

KPI Analysis

***Overview***

*It is well known to Cocoa growers that the plant is very susceptible to stress caused by the lack or excess of moisture, scarcity of nutrients in the soil and nutrient depriving weeds. Plantation won’t yield desired crop without proper fertilization, pruning and fungicide application. Trees that do not receive proper care on a regular basis eventually produce fewer pods with small deformed beans and are more prone to diseases. (Note: number of pods produces throughout the year is lower in the younger tree compare to mature 5 year old tree).*

*An important indicator used in the cocoa industry to measure successful production (Key**Performance Indicator (KPI)) is the* ***Bean Index*** *(Indice de Grano), which is calculated by weighting a control sample of fermented and dried beans. The weight of a bean varies by variety and averages to 1.62gr for CCN-51.*

***New Tables***

***Bean Index Table* *is designed to contain KPI historical values of the Bean Index collected from different land sections and represent the actual weight of bean sampling. This data is a core element in decision making on pruning, irrigation, fertilization and the application of fungicides & insecticides.***

|  |  |  |
| --- | --- | --- |
| **Bean Index (Crop Sample)** | | |
| **Crop Id** |  | **FK** |
| **Date** | **date** |  |
| **Sample Weight** | **real** |  |
| **Cycle number** | **Small int** |  |
| **Land Section ( or Id ?)** |  | **FK** |

**Example:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Crop Id** | **Cycle** | **Section** | **Bean Index** | **Date** |
|  | 1 | 1 | 137.5 | Jan. 15, 2015 |
|  | 1 | 2 | 138 | Jan 16, 2015 |
|  | 1 | 3 | 136.7 | Jan 17, 2015 |
|  | 1 | 4 | 140 | Jan 18, 2015 |
|  | 2 | 1 | 135.9 | Jan 29, 2015 |

***Section table:* Plantation is broken into Sections based on soil composition and climate differences. There is also “section” that is just an index for very young trees and don't have physical location(this info can be in the description part)**

|  |  |
| --- | --- |
| **Section** | |
| **Section Id** | **PK** |
| **Section Name (number?)** | **text** |
| **Description** | **text** |

***BACKLOG: Tree Type table*** : Type Id, Type(text), Description(test)

Blooms: Date, Number of Blooms (int), Plot Id, Tree type, ~~Segment~~ Section Id

Pod Index: ~~Date,~~ Plot Id, Tree Type Id, ~~Segment~~ Section Id

***Cherelles: Date (date), Number of Cherelles (int), Plot ID, Tree Type Id, ~~Segment~~ Section Id.***

***KPI and Yield Analysis***

*KPI analysis proposed here is statistical analysis created to assist in decision making and planning future activities such as pruning, fertilization and phytosanitary treatments..*

***Bean Index – General Trend:*** Report shows tendency of average Bean Index across the plantation. o create a representation of the overall improvement of the Bean Index (bean KPI), the average values from all the land sections for the same cycle are added together and divided by the number of sections participating in the study( 5 for this plantation). The formula to be used is where the Bean Index on the *N-th* section and *n* is the number of sections participating in the study.

***Bean Index by Sections:***

Report shows tendency of average Bean Index for individual section. Values from Bean Index table will be taken for these reports

"By Sections" KPI Report should represent bean indexes grouped by land sections. Prior to running a report system should prompt user to select FROM and TO dates. This is necessary to avoid confusion between record that have same cycle number but belong to different years. Also, user will be able to see progress for more than one year or just for part of the year that may belong to different crops. System should validate the dates.

Each Land section should have its own Trend Line on the graph. (Graph should have as many lines as section defined in the system).

***Bean Index by Tree Maturity:***

***Bean Index by Tree Maturity*** analysis displays the averages of the **current (These ranges will change as the plantation matures)** 3 main age categories (mature -3 years and older, young trees - 1.5 -2 years old, and seedling- under 1.5 years). Knowing that the yield of each age group can assists in decision making on the frequency of fertilization, pruning and phytosanitary measures and with regular soil analysis, the farmer can make conclusions on the plantation’s overall productivity and expected harvest forecast.

In addition to forecasting, extremely low or conversely unexpected high results in bean weight should help the farmer in timely detecting a lack or excess of fertilizer.

***KPI: Yield by Pruning:***

***Yield by Pruning:*** As stated at [www.icco.org](http://www.icco.org), pruning “can affect yield…, shape and structure of the tree for the rest of its life.  Insects and diseases multiply more on un-pruned cocoa trees with dense canopies than on trees that have been opened up by pruning and display well-aired canopies.  Pruning can also stimulate flowering and pod production…” In addition, pruning facilitates sunlight entrance, which is essential for pollination, fecundation, pod growth, and strengthening of the formation of new leaves and production areas (for each pod to grow healthy, it needs 100 healthy leaves)***.***

***Bean Index and Yield by Fertilization***

***Cherelles (Pepinillos) Stability:***

Multiple factors affect cherelles (cacao berry) development and the rate of wilting. Although shriveling of young fruits is a natural process, “… evidence suggests that one cause of cherelle’s wilt, probably the major one, is competition between fruits for nutrients and water.” (From Studies of Fruit Development of Cacao (Theobroma cacao) in Relation to Cherelle Wilt: II. Auxins and Development of the Seeds.

by R. Nichols, Published by Oxford University Press http://www.jstor.org/stable/42908641?seq=1#page\_scan\_tab\_contents)

<http://www.hindawi.com/journals/isrn/2012/461674/>

Pruning, on the other hand, helps to get adequate light to the blooms to promote photosynthesis and cherelles formation.

* ***- Fertilization.***

 ***- Pruning***

***\*\*\*\* Flip the Key to match the graph order***

***KPI by Soil ~~Segments~~Sections:***

Plots on the plantation are divided into different ~~segments~~ Sections based on soil composition and climate. Depending on thesecion’s needs, each will receive an individual fertilization plan (composition).

To track improvements in the Bean Index and the Bloom to Pod Index, trends in the different ~~segments~~ Sections may need to be analysed separately.

\*\*\*\* Move the keys to match the graph