

# UNIVERSITAS SUMATERA UTARA SUSTAINABILITY REPORT 2022



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# FOREWORD

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Since its establishment until now, the University of Sumatera Utara has made a significant contribution through education, research and community service activities in various sectors of life. The activity highlights contributions to scientific research, technological advancement, innovation, community empowerment, and the achievement of national programs. Various national, regional, and international partnerships have been established by the University of North Sumatra in an effort to address global issues with the Sustainable Development Goals (SDGs) as the focal point.

As a higher education institution that prioritizes sustainable development, the University of North Sumatra has programs that are in line with the excellence and roadmap of TALENTA (Tropical Science and Medicine; Agroindustry; Local Wisdom; Energy (sustainable); Natural Resources (biodiversity, forests, marine, mining, tourism); Technology (appropriate) and Art (ethnicity). Through TALENTA, the university has supported SDG research and collaboration across all units. The report summarizes and highlights several activities including SDG-related teaching, research, collaboration, and innovation at the University of North Sumatra during 2022.

Our university is eager to achieve a higher global ranking in each SDG and a good ranking in the Times Higher Education (THE) Impact Rankings for the coming year. This goal will be supported by the active contributions of faculties, units, and students in education and research. We will continue to work hard to participate and contribute to society while also protecting the environment based on the SDGs. Scientific discovery, technological capabilities, and innovation will also support to achieve the goals. Thank you to all parties at the University of North Sumatra who have contributed in any way to the implementation of the SDGs. Thanks also to the team that compiled this Sustainability Report as a showcase of USU's contribution and efforts in the SDGs through our actions and work.



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## END POVERTY IN ALL ITS FORMS

The University of Sumatera Utara (USU) has played an active role in carrying out various activities aimed at realizing a world without poverty. The activities carried out include educational, research, and service activities as well as collaborative activities carried out together with regional, national and international agencies. Here are some of the activities that received funding from USU that are specifically directed at realizing a World Without Poverty.

### Fish Sensor Network (FSN) for supporting the coastal fishermen



One of the activities related to SDG goal number 1 is research conducted by Suherman, ST, M.Comp, PhD and teams in coastal areas in order to support local fishermen. This research focuses on developing fish sensor network (FSN) technology. FSN is an implementation of wireless sensor network (WSN), where the FSN network contains fish finder points that are set to be able to share data to the server to be able to map the location of fish in a water. The location that has been surveyed is the location of coastal waters in the Sicanang area. The sweep of the water location was carried out along the fishing route in Sicanang village, with exploration of the estuary floor using underwater radar. After obtaining the basic plan of the estuary and the potential of the fish nest, subsequently in the second year, the design, laying, localization and connection of sensors became a concern. Sensor localization is a problem because it is likely that the sensor will move easily. The connectivity of sensors to servers and information sharing with fishermen is the main job. 802.11, ISM and mobile networks are connectivity candidates. So far research has produced international proceedings indexed by Scopus. Journal publications are still in the draft stage.



### Evaluation of Medan City Law Concerning the Prohibition of Homeless and



The research conducted by Husni Thamrin, S. Sos, M.SP and his team is intended to contribute to the management of poverty. The research was conducted in the city of Medan. The population of vagrants and beggars from year to year is still in dire need of serious treatment from the central and local governments. Medan City already has a Regional Regulation Number 6 of 2003 concerning prohibiting Vagrants and Beggars as well as the practice of Tuna Susila in Medan City. Sumatera Utara Province has also issued a Regional Regulation of



Beggars as well as the practice of Tuna Susila in Medan City. Sumatera Utara Province has also issued a Regional Regulation of Sumatera Utara Province Number 8 of 2008 concerning the Handling of Vagrants and Beggars in Medan City at the Social Welfare Office of Sumatera Utara Province. However, from the results of various regulatory studies, it has not run optimally and cannot solve the overall problem of Homeless and Beggars. Therefore, it is necessary

to evaluate Medan City Bylaw Number 6 of 2003 concerning the Prohibition of Vagrants and Beggars as well as Moral Practices in Medan City with the hope that the evaluation can be a suggestion and also input to the Medan City Government in overcoming the problem of the rise of Vagrants and Beggars in Medan City and can be implemented in other Cities / Regencies in Sumatera Utara Province. Data collection techniques use observation, in-depth interviews and Focus Group Discussion (FGD), the data analysis used is qualitative data analysis. The outputs produced in this study are draft policies and rules in Medan City and articles that will be published in accredited international journals as mandatory outputs.

**Triple Helix Model Performance of Socio-Economic Empowerment Program for Coastal Communities in Medang Fishing Village, Medang District, Batubara Regency**



The empowerment of coastal communities is a concern of Dra. Dara Aisyah, M.Si, PhD and team. This activity is a research activity carried out in the Batubara Regency. Nowadays, there are many university findings in the form of community empowerment models and innovative works that have not been optimally utilized. The gap that occurs between academia, government and business from society needs to be bridged. Each has a strategic role in solving socioeconomic and environmental problems. This study was conducted in several Fishing Villages in Medang District, Batubara Regency, Sumatera Utara Province. Preliminary studies have photographed the socioeconomic problems of traditional fishermen, but have not photographed their needs (need analysis assessment), do not know where the potential waste utilization of each of their households goes, in order to be able to treat their waste utilization innovations with knowledge

transfer (action research) and conduct user analysis of the product innovations they receive and collaborate with the village government. The study uses a social engineering approach, providing assistance to form traditional fishermen groups that are entrepreneurial through USU fostered based on innovative products from their waste utilization. Coastal waste from household sources requires innovative solutions through a knowledge transfer program for the use of waste into products to be applied to the needs of traditional fishing families. The triple helix model is a study to make program recommendations through product innovation in order to improve the performance of the socioeconomic empowerment program of traditional fishing families through the collaboration of three parties. Programs will play an important role in providing solutions, especially in alleviating poverty.



## Financial Literacy as a Stimulus to Improve the Welfare of Serdang Bedagai Farmers



Munawarah, SE, M.Si and the team carried out financial literacy activities for the farming community in Serdang Bedagai. Serdang Bedagai Regency as one of the regions in Sumatera Utara Province has a high source of income in agriculture. More than 75% of people have a livelihood as farmers by managing paddy fields. In fact, most farmers have a low level of welfare, marked by the rampant practice of borrowing money from middlemen or illegal pawns as an alternative source of farmer funding to meet urgent needs such as consumption, education, and health. Gradually, paddy fields that were supposed to be productive assets had to be released free of charge due to the inability of farmers to settle obligations. This condition is very detrimental to farmers due to the lack of clear sources of information related to

finances. This study aims to assess the extent of the influence of farmers' financial understanding in improving their welfare. Good financial literacy will be in line with good financial inclusion, because it has a fundamental understanding of the principles of productive asset governance, so that it can take advantage of financial instruments that are minimally risky, legal because they are supervised by the government. The results of the study obtained Financial Inclusion has a positive and significant effect on the Welfare of Farmers in Serdang Bedagai Regency. Financial literacy directly affects the welfare of farmers. Meanwhile, financial literacy does not have a significant effect on the welfare of farmers. However, financial inclusion can mediate the influence of financial literacy on the welfare of Serdang Bedagai farmers.

## Utilization of Integrated Data for the Poor Handling Program (Dt Ppfm) through the Implementation of the Covid-19 Assistance Program in Medan City



Activities related to handling the poor were carried out by Siti Hazzah Nur, S.Sos, M.AP with a team in the city of Medan. The problem of poor people who are targeted by social assistance programs is that the data of people as beneficiaries is invalid. The government provides social assistance for communities impacting PPKM, namely the Cash Social Assistance Program (BST) through the Social Service Office. The purpose of this study is to see how the process of utilizing the Integrated Data of the Poor Handling Program (DT PPFM) by the Social Service Office in the implementation of the Social Cash Program (BST) using qualitative research methods with a descriptive approach. Using data collection techniques from interviews, observations, and documentation studies and using qualitative data analysis of Miles, Huberman and Saldana interactive models. The findings of the interim study show that the use of Integrated Data on the Handling of the Poor (DT PPFM) by the Social Service in the

implementation of covid19 assistance in Medan City has not been carried out at all. The integrated Data used in determining the beneficiary community is the Integrated Social Welfare Data (DTKS). This is in accordance with the Regulation of the Minister of Social Affairs Number 3 of 2021 concerning Integrated Data Management of Social Welfare. Therefore, this study further looked at the use of DTKS in the implementation of covid19 assistance. However, many vulnerable communities that emerged after the impact of covid19 were not targeted by the covid19 assistance provided. The final results of this research are in the stage of preparing a draft that will be published through scientific publications in the form of accredited international journals which are planned to be published in 2022 in Jurnal Social Work/Maatskaplike Werk (South African academic peer-reviewed journal).





## Community Empowerment in Herbal Medicine Production in Pondok Tengah Village, Pegajahan District, Serdang Berdagai Regency



Community service activities were carried out by Dr. Nurman Achmad, M.Soc.Sc and his team to increase the productivity of women in Pegajahan Village, through HAPSARI partners conducting community empowerment programs in herbal medicine production to overcome poverty to reach 8.40%, low levels of education, and job feasibility and economic growth. For this reason, this program empowers women to improve their quality by providing self-skills training so that they can create their own jobs, namely herbal medicine businesses. The desired goal and target of this program is that the community can understand and be able to produce herbal medicine so that they can have their own herbal medicine business. Community service activities in community empowerment in herbal medicine production in Pegajahan District that have been carried

out are at the planning stage, namely assistance in making herbal medicine according to standards and the delivery of infrastructure needed to support herbal medicine production. This can support the fulfillment of solutions to problems faced by partners, namely the production of herbal medicine according to standards and supervision, herbal medicine production equipment to improve time and process efficiency. The next activity that will be carried out is the implementation or implementation stage in the form of seminars and workshops on making herbal medicine according to standards and business management and the distribution of modules and activity assessment surveys. This is to support the productivity and skills of the community in Pegajahan District for business management and productivity

## Increased Rendement of Charcoal and Liquid Smoke Production in Micro, Small and Medium Enterprises Baluse Kanira North Nias



Saharman Gea, Ph.D dan tim melaksanakan community service activities with the Baluse Kanira micro, small and medium enterprises (UKM) unit are partners that will be fostered by the community service team (abdimas) of the University of Sumatera Utara(USU). MSMEs Baluse Kanira is engaged in the production of coconut shell charcoal. So far, these MSMEs have experienced difficulties with charcoal production with low quality and yield. In addition, thick smoke is also a health problem for local residents due to the burning of coconut shells. Through this program, the USU community service team provided a solution in the form of designing a pyrolysis reactor that can produce charcoal with high yields while producing liquid smoke that can be used as a food preservative. The reactor is designed with a double condenser that can convert smoke into high-grade liquid smoke. To increase the amount of charcoal produced,

a hermetically sealed pyrolysis reactor is introduced so that oxygen cannot interact with the charcoal and produce high and even heat. This activity is in accordance with the spirit carried out in the concept of Sustainable Development Goals (SDGs), namely a healthy and prosperous life and decent work and economic growth. The same thing is expected that through this community service activity will give value to the main kiner indicators (IKU), especially IKU 2, namely students get experience outside the campus by actively involving 5 students and also IKU 5, namely the results of lecturers' work used by the community. It is hoped that the manufacture of this pyrolysis reactor can provide an increase in the income of fostered partners in line with increasing the quality and quantity of products, activity videos, and scientific articles as well as Intellectual Property Rights (IPR).



## END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION AND PROMOTE SUSTAINABLE AGRICULTURE

Food security is an important part of supporting people's welfare. Achieving food security can prevent hunger, improve people's nutrition. Food security can be realized by activities related to sustainable agriculture.

### Additional Food for Pregnant Women in the Form of Biscuits Modified Yellow Pumpkin and Moringa Leaves and Peanuts as a Prevention of Stunting in Tapanuli Utara Regency



The study entitled "Supplementary Food for Pregnant Women in the Form of Biscuits Modified Yellow Pumpkin and Moringa Leaves and Peanuts as a Prevention of Stunting in Tapanuli Utara Regency" conducted by Ir. Etti Sudaryati, MKM, Ph.D. and his team discussed the use of local plants in North Tapanuli as additional food for pregnant women that can prevent stunting, such as yellow squash and peanut plants which are the most common local foods found in North Tapanuli. Moringa leaves are a plant that is being cultivated in North Tapanuli. The purpose of this study is to analyze the additional food of pregnant women in the form of biscuits modified yellow pumpkin and Moringa leaves and peanuts as a prevention of stunting in North Tapanuli Regency. This research method is quasi-experimental design with a pretest posttest control group design, which is to compare the treatment group and the control group. The treatment group was a group of 3rd trimester pregnant women who were given PMT in the form of biscuits modified moringa leaves, yellow squash and peanuts, for 30 days. The control group is a group of pregnant women who are only given nutritional information through the MCH book without being given PMT. Blood Add Tablets were also given to these 2 groups in both the control group and the intervention group. The biscuits given for



the previous intervention were tested for acceptability from 3 modified treatments of biscuits made from local food, then the most preferred biscuits of the 3 treatments to be given to the intervention group. In addition, the composition of the nutritional content of biscuits is analyzed in the laboratory. Examination of the health status of the mother and the child born was measured in this study such as the status of SEZ and anemia of pregnant women, as well as the length and birth weight of the baby. Consumption data with the 24-hour recall method was measured at the beginning of the study. Based on the above exposure, this study is expected to be one of the solutions to stunting in Tapanuli Utara.



## Classification and Characterization of Indonesian Green Bean Coffee Based on Geographical Indications Using FT-NIRS



Putri Chandra Ayu, STP, M.Si carry out research activities related to coffee products. So far, coffee bean exporters have applied sensory analysis with the cupping test method in determining coffee traceability based on geographical indications (IG) and determining the quality of coffee beans. A method is needed that can classify and characterize coffee beans based on their variety and growing location (IG) and determine the quality of coffee beans quickly, efficiently and nondestructively, one of which is to use the Fourier Transform - Near Infrared Reflectance spectroscopy (FT-NIRS) method. The purpose of this study is to characterize rice coffee beans from four islands in Indonesia (Toraja, Flores and Kintamani arabica coffee and Mandailing robusta coffee) based on geographical indications and to determine the chemical content of coffee beans quickly, efficiently and nondestructively using FT-NIRS which can be



applied to the Indonesian coffee industry (farmer cooperatives, exporters and coffee processing industries). The development of the NIRS model was carried out by measuring the reflectance of coffee beans, measuring the chemical properties of coffee beans and predicting the chemical content of coffee beans using the best calibration model between processed coffee bean reflectant data and their chemical levels using Partial Least Squares (PLS) and Stepwise Multiple Linear Regression (SMLR). The results showed that the NIR spectroscopy method can be used to build a model for determining the chemical content of Indonesian coffee beans using the PLS method.

## Evaluation of Local Irrigated Rice Diversity from South Tapanuli Based on Morphological and Agronomic Characters



Research conducted by Rahmatika Alfi, SP, M.Si and team on evaluating the diversity of irrigated rice. Rice is still a staple food, including in Indonesia. Irrigated rice is the highest contributor to crop yields compared to other types of rice. Local rice usually has resistance to pests and diseases, as well as a taste that is preferred by the locals. But local rice usually has a deep lifespan, and if released as a commercial seed (blue label) the results displayed are unlike their natural habitat.

This activity aims to evaluate the morphological and agronomic character of local rice from South Tapanuli. The research was conducted on the experimental land of the Campus of the Faculty of Agriculture, University of North Sumatra, from October 2022 to 2023. The study used a Randomized Group Design and will be further tested with the Duncan Multiple Range Test (DMRT). Until the writing of this progress report was written, the local rice was still in the seeding phase.





### Analysis of Macronutrient Content in Catfish (Clarias sp.) Fed with Maggot Caterpillar Alternative Feed (Hemeticia illucens)



A healthy diet has promoted eating fish as one of the efforts to increase the intake of macronutrients as well as vitamins and minerals that are essential for the human body. Therefore, the content of nutrients in the fish also needs to be considered. The nutritional content of catfish is lower when compared to other freshfish proteins. Meanwhile, catfish production is a fishery cultivation that is widely produced. Many catfish farming today has used alternative feed, one of which is to use maggot caterpillars. Maggot caterpillars are organisms that can decompose organic waste to thrive. The use of maggot caterpillars that are rich in protein as an alternative feed provides many advantages and benefits for catfish cultivation, but there

have been no studies that look at the nutritional content in catfish that are given alternative feed for maggot caterpillars. The research of Risanti Febrine Ropita Situmorang S.K.M., M.Sc and his team was an experimental study using a complete randomized design with 3 treatments (giving 100% pellets, 50% pellets and 50% maggots, and 100% maggots). This study aims to see the differences in macronutrients in catfish that are given three different treatments. The results showed that the growth of catfish given 100% pellets and 50% pellets + 50% maggots was faster than catfish that were only given maggots. The next step of this study is the analysis of macronutrients in the Laboratory.



### Overcoming Wasting and Stunting in Toddlers through an Integrated Model of Nutrition Education and Local Food-Based Supplementary Feeding in Medan City



Dr. Ir. Zulhaida Lubis, M.Kes and his team carried out research related to nutritional problems in toddlers. One strategy to overcome the problem of malnutrition in toddlers is to improve their food intake. From the results of the initial survey, it is known

that Percut Sei Tuan District, Deli Serdang Regency, has local food potential that can be utilized from marine products such as fish, shrimp, etc. This study is a quasi-experimental study with a 'pre-test post test nonrandomized control design' design conducted on 30 Wasting toddlers (treatment group) and 30 Wasting toddlers (control group) in Percut Sei Tuan district. The treatment group was given local food PMT for 1 month to be eaten daily with different preparations. Measurement of Nutritional Status (BB, TB), Food Intake and Consumption Patterns measured pre- and post supplementary feeding. Analysis of the effect of PMT administration on nutritional intake,



and weight and height improvement of toddlers was carried out with pre- and post-test differences with a 'paired T test' and an "independent t" test to analyze differences in the treatment group and control group. The results that have been obtained to date are pretests to determine the nutritional status and level of children's food consumption as well as maternal nutritional knowledge. The results were obtained that from the pretest in 2 villages (Percut and Bandar Khalifah, 33 stunted children and 32 wasting children were found. Most mothers have been good at 77.1 percent. Meanwhile, the level of nutritional adequacy of children (energy,

protein and carbohydrates) is generally in the category of lack and deficit. The next plan is the intervention stage in the form of nutrition education and pmt based on local food (fish and shrimp) for 1 month and conducting a post test to find out the impact of the intervention provided. The output of this research as planned is an article in a reputable international journal and patents for processed fish products. Additional outputs in the form of national journal publications and recommendations (policy brief) for the model of overcoming Wasting toddlers and stunting in the Deli Serdang Regency government.

### Shelf Life Analysis of Mushroom Broth Merang Tankos Village Hornan Raga TPC Method



Community service activities have been carried out by Liana Dwi Sri Hastuti, M. Si., PhD and the team. Most of the people and farmers of merang mushrooms have not been productive in Hornan Raga Village, Deli Serdang. This is a consequence of farmers' knowledge of minimal post-harvest handling so that the marketing of merang mushrooms and the development of processed products based on merang mushrooms are still very simple and have not been able to compete in the market. The production and breeding of mushrooms is not a major problem for mushroom growers today, but rather

mushroom-based processed products to improve their marketing. In addition, several previous studies have tried to process the mushrooms into food flavorings. This is supported by data that the amino acid content of the fungus, especially glutamic acid, is quite high. Therefore, in order to ensure sustainable production and consumption patterns, in this community servant research, a new breakthrough will be proposed in the form of processing palm oil tankos merang mushrooms (*Volvariella volvacea*) in Hornan Raga Village into natural flavorings accompanied by an analysis of shelf life using the TPC method.

### Innovation in the Use of Fermented Palm Fronds Using Local Microorganisms to Increase Cow Productivity in Batu Malenggang Village, Hinai District, Langkat Regency



Community service activities have been carried out by Dr. Ir. Ma'ruf Tafsir, M.Si and team. This activity was carried out in Batu Malenggang Village, Hinai District, Langkat Regency. This activity will be held from May to November 2022. The partner of this activity is a group of beef cattle breeders located in Batu Malenggang Village, Hinai District, Langkat Regency, Sumatera Utara Province. The purpose of implementing this activity is 1) so that farmers use palm leaf frond waste as

animal feed 2) Farmers can process palm leaf frond waste by fermentation method utilizing local microorganisms. 3) training on how to raise beef cattle so that livestock productivity increases 4) to develop the business of beef cattle farmers. The output target to be achieved from this activity program is that farmers can process agricultural waste into animal feed using the fermentation method. The details of the resulting program outputs include: 1) training and assistance services



for processing agricultural and plantation waste into animal feed 2) Standardized Products 3) Activity videos 4) Scientific articles. 5) Mass/Online Media. The results obtained after training 100% of the community are interested in feed management of slaughter livestock maintenance by 60%, management of disease management by 24%, maintenance management by 8% and management of selection of prospective 8%,

then the Service Team in addition to teaching palm frond processing using fermentation methods using local mycoroorganism (MOL). It is also taught to make silage as an alternative to be able to store abundant forage in the rainy season so that it can be used in the dry season. Silage is a fresh wet preserve that is stored in a silo, then hermetically sealed and airtight, under anaerobic conditions.

### Waste treatment technology with an All Out system in an effort to improve environmental biosecurity, livestock health and farmer income at Activist Farm farm



Dr. ADE TRISNA, S.Pt, MM and the team carried out community service activities on a farm. Sheep goat farming "Activist Farm" is a sheep farm that was established aimed at increasing family income and with the concept of integrating livestock whose target is to meet the protein needs of the community and the fulfillment of livestock seeds as a center for the production of goats and sheep in North Sumatra. The specific target of this service activity is that farmers are able to determine potential alternative feeds to be given to goats, are able to make probiotics for fermentation, complete fermentation and formulate rations, understand good farm management and efforts to improve biosecurity in supporting livestock health and the environment. The service method is

packaged in the form of lectures, discussions, demonstrations, training and pilots (pilot projects). Service activities are summarized in a guidebook in the form of a Management Module for Maintaining Goats and Sheep. From this activity, it is targeted that there will be cost efficiency (saving animal feed costs because it can utilize alternative sources of feed ingredients), formulating and making independent concentrate feed, saving the cost of purchasing probiotics and organic fertilizer fermentation methods. The service is planned to be carried out at the Activist Farm farm in Sidingkat Village, Gunung Tua District, Padang Lawas Regency, Sumatera Utara+ km from the USU Campus. The location is not too far away so that the implementation of activities and monitoring will be easier.

### Effect of Nusantara Diet on Fat Mass and Metabolic Syndrome Parameters



Prof.dr. Nur Indrawaty Lipoeto, M.Sc,PhD, Sp.GK Faculty of Medicine - Andalas University; dr Agussalim Bukhari, MMed Clin, PhD / Faculty of Medicine / Hasanuddin University; Prof.Dr.dr.Dina Keumala, M.Gizi / Faculty of Medicine / University of Sumatera Utaracarried outcollaborative researchon the archipelago diet. This study aims to prove that the Nusantara Diet is a healthy diet and can be used in overcoming Metabolic Syndrome. This research was conducted for the first time by compiling a menu consisting of the

Nusantara Diet which qualifies as a Healthy Balanced Menu but low in calories, low in salt. Furthermore, research will be carried out by giving this diet to subjects who have been screened and suffer from Metabolic Syndrome. Dietary interventions will be carried out on 50 subjects of the Intervention group and 50 subjects of the control group in Padang City (from Andalas University researchers), 25 subjects of the Intervention group and 25 subjects of the control group in Medan City (from researchers of the



University of North Sumatra), 50 subjects of the Intervention group and 50 subjects of the control group in Makassar City (from researchers of Hasanuddin University). The intervention group will receive nutrition consultations, menu arrangements and examples of the Nusantara Sehat Diet for 8 weeks. The control group will receive a nutritional consultation at the beginning of the study. Before and after the study, weight, waist circumference, blood pressure and the proportion of fat and non-fat were examined with a Body Impedance Analyzer tool. The results of the study were presented by

looking at changes in body weight, waist circumference, blood pressure and the proportion of fat and non-body fat.

The results of this study show that giving a balanced Nusantara diet with low calories for 8 weeks can lose weight, and blood pressure. It can significantly lower BMI, fat mass, waist circumference. The Indonesian diet is a diet that can be compiled into a healthy diet. It is necessary to disseminate this information to the wider community so that the public knows and accepts Indonesian food as part of a healthy lifestyle.



## ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL AT ALL AGES

Health-related activities refer to SDG number 3, namely ensuring a healthy life and promoting well-being for all people of all ages. Through teaching, service and research activities, the University of Sumatera Utara plays an active role in achieving these goals.

Various activities have been carried out during 2022. Such activities are carried out by teaching staff and researchers. In service activities, there are partners who are an important part in achieving these goals.

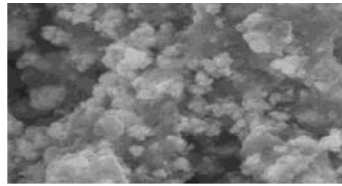
### Antibacterial And Antioxidant Activity Of Sungkai Leaf Silver Nanoparticle (Peronema canescens Jack.) And Poguntano Herba (Picria fel-terrae Lour.)



Prof. Dr.rer.nat. apt. Effendy De Lux Putra, S.U. and his team conducted research on anti-bacterial and antioxidants. The sungkai plant (*Peronema canescens* Jack) is one of the herbal medicines found in Indonesia. Antibacterial activity tests of pathogenic bacterial strains were used for antibacterial screening of silver nanoparticles of sungkai leaves and poguntano herbs against *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Propionibacterium acnes* and *Pseudomonas aeruginosa* and MRSA. Inhibits the growth of bacteria. the growth and number of bacteria < 10 colonies, as well as biofilm testing and calcium and potassium analysis. The results of characterization using PSA show the overall average diameter size of silver nanoparticles that have been successfully synthesized ie. The results of this characterization support the results obtained using UV spectrophotometers. The size in the resulting nanoscale proves that breadfruit leaf extract has potential as a reducing agent in the synthesis of silver nanoparticles. SEM analysis aims to show the morphology of particles. The morphology of

nanoparticles shows that nanoparticles have varying shapes and sizes explaining that the varying sizes result from the effects of nanoparticle aggregation and have non-uniform particles. There are several compounds contained in breadfruit leaves, including antioxidant compounds that fall into the polyphenolic group. The peculiarity of polyphenol compounds is that they have an O-H group and several aromatic rings characterized by an aromatic C=C group. The results of this FT-IR test show results that indicate the presence of tannin, polyphenol and flavonoid compounds. A UV-vis spectrophotometer is used to determine the characteristics of nanoparticles formed based on their peak absorbance spectrum. Characterization of silver nanoparticles of breadfruit leaves using a UV-Vis spectrophotometer in the wavelength range of 400–800 nm obtained a maximum wavelength at 415 nm and the results obtained from EDS give a clear indication of the nanoparticle element. The strong signal of the silver atom confirms that silver nanoparticles contain pure silver.





### Development of facial serum cosmetics containing a combination of nanogold, hyaluronic acid, collagen and olive oil as anti-aging



Imam Bagus Sumantri, S.Farm., M.Si., Apt. and the team carried out anti-aging research. Skin aging caused by external factors through the process of exposure to free radicals can be prevented with antioxidants. Nanogolds, olive oil, hyaluronic acid and collagen contain phenol-derived antioxidant compounds such as tannins and flavonoids that can ward off free radicals due to sun exposure. Serum is a preparation with an active substance of high concentration and low viscosity, which can deliver the active ingredients of a thin film on the skin.

To formulate a facial serum preparation containing a combination of Nanogold, olive oil, hyaluronic acid and collagen that is stable and does not irritate the skin and test the effectiveness of the serum as an anti-aging preparation.

In year I, the stages of research carried out were the preparation of ingredients, the orientation of serum formulas containing a combination of Nanogold, olive oil, hyaluronic acid and collagen, optimization of formulas to be up-scale, antioxidant testing with the DPPH method, accelerated stability testing, preclinical irritation testing, brand submissions, distribution permits and halal certificates

The serum product orientation that has been carried out contains Nanogold, olive oil, hyaluronic acid, collagen, sorbitol, tween 80, Hydrogenated castor oil, propylene glycol, preservatives and aquadest. Preliminary irritation testing is performed with pH testing ranging from 5.5-6.0. This product has been branded under the name Co-Hyang.



### Use of Mikania Micrantha Extract Nanogel Against Diabetic Wound Patients Topically



Ismayandi, S. Kep., Ns., M.Kes and team members have carried out research related to diabetic wounds. The prevalence of diabetes mellitus is increasing every year. In adults aged 20-79 years, the prevalence of diabetes in the world increased to 6.4% affecting 285 million people in 2010 and is estimated to increase to 7.7% by 2030 and

affect 439 million people. The number of diabetics has increased by 69% in developing countries, including Indonesia (Shaws, et al, 2010).

Based on the results of the research conducted, simplisia and Mikania micrantha extract contain alkaloids, tannins, saponins, triterpenoids / steroids, flavonoids and



glycosides. Characterization of simplicia shows a moisture content of 9.31%; ethanol soluble juice content of 18.45%; water-soluble juice content of 21.87%; the total ash content is 15.47% and the acid insoluble ash content is 3.97%. Characterization of the extract showed a water content of 17.27%; the total ash content is 22.55% and the acid insoluble ash content is 8.09%. The nanogel formulation is prepared by converting a 2% concentration of Mikania micrantha extract in nanoemulsion form to a nanodroplet form. The nanogel preparation obtained is a gel preparation

measuring 450 nm, green, with a distinctive aroma with a pH of 6.1. Wound healing test in diabetic rats on the left and right legs with observations for 14 days. The test groups carried out were positive control, negative control, Mikania micrantha extract gel, and Mikania micrantha extract gel. On the left leg, the wound healing activity showed positive control had the best effect with % healing of 94.25%, while in the right leg, right wound healing showed that the nanogel extract of Mikania micrantha had the best effect with % healing of 94.25%.



### Differences in the Effect of Black Tea on Saliva in Patients with Caries and Non-Caries



Atika Resti Fitri, drg., M.Sc and the team carried out research related to caries. Dental caries is a multifactorial disease, that is, it cannot be caused by one cause alone. The causes of dental caries are related to four main factors, namely, oral bacteria in dental plaque, the presence of fermentable carbohydrates, the surface of the teeth themselves, and time. Saliva can play a role in preventing dental caries related to the role of pH, flow rate and salivary proteins. An increase in the salivary flow rate can be done by providing stimulation, one type of stimulation that can be given is tea. Black tea (*Camellia sinensis*) is a type of plant that contains catechins and has been shown to be useful against saliva, so it can prevent the occurrence of caries. However, research into

the benefits of black tea against saliva is still limited. The purpose of this study was to determine the difference in the effect of drinking sidamanik black tea (*Camellia sinensis*) on pH, flow rate, lysozyme and salivary sIgA in patients with caries and caries-free. This research method is quasi experimental design with pre-test and post-test designs. Saliva is collected before and 30 minutes after drinking tea. The salivary flow rate by weighing the collected saliva is divided per time, and lysozyme and sIgA are examined using ELISA. The mandatory outputs targeted at this study are the publication of articles in indexed international journals, as well as additional outputs in the form of article publications in international journals.



### Mapping Occupational Safety and Health Risks Using the Siriska Online Smart Application (Work Risk Mapping System) for Palm Oil Harvester Workers at PTPN IV Adolina Plantation





Dr. Umi Salmah, SKM, M.Kes and the team carried out mapping of occupational safety and health risks. The dominant plantation land in Indonesia is oil palm land. The potential for accidents in the work of oil palm plants is when the harvester harvests the oil palm (grinding). Data that is very important with the aim of preventing work accidents with this science approach already has the desired information, but in the era of digitalization 4.0 prioritizes the element of speed of the availability of information, where all entities of an industrial environment are always connected & can share information with each other. With fast information and not using traditional systems anymore, it will make it easier for us to make decisions and control measures, especially occupational safety and health issues.

The writing of the report on the results of the accident investigation and its analysis using the standard form of filling in the work accident report is made by referring to the Regulation of the Minister of Manpower No.

03 / MEN / 1998 and the Decree of the Director General of Industrial Relations Development and Manpower Supervision of the Ministry of Manpower. Writing reports on the results of accident investigations and their analysis using predetermined form standards is quite good, but in reporting it is rarely done because it is considered a complicated procedure, especially using the traditional file system. One of the applications that will be designed to provide accurate data is the online intelligent application SIRISKA (Work risk mapping system), with the way of work every worker can report the risk of work accidents, accidents and cases of work accidents easily that workers and others can do in the application, as we know in this day and age everyone has a cellphone, so that SIRISKA can be used by anyone who knows about work accidents and almost wretched events. It is hoped that in the future the SIRISKA application can be applied to every job and can be used by every worker.



### Cleft lip and palate rehabilitation center



Syafrinani, drg., Sp.Pros (K) and the team have carried out community service for handling cases of cleft lip and palate. Mitra Sejati Hospital Medan and Dental and Oral Hospital of Sumatera Utara University Medan are hospitals in Medan that handle many cases of cleft lip and palate, because they have collaborated with the Smile Train Indonesia Foundation (around 150 cases per year). However, the treatment given so far is only limited to surgical treatments, but other treatments such as making feeding plates and NAM devices are not facilitated, so the food intake process is disrupted and causes the general health and weight of patients to be difficult to increase. To solve this problem, we plan to make a feeding plate as a feeding aid for babies with cleft lips and palate. Pre-

surgical treatments such as the use of pre-surgical NAM devices are to reshape the gums, lips, and nostrils before CBL surgery to reduce the level of the gap. In addition, postoperative speech therapy is also required. This speech therapy can help in reciting various words that are used daily to communicate and train the child to regulate breathing when speaking. The mandatory output of this service is the publication of accredited national journals. An additional output of this devotion is services and goods. Services in the form of comprehensive CBL patient care. Products in the form of feeding plates as feeding aids and pre-surgical NAM devices to reduce the severity of deformation. The method carried out to achieve the purpose of this service is the data collection of CBL patients in both hospitals, then conducting a general examination of the baby



assisted by a Pediatrician, printing the oral cavity and making feeding plates and NAM devices. Then an evaluation will be carried out whether the baby can drink milk normally

using a bottle. Evaluation of weight gain is carried out every one month until it is declared that the baby is ready for surgery and speech therapy is carried out

### Improving the Quality of Public Health through the Implementation of "Megermet" Behavior and Training on First Aid for Acute Pesticide Poisoning in Peasant Women in Semangat Village, Merdeka District, Karo Regency



Community service activities were carried out by Evi Indriani Br Karo, SST, M.Keb and a team of women farmer groups. The use of chemical fertilizers (pesticides) is one of the biggest occupational health threats faced by farmer workers, especially women. Improper use of pesticides can have a negative impact on poisoning on its users. The causes are the low level of awareness about the negative effects of chronic diseases caused by pesticide exposure, lack of information about the risks of pesticide use resulting in pesticides often being used irresponsibly and inappropriately, both dosages and usage practices are inappropriate and unsafe and farmers often do not wear appropriate Personal Protective Equipment (PPE) when using pesticides. This community service aims to improve the quality of health of semangat village peasant women through the implementation of "MEGERMET" behavior and pesticide acute poisoning first aid training. The methods used are socialization, health checks, health education about pesticides and

their impact on health, procedures for using pesticides correctly through the behavior of "MEGERMET", demonstrations of the use of personal protective clothing (BPD) and Personal Protective Equipment (PPE) as well as first aid training on acute pesticide poisoning in women who are members of the Semangat village farmer group. The results of this community service activity show that there is an increase in the knowledge of semangat village peasant women about pesticides and how to use pesticides safely and healthily by 80%, semangat village peasant women are able to implement the behavior of "MEGERMET" as a procedure for using pesticides wisely and 80% of semangat village peasant women are able to carry out first aid in acute pesticide poisoning. To continue to support village peasant women The spirit of improving health and reducing the impact of the risk of pesticide use by forming an occupational health forum (UKK Post).

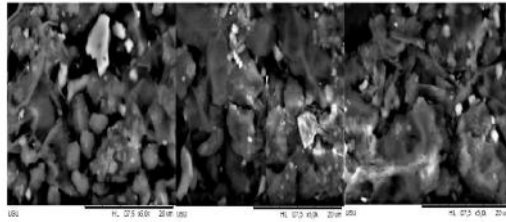
### Development of Nanoherbal Gagatan Harimau (*Vitis Gracilis* BL) as a Sexual and Non-Sexual Vitality Strengthening Agent of Male Rats (*Rattus Norvergicus*): Molecular, Hormonal, and Cellular Approaches



Prof.Dr. Syafruddin Ilyas, M.Biomed (USU); Dr.Drs. Yurnadi, M.Kes. (UI); Dr. Putra Santoso, M.Si. (UNAND) has carried out collaborative research. In conditions of physical activity causing hormonal and sexual and cellular disorders, it is very necessary to have alternatives to prevention and treatment. For example, the use of medicinal plants, which are environmentally friendly, do not create dependence, are easy and cheap to use, and do not have harmful

side effects. Plant species can be used as a source of medicinal materials in the medical world. One of them is the tiger gagatan (*Vitis gracilis* Wall) which contains many secondary metabolites, and among them flavonoids, terpenoids, and steroids that act as antioxidants and trigger the improvement of histological and physiological structures of organs. Especially the content of phenylethanoid glycosides in tiger gagatan extract which acts as a powerful antioxidant.

The study used a Complete Randomized Design with 5 test groups, namely (1) negative control group (without any treatment), (2) positive control (swimming until first sinking (bstp)). (3) bstp+Vitamin C 0.002 g/kg BB rats) (4) bstp +100 mg/kg BB rats) (5) bstp+125 mg/kg BB rats) (6) bstp+150 mg/kg BB rats). The number of replays per group of 5 mice from Federer's formula. Mandatory output: 1 article in Saudi Journal of Biological Sciences (Scopus Q1) and 4 other articles; Pharmaceutical Sciences



Gambar 1. SEM nanoherbal gagatan harimau (*Vitis gracilis* Wall.)

(Scopus Q2), Rasayan Journal of Chemistry (Scopus Q2), Journal of Pharmacy and Pharmacognosy Research (Scopus Q3), Pakistan Journal of Biological Sciences (Scopus Q3). The level of preparedness of research and development results is measured systematically, namely the basic principles of technology have been studied and recorded as well as the formulation of technological concepts and their application in using tiger gagatan leaves as a medicine for physical fatigue, impotence, and fertility.

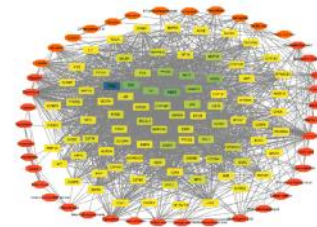


Figure 1. PPI network of 81 targets of *Vitis* against sperm and non-sexual oxidative stress. The brown octagon nodes represent bioactive compound *Vitis*; edges represent protein-protein associations. The larger degree value in the graph was visualized by the deeper color.

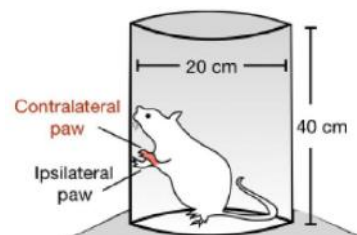
## Neuroprotector Effects of Red Palm Oil Supplementation On Dopaminergic Neurons in the Rat Brain Paraquat-Induced Parkinson's Model



Dr.rer.medic.,dr. M.Ichwan,M.Sc.,Sp.KKLP (USU); dr Nur arfian, Ph.D (UGM); Dr. Dinah Cherie, STP, MSi (UNAND); Dr. Hasrul Abdi Hasibuan, SSi., MSi (PPKS) has carried out collaborative research on red palm oil. Parkinson's disease is a neurodegenerative disease characterized by the loss of dopaminergic nerves in the brain. The incidence of this disease is increasing in the elderly population. In this study, rattus norvegicus wistar strain rat experiments were used intraperitoneally induced with Paraperitoneal every week for 3 consecutive weeks. Red palm oil is administered perorally, 3 weeks before induction is carried out until the end of the experiment. Before the rat was "euthanasia", a balance test and cylinder test were performed to see motor function as a symptom parameter of Parkinson's. At the end of the treatment, rats were euthanized and brain tissue was taken for antioxidant examination (GSH / GSSG, SOD, MDA),

levels of tyrosine hydroxylase and BDNF in brain tissue using the ELISA method. In the other hemispheres of the brain, histopathological examination with hematoxylin eosin staining is carried out to see brain damage in general and more specifically immunohistochemistry examination is carried out to check the number of dopaminergic nerve cells using antibody tyrosin hydroxylase and look at inflammation with GFAP markers and also markers of cleaved caspase-3 apoptosis.

In the early stages of this study, a trial has been carried out in the process of selecting fresh fruit bunches (FFB) with various levels of maturity so that it can be known the level of maturity that has the oil with the highest antioxidant content. The oil with the best antioxidant activity will continue for trials in animal models of Parkinson's disease





## Development of a School-Based Tele Pediatric Nursing Application (Telepednursapp) for Children Affected by the COVID 19 Pandemic for Mental Health and Psychosocial Recovery for Children in New Normal Life



Collaborative research conducted by Dewi Elizadiani Suza, S.Kp, M.N.S., Ph.D (USU); Dr. Tintin Sukartini, S.Kp., M.Kes (Universitas Airlangga); Dr. dr. Finny Fitri Yani, SpA(K) (Andalas University). The COVID 19 pandemic illustrates something fraught with uncertainty and frightening. Children's mental and psychosocial health is particularly devastating as they struggle to cope with the problems they face during their lives during the COVID-19 pandemic. A number of studies have begun to describe the impact of the pandemic on children's mental and psychosocial health, with most concluding that children's mental and psychosocial health deteriorated during the COVID 19 pandemic. The results of this study emphasize that children are very vulnerable during the COVID-19 post-pandemic so that they experience an increase in mental health and psychosocial problems. It is not easy for children to undergo a

pandemic, new normal, and post-pandemic, this is because children experience many delays in activities, especially in schools, which are associated with a high level of uncertainty in the pandemic. Uncertainty is particularly heightened at a time when some changes are being made to limit the spread of COVID-19 in reference to the uncertain future future that children face in relation to future education. Tele Pediatric Nursing Application is a web and mobile-based application that will be developed by a collaboration of health practitioners and information technology, as an effort to apply telenursing in mental health and psychosocial services in children. The result of this application can be a new strategy for the implementation of mental health and psychosocial nursing services with a technological approach so that it is able to reach all children in certain areas even with limited human resources.

## Family-Based Aged Care Model



The collaborative research has been completed by Jenny Marlindawani Purba, S.Kp., MNS. Ph.D (USU); Prof. Dr. Ah Yusuf, S.Kp., M.Kes; Ns. Dewi Eka Putri, M.Kep., Sp. Kep.J (UNAND) A healthy, successful and prosperous condition is the highest hope for all the elderly. Healthy and prosperous elderly people have the ability to maintain physical and mental health, avoid the ongoing impact of the disturbances faced, and remain active and independent. However, not all elderly people can feel this condition, especially during the Covid-19 pandemic. The majority of the elderly have one chronic disease and Some of the elderly even have 2 chronic diseases. The physical limitations experienced by the elderly due to chronic diseases and this pandemic affect the ability of the elderly in self-care and a decrease in the overall quality of life. Impaired thought processes, frequent pain suffering, hostile environment and insecurity with circumstances can also worsen the quality of life of the elderly. Facing the new era of adaptation, families are expected to be the main source of support to assist in the care and fulfillment of the basic needs of the elderly at home.

This research consists of 2 stages, namely a descriptive design of phenomena that aims to explore the psychological well-being of the elderly who have diabetes mellitus in the face of adaptation to new habits and stage 2 is to conduct a quasi-experimental study to determine the influence of family-based nursing models on psychological well-being and quality of life of the elderly. There were 12 participants who participated in the phenomenon description study. Meanwhile, in the quantitative approach, as many as 60 percent divided into intervention groups and control groups participated in the study. The quantitative approach consists of 5 sessions that are carried out over 6 weeks. The results of qualitative research produced 6 themes, namely: 1) Being able to accept yourself; 2) fostering positive relationships with others; 3) Have the right of autonomy; 4) participating in the activities of the elderly in the community; and 5) have a purpose and meaning in life. The output of this study is 1 article with submitted status.



## Development of Targeted Therapy Compounds N-phenylpyrazoline Derivatives in Breast Cancer Stem Cells



Collaborative research on breast cancer has been carried out by Dr. apt. Denny Satria, M.Si (USU); Dr. dr. Eti Nurwening Sholikhah, M.Kes (UGM); Partner Researcher : 1. Prof. Dr. apt. Mustofa, M.Kes (UGM); Dra. Tutik Dwi Wahyuningsih, M.Si., Ph.D (UGM); Dr. drh. Pamungkas Bagus Satriyo, Ph.D (UGM); Dr. Ema Damayanti, S.Si., M.Biotech (BRIN); Dr. Hesti Lina Wiraswati, M.Si (UNPAD). Breast cancer is a cancer that has the highest incidence rate in women in Indonesia and around the world. The development of standard therapies in breast cancer patients such as chemotherapy, radiation, and surgery can improve the survival rate and pathologic complete response of breast cancer patients. However, metastatic breast cancer is still categorized as incurable diseases because all therapies available are only as palliative treatments to alleviate symptoms and increase life expectancy only. This study aims to mitigate the effect of giving N-phenylpyrazolin derivative compounds on cell proliferation, migration ability, and cancer stem cells in breast cancer cells. The effect of giving this compound on breast cancer

chemo-resistance will also be studied. In the next stage, the identification and confirmation of specific target proteins from N-phenylpyrazolin derivative compounds in payudar cancer cells will be carried out, as well as the relevance of target proteins in clinical cases of breast cancer. Analysis of prediction of in silico-organism compound activity shows that pyrazoline derivate compounds have activity in inhibiting the expression of Her-2 and EGFR while molecular analysis of doking shows pyrazoline compounds A, B, C, D and M have the ability to inhibit the expression of Cox-2, Her-2, PI3K, ER- $\alpha$  and PR. Pyrazoline compounds A and B have IC50 values of  $20.82 \pm 0.16 \mu\text{g/mL}$  and  $16.81 \pm 0.23 \mu\text{g/mL}$  against MCF-7/Her-2 cells. Pyrazoline B compounds at a concentration of  $8 \mu\text{g/mL}$  cause cell cycle inhibition in the G2-M phase (19.10% to 20.8%), cause early apoptosis and late apoptosis, inhibit the expression of PI3K and mTOR proteins, increase p53 protein expression, inhibit Her-2 protein expression and increase ROS expression.

Struktur 3D ligan

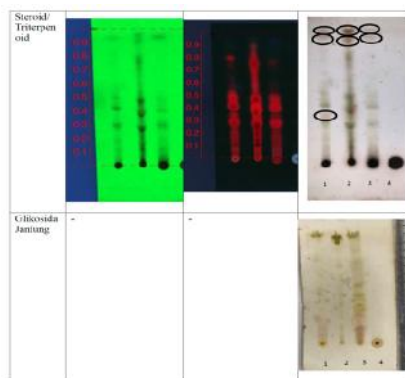


## Effect of Ethanol Extract and African Leaf Ethylacetic Fraction (Vernonia amygdalina Delile) on Glioblastoma Cancer Cell Development and Breast Cancer Over Her-2 Expression



Collaborative research has been carried out by Prof. Dr. apt. Poppy Anjelisa Z. Hasibuan, M.Si. (USU); Dr. rer.nat. apt. Adam Hermawan, M.Si. (UGM); dr. Fathul Huda, Ph.D., Sp.N. (UNPAD). Cancer is still a major health problem in both developed and developing countries. The number of patients and deaths from cancer increases from year to year, especially glioblastoma cancer and breast cancer with the Her-2 overexpression condition. The use of natural ingredients that have the potential to be

anticancer, especially those that are able to inhibit the development of cancer with a known mechanism is one of the approaches used in the discovery of new anticancers. In vitro testing can be used as a model for the exploration of natural materials that have the potential to be anticancer.



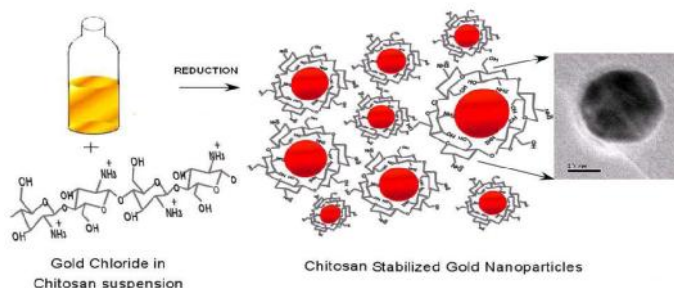
Tabel 2. Visualisasi Pengujian Skrining Fitokimia

ingredients that have the potential to inhibit development in cancers, especially glioblastoma cancer and breast cancer. This study provides information related to the potential of cardiac glycoside compounds from the Vernonia amygdaline Delite plant. Resulting in 75 target

The long-term goal of this study is to find natural

candidates regulating several biological processes including signal transduction and protein phosphorylation, located in the cytosol and cytoplasm, as well as regulating the molecular functions of proteins and ATP binding, with a confidence score of 0.9. among the proteins in the network is then selected top 10 based on the MCC score which produces PIK3CA and GRB2 as the proteins with the highest scores. Ethanol extract and ethylacetic fraction had inhibitory activity against MCF-7 cells with IC50 (217.90 ± 2.25 µg/mL and 25.14 ± 0.13 µg/mL), HCC 1954 cells with IC50 (57.30 µg/mL and 12.62 µg/mL), U87 cells with IC50 (37.65 µg/mL and 10.12 µg/mL). The ethylacetate fraction causes inhibition of the cell cycle in the G2/M phase, causes apoptosis in the early and late phases, increases the expression of p53 protein and the expression of ROS. Ethanol extract and ethylacetic fraction have the potential to be developed in the treatment of the development of glioblastoma cancer and breast cancer.

### Preparation and Characterization of Gold/Chitosan Nano Particles and Their Derivatives as Serum For Facial Skin Care



Prof. Dr. Harry Agusnar. M. Sc (USU); Prof. Dr. Rahmayeni (UNAND); Prof. Dr. Dra.Purwantiningsih Sugita. MS (IPB); Witta Kartika Blessing. Ph.D (BRIN) conducts collaborative research. Gold nanoparticles are one of the nanomaterials that can be applied in pharmaceutical preparations. In cosmetics, gold nanoparticles are widely used in cosmetics because they have anti-aging effects and improve skin elasticity. Chitosan and its derivatives have a moisturizing effect, soften the skin, also as an antibacterial. The purpose of this study is to formulate and evaluate the development of gel serum preparations containing nanogolds

/ chitosan and its derivatives as anti-aging agents. The formulation of serum preparations is carried out by making variations in the concentration of nanogolds and the concentration of chitosan and its derivatives which are then mixed with the serum base. Evaluation of serum gel preparations containing nanogolds / chitosan and its derivatives includes stability tests, pH tests, homogeneity tests, viscosity tests, irritation tests, anti-aging effectiveness tests (moisture, flatness, pores, stains, wrinkles), antioxidant tests, and anti-bacterial tests. The results of the evaluation of serum preparations were found to be stable at





storage for 16 weeks at room temperature, pH 6.38–6.36; homogeneous, viscosity 99.51 cps; does not irritate the skin. The anti-aging effectiveness of serum preparations provides 94.87% moisture recovery percent, 77.78% evenness, 90% stains, 58.97% pores, and 77.78% anti-wrinkles, 87.2% inhibitory power

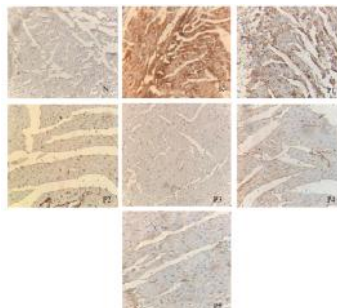
percentage, and an inhibitory zone for *S. aureus* and *P.acnes* bacteria with optimum values of 20.3 mm and 14.5 mm. Nanogolds and their derivatives can be formulated into cosmetic preparations of facial serums as anti-aging.

### Effect of African Leaf Ethanol Extract Administration on Doxorubicin and Doxorubicinol Levels by DBS Method in Doxorubisin-Induced Rats

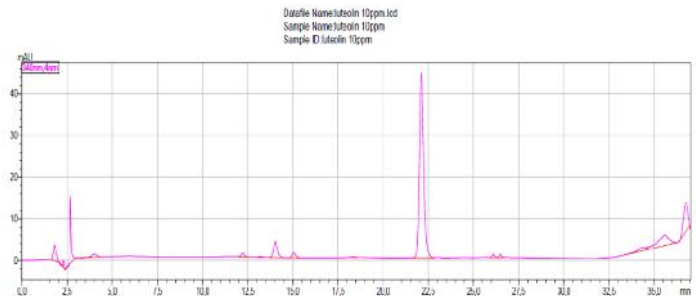


Collaborative research was carried out by Prof. Dr. Urip Harahap., Apt. (USU); Prof. Dr. Yahdiana Harahap., M.Si., Apt. (UI); Dr. apt. Andayana Puspitasari Gani, M.Si. (UGM). Doxorubicin has been used as an anticancer drug and has been shown to be potent for the treatment of cancer. The incidence of cardiotoxicity due to the use of doxorubicin occurs around 11% this results in a limitation of the use of doxorubicin. Administration of doxorubicin may reduce the activity of endogenous antioxidants including superoxide dismutase (SOD), GR. The oxidative stress formed will activate the signal of cardiomyocyte apoptosis. In some patients it can cause congestive heart failure. Until now, guideline therapy of doxorubicin induced cardiotoxicity, so it is very necessary to research compounds that can be used as cardioprotective agents during doxorubicin therapy. Doxorubicinol is a metabolite of

doxorubicin that accumulates a lot in the heart during the administration of doxorubicin. Cardiotoxic events are highly dependent on the amount of doxorubicinol accumulated, the carbonyl reductase-1 and carbonyl reductase-3 proteins play an important role in converting doxorubicin into doxorubicinol. The results showed that african leaf ethanol extract can lower levels of BNP, Troponin T as a biomarker of heart damage. In silico also proves that flavonoids found in the african leaves are apigenin, hesperidin, luteolin, quercetin and rutin. The results showed that the lowest tilapia docking score was 11.1 kcal/mol heceperidin against carbonyl reductase 3 which has an important role in converting doksorubicin into doksorubisinol. In this case docsorubisinol has an important peran because it can cause damage to the heart.



Keterangan: N (kontrol normal), K (kontrol negatif), P1 (doksorubisin dosis 100 mg/kgBB), P2 (doksorubisin dosis 200 mg/kgBB), P3 (doksorubisin dosis 400 mg/kgBB), P4 (doksorubisin dosis 500 mg/kgBB), P5 (doksorubisin dosis 800 mg/kgBB).



Gambar 4.1 Kromatogram Luteolin



## ENSURE INCLUSIVE AND EQUITABLE QUALITY EDUCATION AND PROMOTE LIFELONG LEARNING OPPORTUNITIES FOR ALL

The University of Sumatera Utara contributes to realizing SDG goal number 4, namely ensuring inclusive and fair quality education and promoting lifelong learning opportunities for all. Every element of society, especially the younger generation, has access to education. Education can be formal or non-formal. Formal education is provided through vocational education, S1, S2 and S3 levels. Non-formal education is provided to various levels of society through community service activities. The University of Sumatera Utara has supported equitable access to education through Rector's Policy No. 43 of 2017 concerning New Student Admissions. This is shown by the diversity that can be seen in students who include regional origins, tribes, and religions of students studying at USU. The Rector's policy that does not discriminate against religion, ethnicity, race, gender, age, social position, region, physical condition, and level of economic ability of prospective students, while continuing to study. considering the potential of prospective students. as well as the academic and nonacademic achievements of prospective students and the specifics of each study program.

### Utilization of Campus Dry Leaf Waste into Charcoal Briquettes as a Support for the Green Campus of the University of North Sumatra



Dr. Muhammad Sontang Sihotang S,Si,M,Si and his team carried out research on dry leaf waste. The University of Sumatera Utara is a campus environment around which there are many shady pepohonan. With the manufacture of briquettes from this waste, it can help reduce waste stockpiles, especially leaf waste and can be an alternative fuel for the community while reducing high consumption of petroleum.

It is hoped that the effort to make leaf waste briquettes can be used to overcome the energy crisis that has recently hit Indonesia. So far, people only rely on fuel oil (BBM) to meet their daily needs. By processing waste into alternative fuels, people no longer depend on fuel and can produce their own fuel for daily cooking purposes.

In addition, briquette fuel is a substitute for coal that has been used by the State Electricity Company (PLN). Moreover, the price is more affordable, so the market opportunity is very open and the alternative energy development effort is also one of the efforts to preserve the environment. So far, waste has only been considered a useless item and pollutes the environment. However, after being processed in such a way, the waste is transformed into goods that produce rupiah.

With the use of raw materials, it is also able to overcome the increase in fuel prices and soaring kerosene prices. In addition, garbage briquettes also do not contain sulfur so they do not have a pungent smell and the flame is not inferior to the flame of a gas stove. The price is also cheaper than kerosene.





## Development of a Machine Learning-Based Sign Language Translation System for the Disabled



Dr. Eng. Ade Candra, ST., M.Kom and the team carried out research on sign language. In 2021 it is estimated that more than 1 billion people or about 15% of the world's population are people with disabilities. The majority of these people with disabilities live in developing countries and have not been properly facilitated. Barriers to education, health, discriminatory attitudes, and limited infrastructure are some of the problems that people with disabilities often experience. These deaf children are less likely to get a good education in developing countries. Adults with disabilities are also high in unemployment. This condition is triggered by the difficulty of people with disabilities when communicating with others which makes it

difficult for them to follow lessons, live independently, or have a decent income. Sign language is the primary method of communication for people with disabilities. Researches developing sign language interpreter systems in line with advances in sensor technology and artificial intelligence have become an ever-evolving and important topic to continue. This research implements image processing methods such as histogram equalization, grayscale, and conducts machine learning-based training processes with MediaPipe. The data used is images recorded using a smartphone camera as many as 1247 letter images and 1919 word images. The study obtained an accuracy of 76% for words and 70% for letters.



## Community Broadcasting Media Education Strategy Model in Sumatera Utara Province in Anticipating the Spread of Fake News in Its Community



The research of Yovita Sabarina Sitepu, S.Sos., M.Si and team aims to find out the strategies used by community media, especially radio, in Sumatera Utara facing the development of digital technology and the rampant spread of hoaxes today. This study also aims to determine the exact impact of digital technology developments on community media in campaigning for educational information to community members. The research method used in this study is a mix method, namely through surveys targeting audiences from community radio, interviewing community media managers, and holding focus group discussions (FGDs) involving managers and members/audiences from community media, academics, media practitioners, and the government. The level of Technology

Preparedness (TKT) in this study has reached level 3 in the field of social humanities, namely based on the problem of the development of fake news in the digital space, extracting theories and previous studies related to community media education models, to the use of methodologies that are considered very complete for the implementation of this research. The mandatory output of this research is in the form of an article that is planned to be published in an international journal indexed by Scopus Q3, namely the Journal of Studies in Communication Sciences. From the results of the FGD that has been carried out, the managers and the community radio audience admitted that they did not broadcast or listen to any fake news spread through their media. Anticipatory efforts are carried out, for



example, checking news circulating on social media such as Whatsapp groups before going on air or broadcasting. FGD participants also

acknowledged the need for awareness of users in using social media so that they are not easily exposed to hoaxes.

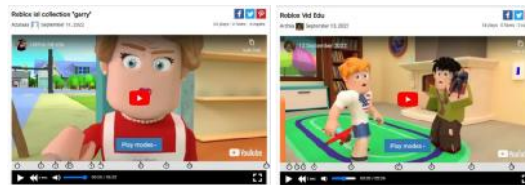


### The Use of Roblox in Improving English Multimodal Literacy in the Era of the Industrial Revolution 4.0



Research by Prof. T. Silvana Sinar, Dipl. TEFL M.A., PhD and team used one game, Roblox Game, as a learning medium for understanding English reading literacy. This study aims to increase student involvement in learning; to increase motivation and interest in learning; to make the learning process more interesting and enjoyable. The method used in this study is descriptive qualitative. The stages of this research method are analyzing and understanding problems, formulating and limiting problems, preparing and designing ideas, collecting primary data, implementing ideas, analyzing and revising drafts of observations and finally preparing a final report. In addition, the output of this research is also in the form of articles in reputable international scientific journals

indexed by Scopus along with additional outputs in the form of international journals. The results showed that students have a good perception of the use of Roblox media in English language learning. Students absorb English Bahasa vocabulary faster because each vocabulary is visualized with an attractive design. The results of this study show an increase in student learning motivation when learning with innovative learning media. The use of smartphones as a learning medium has proven to be able to encourage students' interest in learning and can be an interesting new alternative for teachers in providing learning materials. This research contributes to the development of digital-based games learning media in public schools selected as research locations.



### Innovation Activity Workbook as a Medium for Sexual Education for Early Childhood



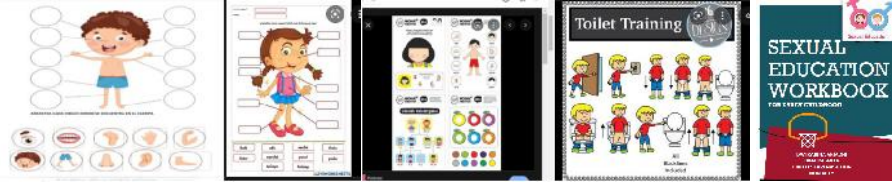
The development research conducted by Dwi Karina Ariadni, S.Kep., Ns., M.Kep aims to produce innovative activity workbook products as a medium of sexual education for early childhood Activity workbook. Sex Education that is suitable for use as a support for teaching materials related to sex education in early childhood. This type of research is research and development that

adapts the steps of Borg & Gall. The development research procedures used consist of 1) Research and Information Collection, 2) Planning, 3) Initial Product Development, 4) Product Validation, 5) Initial Product Revision, and 6) Small Group Field Trials. At the product validation stage, it is assessed by three expert validators, namely media expert validators, material expert



validators and assessed by user validators, namely early childhood / parents. This research was conducted at TKQ Balitaku Khatam Quran. The data collection method used in this study was to use interviews and questionnaires, with data instruments in the form of questionnaires. Research data

analysis techniques use qualitative data analysis techniques and quantitative data analysis techniques. The participants were 40 students of TKQ Balitaku Khatam Quran. The results of this study are expected to help parents and children learn about sexual education from an early age.



Advocacy for reducing the use of plastic in our living environment and the use of plastic waste to create value-added products



Arif Nuryawan, S. Hut, M.Si, PhD and the team carried out community service activities in the international community service scheme. This service activity partners with the Plastic Litteracy Network, a community whose members cross countries (UK, Australia, Philippines, and Indonesia) who are concerned or concerned about plastic waste in the environment around us. Some of the activities that have been carried out include: Plastic encounter workshops because they involve various countries and the covid pandemic situation is still uncertain, this community service activity is carried out virtually or online through webinar series activities. This webinar series was realized consisting of 4 (four) webinar activities with a combination of partners and a team of abdimas of the University of Sumatera Utara (USU) as follows: (1) in July, the theme: Plastic Litter in Land, speakers: Deirdre McKay (England) and Rahmawaty (USU) and opened by the Deputy Dean of the USU Faculty of Forestry (Agus Purwoko); (2) in August, the theme: Plastic Litter in Aquatic Ecosystems, speakers: Simon J Dixon (UK) and Novrida Hasibuan (USU) and opened by the Head of the USU S1 Forestry Study Program; (3) in September, the theme: Sustainable Fashion using Natural Fiber, speakers: Elyse Ruby Stannes (Australia) and Iwan Risnasari (USU) and opened by the Head of UPT Integrated Lab USU (Rahmi Karolina) and introduction by the Head of R&D of AEPI (Indonesian Eco-Printer



Association) (Kun Sri Budiasih); (4) in October (implementation on September 30, 2022), the theme: Plastic Litter in Sea and Coastal Area, speakers: Neil Angelo Abreo (Philippines) and Rudy Sofyan (USU) and opened by the Head of the USU Master of Forestry Study Program. In each of the webinar activities, the introduction and moderator by the head of the USU community service team (Arif Nuryawan). Before and after the activity, a questionnaire is given to webinar participants and evaluated and validated so that the questionnaire data obtained can be used for joint publication materials which are the main output of this international community service activity.



## ACHIEVE GENDER EQUALITY AND EMPOWER ALL WOMEN AND GIRLS

SDG number 5 is a part that has received special attention from the University of North Sumatra. It is also aligned with the goals to be achieved globally which is to achieve gender equality and empower all Women and girls. The University of Sumatera Utara also plays an active role in helping the government to solve problems in goal 5 of the SDGs through education, research and community service. The University of Sumatera Utara has a policy regarding tracking the number of registrants through a registrant form that shows that the prospective student is female through [registrasi.usu.ac.id](http://registrasi.usu.ac.id). In addition, USU also considers Women in the provision of scholarships and other matters that require university assistance and improvement of their achievements. The University of Sumatera Utara also supports teaching staff to be active in carrying out teaching, research and community service.

### The Urgency of Media Literacy in Increasing Women's Participation to Achieve Sustainable Development Goals in the Sukaluwei Village Plantation Community, Bangun Purba District, Deli Serdang Regency



Dra. Mazdalifah, Msi., Ph.D and his team conducted research on media literacy. The SDGs mandate that women must have ICT (information Technology and communication) skills. The objectives of the study are to identify the form of women's participation in village development, identify what obstacles are encountered when participating in development in the village, identify media literacy skills in the form of ICT, then will see the urgency of media literacy in increasing women's participation in achieving Sustainable Development Goals. The research location is in an oil palm plantation area in Sukaluwei Village, Bangun Purba District, Deli Serdang Regency. The research informant was a woman who participated in the development in Sukaluwei village, Bangun Purba Deli Serdang District. The data collection method uses in-depth interviews, Focus Group Discussions (FGDs) and observation. The data obtained and collected were analyzed using the Miles & Huberman method, where the data was collected by category, analyzed and finally inferred. The interim results of this study are: the form of women's participation in development is

generally as members and chairmen in development activities, such as the head of PKK activities, the chairman of BPD (Village Supervisory Agency), hamlet heads, BPD members, and posyandu members. The obstacles they encounter are involving the community in activities, the difficulty of time to meet in talking about or deciding on an activity. Media literacy skills in the form of ICT owned by informants are the ability to use smartphones, where generally informants can use smartphones to send and receive messages such as: making invitations and sending them, searching for materials (browsing), forwarding important information back into groups. Based on the results of in-depth interviews, it is generally stated that media literacy (especially the ability to use smartphones) as well as ICT capabilities, are very important in supporting their involvement in participating in village development. Media literacy and ICT skills make women's participation faster, smoother and more effective. The output of this research is still in the form of a draft paper that will be sent to the indexed journal Scopus or Sinta 1.



## The Role of the Association of Persons with Disabilities (Ppd) in Medan City Development



Hairani Siregar, S.Sos., M.SP and the team have carried out a study in the city of Medan on the role of associations of people with disabilities. People with disabilities are still being treated poorly, both from their families, communities and the government. It is not uncommon for things of exclusion or discrimination to be directly or indirectly experienced by persons with disabilities. Seeing this condition, people with disabilities must have a place to channel their aspirations, both as a place to create and carry out self-development and various other creativity or to just share stories of fellow people with disabilities. The formation of the Association of Persons with Disabilities (PPD) DPC Medan City is expected to be able to become a "second home" for people with disabilities as a forum for channeling aspirations and so on so that independent

people with disabilities can be side by side and compete in the outside world. The purpose of this study is to see how the role of the Association of Persons with Disabilities (PPD) DPC Medan City which includes several organizations of persons with disabilities in development in Medan City from various sectors. Whether the organization of persons with disabilities or PPD plays a role in the development in Medan City. This research was conducted in Medan City, North Sumatra. This research will use qualitative research methods with a descriptive approach. Using data collection techniques from interviews, observations, and documentation. The results showed that the Medan City PPD has not been fully involved in the development of Medan City. People with disabilities in Medan still feel abandoned in the development of Medan City.

## The Urgency of Implementing a Victim Trust Fund on Victims of Sexual Violence in Law No. 12 of 2022 concerning the Crime of Sexual Violence



Siti Khairunnissa SH.,MH and her team have carried out a study on the crime of sexual violence. The reality that exists in the community shows that the concept of Victim Trust Fund is a priority to run. The concept of a Victim trust fund in handling sexual violence cases refers to Law No. 12 of 2022 concerning the Crime of Sexual Violence. Victim fund trust or providing representative funds for victims is the best legal remedy for victims of internal sexual violence. Victim trust fund arrangements need derivative implementing rules or government regulations for the implementation of victim trust funds in ensuring the safety of victims during the case enforcement period. Therefore, the urgency of the victim trust fund is the goal of providing protection and recovery for victims. The purpose of this study is as a contribution to answering questions, among others, first, to

analyze and identify the urgency of the victim trust fund on victims of sexual violence in Law No. 12 of 2022 concerning criminal acts of sexual violence. Second, a review of the development of victim trust funds in Indonesia in the future. Third, analyze legal remedies in empowering institutions against the concept of victim trust funds for victims of sexual violence. The research method used by researchers is to use a normative juridical approach. This means that the legal material used as a study is secondary data. In this normative legal research it is possible that empirical (field) data are also presented as an option to support and sharpen the study. The targeted output is the mandatory output of articles in internal journals; and additional output of articles in national-scale scientific journals and enrichment of teaching materials



## Readiness of Higher Education Structure and Culture in the Prevention and Handling of Sexual Violence in the Campus Environment



The research collaboration was conducted by Hendra Susanto, S.Pd., M.Kes., Ph.D (State University of Malang); Dr. Azizatus Zahro', S.Pd., M.Pd (State University of Malang); Desinta Dwi Rapita, S.Pd., SH., MH (State University of Malang); Dr. Fatmariza, M.Hum (Padang State University); Dr. Nurman Achmad, M.Soc. Sc., CIQaR (University of North Sumatra). Permendikbud Ristek Number 30 of 2021 concerning Prevention and Handling of Sexual Violence (PPKS) is a guideline for universities to formulate policies and take measures to prevent and handle sexual violence related to the implementation of the Tridharma of Higher Education on and off campus. This implies that every university is required to be able to implement these regulations. The campus community's understanding of forms of sexual violence is still minimal. While being studied based on the structure in universities, there are still many campuses that do not have special instruments in the context of implementing the prevention and handling of sexual violence, such as policies or regulations related to sexual violence or special task forces in the process of preventing and handling sexual violence. In

addition, facilities and infrastructure supporting sexual prevention and handling have not been fully fulfilled, for example the installation of CCTV, the existence of pamphlets or information regarding the handling of sexual violence. The conditions obtained on campus today are still many civitas who have different views on sexual violence. Sexual violence that occurs on campus is considered a disgrace and can also defame the campus. Changes in good structure will have an impact on culture changes. From the studies conducted, the culture of Indonesian society, which is generally permissive and patriakhi, is an obstacle in cultivating PPKS policies. Even the use of the word "sexual" in some groups of society is still taboo to talk about. We still have a culture of 'shame' to expose or report sexual violence in our society. With this condition, it is necessary to increase campus readiness in PPKS efforts. Campuses must have the courage to make progressive policies in supporting the implementation process of permendikbudristek No. 30 of 2021. In addition, changing the perspective of society influenced by adverse cultures in the context of sexual violence needs to be done.

## Gender and Smallholder Oil Palm Plantations: A Study of the Impact and Potential of Women's Social Entrepreneurship in Three Indonesian Ethnic Groups



Indonesian Collaborative Research was carried out by Prof. Dr. Ir. Rudi Febriamansyah, M.Sc. (UNAND); Drs. Jendrius, M.Si., Ph.D.; Prof. Dr. Ir. Keppi Sukesi, MS; Prof. Dr. Ritha F. Dalimunthe, SE., M.Si (USU) in three Indonesian ethnic groups. The income of smallholder oil palm farming per hectare still earns relatively much lower than the average income per hectare from core plantations. The purpose of this study is to (1) identify the impact of smallholder oil palm development on the role of women in productive, reproductive and social activities in three different ethnic (socio-cultural) areas, (2) explore the potential for developing patterns of women's cooperation in the development of creative enterprises and social entrepreneurship in three different ethnic (socio-cultural) areas, (3) formulate a gender-based sociopreneurship institutional model in the development of smallholder oil palm plantations.

Ranto Baek community has a relatively low level of education, namely the elementary school level, for this reason, the average community chooses to farm. The dominant thing owned by the people is oil palm plantations. All cleaning activities until the sale are carried out by the husband, in activities in oil palm women only help the husband when picking up scattered fruit, or occasionally participate in this treatment because oil palm plantation activities are hard work, usually done by husbands assisted by family involvement such as siblings or relatives near or far who are considered to be able to help oil palm activities by brothers. For decision-making men are more dominant do it.

As for the women or wives of the Mandailing Tribe, they predominantly carry out domestic activities such as accompanying children to study and play,





taking care of children, taking care of the house, starting from washing, cooking, and so on. The wives also predominantly participated in jula-jula gatherings and opened their own businesses at home. The business carried out is to do household industries such as baking. In addition, they also opened coffee shops, clones, and so on. They do

this in addition to getting additional income also because of their hobbies. In addition, these mandailing women admit that they are more interested in opening a business than working with others. They have the ability to identify and make the most of opportunities.





## ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL

Man always needs clean water and proper sanitation. Water and sanitation are an important part of supporting the quality of human life. SDG number 6 is intended to ensure that communities have universal access to clean water and sanitation. The University of Sumatera Utara has played an active role in fulfilling the needs of clean water and good sanitation through activities in the fields of education, research, community service and cooperation.

Identification of potential infection-causing pathogens in flood-prone areas, focusing on *Leptospira* spp.



Dr.dr. Dewi Masyithah Darlan, DAp&E, MPH, Sp.ParK and the team carried out research in flood-prone areas. In Indonesia, pathogenic contamination in flood water is higher than river water so that flood water can be a medium for infectious disease outbreaks, especially in densely populated residential areas. Surveillance activities in the form of screening pathogens from reservoirs and careers in flood-prone environments can help control the transmission of these infectious diseases. As part of surveillance activities for infectious diseases in flood-prone areas, this study aims to identify bacterial pathogens, especially *Leptospira* spp. And parasitize from the reservoir and asymptomatic career in the associated location. This categorical descriptive research will begin with the collection of samples to flood-prone locations, followed by sample processing in the laboratory for the identification of bacteria and parasites, then the data collected will be analyzed statistically descriptive and the results presented in the form of graphs and tables. From flood-prone locations, 59 house mice and wild rats were collected, which have the potential to be reservoirs of *Leptospira* spp. causes of Leptospirosis. Then, from the kidneys and serum of rats, deoxyribonucleic acid (DNA) extraction has been carried out, and subsequent identification of *Leptospira* spp. will be carried out using polymerase chain reaction (PCR) techniques. About 36



stool samples were successfully collected from residents in flood-prone locations, and bacterial screening from these stools has been carried out using culture techniques followed by identification using the VITEK-2 Compact instrument, with the highest prevalence being Gram-negative bacillus bacteria with the species name *Escherichia coli* followed by *Klebsiella pneumoniae*. The



next stage of the plan is to collect data on the results of identification using PCR and analyze the results. In addition, an analysis of the results of the identification of bacteria and parasites from the feces of the population will also be carried out. Then a manuscript of the

results of this study will be written for publication purposes in indexed international journals. Additional outputs that are planned are in the form of books / textbooks containing content related to the research topic.

### Carbon-hydroxyapatite synthesis from yellowfin tuna bones as a filter to reduce ferrous metal (Fe) in well water



Research on well water filters was carried out by Prof. Dr. Zuriah Sitorus, MS and his team. This study will investigate the potential of fish bone waste as a basic material for making carbon to reduce Fe metal levels in well water by filtration methods. Carbon making will be carried out with carbonation temperature variations of 600, 700 and 800oC to determine the effect of temperature on the carbon ability of fish bones as a filtrate medium. At first the yellowfin tuna bone waste will be washed, dried, dehydrated, carbonated, then it will be characterized and used as a filter material for well water.

Characterization will be done with XRD to determine the degree of crystallinity of carbon and SEM- EDX to find out the pore structure of

the carbon surface and the chemical composition of the carbon synthesized from the bones of yellowfin tuna. Sample water will be taken from well water sourced from residents' homes around the finished iron treatment plant. The sample water will be measured Fe metal content before and after filtration using carbon. It is hoped that the carbon synthesized from the bones of yellowfin tuna can reduce the level of Fe metal in the well water so that the water can be utilized without causing any problems.

The expected output of scientific articles based on this research is the publication of the article in an international journal indexed by Q3 or the proceedings of an international seminar indexed by SCOPUS.



### Identification of Salivary Microflora in Residents and Water Sanitation Quality Test in Medan Suburban Area



Zulham, M. Biomed, PhD and team members carried out research in the suburban area of Medan. In the human body, the oral cavity is the most common place where microflora after the intestines are found. Normal microflora found in human saliva includes bacteria, yeast, protozoa, and viruses. Microflora can live in the oral cavity due to the presence of nutrients that can be used to survive. There is an association between the presence of certain microorganisms and overgrowth in one organ may indicate a disease. DNA collection currently prefers to

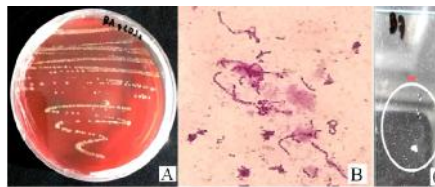
use saliva instead of blood because there are saliva biomarkers that have been recommended for early detection and regular screening in abnormal body conditions. The challenge in using saliva samples for human genetic diagnosis is that salivary microflora can annihilate and interfere with the purity of human DNA. A strategy that can be carried out in the preservation of DNA from saliva is to kill these microflora with sensitive antibiotics. Impaired DNA purity can be minimized by the identification of normal microflora. The target sample that will be



used in this study is residents in the suburban area of Medan, namely Tembung, by estimating low hygiene and sanitation in this area. Based on this, it is also necessary to test the quality of clean water sanitation for sanitary purposes to see if there is a relationship between the quality of the water used and the balance of microflora contained in saliva.

The research will be carried out in several stages. The collection of saliva samples will be carried out in the Tembung Area with 30 subjects. Participants were instructed to collect samples independently on a tube of ± 12 mL. The samples were then taken to the USU School of Medicine Integrated Laboratory to perform DNA extraction targeting protozoal microbes and microbial cultures (bacteria and yeast). Microbial culture will be carried out on the medium of Blood agar (bacteria) and Sabouraud's Dextrose Agar (Yeast). After the bacteria and yeast grow, macroscopic and microscopic

identification is then carried out. After extraction, then DNA sources and colonies of bacteria / protozoa / yeast will be amplified on the Themocycler device with the target genes 16s rRNA (colony PCR), 18s rRNA (routine PCR), and ITS2 rDNA (colony PCR). The results of the amplification will then be carried out in the sequencing stage to obtain species / strains from the salivary microflora. In addition, water sanitation tests will also be carried out with physical, chemical and microbiological test parameters in accordance with water quality standards for hygiene purposes from the Ministry of Health of the Republic of Indonesia. The results will then be carried out by scoring with categories of meeting the standards, mild contaminants, moderate pollutes and severe contaminants. Water samples will also be carried out microbial cultures and identified macroscopic and microscopic characteristics and biomolecular identification.



### Study of Ecological Status and Water Quality of Alas-Singkil Watershed, North Sumatra and Aceh Provinces



Dr. Ahmad Muhtadi, S.Pi., M.Si and his team have carried out research in the Alas-Singkil River Basin. This study aims to determine the characteristics of fish habitats in the Las-Singkil watershed, the status of water quality of the Alas-Singkil watershed, the biodiversity of nekton and macroinvertebrates in the Alas-Singkil watershed in Sumatera Utara and Aceh Provinces. The study was conducted between May and October 2022. Determination of research stations using the random purposive sampling method. The data collection station represents the upstream (Kutacane, Dairi, Salak, Parlilitan), middle (Subulussalam and Fak-fak), and downstream (Singkil) areas. Fish and shrimp sampling using backpack electrofishing units with weak electric current (sourced from 12

volt and 9 ampere batteries) and nets. Meanwhile, macroinvertebrate sampling uses surbernet and sampling on other substrates, such as wood, plastik, stone, and others. The observed environmental parameters include physical, and chemical parameters. The data analysis carried out includes community structure analysis including diversity, uniformity, and dominance as well as determining the characteristics and status of rivers based on environmental and macroinvertebrate parameters. The results of the study include the composition of each type, the results of the analysis of community structure and habitat conditions. The results of the community structure analysis include an index of diversity, uniformity, dominance and type distribution patterns. Determination of



characteristics and river status based on environmental and macroinvertebrate parameters will determine the status of the river whether the composition of the types of fish produced will be classified into economical and ornamental fish which will later provide benefits to the management of

the Alas-Singkil watershed waters in the Provinces of Sumatera Utara and Aceh. The outputs targeted in this study are international journals indexed by Scopus (journal of Limnology) as a mandatory output and proceedings and teaching materials as additional outputs.



### Policy Politics: (A Study on the Implementation of the Master Meter Program in Providing Access to Clean Water, Sanitation and Hygiene to Improve the Welfare of the Poor in Medan)



Muhammad Ardian, S.Sos, M.Ipol and his team conducted research on policy politics. The problem of clean water shortages and the drain of access to good sanitation facilities is also experienced by residents in North Sumatra, including Medan, which is the capital city. The purpose of this study is to describe how the Implementation of the Master Meter Program Policy in Providing Access to Clean Water, Sanitation and Hygiene to improve the Welfare of the Poor in Medan City and analyze the Supporting and Inhibiting Factors. The method used is a descriptive research method with a qualitative approach. In-depth interviews with various stakeholders in the policy. The analysis is carried out qualitatively. The results of research conducted in Medan City show that the Implementation of the Master Meter Program in Providing Access to

Clean Water, Sanitation and Hygiene to Improve the Welfare of the Poor has gone quite well. The whole series or process of activities starting from initial socialization, poverty reflection, program implementation, program monitoring all went quite well. The success of the Master Meter Program really needs to be done so that it can provide access to clean water to residents in need. The obstacle that occurs in the implementation of this policy is that there are still poor people who still exist who have not received the benefits of the Master Meter Program. The Sumatera Utara Provincial Government, PDAM Tirtanadi, and Stakeholders continue to make efforts to be able to develop the Master Meter Program to all areas in Medan City where residents do not yet have access to clean water.





## Integration of Nano-Condensing Surfaces and Solar Collectors to Increase Clean Water Productivity Solar Still Double Slope



RKI research in order to increase clean water productivity was carried out by Prof. Dr. Eng. Himsar Ambarita, S.T., M.T (USU); Dr. Eng. Pandji Prawisudha, S.T., M.T; Dr. Eng. Arnas Lubis, S.T., M.T. Clean water sources are decreasing due to an increase in the population, resulting in a clean water crisis. An alternative that can be used is the desalination of the distillation system (solar still). Solar stills can be used to convert seawater into clean water. Solar stills have a simple and easy-to-make construction, but the productivity of clean water produced is low. Freshwater productivity is greatly influenced by the evaporation and condensation processes in solar stills. In this study, the evaporation and condensation process was improved using a solar collector and nano coat on the cover. To achieve this goal, 3 solar stills were built, namely conventional solar stills (SSC),

solar stills with  $\text{CaCl}_2$  nano coats on the cover (SSN) and solar stills with the addition of solar collectors (SSSC). All three solar stills were tested under the same environmental conditions and conducted temperature, freshwater mass, and economic analysis were carried out. From the results of the study, the use of solar collectors increases the temperature inside the SSSC and is higher than the SSC. The use of nano coats causes the temperature on the SSN cover to be lower compared to SSC. The use of nano coats and solar collectors can increase freshwater productivity by up to 70%. The production cost of fresh water using nano coat coatings is 0.298 \$/L/m<sup>2</sup> and solar collectors are 0.082 \$/L/m<sup>2</sup> which is cheaper than conventional solar stills. The results of this study have been submitted to the journal Case Studies In Thermal Engineering with the title "Integrated Nano Coat on Condensation Surface and Solar Collector to Enhance Fresh Water Productivity of Double Slope Solar Still" and have been submitted in the journal Applied Thermal Engineering with the title "Theoretical and Experimental Study of Double Slope Solar Still".



## ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL

The 7th goal of the SDGs is to ensure access to obtainable, reliable, sustainable and modern energy for everyone. Sustainable economic development plays an active role in alleviating poverty and improving welfare. Economic availability requires the support of modern energy that is adequate, reliable and has competitive prices. Energy and how it is used should be as efficient, sustainable and renewable. The University of North Sumatra through teaching, research and community service activities contributes to the achievement of this goal such as carrying out activities related to the development of renewable energy technology, energy efficiency technology, good building design, and new renewable rooftop technology, zero net energy buildings.

### Development of Palm Oil Empty Bunch Pellet Pyrolysis Process Using Microwaves To Produce Commercial Biochar Products



Prof. Dr.Eng. Irvan, MSi and his team carried out research on empty bunches of oil palm. Biochar is a solids product of biomass pyrolysis, which is one of the technologies available for bioenergy production. This study aims to obtain the conversion of EFB Pellets into biochar through the pyrolysis process. The specific purpose of this study is to obtain and analyze the data on the influence of pyrolysis power and mass from EFB Pellets on biochar production. This research was

conducted by method in the form of characterization of raw materials, pyrolysis and biochar extraction through several analyses. The highest biochar moisture content value is 6.93% and the lowest is 3.33%. The highest volatile matter content biochar value was 29.20% and the lowest was 17.14%. The highest biochar ash content value is 17.65% and the lowest is 3.81%. The highest fixed carbon biochar value is 63.83% and the lowest is 55.02%.



### Effect of Tilt Angle, Pollutants and Reflector Type on Solar Panel Output Power



Ir. Ferry Rahmat Astianta Bukit, ST., MT and the team carried out research on solar panels. The use of solar panels to generate

electrical energy secured by Solar Power Plants (PLTS) continues to be developed. The output power and efficiency of solar panels



are strongly influenced by the angle of inclination of the panels, the pollutants covering the panels, as well as the light capture of solar radiation. Therefore, in this study, an experiment was carried out on the influence of the tilt angle, pollutants, and types of reflector materials on the output power of solar panels. From this study, it was seen that the panel installed with a mirror whose angle was determined by the calculation method had the highest average

output power. With the angles determined by the calculation method, an average output power of 59.021 Watts was obtained at an average daily radiation intensity of 669.5 W / m<sup>2</sup>. With the angles determined by the experimental method, the highest average output power is 48,654 Watts at a daily average radiation intensity of 669.1 W/m<sup>2</sup>. As for mirrorless solar panels, the average output power is 56,161 Watts at a daily average radiation intensity of 698.9 W/m.



### Design and Build a Machine with Technology to Convert Plastic Waste into Fuel Renewable Energy



Research on renewable energy was carried out by Rahmadhani Banurea, S.Si., M.Si. and team. Plastic waste will have a negative impact on the environment because it cannot decompose quickly and can reduce soil fertility. Plastic waste that is thrown carelessly can also clog drainage channels, sewers and rivers, causing flooding. This research is intended to design the pyrolysis machine build and is carried out also to find out how much oil product is produced. Many studies have been carried out in determining how to manage plastic waste, one of which is recycling, destroying plastic waste by incineration, although this method is

considered practical, but testing through combustion is less effective and risky because of the combustion of pollutants from exhaust emissions. Based on these problems, in this study designed a machine with practical plastic waste converting technology and is a renewable technology in converting plastic waste into gas and liquid phases that can be reused to produce renewable energy fuel. The purpose of this study is to determine pyrolysis technology which is a renewable technology in converting plastic waste into reusable gas and liquid phases that have the potential to be used as a renewable energy fuel source.



### Technoeconomic Study of Biodiesel Mixture of Cooking Oil Residue and Waste Oil Plastic With Ultrasonic Technology Pilot Plant Scale



The technoeconomic study was carried out by Prof. Dr. Ir. Ilmi, M.Sc and team. The purpose

of this study is the application of ultrasonic techniques in the process of making biodiesel





from waste cooking oil at a pilot plant. The research began with the design and continued the manufacturing process and trials. The pilot plant of a jacketed reactor made of stainless steel with a capacity of 50 liters / day was built to convert WCO oil into methyl ester using an ester / transesterification process with an alkaline catalyst (KOH). The reactor system is equipped with an ultrasonic transducer connected to a 1500 W ultrasonic generator. Furthermore, LDPE, HDPE and PE type plastic waste is converted into oil using a pyrolysis machine with a capacity of 15 g/h producing oil with diesel-like properties. The properties of WCO methyl ester and plastic pyrolysis oil follow the standard (ASTM)

D6751 and the European standard (EN) 14214. In the final part of the study, WCO methyl ester and plastic pyrolysis oil mixed with diesel in several ratios (B10-B50) were applied to the diesel engine test bed to test engine performance and exhaust emissions. ASPEN PLUS software is used to compare some of the processes used in producing WCO oil against its economy. On the other hand, the calculation of investment costs and time and production costs is calculated to take into account the feasibility of biodiesel production from WCO by taking into account the value of OPEC and APEX. This study involved 5 students through the MBKM program.



### EFFECT OF PTC/NTC ON CPO FOR CRACKING TO PRODUCE DIESEL FUEL AND PERTALITE



Dr. Minto Supeno, MS and his team carried out research on diesel fuel and pertainite. Based on DSC CPO data, it is known that CPO degradation occurs between temperatures of 250-450°C. Based on this data, CPO can be cracked at a temperature of 400°C to produce diesel hydrocarbon fuel and pertainite. DSC analysis to obtain the appropriate degradation temperature where in this analysis it can be known how the range of PTC / NTC value curves in the CPO cracking process. In the process, cracking or cracking of palm oil into diesel hydrocarbon fuel and pertainite is carried out which is accompanied by observations of the PTC / NTC range in

CPO. CPO is found in a split funnel that will go through the cracking process to be dripped slowly on an aluminum metal container with a size of 3 mm will be condensed to produce diesel fuel and pertainite. GC-MS analysis was carried out to identify compounds contained in Hydrocarbon Fuels. The results obtained by Hydrocarbon Fuel contain the compound 1-Dodekane (C<sub>12</sub>H<sub>24</sub>). The nature of the hydrocarbon fuel analyzed is that the heat quality value of combustion is determined using the Bomb Calorimeter tool, and the Cetane Index is determined using the Calculated Cetane Index analysis.



### Rainwater Treatment as an Alternative to Clean Water Supply with a Gravity-Fed Filtering System at HKBP Sidorame Private High School Medan





Community service activities were carried out by Prof. Dr. Juliati Br Tarigan, M.Si and the team regarding rainwater treatment. Rainwater that falls on the earth's surface is sometimes poorly managed. Whereas if managed properly, rainwater can be a useful source for the community, especially those who have difficulty accessing clean water. The rainwater can help community activities such as cooking, washing, bathing, and even for drinking water. People have not fully realized how important rainwater is in life. So far, there are still many assumptions that rain is just a natural event that is missed, so this

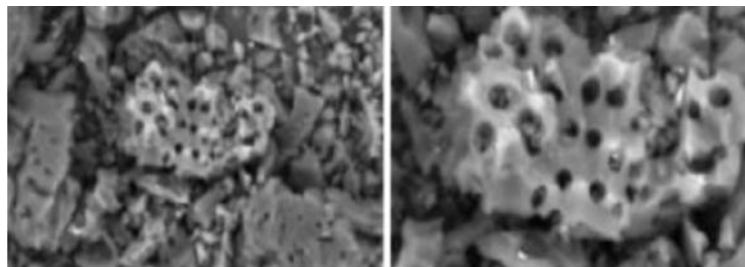
poor management can cause environmental problems such as flooding. The importance of sanitation and clean water takes precedence in everyday life. From the description of the data above, it can be seen the importance of these two aspects and there needs to be efforts to improve in order to meet the basic needs of clean water and participation in preserving the environment. This activity is a form of providing tools that can be useful for providing clean water through a simple filtration process, namely by creating alternative clean water sources by utilizing rainwater.

### Performance of carbon graphite (nano-coated graphene and nano-coated N-graphene) from coconut (Cocos nucifera L.) As Primary Battery Electrodes



Rikson Asman Fertiles Siburian – University of North Sumatra (USU); 1. Isa Anshori, S.T., M.Eng., Ph.D – (ITB); Dr. Eng. Jon Affi (UNAND); Prof. Dr. Ab. Malik Marwan Ali and Prof. Ts.; Dr. Ing. Oskar Hasdinor Bin Hassan – (UiTM); Prof. Madya Ts. Dr. Suriati Paiman – (UPM) carried out collaborative research on the performance of carbon graphic. The need for batteries is constantly increasing in the modern era. But in the development of primary batteries have their drawbacks. Therefore, the solution to solve various problems of primary battery development is i) Use C- $\pi$  and its alloys from coconut: GBN, N-GBN because: derived from renewable and cheap natural resources; C- $\pi$  can improve the performance of electrical properties, service life and chemical stability (alloys with metals); ii) Use transition metals (d- $\pi$ ) and non-transition metals (s- $\pi$ ) on the anode. This can increase the life span of the primary battery; and iii) Use battery electrode nanomaterials (Alloys C-

$\pi$  and M/C- $\pi$ ; M = Mg and Li of Coconut). The production of GBN and N-GBN from coconut shell raw materials has been successfully carried out on a large scale and the primary battery electrodes Mg/GBN//Electrolyte//GBN have been successfully synthesized. The electrical conductivity (DHL) of the Mg/GBN//Electrolyte//GBN electrode with a mass ratio of 1: 2: 2 has a DHL value (510.39  $\mu\text{S}/\text{cm}^2$ ), power density (58.93  $\text{W.kg}^{-1}$ ) and energy density (33.27  $\text{Wh.kg}^{-1}$ ) which is greater than other electrodes. These results show that the performance of the primary battery electrodes can be improved by using the right ratio ratio of the weight of the Anode//Electrolyte//Cathode, the type of material and the composition of the material used on the electrode as well as the chemical interactions that occur in the Anode//Electrolyte//Cathode.



zoom 5,000x and 10,000x

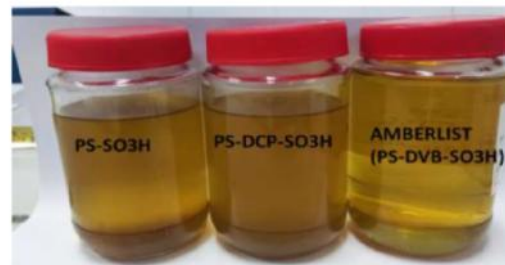
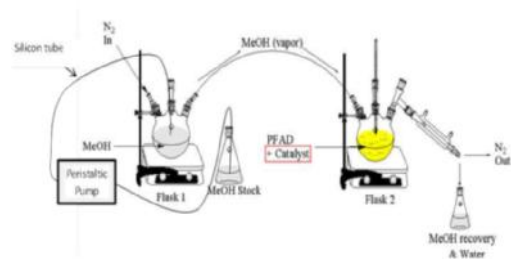
### Synthesis of Polystyrene Divinilbenzene Sulfonate Copolymer Resins as Heterogeneous Catalysts in the Manufacture of Biodiesel from Oleic Acid

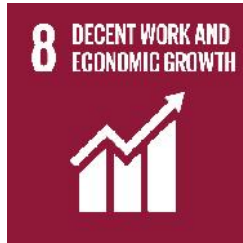




Collaborative Research conducted by Saharman Gea, S.Si, M.Si, Ph.D (USU); Dr. Alfa Akustia Widati, S.Si, M.Si (UNAIR); Dr. Syukri (UNAND). The main problem in the production of biodiesel from palm oil is the choice of using homogeneous or heterogeneous types of catalysts in the (trans)esterification reaction. The main objective of this study is to produce biodiesel products using heterogeneous catalysts of PS-co-DVB Sulfonate resins. THE FIRST STAGE is carried out the development of polystyrene (PS) and divinyl benzene (DVB) based resin synthesis. The manufacture of such resins is carried out by the method of copolymerization of styrene and divinyl benzene (DVB) in hexane solution through a free radical reaction with the presence of peroxide benzoyl (BPO) or azoisobutyronitrile (AIBN) as the initiator (co)polymerization. Followed by the sulfonation process, namely pasting the -SO<sub>3</sub>H group to the resin using dichloroethane and concentrated H<sub>2</sub>SO<sub>4</sub> at a temperature of 90oC for

60 minutes. Copolymerization and sulfonation products will be characterized through FTIR analysis, morphology with SEM, crystallinity with XRD, DSC thermal analysis, porosity surface area analysis with BET method, and sulfonation degree by acid-base titration method. THE SECOND STAGE, the synthesis product of PS-co-DVB sulfonic resin will be used as a heterogeneous catalyst in the esterification reaction of oleic acid with methanol. Raw materials and esterification products, fatty acid methyl ester (FAME) are characterized by gas chromatography, FTIR, viscosity, iodine value, lathering number and flash point. The Level of Technology Preparedness (TKT) of this study is for (1) synthesis of PS-co-DVB sulfonate copolymerization resins (2) using PS-co-DVB sulfonate resins as heterogeneous catalysts in oleic acid esterification reactions (3) looking for optimization conditions in producing biodiesel with the use of heterogeneous PS-co-DVB sulfonates.





## PROMOTE SUSTAINED, INCLUSIVE AND SUSTAINABLE ECONOMIC GROWTH, FULL AND PRODUCTIVE EMPLOYMENT AND DECENT WORK FOR ALL

The University of North Sumatra has made an effort to contribute to the improvement of inclusive and sustainable economic growth, productive and comprehensive employment opportunities, and decent work for all. Documented contributions include developing cooperation with various partners. The University of North Sumatra also instills the values of sustainable development in various educational activities, research, community service. The existence of regulatory support, to funding support, USU strives to always play a role in every development activity that is oriented towards achieving goal 8 of the SDGs.

### Traffic density probability analysis using Monte Carlo markov chain simulations integrated with copula bivariate statistics



Sincere Joseph Herianto, S.Si., M.Si. and the team carried out the research using a Markov Chain Monte Carlo simulation. The relationship of a variable with another variable can be known by various methods. One method that can be used to determine the relationship between variables that are not normally distributed is the Copula approach. This method is flexible because it does not require the assumption of normality of the data and can combine several marginal distributions into a common distribution. Copules have the ability to describe the

structure of dependencies between different variables and model their dependencies. Copules can also clearly describe dependencies on extreme points. Dynamic and automatic regulation of traffic lights to set the optimal traffic light cycle according to traffic conditions. The use of Monte Carlo simulations in traffic modeling is also used in the problem of setting up one crossroads. In this study, a simulation of traffic light regulation was carried out using the Monte method.



### The Role of the International Financial Digital Platform to Support the National Food Estate (Fe) Barn Program



The national food barn program is a concern of Prof. Dr. Azhar Maksum, SE, M.Si Ak, CA, CMA and the team. The Food Estate project

or horticultural food barn in Humbang Hasundutan Regency, North Sumatra is aimed at improving national food security. The



project is considered to be a pilot for agricultural cooperatives from upstream to downstream. In the development of the area in North Sumatra, an upstream-downstream industrial model will be built, including post-harvest so that there will be a market place like a modern market. This study aims to (1) find out the right and ideal financial platform model for farmers in the Humbang Hasundutan Food Estate (FE) area (2) increase the planting area and production of onion, garlic and potato commodities and strengthen cooperation and synergy between

farmers and related stakeholders thanks to the financial digital platform and (3) know the upstream-downstream industrial model including postharvest so that there will be a market place like the modern market. The results show that there is an influence of post-harvest variables, planting area increase process, production and market place on financial digital platform. All influential variables indicate that the development of the Food Estate Area should be supported by the development and support of Financial Digital Platform.



### Model of Empowering Coffee Farmers to Increase Arabica Coffee Productivity in Permata District, Bener Meriah Regency



Research conducted by Prof. Dr. R. Hamdani Harahap, M.Si and his team led to the empowerment of coffee farmers in Bener Meriah Regency. The quantity and quality of Gayo coffee is still low because maintenance is not optimal, soil fertility is declining, human resources are lacking, farmer institutions are weak, coffee plants are old, varieties are mixed, coffee fruit processing has not been uniform and the marketing chain is too long. Some of the efforts made by local governments in their implementation, GAP and post-harvest processing require responsive institutions at the farmer level and community empowerment efforts.

Community empowerment becomes a spirit in the development paradigm that is people centered. This research is in line with the flagship topic and the USU 2020-2025 road map, which is packaged in TALENT, namely the agro-industry sector. This research method is implemented in stages over three years. The first and second years are the implementation of data collection of post-harvest cultivation and processing as well as coffee farmer institutions and the design of a coffee farmer empowerment model in Permata District, Bener Meriah Regency. Finally, in the third year, a trial of the coffee farmer empowerment model was carried out.





## Productivity Analysis of System Formwork Work on Multi-Storey Building Projects



Rezky Ariessa Dewi, S.T., M.T. and the team conducted research on formwork work. Formwork or Formwork is a mold for fresh concrete. Formwork is used so that the finished concrete yield is as desired. In its development, bekisting there are those who use conventional methods, semi-systems and systems. Formwork work also makes a considerable contribution in terms of the proportion of the cost of concrete work, therefore in planning formwork work should

be determined which type of formwork is best and in accordance with the conditions of the project. By using the formwork system method, researchers want to know the actual value of the productivity of formwork work and which formwork cycle capital provides the best productivity value. This research has a research stage, namely conducting an analysis of the productivity of the formwork system. Then the actual value of productivity and the best model of the work cycle of formwork are sought.



## Revitalization of Illumination of Karo Ancient Manuscripts on Souvenir Products



Dra. Nurhayati Harahap, M.Hum conducted research related to the ancient manuscript of Karo. Karo illumination and script are relics in the form of Karo cultural documents contained in the Karo manuscript that need to be revitalized to be introduced and can be used for human needs. Cultural documents can be revitalized in various forms, one of which is by displaying the content of manuscripts, including illuminations / characters in the form of souvenirs in the form of T-shirts, bags, wall drawings, wallets, and others as an introduction to the local wisdom of a tourist destination. The collected manuscripts are tabulated based on the group/type of illumination found and take into account artistic and artistic aspects. Selected illuminations are categorized and arranged in such a way. Karo ancient manuscripts were written with bark media (laklak), a total of four ancient manuscripts are stored in the Karo Heritage Museum, Berastagi. Of the four ancient manuscripts starting from manuscript 1 there are 15 illuminations, in manuscript 2 there are 32 illuminations, in manuscript 3 there are 6 illuminations, and in

manuscript 4 there are 4 illuminations. These illuminations vary greatly in shape. Of the several illuminations found in manuscript 1 there are 4 illuminations, manuscript 2 there are 32 illuminations, manuscript 3 there are 6 illuminations, and manuscript 4 there are 4 illuminations. All the illuminations contained in the four manuscripts vary in shape, which is similar to Karo carving art, and can be used as a drawing design for souvenirs. In addition to the illumination images found in the four Karo ancient manuscripts, the Karo script is 21 but only 19 Karo scripts are found. Karo script has the potential to be used as a souvenir design by stringing it into one meaningful word or sentence, for example the name of the association such as merga silima, kalak karo, etc. This research is in line with the design of USU's competitive advantage areas contained in USU's long-term Plan (2015-2039), namely local wisdom and arts. This level of research is TKT 4. The results of the study target SDGs 8, namely increasing equitable and sustainable economic growth, an optimal and productive workforce, and decent work for all.

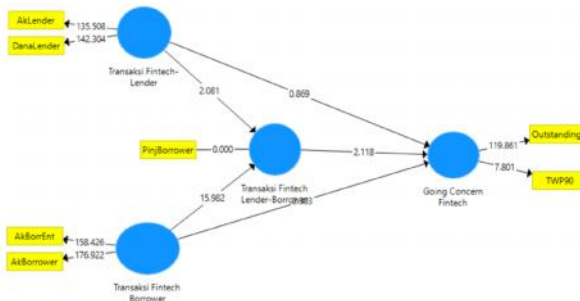


## Aggregate Quality of Financial Technology (Fintech) Start Up Loans and Their Impact on Economic Growth



Collaborative Fintech Research was carried out by Prof. Dr. Iskandar Muda, SE, M.Si Ak, CA, CPA (USU); Prof. Dr. Abdul Hamid Habbe, SE., M.Si. (Unhas); Dr. Ida Farida Adi Prawira, S.E., M.Si (UPI) regarding financial technology (Fintech). This study aims to (1) find out the Accumulated Fintech Lender Transactions in Java Island and Outside Java Island, (2) know the Accumulated Fintech Borrower Transactions in Java Island and Outside Java Island, (3) know the quality of Fintech Lending loan collectibility, and (4) know the effect of Fintech Lending loans on the economy. The research output is planned to be published in international proceedings and reputable international journal articles indexed by Scopus. The results show that Fintech transactions are accumulatively dominant in Java Island with an aggregate percentage in 2018 (20.62%), in 2019

(20.51%), in 2020 (20.38%) and in 2021 (20.43%). Fintech Borrower transactions are accumulatively dominant in Java island by 51.31%, outside Java by 13.46% and abroad by 20.26%. The average loan quality reached the level of 34.07%. Fintech Borrower transactions affect Fintech's Going Concern with an alpha significance value of 0.022 (< 5 %). Fintech Borrower transactions affect Fintech Lender-Borrower Transactions with an alpha significance value of 0.000 (< 5%). Fintech Lender-Borrower transactions affect Fintech's Going Concern with an alpha significance value of 0.035 (< 5%). Fintech-Lender transactions have no effect on Going Concern Fintech with an alpha significance value of 0.385 (> 5 %). Fintech-Lender transactions affect Fintech Lender-Borrower Transactions with a significance value of alpha 0.038 (< 5%).



Gambar 3.15. Pintu Masuk Toko Metaverse dengan Daftar Belanja Dan Nilai Keranjang serta Jumlah dan Panduan



## BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALIZATION AND FOSTER INNOVATION

The 9th goal of the SDGs is to build sustainable infrastructure, increase inclusive and sustainable industries and encourage innovation. Efforts to achieve this goal have been carried out by USU in accordance with the Tri Dharma of higher education, namely strengthening scientific research and technological capabilities in the industrial sector and increasing access to information and communication technology. Usu's active involvement can be seen from the research, service and of course the innovations resulting from these activities.

### Optimization of mechanical strength and interface bonding of thin layer asphalt modified sand liquid natural rubber with the addition of wax-based additives as wear layer (ac-wc) of road pavement



Dr. Amir Hamzah Siregar M.Si and his team carried out research related to road pavement layers. This study aims to develop the benefits of Indonesian latex natural rubber, reduce the use of non-renewable natural resources and produce quality road pavement wear layers. The stages of the research method are: 1. Testing the content of latex dry rubber using the method of heating and adding acid; 2. The manufacture of liquid natural rubber using the photochemical method with the addition of anionic surfactants collaborated with heating (UV 30

watts, 70oC, H2O2 0.25 mol) then characterized its functional groups; 3. Making asphalt-rubber by adding liquid natural rubber that varies, namely 8, 10, 12, 14, 16% with the addition of wax-based additives so that the most optimal ductility value of the asphalt-rubber mixture based on SNI 8198-2015 is obtained, contact angle analysis, end group analysis, and morphological analysis using SEM; 4. The most optimal asphalt-rubber mixture is then mixed with fine sand aggregate and medium and then tested for mechanical strength using Marshall tools.



### Development of Brick Interlock Fly Ash (Bifa) as a Building Sheath that Supports Energy Efficiency



Muhammad Agung Putra Handana ST., MT and his team carried out energy efficiency research. Penelitian this Menguse fly ash as a substitution of cement interlocking

masonry brick. The reason for using fly ash substitution is because a lot of coal waste is wasted and not used. This research is a development of interlocking masonry bricks





with a mixed variation of fly ash 0%, 10%, 20%, 30%, 40%, and 50%. Interlocking masonry brick with dimensions of 25 x 12.5 x 10 cm with two holes each with a diameter of 6 cm with a treatment method, namely air curing, while the parameters to be seen are the compressive strength and absorption of concrete. Compressive strength testing is carried out at the age of 28 days. After obtaining the optimum percentage, a test object is made for shear testing on wall pairs which will be carried out in the second year.

It is hoped that the results of this research can produce interlocking masonry bricks with the use of fly ash waste which is in line with the concept of green building as a solution to environmental threats contributed through construction activities. The output produced is a simple patent draft in the first year, so in the first year a simple patent registration number has been obtained, while in the second year it has become granted status and received a simple patent certificate.



### Dimensional Optimization of Cross-Section Beam I Pervious Concrete as Drainage Cover



Research has been conducted by Ir. Syahrizal MT. and the team regarding drainage. Due to the high level of rainfall in Indonesia which causes a lot of puddles to form on the sidewalks on the road which causes disturbances to its users. One method to deal with these inundations is to increase the absorbency of drainage, namely using Porous Concrete to increase the absorbency of a drainage. Therefore, the researcher proposed a solution that can be an alternative to the problem in the form of

pervios concrete as an I-ditch cover so that the I-ditch cover that previously flowed water can escape water without reducing its use as a sidewalk for pedestrians. So that through its application, it is hoped that the infiltration rate of surface water flow can be increased and waterlogging can be minimized. The output produced is a simple patent draft in the first year, so in the first year a simple patent registration number has been obtained, while in the second year it has become granted status and received a simple patent certificate.



### Effect of Lecithin Addition and Various Types of Oil on the Characteristics of Chocolate Bars Production of Pendawa Farmer Group



Edy Syahputra Harahap, S.TP., M.Si and the team carried out research on chocolate production in farmer groups. Chocolate jam, chocolate bars, chocolate powder, brown fat, chocolate paste are some types of processed

ingredients from cocoa. The processing process requires very careful attention because it will affect the final result of the product. Starting from the process of harvesting, fermentation, drying to become



powder, all types of tools and materials used must be considered. During the storage process of dried cocoa beans using burlap, the final product used will give a musty aroma (gunny). In addition, the most important thing is the type of cocoa used for the production process. This is because there are three types of cocoa, namely, Coriollo, Trinatario, and

Forastero. The three types of cocoa contain different fats that affect product quality. This research consists of 4 stages, namely characterization of raw materials, processing of raw materials, making chocolate bar products, and analyzing chocolate bar products.



### Development of Blood Mussel Shell Powder With Different Concentrations As The Basic Material Of Abrasive Polishing Paste Restoration Of Nanohybrid Composite Resins Against Roughness, Shine, And Surface Hardness



Wandania Farahanny, drg., MSc., Sp.KG(K) and team have carried out research on red clam shells. The purpose of this study is for the development of blood mussel shell powder of different concentrations as the basic material for nanohybrid composite resin restoration polishing paste against roughness, shine, and surface hardness. The research that will be carried out includes the manufacture of blood clam shell powder preparations, measurement of blood clam shell powder with a particle size of 1250 mesh and its content using SEM-EDX. Then analyze

the elements of the blood mussel shell using XRD and FT-IR and then made in the dosage form of a paste. The sample was restored with composite resin and the manufacture of composite resin plates was polished with blood mussel shell polishing paste with different concentrations of 12.5%, 25%, 50%, 75%. After that, polished samples are tested for surface roughness with AFM, surface sparkle tested with Glossmeter, and then other samples are tested for surface hardness with Vickers.



### Recycling of plastic waste and utilization of household waste as planting media and fertilizer for medicinal plants to add selling value and community income



Community service activities regarding plastic waste recycling were carried out by Prof. Rahmawaty, S.Hut, M.Si, Ph.D and his team. The service activity aims to process

plastic and organic waste starting from the receipt of raw materials, namely waste from households and traditional markets in Sei Semayang Village and its surroundings to the



results of the organic waste processing process in the form of containers where medicinal plants and organic liquid fertilizers are grown. In making containers for planting medicinal plants from plastic waste and organic liquid fertilizer using organic waste as raw materials, first the selection of plastic waste and organic waste is carried out. For organic waste carried out chopping. The fundamental contribution to be achieved in this activity is the availability of products in the form of medicinal plant containers from

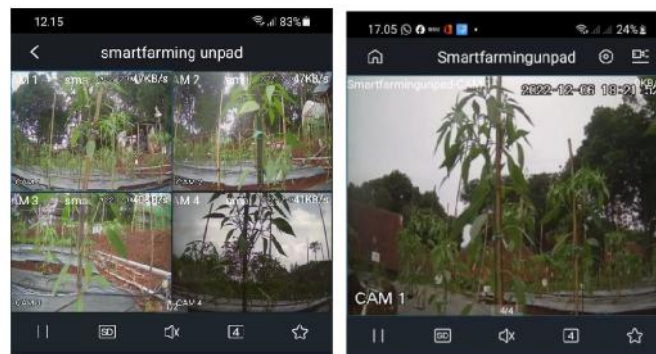
recycled plastic and organic fertilizers with a variety of packaging so that, there are several types of packaging for various sizes that can be purchased by the entire community, increasing partner skills in terms of the use of chopping tools and factors that affect the process of making organic fertilizers and containers where medicinal plants are planted that can be sold at high prices. So as to increase partner income.

### Artificial Intelligence Precision Farming Design Based on Drip and Foliar Feeding Systems for Chili Plants



Collaborative research conducted by Ir. Endra Joelianto, Ph.D. (ITB); Prof. Dr. Tualar Simarmata (UNPAD); Poltak Sihombing, Ph.D. (USU); Dr. Hanif Fakhurroja, S.Si., M.T. (BRIN); Prof. Dr. Putra Sumari (USM-Malaysia) with the title "Rekacipta Artificial Intelligence Precision Farming Based on Drip and Foliar Feeding Systems for Chili Plants" consists of 2 stages, stage 1 to create a distribution system for water supply and nutrition delivery through leaves or foliar feeding. Water distribution regulation system 1 gives the best results to plant growth. Providing nutrients through foliar feeding provides the best results on the weight of the planting fruit, but not on plant growth.

Phase 2 research was conducted by upgrading components based on the results in stage 1. At this stage, a water feeding system is carried out using the SARSA and Q-Learning methods as well as the development of drones for watering nutrients through leaves. The water feeding system using the SARSA and Q-Learning methods is still in the learning process, so it has not affected plant growth. The drones developed have successfully run autonomously according to the waypoints made, it is still necessary to develop foliar feeding on plants. The use of drones for watering on chili plants needs to be developed and tested on chili plants.



Gambar 35. Monitoring Pertumbuhan Tanaman dengan CCTV dari USU, Medan

### Development of Electric Vehicle Battery Monitoring System



Collaborative research was conducted by a team consisting of Dr. Ir. Fahmi, ST, MSc, IPM (University of North Sumatra); Muhammad Imran Hamid, ST,

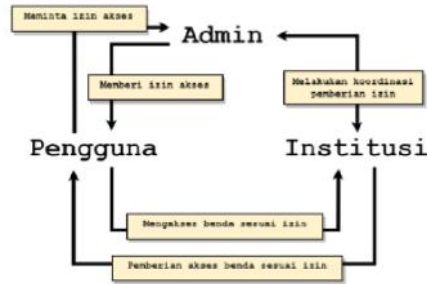
MT, PhD (Andalas University); Erwin Sutanto, ST., Msc (Universitas Airlangga); M. Yazid, B.Eng., M.Eng (Sepuluh Nopember Institute of



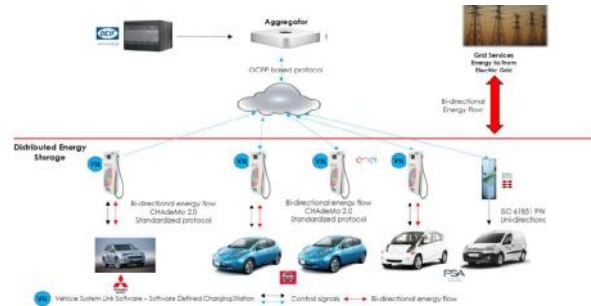
Technology); Wervyan Shalannanda, ST, MT (Bandung Institute of Technology); Assoc.Prof Dr. Eng. Muhammad Azis. The development of electric vehicles in Indonesia can be seen from the number of electric vehicles used increasing every day and there is a need to monitor the remaining power from batteries as the main source in real-time and remotely. Not only does it collect data, send it remotely, store it in a database, and display the results through a website or mobile application, but also analyze the capabilities of such batteries, plan a charging or replacement schedule, and evaluate their quality. A battery monitoring system

will be developed in this study. Hardware is used to collect data from vehicles, and simultaneously send it to the server. Later, applications are developed to display analysis results that may be useful to users. However, the main focus of this work is on the periodic analysis of the condition of the battery.

The purpose of this study is to build a prototype of a car vehicle battery condition monitoring system equipped with a diagnostic module that will send data to the server in real time for battery quality development and monitoring.



Gambar Pihak-pihak dalam sistem kontrol akses many-to-many



Gambar Bagan struktur dasar dari sistem vehicle-to-grid (V2G)



## REDUCE INEQUALITY WITHIN AND AMONG COUNTRIES

The 10th goal of the SDGs concerns inequality within and among countries around the world. Income inequality is a global problem that requires global solutions. This includes improving regulation, monitoring markets and financial institutions, and encouraging development assistance and foreign direct investment in areas most in need. The University of North Sumatra has contributed to achieving the target in this goal through research, service and cooperation activities.

USU Lecturer Socializes Earthquake Awareness



The Community Service Team of the University of North Sumatra in this case was represented by Ir Rahmi Karolina, ST, MT, IPM, Hilma Tamiami Fachrudin, ST, M.Sc, Ph.D, GP and Indra Aulia, S.TI, M.Kom, CIAR, who are teaching staff at the Department of Civil Engineering, Department of Architecture and Department of Information Technology, University of North Sumatra Conducting Earthquake Awareness Socialization at SDIT Siti Hajar which is located at Jalan Letjen Jaming Ginting, Medan Tuntungan.

The Community Service Team of the University of North Sumatra hopes that early childhood has the character of being aware of the dangers of earthquakes, so that they can prepare themselves when the disaster occurs. This digital educational game has arrived on the playstore and can be downloaded under the name Aku Anak Siaga Facing the Earthquake <https://www.usu.ac.id/id/bulletin/usu-bekerjasama-dengan-bp2mi-untuk-atasi-pekerja-migran-ilegal>

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[\https://www.usu.ac.id/id/pengabdian-masyarakat/dosen-usu-sosialisasi-kewaspadaan-gempa](https://www.usu.ac.id/id/pengabdian-masyarakat/dosen-usu-sosialisasi-kewaspadaan-gempa)

### Lack of Dental and Oral Care, Adolescents Are Prone to Natural Caries





The USU Faculty of Dentistry Lecturer Team conducts community service through health improvement counseling, as well as dental and oral health maintenance training and training on how to brush your teeth.

Team Leader drg Cek Dara Manja, Sp.RKG(K) stated that this activity arose from the encouragement to help students improve their health, especially oral and dental health. "Adolescence is a time that is prone to caries in teeth, if you don't have good and correct habits in brushing your teeth," he said.

In this activity, they were trained on how to brush their teeth properly, how to wash their hands properly and the introduction of radiographic examinations of dentistry needed as supporting examinations in dental care. It is hoped that by providing counseling and training, students can be more optimal in maintaining their health, especially dental and oral health in daily activities.

<https://www.usu.ac.id/id/pengabdian-masyarakat/kurang-menjaga-gigi-dan-mulut-remaja-rentan-alami-karies>

### USU Scout Community Service Encourages SDG's Silalahi Village





The Student Activity Unit (UKM) of the Scout Movement of the Medan City Front Cluster 08,137 and 08,138 Pangkalan Universitas Sumatera Utara (USU) held a community service activity in Silalahi II Village, Silahisabungan District, Dairi Regency, North Sumatra on Friday-Saturday (16-17/12/2022). Raising the title of Environmental Awareness to Improve SDG's Silalahi II Village, USU Scouts held a series of service activities. In the first activity, socialization of Sustainable Development Goals (SDG's) point No. 12 was carried out, namely Environmentally Conscious Consumption and Production by the Chairman of the USU Scout Racana Council, Roni Hikmah Ramadhan, S.S., M.A. to provide understanding and awareness to the

village community about the importance of protecting the environment.

After that, the USU Scout service team along with the people of Silalahi II Village carried out mutual cooperation to clean the village area and build garbage disposal facilities at several predetermined village points. The activity took place lively when elementary school students who had just received a report card participated in helping in the action. The activity was closed with friendship and hospitality with the villagers.

<https://lppm.usu.ac.id/index.php/agenda-kegiatan/panduan/373-pkm-lppm-pramuka-sdgs>

#### Empowering Housewives, USU Faculty of Forestry Lecturer Introduces Toga Processed Products



Lecturers at the Faculty of Forestry, University of North Sumatra (USU) provided training on planting and utilizing Family Medicinal Plants (Toga) into processed products of economic value to housewives in

Harjosari II village, Medan Amplas District, Medan City.

The head of the community service team at the USU Faculty of Forestry, Mariah Ulfa, S.Hut, M.Sc, explained that she was active in reintroducing various types of Toga





that are often found around the house and are very easy to cultivate such as ginger, turmeric, temulawak, temu ireng, kencur, temu kunci, white turmeric, lemongrass, telang flowers and others," Mariah said to *Waspada*, Sunday (9/10).

Added Team Member, Dr Ma'rifatin Zahrah, basically Toga rhizomes are part of the spices that are always used as a seasoning in the kitchen," he said.

For the series of peak activities in the form of innovative processing of Toga into processed products of economic value and bringing benefits, namely TOGA ice cream with various flavors of telang ice cream, ginger lemongrass ice cream, and rosela ice cream.

<https://waspada.id/medan/berdayakan-ibu-rumah-tangga-dosen-fakultas-kehutanan-usu-perkenalkan-produk-olahan-toga/>

## FMIPA-USU Students Join PKM in Bingkawan Village



Five students of the mathematics study program of the Faculty of Mathematics and Natural Sciences, University of North Sumatra (FMIPA-USU) participated in a Community Service (PKM) activity in Bingkawan Village, Sibolangit District, Deliserdang Regency.

PKM is one of the implementations of the Merdeka Belajar Kampus Merdeka (MBKM) Program launched by the Ministry of Education of the Republic of Indonesia, so that it can also be loaded with off-campus education that can be accommodated in a certain amount of semester credit system.

From June to November 2022, USU lecturers involving their students have begun to carry out PLM activities in various selected locations coordinated by LPPM-USU.

One of the PKM implementation teams from the FMIPA-USU mathematics study program, Zahedi said, PKM produces double benefits for students. On the one hand, students find a whole new atmosphere of interaction in the community.

<https://www.fokusmedan.com/2022/09/08/mahasiswa-fmipa-usu-ikuti-pkm-di-desa-bingkawan/>



## USU Community Service Team Educates Clean Lifestyle of Modern Islamic Boarding School Students Al-Mukhlishin Deliserdang



The Community Service Team of the University of North Sumatra (USU) conducted education about clean and healthy lifestyles and prevention of dental and oral diseases during the adaptation of new habits to the students of Pesantren Modern Al Mukhlishin Jalan Medan – Tanjung Morawa Desa Bangun Sari Deliserdang.

This community service team consists of lecturers from the Faculty of Dentistry, University of North Sumatra (FKG USU),

namely drg. Fitri Yunita Batubara, MDSc, Sp.KG; Prof. drg. Trimurni Abidin, M.Kes, Sp.KG (K-E); Drg. Wandania Farahanny, MDSc.,Sp.KG (K); and drg. Sefty Aryani Harahap, M.Si.

<https://sumutcyber.com/tim-pengabdian-masyarakat-usu-edukasi-pola-hidup-bersih-santri-pesantren-modern-al-mukhlishin-deliserdang/>

## LPPM-USU Helps Overcome Clean Water Difficulties in Bingkawan Village



Bingkawan Village, Sibolangit District, Deliserdang Regency, North Sumatra (Sumut), covering an area of about 250 hectares at first glance does not have any problems, because the villagers mostly live along the Medan-Berastagi causeway.

However, villagers who live in the hills or better known as Sikeci-keci Hamlet apparently have to go down a deep valley through steep and slippery paths to get clean water for drinking and cooking purposes.



Since June 2022, 3 lecturers from FMIP-USU as the implementation team for LPPM-USU Community Service activities with the support of hydraulic pump technical consultants and hydroponic cultivation have collaborated with villagers to overcome the difficulties faced by the community.

Dr. Zahedi as the team leader accompanied by Dr. Suyanto and Dr. Suryati Sitepu said that if the difficulties for the procurement of clean

water can be overcome, then the villagers will also be able to develop efforts to cultivate hydroponic vegetables and freshwater fish.

<https://analisadaily.com/berita/baca/2022/08/29/1033761/lppm-usu-bantu-atasi-kesulitan-air-bersih-warga-desa-bingkawan/#.YwyZiOE8u0.whatsapp>

#### USU Lecturer Introduces Complete Feed Fermentation Technology for Quality Animal Feed



USU lecturers introduced fermented complete feed processing technology in Batu Malenggang Village, Hinai District, Langkat Regency. With this feed processing technology, it can increase the nutrient content in the feed.

This was conveyed by Ir Achmad Sadeli SPt MSc IPM as the Head of the Community Service Team who is also a Lecturer of

Animal Husbandry Study Program, Faculty of Agriculture, USU in the presence of the chairman and secretary of the Berkas Tani Farmer Group, all members of the farmer group thanks to farmers and the people of Batu Malenggang Village, recently. At that time, Achmad Sadeli was accompanied by members of the community service team such as Dr Nevy Diana Hanafi SPt MSi and Dr Ir Ma'ruf Tafsir MSi.



# MAKE CITIES AND HUMAN SETTLEMENTS INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE

The concept of a sustainable city is related to the welfare of the community and the quality of the environment that is maintained. Economic and social activities become part of city life. Goal number 11 of the SDGs is intended to achieve inclusive, safe, resilient and sustainable cities and settlements.

The University of North Sumatra as a higher education institution that upholds sustainable development in an effort to create safe and inclusive settlements and preserve art and cultural dwellings has programs that are in accordance with the excellence and roadmap of TALENTA (*Tropical Science and Medicine;*

*Agroindustry; Local Wisdom; Energy (sustainable); Natural Resources (biodiversity, forest, marine, mine, tourism); Technology (appropriate) and Arts (ethnic)* set out in USU's Long-Term Plan 2015-2039.

In an effort to realize goals that are in accordance with the development of cities, safe and inclusive settlements and preserve art and cultural habitation, the University of North Sumatra provides easy access to the public in libraries, art and cultural performances, access to mass transportation, and green open spaces within the University of North Sumatra.

## Realizing a Green City through the Application of Urban Design Principles and Green Behavior to Millennials and Generation Z



Green cities are related to sustainability theory, namely social, economic and environmental as well as health, greening, resilience and equity. Some of the attributes of green cities are green planning and design, green communities, green open spaces, green water, green waste, green energy, green transportation, and green buildings. Efforts to realize a green city must be supported by the planning and design of green cities, green open spaces and green habits (Green Behavior) of its residents. The research of Hilma Tamiami Fachrudin, ST, M.Sc, Ph.D. and this team aims to analyze the application of urban design principles, green open spaces and green habits that support

the realization of green cities. Analysis was performed descriptively and multiple linear regression. Green cities can benefit their residents and improve their quality of life. The implementation of green roads and the fulfillment of a minimum of 30% green open space in cities can support the realization of green cities physically. Green communities through green behavior, especially in millennials and generation Z, can support green cities. Attitudes, behavioral intentions, responsibilities, behavioral control and motivation influence green behavior in the city. The application of urban principles and design is embodied in the design of green roads.



### Spatial Study of Tarutung City Image



Tarutung City, which is located in North Tapanuli Regency, Sumatra Province, was originally a land dominated by the civilization of the Batak people. The presence of the German missionaris, the Rheinische Missions-Gesellschaft (RMG) and the active Dutch colonial control with the establishment of Tarutung as the place of control of Onderafdeling Silindung has given birth to planning and various construction of space and functions in the city. However, modernity is slowly present and is thought to have changed the image of the city of Tarutung that had been planned in advance. This attracted the attention of researchers to examine the spatial image of the city, to see how the initial design pattern of the city was formed; the process and form of physical and functional changes of the city up to its current state.

Through descriptive research with qualitative and quantitative approaches, with data collection techniques for literature studies, field studies, secondary data collection, interviews, map drawing, and spatial analysis, it is hoped that it can produce a study of patterns and forms of initial planning for the city of Tarutung. The study conducted by Ir. Morida Siagian, MURP, Ph.D and this team is expected to contribute to the planning and spatial planning of tarutung city which is identifiable, distinctive, sustainable and competitive. This is in accordance with the objectives of the Global Action Plan or Sustainable Development Goals (SDGs), namely to make cities and settlements inclusive, safe, resilient and sustainable.



### Road Corridor Planning Model as a Means of Developing Historic Tourism in Medan With the Concept of Walkable City



Medan is the largest city on the island of Sumatra and the capital of North Sumatra. The main tourist attractions are in the center of the city, which is located in the Kesawan corridor, around Merdeka Square, Maimun Palace, and Al Mashun Grand Mosque. Nevertheless, there is still no adequate pedestrian environment connecting these areas so there is very little walking activity.

The research conducted by Firman Eddy, ST, MT and this team aims to examine the current environmental conditions of pedestrians and develop a design model to improve the ability of pedestrians in the historical tourist area of Medan. The final walkability score of the study site was 58.8. The authors propose five recommendation models for the improvement of pedestrian



paths at the study site, namely: (1) Improvement of pedestrian path facilities; (2) CPTED design application on the trail; (3) Implementation of pelican crossing; (4) Signage and speed bump applications; and (5)

Portal barrier applications Ramp and S. Authors believe the proposed model recommendations are sufficient to improve walkability at the study site.



### Evaluation Of Fire Vulnerability To Traditional Batak Toba Houses In Huta Raja Tourism Village, Samosir Regency



Research conducted by Ir. N. Vinky Rahman, M.T. and this team aims to examine what factors are significant in the Batak Toba traditional house to assess fire vulnerability. The main result of the study is a recommendation for a set of indicators for assessing fire susceptibility. This research uses a systematic literature review approach. This approach is used to identify and organize concepts in the relevant literature the author has classified and categorized different indicators and analyzed their suitability with the Batak Toba Traditional House. There are 11 indicators needed to assess the fire

vulnerability of the Batak Toba Traditional House, namely: (1) building materials and finishing; (2) electrical components; (3) type of construction; (4) structural resilience; (5) accessibility of buildings; (6) road materials; (7) the distance to the main road; (8) water resources; (9) the density of the fire load; (10) the source of the fire inside the building; (11) the source of the fire outside the building. Overall, this research can help other researchers / practitioners in the field of fire engineering or architecture to assess the vulnerability of fires in the Batak Toba Traditional House.



### Analysis of Structural System Transformation and Roof Construction of Traditional Batak Toba Houses in Samosir Regency Tourism Village



Research on traditional houses was conducted by Ir. Novrial, M.Eng. and team. This research aims to determine the transformation of the roof structure and construction of the Batak Toba Traditional House in four villages on Samosir Island, namely Huta Siallagan, Lumban Sigiro, Lumban Parmonangan, and Sosor Batu. This research uses a descriptive qualitative approach, where the author will produce

descriptive information about the problem under study in written and oral form. The author will observe and analyze the transformation of roof construction and structural components at the Batak Toba Traditional House on Samosir Island. The result of this study is that there are slight changes in the structural system and roof construction of the Batak Toba Traditional House on Samosir Island. First, there is a



transformation in the roofing material. Secondly, transformations in structural design. Third, the stages of construction of

traditional houses. Finally, the transformation of the roof structural connection system.



### Advocacy for reducing the use of plastic in our living environment and the utilization of plastic waste



Community service activities of the international community service scheme by Prof. Rahmawaty, S.Hut, M.Si, Ph.D and team bpartnering with the Plastic Literacy Network, a community whose members cross countries (UK, Australia, Philippines, and Indonesia) who are concerned or concerned about plastic waste in our surroundings. KThis international community service activity is already on-going or is a continuation of the implementation of the Memorandum of Understanding (MoU) between Keele University (UK) and USU. Some of the activities that have been carried out include: Webinar seRies that realized consisting of 4 (four) webinar activities with a combination of partners and the abdimas team of the University of North Sumatra (USU) as follows: (1) in July, the theme: Plastic Litter in Land, speakers: Deirdre McKay

(England) and Rahmawaty (USU) and opened by the Deputy Dean of the USU Faculty of Forestry (Agus Purwoko); (2) in August, the theme: Plastic Litter in Aquatic Ecosystems, speakers: Simon J Dixon (UK) and Novrida Hasibuan (USU) and opened by the Head of the USU S1 Forestry Study Program; (3) in September, the theme: Sustainable Fashion using Natural Fiber, speakers: Elyse Ruby Stannes (Australia) and Iwan Risnasari (USU) and opened by the Head of UPT Integrated Lab USU (Rahmi Karolina) and introduction by the Head of R&D of AEPI (Indonesian Eco-Printer Association) (Kun Sri Budiasih); (4) in October (implementation on September 30, 2022), the theme: Plastic Litter in Sea and Coastal Area, speakers: Neil Angelo Abreo (Philippines) and Rudy Sofyan (USU) and opened by the Head of the USU Master of Forestry Study Program.

### Linguistic Landscape for Tourists' Guide to the Toba Caldera Geosite as a Tourist Destination in the Lake Toba Area



Research team collaboration research from Prof. Dr. Robert Sibarani (USU); Prof. Dr. Njaju Jenny Malik, S.S., M.A. (UI); Lusia Marlina Nurani, Ph.D (ITB) about the linguistic landscape for a tourist guide to the Toba Caldera Geosite as a tourist destination for the Lake Toba Area. This research is motivated by seven problems found in the Toba Caldera Geosite related to the linguistic landscape for the promotion of geosites as tourist destinations.

The results showed that the shape of the linguistic landscape was carried out uniformly, for example, the reception at the Toba Caldera Geosite was in the form of an archway, the digeopoin reception

was in the form of a monument, the directional information board was made locally distinctive, the description of geographical information was uniform in the structure of the information, and the folk discourse was side by side with a common folk discourse with cultural story information, bio-story, and earth story (bio-story), but the semiotic design was like a verbal sign, carved motifs, and colors adapted to the local culture. Allinguistic landscapes can be designed in linguistic landscape applications, and public perceptions are still being collected about geopoint names in the Toba Caldera Geosite.

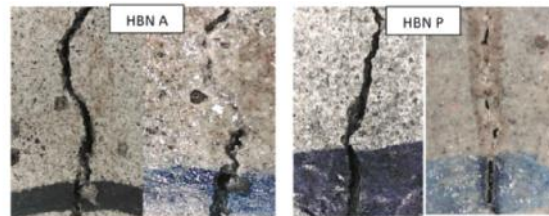
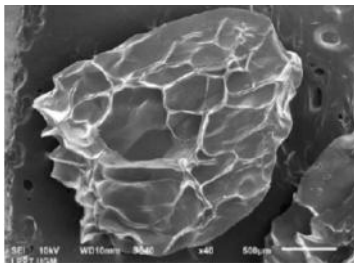


## Study on the Use of pH Responsive Hydrogel as a Bacterial Protective Material in the Manufacture of Self-Healing Concrete in the Collaboration Rist Program



The team consisted of Puput Risdanareni, S.T., M.T., Ph.D (UNM); Dr. Apt. Agustina A.M.B Hastuti, M.Sc (UGM); Dr. Apt. Khadijah, M.Si (UGM); Ir. Rahmi Karolina, S.T., M.T., IPM (USU) conducted a research collaboration on the use of pH responsive hydrogel. The main objective of this study is to explore locally based hydrogel types that are safe for bacteria and have low swelling ability when mixed into concrete matrices that have a high pH so that self-healing concrete with optimal performance is obtained. To achieve this main goal, this study is divided into three work packages (WP): (1) hydrogel formulations for the encapsulation of compatible bacteria for the concrete matrix and its characterization, (2) studies of bacterial performance after the encapsulation process into the hydrogel, and (3)

studies of the use of hydrogels containing bacteria on the performance of self-healing concrete. Locally based hydrogel characterization test, *Bacillus* sp spore viability test. R20 after encapsulation into a hydrogel and healing performance test of concrete containing *Bacillus* sp spore-charged hydrogel. R20 will do. The results showed that xanthangum-based hydrogel (hydrogel P) had low swelling at high pH. In addition, the addition of xanthangum-based hydrogel has also been shown not to cause a decrease in the mechanical strength of the resulting mortar. The healing performance of mortars containing type P hydrogels is also better than the healing performance of concrete with commercial hydrogels.







## Study of Aspects of Sustainable Tourism Governance After the Revitalization of Huta Siallagan in Samosir Regency



Collaborative research conducted by Prof. Ir. Nurlisa Ginting, M.Sc., Ph.D. (USU); Dr. Ike Revita, M.Hum. (UNAND); Dr. Ir. Eko Budi Santoso, Lic.Rer.Reg. (ITS) . This research was carried out to understand the benefits of the Huta Siallagan revitalization project by examining aspects of sustainable tourism governance in the destination. Through the Indonesian Collaborative Research scheme with the collaboration of three researchers from PTN-BH (USU, UNAND, ITS).

Using the framework of aspects of sustainable tourism governance, researchers found that the revitalization of Huta Siallagan has caused various conflicts of interest, especially from the side of local communities affiliated with the tourism sector. This arises because the initiation of top down planning from the central government on the implementation of revitalization is very minimal in

involving cross-stakeholder roles, so, there is a dynamic among people who expect that this revitalization can improve the economy of the people in Siallagan. Meanwhile, in terms of tourism sustainability, it was concluded that the revitalization that occurred in Huta Siallagan had a major effect on the governance of its destination. The changes and shifts that have occurred along with the improvement of tourism infrastructure in Huta Siallagan, namely the degradation of cultural values because tourism-oriented development – in the form of space transformation and activity programming – has reduced Huta's authenticity and wisdom, thus creating a new image of Huta Siallagan. By maintaining an authentic community culture and compiling a destination governance system oriented towards community welfare, it can actually elevate Huta Siallagan into a sustainable tourism destination.





# ENSURE SUSTAINABLE CONSUMPTION AND PRODUCTION PATTERNS

The 12th goal of the SDGs is to ensure sustainable consumption and production. In achieving economic growth and sustainable development, we must consider production and consumption efforts that can support the achievement of the SDGs. Efficient management of shared natural resources and methods of disposal of toxic waste and pollutants are the main objectives in achieving this goal. USU also takes an important role in achieving goal 12 of these SDGs through research activities, community service and collaboration with various stakeholders.

### Study of Honey Bee Cultivation in North Sumatra Province



Dr. Oding Affandi, S. Hut, M. P and the team carried out a study of honey bee cultivation. The honey bee cultivation business has developed in North Sumatra and is spread in various locations. During the development process of honey bee cultivation, a series of studies are needed to increase the quantity and quality of honey produced and be able to increase the income of honey breeders to remain consistent in their cultivation. The quantity and quality of honey produced is closely related to the

availability of feed and the quality of feed. Increasing the quantity and quality of honey production accompanied by marketing will increase the income of honey beekeepers. The results of the study were analyzed descriptively and tabulated to get an overview of the results of the studies carried out, in addition to a SWOT analysis related to cultivation strategies and marketing development of cultivated honey.



### Incorporation of Moringa Leaf Bioactive Extract (*Moringa Oleifera*) In Carboxymethyl Cellulose And Malic Acid Based Hydrogel With Cellulose Filler Of Kombucha Tea Bacteria



Research conducted by Dede Ibrahim, S.Si, M.Si and team regarding the bioactives of Moringa leaves. Indonesia has very abundant organic natural resources and contains a variety of efficacious bioactive chemical compounds. Moringa plant (*Moringa oleifera*) is a household plant that grows in all regions in Indonesia and its leaves are widely consumed by the public and cooked as vegetables and it turns out to contain bioactive compounds that

function as antioxidants. However, its utilization, (preparation, packaging, storage, and consumption), needs to be improved so that it is more hygienic and efficient. In other respects, the steeping of kombucha tea after adding sucrose and various mineral nutrients, can be used as a medium for the preparation of bacterial cellulose. Furthermore, the resulting bacterial cellulose can be utilized for in-situ hydrogel fillers based on carboxymethyl cellulose and maleic acid which are suitable as a medium for incorporation of various bioactive extracts of water- or alcohol-based natural ingredients. Therefore, this study is expected to produce a formulation of Moringa leaf extract in the form of incorporation in hydrogel as an antioxidant supplement that is more hygienic and efficient for consumption.



### Development of Purun and Purun Fiber Products in an Effort to Support the Community Economy and Purun Conservation as Local Wisdom on Peatlands



There are several types of purun that are used as raw materials for wicker, but currently the potential is decreasing, as well as processed products, especially in North Sumatra. On the other hand, weaving is a culture that needs to be preserved. The problem that arises then is the shift in culture and the use of purun which is followed by the decreasing availability of raw materials due to the pressure of changing the function of the land where it grows into other commodities growing land.

Cultural preservation and the development of purun-based products is a necessity, considering that purun is a versatile plant source of fiber that is beneficial to human life, which is the local wisdom of peatlands. Therefore, Dr. Ridwanti Batubara, S. Hut., M.P. and his team conducted research on "Development of Purun And Purun Fiber Products in an Effort to Support the Community Economy and Purun Conservation as Local Wisdom on Peatlands"



### Manufacture of Telang Flower Extract Concentrate and Syrup Using Ultrasound Extraction



Research conducted by Okta Bani, S.T., M.T. and his team regarding telang flower extract. Kembang telang shows promising benefits due to the many health properties discovered recently. Research on the use of telang flower has been carried out but most of the emphasis is placed on the benefits of telang flower extract, the extraction process of

telang flowers, and the processing of extracts into telang flower extract powder. Research on telang flower extract concentrate is not widely publicized even though telang flower extract concentrate has been commercialized. Similarly, research on making telang flower syrup, where the process of making telang flower syrup is simple and traditional is available but a review of the traditional manufacturing process implies that the quality of the telang flower extract produced is not very good. Therefore, in general, this study aims to review the process variables in making telang flower syrup and storing telang flower syrup. The results of the study are expected to be adapted to improve the quality of telang flower syrup so that the nutrition of telang flowers is maintained.

### Risk Assessment of Plunged Waste Final Processing Site (TPA) in Medan Marelán District



Novrida Harpah Hasibuan S. Si, MT conducted a final processing research on waste. The landfill open dumping system is one of the sources of pollution in the environment, especially water bodies around the landfill. The Waterfall Landfill is the only final waste processing site that holds waste in Medan

City which has been operating for 29 years. This study aims to analyze the type, shape and abundance of microplastics in leachate, river, pond water and tilapia around the Marelán Waterfall landfill and analyze water quality with in situ parameters (pH, Temperature and DO) as well as heavy metal concentrations of Pb and Cd. Research results show that the metal concentration has exceeded class 2 water quality standards based on Government Regulation Number 22 of 2022 concerning the Implementation of Environmental Protection and Management.



### Waste treatment technology with an All Out system in an effort to improve environmental biosecurity, livestock health and farmer income at Activist Farm farm



Community service activities were carried out by the team of Dr. Ade Trisna, S.Pt, MM related to sewage treatment. The service method is packaged in the form of lectures, discussions, demonstrations, training and pilots (pilot projects). Service activities are summarized in a guidebook in the form of a Goat and Sheep Maintenance Management Module. From this activity, it is

targeted that there will be cost efficiency (saving animal feed costs because it can utilize alternative sources of feed ingredients), formulating and making independent concentrate feed, saving the cost of purchasing probiotics and organic fertilizer fermentation methods.

### Farmer Empowerment Based on Integration of Agribusiness Development of Superior Commodities and Tourism in Garunggang Village, Kuala District, Langkat Regency



Community service activities carried out by Ir. Yusak Maryunianta, MP and the team are related to agribusiness and tourism. Using the FGD method, Training and Field Practice / Plot Demonstration, a series of service activities have been carried out, namely counseling on improving cultivation techniques and increasing the productivity of superior crop crops, training on processing systems for combinations of superior products with high added value, training on increasing the capacity of farmers in product marketing, training on preparing processed product certification files, and increasing the ability to raise agribusiness partnerships. Until now, the interim results that have been achieved are the improvement of

cultivation techniques and increasing the productivity of ginger superior plants, increasing processing skills of ginger-based superior product combinations, increasing packaging skills of processed products, product marketing, especially in packaging and label making, increasing the ability to prepare exhibitions, preparing processed product certification files, increasing the ability to raise partnerships, forming and strengthening of processing groups, as well as the acquisition of Business Identification Numbers by processing groups.

### Utilization of Unmanned Aerial Vehicle, Deep Learning and Transect Survey for Environmental Pollution Mapping in 3 major cities in Indonesia



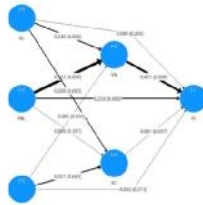
Dr. Eng.Hafizhul Khair, S.T., M.T. (USU); Prof. Dr. Ir. Syafrudin, CES, M.T., IPM (UNDIP); Raden Tina Rosmalina, S.Si., M.Si. (BRIN); Dr. Eng. Munawir, M.T. (UPI) conduct collaborative research on environmental pollution. This study aims to map the distribution of water waste using UAVs with a case

study at one of the estuaries of the Deli River, Medan City. The results showed that the types of waste found were; styrofoam, plastic, wood, multilayer, leaf, plastic bottle, textile, plastic cup, rubber and paper. These wastes can be easily found on the banks of the river.





### Circular Economy and Innovation in MSMEs: Challenges and Opportunities in the Value Creation Process



Collaborative research was conducted by the team of Dr. Ir. Tengku Ezni Balqiah, ME (UI); Dr. Rifelly Dewi Astuti, SE., MM (UI); Prof. Dr. Heri Praktiko, M.Si (UM); Doli Muhammad Jafar Dalimunthe (USU). Based on the results of research that has been carried out, there are three

variables that have a significant effect on Purchase Intention (PI) directly, namely the Environmental Concern (EC), Perceived Behaviour Control (PBC), and Subjective Norm (SN) variables. Meanwhile, the influence of the relationship between the three exogenous variables and moderate variables only has two pathways that are stated to be significant and have a strong effect, namely the relationship of the Social Capital (SC) variable on the Subject Norm (SN) variable then from the moderate variable affects the Purchase Intention (PI). Then followed by the influence of the Perceived Behavior Control (PBC) variable on the Subject Norm (SN) variable then from the moderate variable to the Purchase Intention (PI).

### Properties of Oriented Strand Board (OSB) Made from Vascular Bundles of Palm Rod Waste Adhesive Urea-Formaldehyde (UF) Resin, Isocyanate, and Binderless as Plywood Substitution



Arif Nuryawan, S.Hut., M.Si., Ph.D (Universitas Sumatera Utara); Prof. Dr. Ragil Widyorini, S.T., M.T(Universitas Gadjah Mada); Nanang Masruchin, S.T., M.T., Ph.D (Badan Riset Inovasi Nasional); Prof. Dr. Eddy Herald, M.Si. (Universitas Sebelas Maret) conduct collaborative research. The results of the research by BRIN host researchers and partners will be published in the Fibers MDPI Journal (Q1) because it focuses on the properties of OSB which is composed of fibers bundles in the form of VB

palm stem waste including morphological studies. The results of the UGM partner research will be published in the Processes MDPI Journal (Q2) because it focuses on the binding process between VB in osb without adhesive (binderless). The results of the UNS partner research will be published in the Building MDPI Journal (Q2) because it focuses on applications, especially OSB with exterior adhesives for structural components of buildings.



## TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS

One of the targets of SDG 13 is to play an active role in dealing with climate change and its impacts. Therefore, it is necessary to strengthen resilience and adaptation capacity to climate change. The University of North Sumatra participates in education, research and community service related to climate change and its impacts.

Implementation of Environmental Administration Law Enforcement regarding Environmental Approvals and Environmental Protection and Management Permits for Palm Oil Mill Companies in North Sumatra Province



Dr. Fajar Khaify Rizky, S.H., M.H and the team carried out research on environmental administrative law. As in Law Number 11 of 2020 concerning Job Creation, there are several legal aspects in enforcing environmental laws, one of which is environmental administrative law. Enforcement of environmental administrative law is carried out preventively and repressively both in supervision, provision of administrative law sanctions and administrative law enforcement, the indicator is approval. The approvals that must be

owned by palm oil mill companies include environmental approvals and environmental protection and management permits (technical approvals) as the company's obligation to maintain the sustainability of environmental functions. The stage of the research method carried out is normative legal research, meaning that the legal material used as a study is secondary data. In this normative legal research, it is possible that empirical (field) data are also presented as an option to support and sharpen the study.



Carbon Conservation in Campus Green Spaces as an Effort to Mitigate Climate Change and Support Sustainable Development Goal 13



Carbon sequestration research conducted by Mariah Ulfa, S.Hut, M.Sc. and team. Research was carried out to complete information on the value of biomass and the potential for carbon sequestration in the USU Green Campus RTH area as an effort to mitigate the impacts of climate change. This study aims to analyze the value of above ground biomass, ground biomass, below

ground biomass, and identify potential carbon reserves and sequestration of the USU Green Campus RTH area. The research stages are the creation of land cover stratification maps, the collection of vegetation and sample data, biomass analysis in the laboratory, as well as the estimation of carbon reserves and sequestration.





### Mitigation and adaptation strategies for farming communities in the face of climate change with a socio-cultural approach



Prof. Rizabuana, PhD and his team carried out research on climate change mitigation. Climate change has a very significant impact, especially in agriculture. Not many communities and farmers are aware of the significant correlation between climate change and agricultural productivity. The purpose of this study is to produce a policy in an effort to improve the mitigation and adaptation of farmers in the face of climate change and find effective mitigation in overcoming climate change.

This research uses a mixed method, namely descriptive qualitative and quantitative approaches. Data collection was carried out through in-depth interviews, dissemination of questionnaires, FGDs, observation and documentation. The output of this study is to produce mitigation and adaptation policies in the face of climate change from the agricultural sector.



### Model of Local Government Handling towards Prevention of Environmental Damage to Industrial Estates in Kuala Tanjung Village



Adil Arifin, S.Sos, MA and the team carried out modeling of the government's handling of environmental damage prevention. This study aims to find a model of handling by local governments in solving these problems. The research method that will be carried out is quality research. While the type of research is descriptive. Meanwhile, the data used in this study are primary data and secondary data. In general, the regional government of Batubara regency has a Regional Regulation (Perda) that regulates environmental management and environmental protection,

namely Regional Regulation Number 2 of 2022 concerning the implementation of environmental protection and management, in which it is regulated how obligations and what are prohibitions on business actors in the process of implementing environmental protection and management. In addition, programs and activities refer to programs from the ministry of environment, namely monitoring river water, regular monitoring to companies in the coal district, and planting mangrove forests.

### UAV-Based Interpretation of Trees to Support Forest Science Techno Park at USU Campus



Moehar Maraghiy Harahap, S. Hut., M.Sc. and the team carried out UAV-based research. The results of the research are expected to be useful in the learning process of introducing the surrounding nature for the academic community and visitors

who come, efforts to maintain the microclimate and reduce the impact of global warming, support the concept of the Forest Science Techno Park, open the way for further research and supervision and evaluation of the USU campus arrangement.





### Rainwater Treatment as an Alternative to Clean Water Supply with a Gravity-Fed Filtering System at HKBP Sidorame Private High School Medan



Prof.Dr.Juliati Br Tarigan, M.Si and the team carried out community service regarding rainwater treatment. Rainwater that falls on the earth's surface is sometimes poorly managed. Whereas if managed properly, rainwater can be a useful source for the community, especially those who have difficulty accessing clean water. The rainwater can help community activities such as cooking, washing, bathing, and even for drinking water. People have not fully realized how important rainwater is in life. So far, there are still many assumptions that rain is just a natural event that is missed, so this poor management can cause

environmental problems such as flooding. The importance of sanitation and clean water takes precedence in everyday life. From the description of the data above, it can be seen the importance of these two aspects and there needs to be efforts to improve in order to meet the basic needs of clean water and participation in preserving the environment. This activity is a form of providing tools that can be useful for providing clean water through a simple filtration process, namely by creating alternative clean water sources by utilizing rainwater.

### Edukasi Interaktif Pada Masyarakat Desa Sempakata Dalam Menanggulangi Banjir



Dr. Drs. Arlen Hanel John, M. Si. Sum and his team carried out service in flood-prone areas, Floods are land setting events due to increased water volumes. Flooding is a natural event that can occur because it is caused by nature itself or caused by human actions. Sempakata Village, Medan Selayang District, is one of the North Sumatra areas, precisely in Medan City, which is vulnerable to flooding. Almost every rainy season, catastrophic floods hit this region. In overcoming disasters, it is necessary to have the involvement,

participation of the community in order to anticipate when a disaster will occur and know what actions must be taken during pre-disaster, during disasters and post-disaster so that the community can minimize the impact of flood disasters. Therefore, there is a need for a solution to overcome this. The solution that can be done is introduction, demonstration, and socialization on how to overcome floods in Sempakata Village.

### Establishment of Fire Volunteer Community, Mitigation, Prevention & Empowerment in Fire Prone Districts



Community service activities in fire-prone areas are carried out by Meutia Naully, SPsi., M.Si, Psychologists and team. . This activity further strengthens the spirit of volunteering and strengthens the ability to organize fire volunteers in the city of Medan. Preparedness for potential disasters is a form of effort to improve the ability of the community to respond effectively to threats and impacts of disasters and immediately recover from long-term impacts. The active participation of the community plays the most

important role in the aspect of disaster preparedness. In this case, community empowerment needs to be carried out in order to improve monitoring of forest fire prevention through the formation of a community of fire volunteers, mitigation, and prevention. Formation of a community team of Fire, Mitigation, Prevention & Empowerment volunteers in fire-prone sub-districts.





## CONSERVE AND SUSTAINABLY USE THE OCEANS, SEA AND MARINE RESOURCES FOR SUSTAINABLE DEVELOPMENT

The SDGs have provided a reference for the protection of marine and coastal ecosystems and the resources in them for sustainable development. Various things of concern include pollution originating from land, the impact of ocean acidification. Also of concern is the protection and sustainable use of marine resources through international law. The University of North Sumatra provides funding facilities to support education, research and community service related to the achievement of SDG number 14. The university also offers education on fisheries processing, aquaculture and sustainable tourism which is poured into a curriculum containing related courses. To Support Action Through Aquatic Ecosystems, the University has formed a Team of the Center for the Study of the Strait of Malacca Sumatra, this is done considering that the Strait of Malacca is one of the most important assets in the world and a strategic asset for the nation so that it needs to be well supervised and to support these activities the University also provides funding facilities for institutional strengthening of the Center of Excellence for Higher Education in Science, Higher Education Technology and Science (IPTEKS) (PUI-PT) to support the strategic plan. The actions taken by the University are also outlined in the University-funded TALENTA Research and Community Service as support for lecturers who collaborate with cooperation partners that have been established with the University in order to maintain existing ecosystems and biodiversity, both plants and animals, especially threatened ecosystems and appropriate technology to minimize or prevent damage to aquatic ecosystems. To Maintain Local Ecosystems, the University supports activities to organize, care for and minimize physical and biological changes in aquatic ecosystems and supports activities to monitor the health of aquatic ecosystems by conducting marine conservation, creating a center for Mangrove Science and Technology, University of North Sumatra. As well as conducting cooperation programs with the community in an effort to maintain aquatic ecosystems together by implementing watershed management strategies based on aquatic species diversity. In 2021. The University continues to be committed to supporting activities in terms of preserving the aquatic environment. The form of support provided by the academic community such as conducting research activities and TALENT Community Service, collaborating with partners related to the preservation and protection of aquatic ecosystems, both plants and animals, and supporting science and technology programs.

### Ikti fauna Siluriformes from Das Belawan, North Sumatra Province



Desrita, S.Pi, M.Si and team conducted research on the watershed. This study aims to identify morphological variations, determine the composition of species richness, determine the abundance of fish included in the Order Siluriformes, know habitat characteristics and environmental parameters in the Belawan watershed. The results showed that there is 1 type of fish from the Siluriformes Order obtained from the Belawan watershed, namely *Mystus nemurus*. However, other types of fish are found. This type is found in the upper reaches of the watershed, namely in Suka Ramai Village, Deli Serdang District. For water quality parameters such as

temperature, brightness, current speed, depth, pH and dissolved oxygen (DO) are still in a state that can support the lives of fish and other biota contained in the Belawan watershed. One thing that is very interesting here is that the brightness upstream of the watershed is 100%, then the current speed in the upper reaches of the watershed is also very fast, which is 0.289 m/s different from the middle and downstream stations of the watershed. The degree of acidity and dissolved oxygen is also still around optimum where these conditions can still support the survival of fish and other aquatic biota.





### Bioeconomic Model Management Policy and Prey Predator of Small Pelagic Fish Resources in Malacca Strait Waters in Deli Serdang Regency, North Sumatra Province



Research in the waters of the Strait of Malacca was conducted by Julia Syahriani Hasibuan, S.Pi, M.Si and team. This study aims to calculate the composition of small pelagic fish catches, the optimal exploitation rate and the level of exploitation of multispecies caught biologically, ecologically and economically based on data on catches landed in the Deli Serdang Regency TPI with a multispecies bioeconomic model and

provide alternative policies for managing the resources of small pelagic fish caught using the right fishing gear in Deli Serdang Regency. The results of the study at TPI Pantai Labu in Deli Serdang Regency include biological, ecological, economic, and social analysis which will be identified based on primary and secondary data whose results are in the form of multispecies bioeconomic models and predator prey models.



### Identification of DNA Barcoding of Sharks and Rays Using Mitochondria Coi as an Effort for Conservation Status in the Malacca Strait Waters Fisheries Management Area (Wpp) 571



Vindy Rilani Manurung, S.Pi, M.P and the team conducted research in the field of fisheries. It is necessary to conduct research on DNA identification of shark and ray barcoding using CO1 mitochondria as an effort to maintain the status of conservation in the waters of the Malacca Strait of fisheries management area (WPP) 571. The stages of the research method by collecting statistical data on shark and ray capture fisheries in the waters of the Malacca Strait, namely production data and fishing efforts, followed by sampling fish

tissues or fins taken with a thickness of 0.01-0.5 cm<sup>3</sup> and then preserved with 98% ethanol then DNA barcoding samples were analyzed at the Molecular Biology Laboratory FMIPA Universitas Brawijaya Malang. The next stage of fish data analysis is sex, weight length relationship, condition factors, mortality and exploitation rate, then the genetic identification analysis stage is DNA extraction, PCR, Sequencing and phylogenetic maximum-likelihood methods with the help of MEGA X software.





### Social Mapping Model of Mangrove Forest Management Stakeholder Network in Langkat Regency



The social mapping model became the research material of Dr. Farid Aulia, S.Sos, M.Si and team. This study examines the social mapping model of the mangrove forest management stakeholder network in a sustainable manner in Langkat Regency. The objectives of this

study: knowing the form of networks and roles of stakeholders (actors and institutions) as mangrove forest managers, analyzing government involvement into the network of stakeholders (actors and institutions) mangrove forest managers, designing a social mapping model of stakeholder networks (actors and institutions) of sustainable mangrove forest managers. The targeted output in the study is the Social Mapping Model of the Sustainable Mangrove Forest Management Stakeholder Network,

### Morphometric Study and Water Quality Profile of Coastal Lakes in Anak Laut Lake, Aceh Sigkil, Aceh Province



Rusdi Leidonald, SP., M.Sc and team conducted research on lake water quality. The results obtained are data in the form of lake length and area, lake depth and lake bathymetric map. In addition, data on the distribution of temperature

and salinity in the surface and bottom of the lake will also be obtained. With this data, decisions / policies can be made on the right lake management and utilization model so that the lake remains sustainable.





# PROTECT, RESTORE AND PROMOTE SUSTAINABLE USE OF TERRESTRIAL ECOSYSTEMS, SUSTAINABLY MANAGE FORESTS, COMBAT DESERTIFICATION, AND HALT AND REVERSE LAND DEGRADATION AND HALT BIODIVERSITY LOSS

Mainland ecosystems as an important part of the place where humans and other living things live are an important concern in SDG number 15. The objectives to be achieved are to protect, restore and promote the sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification, and stop and reverse land degradation and stop biodiversity loss. Through the implementation of SGDs, each individual has the same role and responsibility to contribute to preserving the terrestrial environment. The University of North Sumatra as one of the universities also contributes to efforts to support the achievement of SDG point 15. Through the Tri Dharma of Higher Education activities, namely Education and Teaching, Research and Community Service, the University of North Sumatra North Sumatra has carried out many activities that are expected to increase the understanding of all stakeholders including the community, as well as improve the application of sustainable principles in environmental use.

Changes in coastline and changes in the characteristics of natural mangrove forest ecosystems remain on the coast of Labuhanbatu



Dr. Samsuri, S.Hut. M.Si and his team conducted research in coastal areas. This study aims to (1) analyze changes in mangrove forest cover, coastline changes, and the relationship between changes in mangrove forest cover and changes in coastline changes in the coastal area of Labuhanbatu reGENCY; (2) calculating the area of mangrove forest cover change and detecting coastline changes in the coastal area of

Labuhanbatu district using landsat imagery in 2011, 2015, and 2019; (3) obtain a biomass map of the soil surface in KPHL Unit VII North Sumatra and choose the best equation model with several vegetation indices. It concluded that the relationship between land cover change and coastline change correlates moderately / moderately and has a significant effect.



Participatory, Conservative and Local Wisdom-Based Forest And Natural Tourism Development Strategy In Kph Region 4 Balige



Prof. Rahmawaty, S. Hut, M. Si, Ph.D and the team carried out research on local wisdom. The study aims to inventory the types of HHBK and natural tourism as well as HHBK priorities and tourism potentials to be developed; analyze the feasibility of developing superior natural tourism; assess the suitability of land for specific land use and evaluate mpts crop types to be developed with agroforestry systems; drawing up a business plan of the leading

types of HHBK; analyze the form of community participation in the management of natural tourism; analyze the application of conservation methods in the management of natural tourism, ; Analyzing the form of local wisdom in the management and utilization of HHBK and natural tourism; Develop a strategy for the development of HHBK and natural tourism. In this study, this research was divided into several stages of



research, namely: Literature study, Observation, Survey, In-depth interview and group discussion. In this activity, it is also carried out by distributing

a questionnaire in the form of a list of questions or a fill-in form prepared based on the focus of the activity.

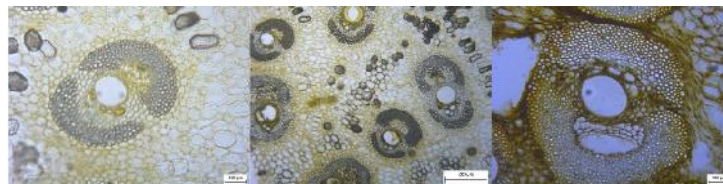


### Basic Characteristics of Fibrovascular Bundles Palm Fronds (*Arenga Pinnata* Merr.) As a Composite Raw Material



Dr. Ir. Luthfi Hakim, S.Hut., M.Si, IPM and the team conducted research on palm oil that has the potential to be used as a composite raw material. The purpose of this study is to characterize the basic properties of palm fronds both from their

anatomical, physical, chemical, and mechanical properties and utilize palm fronds as raw materials for making environmentally friendly composite boards using natural adhesives of citric acid and gambir.



### Utilization of DNA Sequence Data Base for Making Tree ID Cards Based on QR Code Technology



The tree ID Card research was conducted by Ahmad Baiquni Ranguti, S.Hut, M.Si and team. In this study, QR Code technology which has been widely used in various fields is applied to make tree ID Cards. The information stored in the barcode is information on the type, health of the tree and its genetic information. The barcode comes from the DNA sequence of the tree. Based on the results of research that has been carried

out, as many as 73 types of trees have been found at the research site with 30 families in it. A total of 62 identified tree species have sequences on the ncbi web, with matK, ITS, ITS 2 primers and there are 59 sequences with rbcL primers. The reconstruction of the phylogeny tree was successfully made with a bootstrap value between types that had a relationship with 99%.





### Application of Mycorrhizal Shorea platyclados Seedlings for Critical Land Handling



Dr. Kansih Sri Hartini, S.Hut, MP and his team carried out research on critical land management. This research aims to determine the growth of Shorea platyclados seedlings on Campus 2 of USU, Kwala Bekala as an effort to conserve exsitu and as an effort to green in supporting the USU campus

as one of the green campuses in the go green program in Indonesia. The activities in this study start from the selection of research sites on critical land, planting land preparation, planting, maintenance, taking growth data.



### Waste treatment technology with an All Out system in an effort to improve environmental biosecurity, livestock health and farmer income at Activist Farm farm



Community service activities were carried out by the team of Dr. Ade Trisna, S.Pt, MM related to sewage treatment. The service method is packaged in the form of lectures, discussions, demonstrations, training and pilots (pilot projects). Service activities are summarized in a guidebook in the form of a Goat and Sheep Maintenance

Management Module. From this activity, it is targeted that there will be cost efficiency (saving animal feed costs because it can utilize alternative sources of feed ingredients), formulating and making independent concentrate feed, saving the cost of purchasing probiotics and organic fertilizer fermentation methods.

### Institutional Strengthening and Business Development in Social Forestry Development



Dr. Rulianda Purnomo Wibowo SP, MEc. (USU); Mahdi, SP, MSi, PhD. (Andalas University); Dr. Ir. Dwi Rachmina, M.Si (Bogor Agricultural Institute); Dr. Feryanto, S.P., M.Si (Bogor Agricultural University) conducted collaborative research on social forestry. There are two objectives of this study. The first is to assess the institutional strength of social forestry that has been established in West Sumatra Province. The second goal is to find out the forms and prospects of the business that have been developed in relation to social forestry. This research begins with studying the document The first research objectives will be

achieved qualitatively by assessing political dynamics and social interactions in the formation and strengthening of social forestry institutions. The institutional sustainability of social forestry will be judged by its conformity with the theory of collective action in natural resource management developed by Ostrom (1990) and expanded by Gautam and Shivakoti (2005). While the second research objective will be analyzed using a strategy management analysis approach in the availability of inputs, technology, human resources, management capabilities, marketing and potential demand.

### Prediction of The Maturity Level of Tongar Avocado Fruit with a Metabolic Approach (USU Subtitle: The Effect of Maturity Level on the Physical and Chemical Characteristics of Tongar Avocado Fruit)



Collaborative research on the maturity level of avocado fruit was conducted by Khandra Fahmy, Ph.D (Andalas University); Dr. Mohamad Rafi (IPB University); Dimas Rahadian Aji Muhammad, Ph.D

(Sebelas Maret University); Prof. Dr. Ir. Elisa Julianti, MSi (University of North Sumatra). This study aims to determine the physico-chemical characteristics of avocados at various levels of maturity.



The results showed that the higher the level of maturity of the fruit, the more noticeably ( $p < 0.05$ ) increased the weight, volume, and hardness of the fruit, as well as the ash content (minerals), fat content and total phenolic of the avocado fruit. The age of the fruit harvest affects the physical characteristics and chemical composition of the

avocado tongar fruit. The color and hardness of the fruit increases as the age of the harvest increases. Consumer acceptance of avocado fruits is also influenced by the age level of the harvest. At the age of 6.5 months of harvest avocado fruits contain the highest fat content, and are organoleptically acceptable to consumers.

### The Role of Insect Diversity as an Ecosystem Service Agent in the Development of Sustainable Agricultural Systems for Food Security (Subtitles: Agro-Biodiversity Diversity and the Functional Role of Insects in Some Habitat Types)



Dr. Henny Herwina (UNAND); Indah Trisnawati Dwi T., M.Si, Ph.D (ITS); Ameilia Zuliyanti Siregar, M.Sc, Ph.D (USU) conducted collaborative research on agro-biodiversity diversity.

The objectives of this study are: 1) Mapping the diversity and functional role of local insects in agro-ecosystems in various locations and habitat types; 2) Knowing the interaction of environmental variables and agroecosystem management practices that form ecosystem services; and 3) Provide recommendations for the suitability of

agro-biodiversity habitats of local insect forming ecosystem services, especially those capable of supporting food security.

The results obtained in this study showed that the highest abundance of individuals and insect species diversity were identified from the use of YST traps (479 individuals from 47 species), followed by LT traps (288 individuals, 14 species) and SN (236 individuals, 36 species), while the smallest were identified from CPT devices (66 individuals, 14 species).



Gambar 3. Papan Perangkap (YST) di lapangan (Dokumentasi Pribadi, 2022)



Gambar 4. Pencuplikan tanah dengan menggali tanah (*soil sampler*) dan proses sortir sampel tanah (Dokumentasi Pribadi, 2022)

### Capacity Building of Communities around Forests in Sustainability of Forest Management



Siti Latifah, S.Hut,MSi,PhD (Universitas Sumatera Utara); Prof. Ir. Yonariza, MSc, PhD (Universitas Andalas); Dr. Purwanto, S.Pd, M.S (Universitas Negeri Malang) conduct collaborative research on the sustainability of forest management.

The results showed that members of the HKm Forest farmer group belonged to the moderate income group. The variables of age, gender, level of education, production costs, arable land area simultaneously have an influence on the income of KTH members. Only the variable land area partially affects the income of farmers of the KTH member community of Pakpak Bharat District. Land cover in protected forest areas of Bantur and Donomulyo Districts, Malang Regency in 1994, 2000 and 2010 consisted of primary forests, secondary forests, plantation forests, shrubs, Dryland Agriculture, water bodies and vacant land, but in 2020 and 2025

land cover is more varied, due to the emergence of new land cover. Deforestation patterns in the region are dominated by deforestation for agricultural, tourism and infrastructure activities. The air quality in the protected forest area of Bantur and Donomulyo Districts, Malang Regency is still relatively good. The results of the regression analysis also showed that there was an effect of deforestation on CO, NO2 and ESG in protected forest areas. Based on the regression of community capacity for deforestation, it is known that there is an influence of the level of community capacity on deforestation. The social forestry approach can reduce tensions between local communities and the government in the Nagari Forest of West Sumatra.



## PROMOTE PEACEFUL AND INCLUSIVE SOCIETIES FOR SUSTAINABLE DEVELOPMENT, PROVIDE ACCESS TO JUSTICE FOR ALL AND BUILD EFFECTIVE ACCOUNTABLE AND INCLUSIVE

Promote peaceful and inclusive Communities for sustainable development, Provide access to justice for all And build an effective and inclusive accountability is what is to be achieved in goal number 16 of the SDGs. The University of North Sumatra participates in contributing to the achievement of this goal through education, research and community service activities related to matters in this goal.

### Ethnicity and Culture in Simalungun



The research of the Center for Professor Studies Prof. Dr. Drs. Budi Agustono, M.S. and this team uses various scientific disciplines using historical, cultural and ethnic approaches. The method used in this research is an analytical-qualitative approach, which is a study to reveal an empirical fact objectively, scientifically based on strong logic, science, procedures, methodology and theoretical. In the research process, the research team will conduct research by digging up documents and written sources and plunging directly into the field. In tracing sources and documents, researchers will conduct archival and document studies at

the National Archives of the Republic of Indonesia (ANRI) and the National Library of the Republic of Indonesia (PNRI) in Jakarta. In addition, researchers will conduct field research in various areas of Simalungun and Pematang Siantar City. This is done considering that the area studied is quite large and the research material consists of inter-ethnic relations. Once the source is documented, the researcher will conduct an analysis of the findings in the field. From the results of analysis and synthesis, writing is then constructed that will explain the relationship between ethnicities and cultures in Simalungun.



### Surviving with Rubber: A Case Study of Kotanopan Subdistrict, Mandailing Natal Regency, North Sumatra Province



Research on the presence of rubber was conducted by Dra. Nina Karina, M.SP and team. This research is a descriptive analytical study, in which qualitative data and quantitative data are

used. To achieve this, primary and secondary data collection techniques are used through observation or conducting direct surveys to the object of study. Searching for supporting data to libraries and institutions that are considered to be sources of data in research, such as the National Archives, National Library and North Sumatra Provincial Library; and research that has been done; as well as publications/magazines related to folk rubber plantations and Koetanopan during the colonial period.





### Ideology of Kain Songket Malay Community of Batu Bara Regency



The ideology of songket cloth became the research material of Dr. Nurlela, M.Hum. and the team. This research uses an ecolinguistic approach while the research method used is

qualitative. The data collection method used is by using observation, interview and documentation methods.



### Inference at the Mangupa Traditional Ceremony of the South Tapanuli Community: A Study of Local Wisdom



Drs. Asrul Siregar, M. Hum. And the team carried out research on local wisdom. Language is the basis of verbal human interaction. This research is descriptive qualitative by applying text documentation, observation, and interview methods. The linguistic theory used is the discourse analysis approach. The study of inference in the text of the traditional ceremony of mangupa found that in meaning, the utterances of all parties of the na tolu dalihan involved in the ceremony were a request to the harajaon and hatobangon to be willing to deliver admonitions to the waged. Meanwhile, the utterances spoken by harajaon and hatobangon

as the pandok hata contain messages and advice that are full of inference meanings in terms of language. In establishing references between expressions in ceremonial texts, phonological inference is effective for showing the relationship between one expression and another. Meanwhile, pragmatic inference is effective for seeing or establishing the interrelationship between text and context. These two kinds of inference play a role in expressing understanding of speech at mangupa ceremonies. However, semantic inference, syntax, and discourse inference can also be used to provide explanations for utterances.



### Model of Corruption Prevention Efforts with Training and Formation of Legal Cadres in Galangsuka Village, Deliserdang Regency



The research was conducted by Erna Herlinda, SH, M.HUM and the team regarding the corruption prevention model. .

This community involvement is the most fundamental factor because the community knows the needs of the village and directly witnesses how the development in the village is. The village government should conduct training and establish legal cadres in the village from the village community who will later be in charge of supervising the management of village funds. This legal cadre should take the form of an institution authorized by the village head.



### Managerial Ties and Creative Industry Collaboration to SME Performance: Cross Culture in Indonesia



Prof. Dr. Isfenti Sadalia, SE, ME (USU); Dr. Yulia Hendri Yeni, SE, MT, Ak (Andalas University); Prof. Doddy Setiawan, SE., MSi, IMRI, Ph.D., Ak (Sebelas Maret University) conducted collaborative research on cross culture. This research tries to reveal more carefully about local wisdom in Indonesia, especially across different ethnicities. For example, ethnic Madurese who are famous for scrap metal traders, minang ethnicity established many restaurants, tapanuli ethnicity who made cooking oil factories and so on. Supply chain

collaboration is a party that is able to work together, share information, and make decisions together in achieving benefits in action. Different social media distribution channels are able to empirically analyze the inter-ethnic conditions in family companies. Supply chain collaboration is too considered dynamic and is considered a high-level capability that companies must develop by focusing on removing scale constraints such as SME performance, firm resources, and managerial ties.

### Oil Palm Plantation Conflict Resolution: An Analysis of the Use of Conflict Resolution Mechanisms by Communities in North Sumatra Province



Prof. Afrizal (UNAND); Dra. Linda Elida, M.Si. (USU); Dr. Eka Vydia Putra, M.Si. (UNP) conducted collaborative research. This research is about conflict resolution of oil palm plantations, especially regarding the basis for the use of conflict resolution mechanisms by communities that are in conflict with oil palm plantation companies and the effectiveness of the mechanisms used. The research findings suggest that communities prefer conflict resolution with non-litigation pathways. This decision is taken when there is an awareness that the potential and opportunities for litigation or judicial channels are very small and require long energy and time. The report also describes

a long journey of conflict resolution mechanisms that occur in oil palm plantation conflicts between communities and plantation owners. A long journey from 1996 to 2018 that has attracted the attention, energy, thoughts, materials of a number of parties. The community chose to use a non-litigation mechanism, inseparable from the reason that the company and the government did not involve the community when starting the initial plans and activities for the construction of oil palm plantations; open accessibility when the community is proactive, leadership, solidarity, effective processes and process contexts are internal factors that strengthen the community to resolve these conflicts.



## STRENGTHEN THE MEANS OF IMPLEMENTATION AND REVITALIZE THE GLOBAL PARTNERSHIP FOR SUSTAINABLE DEVELOPMENT

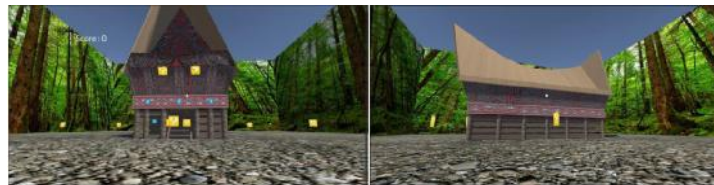
Goal 17 of the SDGs is to strengthen implementation tools, activate global partnerships to achieve all the Sustainable Development Goals. The SDGs within the University focus on exploring the different ways universities can support the SDGs through collaboration with other countries, promoting best practices, and publishing data. The SDGs cannot be achieved without all partners working together. USU takes an active role through research, service and cooperation with several related stakeholders.

### SUMUT E-Heritage Virtual Tour Traditional House Batak Toba And Batak Simalungun Tribe



Ulfi Andayani, S.Kom., M.Kom. and the team carried out research on traditional houses. In this study, observations were made regarding the Batak Toba Traditional House and the Simalungun Batak Tribe Traditional House. The use of multimedia technology, namely Virtual Reality, is used to build virtual Traditional Houses in North Sumatra. The purpose of this study is to reach the digital community and tourists in making it easier for them to learn the introduction of the nation's

ancestral heritage in North Sumatra. The method carried out in this study is the introduction and comparison between the two traditional houses accompanied by gamification games in the interaction of virtual scenes in the application. This Virtual application uses a Virtual Box tool that is more affordable for the community and mobile-based. The output of this research will be published in one of the reputable international proceedings and additional IPR outputs.



### The impact of Universal Health Coverage Before and After The Covid-19 Pandemic



Riset Kolaborasi terkait Covid-19 dilaksanakan oleh dr. Rahayu Lubis, M.Kes, Ph.D (USU); Dr. dr. Santi Martini, M.Kes (UNAIR); Dr.dr. Harnavi Harun, SpPD-KGH (UNAND); Ass. Prof. dr. Rafdzah Ahmad Zaki, MBChB, MPH, DrPH (University of Malaya). The HDI, HWD, and GE are the factors that significantly affect the average HE in the last 20 years. The HDI, HWD, and UHC are the factors that significantly affect the average HE in the last 20 years. The increase in HWD is associated with a 10% and 8% decrease in the odds of having a high average HE respectively. The increase in UHC coverage is associated with the 7% decrease in the odds of having a high average HE.

There's fluctuation in the average Health Expenditure (HE) and a consistent increase in Health Service Coverage across 179 countries in the period 2000 to 2019. The HDI, and HWD, as well as Voice and Accountability (VA), Government Effectiveness (GE), and Control of Corruption (CoC) indicators of Governance Indicators (GI) are factors that are significantly associated with the implementation of UHC in that period. The existence of linkages between the implementation of UHC and other sectors makes mutual understanding and cross-sectoral cooperation essential to achieve the UHC and SDGs targets by 2030