

Impact Of Climate Change On Cognitive Aspect And Income Of Marn Farmers In Marginal Area In Lombok Timur District

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DAMPAK PERUBAHAN IKLIM TERHADAP ASPEK KOGNITIF DAN PENDAPATAN PETANI JAGUNG DAERAH MARGINAL DI KABUPATEN LOMBOK TIMUR

4 THE IMPACT OF CLIMATE CHANGE ON COGNITIVE ASPECT AND INCOME OF MARN FARMERS IN MARGINAL AREA IN LOMBOK TIMUR DISTRICT

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ABSTRAK

Perubahan iklim menjadi fenomena yang tidak diinginkan keberadaannya oleh petani karena risiko produksi yang ditimbulkan cukup tinggi. Mengingat kemampuan petani didalamantisipasi masih minim dengan keterbatasan informasi dan pengetahuan sehingga potensi gagal panen petani besar. Tujuan penelitian ini adalah estimasi dampak perubahan iklim terhadap aspek kognitif dan pendapatan petani jagung wilayah marginal. Lokasi penelitian ditentukan secara *purposive* di Kecamatan Jerowaru. Sampel penelitian sebanyak 30 ditentukan secara sensus pada kelompok tani Temodo Lestari. Estimasi terhadap aspek kognitif menggunakan EPIC model dengan skala *likerts Summated Rating Scale* (LSRS) sementara pendapatan diestimasi menggunakan konsep total penerimaan dikurangi dengan total biaya selama menjalankan usahatani jagung. Hasil penelitian menunjukkan lebih dari 60 persen petani mengetahui perubahan iklim dan risiko yang ditimbulkan. Sementara strategi adaptasi perubahan iklim petani mayoritas belum melakukan akibat lebih dari 30 persen petani masih minim informasi terkait perubahan iklim. Pendapatan petani jagung akibat adanya perubahan iklim lebih dari 40 juta per hektar.

Kata Kunci : aspek kognitif, perubahan iklim, pendapatan petani jagung

ABSTRACT

Climate change is a phenomenon that farmers do not want to exist because the production risk it creates is quite high. Given that the ability of farmers in anticipation is still minimal with limited information and knowledge so that the potential for crop failure is large. The purpose of this study is to estimate the impact of climate change on the cognitive aspects and income of corn farmers in marginal areas. The research location was determined purposively in Jerowaru District. The research sample of 30 was determined by census in the Temodo Lestari farmer group. Estimation of the cognitive aspects uses the EPIC model with the Likerts Summated Rating Scale (LSRS) while income is estimated using the concept of total revenue minus the total cost while running a corn farming business. The results showed that more than 60 percent of farmers know about climate change and the risks it poses. While the climate change adaptation strategy for the majority of farmers has not been implemented it as a result of more than 30 percent of farmers still lack information related to climate change. The income of corn farmers due to climate change is more than 40 million per hectare.

Kata Kunci : cognitive aspects, climate change, corn farmer income

INTRODUCTION

The phenomenon of climate change has become a serious concern to date because of unnatural changes (Pratama, 2019). This change is a structural impact of lifestyle and instantaneous needs for human life and the massive use of technology (Ainurrohmah & Sudarti, 2022). Climate change has an impact on the order of the agricultural sector and the regional economic sector (Priyanto et al., 2021). So that climate change becomes a phenomenon that needs serious attention from all sectors. Starting from the community as the main actors, industry, services, housing, companies and the government as regulators. Thus if handling is not carried out, it can become an environmental, health, food security and economic development risk (Sudarwanto et al., 2021).

The problem of climate change (climate change) seems to have been felt by the community at this time (Moh. Wahyudi et al., 2023). Especially people who work as farmers. Phenomena that arise include erratic rainfall, plant pests that cannot be predicted beforehand by the emergence of new variants (Julismin, 2013). This causes them to behave reluctantly towards the risk of farming. In fact, if farmers are able to adapt to the climate, the opportunity for high income is real. The most unfavorable risk for farmers

is decreasing land fertility as well as decreasing productivity and quality of farming results (Yunginger & Dako, 2021). Thus the community must have information and knowledge about attitudes and actions that must be taken to respond to climate change (Furqan et al., 2020). This step is the current climate change strategy where farmers must be able to adapt to the natural environment earlier.

The Ministry of Environment and Forestry (KLHK) in efforts to control climate change by encouraging multi-stakeholder collaboration to strengthen collective and group-based adaptation and mitigation capacities through the climate village program. In particular, the community as producers and consumers of climate change needs to gain an understanding regarding the actions of climate change adaptation strategies that are taking place. So as to reduce and inhibit the risks that arise. Increasing the role of the community is the main key to mitigation both individually and in groups. This active role is in the form of concern for environmental protection and management, increasing independence, community empowerment, social supervision, culture and local wisdom (Sudarwanto et al., 2021).

One of the programs that have been implemented by the Indonesian government to reduce emission levels and

increase the level of community resilience is the Climate Village Program which was ratified in 2012. Based on the Law of the Ministry of Environment and Forestry/KEMEN-LHK (2016) Number P. 84/ MENLHK-SETJEN/KUM.1/11/2016, the Climate Village Program or called Proklam was formed to increase the involvement of the community and other stakeholders to strengthen adaptation capacity to the impacts of climate change and reduce greenhouse gas emissions and provide recognition for adaptation efforts and climate change mitigation that has been carried out which can increase welfare at the local level according to regional conditions (KLHK, 2016).

Corn is one of the results of the agricultural sector which is important in national food security, animal feed and industry (Heru et al., 2011). In addition, corn is the government's superior commodity because of the easy cultivation process. The ease of production is the opposite due to uncertain climate change (Heru et al., 2011). Farmers are faced with the risk of crop failure, especially in marginal areas where agricultural conditions have minimal adaptation strategies to non-productive land conditions. In the end it will affect the income and sustainability of corn farming. Based on this, it is necessary to analyze the impact of climate change on cognitive

aspects and the income of corn farmers in marginal areas in East Lombok Regency. Thus the aim of this study is to estimate the impact of climate change on the cognitive aspects and income of corn farmers in marginal areas in East Lombok Regency.

METHODS

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The basic method of this research is descriptive analysis. The research location was determined purposively in Jerowaru District with the consideration that this area is a marginal area with the majority of farmers cultivating corn only once planting season so there is more risk of crop failure. The research respondents were determined by census as many as 30 farmers in the Temodo farmer group. Production costs are estimated by determining fixed costs and variable costs. Total costs are obtained from the sum of fixed costs and variable costs (Suratiah, 2009). The income of corn farmers is measured using the multiplication result between production and price (Soekartawi, 1984). While farmers' income is obtained from the results of reducing the total revenue to the total cost. Farmers' cognitive aspects of climate change are measured using the EPIC model with the Likerts Summated Rating Scale (LSRS) where each choice of answers is given a score (Budiman et al., 2015; Fauziah et al.,

2019). If the farmer gives an answer score of 3 then the farmer knows the impact of climate change; if the farmer gives an answer score of 2 the farmer is quite knowledgeable about climate change; and if the answer score is 1 the farmer does not know at all about the impact of climate change.

RESULTS AND DISCUSSION

Profile of Respondent

Age is closely related to the physical ability of farmers to carry out their farming activities. Not only physical ability but age also affects the ability to think. At a certain age, there is an increase in physical ability which is then followed by a periodic decline. Especially while running corn farming requires good on-

farm and physical skills. Age distribution of maize farmers in marginal areas at the time of cultivation ranged from 40-55 (47%). In farming practices, age is an indicator of the most active role in climate change and income. Age of productive farmers with a young demographic structure tends to be responsive to existing changes. By utilizing technology in absorbing information about climate change and increasingly scarce production inputs. Automatically the risk of crop failure due to climate change can be properly anticipated and will ultimately affect income. At least farmers are able to survive in their on-farm farming conditions due to structural changes in the agricultural sector.

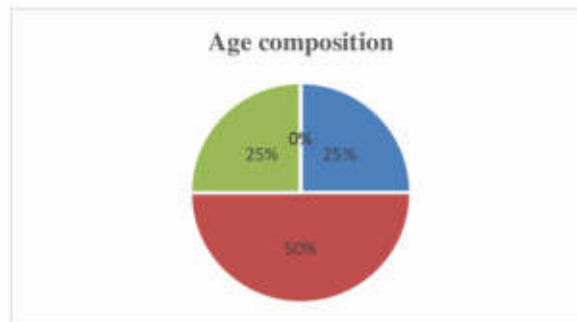


Figure 1. Age Composition of Farmer's

Maize farmer education is a formal education that has been taken while running his farming business. Education has a managerial function in all aspects of corn farming. Especially in dealing with climate change anomalies and the ability to combine the use of production inputs according to recommendations. Farmers with higher education levels have above average ability in making decisions related to cropping patterns in anticipation of climate change, using production inputs as recommended for estimating high costs. Of

course, this can be achieved through engineering formal education with the adaptability of farmers through skills in processing the latest information and functional literature. The majority of corn farmers' education when running their farming business was 47 percent elementary school (SD). These results indicate the level of education of farmers is low. The low education level of farmers is an early indication of low adaptability to climate change (Moh. Wahyudi et al., 2023).

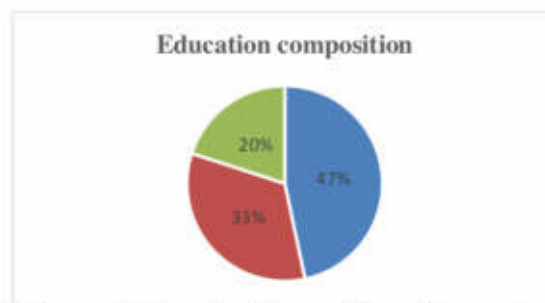


Figure 2. Education Composition of Farmer's

Farming experience is a learning process so that farmers have managerial abilities and skills in farming. Allegedly long experience will be better in the on-farm process of farmers. That is, the longer the farming experience, the richer the knowledge one has to manage farming. Apart from being an incubation of farming management, this experience serves as a parameter of the ability to respond to climate change. Based on their long experience, farmers are considered capable

of carrying out adaptation strategies such as using production inputs according to standards. Changes in cropping patterns follow the seasonal calendar in anticipation of pre-cultivation. More than 90 percent of farmers have more than 5 years of corn farming experience. This means that farmers have been cultivating corn for quite a long time so in making decisions in anticipation of climate change it is thought to be better than before.

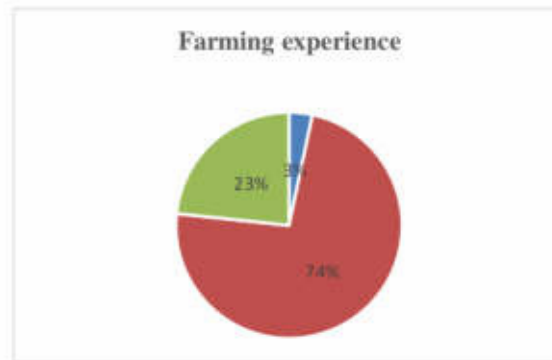


Figure 3. Farming Experience

Land is the most important production factor in running corn farming in marginal areas. The characteristics of maize cultivation land are dry land with the majority on farm utilizing a rainfed irrigation system. This means that farmers are only able to produce once a year. Of course, farmers' production efficiency has not been achieved due to the constraints on the supply of water resources. Farmers in improving the production and productivity of corn farming by using production inputs appropriately and expanding the planting area. The majority of land used for corn production is non-productive land that was

not previously used. This farming land is the result of extensification from the clearing of forest areas on the basis of the potential for the development of corn plants. More than 90 percent of farmers have arable land area of 5 ha, the rest is less than 5 ha. The average ownership of farmers' land area of more than 5 ha shows that farmers according to the welfare index are at the economic level. In line with the findings of Susilowati & Maulana, (2012) the level of welfare of farmers can be achieved with a minimum land area of 0.5 ha.

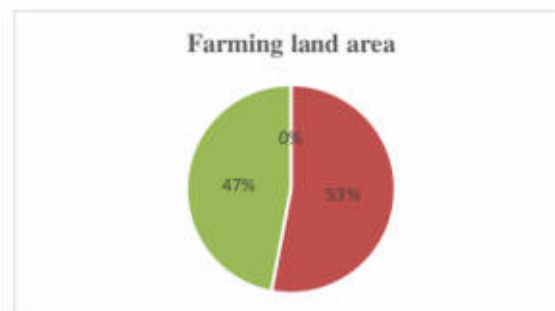


Figure 4. Farming land area

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The Impact of Climate Change on Farmers' Cognitive Aspects

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The cognitive response is the response of corn farmers to climate change which causes crop failure. If there is damage to production, will they seek information about adaptation strategies or will they let their crops fail to harvest. Usually, farmers take precautions after their crops have been damaged by climate change. Even though they had previously been informed by field extension officers

to pay attention to their on-farm business, the cultivation part started from land preparation until it was close to harvest time. This response is influenced by the individual characteristics of farmers, their long experience in farming, the information they receive, and the socio-cultural context of where they live (Van Der Linden, 2015). The cognitive responses of farmers to climate change in marginal areas are as follows.

Table 1. Cognitive Response of Farmers to Climate Change

No	Indicator	Score 3		Score 2		Score 1	
		r	%	r	Sp. %	r	Sp. %
1	Knowledge of climate change	20	66.67	5	16.6	5	16.67
2	Risk of crop failure due to climate change	25	83.33	5	16.6	0	0.00
3	Climate change adaptation strategy	10	33.33	15	50.0	5	16.67
4	Impact of adaptation strategy on production	17	56.67	10	33.3	3	10.00
5	Sources of climate change information	10	33.33	5	16.6	15	50.00

Source: Primary data, 2023

Table 1 shows more than 60 percent of farmers know about climate change that occurs during maize farming and also the risk of crop failure (Arifah et al., 2022). This means that climate change has a significant impact on farmers' knowledge. Like it or not, farmers must face the existing changes and must be able to adapt. They cultivate corn on dry land

which is less productive. This further strengthens the risk of low farmer production. Farmers during cultivation only use rainfed water so that cultivation is only done once a year. Meanwhile, more than 60 percent of farmers' adaptation strategies have not been fully implemented. This is because they are still lacking in managerial climate change

response strategies. As a result of the lack of integrated knowledge and information to farmers. Until now they have only relied on experience to prevent change when it is not enough. According to De Matos Carlos et al., (2020) information that farmers receive regarding climate change can be the most adaptive strategy. Based on field results, more than 30 percent of farmers rarely access climate change information. This is due to the fact that the majority of farmers' education is low, so they cannot access available information, coupled with their advanced age, the uncertainty of farming results will be quite high (Silvestri et al., 2012). Public sector policies are needed, in this case policy makers, to continue to provide information services to farmers, given the limited knowledge and ability to access information in supporting production resilience. So far, farmers have used local strategies to deal with climate change such as fertilizers, pesticides, and long-lasting seeds (Arifah et al., 2022).

3 Impact of Climate Change on The Income of Corn Farmers

Climate change is a phenomenon that farmers do not want. This phenomenon often causes the risk of crop failure for corn farmers. Climate change cannot be estimated because it is beyond the control limits of farmers. In farming practice, when farmers are faced with

conditions of uncertainty in their production, they start on the farm with forecasts for the early rainy season as a sign that planting will be carried out soon. Furthermore, the selection of the use of production inputs in the form of certified seeds. This step is an alternative adaptation strategy for farmers in dealing with climate change besides the combination of using other production inputs. The marginal area corn farming income is as follows.

The estimated income of corn farmers due to climate change is Rp. 45,996,747.00 per hectare. This income is still relatively low when viewed from the ratio of the sacrifice of farming costs. The low income of farmers is caused by the phenomenon of high rainfall intensity so that the distribution of damage to corn crops is wider, farmers' production is also low. The average selling price of dry corn is Rp. 5300.00 per kilogram. This price is already high, but farmers' production has not reached its potential. The highest production of farmers is only able to reach 7 tons per hectare. Thus the income of farmers needs to be increased through the implementation of adaptation strategies to climate change so that they can anticipate anomalies in natural changes (Moh. Wahyudi et al., 2023). In addition, the use of production factors is in accordance with regional recommended doses to reduce costs incurred while running farming

(Iskandar & Jamhari, 2020). Coupled with the existence of new appropriate technology breakthroughs to increase the potential production of farmers (Defidelwina et al., 2019; Suharyanto et al., 2015). According to Reyer et al., (2017), this climate change phenomenon has a negative impact on farmers'

structural income and consumption. Obviously this will have an impact on the sustainability of farming and the farmer subsistence economy (Harvey et al., 2018). In the sense that this climate change can certainly reduce farmers' income and will ultimately increase poverty.

Table 2. Variable Cost of Corn Farming in Jerowaru District, 2023

Variable	LLG/ Arable Land	Ha/ Hectare
Seeds (Rp)	477.333	410.080
Fertilizer (Rp)	7.220.000	6.202.749
Pesticides (Rp)	538.333	462.486
Labor (Rp)	2.008.000	1.725.086
Variable cost	10.243.667	8.800.401
Land lease (Rp)	1.483.333,33	1.274.341,35
Land tax (Rp)	50.000,00	42.955,33
Depreciation (Rp)	144.454	15.949
Manager salary (Rp)	1.406.666,67	1.208.476,52
Fixed cost	3.084.453,70	2.469.874,32
Total Cost	13.328.120,70	11.450.275
Revenue	66.868.333	57.447.022
Profit	53.540.213	45.996.747
R/C Ratio	5	5

Source: Primary date, 2023

Thus, the influence of climate change on corn farming poses quite high income risks. In the short term, climate change can increase the risk of farmer failure. Because, basically climate change is difficult to prevent because it is beyond farmers' control. So far, farmers, as a form of anticipation of climate change, only carry out standard planting operations based on directions from field extension workers; the rest is anticipated based on the experience of each farmer. Therefore, there is a need for breakthroughs to help

farmers carry out their cultivation, especially easy access to information on environmental conditions and precise weather predictions, thereby reducing the risk of farmers' crop failure.

CONCLUSION AND SUGGESTION

The problem of climate change (climate change) seems to have been felt real at this time by the community, especially people who work as farmers. Phenomena that arise include erratic rainfall, plant pests, and diseases that

cannot be predicted by the emergence of new variants. So farmers use local strategies such as chemical pesticides and durable seeds in anticipation of crop failures which will impact farmers' income. The results showed that more than 60 percent of farmers know about climate change and the risks it poses. While the climate change adaptation strategy for the majority of farmers has not implemented it as a result of more than 30 percent of farmers still lack information related to climate change. The income of corn farmers due to climate change is more than 40 million per hectare. Farmers' knowledge needs to be increased through increased participation and the active role of field extension agencies so that the losses incurred can be minimized. The activation of field extension agencies, can also provide a more relevant source of information as a climate change adaptation strategy considering that the majority of corn farmers in marginal areas have low education and are old. Old farmers do not mean they are unable to search for information, it's just that they need education to meet the need for climate change information to support their on-farm.

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Article Error You may need to use an article before this word. Consider using the article **the**.



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Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.



Word Error Did you type "**the**" instead of "**they**," or have you left out a word?



Confused You have used **adapt** in this sentence. You may need to use **adept** instead.



Article Error You may need to use an article before this word. Consider using the article **the**.



Article Error You may need to use an article before this word.



Word Error Did you type "**the**" instead of "**they**," or have you left out a word?



Confused You have used **an** in this sentence. You may need to use **a** instead.



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Proofread This part of the sentence contains a grammatical error or misspelled word that makes your meaning unclear.



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Missing ", " You may need to place a comma after this word.



S/V This subject and verb may not agree. Proofread the sentence to make sure the subject agrees with the verb.



P/V You have used the passive voice in this sentence. Depending upon what you wish to emphasize in the sentence, you may want to revise it using the active voice.



Proofread This part of the sentence contains a grammatical error or misspelled word that makes your meaning unclear.



Missing ", " You may need to place a comma after this word.



Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.



Dup. You have typed two **articles** in a row. You may need to delete one of them.



Article Error You may need to use an article before this word. Consider using the article **the**.



Article Error You may need to remove this article.



Garbled Grammatical or spelling errors make the meaning of this sentence unclear. Proofread the sentence to correct the mistakes.



Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.



Missing "," You have a spelling or typing mistake that makes the sentence appear to have a comma error.



Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.



Missing "," You may need to place a comma after this word.



Wrong Article You may have used the wrong article or pronoun. Proofread the sentence to make sure that the article or pronoun agrees with the word it describes.



Word Error Did you type "**the**" instead of "**they**," or have you left out a word?



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Article Error You may need to remove this article.



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Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.



Proper Noun If this word is a proper noun, you need to capitalize it.



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PAGE 4



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PAGE 5



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Article Error You may need to use an article before this word.



Article Error You may need to remove this article.



Article Error You may need to remove this article.



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Missing "," You may need to place a comma after this word.



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Prep. You may be using the wrong preposition.



Article Error You may need to use an article before this word. Consider using the article **the**.



Wrong Article You may have used the wrong article or pronoun. Proofread the sentence to make sure that the article or pronoun agrees with the word it describes.



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Proofread This part of the sentence contains a grammatical error or misspelled word that makes your meaning unclear.



Possessive You may need to use an apostrophe to show possession.



Prep. You may be using the wrong preposition.



Confused You have used **are** in this sentence. You may need to use **our** instead.

PAGE 7



P/V You have used the passive voice in this sentence. Depending upon what you wish to emphasize in the sentence, you may want to revise it using the active voice.



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Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

PAGE 8



Confused You have used **to** in this sentence. You may need to use **two** instead.



Missing ", " You may need to place a comma after this word.



Confused You have used **a** in this sentence. You may need to use **an** instead.



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Run-on This sentence may be a run-on sentence. Proofread it to see if it contains too many independent clauses or contains independent clauses that have been combined without conjunctions or punctuation. Look at the "Writer's Handbook" for advice about correcting run-on sentences.



P/V You have used the passive voice in this sentence. Depending upon what you wish to emphasize in the sentence, you may want to revise it using the active voice.



Verb This verb may be incorrect. Proofread the sentence to make sure you have used the correct form of the verb.



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Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

PAGE 10



Confused You have used **their** in this sentence. You may need to use **there** instead.

PAGE 11

PAGE 12
