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Thermal Processing and Chemical Characteristics of Canned Traditional Foods Based on Beef: Rawon, Kuah gandul and Empal gentong

Annisa Kusumaningrum, Aldicky Faizal Amri, Asep Nurhikmat, Agus Susanto, Siswo Prayogi

The traditional food products were produced by home industries need to be packaged to extend the shelf life and to expand the market during the pandemic. The study aims to provide information about thermal processing, chemical characteristics and metal contamination on canned rawon, kuah gandul and empal...

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Design and Implementation of Water Quality Monitoring System (Temperature, pH, TDS) in Aquaculture Using IoT at Low Cost

Novita Dwi Susanti, Diang Sagita, Ignatius Fajar Apriyanto, Cahya Edi Wahyu Anggara, Doddy Andy Darmajana, Ari Rahayuningtyas

This research aims to design and implement a water quality monitoring system in aquaculture that will be implemented in SME. Subang is a city which has a lot of potential fish farming in ponds, one of them is Rojo Koyo SMEs. The farmer has a problem, especially in the rainy season, mortality of fish...

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Manufacturing Process Development of Health Supplement Containing Water Hyacinth (*Eichhornia crassipes*) Extract

Diah Indriani Widiputri, Quincy Juventinus, Silvy Yusri, Febbyandi Isnanda Pandiangan, Jimmy

Water hyacinth (*Eichhornia crassipes*), WH, is an aquatic plant that usually lives on the surface of lakes, marshes or rivers and often considered to be a weed that brings many negative impacts for the aquatic ecosystem. Previous research has proven the presence of antioxidant activity in the extract...

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The Mechanistic Study on the Effect of *Acacia concinna* and *Cymbopogon nardus* on Lipid Metabolism

Wijitrapha Ruangaram, Eisuke Kato

Obesity is one of the most concerning health problems globally. At the moment, medicinal plants have been widely studied in order to assist in the treatment of obesity instead of the developed drugs. From our previous study, Thai medicinal plants were tested through screening methods regarding anti-obesogenic...

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Profile of FTIR (Fourier Transform Infra Red) and Comparison of Antioxidant Activity of Coffee with *Tiwai* (*Eleutherine americana* Merr)

Bernatal Saragih, Maulida Rahmawati, Arif Ismanto, Frederic Morado Saragih

Coffee consumption is increasing and it has become part of people's lifestyle, so there is a need for an innovation in coffee making with the addition of local ingredients such as tiwai onions. This study analyzed the chemical profile using FTIR and the antioxidants of coffee, tiwai and their mixtures...

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The Effect of Cinnamon Extract (*Cinnamomum burmanii* L.) Addition Towards the Characteristics of Soy Milk Ice Cream

Melanie Cornelia, Aurelia M. Tunardy, Wenny S. L. Sinaga

Generally ice cream was made from cow's milk, resulting in high calorie and fat. Soy milk was used as an alternative for cow's milk which had several advantages, but soy milk contains beany flavor that some people did not like.

Cinnamon (*Cinnamomum burmannii* L.) extract has a unique aroma and flavor...

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Biopellet Production from the Wastes of Palm Oil Plantation and Processing Plant Through Various Pretreatment Processes: A Review

Diah Indriani Widiputri, Fernanda Ayuyasmin, Evita Herawati Legowo

Indonesia as one of the world's largest palm oil producers is facing one significant problem with the amount of wastes they are producing from different stages in palm oil processing, which are consisted of the oil palm trunk (OPT), oil palm frond (OPF), empty fruit bunches (EFB), mesocarp fibre (MF)...

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The Study of Several Applicable Treatments for Serving Butterfly Pea Flower Drinks

Jesslyn Sofyan, Tabligh Permana, Abdullah Muzi Marpaung

A wide range of serving methods of butterfly pea flower drinks are available in practice. Three typical variables in the serving method are studied in this research. They are pre-treatment of the petal before extraction (fresh, refrigerated for two days, dried at 45°C for 48 hours), the method of extraction...

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Analysis Influence of Consumer Behavior to Purchase Organic Foods in Jakarta

Antonius Siahaan, Jeffry Thiodore

This research aims to prove whether there is positive correlation among theory of planned behavior variables and give suggestions to the organic food producers to create and formulate a preferable marketing strategy, achieve better sales performance and to support organic food growth in Jakarta. A survey...

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Physical and Chemical Properties of Corn-Almond Cookies Affected by Mung Bean Supplementation and Source of Fat

Nur Aini, Budi Sustriawan, Ervina Mela, Lisna Fuji Lestari

Cookies generally contain gluten because they are made from wheat flour obtained from wheat, while there are groups that are intolerant of gluten. Patients with gluten intolerance also tend not to be able to consume casein and lactose intolerance. So, one of the innovations that can be done to make cookies...

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Evaluation of the Ethyl Acetate Extract of the Roots of *Avicennia marina* as Potential Anticancer Drug

Immanuel B. Tanjung, Norma N. Azizah, Ade Arsianti, Amalda S Anisa, Kholis A Audah

In this modern age cancer is still a prevalent disease. Even with advancements of technology, current treatments for cancer still have various side-effects that sometimes create more harm to the patient. A complete solution for cancer is still not found yet. Recently, mangroves were shown to be promising...

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Utilization of Banana Peel for Bioethanol Production Using Baker's Yeast Starter

Dedy Eko Rahmanto, Deny Arizal, Nurhayati Nurhayati

Research on the second generation of bioethanol production continues to be developed in the world. Second generation bioethanol has been produced from non starch substrates like cellulose, hemicellulose and bounded lignin as raw material. This research produced bioethanol using Ambon banana peels that...

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Application of *Stenochlaena palustris* in Black Tea and Coffee Beverages Targeting Consumers with Sugar Concern

Filiana Santoso, Natasya Oktavianti, Febbyandi I. Pandiangan, Yanetri A. Nion, Maria D.P.T. Gunawan Puteri

Kelakai is an endemic fern found abundantly in Central Kalimantan. Regardless of its high availability, low economical value, and potential health benefits (natural source of iron, folic acid, antioxidant, antidiabetic, etc.), the utilization of the plant as a food ingredient is still limited. Black...

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Bioconversion of Lignocellulosic Agriculture Waste to an Edible Mushroom, the Functional Food for Healthy Life During Covid 19

Iwan Saskiawan, Atik Retnowati

Production of lignocellulosic biomass is routinely generated by agro-industrial activities in Indonesia. Those materials are disposed of in the environment without any treatment leading to serious environmental pollution problems. These agricultural wastes can be potentially bio converted into edible...

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Aquaculture Employment and Economic Diversification Digital Technology, Training and Sector Development Options in Brunei

Shahid Anjum, Abidah B.M. Abidin

Facing the question of economic diversification for income and employment enhancement, the answer to the question of whether incorporation of modern digital technology and sectoral training facilities may replace imported labour for local youth, the study taking up the case study of the aquaculture sector...

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A Review on the Potential of Natural Antioxidant Sources Improve Oxidative Stability in Edible Oils

Tabligh Permana, Nia Wiradjaja, Hery Sutanto, Vincent Satya Surya

Edible oils have been used widely in food processing, especially processes with thermal treatment such as frying. In the frying process, oils are usually used repetitively and trigger the presence of lipid oxidation which results in the degradation of fatty acids. This degradation of fatty acids then...

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A Review on the Potential Applications of Cocoa Shell in Food Industry

Glynnis Netania, Tabligh Permana, Juli Effendy, Filiana Santoso, Edrick Alvaro Oslo

Cocoa shell is one of the main by-products of cocoa beans. It is separated from the nibs and are disposed of, as it could affect the final quality of cocoa products. As a result, a high amount of waste can be produced during mass production of cocoa beans. Indonesia is one of the largest producers of...

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Modification of Cassava Starch (*Manihot utilissima*) Using Precipitation Method with Addition of NaCl

Ulyarti, Mursyid, Ismanto, I Rahmayani, R Suseno, Nazarudin

Cassava starch has been widely used as a functional ingredient in many food products with some limitations. To improve its usage, cassava starch has been modified to have a better functionality. A lot of starch modification has

been applied including alcoholic treatment or known as precipitation method....

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Biodiesel Production from Spent Coffee Grounds Oil

Chelselyn Chuaca, Elza Karenina, Kezia Yusuf, Shafwah Dzahabiyya, Alwan Raihan, Evita Legowo, Hery Sutanto

Biodiesel has been considered as an alternative fuel to replace conventional oil in the world. Biodiesel development has reached blending for 30% and has been implemented by Indonesia since 2020. Sources for biodiesel production vary, as is well known, mostly from CPO, raw vegetable oil, used cooking...

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Effect of Heating Treatment of VCO By-product on Protein, Fat, Free Fatty Acid, Emulsification Capacity, and Fatty Acid Characteristics

Ansharullah, Sitti Aida Adha Taridala, Muhammad Natsir, Eva Nopitasari, Sri Damayanty, Sriyana Herman

Virgin coconut oil (VCO) waste or blondo was a by-product, which still contains many important nutrients, and has a potency to be included for the production of nutritious food products. Blondo still contains a high moisture, and so to extend its shelf life and expand its application, it needs to be...

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Anthocyanin Extraction from *Clidemia hirta* (L.) D. Don Fruit and Its Stability During Storage

Gayatri Annisa Larasati, Irvan Setiadi Kartawiria, Abdullah Muzi Marpaung

There have been concerns regarding the use of artificial food colorant, triggering the food industry to develop natural food colorant with nutraceutical properties, which could be solved by anthocyanins. A series of studies to evaluate the potency of harendong bulu (*Clidemia hirta* (L.) D. Don) fruit...

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Study of Biogas Production From Palm Oil Solid Wastes: A Review

Jean Aldrich M. Piolo, Evita H. Legowo, Diah Indriani Widiputri

In 2021 Indonesia currently provides 58% of global crude palm oil, resulting in enormous amounts of oil palm wastes. The purpose of this research is to determine which palm oil solid waste has the potential to be used as a substrate for biogas production, and what is the optimum method and parameter...

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Supply Chain Resources of Red Chili Based on Food Supply Chain Network in Kulonprogo Indonesia

Susanawati, Muhammad Fauzan, Ivo Mega Candela Fanestia

This study is to describe the structure of the red chili supply chain relationship and describe the resources of the red chili supply chain in Panjatan District, Kulonprogo Regency. The research location was determined intentionally with the help of Cluster Sampling in determining farmers' samples. The...

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The Effects of Tomato Concentration on Sensory and Chemical Properties of Jelly Drink

Setiarti Sukotjo, Heru Irianto, Shinta Leonita, Nita Yustika Sari

Tomatoes, which have a limited shelf life must be processed further, one of which will be used as a jelly drink. In Indonesia, tomatoes are relatively inexpensive, but beverage products made from tomatoes are still limited. Jelly drinks are common among the general public, and they also serve as a hunger...

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Prebiotic Potential of Oligosaccharides: *In Vitro* Study of Indonesian Local Honey from *Apis spp.* and *Trigona spp.* Bees

Fitria Susilowati, Mita Nurul Azkia

Oligosaccharide compounds (FOS, GOS) have gained huge commercial interest due to their beneficial properties in human health as prebiotics. This study aims to isolate the oligosaccharides compounds and investigate the prebiotic potential of Indonesian local honey from *Apis spp.* (KR) and *Trigona spp.*....

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Characteristic of Red Ginger Jelly Stick with Variation Type of Gelling Agent

Titri S. Mastuti, Aurelie F. Setiawanto

Jelly stick is a semi-solid product which is made with the addition of a gelling agent. Jelly sticks have a different texture compared to ordinary jelly. This product is easy to consume, more sticky and chewy. Ginger is widely available in Indonesia, has high antioxidants and can enhance human immunity...

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Empowering Communities of Mango Agribusiness in North Lombok, Indonesia

Zainuri Zainuri, Taslim Sjah

System and sub systems of mango agribusiness in North Lombok, Indonesia have not fully worked well. One of the parts of the weaknesses is on the human side, i.e. the entrepreneurs of the mango agribusiness. Therefore actions need to be taken to this human capital to be empowered with necessary skills...

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Review: Nutrient, Fiber, and Bioactive Content of Fruit Pom Major By-product of Juice Industry

Florence Ignatia, Kezia Meivira, Irvan Setiadi Kartawiria, Maria D.P.T.
Gunawan-Puteri

The market of the juice industry is increasing globally including in Indonesia and one of the factors that support the developing market of juice is the sufficient supply of raw material. Consequently, the increasing production of juice has resulted in a high amount of solid waste such as under-ripe...

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Profiles of Oligosaccharides Synthesized from Under-Explored Tuber Starches Using *Aspergillus oryzae* Amylase

Achmad Dinoto, Rini Handayani, Sulistiani, Ninu Setianingrum, Mulyadi,
Heddy Julistiono

Oligosaccharides are beneficial compounds for human health that are widely used in the food, cosmetic, and pharmaceutical industries. Our knowledge on the synthesis of oligosaccharides from tropical plant sources using amylases of indigenous microorganisms are still limited. This study aims to determine...

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Farmer Decision on Cocoa Farm in North Lombok, Indonesia

Taslim Sjah, Ridwan, Ibrahim, Sri Supartiningsih, Padusung

Agricultural land in North Lombok, Indonesia, provides farmers with several choices of crops to be grown, among others is cocoa. However, farmer reasons for growing this crop is not completely documented. This paper explores

farmer reasons for growing the crop and models their decisions. This pa] used...

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Identification of Ponorogo Coffee Agro-industry Supply Chain

Devi Urianty Miftahul Rohmah, Arief Rahmawan, Mohammad Fuad

Coffee is one of the plantation commodities that has an important role in economic activities in Indonesia. The important role of coffee in Indonesia's economic activities are as a source of foreign exchange earnings, as a provider of employment, and as a source of income for coffee planters and other...

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Production of Bioethanol from Dragon Fruit Wastes by Using *Aspergillus niger* and *Saccharomyces cerevisiae*

Selvia Sarungu, Karnila Willard, Hamriani Ryka, Simon Tampang, Junaesar Tangke Tasik, Bodhi Dharma, Sitompul Afrida

East Kalimantan are able to produce dragon fruit throughout year, while, East Java are only in raining season. This fruit will be produced abundantly when the peak season comes and often becomes waste. To reduce this cellulosic waste from traditional market, we attempt to convert the dragon fruit waste...

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Increasing of Wet Noodles Quality Using Vegetables Oil Coating

Nurhayati Nurhayati, Maria Belgis, Jay Jayus, Infidzah S. Velianti

Wet noodles are often used as the main ingredient in making chicken noodles, which is one of the favorite foods like Indonesian. The process of making wet noodles without going through the drying stages makes the noodles easily damaged by microbial growth such as bacteria. This study evaluated the effect...

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Confidence Level to Purchase Halal Food Products Via Ordering Online Application

Nainatul Farzuha Nor, Hartini Ahmad, Ahmad Shabudin Ariffin

The Covid-19 pandemic has turned out to be an opportunity for a recent noticeable increase in online purchase in Malaysia. Muslim consumer who concern about halal product were affected by this drastic purchasing trends. Although there is no evidence to support Muslim consumer to explore how they select...

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The Influence of Green Campaign Towards Consumer Purchase Intention

A Study of "X" Coffee Shop in Jakarta

Patricia Josephine, Robert La Are

Green Campaigns are used to expose any environmental issues to the societies and at the same time to give knowledge about the awareness of

green behavior on the environment and will later lead to the intention of purchasing green products. However, as a report stated, 86% percent of the adult population...

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The Effect of “*Bile*” Banana (*Musa Paradisiaca*) Maturity Level on Microbiological, Chemical and Sensory Quality of Goat’s Milk Kefir

Satrijo Saloko, Mutia Devi Ariyana, Nadiah Khoiroh

Goat’s milk is processed into kefir with the hope of eliminating the smell of “strong, goaty odour” and extending the shelf life of goat’s milk. Kefir is a probiotic drink whose growth can be optimized with the addition of prebiotics in the form of “*Bile*” bananas. This study aimed to determine the effect...

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Glucose Syrup of Annealing Modified of Cocoyam (*Xanthosoma sagittifolium*) Starch

Dedin Finatsiyatull Rosida, Ricke Amelia

Glucose syrup is made from the hydrolysis of starch which can be hydrolyzed by acid, enzyme, or a combination of both. The liquefaction process in the production of glucose syrup is controlled by the enzymatic hydrolysis by α -amylase. The gelatinized starch is hydrolyzed into simpler molecules to be...

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Study on the Quality of Fermented Tapioca with Variation of Lactic Acid Bacteria (LAB) Types

Baiq R. Handayani, Nurul Hartiwi, Mutia D. Ariyana

Fermentation potentially improves the quality of tapioca. Fermentation of tapioca occurred either spontaneously or with the addition of starters. Lactic acid bacteria widely used as a starter on flour fermentation. This study aimed to determine the effect of the types of Lactic acid bacteria on the characteristic...

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Growth Response and Yield of Shallots to *Trichoderma* Biostimulants and Growth Regulators Substance *Benzyl Amino Purine* (GRS BAP)

Made Sudantha, Suwardji

Shallots are one of the vegetable commodities that have important meaning for the community, both in terms of their high economic value and nutritional content. The productivity of shallots in West Nusa Tenggara is still low compared to the production potential of shallots. One of the causes of the low...

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Identifying Total Economic Value of *Capilong* (*Calophyllum inophyllum*) in Ternate Island–North Maluku-Indonesia

Mardiyani Sidayat, Mila Fatmawati

Beauty leaf tree (*Calophyllum inophyllum*) or locally called capilong is one of the plants which have big potential to be used for biofuel raw material. Indeed, almost all parts of this plant have high economic potential and are currently being used for important industrial raw materials, such as the...

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Hypocholesterolemic Effect of Biscuit Made from Purple Sweet Potato Flour, Starch, and Fiber Rich Flour on Rats

Oktavianna Ginting, Elisa Julianti, Rona J. Nainggolan

The solid residue from purple sweet potato (PSP) starch has a high enough dietary fiber and can be processed into fiber rich flour. In this study, biscuits were made from flour, starch and fiber rich flour from PSP in a ratio of 75: 5: 20. The resulting biscuits were then tested for their hypocholesterolemic...

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Analysis of Food Handler's Knowledge of Hygiene and Sanitation Impact on Food Quality

A Study of Lubana Sengkol Restaurant

Fidjria L. Salsabela, Rano Abryanto

As the food and beverage industry in Indonesia has a large demand and supply, the quality and safety of food as well as effectiveness in the production process are important to consider for quality assurance. Food safety is very important to avoid side effects arising from contamination, abuse, and food...

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ABG Point of View in Lemongrass and Ginger Potency for Commercialization as Herbal with Anti-Diabetic Claim in Indonesia

Hinedreana F.M. Pranoto, Maria D.P.T. Gunawan Puteri, Victor Sahat Ringoringo

Diabetes mellitus is a general disturbance of metabolism and has been a major public health issue in Indonesia. Indonesia has numerous medicinal plants that are used in traditional medicine. Lemongrass and ginger are two of the medicinal plants that show anti-diabetic potency, where they are developed...

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Lemongrass and Ginger Potency for Blood Glucose Control

Claudia Christy, Maria D.P.T. Gunawan Puteri, Abdullah Muzi Marpaung

Lemongrass (*Cymbopogon citratus*) and ginger (*Zingiber officinale*) are herbs that have been used to flavour food and beverages, in addition, they are also believed to possess health benefits. One of them is their ability to control blood glucose levels. Blood glucose control not only is beneficial for...

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Study of the Influence of Stevia and Fructose to the Physicochemical Characteristics of Mocaf-pedada Biscuits

Jariyah, Sri Winarti, Ulya Sarofa, Maya Regina Subagio

Stevia was known to have potential as a sugar substitute sweetener that can be used in various processed foods, including biscuits. The problem in making biscuits was the use of granulated sugar which can increase human blood glucose and was dangerous for people with diabetes mellitus, so we needed a...

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Evaluation of Bacteriocin Produced by *Pediococcus pentosaceus* Strain 2397 as Natural Preservative for Fish Meatballs Stored at Room Temperature

Usman Pato, Yusmarini Yusuf, Shanti Fitriani, Diky Arma Fauzi, Ghina Ismadiyah, Miftahul Hidayah, Windy Sabiliani

Meatballs are one of the most popular processed meats in various countries. The meats commonly used to make meatballs are beef, chicken, and fish. The purpose of this study was to assess the quality of fish meatballs preserved with bacteriocin from *Pediococcus pentosaceus* strain 2397 during room temperature...

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Product Development of Fried Shallot from Dairi Potentiates as Souvenir

Hadassah Elisabeth, Tabligh Permana, Elisabeth K. Prabawati

Dairi regency is rich with their horticultural plants, especially shallots. E shallots are seasonal plants which affect the price fluctuation even though has a big potential. The importance of this research is developing a product from Dairi shallot in order to stabilize the market price of shallot,...

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Characterization of Physicochemical Properties of Powder Coconut Crab Shells (*Birgus latro* L.) from North Maluku

Hamidin Rasulu, Danar Praseptiangga, I Made Joni, Ari Handono Ramelan

Coconut crab (*Birgus latro* L.) or in North Maluku language called coconut crab is one of the biological natural resources of high economic value. People consume coconut crab dishes that have a taste similar to lobster, but have a distinctive advantage because this animal consumes coconut meat.

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Functional Properties of Protein Hydrolysate of Sea Fish and Low Economic Value Hydrolysis Results Using Biduri Protease

Yuli Witono, Livia Wahyuni, Lilik Krisna Mukti, Ardiyan Dwi Masahid, Asrul Bahar

In 2017, The Indonesian fishing productivity reached 6,424,114 tons from the sea and 467,821 tons from freshwaters. Some kinds of sea fish which contain high protein are Crocodile flathead fish (17.86%) and Cardinal fish (18.26%), while kinds of freshwater fish that contain high protein are Common barb...

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Transaction Cost for Marketing of Voor Oogst Kasturi Tobacco: Case in Jember Regency

Wilda A. Safitri, M. Rondhi, Triana D. Hapsari

The tobacco marketing institution has strategic roles (entry point) in driving tobacco agribusiness system and improving farmers' bargaining position. However, the limited information owned by the farmer in marketing the tobacco causes not all farmers to directly sell the tobacco to the warehouse, even...

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Overripe Tempe Stock Prototype Development and Evaluation of Consumer Acceptance for Commercialization Preparation

Elissa Florentina, Stacia Andani Fortunata, Nila K. Hidayat, Maria D.P.T. Gunawan-Puteri

Indonesia is experiencing a growth of sales in health and wellness packaged foods with more consumers aiming to adopt a healthy and balanced diet. Overripe tempe is traditionally used in Central Java as condiment, however it is not well known in other areas of Indonesia. Overripe tempe stock is a food...

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Optimization of Aqueous Extraction of Indonesian Bay Leaf (*Syzygium polyanthum* Wight) as Powder Seasoning

Gabriella Masaki, Filiana Santoso, Maria D.P.T. Gunawan Puteri

Indonesian bay leaf (*Syzygium polyanthum* Wight) is one of traditional spices originated from Indonesia which is usually used as spices to add the aroma of foods. Extraction of the aroma of Indonesian bay leaf could be proposed as a more practical usage to its fresh form. This research aims to find the...

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Impact of Storage Temperature on Physiological Changes and Shelf Life of Mango CV. Mahachanok

Napong Kantanet, Pavalee Chompoorat

Mango (*Mangifera indica* L.) is one of the most popular fruits in Thailand. It is rich in dietary fiber, vitamin C, provitamin A, carotenoids and other phytochemical compounds. Mango is characterized by climacteric fruit and ripen rapidly after harvest. Commercial growers normally harvest mango during...

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Increasing Sorghum Production on Marginal Land in the Framework of Food Procurement Post-Covid-19 Pandemic

Muhammad Hazmi, Iskandar Umarie, Hidayah Murtiyaningsih, Laras Sekar Arum

The Covid-19 outbreak has been going on for more than a year in Indonesia, causing many people to die and lowering the economic level of the community. People's income and food availability decreased. The

procurement of staple foods has always relied on the production of rice and corn. Sorghum is a cereal...

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Halal Dark Chocolate Quality: Influence of Tempering Time and Temperature

Addion Nizori, Lamasih Diniaty Simamora, Silvy Leila Rahmi, Fitry Tafzi, Mapegau, Budiyati Ichwan

The quality of the raw cocoa mass used greatly affects the final quality of the chocolate product. Conching and tempering are also important processes in chocolate making to produce high-quality chocolate that customers like. The process includes mixing, cutting and aeration of the chocolate mass during...

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The Effective Adsorption of Phosphate and Nitrate Using Spent Coffee Ground Loaded Iron and the Effect for Plant Growth

Aisyah Humayro, Hiroyuki Harada, Kanako Naito, Atsushi Hashimoto

The aim of this study is to determine the effectiveness of phosphate and nitrate adsorption through several parameters, such as different initial concentrations, kinetic behaviour, the effect of pH, and ratio liquid solid. Fe-SCG showed the adsorption capacity values were 35.82 mg/g for phosphate and...

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The Effects of F/M Ratio on in Treatment of Wastewater from Brewery Slurry by an Anaerobic Sequencing Batch Reactor

Hiroyuki Harada, Endar Hidayat

In this study, the influence of F/M (total organic carbon (TOC)/mixed liquor suspended solids (MLSS)/day) ratio in the anaerobic batch treatment method was performed on the distillation effluent of barley shochu. The operation was to add 0.7 L seed sludge, supply 0.2 L of waste liquid every day and react...

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Increasing Sorghum Production on Marginal Land in the Framework of Food Procurement Post-Covid-19 Pandemic

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ABSTRACT

The Covid-19 outbreak has been going on for more than a year in Indonesia, causing many people to die and lowering the economic level of the community. People's income and food availability decreased. The procurement of staple foods has always relied on the production of rice and corn. Sorghum is a cereal crop that has the potential to increase the availability of staple foods and can produce well on marginal land, so as not to reduce the area of rice and corn planted. Chemically, sorghum seeds are very likely to be able to substitute or complement the use of materials derived from rice, corn, and wheat. Sorghum is also potential to be used as industrial raw material. Sorghum stalks can produce sap as raw material for bioethanol. Sorghum leaves can be used as fodder for ruminants. Sorghum seeds can be used as a staple food for humans, poultry feed, can be used as flour, bread, snacks. In many countries, except in Africa, India, and America, Sorghum is less attractive to farmers than rice, corn, and wheat. The superiority of Sorghum needs to be socialized more intensively to the community so that farmers are interested in planting it and people like to consume it. The development of sorghum cultivation will reduce dependence on rice, corn, and wheat as well as make sorghum an important economic commodity.

Keywords: Increase, production, Sorghum, marginal land.

1. INTRODUCTION

The Covid-19 outbreak began to spread in Indonesia since the beginning of 2020, causing 3,331,206 people to be exposed and 90,552 people died [1]. The Covid-19 pandemic, in addition to causing human casualties, also has a negative impact on all life activities, such as education, offices, transportation, tourism, trade, and the economy. In the first semester of the pandemic, the Director General of Taxes at the Ministry of Finance warned that this epidemic will have three major impacts on the Indonesian economy, namely: 1) A deep decline in household purchasing power and consumption, which has so far supported 60% of economic transactions. 2) Generating prolonged uncertainty so that investment will also weaken and have implications for the cessation of business. 3) The whole world experienced a weakening economy, causing commodity prices to fall and Indonesia's exports to several countries also stalled [2]. This situation triggers a food crisis which

is usually overcome by imports of food. To reduce imports of food sources of carbohydrates, it is necessary to immediately empower the potential for local food production to complement rice and corn production.

Anticipating the possibility of a severe food crisis, the government and the community will try to secure the availability of the main food ingredients, namely carbohydrates. The COVID-19 pandemic affected the availability of family food, reduced family income, and caused 92.6% of respondent families to choose to focus on fulfilling carbohydrate needs from other types of needs [3]. The main sources of carbohydrates in Indonesia are rice, corn and wheat. Procurement of rice and corn in Indonesia is difficult to fulfill together from within the country, because both are planted intensively alternately on the same land, meanwhile wheat is almost completely imported. Before the food crisis gets worse, it is necessary to increase the production of alternative sources of carbohydrates that

can complement and even substitute some of the functions of rice, corn, and wheat.

Sorghum (*Sorghum bicolor* (L.) Moench) is a cereal crop that can be relied upon to complement the uses of rice, corn, and wheat. Sorghum is known to have been cultivated in Indonesia since 1970 with the planting area covering the islands of Java, South Sulawesi, Southeast Sulawesi, West Nusa Tenggara (NTB) and East Nusa Tenggara (NTT) until now [4]. Sorghum production in Indonesia is still very limited when compared to rice and corn. On the other hand, sorghum has the potential to substitute various functions for rice, corn, and wheat. The low production of sorghum in Indonesia is caused by the limited planting area in a few areas and low consumer demand, so that it is less attractive to farmers to plant sorghum. This paper briefly describes the need to increase the production of sorghum in Indonesia, because its nutritional content is equivalent to that of rice, corn, and wheat, agronomically easy to cultivate, economically very profitable, and socially well-known by the public.

2. THE DILEMMA OF AVAILABILITY OF CEREALS PRODUCTS IN INDONESIA

The dominant cereal crops grown in Indonesia are rice and corn. Most of the rice and corn crops and even other seasonal crops are planted intensively alternately on the same land. As a result, during the rice harvest season, there will be a shortage of corn supply, and vice versa. Rice and corn, especially on the island of Java, are difficult to plant in the same season, because the area of land managed by farmers is small.

Other cereal crops in Indonesia that are grown on a limited basis are sorghum and wheat. Sorghum has actually become a people's crop, especially in marginal dry land, such as in a small part of West Java, Central Java, and East Java as well as in East Nusa Tenggara and West Nusa Tenggara. Consumer demand for sorghum seeds in Indonesia is still very limited compared to rice and corn, so farmers are not interested in growing sorghum as the main crop. This causes sorghum production in Indonesia to stagnate compared to rice and corn.

Another cereal crop that is much needed by the Indonesian people is flour with a variety of downstream products, namely wheat. Wheat is a staple food for the people of Europe, America, Australia, parts of Africa. In general, wheat is widely grown in subtropical regions with four seasons, although there is also wheat grown in hot climates such as Africa and India. Wheat is planted once a year, as in Europe it is mostly planted in early spring and harvested in summer. Wheat cultivation in Indonesia is still very limited and managed by certain companies for the benefit of industrial raw materials.

Wheat as an ingredient in wheat flour is an international trade commodity. In Indonesia, wheat flour consumption is very high, both on an industrial and household scale. Many types of processed foods in Indonesia are based on wheat flour. This causes the consumption of wheat flour to be very high, on the other hand Indonesian farmers do not cultivate wheat. As a result, the procurement of wheat for the community is very dependent on imports [5 - 9] from abroad, especially from Australia. The data shows that Indonesia is not yet independent in the procurement of cereal products and is highly dependent on imports (Table 1).

Table 1 Imports of Cereals (Wheat, Rice, Corn) Indonesia in 2017-2021 (before and during the Covid-19 Pandemic).

Year / month	Cereal type (Net weight Kg)			
	Wheat	Rice	Corn	
2017	May	1.144.182.600	23.286.390	57.352.164
	Cumulative	4.420.356.228	94.692.495	185.846.873
2018	May	866.805.808	346.978.953	65.025.175
	Cumulative	3.864.088.229	896.035.773	228.414.105
2019	May	1.013.737.508	41.716.908	67.251.666
	Cumulative	4.942.433.515	166.658.989	479.389.566
2020	May	628.070.316	37.030.094	81.147.490
	Cumulative	4.970.580.772	105.914.237	316.382.937
2021	May	661.733.915	53.258.295	35.646.962
	Cumulative	4.130.822.700	136.650.259	307.793.327

Sources: [5 - 9]

Table 1 shows that from 2017 to 2021, Indonesia imported wheat, rice and corn. Indonesia imports wheat is understandable, because Indonesia's wheat production is very small compared to its consumption. Facts show that Indonesia also imports rice and corn to meet the needs of consumers, both industrial and household, even though the cultivation of rice and corn is very intensive by most farmers. This situation is caused by various weaknesses in the development of cereal crops in Indonesia, such as: alternately planted on the same land, the area of land per farmer is narrow on average less than 1 hectare, harvesting one type will lack the other, planting intensity is very high and intensive, especially on the island of Java which resulted in a decrease in the organic matter content of the topsoil, has not been able to meet the consumption of wheat flour (wheat) except imports, has not maximized the potential of sorghum as an alternative substitute for other cereal products. Therefore, it is necessary to immediately improve the cultivation of cereals to reduce dependence on imports of wheat, rice, and corn. The most likely alternative is to optimize the function of sorghum as a substitute for wheat, rice, and corn.

3. POTENTIAL SORGHUM

Sorghum is a cereal crop that has a lot of potential that is very valuable with a variety of product contributions it produces [10]. Parts of the sorghum plant, such as seeds, seed stalks, leaves, stems and roots, can be used as industrial raw materials. Seed stalks (panicles) can be used as material for making brooms or handicrafts. Sorghum seeds can be cooked as rice, porridge, and can be processed into flour which has the potential to substitute wheat flour (wheat) as an ingredient for making bread. Sorghum leaves are useful as animal feed for mammals and can also be used as organic fertilizer. Sap from sorghum stalks can be processed into syrup, sugar, bioethanol and others. Sorghum stalk dregs can be used as a mixture of planting media. The great potential of sorghum, especially its seeds, is supported by its chemical content [11] which is not much different from the chemical content of other cereal crops such as rice, corn, and wheat (Table 2).

Table 2 Nutrient composition of sorghum and other cereals

Cereal type	Protein (g)	Fat (g)	Crude fibre (g)	Carbohydrate (g)	Energy (kcal)	Calcium (mg)	Iron (mg)
Sorghum	10.4	3.1	2.0	70.7	329	25	5.4
Rice (Brown)	7.9	2.7	1.0	76.0	363	33	1.8
Wheat	11.6	2.0	2.0	71.0	348	30	3.5
Maize	9.2	4.6	2.8	73.0	358	26	2.7
Per Millet	11.8	4.8	2.3	67.0	363	42	11.0
Finger Millet	7.7	1.5	3.6	72.6	336	35	3.9

Source: [11]

Table 2 shows that the nutritional content of sorghum seeds contains higher protein than rice and corn and lower than wheat. The fat content is higher than rice and wheat and lower than corn. The crude fiber content is higher than rice, the same as wheat and lower than corn. The content of carbohydrates, energy, and calcium is lower than rice, wheat and corn. Sorghum has a higher iron content than rice, wheat, and corn. In general, it can be said that the nutritional content of sorghum is more or less equivalent to that of rice, wheat, and corn, so it has the potential to complement and even substitute for the function of rice, wheat and corn as a source of carbohydrates.

In Europe and Japan, the consumption of sorghum flour-based foods is increasing, mainly due to the

increasing number of people experiencing celiac disease [12]. An increasing number of people are experiencing celiac disease, an autoimmune disease whose symptoms appear as a result of consuming wheat flour-based foods that contain gluten. Sorghum flour that does not contain gluten [11] is very prospective to be developed in a healthy diet.

Sorghum has good agronomic potential, so its cultivation management is easier when compared to rice, wheat, and corn. The minimal agronomic potential of sorghum includes:

- 1) Reliable to support national food diversification made from local food.
- 2) All parts of the plant have economic value.

- 3) Can substitute wheat flour and its processed products.
- 4) Sorghum is mature and can be harvested at the age of 80-110 days.
- 5) Sources of carbohydrates, foodstuffs, animal feed, and export commodities.
- 6) Sorghum is usually grown through seeds or stem cuttings.
- 7) Resistant to drought and inundation when compared to other secondary crops.
- 8) Optimum temperature 23-30 degrees C.
- 9) Relative humidity 20-40% and rainfall 375-425 mm.
- 10) Can grow on almost all soil types and pH 5.0-5.5.
- 11) Can grow well on marginal land, does not disturb land for rice and corn
- 12) The productivity of sorghum in Indonesia is around 4-6 tons/ha, there are even varieties that reach 10 tons/ha.

Sorghum also has economic potential because it can increase farmers' household income. In Gunungkidul Regency, which is famous for its dry, barren lands, sorghum contributes 2% of the total family income [12]. The contribution of sorghum was obtained from planting sorghum as a filler for the vacant land in the second dry season. Sorghum yields have not been processed to obtain higher added value products. Sorghum seeds are sold for bird feed, while the stems and leaves are partly used for animal feed and partly sold. This simple cultivation of sorghum generates farm income of IDR 2,754,794 per hectare and income of IDR 1,973,144 per hectare (Table 3).

Table 3 Revenue, costs and income of sorghum farming on marginal land in Gunungkidul Regency.

Component analysis	Per Farm (Rp.)	Per Hectare (Rp)
Total Revenue (a)		
Sorghum Seeds	236.800	1.480.000
Sorghum Stem	203.967	1.274.794
Total Cost (b)		
Seeds	6.450	40.313
Urea Fertilizer	16.500	103.125
TSP Fertilizer	4.767	29.794
Manure	16.480	103.000
Ponska Fertilizer	3.467	21.669
Others	4.567	28.544
Workers Outside the Family	72.833	455.206
Sorghum Farming Income (a-b)	315.703	1.973.144

Source: [13]

Table 3 shows the results of the analysis of the income of sorghum farming in Gunungkidul Regency. Even though it was carried out in a very simple way in the second dry season, it was able to contribute to the income of farming families. Of course, it is not easy to find types of plants that can be produced in extreme dry land such as in Gunungkidul Regency.

4. MARGINAL LAND POTENTIAL

Rice and maize farming in Indonesia is carried out on fertile land with good irrigation channels, meanwhile wheat is cultivated by a small number of companies to produce raw materials for their factory products. However, Indonesia still imports rice and

corn, let alone wheat. The cereal crop that is most likely to be developed to reduce dependence on imports, especially wheat, is sorghum, because it has the same nutritional content and can grow well on marginal land, so it does not interfere with the intensity of rice and corn planting.

Marginal land is also called sub-optimal land (LSO) [14] is land that has low quality soil for plant growth and development, because there are several limiting factors. The limiting factors consist of land slope, parent material dominance, poor in nutrients and organic matter, low moisture content, pH that is too low or too high and drought. There may also be accumulation of metallic elements that are toxic to

plants. Marginal land area in Indonesia reaches 157,246,565 hectares and 91,904,643 hectares (58.4%) [15] can be used for food crop agriculture, especially sorghum.

Cultivation of sorghum on marginal land will be easier than other crops. Sorghum can grow well on dry land in Gunungkidul Regency [12]. Optimizing the function of marginal land is very important to increase the extensification of sorghum production. The increase in sorghum production will increase the reserves of local carbohydrate sources and is expected to reduce imports of wheat.

5. CONCLUSION

The COVID-19 outbreak is not yet certain when it will end, but the damaging effects have already occurred. It can be expected that it will greatly affect the food security of the community. Purchasing power declines, food prices may rise, foodstuffs may become scarce or insufficiently available. This makes it difficult to get basic food ingredients. On the other hand, dependence on imported carbohydrate sources is very high, especially wheat. Therefore, as early as possible there must be an effort to increase the availability of food ingredients as a good source of carbohydrates to overcome the impact of the Covid-19 outbreak while reducing imports of wheat.

Extensification of sorghum cultivation on marginal land is the best alternative to increase the availability of carbohydrate sources. Sorghum plants can produce well on marginal land, so as not to reduce the planting area of rice and corn. Indonesia still has around 60 million hectares of uncultivated marginal land. Increasing sorghum production on marginal land is the most likely solution to reduce the government's annual wheat imports.

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