The International Journal of Business Management and Technology, Volume 6 Issue 2 March-April 2022
ISSN: 2581-3889

Research Article Open Access

Water Controlling for Watering Plants with Smart Control

[1*)] Kifaya

[1)] Department of Electrical Engineering Electronic Engineering, Polytechnic Negeri Ujung Pandang, Indonesia

Abstract: The purpose of this study is to provide a model of how to maintain water conservation with limited circulation in storage and planting areas. The technology used is a device system that can control by monitoring the soil and controlling the water level of the circulating reservoir based on IoT, using the ESP32 MCU Node as a controller and WiFi, a relay to turn the water pump on and off, and a smartphone to display the soil moisture value. Based on the test results, this tool can detect soil moisture and display the moisture value on a smartphone, then watering can be done. The rest of the watering water is accommodated in a circulation container. The water level in the circulation vessel is monitored by a water level sensor. This system makes it easy to monitor even though they are in different places.

Keywords: Container, sensor, relay, pump, watering.

I. Introduction

Not all planting areas are areas that easily get water. For this reason, control is needed so that cultivation continues as expected. Efforts to overcome the availability of water for plants are carried out through water conservation with technological innovation. Information and communication technology innovation in agriculture is the use of sensors and microcontrollers. This technology can be done by controlling plants through planting media. Soil moisture values can be used as an indicator of controlled conditions. The use of sensor devices that are integrated with a web server can be used for remote monitoring and control.

In certain lands that lack water, it can be managed with good water management, but if the planting land is not owned, this study provides a model of how to cultivate by utilizing the available empty space.

Moisture sensor embedded in the soil and the results of the sensor soil moisture and water level will be displayed online. The implementation of an Internet of Things-based monitoring and control system can make work easier and there is no need to use manual labor, it is enough to connect the system and open a smartphone application to find out the data results.

II. Literary Review

The proposed Smart Watering System is designed with the ability of Blockchain security support to track and trace the device transactions performed during the processing of the Smart Watering System (SWS) Hamouda, Y. E. (2017). Such ability to trace blockchain based transaction does not only enable the proposed system to provide security and privacy features but also provides seamless connectivity and availability of the features proposed smart system (Kamienski, 2018).

A server-side application was designed to handle the proposed Smart Watering System, with the help of a web-based interface. The interface of the management provide different options to control the Smart Watering System Gubbi, et al., (2013). This page also includes the option for administrator to be login into system and also shows description of system working. To manage plants data at admin panel, system provides a dash-board to manage plants data on server side (Kamienski, 2018). Admin can add news plant with its details regarding to planting period, fertilizer to be used, required water level and other details; in the plant list that will be available and visible to gardener according to preference. Administrator can delete plants details irrelevant and unneeded from repository. Admin manage users by allowing them to create his accounts to SWS to avail functionalities of system.

Previous research revealed a DHT 11 sensor that reads the temperature and humidity of the air around the mustard plant. When the air temperature is over 32 °C, the pump will start. When the temperature becomes 27°C then the pump will stop. From the test results, it is known that the water pump will turn on 2 times a day at 07.00-07.30 for 33 seconds and 16.00-16.33 for 24 seconds. In 1 watering, the amount of water needed is approximately 1.6 liters so that in 1 day only 3.2 liters of water are needed for watering. On a land area of 1m2 (Aryanto, 2020).

Sulastri Angela Nababan with "Monitoring Soil Moisture in Chili Plants Using Soil Moisture Sensors Based on the Internet of Things" 2020. This research uses a nodemcu esp8266 microcontroller. The humidity sensor detects soil moisture and the data obtained is sent to the microcontroller to be processed and displayed on the LCD. The microcontroller sends data to the blynk application via nodemcu esp8266 which will then be displayed on the smartphone (Nababan, 2020).

Alam and Nasuha (2020) in their research with the title Sistem Pengendali pH Air dan Pemantauan Lingkungan Tanaman Hidroponikmenggunakan Fuzzy Logic Controller berbasis IoT, stated that Hydroponics is a farming solution for shrinking agricultural land. However, manual pH environmental control and monitoring make crop yields less than optimal. This final project aims to make hardware and software for controlling water pH and monitoring the hydroponic plant environment based on: Internet of things (IoT). This system uses a fuzzy logic control system to control the pH of hydroponic plants planting media and the development of cloud servers to make it easier for farmers to control planting media and hydroponic plant environment. The manufacture of this tool refers to a quantitative method consisting of: analysis, design/design, assembly and testing stages. The results of the tests that have been carried out are pH meter sensor accuracy is 98.38%, DHT22 sensor accuracy for temperature measurement 97.91% and 95.89% humidity, DS18B20 sensor accuracy 96.16%, HCSR-04 accuracy sensors. of 97.65%, the average stabilization time of pH 64s with an error of 2.05%. All features in Blynk app works well, average server ping time is 18ms and tool response time is 83s average. Expected use this system will be useful for ordinary people in gardening without worrying about the need for a large area of land soil and the complexity of its maintenance. This has an impact on food self-sufficiency at the household level, which this can be realized through the provision of food crops for family consumption.

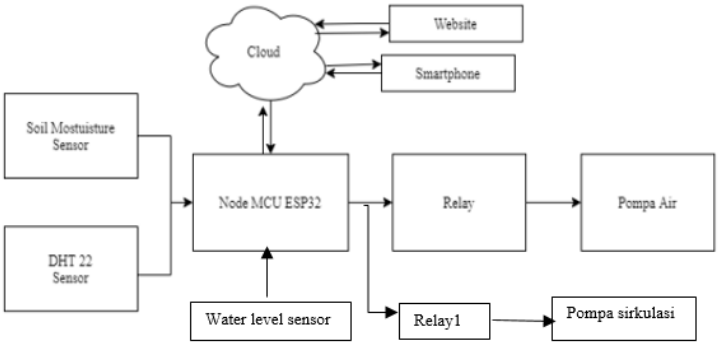
Nadzif, et al., (2019) stated in their study with the title Sistem Monitoring Kelembaban Tanah dan KendaliPompa Air Menggunakan Arduino dan Internet, Eggplant cultivation requires special conditions, especially with the surrounding soil moisture 80% - 90%. The factor that influences soil moisture on plant growth is the need for water. To meet water necessary and maintaining soil moisture can be done by watering the plants. Currently, cultivation with the technique of watering eggplant manually, a system that is able to monitor soil moisture is needed and control the water pump to water the plants automatically so that the soil moisture conditions can be maintained. This system uses Arduino as a microcontroller, YL-69 soil moisture sensor, SIM800L GSM module as data transmission, water pump as sprinkler, and website as system interface because it has advantage and convenience in operation. The research method used is the Research and Method Development. Tests are carried out with the Black Box test, Sensor Calibration test, and system performance test. The results of the Black Box test show that the functions on the website can run well, sensors calibration test results show an average error of 2.2%, and the performance testing system obtained 100% success percentage.

In addition, Calibra, et al., (2021) Water Quality Control for Plants Hydroponics Using Raspberry Pi and Arduino Uno, stated that, Water quality is very important for plant growth and development. Some important parts of water quality is TDS (Total Dissolved Solid), EC (Electricity conductivity), pH (acidity). Cultivation in a greenhouse provides several benefits but also has some disadvantages, such as: lack of soil nutrients because most of the plants in the greenhouse use planting medium instead of soil. To overcome these shortcomings, An Automated and remote systems are required for easy control water quality and food nutrition for plants. This lesson aims to make low-cost greenhouse water quality monitoring which automatically displays real time data on a website. This research was conducted using the engineering design method. This system can be integrated with auto-pot watering system. That results show that the system can adjust TDS and pH as programmed, i.e. TDS= 1000-1200, and pH = 5.5-6.5 The The TDS sensor in this study has limitations in reading 0~1200ppm which cannot meet the nutritional needs of plants.

The implementation phase consists of: 1) Preparation, 2) Design and manufacture, and 3) Test

This research can physically be described according to the following block diagram:

Figure 1. Block diagram



System hardware consists of:

The planting area container is placed on a water circulation container with a size of 40 cm x 40 cm x 20 cm Components used:

a. Soil moisture sensor is a capacitive soil moisture sensor that can detect moisture in the soil. This sensor consists of two probes that are used to pass current in the soil, then read the resistance to get the value of the moisture level. More water will make it easier for soil to conduct electricity (small resistance), whereas dry soil will have difficulty conducting electricity (big resistance).

b. This sensor is unique because it can read the temperature and humidity of the room. In this sensor there is a thermistor type NTC (Negative Temperature Coefficient) to measure temperature and an 8-bit microcontroller that processes the two sensors and will send the results to the output pin in a single-wire bidirectional format.

c. Water Level Sensor is a set of tools used to measure the water level in different places to gain comparative knowledge. The simplest water level is a pair of pipes that access each other at the bottom. Simple water level measures the water level through the water level in 2 pipes whether they are similar or not. Water level can also be used to measure water pressure using the principle of hydrostatic pressure.

d. Internet of Things Internet of Things (IoT) is a concept/scenario where an object has the ability to transfer data over a network without requiring human-to-human interaction (Yudhanto, Yudha 2015). HOBO KIT-D-U20-04 Water Level. Water level HOBO KIT-D-U20-04 is a water level device that can measure water level, absolute pressure, barometric pressure, temperature and water level with high accuracy.

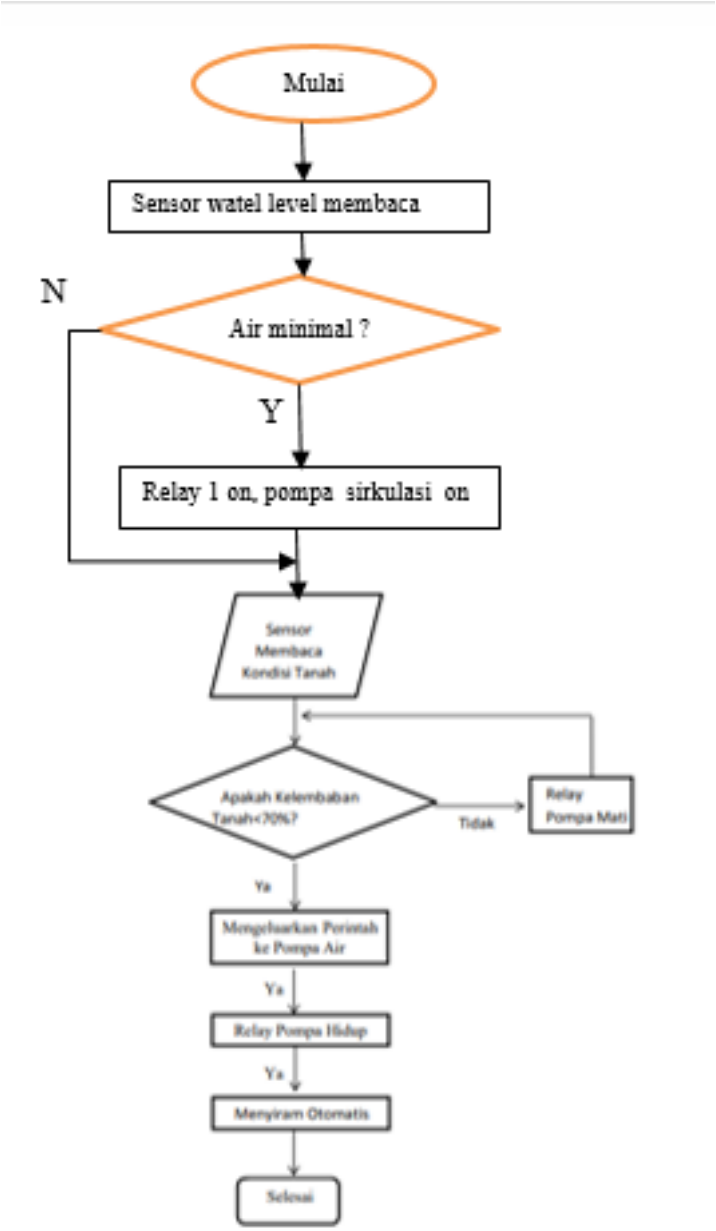
e. Android is an operating system that is open source (open source). Called open source because the source code (source code) of the Android operating system can be viewed, downloaded, and modified freely. This open source paradigm facilitates the development of Android technology because all interested parties can contribute, both to the development of the operating system and applications.

f. Blynk is an application for iOS and Android OS to control Arduino, NodeMCU, Raspberry Pi and the like over the Internet. This application can be used to control hardware, display sensor data, save data, visualize, and more.The Blynk app has 3 main components. namely Applications, Servers, and Libraries. The Blynk server is used to handle all communication between the smartphone and the hardware. Widgets available on Blynk include Button, Value Display, History Graph, Twitter, and Email. 2.6. NodeMCU ESP8266 ESP 8266 is a WiFi module that has recently become increasingly popular among hardware developers. NodeMCU is an IoT platform that is OpenSource and SOC (System on Chip), so it can program directly into the NodeMCU ESP8266 without the need for an additional microcontroller. Another plus, this ESP8266 can perform the role of an ad hoc access point and a client simultaneously(Mehta, 2015).

g. Relay and Pump, to control the water pump, a 1-channel relay module is used. In principle, the relay is an automatic switch that can be triggered by a voltage of 0 volts (low) and 5 volts (high). The relay itself can be used to switch DC and AC voltages, so it can be used to control the water pump used to water chili plants. The pump used for watering is a 12 Volt DC pump with a water flow rate of 4 liters/minute with a power of 60-65 watts. 2 relays and 2 pumps are used. Relay for sprinkler pump and relay 1 for circulation pump for circulating water reservoir.

Software:

Figure 2. Flow chart of water control in plants



III. Objective of the Research

This research is a planting model that utilizes free space (cultivating with limited land, without land). In addition, the location of the land with a low level of rainfall so that the planting area is equipped with water reservoirs. In this container the water circulation is controlled, water conservation. This study controlled the time of watering plants and filling the water container that was placed under the planting area.

IV. Methodology

In this study used secondary data, namely stock price data and transaction volume from PT. Ramayana Lestari Sentosa,Tbk taken from the internet. The data taken was 31 days before and 31 days after the announcement of the first case ofCOVID-19, which was on March 2, 2020. In this study using data obtained from the yahoo finance website. The stockprice used is at the time of closing or commonly called the closing price. The closing price data used is daily data.Meanwhile, the transaction volume data is taken from the daily stock transaction volume of PT. Ramayana LestariSentosa,Tbk.

1. The first national announcement of COVID-19 cases in Indonesia for the first time. The first case of COVID-19 in Indonesia started on March 2, 2020, when the government announced that there were Indonesians who had been infected withCOVID-19.

V. Results

The results of the descriptive statistical calculation of stock prices before the announcement of the first COVID-19 case in Indonesia and after, can be read in table 1. The stock price before the announcement of the first Covid-19 case had an average value of Rp. 1,052.72 and the stock price after the announcement of the first case of covid-19 had an average value of Rp.628, 48. The data taken are 31 data before and 31 data after the announcement of the first case of covid-19. If we look at the average values in table 1, there is a decline in stock prices after the announcement of the first COVID-19 case in Indonesia.

Table1. Stock Prices (Descriptive Statistics)

		Mean	N	Standard Deviasi	Standard Error Mean
Pair1	X1	1052.74	31	80.092	14.385
	X2	628.483	31	168.013	30.176

Sources: Data processed,2021

Table2showstheresultsofdataprocessingfromthepairedsamplet-TestofstockpricesoperatedwithSPSSversion20.In table 2, it can be seen that the significance value is 0.00. The significance result is smaller than 0.05. This value indicates that Ha1 is accepted and H01 is rejected, which means that there is a significant difference between the stock prices of PT. Ramayana Lestari Sentosa, Tbk. before and after the announcement of the first case ofcovid-19inIndonesia. Table 2 also shows the difference in the average value of stock prices at PT. Ramayana Lestari Sentosa, Tbk. before and after the announcement of the first case of COVID-19 in Indonesia was 424,258. The magnitude of this value is positive, indicating that the stockprice before the announcement has an average value greater than the average value of the stock price after the announcement. This indicates a decrease in the average share price at PT. Ramayana Lestari Sentosa, Tbk. Caused by the Covid-19case.

Table2.Stock Prices (Paired Samplet-Test)

		Paired Differences					t	df	Sig.(2-tailed)
		Mean	Standard Deviasi	Standard Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair1	X1-X2	424.258	120.171	21.583	380.179	468.337	19.657	30	.000

Sources : Data processed,2021

At PT. Ramayana Lestari Sentosa, Tbk. experienced a significant decline in stock prices due to the Covid-19 case that occurred in Indonesia. To prevent the spread of COVID-19, the government asks people to always stay at home. Ofcourse this causes people to reduce their purchases of goods at the Ramayana, and causes a decrease in turnover at the Ramayana. This decrease in income has even caused some employees to be laid off. For investors, of course this is a disadvantage, because investors have a great chance of not getting dividends and can experience capital loss.

The results of descriptive statistical calculations of transaction volume before and after the announcement of the first COVID-19 case in Indonesia are shown in table3. The average value of transaction volume after the announcement of the first case of covid-19 was 16,060,709.68. The data taken are 31 data before and 31 data after the announcement of the firstCovid-19 case in Indonesia. If we look at the average values in table 3, there is an increase in the volume of share transactions being traded after the announcement of the first COVID-19 case in Indonesia.

Table3.TransactionVolume (Descriptive Statistics)

		Mean	N	Standard Deviasi	Standard Error Mean
Pair1	X1	5454712.90	31	3771616.768	677402.369
	X2	16060709.68	31	15711460.100	2821861.537

Sources: Data processed,2021

Table4. Transaction Volume (Paired Samplet -Test)

		Paired Differences					t	df	Sig.(2-tailed)
		Mean	Standard Deviasi	Standard Error Mean	95%Confidence Interval of the Difference				
					Lower	Upper			
Pair1	X1-X2	-10605996.774	16878955196	3031549.846	-16797247.524	-4414746.024	-3.499	30	.001

Sources: Data processed,2021

To see the difference in transaction volume before and before the announcement of the first COVID-19 case in Indonesia, it was carried out using the paired sample t-Test, which can be seen in table 4. In the table, it can be seen that the significance value is 0.01, which is smaller than 0. ,05. Based on the significance value, then H01 is rejected and Ha1 is accepted. From the test results, it means that there is a significant difference between the volume of transactions at PT.Ramayana Lestari Sentosa, Tbk. before and the announcement of the first case of covid-19 in Indonesia. Table 4 also shows the difference in the average value of transaction volume at PT. Ramayana Lestari Sentosa, Tbk. before and the announcement of the first case of COVID-19 in Indonesia of -10,605,996.774. This value is negative, which means that before the announcement of the first COVID-19 case in Indonesia, the average value was smaller than the average volume value before the announcement. This value indicates an increase in the average volume of share transactions at the Ramayana company caused by the COVID-19case.

At PT. This Ramayana, experienced a significant increase in the volume of stock transactions due to cases caused by COVID-19. The increase in the volume of share transactions occurred due to the increased activity of buying and selling shares at PT. Ramayana Lestari Sentosa, Tbk. This increase in share transaction volume was not followed by an increase in share prices. This event shows that many investors are selling their shares, due to concerns that investors will suffer losses caused by the impact of the COVID-19pandemic.

VI. Conclusion

The conclusion obtained from this study is the paired sample t-test, from the stock price of PT. Ramayana Lestari Sentosa, Tbk. before and after the announcement of the first case of covid-19 in Indonesia showed a significant difference. This is indicated by a significance value of 0.00 < 0.05. Likewise for the transaction volume of shares of PT. Ramayana Lestari Sentosa, Tbk. There is a significant difference from before the announcement of the first case of covid-19 in Indonesia and after the announcement. This is indicated by a significance value of 0.01<0.05.

With the Covid-19 case, share prices have decreased, while transaction volume has increased. Therefore, the company should change its sales strategy, by more aggressively selling online, sothat the turnover obtained can increase. Increased income will be able to attract investors to buy shares of the company. So the stock price can rise again.

References

[1.] Bash, A. (2020). International evidence of COVID-19 and stock market returns: an event study analysis. International Journal of Economics and Financial Issues,10(4),34–38.https://doi.org/10.32479/ijefi.9941

[2.] Brown, S. J., & Warner, J. B. (1985). Using daily stock returns. The case of event studies. Journal of Financial Economics, 14(1),3–31. https://doi.org/10.1016/0304-405X(85)90042-X

[3.] Camelia (2020, April 9). Tangis Pilu Puluhan Karyawan Ramayana Depok Terkena PHK Akibat Corona. Dibaca April, 18, 2020, dari https://www.liputan6.com/citizen6/read/4222812/tangis-pilu-puluhan-karyawanramayana-depok-terkena-phk-akibat-corona.

[4.] Dodd, P., & Warner, J. B. (1983). On corporate governance. A study of proxy contests. Journal of Financial Economics,11(1-4),401–438. https://doi.org/10.1016/0304-405X(83)90018-1

[5.] Fitria, T. A., Afifudin, A., &Junaidi, J. (2019). ―AnalisisDampak Reverse Stock Split TerhadapHargaSaham DanVolume PerdaganganSaham (StudiKasus Perusahaan Manufaktur di Bursa Efek Indonesia Periode 2010-2018)‖.JurnalIlmiahRisetAkuntansi,8(01).

[6.] Hartono,J.2018.―StudiPeristiwaMengujiReaksiPasarModalAkibatSuatuPeristiwa‖.BPFE-Yogyakarta.

[7.] He, P., Sun, Y., Zhang, Y., & Li, T. (2020). COVID–19's Impact on Stock Prices Across Different Sectors—An EventStudyBasedontheChineseStockMarket.EmergingMarketsFinanceandTrade,56(10),2198–2212.https://doi.org/10.1080/1540496X.2020.1785865

[8.] Hezee,E.AnalisisTeknikal:VolumeNaik,HargaTurun.DiaksespadaMei,5,2020,darihttp://www.sahamgain.com/2019/08/analisis-teknikal-volume-naik-harga.html.

[9.] Huo, X., &Qiu, Z. (2020). How does China's stock market react to the announcement of the COVID-19 pandemiclockdown?.EconomicandPoliticalStudies,1–26.https://doi.org/10.1080/20954816.2020.1780695

[10.] Islami, L. N., &Sarwoko, E. (2012). Reaksi pasar modal Indonesia terhadappergantian Menteri Keuangan(eventstudysahamyangterdaftardiBEI).Modernisasi,8(1),44–67.Retrievedfrom

[11.] Islami, L. N., &Sarwoko, E. (2012). Reaksi pasar modal Indonesia terhadappergantian Menteri Keuangan(eventstudysahamyangterdaftardiBEI).Modernisasi,8(1),44–67.Retrievedfrom

[12.] Kadim, A., &Sunardi, N. (2018). Pengaruhanalisakesahatan dan kebangkrutandenganpendekatanaltman z-score terhadaphargasahamIndustriKonstruksidi indonesiayang listing di BEI periode 2013-2017. JurnalSEKURITAS (Saham,Ekonomi,KeuangandanInvestasi),1(4).

[13.] Liu,H.,Manzoor,A.,Wang,C.,Zhang, L.,&Manzoor,Z.(2020).TheCOVID-19 out break and affected countries stock markets response. International Journal of Environmental Research and Public Health, 17(8), 1–19. https://doi.org/10.3390/ijerph17082800

[14.] Luhur, S. (2010). Reaksi pasar modal Indonesia seputarpemilihanumum 8 juli 2009 pada saham LQ-45. Jurnal Keuangan dan Perbankan, 14(2), 249–262. Retrieved from http://jurnal.unmer.ac.id/index.php/jkdp/article/view/971

[15.] Nanda, R., &Saryadi, S. (2017). Reaksi pasar modal Indonesia terhadapkebijakan tax amnesty Indonesia padasahamLQ45tahun2016-2017.JurnalIlmuAdministrasiBisnis,6(4),144-156. Retrieved from https://ejournal3.undip.ac.id/index.php/jiab/article/view/17606

[16.] Narjoko,D.(2020).COVID-19 and South ea stand East Asian Economic Integration: Understanding the Consequences for the Future. Economic Research Institute for ASEAN and East Asia, 1–7. Retrieved from https://www.eria.org/uploads/media/policy-brief/COVID-19-and-Southeast-andEast-Asian-Economic-Integration. pdf

[17.] Nasution, D.A.D., Erlina, E., & Muda, I. (2020). Dampakpandemi Covid-19 terhadapperekonomian Indonesia. *JurnalBenefita*,*5*(2),212-224.

[18.] Nasution,D.A.D., & Ramadhan, P.R.(2020). Faktor-Faktor Yang Mempengaruhi Kebijakan Deviden Pada Perusahaan LQ45. *Bisnis-NetJurnalEkonomidanBisnis*,*3*(1), 6-17.

[19.] Ningsih, E. R., & Cahyaningdyah, D. (2014). Reaksi pasar modal Indonesia terhadappengumumankenaikanharga BBM22 Juni 2013. Management Analysis Journal, 3(1),1-5. Retrieved from https://journal.unnes.ac.id/sju/index.php/maj/article/view/3352

[20.] Nurmasari,I.(2017).—Analisis Current Ratio, Return On Equity, Debtto Equity Ratiodan Pertumbuhan Pendapatan Berpengaruh Terhadap Return Saham Pada Perusahaan Pertambangan DiBursaEfek Indonesia 2010-2014‖. Jurnal Kreatif, 5(1),112-131.

[21.] Nurmasari, I. (2018). —Pengaruh Rasio Keuangan dan Pertumbuhan Pendapatan Terhadap Return Saham Pada Perusahaan Perkebunan Di Bursa Efek Indonesia 2010-2017‖. Jurnal SEKURITAS (Saham, Ekonomi, Keuangandan Investasi),2(1).

[22.] Pratama, I. G. B., Sinarwati, N. K., &Dharmawan, N. A. S. (2015). Reaksi pasar modal Indonesia terhadapperistiwapolitik(event study padaperistiwapelantikanJokoWidodosebagaiPresidenRepublikIndonesia ke-7). JurnalIlmiahMahasiswaAkutansiUndiksha, 3(13), 1–11.http://dx.doi.org/10.23887/jimat.v3i1.4754

[23.] Pratomo,M.N.(2020,October1). Prospekpasarsaham: cermatise ktortahanbanting. Available at Bisnis Indonesia. Retrieved from https://koran.bisnis.com/m/read/20201001/441/1298915/prospek-pasar-sahamcermati-sektor-tahan-banting

[24.] Ramadhan, P. R., & Nasution, D. A. D. (2020). Analisis Determinan Harga Saham Perusahaan Sektor Agriculture Yang Terdaftar Di Bursa Efek Indonesia. *Jurnal Riset Akuntansidan Bisnis*,*20*(2),162-171.

[25.] Ruiz Estrada, M. A., & Lee, M. (2020). How COVID-19 can Affect the Worldwide Stock Markets?. SSRN Electronic Journal. Retrieved from https://doi.org/10.2139/ssrn.3591698

[26.] Sari, S. T. (2007). Pengaruhkondisikeamanandalam negeri terhadaphargasaham di Bursa Efek Jakarta (eventstudy peristiwa bom Kuningan). Undergraduate Thesis. Retrieved from http://eprints.ums.ac.id/id/eprint/11343

[27.] Suganda, T. R. (2018). Event study, teori dan pembahasanreaksi pasar modal Indonesia. Malang: Seribu Bintang.

[28.] Suryawijaya, M.A., & Setiawan, F.A.(1998). Reaksipasarmodal Indonesia terhadapperistiwapolitikdalam negeri(event study pada peristiwa27 Juli1996). JurnalKelola, 7(18), 137–153. Retrieved from http://ilib.ugm.ac.id/jurnal/detail.php?dataId=8272

[29.] Sugiyono.2016.—MetodePenelitianKombinasi.PenerbitAlfabeta‖.Bandung.

[30.] Sunardi,N.(2018).KinerjaPerusahanPendekatanDuPontSystemTerhadapHargaDanReturnSaham(Perusahaan yang tergabungdalamIndustri Real Estate dan Properti yang terdaftar di Bursa Efek IndonesiaTahun2011-2017).JIMF(JurnalIlmiahManajemenForkamma),1(3).

[31.] Sunardi, N. (2019). Profitabilitas, Likuiditas, Dan Multiplier Equity PengaruhnyaTerhadapHarga Serta ReturnSahamPadaIndustriManufakturTahun2012-2017.INOVASI,6(1),58-73.

[32.] Sunardi, N., & Ula, L. N. R. (2017). Pengaruh BI Rate, Inflasi Dan KursTerhadapIndeksHargaSahamGabungan(IHSG).JurnalSekuritas:Saham,Ekonomi,KeuangandanInvestasi,1(2),27-41.