recommendation reconciliation form
- Additional grouping options on monthly fertilizer recommendation vs actual

Add-ins

- OMP-FP: implement handling of existing fertilizer stocks
- OMP-BBC: add option to enter the monthly distribution for crop ripening on division basis
- OMP-BBC: improve totals line on manager’s adjustment form
- OMP-FS: point type “Palm row”
- OMP-HRR: analysis of productivity by harvest method