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Economic Impact of Climate Smart Agriculture Practices: A Social Accounting Matrix (SAM) Analysis

Eka Novitasari✉**, Djoni Hartono**

Development Economic Study Program, Faculty of Economics and Business, Universitas Indonesia

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Abstract

This research was driven by climate change, which impacted the Indonesian economy. Climate Smart Agriculture (CSA) was selected to mitigate climate change while also potentially benefiting the economy. This study is to explore the economic impacts of CSA practices on rice, coffee, maize and sugarcane. The SAM approach was selected due to its ability in providing comprehensive and in-depth analysis, emphassing the significance of employment, household, and social institutions in the economy. Additionally, it incorporates transactions and transfers between institutions that are relevant to income distribution (Morales, 2024). Nine scenarios with an implementation level of 18 and a successful rate of 80%, were chosen to demonstrate the potential for increasing sectoral income, labour income, household income, value added and employment. The findings indicate that CSA has the potential to present positive impact on the economy, thus the government is encouraged to implement CSA practices in various regions of Indonesia.

Keywords: Agriculture, Climate Change, Climate Smart Agriculture, Economic Impact, Social Accounting Matrix

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✉ Correspondence Address :
Address: Gedung L2 Lantai 2 FE Unnes
Kampus Sekaran, Gunungpati, Semarang, 50229
E-mail : eka.noveetasary@gmail.com

INTRODUCTION

The world is presently encountering climate change, which refers to long-term changes in temperature and weather patterns. The macroeconomic growth rates are being adversely affected by the unprecedented rate of temperature change in the last 66 million years. Studies conducted in 2021 in 1,537 regions around the world over 40 years indicates that a one-degree Celsius increase in daily temperature variability has reduced regional growth rates by at least 5%. (Kotz, 2021).

According to the World Bank, Indonesia is among the third of countries most affected by climate change. Indonesia has varied climate and topography both in term of physical characteristics and chemical composition, resulting in fertile soil conditions, which on the other hand can lead to hydrometeorological disasters such as floods, landslides, and droughts.

According to the Minister of National Development Planning (PPN) and Head of the National Development Planning Agency (Bappenas), Suharso Monoarfa, Indonesia could suffer economic losses of up to IDR 500 billion in the period 2020-2024 due to climate change, unless a policy intervention is executed (Pusparisa, 2023).

The food crop subsector is particularly vulnerable to the effects of climate change, primarily due to biophysical, genetic, and management factors (Surmaini, 2011). Climate change has led to an increase in temperatures, natural disasters, plant diseases, decreased water content, resulting in a decrease in crop productivity, yield, or even significant loss of production(Bappenas,2010;Moore,2017;Downing, 2017).

On the other hand, the agriculture sector has an important role in Indonesia's economy, as it is the second largest contributor to the national GDP. To address the negative impacts of climate change on the agricultural sector, the Indonesian government is looking for strategies to mitigate. One of the initiatives taken is the implementation of Climate Smart Agriculture (CSA).

CSA is an innovation strategy that can be integrated with conventional agriculture, to reduce the risk of crop failure (Dasipah, 2022).It offers both economic and ecological benefits (The World Bank, 2019).Additionally, it can contribute to achieve key development goals such as education, development, and employment (FAO, 2019).

In order to efficiently and systematically conduct CSA, it is necessary to have an identification process at the local level, thus requiring comprehensive collaboration among stakeholders as the key to success. Based on the analysis of costs and benefits, CSA has constraints in terms of costs, where the costs incurred in the initial phase of implementing CSA practices are typically high and demand extra labour, additional capital and the lack of accessible technology (Ariani, 2018).

The Indonesian government fully supports this programme through the implementation of policies, programmes and action initiatives. The support measures include the utilisation of climate information for crop planning, selection of superior varieties, appropriate land preparation, adoption of water-saving technologies, and effective management.

In 2018, the Ministry of Agriculture implemented the Strategic Irrigation Modernisation and Urgent Rehabilitation Project (SIMURP) as part of CSA. This program is funded by the World Bank and Asian Infrastructure Investment Bank (AIIB) until 2024.

According to information provided in the 2020 Project Operational Manual (POM) document, there are 16 districts located in eight provinces that have been identified for receiving CSA practices. These innovations will be in the form of strategic irrigation modernisation and urgent rehabilitation programs.

CSA practices can be adopted in several agricultural sectors. Based on literature studies, there are three practices concerning to CSA for rice: System of Rice Intensification/SRI (Takahashi, 2014,), Smart Rice (Perdinan, 2018), and the practice of adjusting planting schedules based on rainfall conditions and cropping pattern techniques on rainfed land (Pramudia, 2022).

SRI refers to the practice of planting seeds early, using a planting pattern that is shallow and spaced apart, and providing watering at regular intervals. CSA SRI practices increased yields by 64% (Takahashi, 2014). CSA Smart Rice (SR) practices emphasise the importance of climate information for crop planning, rice variety selection, land preparation, water management and integrated pest control.

SR practices increase yields by a maximum of 42% (Perdinan, 2018). The third CSA practice, focused on the practice of optimising planting schedules based on to rainfall conditions and cropping pattern techniques and is implemented on rainfed land. This practice has significantly speeded up planting time and results in 8% increase in rice yields (Pramudia, 2022).

For coffee, one of the CSA techniques applied by coffee farmers is agroforestry, which is a strategy to manage their land that combines agricultural and forestry practices by integrating trees and shrubs into the agricultural landscape. This technique succeeded in increasing the amount of yield by about 11% (Lisnawati, 2017). Other techniques include fertilisation, pruning coffee branches and controlling coffee pests and diseases. This practice succeeded in increasing coffee yields by 39% (Fardinatri, 2024).

Following the Maize CSA practice, the Integrated System of Maize and Cattle Planting (Matitaputty, 2021; Savelli, 2021) is applied in the Kupang district, East Nusa Tenggara. The study findings indicate a significant 194% increase in yields. The second CSA practice for maize is aquacrop. This method used in Uganda. The aquacrop model is a tool utilised to simulate crop water productivity for maize by considering field data on crop parameters, soil properties, and weather data for calibration and validation.

CSA with aquacrop has been demonstrated to contribute to 47% increase in yield. (Zizinga, 2022). The comparative study in Uganda was undertaken due to there was lack of literature in Indonesia that describes the percentage increase in yield of maize resulting from CSA practices. Considering the constraints in conducting surveys and interviews on feasibility of aquacrop practice in Indonesia, it can be concluded that aquacrop is viable CSA practice for maize in Indonesia.

Several CSA practices such as maintaining soil nutrient balance, improving water productivity and crop diversification can be effectively applied to sugarcane (Putra, 2021). The practice of balancing soil nutrients and water productivity is a practice that can increase yields by a maximum of 10% (Wekesa, 2017; Putra, 2021). In addition, using CSA techniques that combine a crop variety approach can lead to increased sugarcane yields.

Implementing CSA practices with a crop diversification approach often results to significant boost in sugarcane yields with potential increases of up to 30% (Ambrosano, 2013; Putra, 2021). A study conducted by Ajatasatru (2024) in India has explored the economic impact of CSA practices with a SAM analysis approach.

The measured economic impact focusses on changes in output, GDP and household income, without providing additional information on the impact on the income of labour and employment. By adopting three different intervention scenarios in rice and wheat CSA practices, it was determined that CSA practices in rice and wheat in India demonstrated higher output, GDP and rural household income compared conventional agricultural practices. (Ajatasatru, 2024).

In Indonesia, there has been no research carried out on the economic impact of CSA practices using the SAM analysis approach. However, a prior study has observed the potential benefits of CSA practices in cocoa, oil palm and rice on enhancing productivity, GDP and investment. The research, conducted through a literature study, concluded that CSA practices have the potential to enhance productivity (Asher, 2021).

In line with the results of previous research conducted in India and Indonesia, it is expected that this study will further explore the impact of CSA on Indonesia's economic growth, as seen from sectoral income, labour income, household income, value added and its effect on employment, using SAM analysis.

The SAM framework approach is considered to have the advantage of capturing the overall impact of variations in a particular sector, along with other sectors in the economy (Hartono, 2020). The SAM data utilised in this analysis is derived from the 2018 SAM dataset, which is produced by the Nexus Project SAM conducted by the International Food Policy Research Institute (IFRI).

The SAM data from the Nexus Project SAM-IFRI is more current in comparison to the SAM data released by the Badan Pusat Statistik (BPS), which is currently only available for the year 2016. The findings of this study have the potential to not only offer current information but also assist policymakers to determine the right approach for the implementation of CSA. This will encourage sustainable agriculture, improve the economy from the agricultural sector and can overcome the challenges of climate change.

RESEARCH METHODS

The Social Accounting Matrix (SAM) approach is used in this study to analyse data. Social Accounting Matrix (SAM) is a data framework in matrix form, which provides a full, balanced, consistent, and integrated description of the economic and social situations of a society, as well as the link between the two.

Therefore, SAM provides a comprehensive analysis of national economy and the relationship between economic and social factors at a certain period. SAM can be considered as an extension of the existing input-output table. It extends the Input-Output Table by introducing social transfers from firms, households and the Government (Alarcón, 2011).

SAM improves the Input-Product model by offering a more detailed perspective, in highlighting the role of labour, households, and social institutions in the economy, and integrating transactions and transfers between institutions related to income distribution (Morales, 2024).

The SAM capacity to summarise all economic transactions that take place over a period of time, it provides an overview of a region's economy and can capture the socio-economic structure of an economy, making it an excellent analytical tool. The Social Accounting Matrix (SAM) is also an essential analytical instrument that may explain the effect of an economic policy on income distribution by applying multiplier coefficients.

The application of SAM is relatively simple, making it applicable in various cases (Hartono and Resosudarmo 2008). The SAM framework in Table 1 is a basic SAM framework using a 4x4 matrix. The sub-matrix Tij displays the income generated (Hartono and Resosudarmo 2008). The SAM framework in Table 1 is a basic SAM framework using a 4x4 matrix.

Table 1. SAM framework

			EXPENDITURES				
			Endogeneus			**Exogeneous**	**Total**
			Production Factors	**Institution**	**Production Activity**		
ACCEPTANCE	**Endogenous**	**Production Factors**	0	0	T_{13}	Z_1	y_1
		Institution	T_{21}	T_{22}	0	Z_2	y_2
		Production Activity	0	T_{32}	T_{33}	Z_3	y_3
	Exogeneous		Z_{41}	Z_{42}	Z_{43}	Z_4	Z
	Total		y'_1	y'_2	y'_3	y'_2	z'

Source: Hartono and Resosudarmo (2008).

The sub-matrix Tij displays the income generated by the accounts in row i of column j accounts. For example, T21 represents labour income and profits (factors of production), which are distributed to household institutions firms, and government T32 shows the amount of money spent by institutions on goods and services produced by all sectors.

T33 represents the transactions that occur between activities/sectors as recorded in a country's input-output). The computable SAM multiplier represents the full impact on each endogenous item of the impact of an additional unit in its set of exogenous variables.

Output multipliers are one of the methods commonly used to analyse the role of a sector in the economy simple, making it applicable in various cases (Hartono and Resosudarmo 2008; Breisinger, 2010;Miller, 2009).

Despite its advantages, the use of the SAM model also has limitations that the interpretation of the research results must be done carefully due to the assumptions used in table. The SAM model assumes that prices are fixed and any change in demand will change physical output, not prices (Fathurrahman, 2017).

Defourny (1984) explained that the multiplier matrix is used to capture the impact of sectoral growth on production factors, institutions, and production sectors, so the multiplier matrix with its mathematical model is as follows:

$$y = Ay + x \Leftrightarrow y = (I - A)^{-1} x \Leftrightarrow y = M_a x$$

y is a vector of endogenous total income, so that $y = \begin{bmatrix} y1 \\ y2 \\ y3 \end{bmatrix}$ is

Resource factors (such as land, labour, capital) are assumed to be unlimited. In addition, the SAM model does not consider regional differences, such as geographical and demographic factors, as it uses the national SAM instead of the inter-regional SAM (Hartono, 2020).

The magnitude of the economic multiplication or change of the endogenous balance sheet consisting of factors of production (y_1), institutions (y_2), and the production sector (y_3),A= $\begin{bmatrix} 0 & 0 & A_{13} \\ A_{21} & A_{22} & 0 \\ 0 & A_{32} & A_{33} \end{bmatrix}$ is an (nxn) matrix of average expenditure trends, $x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$ is the exogenous balance sheet change or the size of the injection to be provided, and $Ma = (I - A)^{-1}$ known as the balance sheet multiplier matrix which shows the different levels in the endogenous account due to a unit shock in the exogenous account.

The balance sheet/multiplier matrix can capture the overall impact of variations in a particular sector, along with other sectors in the economy. In addition, this matrix is also used to illustrate the impact of changes in the exogenous account (ΔX) and exogenous account (ΔY).

Thus, it can be mathematically expressed as follows: (ΔY)= Ma (ΔX). This study uses the coefficients of the multiplier matrix to explain the impact of exogenous account changes (in this case increased output due to CSA practices) on sectoral income, labour income, value added and household income.

Modification of the M_a multiplier matrix is necessary to determine the impact of increased output from CSA implementation in rice, coffee, maize and sugarcane on value added. Firstly, the coefficients of the sectoral value-added matrix (Matrix V) are calculated. Matrix V is a diagonal matrix, whose members are the value-added coefficients. va_{ij} The coefficients are determined only for the production sectors. In the production sector, (va_{ij}) is the ratio of value added (per sector) and total sectoral output; then

$$V = va_{ij}$$

The element (va_{ij}) is equal to zero if $i = j$and va_{ij}, is equal to va_{ij}, if $i = j$. After the sectoral value-added matrix is created, the value-added multiplier matrix (VAM) is calculated as follows:

$$VAM = V\ M_a$$

Where VAM is the VAM matrix that shows the effect of exogenous account variation on value added; V is the sectoral value added matrix in equation, and M_a is the balance sheet multiplier matrix in equation.

Multiplier matrix Ma also needs to be adjusted to analyse the impact of increased output from CSA implementation in rice, coffee, maize and sugarcane on employment. First the coefficients of the sectoral labour matrix (Matrix L) are calculated. Matrix L is a diagonal matrix whose members are the labour coefficients (l_{ij}).

The coefficients are calculated only for the production sectors. In the production sector, (l_{ij}) is the ratio of labour (per sector) and total sectoral output; hence

$$L = l_{ij}$$

Elements l_{ij} is equal to zero if $i = j$ and l_{ij} is proportional to l_{ij} if $i = j$. After the construction of the sectoral labour matrix, the labour multiplier matrix (LM) is determined as follows:

$$LM = LM_a$$

Where LM is a matrix LM which shows the impact of variation in exogenous accounts on employment; L is the sectoral employment matrix, and M_a is the accounting multiplier matrix. Identifying the research scneario. The scenarios used derived from on study of literature covering from 2011 to 2024. Eight literaries have shown that the implementation of CSA practices in rice, coffee, maize and sugarcane, resulted increase in yield.

During the literature study, it was discovered that none of the studies concluded that CSA had a negative impact on yields. Two literatures were sourced from international research conducted in Uganda, Kenya and Brazil. This study aimed to compare the implementation of CSA methods on maize and sugarcane in different countries, assuming these CSA practices can be applied in Indonesia.

Carry out the 2018 SAM multiplier model with the CSA practice interventions specified in step one. The simulations were selected based on a literature review of CSA practices in the agricultural sector in Indonesia from 2011-2024.

Simulate the 2018 SAM multiplier model with the CSA practice interventions identified in the step one and their impact on (1) sectoral income, (2) labour income, (3) household income. (4) value added and (5) employment. Conduct simulation of the third step, assuming an implementation scale of 18% and a success rate of 80%.

The implementation scale of 18% is determined by considering the number of districts that are targeted as CSA practices as part of the government's 2019-2024 SIMURP programme, in relation to the total land data provided by BPS in 2024. According to the SIMURP Operations Manual (POM) document, the selected districts for this level of implementation are districts that have never implemented CSA. The districts that have not previously implemented CSA. This information has been confirmed by the Agency for Standardisation of Agricultural Instruments (BSIP) and the Agricultural Land Resource Instrument Standard Testing Centre (BSIP SDLP), Ministry of Agriculture of Indonesia.

Furthermore, a thorough literarture review has been conducted to identify which districts and provinces in Indonesia where CSA has been applied. The assumption of an 80% success rate acknowledges that not all CSA implementations can achieve 100% success. This assumption factors account of several aspects such as farmers' access to information about CSA, and the level of participation of farmers in implementing CSA practices.

RESULTS AND DISCUSSION

The scale of implementation is 18% and it is expected to have a success rate of 80%. The level of change varies between sectors as a result of varies multipliers in each sector. Based on the carried out shocks, it can be concluded that all sectors showed potential increases in sectoral income/output.

Implementing CSA practices in rice, coffee, maize and sugarcane has the capacity to increase income in the top of eight sectors. This demonstrates that the agricultural sector's income multiplier effect leads to a rice in the consumption of basic needs for farmers, including livestock, fisheries, processed food, beverages, real estate,health, and education.

The findings of this study align with the research conducted in India, which also identified changes in output rice and wheat CSA practices showed increase in output. However, there are slight differences between this study and the Indian study. In India, rice and wheat CSA practices also resulted to changes in ouput in sectors such as dairy, vegetables, wholesale trade, land transport, clothing, and business services (Ajatasatru, 2024).

In terms of total revenue across all sectors, rice CSA practices have the potential to increase sectoral revenue in Indonesia by an estimated range of IDR 12.72 Trillion to IDR 101.75 Trillion, assuming all other factors remain constant (ceteris paribus). Implementing CSA with SRI techniques has the potential to generate the highest sectoral income compared to other rice CSA practices, including Smart Rice practices and rice planting schedule arrangements.

This finding supports research conducted in various countries, which indicates that CSA-SRI practices necessitate a higher standard of diligence and careful management, they will eventually result in a significant increase in yields, that in turn increases the income of farmers (Takahashi, 2014,). SRI CSA has the potential to increase income across all sectors in Indonesia by up to IDR101,751 Trillion or an increase of 0.36%, based on the assumption of 18% implementation and 80% success rate.

Implementing CSA practices in coffee sector in Indonesia at a rate of 18% with a success rate of 80% has the potential to increase sectoral income in all sectors by approximately IDR 4.48 Trillion to IDR 15.88 Trillion , assuming all other factors remain constant (ceteris paribus).

CSA practices in coffee using fertilisation and pruning techniques have a more possibilities to enhance sectoral income compared to CSA techniques with agroforestry. One of the reasons is that under the effects of climate change, agroforestry CSA practices are considered to be not economically favorable. Additionally, the vulnerability to excessive rainfall may impede coffee flowering and the productivity of coffee requires a longer period (Wienhold, 2023). Fertilisation and pruning is the CSA practice that has the potential to increase sector income in all sectors in Indonesia by up to IDR 15.88 Trillion or around 0.06%.

The implementation of CSA in maize with an 18% adpotion rate and assuming 80% success rate offers the potential to generate an increase in income in all sectors in Indonesia of IDR 6.21 Trillion to IDR 25.63 Trillion, given that all other assumptions remain constant. Adopting CSA method with TJPS practices has the potential for generating higher sector income compared to CSA Aquacrop practices.

The simulation results indicate that CSA-TJPS practice has the potential to enhance sector income in all sectors in Indonesia by IDR 25.63 Trillion or a 0.09%. This confirms the findings of earlier studies that the integrated system approach of TJPS has a positive impact on agricultural and farming communities in East Nusa Tenggara by increasing maize production and livestock ownership (Matitaputty, 2021). It also offers confidence for the future sustainability of the agricultural system, provided that this system is well managed (FAO, 2024)

Sugarcane CSA techniques with 18% implementation rate and 80% success rate has potential to increase sector income across all sectors in Indonesia. This increase might vary from IDR 784.70 billion to IDR 2.35 trillion, assuming all other factors remain constant (ceteris paribus). CSA practice that prioritize crop diversification in sugarcane has the potential to generate higher sector income compared to those practice which prefer soil nutrient balance and water productivity. Implementing CSA practice that involve crop diversification has the potential to increase sector income in all sectors Indonesia by IDR 2.35 Trillion which is equivalent to 0.01%.

The three CSA practices in rice, which are assumed to have implementation rate of 18% and success rate of 80%, are illustrated in Table 7 to have the potential to provide a higher percentage increase in labour income for workers who have low education levels, specially those who have not completed primary school. It can be considered that the level of education has a positive impact on productivity in the agricultural sector; however, it is deemed insignificant.

Most workers in the rice agricultural industry in Indonesia are affiliated with farmers group that offer training and supervision to their members, allowing them to implement CSA even if their educational background is limited. This finding is consistent with prior study which has shown that the influence of education on agricultural productivity in agriculture remains relatively small (Farida, 2024).

When comparing labour with different levels of education, CSA practices in coffee have the potential to offer higher labour income for labour with secondary education, which refer to labour that has completed the primary school but not secondary school.

The perception of coffee farmers is influenced by their level of education, which in effect their mindset and ability to receive information, knowledge, innovations, and new technologies that rae useful for the progress of coffee plantations. Farmers with a elementary education levels tend to be less receptive or resistanto to accept new technologies (Fardinatri, 2024). Similar to the three CSA practices, the two CSA practices in maize, based on an 18% implementation rate and an 80% success rate, have the potential to generate higher percentage increase in labour income for labour with limited education.

Despite their lack education, maize farmers in Indonesia can nevertheless participate in maize CSA program. A study conducted by Matitaputty (2021), found that the government instructors often offer training and mentorship to farmers in their group, so maize farmers's low educational backgrounds do not discourage them from participating in the CSA.

The potential for a fairly even percentage increase in labour income is present in CSA practices for sugarcane. Despite the fact that the sugarcane farmers commonly have a preliminary to secondary level of education, their increase in labour income is potentially similar. The low adoption of CSA in sugarcane can be related to the unfamiliarity with CSA methods in the sugarcane, as well as the farmers's limited education, managerial abilities and limited access to information services (Putra, 2021).

The implementation of the three CSA practices in rice, coffee, maize and sugarcane has potentially generated more income for households in rural and urban areas, which are seen in quintiles 1 and 2, as compared to quintiles 3-5. Quintiles 1 and 2 represent the socioeconomic groups with the lowest level of income. These findings indicate that smallholder farmes with the lowest income potentially receive higher benefit from the adoption of CSA.

Implementation of CSA in rice with SRI technique, with implementation rate of 18% and 80% success rate, has the potential to generate highest household income compared to the other two rice CSA practices. Furthermore, CSA practices in sugarcane, particularly with a focus on maintaining soil nutrient balance has potential to result the lowest household income when compared to CSA sugarcane with crop diversification.

While household in quintiles 1 and 2, both in rural and urban areas, have the potential to earn higher incomes, the implementation of CSA practices in coffee, maize and sugarcane has resulted in fairly equal rises in income across all five households' categories. The results further indicate that CSA practices have potential to enhance the economic sustainability of household in both rural and urban areas. Additionally, CSA practices can contribute to the improvement of food security and smalholder farming system (Ma, 2024).

The implementation of CSA practices in Indonesia has the potential to promote employment. In the context of climate change, CSA practices can successfully address decreased job opportunities in the agricultural sector while simultaneously enhancing agricultural productivity. Consequently, this will attract to young farmers and encourage their participation in the sector (Asher, 2021).

Simulations that demonstrate the projected number of changes in employment in the top eight sectors. These simulations are based on shocks and assumptions of 18% implementation rate and an 80% success rate. Implementation of CSA SRI in rice, has potential to increase employment absorption in all industries sectors in Indonesia by 0.99% or 1,327 people, providing all other factors remain constant (*ceteris paribus).*

This absorption is the highest compared to other two CSA practices in rice. Prior study stated that the labour required for carrying out SRI practices involves duties such as seed planting, weeding, water management, harvesting, and threshing. Regarding other CSA practices in rice, such as CSA Smart Rice and CSA practice with planting schedule arrangements based on rainfall conditions and cropping pattern techniques, their impact on increasing the number of workers is not significant. This is due to the challenges related with the major labour cost (Perdinan, 2018).

The implementation of coffee CSA with fertilisation and pruning techniques has a potential to increase employment higher than other coffee CSA practice. The small impact on employment in the coffee sector is partly due to coffee farmers' ineffective perception of CSA practices (Fardinatri, 2024). Furthermore, when additional labour is needed, it is typically their own family members that carry out the tasks. CSA Maize with TJPS practice has the potential to encourage higher employment compared to CSA Maize with aquacrop.

On the other hand, CSA sugarcane with crop diversification practices has the least potential to encourage employment when compared to CSA practices with soil nutrient balance practices and water productivity. For sugarcane farmers, the main challenge is related to the availability of labour. This is due to implementing CSA practice requires a significant amount of labour input. However, smallholder sugarcane farmers often face difficulties in hiring labour, which is why they mostly rely on employing existing family members. (Putra, 2021).

CONCLUSION

Climate Smart Agriculture practices have the potential to generate consistently and positively impact the economy by increasing incomes in all sectors including labour income, rural and urban household income, value added and employment.

With regard to the selected scenarios, the rice CSA practice that has the potential to provide the greatest impact on the economy is the CSA practice with the Rice Intensification System (SRI) technique. Meanwhile, the coffee CSA practice with fertilization and pruning has the most potential to have greater impact.

Maize CSA practices with Integrated System of Maize Planting, Cattle Harvesting (TJPS) has the potential to cause higher economic impact than Aquacrop. Similarly, crop diversification practices potentially provide greater economic results compared to CSA practices with soil nutrient balance and water productivity practice techniques.

Sectors such as livestock, fisheries, processed food, beverages, real estate, health, education, retail and wholesale trade receive positive economic advantages. Assuming an implementation rate of 18% and success rate of 80%, the implementation of CSA in rice, coffee, maize and sugarcane has the potential to significantly enhance the labour income at low and medium levels of education.

The implementation of CSA has the greatest potential to benefit households in quintiles 1 and 2, both in rural and urban areas, in all scenarios. Based on an 18% implementation assumption and an 80% success rate, it is demonstrated that the implementation of CSA in rice with SRI practices has the highest potential to increase employment. On the other hand, the implementation of CSA in sugarcane with soil nutrient balance and water productivity practice techniques has the lowest potential for generating employment.

The Indonesian government should encourage further research on the success of CSA practices in regions where it has already been implemented as well as studies on the feasibility of implementing CSA in other areas that have not been explored. The study of feasible CSA practices in various agricultural sectors in Indonesia's diverse regions is required due to broadness of the country, the relatively diverse climate and topography, and the diverse cultures.

Further attempts should be made to educate farmers about the the costs and benefits of CSA practices in the agricultural sector. Additionally, funding sources should be provided in order to fulfill the high production cost associated with CSA implementation in early stages. It will be necessary to develop policies concerning credit/funding access from the government to avoid burdening farmers in the development of CSAs.

Future research is expected to explore the impact of CSA practices on carbon emissions, analyze the economic costs and benefits of CSA to assess its impact, and figure out if the most recent year of SAM data has been released.

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