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# CORRELATION BETWEEN CROPSTER AND SUSTAINABILITY OF COFFEE ROASTERIES IN THE UNITED ARAB EMIRATES 2021

## Korelasi Antara Cropster dan Keberlangsungan Coffee Roaster di Uni Emirat Arab 2021

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**Abstact**

The crowds in the coffee trade, especially in the coffee shop sector, with the emergence of coffee roasteries that opened enliven the coffee market in Dubai. It is making special attention to roasting areas which are the core sales in the coffee sector. The emergence of products from software as a service such as Cropster, in its functions, provides convenience in roasting areas. In addition to controlling roasting activities, also roasting emission reductions and through their buyer-seller platform. Here, it is interesting to examine the level of sustainability in the coffee roastery area, whether the Cropster has a significant influence in helping sustainability in roasting phases in the coffee roastery and its impact. Using the title "Correlation between Cropster and Sustainability of Coffee Roasteries in The United Arab Emirates 2021", with the formulation of the problem as follows:

- Is there any impact of Cropster towards the sustainability of coffee roasteries in The United Arab Emirates?
- How extensive is the impact of Cropster towards sustainability of coffee roasteries in The United Arab Emirates?
- The author used a correlation study with the questionnaire method, observation and interview methods, and documentation methods to find out the problems. While the author's data analysis using the product-moment correlation technique.

From the description of the research results, the author has conveyed his conclusion as follows:

- The role of Cropster has a significant correlation to the sustainability of coffee roasteries in the united Arab emirates, with pointed criticism of the price of labour r = 2.32 is above the 95% confidence level = 99% = 0.448 and 0.457. So that H1 (Working Hypothesis) reported Cropster contributed in impacting the existence of the sustainability of coffee roasteries in The United Arab Emirates, accepted. Moderate H0 (Null Hypothesis), which states Cropster doesn't contribute to impacting the existence of sustainability of coffee roasteries in The United Arab Emirates, is rejected.
- The role of Cropster has a high correlation when seen from the table with a conservative measure of the size ranges above 0.800 up to 1000.
- Based on the interview result with coffee roasters and owners, they demonstrated their satisfaction in using Cropster to improve sustainability in the coffee production area.

***Keywords: Specialty Coffee, Roasting, Coffee Production, Quality Control, Business Intelligence, Sustainability***

## A. Background of the Study

Coffee is a cyclic necessity for people globally, immensely for anyone who makes a productive day; of course, coffee stimulates caffeine content. As discussed in the article, "The culture of drinking coffee has experienced a shift. In coffee drinks that contain various psychotic substances, caffeine can stimulate the production of two stimulating hormones, namely cortisone and adrenaline. As a result, coffee has the effect of eliminating drowsiness, increasing mental awareness, thinking, focus, and response." (Maspul 2020) The International Coffee Organization mentions the amount of coffee consumption or needs in the world today, "In the coffee year 2019/20, coffee consumption is estimated to increase by 1.24 million bags to 169.34 million bags. This would result in a deficit of 0.63 million bags in 2019/20, which puts upward pressure on prices. However, this may be limited as more of the 2019/20 crop enters the market, as well as a larger crop, is anticipated from Brazil in its 2020/21 crop year commencing in April" (International Coffee Organization, 2019). From the consequences of this report, it can be perceived that the demand for coffee for the world society will be more significant in the future, which is not equivalent to the results of the stagnant coffee harvest.

Meanwhile, most people talked about sustainability from the supply chain, but fewer people talk about sustainability in the production phase. Furthermore, Jim Townley said about it, "the process in terms of sustainability after the product leaves the farmers to the point of consumption, there's a big piece in the middle, and that's roasting" (Townley, 2013). It becomes exciting to look for sustainability from the roasting perspective. As for sustainability itself, may be quoted from the concept stated by the United Nations in the Report of the World Commission on Environment and Development as mentioned, "sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: The concept of 'needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs" (UN, 1987).

Roasting is a heating process in which the beans undergo physical and chemical changes (Dieng et al., 2017). Few failures occur in producing the desired roasting results because roasters do not see the energy needs, such as gas and pressure in roasting coffee. Besides, roasters require experience in forming benchmarks to generate a suitable curve for roasting coffee; different elevations and types of coffee (physical and chemical attributes) farmed will certainly provide complex cupping scores after roasting (Franca et al., 2005). Furthermore, with moisture and weight loss after roasting, it must be standardised to get the most becoming consistency in roasting coffee (Mazzafera, 1999). The purpose of sustainability in production requires the processing need to be environmentally and commercially sustainable (Welton, 2015). Moreover, with coffee roasting, with the growing massive number of consumers, it's a necessity to be an emphasis on the impact of sustainability in the roasting section.

Gas emissions also present to energy use globally, for example, the roastery, which estimates for two to four per cent of energy use (Ghosh, 2020). The developed

software as a service (SaaS) helps roasting activities in developing gas usages, such as Cropster and Artisan. "Software as a service (SaaS): Special purpose software made available by a provider over the Internet/Cloud, with a usage-based pricing model. Some call it "application as a service" or "software on demand" (Howells, 2014). An example of the SaaS is Cropster for developing the roasting machine. Besides, gas, which is the core of coffee production itself, has been adapted with developed software as a service (SaaS). It helps improve the roasting performance of coffee in the area. For example, Cropster has given the role of software as a service, its use in the roasting area as mentioned, "software as a service (SaaS) company Cropster has more than a decade of experience catering to the coffee industry, learning what data is essential to the coffee industry and tailoring. the service provides to it" (Global Coffee Report, 2020).

Among them for production planning, roastery management, quality control, and recently artificial intelligence in predicting roasting curves. In general, roasters have brought this digital software as standard roasting intelligence. As Benedikter has additionally been transpired through, "Well-integrated information is important for making critical choices, whether it's buying inventory, processing coffee, or understanding sales success, financial planning and growth planning, not having this data causes you to fall behind your competitors, and may mean making mistakes or not planning for the future in the best possible way. Better, faster decisions always save money" (Global Coffee Report, 2020). Here, the emergence of technology in assisting roasting is prioritised in developing work and using costs wiser in production.

As previously known, in serving specialty coffee that has the best taste, the roasting track must also be followed after learning that the green coffee has a high level through its grading. It is stated that "There are processes in roasting that we know and can measure, e.g. correct moisture of green coffee, making great coffee an easier goal to reach. However, these processes are not solely responsible for great coffee. Some things are well hidden, for example, the Maillard reaction and other deeper chemical processes. We know that these are taking place, but measuring them reliably or satisfyingly is elusive. For most of us, they occur in the proverbial black box. All these processes, whether known or unknown, are interconnected and affect each other. And there are a lot of things we still don't know but, we are learning more every time we collect data" (Specialty Coffee Association, 2018). In this case, the SaaS like Cropster is a source of accurate data that can be analysed through the roaster's behaviour in handling coffee roasting from the coffee received by the supply chain until to serve it to the customer. The recorded data becomes the central basis for analysis through artificial intelligence and becomes a reliable benchmark in improving the quality and standard of best coffee sales. Improve coffee quality and consistency in controlling the process of the coffee journey created by the roaster. It will be given the massive positive impact of roasted coffee, which does not have to become at the expense of our environment.

## B. Literature Review

In explaining more deeply related to the performance used in running Cropster in a coffee roastery, several points are discussed here, including; theoretical review about sustainability, a theoretical study about the Cropster, and the correlation between the two.

1. Theoretical Review about the Sustainability

Green coffee in roasting requires the right energy to burn and produces the best taste on the sensory table (Mahmud et al., 2020); it is said that Green coffee beans contain the most considerable amounts of chlorogenic acids found in plants, ranging from 6 to 12% (Farah et al., 2005). In need to roast in several samplers, it may not require too much energy, but it requires reasonably vital energy in large quantities (Vuckovic et al., 2016). The emergence of ease in providing energy control in a coffee roastery, where there are many complaints in initiating energy needs, especially in energy consumption and its change that affected the coffee roasters behaviour (Burger et al., 2015), whereas reducing the amount of unnecessary energy expenditure will raise sustainability in the coffee industry, especially in coffee roasters' production. In promoting sustainability, the SDGs require resilience, especially at the system level, where SDG 2 calls for a sustainable food production system and resilient agricultural practices (World Health Organization, 2017). So this is where the role of coffee at the production level helped, especially in supporting the global supply chain, contributing to building resilience by controlling their risk level (Koss, 2019).

To understand more deeply concerning the sustainability determined in roasting in this area, it is necessary to know the sustainability. We can commonly think sustainably in the three essential aspects of the role outlined earlier from the analysis of institutional, legitimacy, and stakeholder theories to reach compatible interpretations with economic, social, and environmental (Tavares et al., 2018). Also affirmed through the article, "the concept of sustainability is based on three main elements: consistent economic growth, protection and preservation of the environment, and respect and improvement of social and human rights. Such an approach to development is called the integral or holistic approach. All of the three interrelated elements must be simultaneously sustainable since they can only shape a world that is just, liveable, and sustainable world. The intersections of the circle, i.e. the pillars of economic development, represent social-ecological, socio-economic and ecological economic elements" (Ivković et al., 2014).

The general public's current large coffee consumption is necessary to promote the supply chain's sustainability (Jaya et al., 2013). Where even though coffee is a fruit that can be planted continuously through the supply chain that will not run out as long as monitoring the appropriate sites for coffee growing should be selected concerning six essential environmental factors, i.e. temperature, water availability, sunshine intensity, wind, type of soil and topography of the land (Descroix, 2004). With the circulation of coffee from the farm described in this way, it is necessary to look back to sustainability in one segment and stop there and the other features. In this case, roasting energy consumption is also one of the complementary elements that go into the coffee cycle from farm to consumer (Schwartzberg, 2013).

Several indicators put forward by management and audit to determine sustainability in general. Sustainable development, corporate sustainability, and CSR are contentious phrases, sometimes without a different definition. Sustainability especially became prominent through the Brundtland-Report in 1987, which described sustainable development as a process to achieve a state of sustainability in society as a whole (World Commission on Environment and Development, 1987). Thus, companies in sustainability and CSR are often used synonymously with phrases that describe the company's contribution to its development. What generally happens, this concept is associated with Elkington's triple bottom line approach, which states that sustainable development has

components that are always related to ecology, social and economy (Wheeler, 2001). Therefore, in determining a sustainability measurement, the three aspects previously described are the necessary foundation desired to help light analysis see whether the roasting area of coffee roasters has positively impacted developing sustainability.

Interestingly, many terms of sustainability implicate both internal and external coffee segments (Behrens et al., 2006). Here, the main focus of the discussion that becomes the benchmark for business in the distribution of roasted coffee is the roasting phase and anything related to the area. As stated in this discussion, most people talked about sustainability from the producing/farming end of the supply chain, but fewer people talk about sustainability in the industrial production phase. Furthermore, Jim Townley said about it, "the process in terms of sustainability after the product leaves the farmers to the point of consumption, there's a big piece in the middle, and that's roasting" (Townley, 2013). Where has also become an introductory statement from the United Nations in this regard, namely, "Energy analysts have conducted many studies of global energy futures to the years 2020-2030./4 Such studies do not provide forecasts of future energy needs, but they explore how various technical, economic, and environmental factors may interact with supply and demand" (World Commission on Environment and Development, 1987). In this case, the core's energy in carrying out coffee roasting establishment will be an important topic that everyone is questioning. Can coffee roasters be sustainable using the energy more wisely?

2. Theoretical Review about the Cropster

Nearly un-defective coffee beans, meeting specific production criteria for altitude, region, botanical variety, and protocol further the term "specialty coffee" was coined in 1974 (Pandergast, 2010). The emergence of SaaS (software as a service) has had a notable impact on software engineering and databases. Mainly, SaaS advances new software lifecycle designs distinct from traditional software lifecycle models (WeiTek et al., 2014). Such as Cropster, as a result of SaaS development, has had a positive impact on the coffee roastery industry, not only in controlling roasting but also with the data used to control energy use such as gas (Global Coffee Report, 2020). Cropster tracks and collects data prepared through the roasting machine, improvising the maximised roasting profile to maintain consistency in the roasting process, especially for non-automatic coffee roasting machines. Professional skills are needed for a coffee roaster to make the right curve, such as RoR (rate of rise). The better curve can produce a taste that is satisfactory to the market and coffee enthusiasts. (Cropster, 2020)

Data analysis of data is also essential in helping sustainability and traceability from various studies in any field (Beske et al., 2019). Likewise, there are considerable microstructure and structuring changes in a remarkable bean volume expansion (Perren et al., 2015). As is well known, the roasting phase, an essential step in coffee processing, causes marked chemical, physical, structural, and sensory changes, which are also affected by different factors that interact with each other such as plant varieties, growing region and conditions, processing methods, grinding size, and brewing methods (Ogunjirin et al., 2020). Physicochemical changes occurring in coffee during roasting are very complex and follow specific kinetics depending on heating conditions. During this process, coffee beans are subjected to high temperatures at different times, depending on the final product's desired characteristics (Romani et al., 2012).

Among them for production planning, roastery management, quality control, and recently artificial intelligence and machine learning in predicting roasting curves (Viejo et al., 2019). In general, roasters have brought this digital software as standard roasting intelligence. As Benedikter has additionally been transpired through, "well-integrated information is important for making critical choices, whether it's buying inventory, processing coffee, or understanding sales success, financial planning and growth planning, not having this data causes you to fall behind your competitors, and may mean making mistakes or not planning for the future in the best possible way. Better, faster decisions always save money" (Global Coffee Report, 2020). Here, the development of technology in assisting roasting is prioritised to improve work and use costs wiser in production.

As previously known, in serving specialty coffee with the best taste, the roasting track must also be followed after learning that the green coffee has a high level through its processing system and structures (Eschenwald et al., 1969). It is stated that "There are processes in roasting that we know and can measure, e.g. correct moisture of green coffee, making great coffee an easier goal to reach. However, these processes are not solely responsible for great coffee. Some things are well hidden, for example, the maillard reaction and other deeper chemical processes. We know that these are taking place, but measuring them reliably or satisfyingly is elusive. For most of us, they occur in the proverbial black box. All these processes, whether known or unknown, are interconnected and affect each other. And there are a lot of things we still don't know but, we are learning more every time we collect data" (Specialty Coffee Association 2018). In this case, the SaaS like Cropster is a source of accurate data that can be analysed through the roaster's behaviour in handling coffee roasting from the coffee received by the supply chain until to serve it to the customer.

The recorded data becomes the central basis for analysis through artificial intelligence and becomes a reliable benchmark in improving the quality and standard of best coffee sales. Improve coffee quality and consistency in controlling the process of the coffee journey created by the roaster. It will be given the massive positive impact of roasted coffee, which does not have to become at the expense of our environment. Apart from the accuracy of the data collected, the goal to be achieved through Cropster is to manage the perspicacity developed in the taste produced through sensory insights. (Brincoveanu, 2019)

The scientific task of analysing big data that can be used in the future to form energy-consumptive intellectual functions must be joined by using algorithmic application methods for mathematical statistics and network algorithms. The practical task of making decisions to improve the energy efficiency of different types of buildings can only meet the criteria based on the visualisation of the results obtained in solving the main problem (Guzhov et al., 2018). To understand more deeply about the use of Cropster in roasting areas, among others, in raising the issue of business understanding where finance is grasped through Cropster's assistance in practice. By determining data used by Cropster through technical terms, it can help achieve the stakeholder's expected goals so that the project plan that will be built through the data collection at Cropster will make it easier to achieve these business goals (Brincoveanu, 2019).

In its application, Cropster contains an example or roast process where a data set created by a coffee roaster can then be used as a reference for the next roasting batch. The

average temperature starts from three warming cycles to make it easier to stabilise the heat in the roasting machine. After everything is stable, you can start with the first batch, where usually the coffee roaster used the highest level of heat when dropping green coffee. And this is commonplace for all coffee roasters to do and is a standard benchmark. Another method used when roasting is when a roaster is importing manually along with charging green beans, and the curve runs according to the hot temperature and time. Likewise, with the ups and downs of gas when roasting green, assisted by a prediction metric shows per second of the heat temperature and gas power used. Back again to the roaster for roasting success in paying attention to consistency when green coffee is charged to the roasting machine and dropped from the roasting phase (Brincoveanu, 2019).

From synchronisation with data from the database sub-encrypted by the client, it can be automatically synchronised through this application, and the preferences used when actualising roasting green coffee. With this application, access links to the database list for green coffee, roast profiles, profiles, and roasting team members. The updating process, which is very massive every time by updating the system, until now Cropster through the Cropster Roasting Intelligence 4.8 application has quite powerful features; coupled with time to productivity for roasters in achieving actualisation of roasting activity from one batch to the subsequent (Brincoveanu, 2019). Because coffee roasters need to know when the first crack occurred during coffee roasting, the artificial intelligence in the latest Cropster application is constructive in predicting it (Cropster, 2021).

Picture 2, Cropster Roasting Intelligence. Source: KA. Maspul

Other concepts combined in Cropster include machine learning which is the primary form of 'Narrow Artificial Intelligence'. It uses an algorithm based on large data sets used for specific use cases. Cropster uses a massive amount of available data; it can process and has developed proprietary algorithms for making inferences and predicting results in near real-time (Kristina, 2020). Regarding the data understanding, including storing general insights, both directly and indirectly. Many things can be found in the Cropster application other than those previously mentioned, including; curves, reference curves, sensorial, weather, cuppings, and alternative datasets. Some things that need to be known in the application include;

- Curves, schemes that write the fluctuation of the hot temperature of the roasting machine. The Cropster will be illustrated with two standard options of temperature. It contained 52608 rows and 63 columns.
- Bean temperature, which gives the actual heat brought by the heat probe in the roasting machine.
- Exhaust and Inlet, where the air is inside the roasting machine and measured through a probe. Although it is not very important in analysing curves, roasters will generally look for this data for general heat prediction.
- Gas data, the percentage visualised in the application, will help the roaster assume the roasting process's processing curve.
- Environment temperature data, air temperature outside and roasting machine environment.
- Reference curves are a set of options joined with other data frames, and each has an identifier in each reference curve.
- Sensorial, which has 7000 rows and 2 columns that contain general data.
- Weather is the common conditions outside the room.
- Cuppings, which contains a data frame containing 33338 rows and 4 columns, includes the quality ratings, which the unique identifier can join in each cupping reference (Brincoveanu, 2019).

3. Theoretical Review about Cropster Impact on the Sustainability

The need for circulation among farmers to roasters and consumers in the digital sphere will facilitate the speed of information and technicalities. The increasing availability of big data and analysis techniques is well explained through semantics and common ontologies, adopting open standards. It can drive more research and development towards more innovative agriculture in tackling the enormous challenges of producing higher quality food on a larger scale and more sustainable on the environment level, protecting physical ecosystems and preserving natural resources (Kamilaris et al., 2017). Meanwhile, type of roasting can determine the market price; as stated, "advances in processing, roasting, and blending techniques permit coffee companies to maintain prices and similar coffee taste even when they add low-quality robustas to their blends" (Tucker, 2011). Cropster has big data storing all records in roasting phases, maintaining consistency from roasting benchmarks to sales; Cropster already delivers complete gas control and replay across multiple manufacturers (Cropster, 2020).

Concerning sustainability made as a goal from Cropster, it is interesting to discuss this segment and discuss the relevant issues in roasting areas. Where the development of software as a service and Cropster is the achieved result of this SaaS. In this regard, Cropster is also determined in examining the method preferably than the software used in the roasting room, including the names set out as follows;

- Record all relevant roasting information in real-time,
- Create, compare, analyse and design roasts to find your best profiles,
- Access schedule, quality, inventory and blend information from your roast machine,
- Set roasting goals, then track and manage your objectives (Diedrich Roasters, n.d.).

The advancement of artificial intelligence combined with the needs of the coffee market, especially in the roasting section, has a significant impact in providing the best results to make sustainability goals, especially in the coffee industry. The newest version

of its Roasting Intelligence features bean temperature and the rate of rise (RoR) predictions. It predicts the next two minutes of bean temperature and the RoR by using Artificial Intelligence (Kristina, 2020).

Likewise with the Cropster Hub created by Cropster to help connect from roasters to farmers. In this case, economics, used as the primary strategy for sustainability, can be assisted by its creation. Cropster Hub will help coffee sellers better manage their information and connect to previously accessible markets. It is a business-to-business platform that provides green coffee sellers with a framework for marketing and selling coffees. In the platform, coffee sellers have ownership of their data and marketing information. There are no middlemen in creating marketing content. Coffee sellers use the framework to develop and promote their own individualised, offering lists in a centralised market (Stringer, 2015).

Analysing communication dynamics provides information that addresses critical research objectives for determining the ethics of primary commerce connections and the ability to resist the coffee paradox. (Arellano, 2016) Analysing data with improved postulates prepared systematically and organised through Cropster will make it easier to present information and support coffee roasters' challenges. Especially in promoting sustainability efforts to reduce carbon footprint, use fewer resources, and reduce waste through the roasting process. (Counter Culture Coffee, n.d.) The ease of using Cropster in roasting areas is none other than to raise traceability and sustainability plays an increasingly important role in the specialty coffee industry, promoting more sustainability, environmentally, socially, and economically (Specialty Coffee Association, 2019).

## C. Data Analysis and Results of the Research Report

1) Questionnaire Results

After the data collected has been allocated into the table, it is further analysed to prove the proposed hypothesis. Then the deviation of each score is calculated with the formula and use of each deviation, after it is inserted in the product-moment as follows:

Table I

Table For The Product Moment Correlation Coefficient

| N | X | Y | X | Y | $x^2$ | $y^2$ | xy |
|---|---|---|---|---|---|---|---|
| 1 | 28 | 21 | 1.65 | 1.24 | 2.71 | 1.53 | 4.14 |
| 2 | 30 | 19 | 1.76 | 1.12 | 3.11 | 1.25 | 3.89 |
| 3 | 25 | 19 | 1.47 | 1.12 | 2.16 | 1.25 | 2.70 |
| 4 | 30 | 29 | 1.76 | 1.71 | 3.11 | 2.91 | 9.06 |
| 5 | 30 | 28 | 1.76 | 1.65 | 3.11 | 2.71 | 8.45 |
| 6 | 28 | 24 | 1.65 | 1.41 | 2.71 | 1.99 | 5.41 |
| 7 | 28 | 22 | 1.65 | 1.29 | 2.71 | 1.67 | 4.54 |
| 8 | 30 | 29 | 1.76 | 1.71 | 3.11 | 2.91 | 9.06 |
| 9 | 30 | 23 | 1.76 | 1.35 | 3.11 | 1.83 | 5.70 |
| 10 | 30 | 22 | 1.76 | 1.29 | 3.11 | 1.67 | 5.22 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 11 | 22 | 22 | 1.29 | 1.29 | 1.67 | 1.67 | 2.80 |
| 12 | 29 | 19 | 1.71 | 1.12 | 2.91 | 1.25 | 3.64 |
| 13 | 25 | 21 | 1.47 | 1.24 | 2.16 | 1.53 | 3.30 |
| 14 | 28 | 23 | 1.65 | 1.35 | 2.71 | 1.83 | 4.97 |
| 15 | 24 | 21 | 1.41 | 1.24 | 1.99 | 1.53 | 3.04 |
| 16 | 30 | 24 | 1.76 | 1.41 | 3.11 | 1.99 | 6.21 |
| 17 | 30 | 27 | 1.76 | 1.59 | 3.11 | 2.52 | 7.86 |
| Total | 477 | 393 | 28.06 | 23.12 | 46.67 | 32.05 | 89.98 |

a. $N = 17$
b. $X = \frac{\sum x}{N} = \frac{477}{17} = 28.06$
c. $Y = \frac{\sum y}{N} = \frac{393}{17} = 23.12$
d. $\sum_x 2 = 46.67$
e. $\sum_y 2 = 32.05$
f. $\sum xy = 89.98$

Furthermore, the above results are incorporated into the product-moment formula as follows:

$$r_{xy} = \frac{\sum xy}{\sqrt{(x^2).(y^2)}}$$
$$= \frac{89.98}{\sqrt{(46.67).(32.05)}}$$
$$= \frac{89.98}{\sqrt{1495.45}}$$
$$= \frac{89.98}{38.67}$$
$$= 2.32$$

After the testing and analysis of the data, the author interprets the results so they can be measured in two ways:

1. Match with the conservative value table

Table II

Table of Conservative Value

| Sizes | Interpretation |
|---|---|
| 0.800 – 1.000 | High correlation |
| 0.600 – 0.800 | Quite correlation |
| 0.400 – 0.600 | Rather low correlation |
| 0.200 – 0.400 | Low correlation |
| 0.000 – 0.200 | Very low correlation (not correlated) |

2. Matching the values of "r" (the price of criticism of the value of r product-moment)

As for the price table's criticism, the product-moment correlation for N = 17, i.e., a 95% significance level, is 0.448 and a 99% significance level of 0.457.

Table III

Table of the Price of Criticism of the Value of r Product Moment

| N | Interpretation 95% | Interpretation 99% |
|---|---|---|
| 17 | 0.448 | 0.457 |

By matching the values in these tables for the product-moment, the correlation coefficient value of 17 is a 95% significance level for 0.448 and the 99% significance level for 0.457. Meanwhile, the results obtained from calculations for 2.32, so the analysis of product-moment correlation significance level greater than 95% and 99% significance level.

2) Interview Results

In this interview session, the author met numerous respondents through the 2021 UAE World Brewers Cup Championship (WBrC) at the World Trade Center Dubai. Simultaneously, the author is a volunteer at the event, making it easier to meet coffee roasters and business owners in the coffee industry from the United Arab Emirates and discuss the related research projects. The 17 respondents were coffee roasters and business owners from across the United Arab Emirates. The majority were respondents from Dubai, Abu Dhabi, plus two respondents from Fujairah and Ras Al Khaimah. Fifteen respondents from the population are active users of Cropster, and the rest use other supporting software to help the roasting process and at the same time maintain a consistent profile.

From the intersectionality of respondents, the majority were men, and 3 were women. Meanwhile, the interviews' languages are also quite diverse; apart from English, Indonesian and Arabic are also spoken. Besides, those who become respondents are varied from the age group and nationalities, but all respondents have qualification skills in roasting coffee, either from the business owner or the coffee roaster itself. Different coffee roasters provide additional information about how much roasting production varies per day, with machines used from manual machines or automatic roasting machines, from micro roasting to macro roasting production.

Several respondents gave interviews about the use of Cropster during roasting and about the importance of Cropster in helping work in the production phase. Among the responses that became the majority was saying that Cropster is very important in the production phase, especially during roasting. The majority explained that with the Cropster, their work was helped in broadcasting gas and maintaining the quality and quality when roasting coffee. The additional answer about the importance of Cropster explained that it is enough with the Crospter to maintain the consistency of taste in coffee and its produced characteristics. Another response to the significance of using Cropster is maintaining an inventory of green beans distilled in a warehouse or the like and maintaining traceability in each roasting results batch. Some minor respondents answered that it was not very important for all the respondents because coffee production was not significant. They were using software such as artisan was sufficient.

The second discussion about using Cropster is that all respondents have the same answer in this case. The majority answered that Cropster makes storing and roasting

easier to connect roasters to producers through the Cropster Hub. Others explained that Cropster is an application that helps coffee roasters in maintaining consistency in sensory quality in coffee and maintaining roasting emission reductions and e-commerce support.

Then proceed with the subsequent discussion about the ease of using Cropster, where the majority here answered that Cropster is an application that is easy to operate online. Only connect a local area network cable or wifi intranet to access the heat gauge probe inside the roasting machine. Another answer explains that the metrics described by Cropster make it easier for roasters to predict the first crack and with the alarm that Cropster emits at the moment it reaches the heat gauge at the first crack level. In the end, the respondents answered that the existence of a Crospter could make it easier for roasters or operators to access more freely in the process from pre-roasting to post roasting.

Then it was continued in the subsequent discussion, which explained Cropster's relationship in helping sustainability in area production, so here the respondents had the majority of answers saying yes. Among them mentioned how Cropster helps forecast the fire and curves created by the roaster, where the roaster can provide a control platform in making each batch roast successful and consistent in traceability from one batch to another. With the supervision of artificial intelligence in Cropster, roasters are helped from roasting failure or inconsistency in the use and control of energy during roasting. So in its role, controlling energy here is also an essential point in protecting the environment. Then from several answers, it was also stated that the use of Cropster could reduce the cost burden in the use of roaster power, wherein large numbers it does not need to be a lot of roasters. Apart from being easy to manage labour, the cost is also a crucial issue in production. Another answer mentioned the ease with which roasters connect with producers through the Cropster Hub to function for sustainable coffee purchases. It can be a positive correlation in social with the connection from farmer to consumer.

## Chapter IV
## Cover

### Conclusion

From the description of the research results, the author has conveyed his conclusion as follows:

1. The role of Cropster has a significant correlation to the sustainability of coffee roasteries in the United Arab Emirates, with pointed criticism of the price of labour r = 2.32 is above the 95% confidence level = 99% = 0.448 and 0.457. So that H1 (Working Hypothesis) reported Cropster contributed to impacting the existence of the sustainability of coffee roasteries in the United Arab Emirates, accepted. Moderate H0 (Null Hypothesis), which states Cropster doesn't contribute to impacting the existence of sustainability of coffee roasteries in The United Arab Emirates, is rejected.
2. The role of Cropster has a high correlation, when seen from the table with a conservative measure of the size ranges above 0.800 up to 1000.
3. Based on the interview results with coffee roasters and owners, they demonstrated their satisfaction in using Cropster to improve sustainability in the coffee production area.

### Suggestions

From conclusions that become exciting particularity ideas in research and development, especially at the production level such as roasting, the author provides suggestions including:

1. This article will provide implications for business intelligence using the software as a service in the coffee area of the world. Unfortunately, the weakness of this research project has only been applied in the United Arab Emirates; of course, it will have a different impact in other countries.
2. It is undeniable that the massive specialty coffee business in the United Arab Emirates has provided many distinct ideas about socio-economy and environment that continue the foundation of sustainability. Furthermore, the current hectic coffee trades in the United Arab Emirates and the exclusive national scale coffee championship have also illustrated the UAE's growth in the coffee industry, especially in specialty coffee. It is highly recommended to create a coffee excellence centre at a local University to study coffee's progress and futures in the United Arab Emirates.
3. Challenges that will always arise through the times' progress are essential to give the role of coffee figures from business owners, roasters, and baristas to face these challenges as things that every person can learn. It is advised to develop coffee science from every actor evenly through this coffee excellence centre and become a bridge between national coffee professionals and international coffee professionals from researchers to baristas.

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