Jurnal Perencanaan Pembangunan:
The Indonesian Journal of Development Planning
Volume VII No. 1 - April 2023/Page: 83 - 99
https://doi.org/10.36574/jpp.v7i1.369
Article

Sustainability Analysis of Primary Forest Areas in The Perspective of Income and Gross Domestic Regional Product Inequality (Vector Autoregressive Approach)

Faradina Zevaya[1], Muhamad Reski Ramadan[2], Putri Intan Suri[3], Rio[4], and Fajar Hadi Pratama[5]

Corresponding author. Email: zevayafaradina@unja.ac.id

Submitted: 2022-11-29 | Accepted: 2023-05-09 | Published: 30th April 2023

Abstract

Jambi Province is a province on Sumatra Island with a land area of 5,016,005 hectares, of which 2,098,535 ha are forest areas. With the potential of existing resources, Jambi province's economic growth in the last ten years has been on a positive trend, but for the period 2006 to 2018, experienced significant land degradation which causes the shrinkage of the province natural forest areas. This research aims to analyze the relationship that occurs between variables of primary forest areas, income inequality, and economic growth in Jambi Province by using the vector autoregression method followed by stationarity test, optimum lag test, cointegration test, var stability test, variance decomposition, and granger causality test. Based on the causality of the three research variables, the Granger causality test results indicate that there is a unidirectional causality between income inequality that occurs in Jambi Province and the percentage of primary forest area in Jambi Province that is still available. In addition, the results of the VAR analysis show that based on the t-statistic value, income inequality in period eight significantly affected the percentage of primary forest area in Jambi Province in the following year. Besides that, based on the coefficient, income inequality negatively affected primary forest areas the following year in period eight. The results of the Decomposition Variant test predicted that in period 1, the primary forest area variable affected 99.98% of the primary forest area variable. Income inequality had an effect of 0.02% on primary forest areas, and economic growth in period one did not affect primary forest areas. Predictions for the 10th period show that the primary forest area affects 52.62% of the primary forest area, while 29.81% and 17.56% of the primary forest area in the 10th period are affected by income inequality and economic growth. The analysis above shows

[1] Department of Economics, Faculty of Economics and Business Universitas Jambi,Indonesia. E-mail: zevayafaradina@unja.ac.id.

[2] Department of Economics, Faculty of Economics and Business Universitas Jambi,Indonesia. E-mail: ramareski17@gmail.com

[3] Department of Economics, Universitas Muhammadiyah Jambi,Indonesia. E-mail: putriintansuri20@gmail.com

[4] Department of Economics, Faculty of Economics and Business Universitas Jambi,Indonesia. E-mail: riohwang08@gmail.com

[5] Regional Development Planner.Ministry of National Development Planning (Bappenas), Indonesia. E-mail: fajar.pratama@bappenas.go.id

the critical role of primary forests in Jambi Province for the existing inequality and economic growth in Jambi Province. Deforestation and non-optimal primary forest management can have a negative impact on the value of income inequality in Jambi Province. Therefore, a policy framework on forestry in Jambi Province is needed that involves the development of plantation forests as an effort that could overcome the decrease in wood supply.

Keywords: primary forest; income inequality; vector autoregressive; economic growth; Jambi.

1. Introduction

1.1. Background of Problems

Economic growth is one of the primary goals to be achieved in a country's economy. Economic growth is a quantitative measure that describes the development of an economy in a given year compared to the previous year—unequal economic development results in inequality or gaps between regions. The disparity between relatively underdeveloped and relatively developed regions results from changes in the economic structure and industrialization process, where investment by the private sector and the government (infrastructure and institutions) tends to concentrate in developed regions.

A primary forest is a forest that humans have not used at all. This forest has stands that have reached an advanced age, specific structural characteristics that match their maturity, and unique ecological characteristics. Primary forests consist of high-diversity trees, dense undergrowth, and large litter surface. It makes primary forests function as the absorber and storage of carbon compared to secondary forests.

The primary forest has the characteristics of having long-lived trees, dead tree trunks that are still upright, and fallen trees that form gaps or gaps in stands, allowing sunlight to enter the forest floor and stimulating vegetation growth. Approximately 90% of the biomass in forests is from wood, branches, leaves, roots and litter, animals, and microorganisms (Aisyah Hutasuhut et al., 2022).

The development of the need for wood used for development purposes and unsustainable land use has an impact on increasing the loss of forest cover, a mainly primary forest in Jambi Province. As a source of economic development, forests are under threat of deforestation.

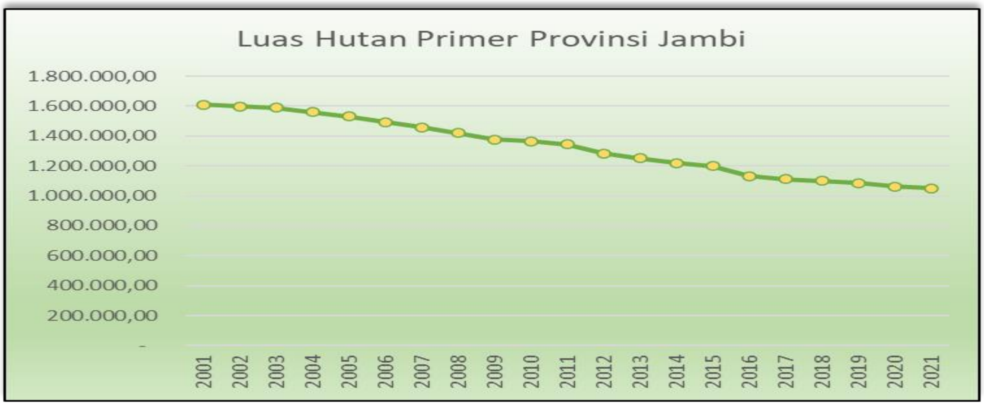

Figure 1. Primary Forest Area of Jambi Province

Source: Global Forest Watch (GFW), 2022.

Based on Figure 1. The area of primary forest in 2021 is 1,051,330 ha, which has decreased compared to the area in 2001 of 1,610,000 ha. The loss of primary forest area is caused by deforestation, degradation, and forest fires caused by a combination of climatic conditions and human activities. There have been many shifts of primary forests into secondary forests, plantations, and industrial tree plantations. Then, forest deforestation is economically inefficient, and ecologically, it reduces carbon sequestration capability and causes biodiversity loss. It is also increasing greenhouse gas emissions increases the intensity of the greenhouse effect.

The green economy is a model of economic development not based on excessive exploitation of natural resources and the environment. The green economy is a development paradigm based on resource efficiency, sustainable utilization, production patterns, and the internalization of environmental and social costs (internalization of the externalities) (Hidayah, 2011). Sustainable development builds on three pillars: economic, social, and environmental. Based on these pillars, it is hoped that it will have implications for an economy that continues to grow, provide employment, and reduce poverty without neglecting environmental protection, ecosystem functions, and biodiversity. (Hidayah, 2011).

1.2. The Problems

Jambi Province is a province on Sumatra Island with an area of 5,343,500 hectares with a land area of 5,016,005 hectares, of which 2,098,535 ha are forest areas (Central Bureau of Statistics of Jambi Province, 2021). With the potential of existing resources, Jambi province's economic growth in the last ten years has been at a positive trend, but it can be seen in Figure 2 that Jambi Province for the period 2006 to 2018 experienced significant land degradation with a change value of y = 41385x – 8E+ 07. Land degradation causes shrinkage of natural forest areas in Jambi Province with a depreciation value of y = -72480x + 1E+08.

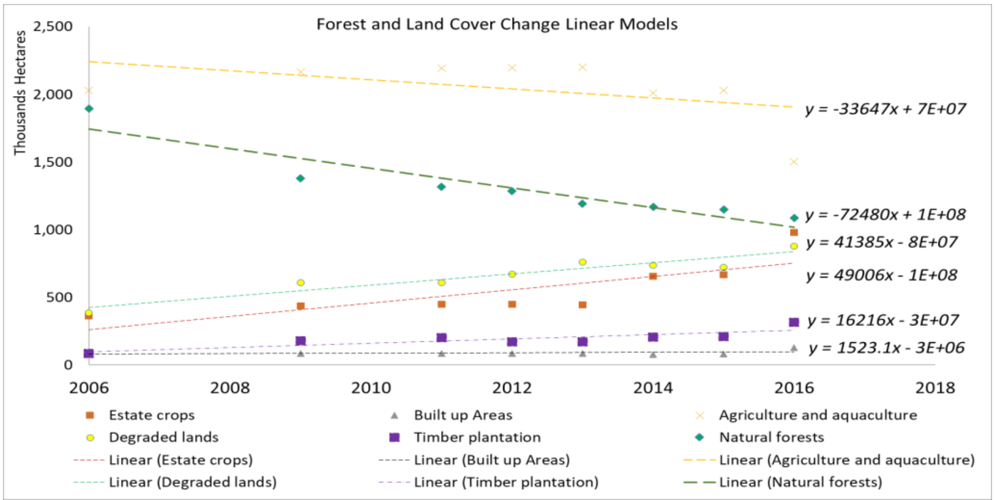

Figure 2. Changes in Forest Area and Land Cover in Jambi Province 2006-2018

Source: The BioCarbon Fund Initiative for Sustainable Forest Landscapes (ISFL), 2022.

1.3. Logical Framework

This research uses the Vector Autoregression method to examine the relationship between primary forest areas, economic growth, and income inequality in Jambi Province.

2. Method

Christopher Sims created Vector Autoregression (VAR) in 1980 to describe the relationship between the variables to be tested. Sims argues that there is a simultaneous relationship between the observed variables, so these variables need to be treated the same so that there are no more exogenous and endogenous variables (Sembiring, 2016). The explanatory variables in VAR include the lag values of all dependent variables in the VAR system, which require the identification of restrictions to achieve equality through forecasting interpretation. This research focuses on the relationship between three variables: primary forest area in Jambi Province, economic growth in Jambi Province, and income inequality in Jambi Province with a quarter from 2005 to 2021. Below is the VAR model used in this study:

$$\Delta HP = \alpha 0 + \sum_j^n \beta_{1j}\Delta HP_{t-j} + \sum_j^n \beta_{2j}\Delta PDRB_{t-j} + \sum_j^n \beta_{3j}\Delta GR_{t-j} + \gamma e_{t-j} + \varepsilon_t \quad (1)$$

$$\Delta PDRB = \alpha 0 + \sum_j^n \beta_{1j}\Delta PDRB_{t-j} + \sum_j^n \beta_{2j}\Delta HP_{t-j} + \sum_j^n \beta_{3j}\Delta GR_{t-j} + \gamma e_{t-j} + \varepsilon_t \quad (2)$$

$$\Delta GR = \alpha 0 + \sum_j^n \beta_{1j}\Delta GR_{t-j} + \sum_j^n \beta_{2j}\Delta PDRB_{t-j} + \sum_j^n \beta_{3j}\Delta HP_{t-j} + \gamma e_{t-j} + \varepsilon_t \quad (3)$$

Description:

ΔHP_t = Variable of primary forest area in Jambi Province

$\Delta PDRB_t$ = Variable of economic growth in Jambi Province

ΔGR_t = Variable of income inequality in Jambi Province

t = Time period, α dan β = Constant, ε = stochastic error term

One of the important requirements in time series analysis, such as vector autoregression (VAR), is that the research variable must be stationary or have no unit roots. Therefore, the first step in data processing is to perform a unit root test. In this case, the unit root test uses the ADF-Fisher test method. After that, the optimal lag is determined to determine how many optimal lags are best used in the constituent model. Determination of the lag was carried out using several information criteria, namely by looking at the results of the Likelihood Ratio (L.R.) and several information criteria, such as the Akaike Information Criterion (AIC), Schwarz Criterion (S.C.) and Hannan-Quinn Criterion (H.Q.). The selected lag is the lag that has the largest L.R. value and the minimum final prediction error (FPE) of AIC, SC, and H.Q.

The next step is to look at the long-term relationship of the model. The cointegration test that will be carried out will use the Johansen Cointegration Test method, followed by a stability test of the VAR model. the Granger causality test was carried out to see whether or not there is a complementary relationship (causality) between the factors of the essential woodland region, financial development, and wage imbalance in Jambi Province.

The Granger causality test compares the likelihood esteem of the F-statistic with an α (degree of freedom) of 5%. When the factual likelihood esteem is littler than the α value of 5%, there is a relationship and vice versa. The conclusions created within the Granger causality test incorporate a bidirectional relationship, unidirectional relationship, or no relationship. The Variance Decomposition test points to the degree how much the mistaken change of a variable is clarified by the stun that comes from the variable itself or other factors (Putri & Erita, 2019). The more prominent the extent of a variable in clarifying the blunder fluctuation, the more prominent the part of that variable for other factors within the system. In this consideration, it will see how enormous the part of the factors of the essential woodland zone, financial development, and salary disparity are.

3. Result

Table 1. shows the result of the ADF-Fisher stationarity test with individual root testing, showing the ADF-Fisher probability value is less than 0.05, meaning that the GDRP, GR, and H.P. variables are stationary in the order I (first differences). With the stationary condition, data analysis is continued by determining the optimum lag in the research model. Table 2 is the optimal lag test result for this research model. It can be seen that Lag 8 has a sequential modified L.R. test statistic, Final Prediction Error (FPE), and Akaike Information Criterion (AIC). It means that the optimal influence of variables on other variables occurs within the time horizon of 8 periods. It indicates that lag eight will use for the estimation process of the Vector Auto Regression (VAR) Model.

Table 1. ADF-Fisher stationarity test

Method	Statistic	Prob.**
ADF - Fisher Chi-square	24.3668	0.0004
ADF - Choi Z-stat	-3.59915	0.0002

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.
Intermediate ADF test results D(UNTITLED)

Series	Prob.	Lag	Max Lag	Obs
D(GR)	0.0079	0	10	66
D(HP)	0.0751	4	10	62
D(PDRB)	0.0087	0	10	66

Table 3 shows the results of the Johansen Cointegration Test results on G.R., GDRP, and H.P., showing trace statistics or max-eigen value statistics that are smaller than the critical value, so the data is not cointegrated. Trace statistic values at most 1 5.56 < 15.49 and at most two 0.89 < 3.84. The data does not contain cointegration or no long-term relationship between economic growth, primary forest area, and income inequality. After it confirms that the research model does not have a long-term relationship between variables, this research can continue with the VAR model, but before entering into VAR testing, it is necessary to test the stability of the VAR model.

Table 4 shows the results of the stability test of the VAR model in this study. The results of the values of Root and Modulus are less than 1 (<1), so the VAR model used is stable because the modulus value is less than 1. Moreover, it explains the model's condition, which is stable because the points are in a circle. Thus, the results of IRF (Impulse Response

Function) and VDC (Varian Decomposition) analysis are valid and can test further, namely Granger causality.

Table 2. Optimum Lag Length Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-277.4724	NA	2.701802	9.507540	9.613178	9.548777
1	-236.2800	76.79938	0.907798	8.416273	8.838823*	8.581219*
2	-235.1190	2.046562	1.187367	8.682001	9.421463	8.970657
3	-233.0651	3.411512	1.512465	8.917463	9.973838	9.329829
4	-213.4125	30.64478	1.066909	8.556357	9.929644	9.092432
5	-193.0041	29.74782	0.739150	8.169632	9.859832	8.829417
6	-190.2316	3.759368	0.940246	8.380732	10.38784	9.164228
7	-186.5317	4.640540	1.173595	8.560397	10.88442	9.467602
Lag	LogL	LR	FPE	AIC	SC	HQ
8	-154.0263	37.46383*	0.560441*	7.763604*	10.40454	8.794519

* indicates lag order selected by the criterion
L.R.: sequential modified L.R. test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
H.Q.: Hannan-Quinn information criterion

Table 3. Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.328049	28.62302	29.79707	0.0678
At most 1	0.077376	5.563982	15.49471	0.7463
At most 2	0.015280	0.893067	3.841466	0.3446

The trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Furthermore, after the VAR model in the study has met a stable condition, the VAR test can carry out. Table 5 is the result of the VAR test, which explains that if income inequality acts as an endogenous variable, then the results of the analysis show that based on the t-statistical value if income inequality in periods 1, 4, and 8 has a significant effect on income inequality in the following year. In addition, based on the coefficient, income inequality has a positive effect in period one and turns negative in periods 4 and 8 for the following year. In addition, the value of the t-statistic of G.R. in period eight significantly affects H.P. in the following year.

Table 4. VAR Model Stability Test

Root	Modulus
0.921793 - 0.364613i	0.991284
0.921793 + 0.364613i	0.991284
0.416688 - 0.870735i	0.965303
0.416688 + 0.870735i	0.965303
0.671507 - 0.691705i	0.964043
-0.874515 - 0.385406i	0.955675
-0.362298 - 0.884175i	0.955523
-0.362298 + 0.884175i	0.955523
-0.671331 - 0.661435i	0.942434
-0.671331 + 0.661435i	0.942434
0.896751 - 0.241030i	0.928578
0.896751 + 0.241030i	0.928578
0.839266 + 0.391394i	0.926043
0.839266 - 0.391394i	0.926043
0.470590 + 0.729554i	0.868161
0.470590 - 0.729554i	0.868161
Root	Modulus
-0.708587 - 0.420015i	0.823716
-0.708587 + 0.420015i	0.823716
-0.378925 + 0.723465i	0.816692
-0.378925 - 0.723465i	0.816692
-0.500812 - 0.565334i	0.755258
-0.500812 + 0.565334i	0.755258
No root lies outside the unit circle. VAR satisfies the stability condition.	

Besides that, based on the coefficient, G.R. negatively affects H.P. in period eight in the following year. It means that if G.R. increases by 1 unit, it will reduce the total forest area by -29.28. The coefficient of determination (R-Square) by placing G.R. in a certain period as a function of G.R., H.P., and GDRP in the previous year shows a figure of 0.78. It implies that G.R., H.P., and GDRP can clarify 78.14% of G.R. in a particular year within the past period.

Be that as it may, if the essential woodland range acts as an endogenous variable, at that point, the comes about of investigation appear that based on the t-statistical esteem, in case the essential woodland zone in periods 4 and 5 contains a considerable impact on wage imbalance within the following year. Other than that, based on the coefficient, the essential woodland zone features a positive impact in period one and turns negative in period five on the primary woodland range within the following year. Besides, the essential timberland zone in periods 1, 4, 5, and 8 considerably impacts the essential timberland region within the taking after year. Based on the coefficients, the essential woodland region contains a positive effect in periods 1 and 5 but negative within the fourth and eighth periods on the essential woodland region within the taking after year. The coefficient of assurance (R-Square) by putting H.P. in specific periods as a work of G.R., H.P., and GDRP within the past year appears as a figure of 0.84. It implies that G.R., H.P., and GDRP can clarify 84% of H.P. in a given year within the past period.

Table 5. Vector Autoregression Analysis Findings

Eq	D(GR)	D(HP)	D(PDRB)
D(GR(-1))	0.510304	-10.46292	3829.687
	(0.14650)	(7.02113)	(20436.1)
	[3.48320]	[-1.49020]	[0.18740]
D(GR(-2))	0.200982	-3.502636	1975.316
Eq	D(GR)	D(HP)	D(PDRB)
	(0.17372)	(8.32536)	(24232.3)
	[1.15694]	[-0.42072]	[0.08152]
D(GR(-3))	0.068126	-1.781019	3512.540
	(0.17546)	(8.40899)	(24475.7)
	[0.38826]	[-0.21180]	[0.14351]
D(GR(-4))	-0.440415	12.57383	856.3687
	(0.16570)	(7.94085)	(23113.1)
	[-2.65798]	[1.58344]	[0.03705]
D(GR(-5))	0.171681	-5.525671	2581.701
	(0.13656)	(6.54477)	(19049.6)
	[1.25714]	[-0.84429]	[0.13553]
D(GR(-6))	0.066910	-0.655220	1676.268
	(0.14097)	(6.75572)	(19663.6)
	[0.47465]	[-0.09699]	[0.08525]
D(GR(-7))	0.023614	2.905985	2091.257
	(0.13987)	(6.70340)	(19511.3)
	[0.16882]	[0.43351]	[0.10718]
D(GR(-8))	-0.488003	-29.27791	-12744.00

Eq	D(GR)	D(HP)	D(PDRB)
	(0.12457)	(5.96977)	(17376.0)
	[-3.91761]	**[-4.90436]**	[-0.73343]
D(HP(-1))	-0.004494	0.365617	-277.1240
	(0.00263)	(0.12624)	(367.446)
	[-1.70590]	**[2.89617]**	[-0.75419]
D(HP(-2))	-0.001842	0.134541	-112.2546
	(0.00304)	(0.14559)	(423.752)
	[-0.60634]	[0.92413]	[-0.26491]
D(HP(-3))	-0.000756	0.071158	-88.93889
	(0.00306)	(0.14648)	(426.351)
	[-0.24728]	[0.48579]	[-0.20860]
D(HP(-4))	0.010927	-0.764821	248.2294
	(0.00301)	(0.14410)	(419.427)
	[3.63392]	**[-5.30756]**	[0.59183]
D(HP(-5))	-0.006970	0.309614	-299.8125
	(0.00308)	(0.14737)	(428.952)
	[-2.26663]	**[2.10089]**	[-0.69894]
D(HP(-6))	-0.002766	0.117260	-130.2758
	(0.00347)	(0.16643)	(484.422)
	[-0.79651]	[0.70456]	[-0.26893]
D(HP(-7))	-0.000899	0.090093	-123.1593
	(0.00346)	(0.16561)	(482.046)
Eq	D(GR)	D(HP)	D(PDRB)
	[-0.26014]	[0.54399]	[-0.25549]
D(HP(-8))	0.001362	-0.410156	-91.26102
	(0.00311)	(0.14899)	(433.645)
	[0.43801]	**[-2.75300]**	[-0.21045]
D(PDRB(-1))	7.28E-07	-3.39E-05	0.564332
	(1.2E-06)	(5.9E-05)	(0.17179)
	[0.59073]	[-0.57470]	**[3.28506]**
D(PDRB(-2))	3.27E-07	-2.19E-05	0.196119
	(1.4E-06)	(6.8E-05)	(0.19819)
	[0.22991]	[-0.32110]	[0.98957]

Eq	D(GR)	D(HP)	D(PDRB)
D(PDRB(-3))	3.20E-07	-3.01E-05	0.053409
	(1.5E-06)	(7.1E-05)	(0.20543)
	[0.21750]	[-0.42602]	[0.25999]
D(PDRB(-4))	-2.37E-06	8.17E-05	-0.606547
	(1.7E-06)	(8.0E-05)	(0.23269)
	[-1.41847]	[1.02160]	**[-2.60665]**
D(PDRB(-5))	1.32E-06	-7.00E-05	0.244682
	(1.5E-06)	(7.0E-05)	(0.20236)
	[0.91295]	[-1.00755]	[1.20916]
D(PDRB(-6))	7.45E-07	-4.70E-05	0.068944
	(1.6E-06)	(7.4E-05)	(0.21638)
	[0.48048]	[-0.63276]	[0.31863]
D(PDRB(-7))	8.16E-07	-6.42E-05	0.020433
	(1.7E-06)	(8.2E-05)	(0.23874)
	[0.47679]	[-0.78267]	[0.08559]
D(PDRB(-8))	-2.82E-06	-2.01E-05	-0.413000
	(2.7E-06)	(0.00013)	(0.37059)
	[-1.06225]	[-0.15802]	[-1.11445]
C	-0.000723	-0.180381	862.2589
	(0.00315)	(0.15080)	(438.919)
	[-0.22965]	[-1.19618]	[1.96450]
R-squared	0.781409	0.843248	0.572837
Adj. R-squared	0.627109	0.732600	0.271311
Sum sq. resides	0.000559	1.284535	10882504
S.E. equation	0.004056	0.194372	565.7505
F-statistic	5.064229	7.620965	1.899791
Log-likelihood	257.4911	29.18327	-441.4087
Akaike AIC	-7.881054	-0.141806	15.81046
Schwarz SC	-7.000742	0.738507	16.69078
Eq	D(GR)	D(HP)	D(PDRB)
Mean dependent	-8.79E-05	-0.444809	1441.965

Eq	D(GR)	D(HP)	D(PDRB)
S.D. dependent	0.006642	0.375883	662.7563
Determinant resid covariance (of adj.)		0.194200	
Determinant resid covariance		0.037165	
Log-likelihood		-154.0263	
Akaike information criterion		7.763604	
Schwarz criterion		10.40454	
Number of coefficients		75	

The Variance Decomposition test can carry after the VAR model's stability test in the research. Table 6 describes the results of the Variance Decomposition of primary forest areas in Jambi Province. Namely, it predicts that in period 1, H.P. affects 99.98% of H.P. itself, while G.R. has an effect of 0.02% of H.P., and GDRP in period one does not affect H.P. Furthermore, predictions in the 10th period show that H.P. affects 52.62% of the H.P. itself, while 29.81% and 17.56% of H.P. in the 10th period are affected by G.R. and GDRP. For economic growth, the Variance Decomposition results are explained in table 7, which predicts that in period one, GDRP affects 97.65% of the GDRP itself, while GR affects 0.33% of GDRP, and primary forest areas in period 1 affect economic growth by 2.02%. Moreover, forecasts for the 10th period appear that financial development influences 88.68% of the GDRP itself, whereas G.R. impacts 5.53% and 5.79% of financial development within the 10th period, and H.P. Gini proportion investigation appears that the salary conveyance of the individuals (Boni & et al. 2021). The Gini record measures pay dispersion over a populace. Concurring to Italian analyst Corrado Gini in 1912, it regularly serves as a gage of financial disparity, measuring pay dispersion or, less commonly, riches dissemination among a populace alluding to the financial development. With its different items, the ranger service segment is the most interested in state income-to-back advancement (Tambunan, 2005). It upholds by the presence of governance arrangements to adjust the industrialization procedure, which are purported substitutes based on shared assets. This condition causes the yield of the ranger service segment to be broadly utilized as input by the division's other economies, causing a tall esteem of the forward linkages of the segment ranger service (Ulya, 2008). Contributing to rebuilding and excellent timberland administration will make occupations, contribute to a more feasible economy, and secure timberland biological systems (Global Forest Watch, 2020).

Next, for the income inequality variable, the variance decomposition is explained in table 8. It predicts that in period 1, GR affects 100% of G.R. itself. Furthermore, predictions for the 10th period show that income inequality affects 80.06% of the G.R. itself. In comparison, 5.14% and 14.8% of income inequality in the 10th period is affected by GDRP and H.P. Research conducted by Ewers (2006) said high levels of economic development probably do allow afforestation to proceed because those nations can compensate for lack of natural resources, in this case, forests, by investing in plantations. It then lays a foundation for further growth because plantations are an increasingly important component of economic growth for many nations. However, the switch prepared to show up to happen; impoverished countries may be depending intensely on the transformation of local timberlands to goad financial development, but they are still as well destitute to be in a position to supplant them, driving to a descending winding in natural quality and a progressing lessening within the probability of maintainable financial improvement. At that point, for pay disparity, firstly, for numerous altered areas, a clear relationship might be watched between the rate of canopy cover diminishment over the 11 years and the fundamental cause of deforestation. The woodland clearance related to large-scale logging concessions, manor ventures, or other development is generally agro-industrial. Generally, show temporarily highly concentrated change processes within brief periods as expressed by very high Gini coefficients. In contrast, forest losses related to uncoordinated logging activities or small-scale agricultural practices of individual farmers, often resulting in forest fragmentation, showed elongated change processes with a more gradual reduction of canopy cover over time, indicated by low Gini coefficients (Leinenkugel et al., 2015)

Table 6. Variance Decomposition of Primary Forest Area in Jambi Province

Variance Decomposition of D(HP):				
Period	S.E.	D(GR)	D(HP)	D(PDRB)
1	0.194372	0.021270	99.97873	0.000000
2	0.211224	4.067057	95.12699	0.805958
3	0.227971	8.890053	88.17891	2.931039
4	0.250491	14.06027	78.23903	7.700705
5	0.266928	12.98700	79.58455	7.428445
6	0.269708	12.73956	78.69385	8.566590
7	0.272685	12.77533	77.83402	9.390654
8	0.279713	15.09124	75.34591	9.562847
9	0.319772	26.44865	57.72619	15.82516
10	0.335546	29.81104	52.62516	17.56381

Table 7. Variance Decomposition of Economic Growth in Jambi Province

Variance Decomposition of D(PDRB):				
Period	S.E.	D(GR)	D(HP)	D(PDRB)
1	565.7505	0.330933	2.019718	97.64935
2	648.6757	0.512319	1.553446	97.93424
3	715.0872	0.960796	1.489898	97.54931
4	772.5158	1.990219	1.935066	96.07471
5	786.3194	3.258174	2.927651	93.81418
6	794.5241	4.469202	91.16565	4.365147
7	802.9233	5.453920	4.108184	90.43790
8	810.1961	5.882146	4.306051	89.81180
9	823.8904	5.729570	5.735969	88.53446
10	838.9546	5.530249	5.793247	88.67650

Table 8. Variance Decomposition of Income Inequality in Jambi Province

Variance Decomposition of D(GR):				
Period	S.E.	D(GR)	D(HP)	D(PDRB)
1	0.004056	100.0000	0.000000	0.000000
2	0.004648	96.16156	3.072887	0.765551
3	0.005256	91.12699	6.475873	2.397140
4	0.005917	84.98121	9.504869	5.513917
5	0.005954	84.22801	10.26133	5.510658
6	0.005974	84.05713	10.19505	5.747811
7	0.005981	83.84998	10.31173	5.838289
8	0.006032	83.09461	11.15884	5.746558
9	0.006436	79.60116	15.33038	5.068466
10	0.006553	80.06400	14.79759	5.138410

Furthermore, the granger causality test is explained in table 9, in which the results of the causality test produce a probability value of primary forest areas for income inequality of 0.027. This value is lower than the probability level (0.05), meaning that there is a causal relationship from H.P. to G.R. Furthermore because the probability value of G.R. to H.P. is greater than 0.05, there is no causal relationship from G.R. to H.P. The Granger causality test results indicate that there is unidirectional causality.

Table 9. Granger Causality Test Results

Pairwise Granger Causality Tests			
Null Hypothesis:	Obs	F-Statistic	Prob.
H.P. does not Granger Cause GR	60	2.46167	0.0272
GR does not Granger Cause HP		1.85495	0.0928
PDRB does not Granger Cause GR	60	0.50031	0.8492
GR does not Granger Cause PDRB		0.33718	0.9466
PDRB does not Granger Cause H.P.	60	1.45111	0.2036
HP does not Granger Cause PDRB		0.77523	0.6264

4. Conclusion and Recommendation

Based on the results of the analysis that has been done, it can be concluded from the three variables analyzed, namely primary forest area, economic growth, and income inequality. Based on the causality of the three research variables, the Granger causality test results indicate that there is a unidirectional causality between income inequality that occurs in Jambi Province and the percentage of primary forest area in Jambi Province that is still available. In addition, the results of the VAR analysis show that based on the t-statistic value, income inequality in period eight significantly affected the percentage of primary forest area in Jambi Province in the following year. Besides that, based on the coefficient, income inequality negatively affected primary forest areas the following year in period eight. It can interpret that if income inequality increases by 1 unit, it will reduce the number of primary forest areas in Jambi Province by -29.27791.

Furthermore, the results of the Decomposition Variant test predicted that in period 1, the primary forest area variable affected 99.98% of the primary forest area variable itself. In comparison, income inequality had an effect of 0.02% on primary forest areas, and economic growth in period one did not affect primary forest areas. Furthermore, predictions for the 10th period show that the primary forest area affects 52.62% of the primary forest area, while 29.81% and 17.56% of the primary forest area in the 10th period are affected by income inequality and economic growth.

The analysis above shows the critical role of primary forests in Jambi Province for the existing inequality and economic growth in Jambi Province. Deforestation and non-optimal primary forest management can have a negative impact on the value of income inequality in Jambi Province. Therefore, a policy framework on forestry in Jambi Province is needed that involves the development of plantation forests as an effort to overcome the decrease in wood supply. Natural forest for the industry. HTI development is encouraged to replace the role of natural forests as a provider of sustainable and sustainable raw materials for the timber industry. Forest management that applies a social forestry system can also overcome forestry problems by optimizing community plantation forests in Jambi Province. This optimization is an effort to overcome the problem of deforestation and the supply of raw materials for primary industries. Optimization of community ranch woodlands in the assembly of the crude fabric needs of the essential industry can carry through a program of planting fast-growing trees such as Saigon trees in social ranger service (HTR) so that with a shorter tree planting time it can increment the generation of crude materials for the essential industry.

In addition, it is crucial to strengthen the dissemination of information regarding the issuance of permits and the silvicultural use of community plantation forests (HTR) in collaboration with universities based on the tri-dharma of education or other organizations. industrial needs, and deforestation problems. Besides, optimizing community ranch woodlands to overcome deforestation issues that happen in the Jambi Area, one of which is by making a territorial ban concerning the utilization of community ranch woodlands through a silvicultural framework which examines limitations on generation zones on community manor timberlands at certain times and gives remuneration for confinements which conducted. The arrangement of the ban is anticipated to preserve woodland cover ranges in community ranch timberlands, and the arrangement of compensation is anticipated to help the operation and advancement of community manor timberlands for their commitment to keeping up deforestation rates and endeavors to decrease carbon outflows in Jambi Area.

References

Aisyah Hutasuhut, M., Mutia, H., & Amrul, Z. N. (2022). Kandungan Karbon Tersimpan Di Hutan Primer Dan Sekunder. *EKSAKTA: Jurnal Penelitian Dan Pembelajaran MIPA*, *7*(1), 133–139. https://doi.org/10.31604/eksakta.v7i1.133-139

Boni, Y., & et al. (2021). Gini Ratio Analysis in North Buton Regency. *International Research Journal of Management, I.T. & Social Sciences*, *8*(4).

Central Bureau of Statistics of Jambi Province. (2021). *Jambi Province in Figures 2021* (Vol. 2021, Issue December).

Ewers, R. M. (2006). Interaction effects between economic development and forest cover determine deforestation rates. *Global Environmental Change*, *16*(2), 161–169. https://doi.org/10.1016/J.GLOENVCHA.2005.12.001

Global Forest Watch. (2020). *Ten countries are losing primary rainforests*.

Hidayah, A. K. (2011). *Ekonomi Hijau (Green Economy) Model Alternatif Peningkatan Kesejahteraan Ekonomi Masyarakat*.

Leinenkugel, P., Wolters, M. L., Oppelt, N., & Kuenzer, C. (2015). Tree cover and forest cover dynamics in the Mekong Basin from 2001 to 2011. *Remote Sensing of Environment*, *158*, 376–392. https://doi.org/10.1016/J.RSE.2014.10.021

Putri, Y. E., & Erita, E. (2019). Analisis Pertumbuhan Ekonomi Dan Ketimpangan Pendapatan, Panel Data Enam Provinsi di Pulau Jawa. *Jurnal Inovasi Pendidikan Ekonomi*, *9*(1), 27. https://doi.org/10.24036/011041740

Sembiring, M. (2016). Analisis Vector Autoregresion (VAR) Terhadap Interrelationship Antara IPM Dan Pertumbuhan Ekonomi Di Sumatera Utara. *EKONOMIKAWAN: Jurnal Ilmu Ekonomi Dan Studi Pembangunan*, *16*(2), 114–123. https://doi.org/10.30596/ekonomikawan.v16i2.939

Tambunan, M. (2005). Forestry Industry Restructuring towards Forest IKM-Based in Indonesia. *Jurnal Kebijakan Ekonomi*, *1*(1).

Ulya, N. A. (2008). Analysis of Forestry Sector Linkages with other economics in Indonesia. *Jurnal Peneitian Sosial Dan Ekonomi Kehutanan*, *5*(1).