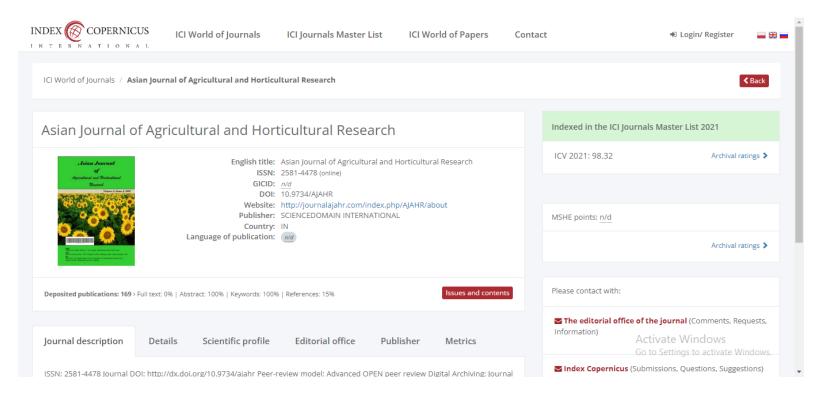
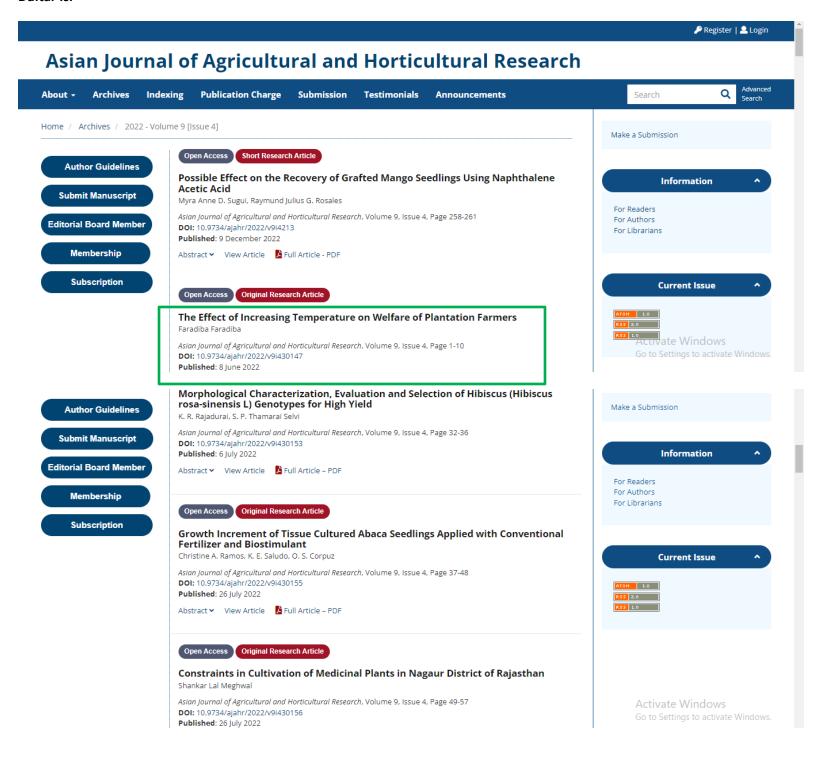
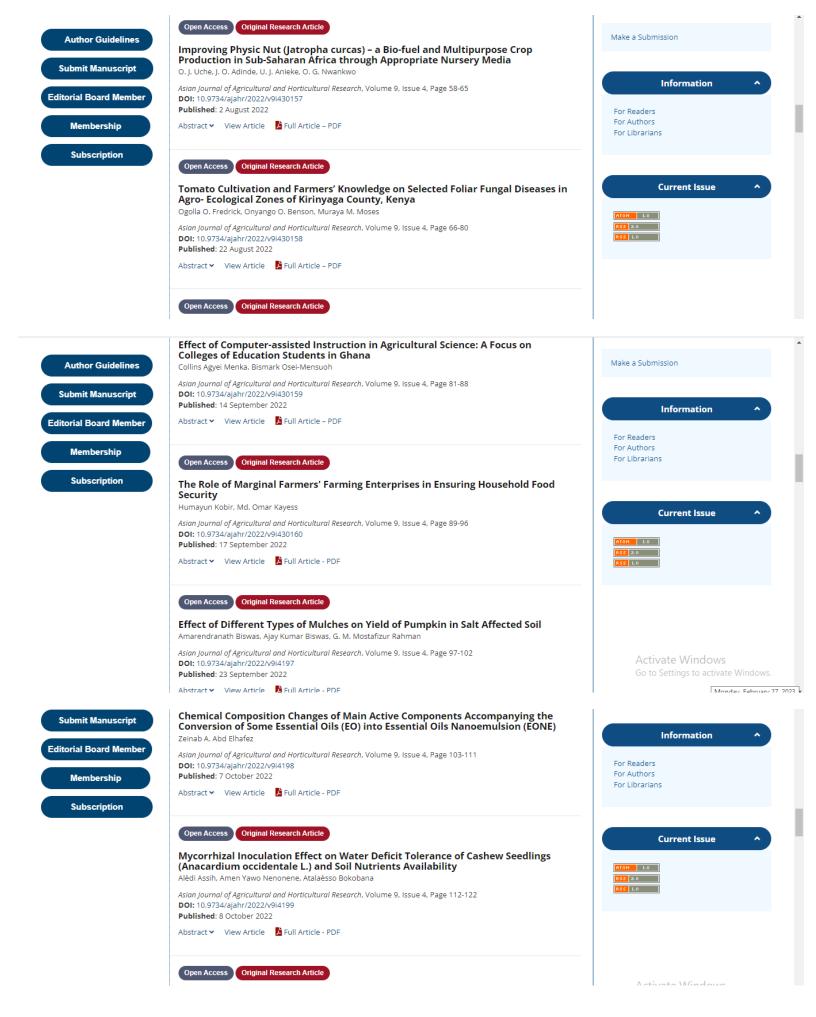
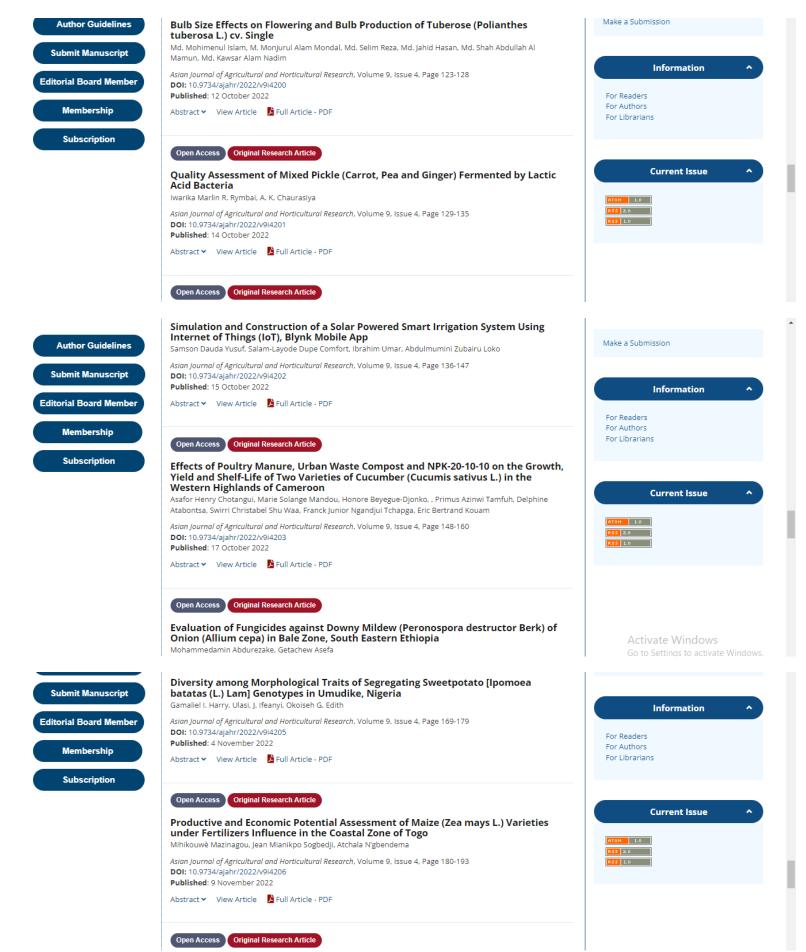


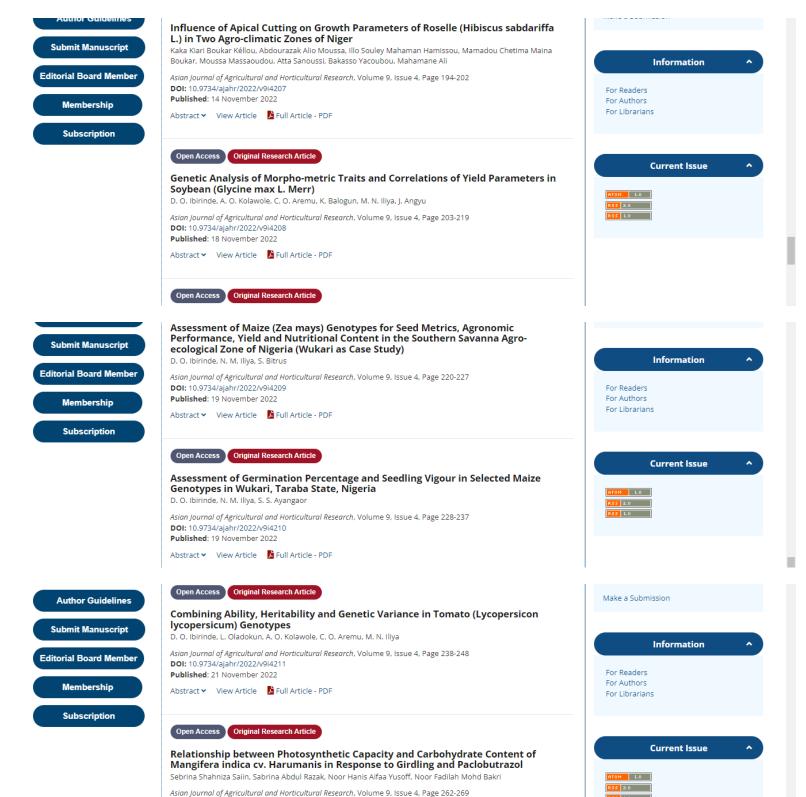
Indeks Jurnal











DOI: 10.9734/ajahr/2022/v9j4214 Published: 12 December 2022

Abstract ▼ View Article 📙 Full Article - PDF

Open Access | Original Research Article

S 1.0



Editorial Board Member



Academic Editors

Dr. Magdalena Valsikova

Professor,

Department of Vegetables Production,

Faculty of Horticulture and Landscape Engineering,

Slovak University of Agriculture (SUA), Nitra, Slovakia

Email: magdavalsik@hotmail.com, Magdalena.Valsikova@uniag.sk

Profile Link: https://goo.gl/mThrFE

Short Biosketch

Dr. Anita Biesiada

Professor,

Department of Horticulture,

Wroclaw University of Environmental and Life Sciences,

ul. C.K. Norwida 25, 50-375 Wroclaw, Poland

Email: anita.biesiada@upwr.edu.pl; anita.biesiada@up.wroc.pl

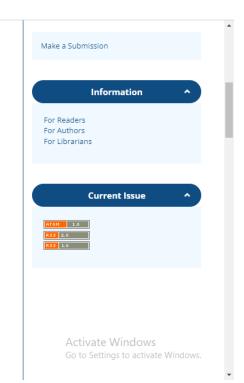
Profile Link: https://goo.gl/cE9VZN

Dr. Paola A. Deligios

Department of Agriculture, University of Sassari, Italy

Email: pdeli@uniss.it

Profile Link: https://www.uniss.it/ugov/person/1952



Dr. Gabriela Civeira

In charge of Environmental Impact in agroecosystems,

Faculty of Agriculture and Agrifood Sciences University of Morón (UM), Argentina

Email: gciveira@agro.uba.ar, civeira.gabriela@inta.gob.ar

Profile Link: NA

Dr. Yash Gupte

Department of Life Science,

Ramnarain Ruia College, Matunga, India

Email: Yash.Gupte@ril.com, yash.v.gupte@gmail.com

Profile Link: NA

Dr. Enver Kendal

Associate Professor,

Department of Crops and Animal Production,

Mardin Artuklu University, Kiziltepe Vocational Training High School, Turkey

Email: enver21_1@hotmail.com, enverkendal@artuklu.edu.tr

Profile Link: http://www.artuklu.edu.tr/tr/akademik/doc-dr-enver-kendal

Dr. Imran Shabbir

Assistant Professor,

Department of Agronomy,

Dr. Fatma Aykut Tonk

Associate Professor,

Department of Field Crops, University of Ege, Turkey

Email: fatma.aykut@ege.edu.tr

Profile Link: https://avesis.ege.edu.tr/fatma.aykut

Short Biosketch

Dr. T. Selvamuthukumaran

Associate Professor,

Department of Entomology, Faculty of Agriculture,

Annamalai University, Tamil Nadu, India

Email: entoselva@gmail.com

Profile link: https://goo.gl/RVc63J

Dr. Ahmed Medhat Mohamed Al-Naggar

Professor of Plant Breeding,

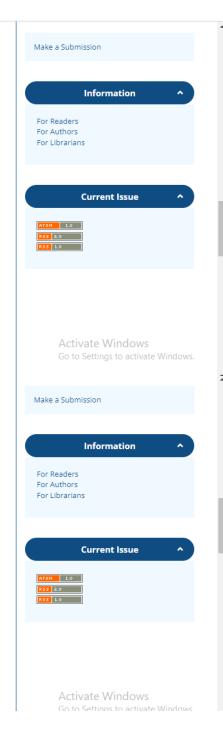
Department of Agronomy, Faculty of Agriculture, Cairo University, Egypt

Email: medhatalnaggar@agr.cu.edu.eg, medhatalnaggar@gmail.com,

ahmedmedhatalnaggar@gmail.com

Profile Link: NA

Short Rinsketch



Bahauddin Zakariya University (BZU), Multan, Pakistan Email: imranshabbir@bzu.edu.pk, imranshabbir111@gmail.com Profile Link: NA

Dr. Mohammad Asadi

Department of Plant Protection,

Faculty of Agriculture and Natural Resources,

University of Mohaghegh Ardabili, Ardabil, Iran

Email: assadi20@gmail.com

Profile Link: NA

Dr. Narayan Lal

ARS Scientist (Senior Scale)

Department of Horticulture-Fruit Science

ICAR-Indian Institute of Soil Science, Bhopal, India

Email: narayanlal.lal7@gmail.com , narayan.lal@icar.gov.in

Profile Link: NA

Dr. Habib Ali

Assistant Professor,

Department of Agricultural Engineering,

Khwaja Fareed University of Engineering and Information Technology,

Rahim Yar Khan, Punjab, Pakistan

Email: habib_ali1417@yahoo.com, habib.ali@kfueit.edu.pk

Profile Link: NA

Prof. (Dr.) Ioana Grozea

Department of Biology and Plant Protection,

University of Life Sciences "King Mihai I" from Timisoara

Romania

Email: ioanagrozea@usab-tm.ro, ioana_entomol@yahoo.com

Profile Link: NA

Dr. Mohammad Kazem Souri

Associate Professor,

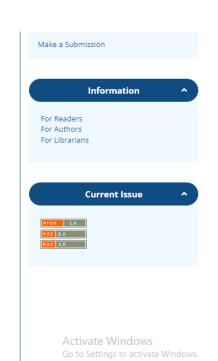
Department of Horticulture,

Tarbiat Modares University, Tehran, Iran

Email: souri1974@gmail.com, mk.souri@modares.ac.ir

Profile Link: NA

Note: We are thankful to all editors for their sincere help and support to develop this journal. All editors confirmed their joining in the board by email. Names of the remaining editors (if any) will be published soon.





Activate Windows
Go to Settings to activate Windows.



Asian Journal of Agricultural and Horticultural Research

9(4): 1-10, 2022; Article no.AJAHR.88217

ISSN: 2581-4478

The Effect of Increasing Temperature on Welfare of Plantation Farmers

Faradiba Faradiba a*

^a Department of Physics Education, Universitas Kristen Indonesia Jl. Mayjen Sutoyo No. 2, Cawang-Jakarta-13630, Indonesia.

Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/AJAHR/2022/v9i430147

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here:

https://www.sdiarticle5.com/review-history/88217

Received 27 March 2022 Accepted 07 June 2022 Published 08 June 2022

Original Research Article

ABSTRACT

Agricultural productivity is a determining factor in achieving food security in Indonesia. Increase in agricultural productivity yields is strongly influenced by climate change. Extreme climate change has resulted in crop failure due to land drought and flooding. The existence of this incident provides an opportunity to decrease the welfare of farmers, especially plantation farmers in Indonesia. The purpose of this study was to determine the effect of temperature on the welfare of plantation farmers in Indonesia. The data used in this study was sourced from the 2018 National Socio-Economic Survey (SUSENAS) data, with a total of 66,754 households in Indonesia. The analytical method used is Ordinary Least Square (OLS). The results of this study indicate that an increase in temperature causes drought, and has an impact on decreasing agricultural productivity. The decrease in the production of agricultural products certainly reduces the income of farmers, which results in a decrease in the level of welfare of farmers. Government policies in terms of climate engineering are needed, as well as assistance programs for farmers to maintain the welfare of farmers.

Keywords: Temperature; climate; farmer welfare; government assistance.

1. INTRODUCTION

Climate change has a wide impact on people's lives. One of the climatic factors that can be felt significant increase in the temperature [1-5]. The increase in the earth's temperature not only has an impact on increasing the earth's temperature, but also changes the climate system which affects various aspects of changes in nature and human life, such as water quality and quantity, habitats, health, coastal ecosystems, agricultural land [6-10]. Climate change that occurs globally is a threat to actors in the agricultural sector [11-14]. Extreme weather will certainly have an impact on the agricultural sector. Extreme drought and heavy rainfall can have a negative impact on the loss of crop productivity. Climate change can disrupt food availability and threaten food security.

Extreme drought and heavy rainfall can have a negative impact on crop productivity loss. Climate change can disrupt food availability and threaten food security. In simple terms, reduced production will result in higher food prices. The high price of food products often triggers an increase in the price of other products [15–18]. The simultaneous impact that can occur in the community due to the high price of goods is a high crime rate and conflict between the community and policy makers [19–21].

The decline in agricultural productivity will certainly threaten the welfare of farmers. Based on data from the Central Statistics Agency (BPS) in 2020, according to the main source of income, the number of households classified as poor in Indonesia mostly comes from the Agricultural Sector, with a percentage of 46.30% [22]. The results of the National Labor Force Survey (Sakernas) in February 2021, the jobs that absorb the most labor are the agriculture. forestry and fishery sectors, with a percentage of 29.59% [23]. In addition, based on BPS data, the welfare of Indonesian farmers in several areas has decreased. Farmers' Exchange Rates (NTP) in seven provinces were below 100 in August 2021. The seven provinces that had NTPs below 100, namely Bali at 92.88, East Nusa Tenggara at 95.05, West Java at 96.46, Special Region Yogyakarta by 96.63, Banten by 96.65, South Sulawesi by 98.19, and Southeast Sulawesi by 99.87 [24]. Farmer's Exchange Rate less than 100 indicates that farmers suffer losses because farmers' income is smaller than the initial expenditure of the index calculation period.

Based on the results of the calculation of the farmers' exchange rate, the plantation subsector is the subsector that has the highest FTT, when compared to other subsectors. This is a doubleedged sword, on the one hand, when people choose the plantation sub-sector as their main source of income, it will generate relatively high household income. However, on the other hand, when the community has made the plantation sub-sector a source of income and climate change has an impact on crop yields, many households will fall into the poor category. This study seeks to answer anomalies that occur in farmers in the plantation sub-sector. Farmers in the plantation sub-sector are expected to remain at an optimal level of welfare.

To maintain the level of community welfare, the government has made a policy of providing Social Assistance (Bansos) for the community. The social assistance program for the community consists of the Poor Rice Program (Raskin), the Smart Indonesia Card (KIP), the Prosperous Family Card (KKS), the Hopeful Family Program (PKH) and the Social Assistance Program (Bansos). The social assistance program is the government's commitment to accelerate poverty reduction. The government realizes that the decline in people's welfare will have an impact on the socio-economic aspects of the community. So that the right Social Assistance Program is expected to minimize worse conditions in the community.

2. DATA AND METHODOLOGY

The data used in this study was sourced from the 2018 National Socio-Economic (SUSENAS) conducted by the Central Statistics Agency (BPS), with a total of 66,754 household observations, covering all provinces in Indonesia. The climatic factor used in this study is the temperature sourced from the Meteorology, Climatology and Geophysics Agency (BMKG). Welfare indicators for plantation farmers sourced from SUSENAS, are measured based on government household participation in assistance programs. The method of analysis used Ordinary Least Square (OLS). The OLS method is used to determine the effect of the independent variable on the dependent variable [25]. In this study, control variables will also be

added to determine regional conditions and ensure the strength of the model.

In this study, several control variables were added, including the island of Java and areas belonging to the category of disadvantaged areas. The choice of the variable Java Island as the control variable is because Java is the center of government and economy, so that the rise of public activities has an impact on the level of population density. While the selection of regions is lagging behind, because these areas tend to be natural so that public activities are relatively rare. The two control variables above describe contradictory phenomena. Control variables will be used in stages to determine the strength of the model. A good model can be indicated by the direction of the model and the significance of the model that does not change, when the control variables are added gradually.

The models that will be formed in this research are:

participation in social assistance = $\alpha + \beta_1 temperature + \beta_i X_i + \varepsilon$

3. RESULTS AND DISCUSSION

Based on the results of data processing, it is known that temperature affects the welfare of plantation farmers. These results are in line with several studies that have been conducted [26-29]. The complete results of this study can be seen from the table that has been presented, based on the type of assistance program followed by the household.

Table 1a presents information on the effect of temperature on poverty as measured by plantation farmers who are recipients of the Rice Poor Program (Raskin). From these results obtained a positive and significant coefficient of 0.0392204. From these results it can be interpreted that an increase in temperature has an impact on the welfare of plantation farmers. Gradually the increase in temperature that occurs has the potential to cause land drought, in a decrease in resultina agricultural productivity. The decline in the production of agricultural products will certainly reduce the income of farmers and have a negative impact on the level of welfare.

The Rice for Poor Families Program (Raskin) is a food subsidy intended for poor families as an effort from the government to improve food security and provide protection to poor families. Concretely, the Raskin Program will reduce the expenditure burden of Target Households (RTS), through fulfilling some basic food needs in the form of rice and preventing a decrease in recipients' energy and protein consumption.

Table 1a. The Effect of Temperature on Plantanation Farmers in the Raskin Program Recipients

. reg r1601 suhu if r804==3, r

Linear regression

Number of obs	=	66,754
F(1, 66752)	=	58.27
Prob > F	=	0.0000
R-squared	=	0.0009
Root MSE	=	.49554

r1601	Coef.	Robust Std. Err.	t	P> t	[95% Conf	. Interval]
suhu	.0392204	.005138	7.63	0.000	.0291499	.0492908
_cons	641109	.1409919	-4.55	0.000	9174531	

Table 1b. The Effect of Temperature on Plantation Farmers Recipients of the Raskin Program in Java and Disadvantaged Regions

Independent Variables	Model 1	Model 2	Model 3	
•	(1)	(2)	(3)	
Temperature	0.039***	0.034***	0.031***	
	(0.005)	(0.005)	(0.005)	
Disadvantaged Regions	, ,	0.108***	0.111***	
5		(0.005)	(0.005)	
Java		,	Ò.101***	
			(0.012)	
Constant	-0.641***	-0.514***	-0.445 [*] **	
	(0.141)	(0.141)	(0.139)	
Observations	66,754	66,754	66,754	
R-squared	0.001	0.010	0.011	
Dependent Variable : Raskir	1			
Robust standard errors in pa	rentheses			
*** p<0.01, ** p<0.05, * p<0.	1			

In Table 1b, a control variable is added to test the previously obtained model. The control variables included in this model are plantation farmers on the island of Java and farmers in disadvantaged areas. The addition of these two variables is in line with the previous model, which can be seen from the temperature coefficient value which remains positive and significant, namely 0.034 when the underdeveloped region variable is included and 0.031 when the underdeveloped region variable is included in Java.

Table 2a presents information on the effect of temperature on poverty as measured by

plantation farmers who are recipients of the Smart Indonesia Program. From these results obtained a positive and significant coefficient of 0.0180084. From these results it can be interpreted that an increase in temperature has a negative impact on the welfare of plantation farmers.

The Smart Indonesia Card (KIP) program is an assistance in the form of cash, access expansion, and learning opportunities from the government given to students and students who come from poor or vulnerable families to finance education through the Smart Indonesia Card (KIP).

Table 2a. Effect of Temperature on Plantation Farmers Who are Recipients of the Smart Indonesia Program

. reg pip_1606 suhu if r804==3, r

Linear regression

Number of obs = 66,754 F(1, 66752) = 22.45 Prob > F = 0.0000 R-squared = 0.0004 Root MSE = .36594

pip_1606	Coef.	Robust Std. Err.	t	P> t	[95% Conf.	Interval]
suhu	.0180084	.0038011	4.74	0.000	.0105582	.0254586
_cons	334787	.1042637	-3.21	0.001	5391438	1304302

Table 2b. The Effect of Increasing Temperatures on Plantation Farmers Recipients of the Smart Indonesia Program in Java and Disadvantaged Areas

Independent Variables	Model 1	Model 2	Model 3
•	(1)	(2)	(3)
Temperature	0.039***	0.034***	0.031***
·	(0.005)	(0.005)	(0.005)
Disadvantaged Regions	,	Ò.108***	Ò.111* [*] *
5 6		(0.005)	(0.005)
Java		, ,	Ò.101* [*] *
			(0.012)
Constant	-0.641***	-0.514***	-0.445 [*] **
	(0.141)	(0.141)	(0.139)
Observations	66,754	66,754	66,754
R-squared	0.001	0.010	0.011
Dependent Variable : Raskin			
Robust standard errors in pa	rentheses		
*** p<0.01, ** p<0.05, * p<0.	1		

Table 3a. Effect of Temperature on Plantation Farmers Recipient of the Family Welfare Program

r1608	Coef.	Robust Std. Err.	t	P> t	[95% Conf.	Interval]
suhu	.0211858	.0041255	5.14	0.000	.0130998	.0292718
_cons	4064362	.113166	-3.59	0.000	6282415	1846308

In Table 2b, a control variable is added to test the previously obtained model. The control variables included in this model are plantation farmers on the island of Java and farmers in disadvantaged areas. The addition of these two variables is in line with the previous model, which can be seen from the temperature coefficient value which remains positive and significant, namely 0.034 when the underdeveloped region variable is included and 0.031 when the underdeveloped region variable is included in Java.

Table 3a presents information on the effect of temperature on poverty as measured by smallholders who receive the Smart Indonesia Program. From the results of the table obtained a positive and significant coefficient of 0.0211858. From these results it can be interpreted that an increase in temperature has a negative impact on the welfare of plantation farmers.

The Prosperous Family Card (KKS) is a card issued by the Government as a marker for underprivileged families, as a substitute for the Social Protection Card (KPS). Through the implementation of this program, the use of technology was introduced to reach the underprivileged so that program distribution could be better and more efficient. With the implementation of this program, the government can increase the dignity of underprivileged families with protection and empowerment and not just give charity. So the increase in temperature is in line with the increasing number of farmers receiving the Prosperous Family Card Program (KKS) assistance.

In Table 3b, a control variable is added to test the previously obtained model. The control variables included in this model are plantation farmers on the island of Java and farmers in disadvantaged areas. The addition of these two variables is in line with the previous model, which can be seen from the value of the temperature coefficient which remains positive and significant, namely 0.018 when the underdeveloped region variable is included and 0.017 when the underdeveloped region variable is included in Java.

Table 4a presents information on the effect of temperature on poverty as measured by plantation farmers receiving the Family Hope Program. From the results of the table obtained a positive and significant coefficient of 0.0175008.

From these results it can be interpreted that an increase in temperature has a negative impact on the welfare of plantation farmers.

The Family Hope Program (PKH) is a social protection program that provides cash assistance to Very Poor Households (RTSM) and for RTS family members are required to carry out the terms and conditions that have been set. This program in the short term aims to reduce the burden on RTSM and in the long term is expected to break the poverty chain between generations, so that the next generation can get out of the poverty trap.

Table 3b. The Effect of Temperature on Plantation Farmers Recipient of the Family Welfare Program in Java and Disadvantaged Areas

Independent Variables	Model 1	Model 2	Model 3
•	(1)	(2)	(3)
Temperature	0.021***	0.018***	0.017***
	(0.004)	(0.004)	(0.004)
Disadvantaged Regions		0.069***	0.070***
		(0.004)	(0.004)
Java			0.028***
			(0.009)
Constant	-0.406***	-0.326***	-0.307***
	(0.113)	(0.113)	(0.113)
Observations	66,754	66,754	66,754
R-squared	0.000	0.006	0.007
Dependent Variable : Progra	m Perlindungan Sos	sial	
Robust standard errors in pa			
*** p<0.01, ** p<0.05, * p<0.1			

Table 4a. The Effect of Temperature on Plantation Farmers Recipient of the Family Hope Program

	reg	r1609	suhu	if	r804 == 3,	r
--	-----	-------	------	----	------------	---

Linear regression	Number of obs	=	66,754
	F(1, 66752)	=	24.17
	Prob > F	=	0.0000
	R-squared	=	0.0004
	Root MSE	=	.33713

r1609	Coef.	Robust Std. Err.	t	P> t	[95% Conf.	Interval]
suhu	.0175008	.0035594	4.92	0.000	.0105244	.0244772
_cons	3493968	.0976239	-3.58	0.000	5407396	158054

Table 4b. The Effect of Temperature on Plantation Farmers Recipients of the Family Hope Program in Java Island and in Disadvantaged Areas

Independent Variables	Model 1	Model 2	Model 3
	(1)	(2)	(3)
Temperature	0.018***	0.015***	0.015***
-	(0.004)	(0.004)	(0.004)
Disadvantaged Regions	. ,	0.045***	0.045* [*] *
		(0.003)	(0.003)
Java		, ,	-0.004
			(800.0)
Constant	-0.349***	-0.296***	-0.299***
	(0.098)	(0.097)	(0.098)
Observations	66,754	66,754	66,754
R-squared	0.000	0.004	0.004
Dependent Variable : Program	m Keluarga Harapar	١	

Robust standard errors in parentheses

Table 5a. The Effect of an Increase in Temperature on Plantanation Farmers Recipient of the Regional Government Social Assistance Program

. reg r1611 suhu if r804==3, r

Linear regression

Number of obs	=	66,754
F(1, 66752)	=	13.98
Prob > F	=	0.0002
R-squared	=	0.0002
Root MSE	=	.25999

r1611	Coef.	Robust Std. Err.	t	P> t	[95% Conf.	Interval]
suhu	.0104232	.0027882	3.74	0.000	.0049584	.015888
_cons	2130778	.076465	-2.79	0.005	3629493	

In Table 4b, a control variable is added to test the previously obtained model. The control variables included in this model are plantation farmers on the island of Java and farmers in disadvantaged areas. The addition of these two variables is in line with the previous model, which can be seen from the value of the temperature coefficient remains positive and significant, namely 0.015 each when the variables are included in disadvantaged areas and when the variables are included in disadvantaged areas and Java Island.

Table 5a presents information on the effect of temperature on poverty as measured by plantation farmers who receive the Regional Government Social Assistance Program. From the results of the table obtained a positive and significant coefficient of 0.0104232. From these

results it can be interpreted that an increase in temperature has a negative impact on the welfare of plantation farmers.

The Social Assistance Program originating from the Regional Government (Pemda) is a program initiated by the Regional Government in order to maintain the welfare of the community. In addition, this program is usually to fill the difference in recipients of assistance that has been determined by the central government. In practice, assistance programs from the central government sometimes cannot target all target households (RTS), so that the regional government through the APBD issues social assistance programs. Basically this assistance program is in line with the assistance issued by the central government.

^{***} p<0.01, ** p<0.05, * p<0.1

Table 5b. Effect of Temperature on Plantanation Farmers who Receive the Government's Social Assistance Program in Java and Disadvantaged Areas

Independent Variables	Model 1	Model 2	Model 3
	(1)	(2)	(3)
Temperature	0.010***	0.007**	0.006**
	(0.003)	(0.003)	(0.003)
Disadvantaged Regions		0.074***	0.075***
		(0.003)	(0.003)
Java			0.017***
			(0.006)
Constant	-0.213***	-0.126*	-0.114
	(0.076)	(0.076)	(0.076)
Observations	66,754	66,754	66,754
R-squared	0.000	0.015	0.015
Dependent Variable : Subsis	i dari Pemerintah Da	aerah	
Robust standard errors in pa	rentheses		
*** n<0.01 ** n<0.05 * n<0.	1		

^{***} p<0.01, ** p<0.05, * p<0.1

In Table 5b, a control variable is added to test the previously obtained model. The control variables included in this model are plantation farmers on the island of Java and farmers in disadvantaged areas. The addition of these two variables is in line with the previous model, which can be seen from the temperature coefficient value that remains positive and significant, namely 0.007 when the underdeveloped region variable is included and 0.006 when the underdeveloped region variable is included in Java.

Through the indications of the recipients of several aid programs above, it is known that the increase in temperature has an impact on the welfare of the community. Efforts are needed from the central and regional governments to monitor the impact of climate change in each region, so that agricultural productivity can be maintained [30-32]. Real form can be through counseling related to planting and harvesting period, seeds used, treatment methods, etc. In addition, the government also needs to prepare anticipatory steps when natural disasters still occur, so that the welfare of the community is maintained. Government support is very important in maintaining the sustainability of agricultural production

4. CONCLUSION

In the midst of climate change that occurs in all parts of the world, there are social and economic

impacts on society. An increase in temperature is known to have an impact on decreasing agricultural productivity, which contributes to an increase in the number of poor farmers in Indonesia. This phenomenon can be seen from the increase in potential recipients of government assistance programs such as the Poor Rice Program (Raskin), Smart Indonesia Card Program (KIP), Prosperous Family Card (KKS), Family Hope Program (PKH) and Social Assistance Program (Bansos). Government are needed to anticipate climate change trends that have an impact on people's live.

DISCLAIMER

This research is in no way a conflict of interest between the author and the product manufacturer. Also, this research was not funded by the producing company but rather was funded by the author's personal efforts.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

 Kimball BA, Idso SB. Increasing atmospheric CO2: effects on crop yield, water use and climate, Agric. water Manag. 1983;7(1–3):55–72.

- Lean JL, Rind DH. How will Earth's surface temperature change in future decades?, vol. 36, no. 15. Wiley Online Library; 2009.
- 3. Lean JL, Rind DH. How will Earth's surface temperature change in future decades?, Geophys. Res. Lett. 2009l36(15).
- 4. Seneviratne SI, Donat MG, Mueller B, Alexander LV. No pause in the increase of hot temperature extremes, Nat. Clim. Chang. 2014;4(3):161–163.
- Tett SFB, Stott PA, Allen MR, Ingram WJ, Mitchell JFB. Causes of twentieth-century temperature change near the Earth's surface, Nature. 1999;399(6736):569– 572.
- 6. Akpodiogaga-a P, Odjugo O. General overview of climate change impacts in Nigeria. Taylor & Francis. 2010;29(1).
- 7. Faradiba F, Dilemma of Business Climate and The Real Climate, International Journals of Sciences and High Technologies. 2021;25(1).
- 8. Kirilenko AP, Sedjo RA. Climate change impacts on forestry. National Acad Sciences. 2007;104(50).
- 9. McNutt M. Climate change impacts. American Association for the Advancement of Science. 2013;341(6145).
- Wheeler T, Von Braun J. Climate change impacts on global food security. American Association for the Advancement of Science. 2013;341(6145).
- 11. Adams RM, Hurd BH, Lenhart S, Leary N. Effects of global climate change on agriculture: an interpretative review. 1998;11(1).
- 12. Faradiba F. Analisis Pola Curah Hujan Terhadap Produktifitas Tanaman Padi Sawah di Provinsi Jawa Barat. Fakultas Keguruan dan Ilmu Pendidikan, Universitas Kristen Indonesia, 2020; 4(2).
- 13. Aydinalp C, Cresser MS. The effects of global climate change on agriculture, vol. 3, no. 5. Citeseer; 2008.
- 14. Mendelsohn R. The impact of climate change on agriculture in developing countries, Pennsylvania State University Press. 2009;1(1).
- Rosyidin A. Perbaikan, Dampak Korosi Pada Pesawat Udara Boeing 737, Mot.

- Bakar J. Tek. Mesin. 2017;1(1).
- Fereres E, Orgaz F, Gonzalez-Dugo V. Reflections on food security under water scarcity, vol. 62, no. 12. Oxford University Press; 2011.
- Qureshi ME, Hanjra MA, Ward J. Impact of water scarcity in Australia on global food security in an era of climate change. Elsevier. 2013;38.
- 18. Rosengrant MW, Cai X. Water scarcity and food security: alternative futures for the 21st century. IWA Publishing. 2001;43(4).
- Brisman A, South N. Food, crime, justice and security:(Food) security for whom? Springer; 2017.
- 20. Cheng H. Cheap capitalism: A sociological study of food crime in China, vol. 52, no. 2. Oxford University Press; 2012.
- 21. Croall H. Food Crime; 2013.
- 22. BPS. Penghitungan Dan Analisis Kemiskinan Makro Indonesia; 2021.
- 23. BPS. Keadaan Angkatan Kerja Di Indonesia. Jakarta; 2021.
- BPS. Statistik Nilai Tukar Petani 2021;
 2022.
- 25. Hutcheson GD, Ordinary Least-Squares Regression; 2011.
- 26. Ali A, Mottaleb KA, Erenstein O. Impacts of changing weather patterns on smallholder well-being: Evidence from the Himalayan region of northern Pakistan. Emerald Publishing Limited; 2017.
- 27. Assan E, Suvedi M, Olabisi LS, Bansah KJ. Climate change perceptions and challenges to adaptation among smallholder farmers in semi-arid Ghana: A gender analysis. Elsevier, 2020;182.
- 28. Halachmi I, Guarino M, Bewley J, Pastell M. Smart animal agriculture: application of real-time sensors to improve animal wellbeing and production. Annual Reviews. 2019;7.
- 29. McGlone JJ. Farm animal welfare in the context of other society issues: toward sustainable systems. Elsevier. 2001;72(1–2).
- Bae J, Feiock R. Forms of government and climate change policies in US cities, vol.
 no. 4. Sage Publications Sage UK: London, England; 2013.
- 31. Berrang-Ford L et al. Tracking global climate change adaptation among

governments. Nature Publishing Group. 2019;9(6).

32. Zimmerman R, Faris C. Climate change

mitigation and adaptation in North American cities, Curr. Opin. Environ. Sustain. 2011;3(3):181–187.

© 2022 Faradiba; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/88217