

## **CALLING FOR FARMERS' CREATIVITY FOR THE ECONOMIC SURVIVAL OF INTEGRATED FARMING OF PIG AND STONE BANANA DURING THE COVID-19 PANDEMIC**

I Made Tamba

Agribusiness Study Program, University of Mahasaraswati Denpasar

Email: [itamba17@unmas.ac.id](mailto:itamba17@unmas.ac.id)

I Gusti Ngurah Alit Wiswasta

MP2WL Study Program, University of Mahasaraswati Denpasar

Email: [alitwiswasta@unmas.ac.id](mailto:alitwiswasta@unmas.ac.id)

Anik Yuesti

Magister Management Study Program, University of Mahasaraswati Denpasar

Email: [anikyuesti@unmas.ac.id](mailto:anikyuesti@unmas.ac.id)

### **ABSTRACT**

As one of the countries exposed to the Covid-19 pandemic, Indonesia has experienced a severe economic contraction. However, the Indonesian agricultural sector still provides positive growth to the national economy. Jobs in the agricultural sector are an alternative for the economic survival of farmer families, one of which is integrated farming of pigs and stone bananas. The aims of this study was to analyze (1) the creativity of farmers in operating integrated farming of pigs and stone bananas during the Covid-19 pandemic, and (2) the primary performance of integrated farming of pigs and stone bananas during the Covid-19 pandemic. This research is survey research conducted on 86 respondents who organize integrated farming of pigs and stone bananas. Data were analyzed descriptively using R/C analysis. The results showed that (1) the creativity of farmers in operating integrated farming of pigs and stone bananas during the pandemic is categorized as high, and (2) the integrated farming of pig and stone bananas were categorized efficient and were a significant source of income for the family farmers. It is proper for integrated farming of pigs and stone banana to be adopted sustainably and promoted to become an alternative for farming families' economic survival during the Covid-19 pandemic.

**Keywords:** integrated farming, pigs, stone banana, economic survival

### **INTRODUCTION**

The Covid-19 pandemic has shocked the world community. Why not? This pandemic has paralyzed the infected country's economy (Rincón-Aznar et al., 2020; Grima et al., 2020). As if indiscriminately, the Covid 19 pandemic has put high financial pressure, which is felt not only by developing countries, but also by developed countries (Huang et al., 2020). The economic foundation that was built before was powerless to face the terrible impact of the Covid-19 pandemic. Many countries experienced a slowing economic growth rate. Some even experienced a severe contraction, which was caused by the negative contribution of several economic sectors. The Covid-19 pandemic has had a significant impact on various sectors of the economy, such as the tourism and energy sectors (Nicola et al. 2020; Rubinic, 2020, Hein, 2020; Norouzi et al., 2020). In some countries where lockdowns have hampered imports and exports (Hasanat et al., 2020), stock markets plummet, commodity prices fall, many companies go bankrupt, unemployment occurs (Stojkoski et al., 2020; Yu et al., 2020), and has also led to increased food insecurity in many developing countries (Elleby et al., 2020).

Indonesia is also a country that has not escaped exposure to the Covid-19 pandemic. The first positive confirmed cases occurred in early March 2020, which then increased significantly every day. The Covid-19 pandemic has negatively impacted and disrupted Indonesia's economic activities (Prawoto et al., 2020; Caraka et al., 2020; Susilawati et al., 2020), and then increased the number of poverty (Suryahadi et al., 2020, and Muzakki, 2020). Indonesia's economic growth in the second quarter of 2020 was contracted by 5.32%, and cumulatively, Indonesia's economic growth in the first semester of 2020 contracted 1.26% (Badan Pusat Statistik RI, 2020).

As Indonesia's leading tourist destination, Bali is facing heavy economic pressure due to the Covid-19 pandemic. This happens because the tourism sector is very vulnerable to the global crisis (Uğur & Akbiyik, 2020).

The tourism sector in Bali has experienced a severe contraction; most hotels are not operating. As a result, many hotel employees are laid off, and open unemployment is inevitable (Rahma and Arvianti, 2020). The economic growth of Bali and Nusa Tenggara in the second quarter of 2020 was contracted by 6.29% (Badan Pusat Statistik RI, 2020). However, Bali still has a sector that is the hope and foundation of the population to earn a fortune, namely the agricultural sector. Most of the agricultural sub-sector still contributes positively to the economy of Bali. Agricultural trade will still exist because it is isolated by the relatively low elasticity of income demand (Barichello, 2020). Jobs in the agricultural sector are an alternative for family economic survival, one of which is integrated farming of pigs and stone bananas.

During the Covid-19 pandemic, integrated farming of pigs and stone bananas was still able to exist, even though it was also exposed to the negative impact of the Covid-19 pandemic. This is inseparable from farmers' innovation and creativity in operating integrated farming of pigs and stone bananas during the pandemic. Therefore, it is imperative to study farmers' innovation and creativity in operating integrated farming of pigs and stone bananas, which can provide economic survival for farmer families during a pandemic. The purpose of this study was to analyze (1) the innovation and creativity of farmers in operating integrated farming of pigs and stone bananas during the Covid-19 pandemic, and (2) the main performance of integrated farming of pigs and stone bananas during the Covid-19 pandemic.

## MATERIAL AND METHODS

This research is survey research. The research location is focused in Payangan District, Gianyar Regency, Bali Province, on the basis of the consideration that Payangan District, Gianyar Regency is the center for integrated farming development of pig and stone banana in Gianyar Regency, Bali Province. This study's population, namely farmer clusters that carry out integrated farming of pigs and stone banana. Respondents were taken using the quota sampling method with the number 86 persons.

The data collection was conducted through direct interviews with respondents using a list of previously prepared questions. Secondary data were collected through a number of *online* media. The creativity of farmers was analyzed descriptively using a Likert scale, and the relationship between the level of creativity of the farmer by the number of pigs and the area of stone banana farming analyzed with Chi-Square, while the performance of integrated farming of pig and stone banana were analyzed by analysis of R/C.

## RESULTS

The integrated farming with pig and stone banana consisted of sub-farming of pigs and sub-farming of stone banana. The two sub-farms are integrated through a number of activities and resource flows. The characteristics of the integrated farming of pigs and stone bananas operated by farmers are presented in Table 1.

Table 1. Statistic descriptive

Number	Integrated farming	Average capacity	Minimum	Maximum	Standard Deviation
1	Pig sub-farming	35 tail	20	60	11,39
2	Stone banana sub farming	0,33 acre	15	60	11,70

Source: Data Processed, 2020

The disparity in the number of pigs reared in the sub-farming of pigs is smaller than the disparity in the area of sub-farming for stone bananas. Most of the farmers (53.49%) integrated the pig and stone banana sub-farming with 20 to 33 pigs and an area of stone banana farming covering 0,15 to 0,30 acres. Such conditions are very conducive for farmers, where they are able to produce compost from pig manure, which is sufficient to fertilize stone banana plants.

## Farmers' creativity for the economic resilience of integrated farming of pigs and stone bananas during the pandemic

Farmers realize that the cost of pig feed is the highest cost in the integrated farming production cost structure of pigs and stone bananas. All farmers use commercial feed as the main feed for pigs. The dependence of farmers on the supply of commercial feed from factories is very high, so farmers face problems related to controlling the nutritional content of a manufactured feed. Farmers cannot control the nutritional composition of commercial feed because farmers do not have a strong bargaining position as a result of not being organized in a particular container. If farmers can form a strong organization to produce feed together, it is possible for farmers to get a lower

price for feed. The only opportunity the farmer has is to change the composition of the feed according to the needs of each phase of his livestock growth. Breeding experience is critical to success because every touch the farmer gives has an impact on the growth of pigs.

The increase in feed price is a severe blow to the farmers, especially while the price of pork is constant and even tends to decline. An increase in the price of feed is rarely accompanied by an increase in the price of pork, and the factual condition shows that the proportion of the increase in the price of feed is greater than the proportion of the rise in the price of pork. Therefore, farmers are always required to innovate and be creative to increase feed efficiency so that they can minimize the impact of rising feed prices, especially during a pandemic. The available alternative is the adoption of technological innovations in the provision of probiotic supplements to feed, to make ready-to-eat feed for pig digestion. Probiotic supplementation in feed can increase the growth rate of pigs so that the maintenance duration is shorter, and the amount of feed consumed is less. The efficiency of pig farming techniques with probiotic supplements is higher than without probiotic supplements (Tamba, et al., 2020). Some farmers have adopted technological innovations in feeding probiotic supplements.

The research identified several farmers exploring the potential local feed ingredients for pigs, especially during the pandemic. Farmers try to save tradable inputs from maintaining the sustainability of the farm. Some of the local feed ingredients used by farmers as alternative pig feed ingredients are water pumpkin, sweet potato tubers, sweet potato stems and leaves, taro, kale, and banana stems. Farmers provide this alternative type of feed fresh and chopped. Pigs like this alternative feed, which is served as interrupt feed. According to farmers, pumpkin and sweet potato are very suitable to be used as additional feed because they positively impact the appetite for pigs' feed, leading to the pigs' growth rate. Pumpkin and sweet potato plants are planted around the pigpen, regularly fertilized with a compost of pig manure to produce continuously regardless of the season. Every day the farmers harvest water pumpkins as needed, then chopped and served as pig feed. The existence of pumpkin plants around the pigpen provides a double benefit and an alternative source of feed and positive benefits for creating a dark atmosphere for pigs.

To reduce tradable input, farmers are also innovating by utilizing taro, which has excellent potential as intercropping for pigs. The chopped taro is then mixed with bran and then given the pig as interrupt feed. For the presentation of interrupt feed, farmers are always creative in serving a variety of feeds so that the pig's appetite is maintained. Farmers acknowledge that their creativity emerges when there is economic pressure from the family due to covid 19. Farmers try to maintain family survival by relying on the integrated farming performance of pigs and stone bananas. It is not surprising then that the farmers and their families do their best to operate the integrated farming of pigs and stone bananas.

The proportion of the use of alternative feed ingredients depends on its availability at the farm level and farmers' preferences as users. This alternative feeding is expected to be able to avoid the saturation of pigs with commercial feed. In addition, these alternative feed ingredients can be used as an actual and reliable pig feed supplement in increasing feed efficiency. Breakthrough technological innovation to formulate local feed ingredients into alternative feed with stable nutrition is an urgent need for farmers in an effort to suppress tradable inputs during a pandemic.

During a pandemic, farmers are more focused on devoting their time to giving a touch of care to the integrated farming of pigs and stone bananas because of restrictions on travel in order to reduce the risk of being exposed to Covid-19. Some farmers have innovated to make vegetable pesticides to maintain a sanitary farming environment. The pig pen is cleaned regularly, and the pigs are washed regularly so that their health is better maintained. This is expected to positively impact the growth of the pigs, which will then lead to a more profitable final weight gain. Farmers are more stringent in checking the pigs' health and are always trying to prevent potentially harmful things.

It is very different from pig sub-farming, stone banana sub-farming does not use tradable inputs, or all of them use domestic resources, including organic fertilizer, labor, and land. In a pandemic situation, banana sub farming has greater toughness than pig sub farming. The organic fertilizers used to fertilize stone bananas result from the creativity of farmers in composting pig manure. Farmers only need additional labor to process the pig manure into compost which is then used to fertilize the stone banana plants. The ability of compost from pig manure to substitute mineral fertilizers has been tested in the field. The laboratory test results showed that the composition of the nutrients in the compost of pig manure, especially the macro N elements, was in the high category, while P and K were in the very high category. The use of pig manure compost to fertilize stone banana plants has advantages over urea, which farmers previously used. The advantages referred to are being able to improve the physical and biological properties of the soil (Bernal et al., 2009).

As a result of all the inputs of stone banana sub-farming as a domestic factor, the farmer's creativity is more focused on increasing the economic benefits of stone banana output, such as young fruit and young and post-productive stems. During the pandemic, the young fruit of stone bananas and young stems were more intensively marketed to get additional income. Through creativity, the young fruit of stone bananas can be processed into delicious vegetables. Likewise, young stems of stone banana can be processed into vegetables with different presentations. Post-productive stems are mostly sold as cattle feed as well as being served as interrupt feed for pigs.

Table 2. Distribution of farmers according to their creativity during the pandemic

Number	Creativity of farmers	Amount	
		Person	Percent
1	Low	0	0,00
2	Medium	17	19,77
3	High	49	56,97
4	Very high	20	23,26
Total		86	100,00

Source: Data Processed, 2020

Cumulatively, farmers' creativity in operating integrated farming of pigs and stone bananas during the pandemic is categorized as high (Table 2) with a score of 75.87%. The results of the Chi-Square test (Attachment 1a & 1b) show that there is no tendency for the more pigs to be raised, the higher the level of creativity of the farmers, and vice versa. Likewise, there is no tendency that the broader the stone banana farming area, the higher the level of farmer creativity, and vice versa. Farmers' creativity level is random with respect to the number of pigs being raised and the area of stone banana farming. This indicates that farmers in all lines are very serious about maintaining the continuity of integrated farming of pigs and stone bananas during the pandemic as the main source of family income. Farmers realize how difficult it is to get income outside the agricultural sector, as happened in the tourism and transportation sectors, which are experiencing great contraction. This condition is a trigger for farmers to focus on managing their farming, which in turn gives birth to creations and innovations that can create added value.

## Performance of Integrated Farming of Pigs and Stone Bananas in the Pandemic Period

For integrated farming of pigs and stone bananas, farmers' costs were identified as shown in Table 3.

Table 3. Costs of Integrated Farming of Pigs and Stone Bananas

Number	Type of cost	Unit	Volume	Unit price	Amount (IDR)
1	Fixed Cost				
	a. Land lease stone banana	acre	33	50.000	1.650.000,00
	b. Shrinkage pen	unit	1	350.000	350.000,00
	Sub-total				2.000.000,00
2	Variable cost				
	a. Piglets	tail	35	700.000	24.500.000,00
	b. Banana seed	tree	835	1.000	835.000,00
	c. Labor	man-days	424,92	60.000	25.495.200,00
	d. Feed of pig	Kg	7005,59	9.000	63.050.310,00
	e. Organic fertilizer	Kg	2205	800	1.764.000,00
	f. Bran	kg	1019,48		2.038.960,00
	g. Water	L	3891,22	2.000	389.122,00
	h. Capital interest	IDR		100	6.969.946,83
	Sub-total				125.042.538,83
	Total				127.042.538,83

Source: Data Processed, 2020

In the integrated farming of pigs and stone bananas, the proportion of feed costs was the highest in the farm cost structure. Most of the pig feed ingredients are tradable inputs so that it dramatically affects farm performance. During the pandemic, the price of pig and stone bananas fluctuated. The behavior of pig prices tends to fluctuate, while the price of stone banana leaves tends to decrease due to the decreasing amount of demand. Reducing global demand from hotels and restaurants has caused agricultural commodity prices to fall by 20% (Nicola et al., 2020). In addition, a decrease in demand will arise from a decrease in consumer income (Hobbs, 2020). Food demand and food security are severely affected due to mobility restrictions and reduced purchasing power (Siche, 2020); agricultural income is also reported to fall for 90% of agriculture (Harris et al., 2020). The economic contraction impacts the narrowing of productive economic activities, such as trade and services, which then directly impact the demand for banana leaves. The demand for young stems and young fruit of stone bananas used for vegetables has also decreased due to the sluggish culinary market. During the pandemic, many restaurants offering typical menus *jukut ares* and *lawar* experienced a lack of buyers, which then resulted in reduced demand for young stems and young fruit of stone bananas at the farmer level, which ultimately led to lower prices for these commodities. However, the demand for the main product and by-product of stone bananas continues, although relatively smaller. This is due to the empirical fact that food products have low-income elasticity (Barichello, 2020). Going forward, farmers of integrated farming of pig and stone banana need to develop collaborative supply chains. These namely are long-term partnerships, help reduce transaction costs, share risks, provide access to resources, and increase productivity.

The average price of pig and banana leaves at the farmer level during the Covid-19 pandemic from March to September 2020 is presented in Table 4.

Table 4. The average price of pigs and stone bananas

Commodity	Average price (IDR) on month						
	March	April	May	June	July	August	September
Pig	25000	20000	23000	28000	32000	38000	34000
Stone banana	13500	12500	12000	11000	12000	12500	12500

Source: Data Processed, 2020

Pig prices were at their lowest point in April and then crawled up to their highest point in August. The increase in the price of pigs is influenced by the decrease in supply (reduction in the pig population), which is greater than the decrease in demand. The decrease in the supply of pigs occurred due to the fact that in several pig raising locations in Bali there were a large number of pig deaths so that this event resulted in the price of pigs increasing gradually. If there were not many pig deaths in Bali's several locations, the Covid 19 pandemic would certainly have had a very negative impact on pig farms in the form of a very significant reduction in pigs' price. This is due to the significantly reduced demand for pigs from hotels and restaurants due to hotels' low occupancy rate, and many hotels and restaurants to stop operating. Meanwhile, the price of stone banana leaves is relatively more stable than the price of a pig, with a range of IDR 11000 up to 13500.

Revenue from integrated farming of pig and stone banana comes from sales of pigs, sales of stone banana leaves (main product), and sales of young stems, young fruit, and old stems of stone banana stems (most productive) as a by-product. Specifically for by the product of stone banana, especially in the form of young stems and young fruit, 62.53% of farmers use these products to be commercialized, while for post-productive stems, all farmers use them for commercial purposes. The frequency of harvesting stone banana leaves (one tree) averages once a month. Each tree is harvested two leaf midribs every month. Harvesting activities can be carried out in rotation according to the available capacity of the family's labor, and harvesting of banana leaves can be postponed for up to 1 month so that the distribution of labor absorption can be carried out. The production of stone banana leaves is not seasonal, so the harvest can be carried out continuously, which then leads to continuity of the returns.

Table 5. Revenue structure for integrated farming of pigs and stone bananas.

Number	Type	Average of production	Unit price (IDR)	Amount (IDR)
1	Pig	4069,16	31.000,00	126.142.255
2	Stone banana Main product - Leaves By-product	1001,09	12.500,00	12.513.662,79

	- Young stem	2450	2000,00	4.900.000
	- Young fruit	1482	1000,00	1.482.000
	- Old stem	5160	500,00	2.580.000
	- Compost	2205	800,00	1.764.000
Total				149.381.917,79

Source: Data Processed, 2020

Pig production is calculated in one rearing period with an average number of pigs being raised as many as 35 heads. The amount of production after being converted into a unit weight of kg was 4069.16 kg. The unit price used is the average price for five months expressed in IDR kg<sup>-1</sup>, which is IDR 31,000 kg<sup>-1</sup>. The production of stone bananas is calculated based on the number of main products and by-products. The main product of stone banana is leaves whose production is expressed in folding units, while the by-products are young stems, young fruit, and old stems. The result of selling by-products is directly stated in IDR units.

## DISCUSSION

The integrated farming performance of pigs and stone bananas can be measured by comparing the amount of revenue with the total cost. The ratio of revenue to total cost reflects the amount of revenue per unit cost incurred. The greater the ratio of income to cost indicates, the better the farm performance. The cumulative R/C of integrated farming of pigs and stone bananas is 1.17 (attachment 2), which shows that integrated farming performance is efficient during the Covid-19 pandemic because each IDR costs incurred generates higher revenues. This indicates that the integrated farming of pigs and stone bananas has proven to be resilient in facing shocks and contraction in the national economy.

In operating the integrated farming of pigs and stone bananas, farmers involve a number of production factors, some of which are owned by the farmers. The production factors are described as follows.

- a. Labor. Most of the labor production factors come from within the farming family. Only a small proportion of farmers who raise pigs beyond their labor capacity use labor outside the family. The calculated income only comes from remuneration for workers in the family. Activities carried out within the framework of integrated pig and stone banana farming include collecting pig manure, cleaning the pen, bathing the pigs, providing feed, making compost, fertilizing stone banana plants with compost, and harvesting rock banana leaves.
- b. Land. All land that is used in the integrated farming of pigs and stone bananas is own land. The rent, which is calculated as compensation for the land production factor, is the farmer's income. This production factor is the internal strength of farmers to continue to exist amid the shocks of the Covid-19 pandemic.
- c. Capital. Farmers in operating integrated farming of pigs and stone bananas do not use loan capital. The interest as remuneration for the capital production factor is the farmers' income.
- d. Pen. All pens used to raise pigs are owned by themselves, so rent/depreciation of the pen as compensation from the pen production factor is the income of the farmers.

The integrated farming system of pigs and stone bananas has proven to be resilient in facing the COVID-19 pandemic. This study's results are not in line with the research results by Timilsina et al. (2020), which states that agricultural activities can be stopped due to the pandemic. The toughness of integrated farming is contributed by the factual condition where the farming model is more oriented to the use of domestic resources. Integrated farming has proven significantly to secure a household economy (Prajanti and Susilowati, 2016), improves the economic condition of the small and marginal farmers (Kumara, et al., 2017), can improve the profitability and achieve sustainable production (Netam et al., 2019), and improves the farm income (Shankar, et al., 2017) : Ahirwar & Nath, 2020). Not only is it economically resilient, but integrated farming also has environmental conservation value because it is able to reduce CH<sub>4</sub> emissions (Cao, et al., 2019), is adaptive to climate (Dang, 2019), and contains climate change mitigation (Munawar et al. , 2015; Rathore et al., 2019). Integrated farming is a forum for domestic knitting resources, which then creates multiple benefits that reinforce each other to survive and rise in times of crisis. Therefore, tactical and systematic efforts are needed to promote integrated farming of pigs and stone bananas as the farming family's economic pillars.

## CONCLUSION

During the pandemic, farmers were always creative in operating the integrated farming of pigs and stone bananas. Creativity primarily aims to reduce the burden of using tradable inputs by orienting towards the use of domestic resources. The cumulative category of farmers' creativity is high. Thanks to the farmers' creativity, the integrated farming of pigs and stone bananas is resilient in facing economic shocks during the pandemic, which is indicated by the R/C amount that was categorized as efficient, and becomes a significant source of income for farming family. This is indicated by the large proportion of family farmers' income comes from production factor fees for integrated farming of pigs and stone bananas. The synergy of the sub-farming of pigs and stone bananas reduces the risk of failure and ensures the sustainability and stability of family farmers' income. It is appropriate for the integrated farming of pigs and stone bananas adopted sustainably and promoted to become the main pillars forming farmers' welfare.

## References

- Ahirwar, C. S., & Nath, R. (2020). Integrated Crop-Livestock Farming Systems: A Strategy for Dry Land and Conservation Agriculture. *Research Biotica*, 2(1), 11-14.
- Badan Pusat Statistik R I.(2020). Berita Resmi Statistik. <https://www.bps.go.id/pressrelease/2020/08/05/1737/-ekonomi-indonesia-triwulan-ii-2020-turun-5-32-persen.html>
- Barichello, R. (2020). The COVID-19 pandemic: Anticipating its effects on Canada's agricultural trade. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*.
- Bernal, M.P., J.A. Albuquerque, and R. Moral. (2009). Composting of animal manures and chemical criteria for compost maturity assessment. A review. *Bioresource Technol.* 100:5444-53.
- Caraka, R. E., Lee, Y., Kurniawan, R., Herliansyah, R., Kaban, P. A., Nasution, B. I., ... & Pardamean, B. (2020). Impact of COVID-19 large scale restriction on environment and economy in Indonesia. *Global Journal of Environmental Science and Management*, 6(Special Issue (Covid-19)), 65-84.
- Dang, H. D. (2019). Sustainability of the rice-shrimp farming system in Mekong Delta, Vietnam: a climate adaptive model. *Journal of Economics and Development*.
- Elleby, C., Domínguez, I. P., Adenauer, M., & Genovese, G. (2020). Impacts of the COVID-19 Pandemic on the Global Agricultural Markets. *Environmental and Resource Economics*, 76(4), 1067-1079.
- Grima, S., Dalli Gonzi, R., & Thalassinou, E. I. (2020). The Impact of COVID-19 on Malta and its Economy and Sustainable Strategies. *Available at SSRN 3644833*.
- Gustiar, F., Hayati, R., & Munawar, A. I. (2015). Crop-cattle integrated farming system: an Alternative of climatic change mitigation. *Media Peternakan*, 38(2), 95-103.
- Harris, J., Depenbusch, L., Pal, A. A., Nair, R. M., & Ramasamy, S. (2020). Food system disruption: initial livelihood and dietary effects of COVID-19 on vegetable producers in India. *Food Security*, 12(4), 841-851.
- Hasanat, M. W., Hoque, A., Shikha, F. A., Anwar, M., Hamid, A. B. A., & Tat, H. H. (2020). The Impact of Coronavirus (Covid-19) on E-Business in Malaysia. *Asian Journal of Multidisciplinary Studies*, 3(1), 85-90.
- Hein, E. Corona Crisis: Causes, Effects and Macroeconomic Policy Requirements.
- Hobbs, J. E. (2020). Food supply chains during the COVID-19 pandemic. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*.
- Huang, Y., Lin, C., Wang, P., & Xu, Z. (2020). Saving china from the coronavirus and economic meltdown: Experiences and lessons. *Available at SSRN 3570696*.
- Kumara, O., Sannathimappa, H. G., Basavarajappa, D. N., Danaraddi, V. S., Pasha, A., & Rajani, S. R. (2017). Integrated Farming System-An Approach towards Livelihood Security. *Resource Conservation and Sustainable Production for Small and Marginal Farmers. International Journal of Plant & Soil Science*, 15(3), 1-9.
- Muzakki, F. (2020). The Global Political Economy Impact of Covid-19 and The Implication to Indonesia. *Journal of Social Political Sciences*, 1(2), 76-92.
- Netam, A. K., Sahu, B., & Netam, C. R. (2019). Impacts of Integrated Farming System on Socio-economics and Livelihood Sustainability of Small and Marginal Farmers in Chhattisgarh. *International Journal of Current Microbiology and Applied Sciences*, 8(4), 822-829.

- Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., ... & Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International journal of surgery (London, England)*, 78, 185
- Norouzi, N., de Rubens, G. Z., Choubanpishehzafar, S., & Enevoldsen, P. (2020). When pandemics impact economies and climate change: exploring the impacts of COVID-19 on oil and electricity demand in China. *Energy Research & Social Science*, 68, 101654.
- Prajanti, S. D. W., & Susilowati, I. (2016). The Prospect of Integrated Farming System of Crops-Fish-Husbandary as the Survival Strategy to Secure the Farmers' Economy: Case Study in Magelang-Indonesia. *International Journal of Economics and Financial Issues*, 6(6S).
- Prawoto, N., Purnomo, E. P., & Zahra, A. A. (2020). The Impacts of Covid-19 Pandemic on Socio-Economic Mobility in Indonesia. *International Journal of Economics & Business Administration (IJEBA)*, 8(3), 57-71.
- Rahma, V. S., & Arvianti, G. F. (2020). THE IMPACTS OF COVID-19 PANDEMIC IN INDONESIA AND CHINA'S HOTEL INDUSTRY: HOW TO OVERCOME IT?. *JELAJAH: Journal of Tourism and Hospitality*, 2(1), 55-64.
- Rathore, V. S., Tanwar, S. P. S., KUMAR, P., & Yadav, O. P. (2019, February). Integrated Farming System: Key to sustainability in arid and semi-arid regions. ICAR.
- Rincón-Aznar, A., Mao, X., & Tong, M. (2020). GLOBAL VALUE CHAINS AND ECONOMIC DISLOCATIONS: INTRODUCTION. *National Institute Economic Review*, 252, R1-R3.
- Rubinić, I. (2020). Pandemic paradigm shift. *Journal of Labor and Society*.
- Shankar, K. A., Yogeesh, L. N., Prashant, S. M., Sheik Peer, P., & Desai, B. K. (2017). Integrated farming System: Profitable farming to small farmers. *International Journal of Current Microbiology and Applied Sciences*, 6(10), 2819-2824
- Siche, R. (2020). What is the impact of COVID-19 disease on agriculture?. *Scientia Agropecuaria*, 11(1), 3-6.
- Stojkoski, V., Utkovski, Z., Jolakoski, P., Tevdovski, D., & Kocarev, L. (2020). The socio-economic determinants of the coronavirus disease (COVID-19) pandemic. *arXiv preprint arXiv:2004.07947*.
- Suryahadi, A., Al Izzati, R., & Suryadarma, D. (2020). Estimating the Impact of Covid-19 on Poverty in Indonesia. *Bulletin of Indonesian Economic Studies*, 56(2), 175-192.
- Susilawati, S., Falefi, R., & Purwoko, A. (2020). Impact of COVID-19's Pandemic on the Economy of Indonesia. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*, 3(2), 1147-1156
- Tamba, I M., Wiswasta, I G N A., Tariningsih, D. 2020. Efficiency of Pig Farming Techniques: A Non Parametric Approach. *Journal of Adv Research in Dynamical and Control System* Vol 12. 01 Special Issue, 825-833.
- Timilsina, B., Adhikari, N., Kafle, S., Paudel, S., Poudel, S., & Gautam, D. (2020). Addressing Impact of COVID-19 Post Pandemic on Farming and Agricultural Deeds. *Asian Journal of Advanced Research and Reports*, 28-35.
- Uğur, N. G., & Akbiyik, A. (2020). Impacts of COVID-19 on global tourism industry: A cross-regional comparison. *Tourism Management Perspectives*, 100744.
- Yu, K. D. S., & Aviso, K. B. (2020). Modelling the economic impact and ripple effects of disease outbreaks. *Process Integration and Optimization for Sustainability*, 1-4.



Attachment 1a. Cross table between farmers' creativity level with the number of pigs being raised.

creativity the amount of pig	medium	high	Very high	Total
≤34	9 (10,46)	23 (26,74)	10 (11,63)	42 (48,84)
>34	8 (9,30)	26 (30,23)	10 (11,63)	44 (51,16)
Total	17 (19,76)	49 (56,97)	20 (23,36)	86 (100,00)

$X^2 = 0,1961^{ns}$

Attachment 1b. Cross table between farmers' creativity level with the area of stone banana

creativity the area of stone banana	medium	high	Very high	Total
≤33	8 (9,30)	25 (29,07)	9 (10,46)	42 (48,84)
>33	9 (10,46)	24 (27,91)	11 (12,79)	44 (51,16)
Total	17 (19,76)	49 (56,98)	20 (23,25)	86 (100,00)

$X^2 = 0,2328^{ns}$

Attachment 2. Return cost ratio (R/C) integrated farming of pigs and stone bananas

Description	Amount of returns (IDR)	Amount of cost (IDR)	R/C
Integrated farming	149.381.917,79	127.104.638,80	1,17