



Harvest Minerals Limited / Index: LSE / Epic: HMI / Sector: Mining

23 April 2020

## **Harvest Minerals Limited ('Harvest' or the 'Company')**

### **Outstanding Results of Long Term Testwork with Coffee**

Harvest Minerals Limited, the AIM listed remineraliser producer, is pleased to announce the results of the long term agronomic trials on coffee of KPfétil, its direct application natural remineraliser produced at the Company's 100% owned Arapua Fertiliser Project in Brazil ('Arapua').

#### **Highlights**

- Testwork conducted by independent consultants Santinato & Santinato Cafés Ltda since 2017
- Results confirm KPfétil can be used to replace conventional fertilisers as a source of potassium and phosphate
- Results in coffee are enhanced when used in association with coffee compost (coffee straw)
- KPfétil increases the value of the coffee produced by increasing the proportion of the largest coffee cherries and yield

**Brian McMaster, Executive Chairman of Harvest stated,** *"These results are outstanding and confirm the results of our earlier testwork proving that KPfétil can and should replace the use of conventional fertilisers. As we have progressed with the development and marketing of KPfétil, our understanding of its use and benefits has continued to grow. This is a view echoed by the feedback we are receiving from our customers, our testwork and field demonstrations we are conducting with clients and co-operatives."*

#### **LATEST COFFEE TEST RESULTS**

##### **Background**

Santinato & Santinato Cafés Ltda ('Santinato'), a renowned agronomic consulting company in Brazil specialising in coffee cultivation, has been conducting trials since 2017 on the suitability of KPfétil as a source of potassium ('K') and phosphate ('P') for coffee plants at one of the Veloso Agropecuária ('Veloso') coffee plantations in Minas Gerais state, Brazil.

The trials consisted of two years of applying a potassium and phosphate fertiliser and a third final year of applying no additional source of potassium and phosphate (fertiliser suppression) to test the effectiveness of different sources of potassium and phosphate. All the soil fertility parameters were measured in May each year, before the peak nutrient extraction by the plants for harvest between May and July in Brazil. All the biometric measurements were made just before the harvest and the productivity, maturation and income measurements were post-harvest.

In total, four experiments were conducted using the following sources of potassium and phosphate:

- T1 - Control – No additional sources of K and P applied
- T2 - Conventional sources – Muriate of Potash (KCl) and Simple superphosphate (SSP) applied
- T3 - 100% KP KPFertil – applied to match the K<sub>2</sub>O applied in T2
- T4 - KP KPFertil and coffee straw (coffee husks from previous harvests – see figure 1) – applied to match 60% of K<sub>2</sub>O applied in T2 due to application of 5t/ha of coffee straw annually

The application rate of nutrients during each season was as follows:

- Year 1 (2017) - 350 kg / ha (N); 80 kg / ha (P<sub>2</sub>O<sub>5</sub>) and 200 kg / ha (K<sub>2</sub>O)
- Year 2 (2018) - 300 kg / ha (N); 80 kg / ha (P<sub>2</sub>O<sub>5</sub>) and 350 kg / ha (K<sub>2</sub>O)
- Year 3 (2019) - 300 kg / ha of N
- In the third year, no additional K or P was applied.



*Figure 1: Coffee husks (straw) and applied to coffee plants with KPfertil*

## **Results**

### **Soil pH**

The soil pH describes how acid or alkaline the soil is. A pH of 7.0 is neutral and a value below 7.0 is considered acidic. In Brazil, soils are typically acidic, ranging between 4.4 and 5.0.

To achieve production from acidic soils, it is necessary to apply sufficient lime to eliminate the toxicity of Al<sub>3+</sub> and Mn<sub>2+</sub>, as well as supply adequate levels of Ca<sub>2+</sub> and Mg<sub>2+</sub>. This creates conditions that will maximise the uptake of the essential nutrients as well as control soil pathogens.

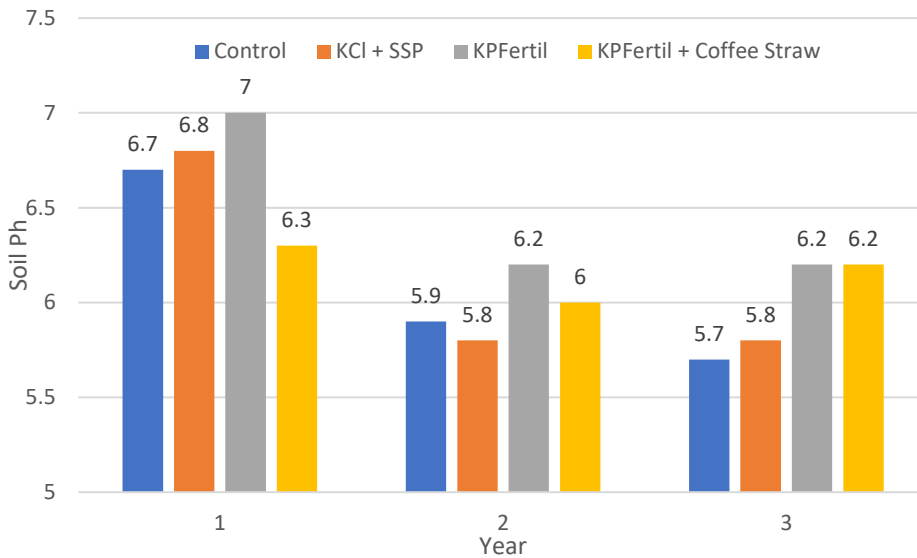


Figure 2: Change in soil pH over three years in the four experiments

As can be seen in figure 2, the experiments with KPfertil and with KPfertil and Coffee Straw have a much better soil pH. This is because KPfertil contains both Calcium (Ca) and Magnesium (Mg), which neutralise soil acidity whereas the traditional KCl contains salt and chlorides which further acidify the soil. As the pH in both experiments including KPfertil remains above 6.0, it also creates an environment which favours nitrification by soil bacteria, an important step in the nitrogen cycle in soil.

### Base Saturation in Soil

Base saturation refers to the percentage of cations in the soil which are occupied by basic cations and not taken by acidic cations ( $Al^{3+}$  and  $H^+$ ). It gives another indication of the acidity of the soil, what is making up the Cation Exchange Capacity (CEC) and what level of nutrients the soil can retain and release.

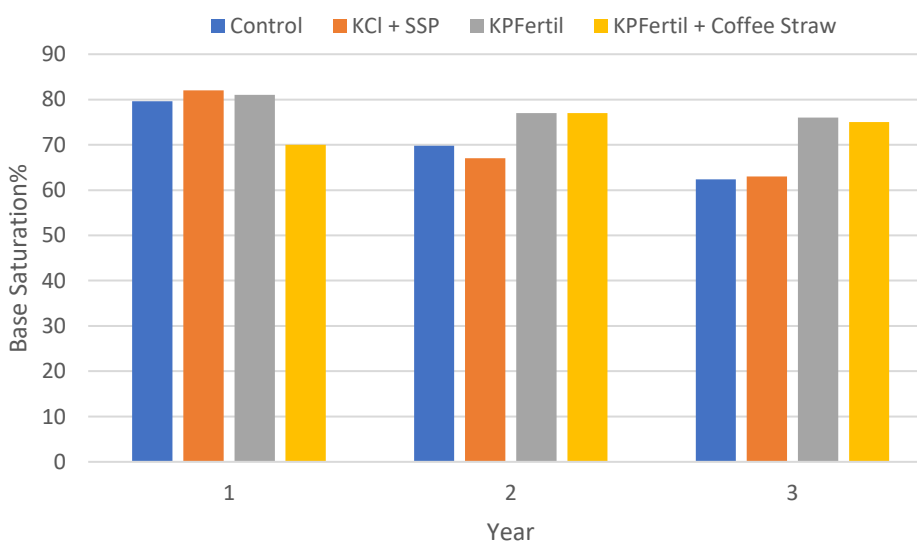


Figure 3: Base saturation over three years

As can be seen in figure 5, the experiments with KPféertil and with KPféertil + Coffee Straw have an increasingly higher base saturation over the conventional fertilisers, indicating that the soil is better able to retain and release nutrients.

### Calcium in Soil

Calcium has two major effects in soil. Firstly it reduces soil acidity, by binding to cations in the soil and thus preventing acidic cations and secondly it acts to bind organic and inorganic material to develop good soil structure.

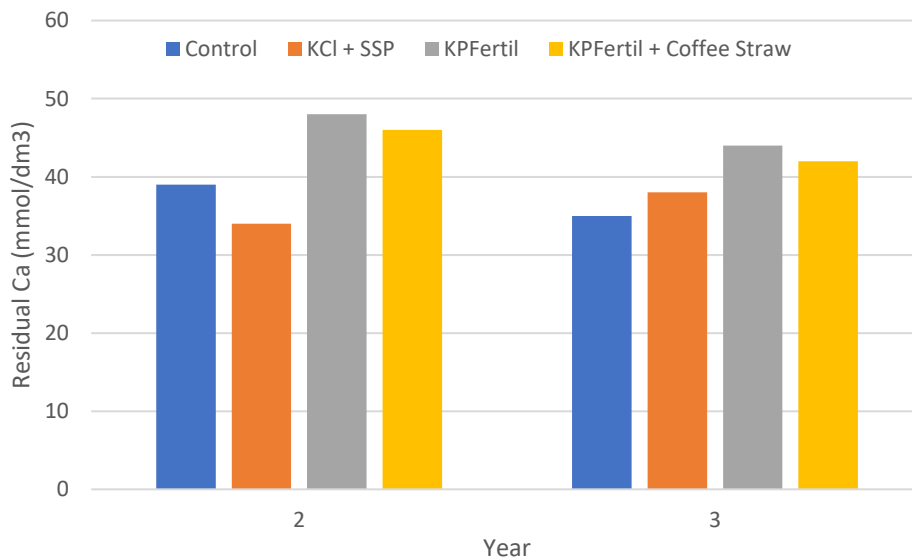


Figure 4: Ca in soil

As expected, the results (figure 4) show significantly higher residual calcium in the soil from the KPféertil treatments compared to the conventional treatments.

### Magnesium in Soil

Magnesium acts similarly to calcium in soil and is an essential nutrient for plant growth, being critical for photosynthesis as a key component for Chlorophyll. The results show that using coffee straw with KPféertil greatly helps with the retention of Mg in the soil over conventional fertiliser or KPféertil in isolation.

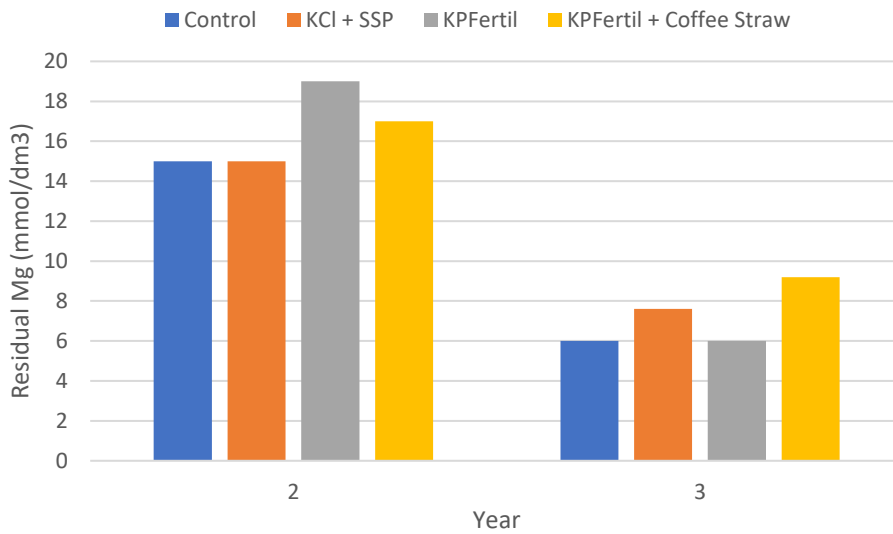


Figure 5: Mg in soil

### Residual Phosphorous in Soil

Phosphorous is an essential macro-nutrient for plants and is required for metabolic processes including photosynthesis, so it is important to ensure there is sufficient readily available phosphorus in the soil for the plants. As coffee has a heavy requirement for phosphorus, it is important to maintain levels above 40 mg/dm<sup>3</sup>.

The use of KPféertil resulted in an increase in phosphorous content in the soil over both the medium and long term when applied alone or alongside the coffee straw, indicating that KPféertil continues to act as a slow release source of phosphorous and is able to maintain adequate levels of nutrition compared to conventional sources even after a year of none being applied.

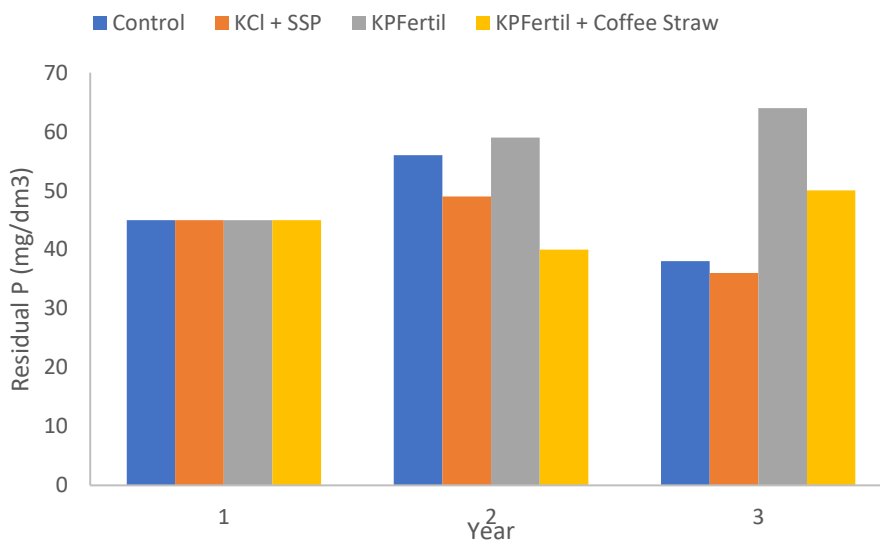


Figure 6: Residual P in soil

### Residual Potassium in Soil

Like phosphate, potassium is also a key macro-nutrient in plants. The potassium content in the soil was highest in the first two years using the conventional KCl, however fell substantially in the first year of suppression of the nutrient, as it has low permanence due to being easily leached. Although the level of potassium in the soil was lower for KPfertil, it was able to maintain the correct level for coffee cultivation (3 to 5% of CTC) for longer, notably with the association with coffee straw even during the first year of suppression.

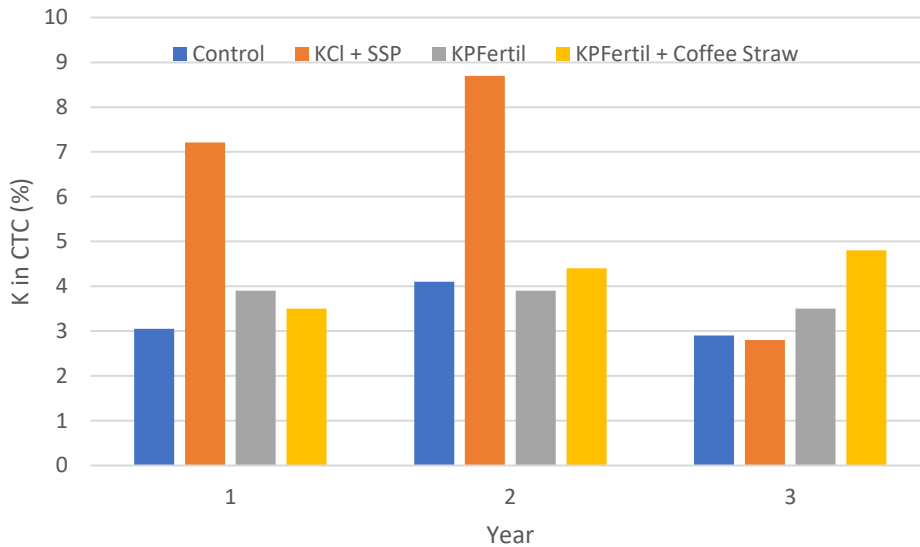


Figure 7: Residual K in soil

### Percentage of cherries in the largest size category

Whilst variety, supply and demand have an impact on price of coffee cherries, the largest impact on the value of the cherries independent of market conditions is the size of the cherries. After the Harvest the cherries were analysed by passing them through a series of sieves. The results show that using KPfertil either with or without coffee straw increased the proportion of cherries in the largest size category and therefore the value of the crop.

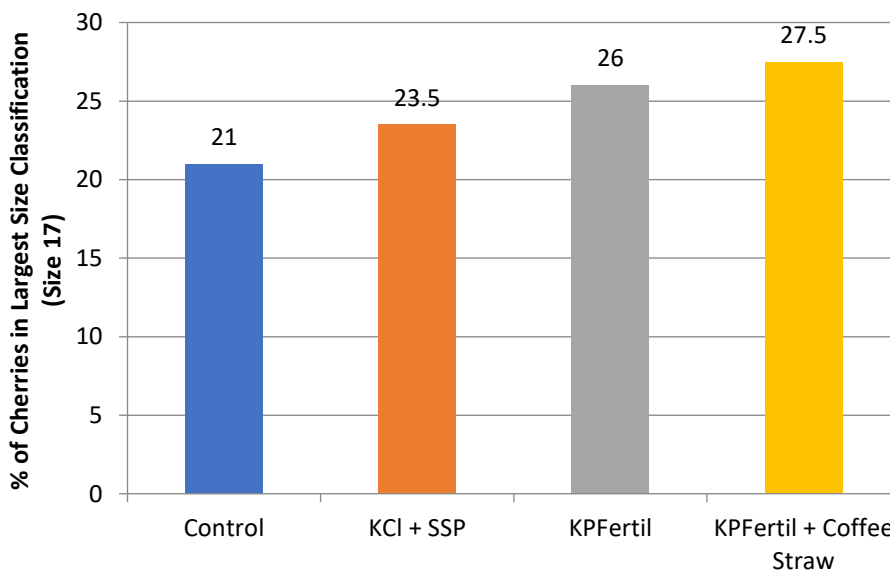


Figure 8: Percentage of coffee cherries in the largest size classification

### Percentage value held in the largest cherries

The percentage value is calculated as the percentage of processed coffee produced after drying and peeling the harvested coffee. Obviously the higher the amount of coffee produced, the higher the value. Figure 9 shows that all three applications produce significantly higher coffee than the control with KPfétil producing the most.

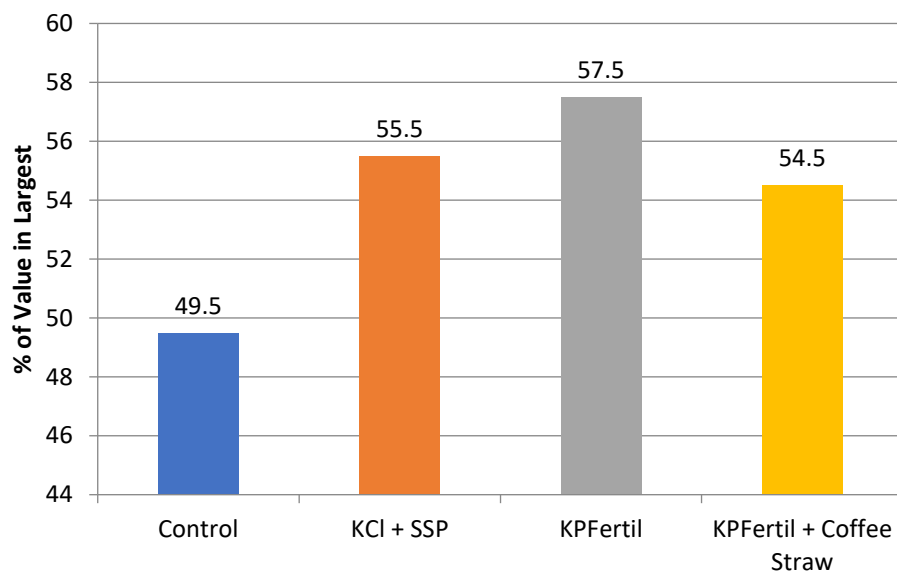


Figure 9: % of value held in largest cherries

Overall, the application of KPfétil either with or without coffee straw produces the most coffee in the largest size classification.

### Conclusions

The conclusions made by Santinato in its report were as follows:

1. KPfétil should be used in the planting furrow to replace  $P_2O_5$  for coffee plants supplied by conventional fertilisers.
2. KPfétil should be used in adult crops to partially replace (<30%) of  $K_2O$  in the first year and an increasing amount in subsequent years.
3. When used in association with coffee straw and / or other organic sources, the results of using KPfétil are enhanced.

**\*ENDS\***

For further information, please visit [www.harvestminerals.net](http://www.harvestminerals.net) or contact:

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#### **Notes**

Harvest Minerals Limited (HMI.L) is an AIM-quoted low-cost and high margin Brazilian remineraliser producer, located in the heart of the largest and fastest growing fertiliser market in Brazil.

The company's product, KPFétil, is a registered and approved organic multi-nutrient direct application fertiliser. It contains many of the essential nutrients and minerals required by plants and, unlike most fertilisers, it does not require any complex processing or chemical alteration, instead it can be applied directly to crops.

KPFétil is produced at the wholly owned Arapua project, that consists of a fully permitted mine, production and storage facilities able to produce and deliver KPFétil to customers. Known mineralisation at the Project is expected to support 100+ years' production at 450Ktpa.

Harvest's focus now remains on growing its business and the Company have the dedicated in-country sales and marketing team with the skills, experience and contacts to sell KPFétil into the potential multi-Mtpa market on the doorstep of the project.

*This announcement contains inside information for the purposes of Article 7 of EU Regulation 596/2014*