Journal of Integrated Agricultural Socio Economics and Entrepreneurial Research
Volume 3 Nomor 1, Oktober 2024. Halaman 01 - 13
p-ISSN 2963-5756 ; e-ISSN 2963-5748
Available : https://jurnal.unimus.ac.id/index.php/jiasee/index

Understanding The Role of Entrepreneurial Ecosystem on Productive Agricultural Entrepreneurship in Bogor Regency Through Structural Equation Modeling

Syhabuddin Al Tapsi[1*], Lukman Mohammad Baga[1], Feryanto[1]
[1] Agribusiness Department, IPB University, Bogor 16680
*corresponding author: altapsisyhabuddin@apps.ipb.ac.id

ABSTRACT

The engagement of entrepreneurs in the agricultural industry is essential to generate business growth and sustainability through Gross Regional Domestic Product (GRDP). However, the sector contributes less to the GRDP of Bogor Regency. The competence of agricultural entrepreneurs and entrepreneurial ecosystems causes this condition. Meanwhile, productive entrepreneurship can occur through interactions between business owners and their environment. So, this research aimed to analyze the entrepreneurial ecosystem's constructions and role in agricultural entrepreneurship productivity in Bogor Regency. The research used a quantitative approach and followed the Structural Equation Model (SEM) technique. The results of primary data obtained by interviewing 110 respondents using a Likert-scale questionnaire showed that this study strengthens the theory of entrepreneurial ecosystems that empirically contribute to entrepreneurial productivity geographically and in terms of industry specifications. Enhancing high-growth entrepreneurs, increasing income, and growing new businesses are related to entrepreneurial ecosystem' roles. Hence, reinforcing essential elements of ecosystems was concluded as the practical implications of the findings.

Keyword : Entrepreneurial Culture, Entrepreneurial Ecosystem, Market Access, Productive Agriculture

1. INTRODUCTION

Entrepreneurial economic contributions are calculated based on the added value of products integrated in aggregate into the Gross Domestic Product (GDP) (Doran et al., 2018; Peprah & Adekoya, 2020). This contribution is generated through productive entrepreneurial activities. Productive entrepreneurship refers to any productive activity that contributes directly or indirectly to the net output of the economy as well as the capacity to produce additional output, thereby increasing total welfare (Acs et al., 2017; Baumol, 1990).

Productive entrepreneurship is the output of the entrepreneurial ecosystem developed by Stam (2018). The entrepreneurial ecosystem approach has become a widely used reference in understanding the environment for productive entrepreneurship. However, the relationship between entrepreneurial ecosystem components and productive entrepreneurship needs to be clarified (Nicotra et al., 2018). Understanding these relationships is essential to ensure the most favorable conditions for developing productive entrepreneurship, which can drive regional economic growth.

Several studies have examined the relationship between entrepreneurial ecosystem components and productive entrepreneurship. Mason and Brown (2014) state that entrepreneurial ecosystems can be geographic or industry-specific. Previous research has tried to explain the relationship between the entrepreneurial ecosystem and productive entrepreneurship in specific industries such as fintech (Koroleva, 2022) and digital industry (Lubis et al., 2023).

Meanwhile, research on agricultural entrepreneurship still needs more attention (Dias et al., 2019; Wadichar et al., 2022). This is due to the characteristics of the agricultural sector, where the number of new farmers is generally limited, the complexity of agricultural market policies, family labor, and the combination of management and governance (Alsos et al., 2011). These challenges even happen in entrepreneurial ecosystem research for specific industrial sectors such as agriculture. In fact, for some developing countries, agriculture is an essential economic sector. So, studies regarding the development of the agricultural entrepreneurship ecosystem need to be built (Wadichar et al., 2022).

As a developing country, the Indonesian economy is still heavily supported by the agricultural sector. One of the regions that makes the largest contribution to Indonesia's GDP is West Java Province, which shows a high level of productive entrepreneurship. Kansheba and Wald's findings (2022) support this, stating that GDP positively correlates with productive entrepreneurship. Among the regions that contribute highly is Bogor

Regency, whose economic structure is supported primarily by the agricultural sector. This condition shows that the area is a center of significant economic activity and agricultural entrepreneurship.

However, the agricultural sector's contribution still needs to be higher than that of other sectors. This contribution happens because individual capabilities as agricultural entrepreneurs and the entrepreneurial ecosystem in the agricultural sector in Bogor Regency still need to be conducive (Anwarudin et al., 2020; Muharastri et al., 2015). Meanwhile, productive entrepreneurship can occur due to interactions between business owners and their environment (Lux et al., 2020). These interactions form an entrepreneurial ecosystem that supports business success.

Concurrently, there has yet to be a consensus regarding measuring this element of the entrepreneurial ecosystem. However, this continues to develop with official statistical measurements, expert views, and surveys (Koroleva, 2022). The measurement results are compiled into an entrepreneurial ecosystem element value, then composited into an entrepreneurial ecosystem index value. However, this index measurement has areas for improvement, such as more substantial effects based on high average values of measurement elements, interactive nature and non-linear relationships that need to be captured, and high variations in the resulting values (Stam, 2018). Therefore, a research measurement framework related to entrepreneurial ecosystems needs to develop an empirical analysis of the cause-and-effect relationship between entrepreneurial ecosystems built from their elements and the output of entrepreneurial ecosystems, namely productive entrepreneurship (Nicotra et al., 2018). Therefore, this research uses a Structural Equation Model (SEM) to calculate it.

Structural Equation Modeling (SEM) has emerged as the leading method for examining cause-and-effect relationships in models involving latent variables (Hair et al., 2014). This method is highly attractive to researchers because it allows the estimation of complex models with numerous constructs, indicator variables, and structural paths without requiring distributional assumptions on the data. Additionally, the researchers employed PLS-SEM to bridge the gap between explanatory and predictive modeling accuracy while also providing robust causal explanations (Sarstedt et al., 2017). The direction of causality flows from a construct to an indicator (reflective model) or from an indicator to a construct (formative model) (Hanafiah, 2020).

The productivity of the agricultural sector contributes to economic development through food production, industrial raw materials, exports, and job creation (Brownson et al., 2012). This sector is one of the vital economic sectors that run the economy in many developing countries. Therefore, based on the low state of agricultural entrepreneurial productivity and the consensus on measuring the entrepreneurial ecosystem, this research aims to analyze the entrepreneurial ecosystem's measurement and the entrepreneurial ecosystem's role in the productivity of agricultural entrepreneurship in Bogor Regency.

2. METHODS

Data Collection

This research was carried out from October to December 2023 in Bogor Regency. The data used in this research is cross-section data obtained from a survey of agricultural entrepreneurs using a 1-5 Likert scale questionnaire. The Likert scale shows a value from 1 to 5 with the parameters strongly disagree, disagree, neutral, agree, and strongly agree. Measuring entrepreneurial ecosystem elements using a survey of entrepreneurial ecosystem actors is adopted from previous research (see. Belitski et al., 2022; Khuong & Van, 2022; Lubis et al., 2023).

Data on characteristics of agricultural entrepreneurs include gender, education, business sector, business domicile, length of business, and number of workers. The laten variabel consists of entrepreneurial ecosystem latent and productive entrepreneurship latent variable. The entrepreneurial ecosystem latent variable as an exogenous variable consists of ten variables, namely Talent (TAL), Network (NET), Demand (DMD), Finance (FIN), Culture (CUL), Leadership (LED), Formal Institution (INS), Infrastructures (PHS), Intermediaries (IMS), New Knowledge (NEK). Meanwhile, the latent variable of productive entrepreneurship, which is an endogenous variable, stands alone as the entrepreneurial ecosystem's output in the Stam concept (2018). These latent variables are constructed by the latent variable indicators explained in Table 1.

Table 1. Indicator measurement of entrepreneurial ecosystem elements

Latent Variable Indicators	Score	Level	References
TAL001: It's easy to find workers to fill open positions.	3.20	moderat	(Khuong & Van, 2022)
NET001: Agricultural entrepreneurs work together to create added value to products through innovation	3.19	moderat	(Leendertse et al., 2022)
NET002: Agricultural entrepreneurs connected to each other in a community	3.23	moderat	(Lubis et al., 2023)
NET003: Agricultural Entrepreneurs and Investors are interconnected	2.79	moderat	(Lubis et al., 2023)
DMD001: Products produced are sold to companies (Business to Business)	3.36	high	(Khuong & Van, 2022)
DMD004: Products produced are sold to international markets (export)	2.12	low	(Khuong & Van, 2022)
FIN002: Information about funding programs available for agricultural businesses is easily accessible.	3.45	high	(Frimanslund, 2022)
FIN003: The amount of credit value received is in accordance with the amount of credit value proposed	3.21	moderat	(ANDE, 2013)
CUL003: Agricultural entrepreneurs carry out experiments/research to later be implemented in business	2.69	low	(Khuong & Van, 2022)
CUL004: Successful agricultural entrepreneurship is my motivation to become an entrepreneur in the agricultural sector	3.49	high	(Khuong & Van, 2022)
LED001: Was a project leader for innovation	2.40	low	(Leendertse et al., 2022)
LED 002: There is a leader who guides and directs collective action in the region.	2.65	low	(Lubis et al., 2023)
INS 001: Government regulations are designed to support business	3.29	high	(Khuong & Van, 2022)
INS003: Government performance is transparent and trustworthy (accountable)	3.08	moderat	(Leendertse et al., 2022)
PHS001: Transportation routes for product distribution are in very good condition	3.85	high	(Leendertse et al., 2022)
PHS002: The internet network can be accessed with very good quality	3.84	high	(Leendertse et al., 2022)
IMS002: Business incubators have played a role in business creation and development	2.87	moderat	(Khuong & Van, 2022)
IMS003: Agricultural business development services by professionals have been carried out	2.67	low	(Khuong & Van, 2022)
IMS004: Mentors/companions in the surrounding area have been active in helping business development	2.68	low	(Leendertse et al., 2022)
NEK001: Efforts made to set aside a budget to conduct experiments or research	2.47	low	(Leendertse et al., 2022)
PRE001: The business being run has grown by at least 20% per year in terms of turnover	3.18	moderat	(Stam, 2018)
PRE003: The number of business units being run increases	3.35	high	(Nicotra et al., 2018)
PRE004: Every year there is an increase in income	3.29	high	(Gancarczyk & Konopa, 2021)

Sampling Techniques

Sample selection was carried out using the cluster sampling method with the selected sub-districts, namely Cibinong, Ciseeng, and Pamijahan. The minimum sample size for Partial Least Squares (PLS) must be equivalent to ten times the most significant number of indicators measuring one construct or model path that forms the inner model (Hair et al., 2014). By the number of latent indicators and inner models that formed 11 model lines, the number of respondents used was 110 samples.

Then, each sub-district has composition number of respondent according to percentage of number entrepreneurs in its area. Number of samples are 48 people in Cibinong and 31 people in each area. The sample used in this research meets the criteria for a business running for at least 24 months.

Analysis Method

The SEM-PLS technique in this research proves the causal relationship between elements of the entrepreneurial ecosystem and its quality. SEM-PLS is widely used in business studies (Hair et al., 2014). The process involves model construction, measurement model evaluation (outer model), and structural model evaluation (inner model) (Hair et al., 2019). Data interpretation is based on the significance and effect of each variable.

Elements of the entrepreneurial ecosystem are modeled as first order to generate second-order of entrepreneurial ecosystem latent variable using a two-stage disjoint approach (see. Sarstedt et al., 2019). The first-order model is shown in Figure 1. According to that, this research provides hypothesis that all elements has significance in constructing entrepreneurial ecosystems.

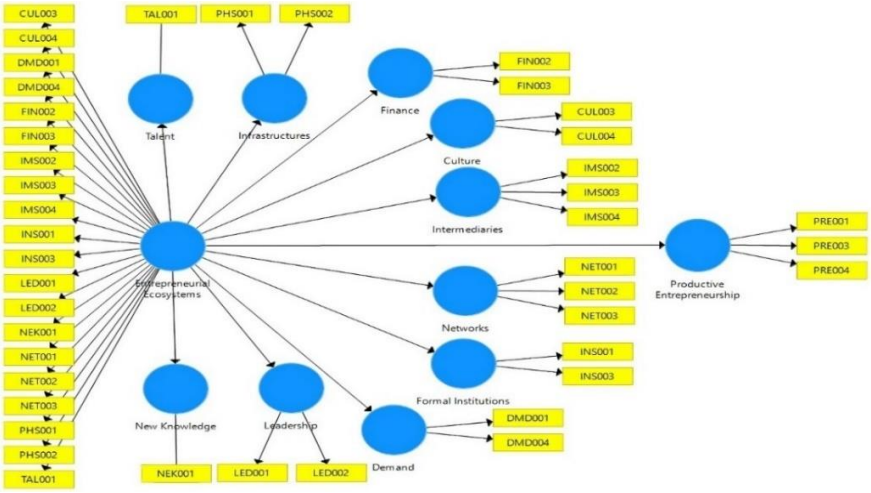

Figure1. Specification first order research model

Then, based on the latent score for each ecosystem element from the first-order model, the variable indicator value for the latent entrepreneurial ecosystem is used as a second order. However, latent variable indicators are still used for latent productive entrepreneurship even though the first order is known. So, the new model is tested based on a second order, with two stages disjoint, as shown in Figure 2. Base on that, the study provisions hypothesis that entrepreneurial ecosystem has significant and positive role to productive entrepreneurship.

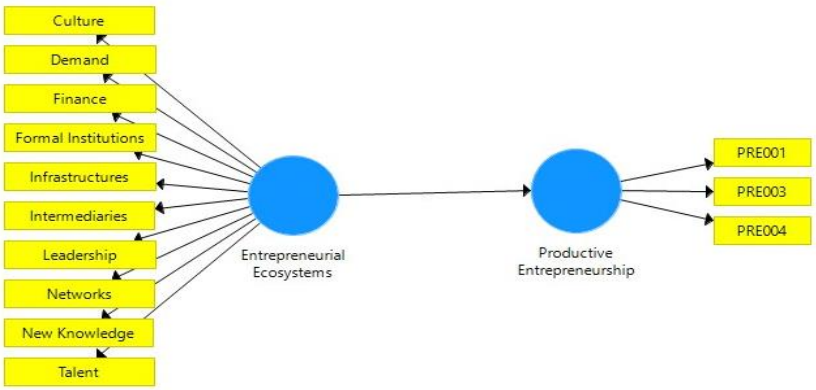

Figure 2. Specification second order research model

Assessment of reflective-reflective second order (high order) follows measurement internal consistency (composite reliability), convergent validity (Average Variance Extracted) and discriminant validity (Heterotrait-Monotrait) (Sarstedt et al., 2019). However, model validity measurement with loading factor is recommended by Hair et al. (2019) more than 0.7 because latent variable explains more than 50 percent of the indicator variance (Hair et al., 2019). Moreover, for Composite Reliability, a value between 0.60 and 0.70 is acceptable in exploratory research, the Average Variance Extracted (AVE) should be at least 0.50, and for discriminant validity, the Heterotrait-Monotrait (HTMT) ratio should be less than 0.85.

Evaluation results of measurement high order models that meet standard thresholds must be considered with the coefficient of determination (R Square), blindfolding-based cross-validation, redundancy measure (Q Square), effect size (f Square), and statistical significance and relevance of the path coefficient (Sarstedt et al., 2019). After testing the reliability of the explanation and predictive ability of the model, the statistical significance and relevance of the path coefficient were tested. The test results were obtained by running bootstrapping according to the default configuration used by the SEM-PLS application. Interpret these results by interpreting and evaluating the significance of the path coefficient, which is interpreted in line with the weight of the latent indicators.

3. RESULTS AND DISCUSSION

Characteristics of Agricultural Entrepreneurs

This study drew responses from several respondents who were surveyed to collect data and gain insight into the perspective of the entrepreneurship ecosystem in the agricultural industry. Agricultural entrepreneurs who became respondents were generally male, reaching 90%, while women were only 10% (Table 2). Agricultural entrepreneurs are dominated by the productive age, which is more than 60%. However, the elementary and intermediate schools still dominate the formal education level. Around 36% of respondents graduated from primary school, while 48% graduated from intermediate school.

Meanwhile, merely 15% of respondents have a high level of education. Nevertheless, the average business experience of agricultural entrepreneurs has been running their businesses for around 5-10 years. This experience is equivalent to the time to achieve higher education. Comparatively, agricultural entrepreneurs in Bogor Regency are still competent in understanding the agricultural sector.

Table 2. Characteristics of Agricultural Entrepreneurs

Characteristic	Description	Frequency (People)	Percentage (%)
Gender	Male	99	90.00
	Female	11	10.00
Level Education	Elementary	40	36.36
	Intermediate	53	48.18
	Higher	2	15.46
Age (years)	16 - 30	18	16.36
	31 - 45	43	39.09
	46 - 60	34	30.91
	>60	15	13.64
Size of Firms (Number of Employees)	Micro (1-4)	96	87.27
	Small (5-19)	12	10.91
	Medium (20-99)	1	0.91
	Large (>100)	1	0.91
Age of Firms	1-4 years	28	25.45
	5 -10 years	31	28.18
	>10 years	51	46.36

Meanwhile, the business sectors in the three sub-districts have differences. Horticultural businesses dominate the Cibinong area, while the fisheries sub-sector is the concentration of the Ciseeng area, and the livestock sub-sector is the centre in Pamijahan (Table 3). However, in general, the Bogor Regency area, based on respondents, described the types of businesses that are mainly carried out, namely fisheries, livestock and horticulture businesses.

Table 3 Business Typically of Agricultural Entrepreneurs

Industrial Sectors	Ciseeng (%)	Pamijahan (%)	Cibinong (%)	Total (%)
Crops	3.23	19.35	10.42	10.91
Fisheries	77.42	16.13	16.67	33.64
Livestock	12.90	41.94	20.83	24.55
Horticultures	6.45	22.58	52.08	30.91
Total	100	100	100	100

Model Evaluation

Model evaluation in SEM-PLS is carried out by testing its validity and reliability in the measurement model (outer model). Validity refers to the accuracy of the variable indicators used to measure a latent variable. In contrast, reliability refers to the consistency of measurement results using the indicators and variables used if repeated. Considering that the model used in this research was built based on latent reflective variables, the model's reliability was measured using Loading Factor (LF) and Composite Reliability (CR). The results of the evaluation are presented in Table 4.

Table 4. Model validity and reliability test results

Latent Variables	LF	CR	AVE	Annotation
	First Order			
Culture		0.77	0.63	Valid and Reliable
CUL003 – Research Culture	0.91			Valid
CUL004 – Successful entrepreneurial role model	0.66			Valid
Demand		0.80	0.66	Valid and Reliable
DMD001 – Domestic market: B to B	0.77			Valid
DMD004 – International Market	0.86			Valid
Finance		0.76	0.61	Valid and Reliable
FIN002 – Ease of access to loans	0.77			Valid
FIN003 – Approved credit application	0.80			Valid
Intermediaries		0.78	0.55	Valid and Reliable
IMS002 – Business incubator	0.60			Valid
IMS003 – Professional service	0.82			Valid
IMS004 – Mentor/companion	0.79			Valid
Formal Institutions		0.78	0.65	Valid and Reliable
INS001 – Business friendly policy	0.67			Valid
INS003 – Quality of Government	0.92			Valid
Leadership		0.79	0.65	Valid and Reliable
LED001 – Project Leadership	0.86			Valid
LED002 – Ecosystem leadership	0.75			Valid
New Knowledge		1.00	1.00	Valid and Reliable
NEK001 – Research investment	1.00			Valid
Networks		0.79	0.57	Valid and Reliable
NET001 – Innovation collaboration engagement	0.83			Valid
NET002 – Business partner network	0.84			Valid
NET003 – Connection to investors	0.55			Valid
Infrastructures		0.72	0.57	Valid and Reliable
PHS001 – Road access/transportation	0.93			Valid
PHS002 – Internet Access	0.53			Valid
Talent		1.00	1.00	Valid and Reliable
TAL001 – availability of freelance workers	1.00			Valid
	Second Order			
Entrepreneurial Ecosystems		0.83	0.35	Valid and Reliable
Culture	0.72			Valid
Demand	0.77			Valid
Finance	0.42			Valid
Formal Institutions	0.37			Invalid
Infrastructures	0.43			Valid
Intermediaries	0.75			Valid
Leadership	0.74			Valid
Networks	0.70			Valid
New Knowledge	0.48			Valid
Talent	0.30			Invalid
Productive Entrepreneurship		0.80	0.57	Valid and Reliable
PRE001 – High growth entrepreneurship	0.83			Valid
PRE003 – Addition of Business Units	0.63			Valid
PRE004 – Increase in revenue	0.79			Valid

Model assessment must confirm the model's reliability and obtain the loading factor value in the range > 0.4 (Table 4). This follows Cheung et al. (2023), the standard loading factor is more significant than 0.4 or 0.5 with a concentration of path significance even though the explanatory consequences of the factor are less than 50%. However, loading factor values lower than 0.7 are often found in measurement models in social science studies, especially in developing new scales (Hulland, 1999).

The loading factor values for NET003 and PHS002 are below 0.6, but the others latent variable indicators of entrepreneurial ecosystem elements above this value. However, this is different from the latent variable of the entrepreneurial ecosystem, which was formed with a second-order two-stage disjoint; there is a loading factor value that is less than 0.4 but is still maintained like the formal institutions and talent. This is maintained on the grounds of the entrepreneurial ecosystem theory, which is constructed from these elements. Several

studies maintain variables below the threshold value, especially latent ones formed from multidimensional or second-order cases, with strong theoretical reasons for constructing these variables (Hulland, 1999).

The results of this Composite Reliability (CR) measurement show that the specified threshold value is fulfilled, all over value above 0.7. Meanwhile, the AVE value of latent variable indicator of the entrepreneurial ecosystem, is close to the lower limit of the provisions because indicators are still included even though the loading factor value is low. However, this latent validity with discriminant validity measurements still meets the criteria, where the Heterotrait-Monotrait (HTMT) ratio is below 0.85 (Table 5).

Table 5. Heterotrait-Monotrait Ratio (HTMT)

Latent Variables	*Entrepreneurial Ecosystems*	*Productive Entrepreneurship*
Productive Entrepreneurship	0.50	-

Based on all validity and reliability tests, the built model is good. So that the conclusions drawn from the analysis carried out on the model can be meaningful and valid. However, concluding requires testing the significance of the inner model or evaluating the structural model. Meanwhile, based on the evaluation results, the R Square value resulting from the research model is 0.15 (Table 6), which shows that the role of the entrepreneurial ecosystem on productive entrepreneurship can be explained by 15%. So, this research model falls into the weak category.

Table 6. Indicators and evaluation values of structural models

Latent Variables	R Square	f Square	Q Square
Culture	0.50	0.99	-
Demand	0.61	1.57	-
Finance	0.26	0.36	-
Formal Institutions	0.12	0.14	-
Infrastructures	0.18	0.22	-
Intermediaries	0.55	1.21	-
Leadership	0.55	1.21	-
Networks	0.53	1.13	-
New Knowledge	0.17	0.21	-
Talent	0.08	0.09	-
Productive Entrepreneurship	0.15	0.17	0.05

However, this value follows Raithel et al. (2012) acceptable and satisfactory results, as R Square values as low as 0.10 are considered satisfactory in some disciplines. Apart from that, R Square is a function of the number of latent predictors, so the greater the number of latent predictors, the higher the R Square value (Hair et al., 2019). Therefore, the R Square of productive entrepreneurship is lower, caused by only the entrepreneurial ecosystem being the latent predictor.

The entrepreneurial ecosystem and productive entrepreneurship reciprocally influence each other based on the concept of Leendertse et al. (2022), whose influence cannot be measured in this study. In addition, the mediating influence of entrepreneurial behavior (Kansheba & Wald, 2022) and innovation (Kansheba, 2020) fully mediates the influence of the entrepreneurial ecosystem on productive entrepreneurship.

Another evaluation is the Q Square value, which measures the model's ability to predict unobserved data outside the sample, which is essential for the accuracy of the predictive model. So, this model has little ability to predict results. Meanwhile, based on the f Square value, the ecosystem elements with the most significant effect size are culture, demand, intermediaries, leadership, and networks. Meanwhile, the effect size of productive entrepreneurship is at a medium level (0.17).

Constructing agricultural entrepreneurship ecosystem

Further model significance testing exploration was carried out through bootstrapping. Based on the results of the significance testing of the model, it can be seen that the elements of the agricultural entrepreneurial

ecosystem in Bogor Regency as a whole reflect the entrepreneurial ecosystem by showing accurate significant results at the 5% level (Table 7).

Table 7. Results of the path significance test for entrepreneurial ecosystem elements

Path	*Loading Factor*	*Standard Deviation*	*T Statistics*	*P Values*	Decision
Culture <- Entrepreneurial Ecosystems	0.72	0.08	8.75	0.00	Accepted
Demand <- Entrepreneurial Ecosystems	0.77	0.09	8,10	0.00	Accepted
Finance <- Entrepreneurial Ecosystems	0.42	0.13	3.38	0.00	Accepted
Formal Institutions <- Entrepreneurial Ecosystems	0.37	0.12	3.20	0.00	Accepted
Infrastructures <- Entrepreneurial Ecosystems	0.43	0.17	2.57	0.01	Accepted
Intermediaries <- Entrepreneurial Ecosystems	0.75	0.06	12.64	0.00	Accepted
Leadership <- Entrepreneurial Ecosystems	0.74	0.08	9.76	0.00	Accepted
Networks <- Entrepreneurial Ecosystems	0.70	0.09	7.83	0.00	Accepted
New Knowledge <- Entrepreneurial Ecosystems	0.48	0.16	2.98	0.00	Accepted
Talent <- Entrepreneurial Ecosystems	0.30	0.15	2.02	0.04	Accepted

Note: significance at 5% level

Even though the elements of the entrepreneurial ecosystem are significant overall, concluding requires paying attention to the loading factor value. Remember that formal institutions and talent elements are still included in the analysis even though the loading factor value is below the threshold. These two elements are statistically significant, but their influence is less than 50%, so there is concern that bias may occur.

This happens to the talent element because even though there is ample labor in Bogor Regency, the agricultural sector has yet to become an option for livelihood. Bogor Regency is one of the regions in West Java with a high Open Unemployment Rate with 10% average each year. In addition to the description of livelihoods in the study location, only a few work as farmers or farm laborers. Apart from that, the level of education is still dominated by the middle level, while higher education still needs to be improved.

Meanwhile, the formal institutions are still considered moderate in terms of accountability for their performance by agricultural entrepreneurs. Even though the policies that have been made support ease of doing business. The role of formal institutions is considered close to information related to agricultural entrepreneurship development in Bogor Regency. Therefore, the results of this study are still in line with the findings of Anwarudin et al. (2020), who state that the role of formal institutions still needs to be improved in encouraging agricultural entrepreneurship.

Apart from that, there are elements of the entrepreneurial ecosystem that, although they meet the criteria, have loading factor values close to the threshold, namely finance, infrastructures, and new knowledge. These three elements are in the value range of 0.4-0.7. So, these elements still have a role that is lacking. This is because agricultural entrepreneurs still consider that there are limitations to financial access with guarantees and adjustments to the agreed value of their proposals. However, information related to financial access for agricultural entrepreneurs is easily obtained.

The quality of transportation access and internet networks is included in the excellent category, but more is needed to strengthen the formation of an entrepreneurial ecosystem. The business scale, dominated by the micro-scale, allows low utilization of transportation access for distribution because it relies on courier or collector services. Meanwhile, the availability of internet access has yet to be fully optimized for business development, whether increasing capacity or expanding market access. Therefore, agricultural entrepreneurs in Bogor Regency also rely more on increasing knowledge by exchanging knowledge with other entrepreneurs or simply managing the knowledge they already know in their business practices. On the other hand, investment in research still needs to be improved.

Elements with high loading factor values are culture, demand, leadership, intermediaries, and networks. These elements have a value greater than 0.7, so their role can be categorized as high. This shows that entrepreneurs in the agricultural sector are motivated by successful agricultural entrepreneurship and a good innovation research culture. Thus, the culture of entrepreneurship in the agricultural sector is embedded in society and driven by these two things. Apart from that, this is also supported by the purchasing power of the

people who continue to need agricultural products. Market expansion to large companies in business-to-business and export schemes encourages production continuity.

This is also inseparable from the role of a supportive environment and innovative leadership, which strengthens entrepreneurs. This includes the role of intermediary institutions such as business incubators, mentors, and professionals who support the growth and development of agricultural entrepreneurship. Thus, the network between agricultural entrepreneurs and network partners is well formed.

This differs from the Fintech entrepreneurial ecosystem studied by Koroleva (2022); infrastructure contributes highly to the demand, talent, and intermediaries elements, while new knowledge contributes lowly. However, the results of measuring entrepreneurial ecosystem elements by Leendertse et al. (2022) showed that all elements were confirmed to have a significant correlation with the entrepreneurial ecosystem. This strengthens the theory that each entrepreneurial ecosystem will have a different number and type of dimensions, even though the starting point used is a homogeneous set of elements for consideration (Wurth et al., 2022). This shows that industry and geographic specifications will form a unique entrepreneurial ecosystem.

This situation illustrates that elements of the entrepreneurial ecosystem have contributed optimally to forming a quality entrepreneurial ecosystem. The number of significant ecosystem elements with a high loading factor value of 50% is quite in line with Adharina's findings (2021), which classify the typology of Bogor Regency's entrepreneurial and innovation ecosystem into sufficient categories.

In the expanding analysis of the bootstrapping results, the latent score of the entrepreneurial ecosystem was tabulated to analyze the differences in the agricultural entrepreneurial ecosystem score in Bogor Regency. The entrepreneurial ecosystem latent score for Cibinong is -0.06, Ciseeng is -0.17, and Pamijahan is 0.26, presented in Table 8. This score shows that the entrepreneurial ecosystem elements forming the latent score oscillate symmetrically around zero, with negative values for areas below the average and positive values for areas above the average. This is similar to the results of ecosystem index calculations by Stam (2018) using natural logarithms. Meanwhile, using SEM PLS, latent values are calculated based on linear logarithms.

Table 8. Latent score of the entrepreneurial ecosystem in the sample test area

Subdistrict	Latent score	Distance to Regency Capital (km)	Standard Deviation
Cibinong	-0.06	0	0.80
Ciseeng	-0.17	20	0.90
Pamijahan	0.26	44	1.29

These results show that the highest score was in Pamijahan sub-district, further from the district capital. This differs from the typical high entrepreneurial ecosystem, which is generally located in urban or developed areas (see. Koroleva, 2022; Leendertse et al., 2022). These conditions are in accordance with the type of agriculture that characterizes rural areas. However, Cibinong Sub-district is also rated higher in value as it is a city area compared to Ciseeng, a Minapolitan area. However, more is needed to generalize the quality of the entrepreneurial ecosystem in Bogor Regency, considering that many sub-districts in Bogor Regency have not been included in this study.

Apart from that, this answered the objective and hypothesis of analyzing the entrepreneurial ecosystem's measurement that structural equation model generated entrepreneurial ecosystem index similar with logarithmic approach by Stam (2018). This approach also found some elements considered vital to construct agricultural entrepreneurial ecosystem in Bogor Regency according to low coefficient value.

Analysis of the Role of the Entrepreneurial Ecosystem on Productive Agricultural Entrepreneurship

Based on bootstrapping results, this research has confirmed that the role of the entrepreneurial ecosystem on agricultural entrepreneurial productivity is statistically significant at the 5% level (Table 9). The productivity of agricultural entrepreneurship in Bogor Regency is caused by the entrepreneurial ecosystem, with a coefficient value of 0.38. Positive and significant values indicate that the entrepreneurial ecosystem has a positive and decisive role in the productivity of agricultural entrepreneurs in Bogor Regency. The productivity of agricultural

entrepreneurs in Bogor Regency will increase by 0.38 units by strengthening the entrepreneurial ecosystem by one unit.

Table 9. Path significance test results for productive entrepreneurship

Path	Coefficient	Standard Deviation	*T Statistics*	*P Values*	Decision
Entrepreneurial Ecosystems -> Productive Entrepreneurship	0.38	0.06	6.49	0.00	Accepted

Note: significance at the 5% level

These findings have strengthened the concept of an entrepreneurial ecosystem about its output, namely productive entrepreneurship. Apart from the research results strengthening the concept of the role of ecosystems on entrepreneurial productivity, this study has also filled research gaps in the agricultural sector at the city level. The results of this research are in line with the results of previous studies conducted by Kansheba & Wald (2022), Koroleva (2022), Leendertse et al. (2022), and Zhang & Roelfsema (2020), which also shows that the entrepreneurial ecosystem played a positive role in productive entrepreneurship.

Another analysis based on latent variable indicators in the context of this research, productive entrepreneurship has a strong relationship with high growth entrepreneurship and increased income because both have coefficients greater than 0.7 but have a moderate relationship with the addition of business units, which have a coefficient of 0.6 (Table 10). Significant results also support this. The reflective model assumes that causality flows from the latent to the indicators, hence a latent will change if the indicators also change (Hanafiah, 2020). So indirectly, the entrepreneurial ecosystem will play a role in stimulating the growth of new businesses, increasing business income and high business growth through its influence on entrepreneurial productivity.

Table 10. Indicators of productive agricultural entrepreneurship

Path	Coefficient	*Std. Dev.*	*T Stat.*	P Values	Decision
PRE001 - High growth entrepreneurship <- Productive Entrepreneurship	0.83	0.11	7.73	0.00	Accepted
PRE003 – Addition of business units <- Productive Entrepreneurship	0.63	0.17	3.83	0.00	Accepted
PRE004 – Increased income <- Productive Entrepreneurship	0.79	0.12	6.61	0.00	Accepted

Note: significance at the 5% level

The role of the entrepreneurial ecosystem in the growth of new businesses is to create a conducive environment and connectivity of ecosystem elements so that resources, information, knowledge, and others can be accessed together for collective interests. This allows entrepreneurs to develop their ideas better and turn them into successful businesses (Mason & Brown, 2014). This role occurs not only at the initial stage of an entrepreneur starting a business, but at the developing stage, the entrepreneurial ecosystem also plays a role in entrepreneurial activities (Kansheba & Wald, 2022).

The growth of agricultural entrepreneurship in Bogor Regency in the last three years has increased according to data investment institution from 2021 to 2023, on average, by more than 100%. This proves that moderate entrepreneurial ecosystem conditions are still good enough to stimulate the growth of new businesses in the agricultural sector so that the desire to start a new business in the agricultural sector can be realized.

Another role of the entrepreneurial ecosystem is to increase income. This is an implication of growth and the addition of new business units. So, the opportunity to earn income is higher than that of stagnant development. Demand element is essential for forming new productive businesses and accelerating the growth of new businesses (Zhang & Roelfsema, 2020). Apart from that, demand for agricultural products is also driven by primary industry types so that they become the main raw material for secondary and other industries.

The entrepreneurial ecosystem facilitates access to markets through a network of business partners, both local and global. Market forces will distribute resource allocation, income, and benefits from the entrepreneurial

ecosystem (Colombo et al., 2017). So, increasing business income is played out by the entrepreneurial ecosystem by providing entrepreneurs with access to resources, encouraging innovation and collaboration, creating a supportive regulatory environment, and facilitating market access.

Results of other research that has been carried out show that the only significant role occurs in encouraging gazelle growth, although the entrepreneurial ecosystem plays a positive role in high-growth entrepreneurs and ambitious entrepreneurs (Stam, 2018). Gazelle can refer to high-growth companies, but the growth speed of gazelle is faster or even more dramatic than high-growth companies (Acs et al., 2019). A high-growth company is a company that shows an unusually fast growth rate in revenue, number of employees, or market value over a specific period.

Based on the number of employees and turnover, agricultural entrepreneurship in Bogor Regency showed the highest growth on a small business scale. This indicates that small scale businesses' growth rate is higher than others. Even though, in terms of numbers, it is still dominated by small scale, this growth shows a movement of agricultural business actors in Bogor Regency to upgrade (scaling up). Entrepreneurial ecosystems facilitate collaboration and connections between various parties. Entrepreneurs can easily find partners, investors, and other business opportunities through a strong network in the ecosystem. So that utilizing this can increase the scale of the business.

This research has directly proven the positive role of the entrepreneurial ecosystem on entrepreneurial productivity. The roles are growing new entrepreneuers, increasing provit and progressing growth to high scale of business. Furtheremore, the causality between entrepreneurial ecosystem and agricultural entrepreneurship productivity is mutually reinforcing. Improving the vital elements will stimulate high performance of the entrepreneurial ecosystem's and boosting productivity agripreneurs in Bogor Regency.

4. CONCLUTIONS

The research echoes existing literature, affirming the pivotal role of the entrepreneurial ecosystem in bolstering entrepreneurial productivity. Specifically, our findings illuminate the profound impression of the entrepreneurial ecosystems on enhancing agricultural entrepreneurship within Bogor Regency. The investigation shows that the entrepreneurial ecosystem serves as a catalyst, propelling agricultural ventures toward higher productivity levels. Notably, critical components within this ecosystem—such as cultural influences, market demand dynamics, intermediary support systems, connection of each actor, and visionary leadership are caused significant and more advanced contribution in constructing entrepreneurial ecosystems. However, the other element also significant, but the path coefficient values are under threshold.

This study underscores the intricate interplay between the entrepreneurial ecosystem and agricultural entrepreneurship productivity. Entrepreneurial ecosystem impulse role in creating new businesses, develop income, and flourishing high-growth venture. Shedding light on its transformative potential in driving regional economic prosperity.

This research recognizes the limitation on scope of study corresponding to various of subsector industries in agriculture, for example agroforestry, fisheries development area or food estate. Besides, this research have not yet analyzed impact on economic growth following the theoretical framework of entrepreneurial ecosystem.

5. REFERENCES

Acs, Z. J., Stam, E., Audretsch, D. B., & O'Connor, A. (2017). The lineages of the entrepreneurial ecosystem approach. *Small Business Economics*, *49*(1), 1–10. https://doi.org/10.1007/s11187-017-9864-8

Acs, Z. J., Szerb, L., Lafuente, E., & Markus, G. (2019). *Global Entrepreneurship Index 2019*. The Global Entrepreneurship and Development Institute.

Adharina, N. D. (2021). Tipologi ekosistem inovasi dan kewirausahaan : Potensi produktivitas inovasi di Provinsi Jawa Barat. *Indonesian Journal of Spatial Planning*, *2*(2), 35–40.

Alsos, G. A., Hytti, U., & Ljunggren, E. (2011). Stakeholder theory approach to technology incubators.

International Journal of Entrepreneurial Behaviour and Research, *17*(6), 607–625. https://doi.org/10.1108/13552551111174693

ANDE. (2013). *Entrepreneurial Ecosystem Diagnostic Toolkit*. Aspen Network of Development Entrepreneurs.

Anwarudin, O., Sumardjo, S., Satria, A., & Fatchiya, A. (2020). The entrepreneurial capacity of young farmers on agribusiness activities in West Java. *Jurnal Penyuluhan*, *16*(2), 267–276. https://doi.org/10.25015/16202031039

Baumol, W. J. (1990). Entrepreneurship: Productive, unproductive, and destructive. *Journal of Political Economy*, *98*(5), 893–921.

Belitski, M., Cherkas, N., & Khlystova, O. (2022). Entrepreneurial ecosystems in conflict regions: Evidence from Ukraine. *Annals of Regional Science*, *72*(2), 355–376. https://doi.org/10.1007/s00168-022-01203-0

Brownson, S., Vincent, I., Emmanuel, G., & Etim, D. (2012). Agricultural productivity and macro-economic variable fluctuation in Nigeria. *International Journal of Economics and Finance*, *4*(8), 114–125. https://doi.org/10.5539/ijef.v4n8p114

Cheung, G. W., Cooper-Thomas, H. D., Lau, R. S., & Wang, L. C. (2023). Reporting reliability, convergent and discriminant validity with structural equation modeling: A review and best-practice recommendations. *Asia Pacific Journal of Management*, *0*(0), 1–39. https://doi.org/https://doi.org/10.1007/s10490-023-09871-y

Colombo, M. G., Dagnino, G. B., Lehmann, E. E., & Salmador, M. P. (2017). The governance of entrepreneurial ecosystems. *Small Business Economics*, *52*(2), 419–428. https://doi.org/10.1007/s11187-017-9952-9

Dias, C. S. L., Rodrigues, R. G., & Ferreira, J. J. (2019). Agricultural entrepreneurship: Going back to the basics. *Journal of Rural Studies*, *70*, 125–138. https://doi.org/10.1016/j.jrurstud.2019.06.001

Doran, J., McCarthy, N., & O'Connor, M. (2018). The role of entrepreneurship in stimulating economic growth in developed and developing countries. *Cogent Economics and Finance*, *6*(1), 1–14. https://doi.org/10.1080/23322039.2018.1442093

Frimanslund, T. (2022). Financial entrepreneurial ecosystems: An analysis of urban and rural regions of Norway. *International Journal of Global Business and Competitiveness*, *17*(1), 24–39. https://doi.org/10.1007/s42943-022-00050-2

Gancarczyk, M., & Konopa, S. (2021). Exploring the governance of entrepreneurial ecosystems for productive high growth. *Foresight and STI Governance*, *15*(4), 9–21. https://doi.org/10.17323/2500-2597.2021.4.9.21

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review*, *26*(2), 106–121. https://doi.org/10.1108/EBR-10-2013-0128

Hanafiah, M. H. (2020). Formative vs reflective measurement model: Guidelines for structural equation modeling research. *International Journal of Analysis and Applications*, *18*(5), 876–889. https://doi.org/10.28924/2291-8639-18-2020-876

Hulland, J. (1999). Determinants of private banks performance in Ethiopia: A partial least square structural equation model analysis (PLS-SEM). *Strategic Management Journal*, *20*(1), 195–204. https://doi.org/10.1080/23311975.2023.2174246

Kansheba, J. M. P. (2020). Small business and entrepreneurship in Africa: The nexus of entrepreneurial ecosystems and productive entrepreneurship. *Small Enterprise Research*, *27*(2), 110–124. https://doi.org/10.1080/13215906.2020.1761869

Kansheba, J. M. P., & Wald, A. E. (2022). Entrepreneurial ecosystems quality and productive entrepreneurship: Entrepreneurial attitude as a mediator in early-stage and high-growth activities. *Journal of Small Business and Enterprise Development*, *29*(2), 311–329. https://doi.org/10.1108/JSBED-05-2021-0209

Khuong, M. N., & Van, N. T. (2022). The influence of entrepreneurial ecosystems on entrepreneurs' perceptions and business success. *Gadjah Mada International Journal of Business*, *24*(2), 198–222. https://doi.org/10.22146/gamaijb.67416

Koroleva, E. (2022). FinTech entrepreneurial ecosystems: Exploring the interplay between input and output. *International Journal of Financial Studies*, *10*(4), 1–19. https://doi.org/10.3390/ijfs10040092

Leendertse, J., Schrijvers, M., & Stam, E. (2022). Measure twice, cut once: Entrepreneurial ecosystem metrics. *Research Policy*, *51*(9), 1–27. https://doi.org/10.1016/j.respol.2021.104336

Lubis, A. S., Wijaya, C., & Sakapurnama, E. (2023). Analysis of entrepreneurial ecosystem factors on productive entrepreneurship of digital start-ups in Indonesia. *International Journal of Business Ecosystem & Strategy (2687-2293)*, *5*(3), 11–21. https://doi.org/10.36096/ijbes.v5i3.439

Lux, A. A., Macau, F. R., & Brown, K. A. (2020). Putting the entrepreneur back into entrepreneurial ecosystems. *International Journal of Entrepreneurial Behaviour and Research*, *26*(5), 1011–1041. https://doi.org/10.1108/IJEBR-01-2020-0031

Mason, C., & Brown, R. (2014). *Entrepreneurial Ecosystems and Growth Oriented Entrepreneurship*. OECD.

Muharastri, Y., Pambudy, R., & Priatna, W. B. (2015). Hubungan karakteristik wirausaha dengan kompetensi. *Jsep*, *8*(1), 25–36.

Nicotra, M., Romano, M., Del Giudice, M., & Schillaci, C. E. (2018). The causal relation between entrepreneurial ecosystem and productive entrepreneurship: A measurement framework. *Journal of Technology Transfer*, *43*(3), 640–673. https://doi.org/10.1007/s10961-017-9628-2

Peprah, A. A., & Adekoya, A. F. (2020). Entrepreneurship and economic growth in developing countries: evidence from Africa. *Business Strategy and Development*, *3*(3), 388–394. https://doi.org/10.1002/bsd2.104

Raithel, S., Sarstedt, M., Scharf, S., & Schwaiger, M. (2012). On the value relevance of customer satisfaction. Multiple drivers and multiple markets. *Journal of the Academy of Marketing Science*, *40*(4), 509–525. https://doi.org/10.1007/s11747-011-0247-4

Sarstedt, M., Hair, J. F., Cheah, J. H., Becker, J. M., & Ringle, C. M. (2019). How to specify, estimate, and validate higher-order constructs in PLS-SEM. *Australasian Marketing Journal*, *27*(3), 197–211. https://doi.org/10.1016/j.ausmj.2019.05.003

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Partial least squares structural equation modeling. In C. Homburg, M. Klarmann, & A. Vomberg (Eds.), *Handbook of Market Research* (Vol. 21, Issue 1, pp. 1–16). Springer International Publishing AG.

Stam, E. (2018). Measuring entrepreneurial ecosystems. In D. B. O'Connor, A., Stam, E., Sussan, F., Audretsch (Ed.), *Entrepreneurial Ecosystems: Place-based Tansformations and Transitions*. Springer US. https://doi.org/10.1007/978-3-319-63531-6

Wadichar, R. K., Manusmare, P., & Burghate, M. A. (2022). Entrepreneurial ecosystem: A systematic literature review. *Vision*, *0*(0), 1–14. https://doi.org/10.1177/09722629221093866

Wurth, B., Stam, E., & Spigel, B. (2022). Toward an Entrepreneurial Ecosystem Research Program. *Entrepreneurship: Theory and Practice*, *46*(3), 729–778. https://doi.org/10.1177/1042258721998948

Zhang, Y., & Roelfsema, H. (2020). Entrepreneurial ecosystems, new business formation, and scale-up activity: Evidence from 286 Chinese cities. *Entrepreneurship Research Journal*, *0*(0), 1–37. https://doi.org/10.1515/erj-2019-0265