JIPF (JURNAL ILMU PENDIDIKAN FISIKA)
p-ISSN: 2477-5959 | e-ISSN: 2477-8451 *Vol. 8 No. 3, September 2023, Page 304-318*

Explorating and Reconstructing the Indegeneus Knowledge of Coffee Processing in Kerinci as a Learning Resources

Jufrida [1], Wawan Kurniawan [2], Fibrika Rahmat Basuki [3*)], Vetty Milyani [4]
Universitas Jambi, Indonesia[1,2,4], UIN Sulthan Thaha Saifuddin, Indonesia[3]
[*)]Corresponding E-mail: fibrikabika@yahoo.com

Received: December 31st, 2022. Revised: May 15th, 2023. Accepted: June 14th, 2023

Keywords :
Ethnoscience; Indigeneus; Learning Resources; Local Wisdom

ABSTRACT
This research aims to exploring and reconstructing of indigenous knowledge of coffee processing in Kerinci into scientific knowledge. This research was qualitative using ethnoscience approach. The research was carried out at Coffee Nur Kerinci. The key informan were the owner and employees of Coffee Nur. Data collection was carried out through observation and deep interview. Qualitative data were analyzed descriptively using the Miles and Huberman models. The processing of Coffee Nur Kerinci carried out traditionally using simple tools. It consists of drying of coffee beans, roasting, cooling, pulverization, sifting, and packaging of coffee powder. Drying of coffee beans was carried out by the sun for 21 days with an average of five hours/day. The roasting process was carried out by using a roaster made of a drum that rotated on the stove. The pulverization was carried out by using a waterwheel as a driving force which was connected to eight pestles. Scientifically, the processing of Coffee Nur Kerinci can be reconstructed into scientific concepts regarding the classification of living things, heat and transfer, circular motion, collisions, and forces.

INTRODUCTION

Kerinci is one of the agricultural areas located in Jambi Province. There are various agricultural commodities in Kerinci, including coffee, tea, rubber, cloves, cocoa, tobacco, and casiavera. One of the most cultivated commodities in Kerinci is coffee plants with a land area of 6.356 ha [1]. Coffee is one of the plantation crops with a fairly high selling value compared to other plantation crops. Coffee plants have a very important role in improving the economy of Indonesian people [2]. Coffee commodities in Indonesia are also one of the non-oil and gas exports that contribute to the increasing the country's foreign exchange [3]. Coffee commodities in Indonesia consists of 90% robusta coffee and 10% arabica coffee. Meanwhile, the world's coffee consumption reaches 70% arabica coffee and 26% robusta coffee [4]. The types of coffee cultivated in Jambi province are robusta, arabica, and liberica coffee [5]. However, liberica coffee is rarely produced and consumed. It is because the quality of the coffee is quite low [6]. The land used to grow the coffee beans must also be adjusted to the climate, soil, and land height [7].

Coffee is also a leading commodity that is favored by the people of Indonesia. Based on research conducted by ICO *Coffee Statistics* and the Association of Indonesian Coffee Exporters in 2019, data showed that coffee consumption in Indonesia has increased significantly. Most of the coffee consumed is coffee that has been processed and ready to be served. The coffee can be in the form of packaged coffee, coffee in plastic cups, and other coffee processed products [8]. Increasing coffee consumption and lifestyle changes of people who prefer instant products resulted in an increasing number of entrepreneurs who have developed in the coffee industry. The development of coffee products at this time can be seen from the number of coffee powder that circulating in Indonesia, one of which is in Kerinci Regency. There are several coffee businesses that are quite popular in Kerinci, including Alam Korintji Coffee (ALKO), Koerintji Barokah coffee, and Nur Kerinci coffee. There are different processing techniques of several types of coffee businesses. Alam Korintji coffee and Koerintji Barokah coffee have used modern processing techniques, namely using machine technology. Meanwhile, Coffee Nur Kerinci still uses traditional processing techniques. It aims to create a unique taste and distinctive aroma on coffee powder.

Traditional processing of Coffee Nur Kerinci was one of the local wisdom. Local wisdom was a local tradition or culture that was passed down through generations and implemented by local people in daily life [9]. In anthropology, local wisdom is also known as local knowledge which is used as the basis of cultural identity [10]. Local wisdom evolved from experience and problem solving by people around. The source of the knowledge obtained comes from the local tradition of ancestors [11]. Local wisdom can also be used as a tool to increase the value of local potential, so that it can become a product that has advantages. This is in accordance with the creation of the 2013 curriculum which aims to provide opportunities for students to develop basic science competencies related to local wisdom [12].

Local wisdom will always change, because it follows the dynamics of culture and never escapes from the intervention of human thought. The most important thing is to remain selective towards outside cultures, so that local wisdom can be maintained [13]. Local wisdom needs to be introduced as early as possible to the younger generation. If not introduced early, it will threaten the identity of the younger generation [14]. In addition, it is also necessary to provide a stimulus that makes the younger generation interested in local wisdom, so that there is a sense of responsibility to continue to preserve it [15].

The people of Jambi, especially Kerinci Regency, are believed to have indigenous knowledge about the local wisdom of traditional processing of Nur Kerinci coffee. The indigenous knowledge possessed by the community about local wisdom can be reconstructed into scientific knowledge. Indigenous knowledge is a belief that has been passed down through generations. Meanwhile, scientific knowledge is a knowledge that contains scientific facts that are able to be associated with certain local cultures [16]. The process of reconstructing people's indigenous knowledge into scientific knowledge is called ethnoscience [17]. Because of ethnoscience relates to the indigenous knowledge of a culture, it can serve as a basis for linking culture with advances of scientific knowledge [18].

Ethnoscience can be considered as a social reconstruction media that can overcome the backwardness of society in a particular field of science. The result of this change will certainly guarantee the opening of the world horizon in the field of education [19]. If ethnoscience can be applied in the world of learning, of course learning will be more memorable. Students can become more active, creative, critical, and analytical. In addition, students who apply ethnoscience-based learning will have more understanding and experience compared to students who learn conventionally. This is because students who apply ethnoscience-based learning have extensive experience and high understanding, not only in the field of science, but also in the field of environment and society [20].

However, in reality there are several schools in Jambi Province that have not implemented ethnoscience-based learning. Not only that, but also many students who didn’t know about the local wisdom of the traditional processing of Coffee Nur Kerinci and other local wisdoms. If students are

not introduced to local wisdom early on, the fear is that students will be easily affected by foreign and western cultures. Therefore, these problems must be resolved immediately. In this research will be reconstructed the indigenous knowledge of the community about the traditional processing of Coffee Nur Kerinci into scientific knowledge. The results of ethnoscience analysis produced in this study can also be mapped in basic competencies and scientific content. This is expected to help teachers in analyzing the scientific concepts contained in the traditional processing of Coffee Nur Kerinci to be used as an example in designing ethnoscience-based learning in schools.

METHOD

The research was qualitative using ethnoscience approach. Ethnoscience studies were conducted to analyze the indigenous knowledge of coffee processing and reconstructed into scientific knowledge. The research was carried out at Coffee Nur Kerinci. The key informan were the owner and employees of Coffee Nur Kerinci. Data collection was carried out through observation and deep interview. Observations were conducted to determine the processing process from drying, roasting, cooling, pulverization, sifting, and packaging of coffee powder. In-depth interviews were conducted to find out the community's indigenous knowledge about coffee processing. Qualitative data were analyzed descriptively using the Miles and Huberman models which included data reduction, data display, and verification [21]. Data that doesn't contain scientific concepts were reduced. Meanwhile, the data containing scientific concepts will be reconstructed. Furthermore, the data was verified by conducting validation with competent experts in the field [22].

RESULTS AND DISCUSSIONS

Coffee Nur is one of the coffee powder businesses which is quite popular among the people of Kerinci, Indonesia. This business has been established since 1943, but at that time the business was still household or small. The products are given the brand name "Kopi Nur" because it follows the name of the owner, namely Nurcaya. This coffee processing is unique, which is still using traditional methods such as the pulverization of coffee beans that use 8 pestles and waterwheel. This traditional processing aims to give a unique taste and distinctive aroma to the coffee powder. Based on the results of interview with the CEO of Nur Kerinci coffee, data was obtained about the processing of Nur Kerinci coffee. The tools used in this processing are iron drums, furnaces, waterwheels, fan machines, pestles, sieving tools, rakes, scales, plastic packaging, wooden boxes, and wooden beaters. While the materials used are coffee beans, cinnamon, and glue. The processing process consists of 7 stages, namely drying, roasting, cooling, pulverization, sifting, and packaging of coffee powder.

Coffee beans produced are robusta coffee of choice purchased from farmers. In addition to its low price, robusta coffee beans are also much in demand by consumers. Arabica coffee beans are also produced, but in less quantities. After the coffee beans are purchased from the farmer, then the coffee beans will be dried in the sun for a few days. For drying whole coffee beans it takes about 21 days (3 weeks), while for coffee beans without fruit meat it takes about 7-15 days [23]. However, it still depends on sunlight, seed size, maturity level, and moisture content in coffee beans. The sign of coffee beans has dried that is no longer smelled the aroma of sap on coffee beans and heard a gurgling sound when the coffee beans are tossed. After the coffee beans are dried, the next step is to fan them to separate the coffee beans from the dirt. After that, the process of roasting coffee beans. Coffee beans as much as approximately 40 kg put in an iron drum, then the iron drum is placed on the furnace using cinnamon as a flame. The sign when the coffee beans have matured is that the iron drum will feel lighter when rotated and there is a puff of smoke coming out of the drum.

After the coffee beans are cooked, the iron drum is lifted and moved to a wider place. Then the coffee beans are spread again to cool. Once cool, the coffee beans are put into a fan machine to be separated again between the coffee beans and pulp. After the coffee beans are separated with pulp, then the next

step is to collision the coffee beans into coffee powder. The collision process uses 8 pestles that is moved alternately by waterwheels. After the coffee beans are pounded, the next step is the sieving/filtering of coffee powder. The coffee powder must be sifted first to separate the coarse powders that stick. The sieving process is still done manually by using traditional sieving tools. The last step is the packaging of coffee powder. Coffee powder that has been finely put in paper and plastic packaging that has been labeled. The packaging process is assisted by using scales, wooden beaters, wooden boxes, and glue. After neatly packaged, the coffee powder is ready to be distributed.

Traditional processing of Coffee Nur Kerinci is one of the local wisdom found in Kerinci, Jambi. Based on the explanation above, some of the community's indigenous knowledge about the local wisdom of traditional processing of Coffee Nur Kerinciwill be reconstructed into scientific knowledge. The scientific concepts contained in the coffee processing includes classification of living things, heat transfer (radiation, conduction, and convection), regularly changed circular motion, partially resilient collisions, and friction forces.

Classification of Living Things

The main ingredient used in the traditional processing of Coffee Nur Kerinciis coffee beans. Coffee beans are produced from coffee plants cultivated by farmers. Coffee plants belong to the *Coffea* genus with the *Rubiaceae* family. The *Coffea* genus includes almost 70 species, but there are only two species grown on a wide scale in the world, namely arabica coffee (*Coffea arabica*) and robusta coffee (*Coffea canephora*). The taxonomy of coffee includes: Kingdom (*Plantae*); Subkingdom (*Tracheobionta*); Super Division (*Spermatophyta*); Division (*Magnoliophyta*); Class (*Magnoliopsida*); Sub Class (*Asteridae*); Order (*Rubiales*); Family (*Rubiaceae*); Genus (*Coffea*); and Species (*Coffea sp*.) [4].

Apart from coffee beans, the ingredient that is also used in the traditional processing of Coffee Nur Kerinciis cinnamon. Cinnamon is used as a fire ignition during the process of roasting coffee beans. The purpose of using cinnamon is to create a fragrant aroma in coffee beans. The taxonomy of cinnamon includes: Kingdom (*Plantae*); Division (*Gymnospermae*); Sub Division (*Spermatophyta*); Class (*Dicotyledonae*); Sub Class (*Dialypetalae*); Order (*Policarpicae*); Family (*Lauraceae*); Genus (*Cinnamomum*); and Species (*Cinnamomum burmannii*) [24].

Radiation Heat Transfer

The processing of Coffee Nur Kerincibegins with the drying of coffee beans that is done traditionally with the help of sunlight. In the drying process, coffee beans must be flipped, so that coffee beans can dry evenly. The sign of coffee beans has dried that is no longer smelled the aroma of sap on coffee beans and heard a gurgling sound when the coffee beans are tossed. The event of drying coffee beans in the sun can be seen in Figure 1 below.

Fig 1. *Drying process of coffee beans*

The purpose of drying is to separate between the skin and coffee beans. D7rying is also carried out to reduce the moisture content contained in coffee beans, namely from 60-65% to a maximum of 12,5%. Coffee beans that are originally wet will become dry and warm because the coffee beans absorb thermal radiation from the sun [25]. Look at the illustration in Figure 2 below.

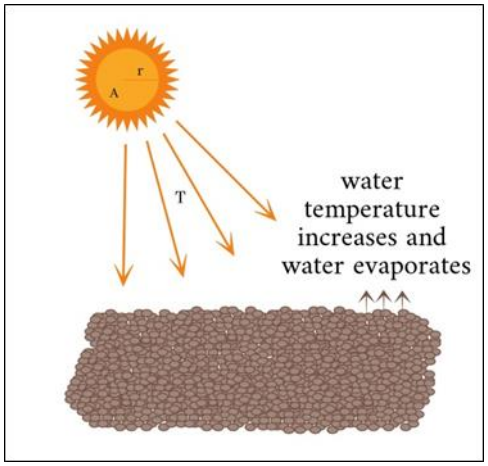

Fig 2. *Illustration of radiation by sunlight*

In Figure 2, there is a process of transferring heat from the sun to coffee beans, so that coffee beans can feel heat from the sun. Scientifically, this event is called radiation heat transfer. Radiation heat transfer is a heat transfer without going through an intermediary and without accompanied by particle displacement. The transfer process only uses the help of electromagnetic waves. The wave energy emitted by the sun will be greater if the sun temperature is high [26]. The amount of solar energy transmitted can be expressed by the following equation.

$$P_{rad} = \sigma \varepsilon A T^4 \quad (1)$$

Description:
P_{rad} : radiation power (W)
σ : the Stefan-Boltzmann constant (5,6703 x 10^{-4} $W.m^{-2}.K^{-4}$)
ε : object surface emissivity
A : surface area (m^2)
T : temperature (K)

This drying process also requires heat energy to vaporize the moisture content contained in coffee beans. Before drying, the water vapor pressure in coffee beans is equal to the pressure of air vapor. Meanwhile, when drying begins, hot steam flowed through the surface of coffee beans will increase the pressure of water vapor contained in coffee beans. When hot steam is flowed to the surface of coffee beans, there will be a mass transfer from coffee beans to the surface of coffee beans in the form of water vapor. Then continued with the evaporation process from the surface of coffee beans to the air [27].

Based on experiments, regarding the drying characteristics of coffee beans using a tub type dryer with a heat source of a coffee husk furnace and a solar collector, three measurement parameters were obtained, namely related to solar irradiation, the rate of decrease in moisture content, and relative humidity (RH).

a. Solar Irradiation
Solar irradiation is the amount of solar energy at a certain time interval. Different locations tend to have different levels of irradiation. The tool used to measure solar irradiation is solarimeter. Look at the following graph.

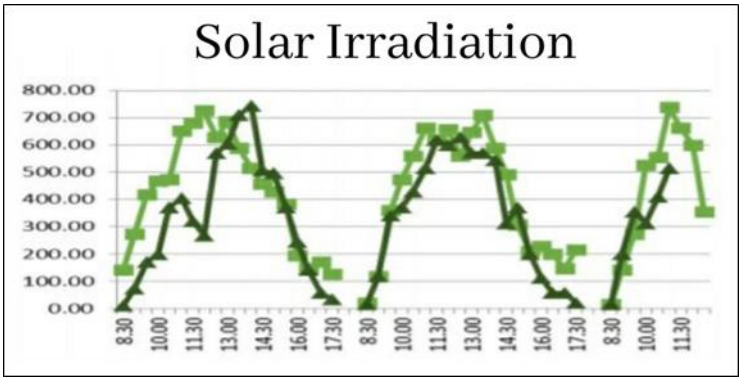

Fig 3. *Graph of solar irradiation*

Based on the graph, it appears that the highest irradiation occurs at 11:00 AM – 12:00 PM so that the temperature value in the dryer rack and the environment is also the highest compared to other hours. This is because during the day the intensity of the sun is very high, so the heat generated by the sun makes the temperature increase.

b. The Rate of Decrease in Moisture Content

The rate of decrease in moisture content in coffee beans is the amount of moisture content that comes out of coffee beans per unit time. The higher the evaporation of moisture content in coffee beans, the higher the rate of decrease in moisture content. Look at the following graph.

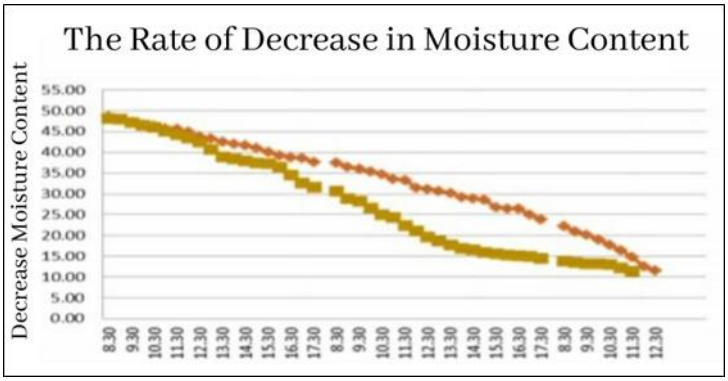

Fig 4. *Graph of the rate of decrease in moisture content*

Based on the graph, it appears that the longer the drying time of coffee beans, the lower the moisture content. The drying process is carried out until the moisture content of coffee beans reaches 12,5%. This is in accordance with the quality standards of coffee beans as in the following table.

Table 1. General quality requirements for coffee beans

Number	Criteria	Unit	Requirements
1.	Live insects	-	Nothing
2.	The seeds smell bad and smell like mold	-	Nothing
3.	Moisture content	% mass fraction	Maximum 12,5
4.	Dirty levels	% mass fraction	Maximum 0,5

c. Relative Humidity (RH)

Relative humidity (RH) is the amount of moisture content in the air. The higher the moisture content in the air, the longer the drying process. Look at the following graph.

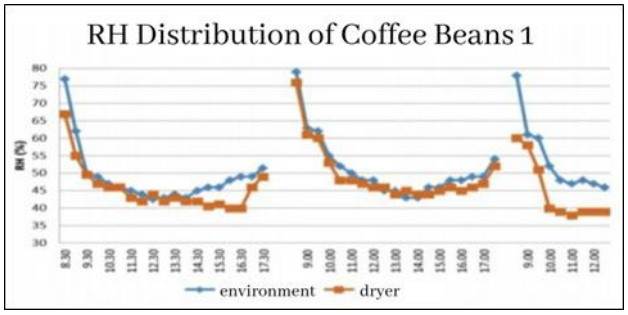

Fig 5. *Graph of relative humidity on coffee beans 1*

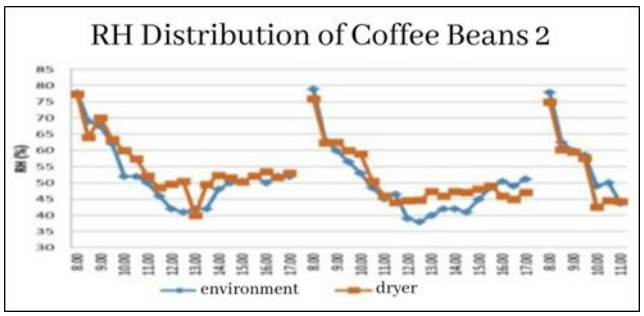

Fig 6. *Graph of relative humidity on coffee beans 2*

Based on the graph, it appears that the low RH value is influenced by the high air temperature in the drying process. This proves that the higher the air temperature, the lower the relative humidity. Thus, the lower the RH value, the better for the drying process [28].

Conduction Heat Transfer

After the coffee beans are dried (moisture content is below 12,5%), the next step is to fan the coffee beans using a fan machine to separate the coffee beans with their impurities. After that, the process of roasting coffee beans traditionally using iron drums. Coffee beans as much as approximately 40 kg put in an iron drum, then the iron drum is placed on the furnace using cinnamon as an ignitor. Look at the Figure 7 below.

Fig 7. *Roasting process of coffee beans*

When the iron drum is heated, the drum will get additional heat energy from the fire so that the temperature increases. Because the iron drum is in direct contact with the fire, this event is called conduction heat transfer. Conduction heat transfer is a heat transfer through an intermediary and without accompanied by particle displacement. If you leave a metal container on fire for a long time, then the metal handle will feel hot. Energy is transferred from the fire to metal handle by conduction [26]. The equation used to determine the level of conduction is as follows.

$$P_{cond} = \frac{kA\,(T_2 - T_1)}{L} \quad (2)$$

Description:
P_{cond} : conduction power (W)
k : coefficient of thermal conductivity ($W.m^{-1}.K^{-1}$)
A : surface area (m^2)
T_2 : highest temperature (K)
T_1 : lowest temperature (K)
L : material thickness (m)

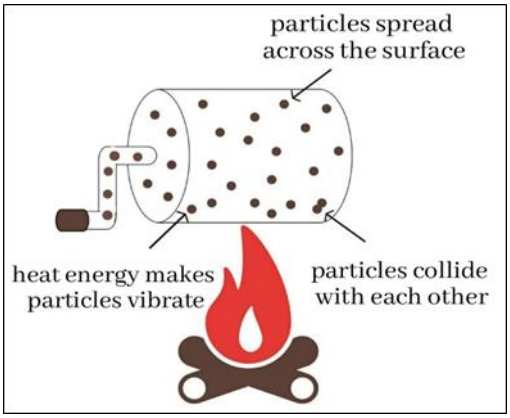

Fig 8. *Illustration of conduction from the fire to iron drum*

Based on Figure 8, it appears that the electrons at the bottom of the iron drum move faster (has a large kinetic energy). Because the electrons has a large kinetic energy, the electrons will move to a place that has a smaller kinetic energy that is the top of the iron drum. The move causes a collision between high-energy electrons and low-energy electrons. Thus, low-energy electrons turn into highs represented by an increase in temperatures. So on so that high-energy electrons can spread across the surface which makes the iron drum feel hot [29].

Convection Heat Transfer
During the roasting process, the coffee beans also get heat from the iron drum through the hot air inside the iron drum. In this event, there is a heat transfer from hot air to coffee beans. So, coffee beans can receive heat evenly [29]. This event can be illustrated in Figure 9 below.

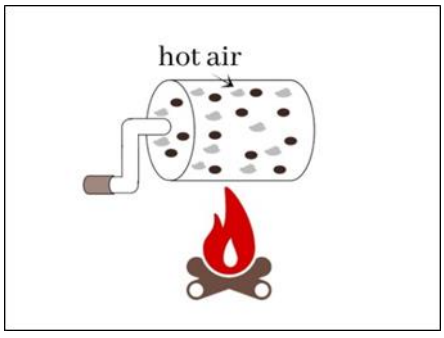

Fig 9. *Illustration of convection heat transfer*

One of the signs that the coffee beans have matured is the appearance of puffs of smoke coming out of the iron drum. Scientifically, the roasting of coffee beans also includes the application of convection heat transfer. Convection heat transfer is a heat transfer through an intermediary and accompanied by particle displacement. Convection occurs due to differences in fluid speed (liquid or gas) when the

temperature is different. That will result in a difference in density.

Low temperature fluids will have a greater density compared to similar fluids with higher temperature. Similarly, during the roasting process of coffee beans, the hot air near the flames will expand and the density becomes smaller. Meanwhile, cold air with a larger density will push the air downward, so that there is a change of position between cold air and hot air. This is called convection flow. This convection flow will also bring puffs of smoke out of the iron drum [26]. The equation used to determine the level of convection is as follows:

$$P_{conv} = hA\Delta T = hA(T_2 - T_1) \quad (3)$$

Description:
P_{conv} : convection power (W)
h : convection coefficient ($W.m^{-2}.K^{-1}$)
A : surface area (m^2)
ΔT : temperature difference in both transmissions (K)
T_2 : highest temperature (K)
T_1 : lowest temperature (K)

Regularly Changed Circular Motion
During the roasting process, the iron drum must be rotated continuously. The rotation process shouldn't be in the same direction, but rotated back and forth. This is done so that coffee beans can be cooked evenly. When turning the drum also shouldn't stop, because it is feared that the coffee beans in the iron drum will be burn.

Fig 10. *Drum rotation during roasting of coffee beans*

Based on Figure 10, it appears that the rotation of the iron drum forms a circular trajectory. In addition to the rotation of the iron drum, the rotation of the waterwheel in moving the pestles also forms a circular trajectory. Look at the Figure 11 below.

Fig 11. *Waterwheel*

The movement of an object whose trajectory is a circle is called a circular motion. There are two types of circular motion, namely regular circular motion and regularly changed circular motion. In this event

only the regularly changed circular motion. This is because the angular velocity is not constant, but changes every time [30]. The rotation process on the iron drum is not in the same direction, but in the opposite direction. Similar to a waterwheel, the rotation depends on the velocity of the flow of water hitting the wheel. The characteristic of circular motion is the distance of objects to a reference point, which is the center point of the circle. Another characteristic that stands out in circular motion is that the direction of velocity always pertains to the trajectory [29]. This means that in a circular motion, the velocity is always perpendicular to the radius of the circle, as exemplified in Figure 12 below.

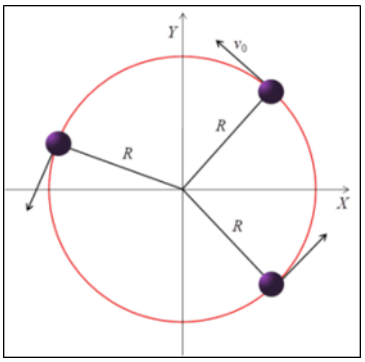

Fig 12. *Velocity direction of objects always perpendicular the trajectory*

When depicted on the x-y axis, the trajectory of objects undergoing circular motion appears as shown in Figure 13 below.

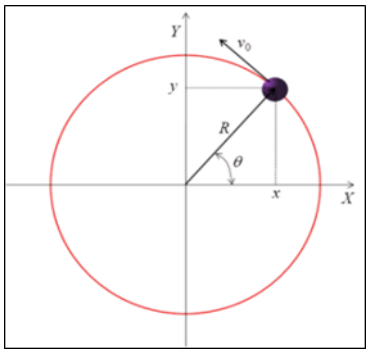

Fig 13. *Trajectory of objects that perform circular motion*

Partially Resilient Collisions

During the pulverization process, coffee beans are pound using 8 pestles which are driven by waterwheel. The pulverization process doesn't use a grinding machine because people believe that pounding of coffee beans using pestles can produce coffee powder with a unique taste and a distinctive aroma. Not only that, the people also expect that coffee beans can be avoided from chemical processes, so that the authenticity or purity of coffee can be maintained. Because the pulverization of coffee beans is carried out by pounding, this event is called a collisions. Collisions is a powerful interaction between two objects that last for a short time. Collisions are divided into three types, namely perfectly resilient collisions, partially resilient collisions, and collisions that are not resilient at all. However, in this event only partially resilient collisions occurred. In the partially resilient collisions does not apply the law of kinetic energy eternity. This is because after the collisions, some of the kinetic energy is lost which turns into heat energy, sound energy, and so on. So, in the partially resilient collisions only applies the law of momentum eternity [31]. The collisions of coffee beans using a pestles can be seen in Figure 14 below.

Fig 14. *The collisions of coffee beans*

The illustration of partially resilient collisions on the pulverization of coffee beans can be seen in Figure 15 below.

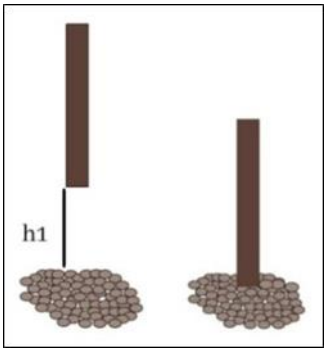

Fig 15. *Illustration of collision on coffee beans*

The longer the coffee beans are pounded, the more unchanged the size. If the coffee beans have a diameter of D_n is given energy to break a coffee beans of U_n, then the final diameter D_{n+1} produced can be predicted by the Kick equation:

$$U_n = K \ln \left(D_n / D_{n+1}\right)$$

$$\mathrm{D_{n+1}} = \mathrm{D_n e^{-U_n/K}} \quad (4)$$

Description:
U_n : energy to break down coffee beans (J)
K : Kick constant
D_n : diameter of coffee beans before pounding (m)
D_{n+1} : diameter of coffee beans after pounding (m)

The shape of particle fragments after being given energy can be seen in Figure 16 below.

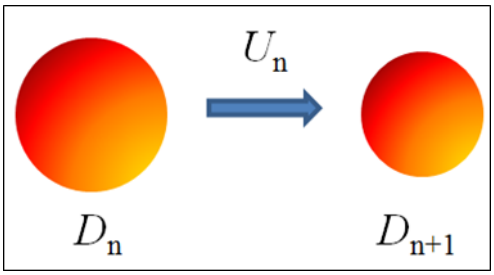

Fig 16. *Particle fractions after being energized*

Assume that the force given by the pestles is constant F_0. If N particles with a radius of R have been generated, one particle receives a force of $F = F_0/N$. The applied force causes the particle to deform as far as *d*, as shown in Figure 17 below.

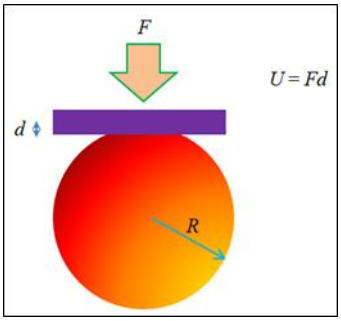

Fig 17. *Deformation on particle surfaces*

While the example of calculation of changes in diameter of crushed particles can be seen in the Figure 18 below.

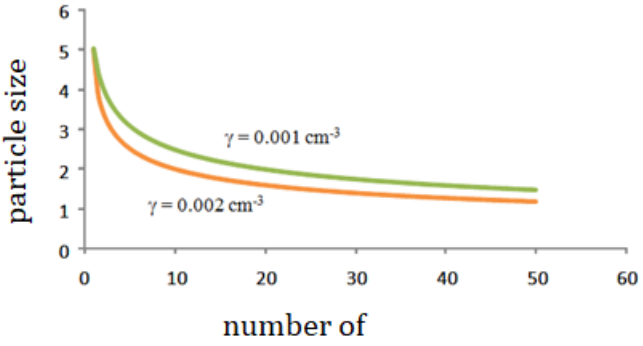

Fig 18. *Graph of particle diameter changes*

Based on Figure 18, it appears that in the beginning, the particle size changes very quickly. However, after pounding it for a long time, the particle size changes very slowly. This is because greater energy is required for smaller particle sizes [29].

Friction Force

After the pounding process is complete, the next step is to sift the coffee powder using traditional sieving tools. Sifting of coffee powder is carried out to separate the coarse powders. So produced coffee powder with a smoother texture. Scientifically, when coffee powder is sifted using sieving tools, there will be a friction between the coffee beans and the tool. This event is an application of the friction force. Friction force can be interpreted as the number of vectors of several forces that work between the atomic surface of an object and the atomic surface of another. When the surfaces of two normal objects are placed together, only the highest points touch each other. If the force exerted is large enough to pull a surface over another surface, there will be damage to the unification site and then a continuous process of forming and breaking again when movement occurs [26].

Fig 19. *Sifting of coffee powder*

Based on Figure 19, there is a friction between coffee powder and sieving tools. When the sieving is shaken, the coffee powder will move down, where the direction of the friction force is always the opposite of the given force, as shown in Figure 20 below.

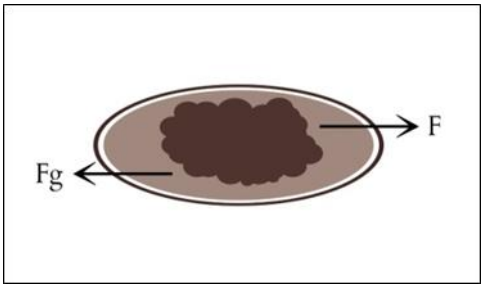

Fig 20. *Friction force direction*

The results of ethnoscience analysis on the traditional processing of Coffee Nur Kerinci can also be mapped in basic competencies and scientific content that can be seen in Table 2 below.

Table 2. Mapping of basic competencies and scientific content of senior high school

Basic Competencies	Scientific Content
3.6 Analyzing physical quantities in circular motion at a constant rate (constant) and their application in daily life.	Analyzing the physical quantities of circular motion on waterwheel and the roasting process of coffee beans.
3.7 Analyzing the interaction of forces and the relationship between force, mass and motion of objects in straight motion	Analyzing the interaction of force (friction force) in the process of sifting coffee beans.
3.10 Applying the concept of momentum and impulses, as well as the law of the eternity of momentum in daily life.	Applying the concept of collision in the process of pounding coffee beans.
3.5 Analyzing the influence of heat and heat transfer which includes the thermal characteristics of a material, capacity, and conductivity of heat in daily life.	Analyzing the effect of heat and heat transfer that occurs in the drying and roasting process of coffee beans.

CONCLUSION AND SUGGESTION

Coffee Nur Kerinci processing was a local wisdom that has been passed down through generations. Coffee processing was done traditionally using simple tools that are hand made. The indigenous knowledge of the Coffee Nur Kerinci processing can be reconstructed into scientific knowledge. Coffee Nur Kerinci produces robusta coffee (*Coffea canephora)*. Coffee plants (*Coffea sp.*) belongs to

the *Coffea* genus with the *Rubiaceae* family. The process of drying the coffee beans was done by drying under the sun for 21 days with an average drying time of 5 hours/day. The characteristics of coffee beans that have been dried and ready to be roasted are not smelled of sap aroma and heard a gurgling sound when the coffee beans were tossed. Scientifically, the drying of coffee beans aims to remove moisture content. A good standard of coffee beans was to have a moisture content of ± 12,5%. The rate of decrease in moisture content was influenced by the temperature of irradiation and humidity of the air. The roasting process was carried out by using a roasting tool made of drums that are rotated on the stove. The drums must be rotated back and forth so that the coffee was cooked evenly and does not burn. Cinnamon was used as fuel when roasting of coffee to produce a distinctive coffee aroma. The process of pounding coffee beans was carried out by using a waterwheel as a driving force which was connected to eight pestles. The mechanical energy of water was converted into motion energy in the pestles. Scientifically in the processing of Coffee Nur Kerinci, there are the concepts of classification of living things, heat and transfer, circular motion, collision, and force.

ACKNOWLEDGMENTS

Author thanks to LPPM Universitas Jambi for providing funding for this research in fiscal year 2020.

REFERENCES

[1] Septika, R. A. (2019). *Hubungan Tingkat Pengetahuan Petani dengan Tingkat Produktivitas Kopi Arabika di Kecamatan Kayu Aro Barat Kabupaten Kerinci* (Doctoral dissertation, Universitas Negeri Padang).

[2] Zebua, A. N., Sayamar, E., & Kausar, K. Analisis Kearifan Lokal dan Strategi Petani Kopi dalam Pengelolaan Tanaman Kopi Ramah Lingkungan di Desa Hutagurgur Kecamatan Dolok Sanggul Kabupaten Humbang Hasundutan Sumatera Utara. *Jurnal Online Mahasiswa (JOM) Bidang Pertanian*, *4*(1): 1-15.

[3] Udayana, I. G. B. (2017). Marketing strategies arabica coffee with information technology in Kintamani District Bangli. *International Research Journal of Engineering, IT and Scientific Research*, *3*(3): 93-102.

[4] Rahardjo, P. (2012). *Kopi*. Penebar Swadaya.

[5] Riany, H., Pradana, D. L. C., & Kartika, W. D. (2019). Effects of coffee consumption in improving hyperglicemia in diabetes-induced mice. *International Journal of Ecophysiology*, *1*(1): 72-80.

[6] Yuwono, S. S., & Waziiroh, E. (2017). *Teknologi pengolahan pangan hasil perkebunan*. Universitas Brawijaya Press.

[7] Harahap, R. H., & Muda, I. (2018). Sustainable management of coffee farms (case in Karo Regency, North Sumatera Indonesia). *International Journal of Civil Engineering and Technology (IJCIET)*, *9*(11): 2721-2731.

[8] Pradinata, J. (2017). Analisis Kepuasan Dan Loyalitas Konsumen Kopi AAA Di Kabupaten Kerinci. *Al-Infaq: Jurnal Ekonomi Islam*, *8*(2): 168-182.

[9] Jufrida, J., Basuki, F. R., & Rahma, S. (2018). Potensi Kearifan Lokal Geopark Merangin Sebagai Sumber Belajar Sains Di SMP. *Edufisika: Jurnal Pendidikan Fisika*, *3*(01): 1-16.

[10] Kartika, T. (2016). Verbal communication culture and local wisdom: The value civilization of Indonesia nation. *Lingua Cultura*, *10*(2): 89-93.

[11] Albantani, A. M., & Madkur, A. (2018). Think globally, act locally: the strategy of incorporating local wisdom in foreign language teaching in indonesia. *International Journal of Applied Linguistics and English Literature*, *7*(2): 1-8.

[12] Subali, B., Sopyan, A., & Ellianawati, E. (2015). Developing local wisdom based science learning design to establish positive character in elementary school. *Jurnal Pendidikan Fisika Indonesia*, *11*(1): 1-7.
[13] Dahliani, D., Soemarno, I., & Setijanti. (2010). Local Wisdom Inbuilt Environment in Globalization Era. *Local Wisdom Inbuilt Environmentinglobalization Era*, *3*(6): 157-166.
[14] Santosa, A. B., Basuki, Y., & Puspita, A. M. I. (2019). The effectiveness of local wisdom-based teaching materials in enhancing creative writing skills of elementary school students. *Journal of English Language Teaching and Linguistics*, *4*(3): 349.
[15] Basuki, F. R., Xena, A., & Pasminingsih, P. (2019). Development of Science Book Based on Jambi Local Wisdom in the Material of Pressure and Vibration. *Indonesian Journal of Science and Mathematics Education*, *2*(3): 287-297.
[16] Rahayu, W. E., & Sudarmin, S. (2015). Pengembangan modul IPA terpadu berbasis etnosains tema energi dalam kehidupan untuk menanamkan jiwa konservasi siswa. *Unnes Science Education Journal*, *4*(2).
[17] Yuliana, I. (2017). Pembelajaran berbasis etnosains dalam mewujudkan pendidikan karakter siswa sekolah dasar. *Jurnal Pendidikan dan Pembelajaran Sekolah Dasar*, *1*(2): 98-106.
[18] Abonyi, O. S., Achimugu, L., & Njoku, M. (2014). Innovations in Science and Technology Education: A case for ethnoscience based science classrooms. *International Journal of Scientific and Engineering Research*, *5*(1): 52-56.
[19] Syarifudin, S. (2017). Etnoscience Dan Etnotechnologi Preaching Di Moluccas. *UMRAN-International Journal of Islamic and Civilizational Studies*, *4*(1-1): 27-33.
[20] Iriani, R., & Kurniasih, I. (2019). The Difference in Critical Thinking and Learning Outcome Using Problem Based Learning Asissted with Sasirangan Ethnoscience Student Worksheet. *International Journal of Recent Technology and Engineering*, *7*(6): 709-716.
[21] Baltacı, A. (2017). Nitel veri analizinde Miles-Huberman modeli. *Ahi Evran Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, *3*(1): 1-14.
[22] Sudarmin, S., Khusniati, M., Nur, F., Seyla, A., & Khoirur, R. (2018, September). Science Analysis of "Nginang "Culture In Context of Science Technology Engineering And Mathematics (Stem) Integration of Ethnoscience. In *International Conference on Science and Education and Technology 2018 (ISET 2018)* (pp. 413-418). Atlantis Press.
[23] Achadiyah, S. (2017). *Teknologi Pengolahan Kopi & Kakao*. Instiper Yogyakarta, 2017.
[24] Rismunandar, F. B., & Paimin. (2001). *Kayu Manis: Budidaya dan Pengolahan*. Penebar Swadaya.
[25] Afriliana, A. (2018). *Teknologi Pengolahan Kopi Terkini*. Deepublish.
[26] Halliday, D., Resnick, R., & Walker, J. (2010) *Fisika Dasar Edisi 7 Jilid 1*. Erlangga, 2010.
[27] Sary, R. (2016). Kaji eksperimental pengeringan biji kopi dengan menggunakan sistem konveksi paksa. *Jurnal Polimesin*, *14*(2): 13-18.
[28] Agustina, R., Syah, H., & Moulana, R. (2016). Karakteristik Pengeringan Biji Kopi dengan Pengering Tipe Bak dengan Sumber Panas Tungku Sekam Kopi dan Kolektor Surya Characteristic Drying of Coffee Beans Using a Dryer with the Heat Source of Coffe Husk Furnace and Solar Collectors. *Jurnal Ilmiah Teknologi Pertanian*, *1*(1): 20-27.
[29] Abdullah, M. (2020). Interdisciplinary Physics. http://profmikra.org/?cat=1 (accessed Nov. 02, 2020).
[30] Utomo, P. (2007). *Fisika Interaktif untuk SMA/MA*. Azka Press.
[31] Daton, G.S., Legiyo, S., Lestari, C. C. E., & Suparmono, Y. B. (2007). *Fisika*. Grasindo.