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Factors Shaping the Capability of Agribusiness Production in the Volcano Disaster Prone Zone

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Abstract

Agroindustry regions with the potential for volcano disasters are strategic to be developed. The long-term post-eruption impact of volcanic ash benefits agricultural crops in the surrounding area. However, in the short term, it will impact crop damage and damage to infrastructure that disrupts production activities and marketing of agricultural products. This paper aims to find out the factors in creating the capabilities of agribusiness actors in the prone zone to the Merapi volcano disaster. These factors are attributes of the production capability construct relevant to a fast recovery process scheme that encourages the availability of production continuity areas as part of disaster management. This paper discusses the factors that form the capability of agriculture production in Magelang regency adjacent to an active volcano, Mount Merapi, with a multivariate approach using factor analysis in the agribusiness zone. The sample of this research is 100 respondents of farmers and agribusiness owners. The sampling technique used was cluster random sampling, by taking sample data from 21 districts in Magelang Regency. The discussion in this paper determines that four factors shape agricultural capability in disaster-prone zones: support for production modernization, knowledge management, communication convergence, and change management. These four components will contribute in the context of scientific disaster management to productivity in the agroindustry area.

Keywords: *Production Capability, Agribusiness, Disaster Management, Factor Analysis*

INTRODUCTION

Magelang regency is one of the growing and developing areas with an agropolitan concept. As a potential vegetable and fruit-producing district, Magelang Regency continues to build its competitiveness with the support of the government's role to realize leading agribusiness (Arisadi & Umilia, 2016). In this case, the role of government is to make farmer groups in each village cooperate between economic units. The development of road and dam infrastructures and internet access considers the strategic location of Magelang Regency as a buffer area of agricultural production adjacent to metropolitan cities which become market zones like Surakarta, Semarang, and Yogyakarta which is the market area for an agricultural commodity products (Hermawan, Nabila , Sartono, Suharmanto, & Suratno, 2017). Be in accordance with its capacity as a buffer zone and market supplier of strategic food needs in Central Java and Jogjakarta, the soil condition in Magelang Regency is distinguished between dry land and paddy field. The total land area was 208.6

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Ha, and the dry land area was 1603.40 Ha (BPS., 2017). Agricultural commodities that have been developing for a long time and are produced by Magelang Regency are primary food ingredients, including rice, corn, cassava and fruit commodities such as salak and papaya. In line with the government program, one village one product, and the development of tourist areas in Magelang Regency, superior iconic commodities emerged in each sub-district in Magelang Regency, which developed into ecotourism product commodities to attract tourists, as shown in Table 1.

Table 1. Leading Agribusiness Production Commodities

Districts (Magelang)	**Primary Commodities**
Salaman	Sawo
Borobudur	Siem orange
Windusari	Pineapple
Kaliangkrik	Guava
Srumbung	Salak
Dukun	Jackfruit
Muntilan	Sweet potato
Ngluwar	Water apple
Mungkid	Mangosteen
Pakis	Guava
Candi mulyo	Durian
Mertoyudan	Papaya
Tempuran	Cassava
Kajoran	Durian
Sawangan	Sweet potato
Grabag	Avocado
Secang	Banana
Tegalrejo	Peanuts
Bandongan	Cassava
Salam	Jengkol
Ngablak	Rice

Another location in Indonesia that is similar to Magelang, near the active volcano, is also the center of agriculture and has volcanoes because the position of Indonesia is in the cluster of Mediterranean mountain paths and the Pacific. It is because Indonesia is a summit area of two large plates, namely the Asian plate in the western region and the Australian continental plate in the east (Tyas & Pujianto, 2020). Records since the disaster of volcanology that ever happened in Indonesia are Sinabung Mountain (2016), Mount Kelud (2014), Mount Krakatau (1883), Mount Merapi (2010), and others (Nakada et al., 2019). According to Choumert-Nkolo, Lamour, and Phélinas (2021), this causes a severe physical hazard for the people and economic assets around the volcano. Physical hazards are tectonic earthquakes, hot clouds, toxic gas leaks, lava flows, mudflow, and landslides, so it is essential to explore the management of volcanic disasters in Indonesia, especially in the productive economic zone. Eruptions have two sides that result in impacts. In the short term, the eruption creates many negative impacts, such as infrastructure damage, ash rain which causes pollution and crop failure. In this impact the role of disaster management becomes strategic, while the positive impact of the eruption is in the long term, because volcanic ash contains many nutrients

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that are important for the soil. Nutrients can produce fertile soil. The fertile soil can increase agricultural potential in Indonesia. Mount Merapi, located in the middle of Magelang Regency, has a regular eruption cycle, a short cycle that occurs in the period of 2 to 5 years, and a long cycle that occurs in the period of 5 to 7 years.

Mount Merapi is considered the most active mountain in the world. The Mount Merapi eruption that occurred in 2010 caused a serious enough impact on the settlements in the towns around Mount Merapi, one of which is the City of Magelang. The effect of the eruption of Mount Merapi is the number of buildings damaged so that residents lost their homes; a rain of ash covered the land, so many people lost their jobs. There were also disruptions in traffic flow and many other impacts. The value of damage and losses caused by the eruption of Mount Merapi in 2010 reached Rp 4.23 trillion, with the most significant damage experienced by the housing sector. The value of the damage caused by the eruption of Merapi reached Rp 1.138 trillion (27%), while the value of losses was Rp 3.089 trillion (73%). The second largest damage after the housing sector was experienced by the water resources and irrigation sector (13%) of the total damage value. The enormous losses experienced by the agricultural areas, with the loss value reaching Rp 1.326 trillion (43%) of the total losses, followed by industrial and Micro, Small, and Medium Enterprise (MSME) losses of Rp 382 billion (12.4%) of the value of losses. Of the total, cultivation and crop agriculture remain the most affected sectors, with a total value of Rp 1.326 trillion, which represents (31.4%) of the total value of damages and losses. From the impact of this disaster on a regional basis, Sleman Regency is the most affected area. It is estimated that about 65% of damage and losses are experienced by the Sleman Regency, followed by the Magelang regency, which receives about 15% of the disaster impact (BNPB, 2011).

Natural disasters that periodically occur in Magelang as a result of the eruption of Mount Merapi will have an impact on the availability of land for the development of superior commodities in the area of the district. The impact of Mount Merapi's eruption on superior commodities development in Magelang city is a problem to be discussed in this study. This study aims to determine the capability of agropolitan agents in leading commodities as well as the magnitude of the impact of the Mount Merapi disaster on superior commodities in the city of Magelang. Records of this research survey investigate the rules of capital structure on the performance of agriculture firms by performing performance modeling based on data collected through a survey in South Africa. This research approach uses the equation model structure, where the observed capital structure has a positive and significant influence on the performance of agriculture firms (Chisasa, 2015). Agribusiness youth actors have substantial roles in extending private agriculture. It is rising, especially in agrarian advocacy, alternative agribusiness dissemination, initiation from the innovation of adaptive non-agricultural enterprise, and institutional development. The approaching model of agriculture by young agribusiness doers is pluralistic, which combines several methods. The counseling content includes complex adaptive systems and ecological agribusiness that integrate socio-systems, ecosystems, and geosystems (Setiawan, Sumardjo, Tjitropranoto, & Satria, 2015).

The same study conducted in Padang City on freshwater fisheries agribusiness proves that the results of descriptive statistics on 284 communication behavior of agribusiness actors accessing information are generally in the low category. It is indicated by the low quality of information services, social interaction, the level of participation, and the ability to perform agribusiness. It

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shows some positive things in implementing information (Oktavia, Muljono, Amanah, & Hubeis, 2017). Besides, Mäkinen (2013) mentioned that dairy farming studies concerning farmers' managerial thinking and the management process's effectiveness contribute to agricultural profitability. It was concluded that it is crucial for good performance that farmers have a clear vision to develop agriculture with business and investment plans. Successful farmers also have strong confidence in their managerial skills, a strong emphasis on instrumental and intrinsic value, and a high appreciation of agriculture as their job. Research on aloe vera in Pontianak shows that performance in each value chain actor has effectively worked so that consumers feel the best service of the received product is when farmers increase their competitiveness and profit level. This research has five areas of concern: marketing, production, finance, infrastructure, and management. Marketing deals with how products are sold and distributed to customers. Production is the ability to maintain supply and improve commodity quality. Finance will determine commodity sales. Infrastructure is the ability of commodities to reach customers because of good facilities and other supporting instruments. Management is the science of developing and creating opportunities for both parties to get a good system for production and consumption (Hartono, 2017).

Strzębicki (2015) said that electronic commerce (e-commerce) greatly influences companies and agribusiness in Poland. Agribusiness companies use e-commerce to strengthen positions and benefit from electronic commerce. There is a demand to use electronic commerce in the agribusiness sector in Poland. Public markets, public consortiums, private property, and information links between organizations can replace traditional transactions and compete with each other. Thus, it is challenging to predict electronic trading solutions within the scope of agribusiness in the future. Research on carrots and chili on the slopes of Mount Merapi has a comparative impact and can be developed for the community's future. The demand for carrot and chili commodities is quite profitable, as evidenced by the selection of domestic production rather than imports. It is to ensure the sustainability of horticulture agribusiness areas development having post-disaster volcanology.

In Merapi, there are several strategies that include the government policy regarding the protection of carrot and chili commodities, subsidies to reduce the issue of carrot price increases, the ban on the import of carrots and chili, and the provision of facilities for carrot and chili production infrastructures. The policy will improve socio-economic conditions and ensure future security for communities living around Mount Merapi (Antriyandarti, Ferichani, & Ani, 2013). The previous study in different areas was done in Banyuwangi, East Java which discussed the potential of a coastal area. The study is expected to produce an agroindustry of cluster model to develop the agroindustry and strengthen the regional information system (SIDa). The sequence of agroindustry MSME development is to implement development policies, improve the quality and quantity of labor, increase export activities, innovate technology, increase investment, and raise the value of goods production (Putri, Annisa, Ningrum, & Mursid, 2015). The problems and challenges of the Lockyer Valley flood disaster in 2011 have been reviewed and discussed in this paper focusing on community resettlement. To avoid the risk of future floods, a focus is needed on the formation of motivation for sustainable development in the community. More extensive, continuous focus and further investment are needed to determine how hazard risks can be mitigated during the repairing process (Okada, Haynes, Bird, van den Honert, & King, 2014).

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Studies on handling disasters in the agribusiness sector are still limited. This research gap seeks to find out about the factors that build the competitiveness of agribusiness actors in areas affected by volcanic disasters. The direction of this paper provides a scientific study of sustainable development mode rooted in infrastructure reliability of socio-economic aspects and superior commodity productivity in Magelang District. Therefore, the strategic impact of this paper is as a strategic study of infrastructure and economic aspects of the volcanological disaster productive zone.

LITERATURE REVIEW

The crucial agribusiness sector is made up of several mutually supporting sub-sectors. The agribusiness sub-sector is coordinated in its capacity to provide basic needs, thus making the industry even more complex. This complexity will accommodate the sector's economic, social, and environmental issues, creating many challenges in its business value chain. Furthermore, fundamental uncertainties originating from nature, such as climate risks, weather changes, and the potential for natural disasters such as earthquakes and volcanic eruptions, add to the complexity of management in the sector, especially in disaster management (Sarrazin et al., 2019). Trade in agricultural products is developing in line with infrastructure needs because an increasing population lives in urban areas. There is a flow of food distribution needs from villages to cities. The agribusiness sector's demand for adequate transportation, processing, and distribution is increasing. National and local government policies and regulations strongly influence bridging the resolution of challenges in this sector. Besides, their properties and effects can have very different dimensions (Gunderson, Boehlje, Neves, & Sonka, 2014). Agribusiness has a strategic position in an agrarian country environment which includes all activities from the procurement of agricultural inputs to the marketing of agricultural products or processed products. Farmers become frontline fighters in the agribusiness sector. In his capacity as an agriculture entrepreneur, a farmer is a leader, a field worker, and at the same time, an investment thinker (Hermawan, Nabila, Sartono, Suharmanto, & Suratno, 2017). A farmer needs to look again at the support of resources such as technology, access to finance, and agricultural management and assess the risk of crop failure and damage due to natural disasters (Hallegatte, Vogt-Schilb, Bangalore, & Rozenberg, 2016).

Agribusiness will become a dynamic business, which requires farmers to be able to project agricultural financial situations to gain agrarian benefits. In line with agribusiness's concept, agribusiness development's direction is to encourage potential geographical investments to develop by involving agribusiness entities. This need will be related to regional and sustainable joint development (Antriyandarti et al., 2013; Sartono, Hermawan, & Maghfuriyah, 2018). In the agribusiness sector, losses will usually be in the form of damage to cultivation products due to disasters and damage to irrigation infrastructure. Other losses are loss of business opportunities due to changing market tastes and demands, environmental pollution (soil and irrigation water), and disasters (Naruetharadhol, Ketkaew, & Srisathan, 2022; Preciados, Cagasan & Gravoso, 2022). The implication in national development is that an agribusiness concept does not only focus on the need for intensification, extensification, and infrastructure support but efforts to build social information related to iconic commodity information and viral marketing. They are the needs of agribusiness network actors, especially in disaster prone zone, fast interaction on social media combined with a high public focus on the sustainability of the agro-food sector. Social media brings

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together commercial, political, and public interests. Social media is essential in managing agro-food sustainability (Dell'Angelo et al., 2021; Stevens, Aarts, Termeer, & Dewulf, 2016). A farmer needs to look again at the support of resources such as technology, access to finance, and agricultural management and assess the risk of crop failure and damage due to natural disasters (Binswanger-Mkhize & McCalla, 2010; Mondal & Palit, 2022).

Many previous studies agreed that the dominant agribusiness development is in rural areas. Farmers with limited knowledge are required to calculate risk-taking related to conditions caused by climate change and other natural disasters. In the example of the previous study, a flood problem impacted the agricultural sector in Vietnam and Haiti (Gunderson et al., 2014; McGreevy & Adrien, 2022). Despite the problems in the study's disaster risk assessment on flood management due to climate change, there are similarities, including the crucial availability of infrastructure and the role of technology in disaster management. In Indonesia, geolocation issues such as the development of a national communication ring, cheaper internet access, and massive road and irrigation infrastructure projects are actual conditions that are relevant to developing agropolitan zones in potential volcanic disaster areas. Then, this geolocation issue becomes the originality of the study.

RESEARCH METHOD

The population of agropolitan research with farmers and agribusiness owners is spread over 21 districts in the Magelang district. Based on BPS Statistics data in 2018, there are 131,596 agribusiness farmers who are involved in various agricultural productions such as fruit and vegetables. Magelang Regency, which has an average temperature of 25.62 degrees Celcius and 82% air humidity, is an area with a cool climate type and allows some agribusiness products to thrive. Another challenge is the presence of an active volcano, the Merapi volcano. It produces volcanic ash, which fertilizes the soil. However, the eruption activity of Mount Merapi also provides destructive impacts in the form of the destruction of crops and agricultural infrastructure when the volcano disaster happens. The sample of research used to build the model has 100 respondents who are farmers who produce agribusiness plants in Magelang Regency. The sampling technique used is Cluster Random Sampling, where the quota of 4 to 5 samples is taken at every subdistrict of 21 areas. The existing sample has shown sufficient sample, because the homogeneity of sampling on farmers is at the same level of resource capability for each cluster so that it can represent the population (Saunders, Lewis, & Thornhill, 2003).

The analysis method in this research is factor analysis. In simple terms, factor analysis aims to determine some factors (variables) so that multivariate data with enough components can be explained and simplified on selected elements (Hair, Black, Babin, & Anderson, 2014).

Factor analysis model:

$$\boldsymbol{X_{ik} = \lambda_{i1} f_{1k} + \lambda_{i2} f_{2k} + \dots\dots + \lambda_{i2} f_{2k} + e_{ik}} \quad \text{.........(1)}$$

Description of the formula model:

$\boldsymbol{X_{ik}}$ = value of the i-th variable for k-observation.

$\boldsymbol{\lambda_{i1}}$ = value of the jth factor for k-observation (also called scores factor).

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f_{1k} = the relationship of the i-th variable by the j-th factor, where there is the factor m and p variable, m <p.

Factor analysis of the sample processed using IBM SPSS 16.0. In this study, extracting the many variables of the reliability of agricultural productivity in the Magelang district is reduced to only a few variables so that by simplifying this group, it is easier to observe more simply. Analyzing the resulting factors will also result in a sequence of the dominance of interests of all the variables formed. The factor analysis method helps to find a model, a variable group of agribusiness production capabilities in an eruptive volcano-prone area.

FINDINGS AND DISCUSSION

This paper is based on respondents' perceptions to reveal factors such as what created their resilience in the agribusiness sector in disaster prone zone by the Merapi eruption. Respondents were divided into farmers and agribusiness owners. Farmers' products are divided into food, fruit, and vegetable production, including rice, corn, cassava, and potatoes. Fruit production includes avocado, star fruit, duku, durian, various types of guava, orange, mango, mangosteen, jackfruit, pineapple, papaya, banana, rambutan, salak, sawo, soursop, breadfruit, and various types of vegetables grown in this area such as mustard greens and chilies. According to Table 1, the education of respondents are junior high school (0.15), senior high school (0.01), and university (0.04). It means that the agribusiness knowledge of farmers is more dominantly provided by informal education. Knowledge in agriculture is obtained from sources outside of academic education, such as the internet and counseling. The sample of education stratum, a farmer in the Magelang district, is dominated by the junior high level, representing the majority of farmers in the Magelang Regency.

Table 1. The research data sample profile

Profession	Education			Total
	University	Senior High School	Junior High & Elementary School	
Farmers	1	1	27	**29 (29%)**
Agribusiness owners	3	15	53	**71 (71%)**
Total	**4 (4%)**	**16 (16%)**	**80 (80%)**	**100 (100%)**

The discussion in this paper is to find scientific facts about the factors that form the capability of agribusiness production. The main challenge is the presence of Mount Merapi, an active volcano that requires a disaster recovery approach at the time of the eruption. Mount Merapi erupted several times from 1953 to 2010, and every explosion resulted in losses due to crop failure and damage to infrastructure and access to communications. It requires the measurement of production capability in this eruption zone, given the limitations of the farmer's model impacts on the acceleration of the sustainability of production, how fast the farmers to re-plant, and how quickly the farmers can get the harvest after the eruption is a capability that will be revealed in this paper. Execution using factor analysis, variables will be clustered if the variable is correlated with other variables that fall within the group of certain factors. Several aspects examined in this study are the capabilities of infrastructure, social, economic, communication, institutional, innovation,

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proactive, intensification, and extensification. This study also analyzed the induction of macroeconomic conditions on the capability frames of farmers and agribusiness owners in the Magelang District.

Table 2. KMO and Bartlett's Test

Test	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.520
Bartlett's Test of Sphericity	
Approx. Chi-Square	331.086
Df	91
Sig.	0.000

The result of the anti-image correlation value in Table 2 is 0.5. It will provide the intention that all variables on infrastructure, social, economic, and agropolitan factors are feasible for factor analysis. The results of the anti-image correlation test on 14 variables tested in the model and all those variables have values above 0.5. The sample adequacy test is done through the Kaiser Meyer Olkin Measure of Sampling Adequacy (KMO) value. The KMO value of the data is 0.520, greater than 0.5. It means that the samples taken are as many as 100 respondents with variable units of as many as 14 variables, which is quite feasible to be analyzed. Bartlett's Test of Sphericity = 331,086 and Sig. = 0,000 indicate that the correlation matrix is not an identity matrix, so it is eligible to enter into the model.

Table 3. Rotated Component Matrix

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	Variance	% Cum	Total	Variance	Cum	Total	Variance	% Cum
1	2.342	16.730	16.730	2.342	16.730	16.730	2.304	16.459	16.459
2	2.073	14.809	31.539	2.073	14.809	31.539	1.968	14.060	30.519
3	1.495	10.676	42.216	1.495	10.676	42.216	1.517	10.834	41.353
4	1.310	9.357	51.572	1.310	9.357	51.572	1.431	10.220	51.572
5	1.142	8.158	59.731						
6	.981	7.009	66.739						
7	.878	6.271	73.010						
8	.845	6.038	79.048						
9	.738	5.273	84.320						
10	.655	4.679	89.000						
11	.566	4.040	93.040						
12	.533	3.806	96.846						
13	.374	2.674	99.520						
14	.067	.480	100.000						

Extraction Method: Principal Component Analysis.

The result of factor analysis in Table 3, the Eigenvalues are greater or equal to one. From five eligible factors, then simplified into four factors so that the focus of the discussion will be more specific. The cumulative percentage value for these three factors is 51.57 percent, which means that the three factors formed can explain the multivariate data of 14 variables more than 0.5.

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Table 4. Rotated Component Matrix of Production Capabilities

Production Capability of Agroindustry	Factor Components			
	1	2	3	4
The availability of appropriate road access	0.4541	0.3506	0.1612	0.0382
Fulfillment of standard dams for irrigation facilities	0.9110	0.1278	0.0421	0.0152
Availability of internet access for product marketing	-0.1094	0.0926	0.6194	0.2396
Transportation for product distribution is easy to obtain	0.8849	0.1467	0.0552	0.0021
Availability of knowledge referral and production assistance	-0.0302	-0.4610	0.6061	-0.1599
Awareness of knowledge of agribusiness products	0.0671	0.6365	0.1163	0.3006
Expertise on productivity	0.1659	-0.4090	-0.3660	-0.0105
Active role in the village cooperative institution	-0.3156	0.5413	-0.0579	0.2806
The motivation of farmer's entrepreneurs on production target commitment	0.1999	-0.5510	-0.0696	-0.1902
Flexibility over changes in macroeconomic conditions	0.2308	0.2300	-0.0868	-0.4887
The spirit of innovation and trying new ways of production	0.0345	0.1418	-0.7272	0.2013
Intensification and development of agricultural quality	0.4827	-0.0630	0.0896	0.3907
Productivity through production extensification	0.2254	-0.5480	-0.1089	0.2797
Proactive entrepreneurial management	-0.0183	0.3803	-0.0262	-0.7137

The result of the component rotation matrix in Table 4 indicates the formation of four factors, with the first component group consisting of a) The availability of proper road access (loading factor 0.4541); b) Fulfillment of good dam (loading factor 0.9110); c) Transportation for easy product distribution (loading factor 0.8849); d) Intensification and development of agricultural quality (loading factor 0.4827). Further in this study, the first four factors are named "infrastructure factor and production approach". The second group consists of four factors, including a) Awareness of knowledge of agribusiness products (loading factor 0.6365); b) Expertise in productivity (loading factor 0.4090); c) Active role in the village cooperative institution (loading factor 0.5413); d) farmer entrepreneur motivation to production target commitment (loading factor 0.5510) e) Productivity through production extensification (loading factor 0.548). In the formulation of this study, the five existing factors refer to domain knowledge. Hence, the second factor in this calculation's results refers to knowledge management factors' capabilities. The third group contains three factors, including a) Availability of internet access for product marketing (loading factor 0.6194); b) Availability of knowledge referral and production assistance (loading factor 0.6061); c) The spirit of innovation and trying new ways of production (loading factor 0.7272). These three factors refer to the ability of communication environment access and external party of farmers, so the third factor in this research refers to the capability of "communication convergence". The fourth group contains two factors, including a) Flexibility over changes in macroeconomic conditions (loading factor 0.4887); b) Proactive entrepreneurial management (loading factor 0.7137). Both factors show the existence of flexibility in the macro environment, and a proactive attitude refers to the capability of factor "management of change".

Factors of Infrastructure and Production Approach

The infrastructure and production approach is the first factor in shaping agricultural production capability in disaster-prone zones. They are crucial aspects in agropolitan infrastructure areas. The development refers to all physical support as a prerequisite for the feasibility of agricultural production, such as roads, irrigation channels, the adequacy of power supplies, and the availability of equipment that ensures the communication networks needed for communication and marketing support. Magelang District's roads of 1,000,830 km are currently available, covering 36,400 km of state roads, and 118,677 km are provincial roads. Meanwhile, if

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viewed from the length of the road by type of road surface is divided into three, namely asphalt road, unpaved road, and other types of roads. The accumulation of each sub-district is different. The average sub-district is Pakis and Grabag Sub-district along 76,730 km, with the total of sub-districts along 1,107,007 km. Unpaved roads are along 41,600 km, and other roads are along a length of 7,300 km, so the total type of road surface is 1,155,907 km.

On the other hand, the state roads in good condition are 36,400 km. While the provincial roads are in good condition along 63.070 km, medium conditions are along 37.857 km, and the damaged ones are along 17,750 km. Furthermore, district roads recorded in good condition are along 684,480 km, the medium condition is along 172,250 km, the middle condition is along 115,620 km, and the damaged condition is along 28,480 km (BPS., 2017). Magelang Regency has irrigation facilities for irrigation water needs of 27,898 km. The availability of infrastructure and non-degraded roads is crucial to support the flow of fertilizer, agricultural equipment, and agricultural product distribution to target markets promptly, where some of the vegetable products must arrive at the market or consumers as well as in fresh conditions. Dam infrastructure and decent irrigation facilities will ensure an adequate water supply until harvest is obtained. As mentioned in this first factor, the production approach is the intensification of agriculture, which are; the motivation to develop the production value through the improvement of the quality of fertilization, the selection of seeds, and post-harvest handling based on the quality standard. Infrastructure has been embedded in the agribusiness context, which is used for distribution channels from rural to urban areas. Damage to dams, irrigation, and pathways due to disasters has a fatal value, so if a disaster occurs, restoring roads to ensure the path of food logistics distribution is a strategic necessity, this is in line with research (McGreevy & Adrien, 2022)

Knowledge Management

The capability of the knowledge management aspect in agriculture refer to the understanding of knowledge products, customer knowledge, and managerial knowledge. Agribusiness actors must understand the planting type, the planting season's character, the duration of fruit maturity, pests and weeds that pose a threat to vegetable products, and what products become competitors. Understanding the product will be a competence of a farmer who also doubles as a superior agribusiness entrepreneur. Customer knowledge is related to the position of farmers as entrepreneurs who deal with many customers to conduct transactions of their products, the ability to understand customers will provide benefits in the form of strengthening bargaining power when making transactions. Strength in understanding the character of the customer will optimize profit. Managerial knowledge is related to stock buffer management and materials management, such as "first in, first out management". The initial product in storage should be sold immediately to avoid fruits or vegetables being too ripe or rotten. In harmony with the study of Osterman et al. (2021), one way to recover from the damage caused by a disaster is to build knowledge to improve management and create acceleration for growth. Knowledge management as learning material is needed to catch up and build effectiveness in agribusiness management.

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Communication Convergence

This third factor in communication convergence refers to the media convergence concept, which emphasizes the need for media unification, such as the internet and mass media, to be used for one purpose. In this case, it is the purpose of agroindustry in Magelang regency. Convergence is aimed at strengthening media access as a reference of knowledge for agroindustry. It also escalates farmers on how to farming intensifies, access knowledge to improve seed quality, shorten the duration of the planting process, and access information for marketing agroindustry products in Magelang regency. Convergence is needed to unseal farmers' knowledge on the internet and online transactions, which are a competitive marketing support medium. Strictly, communications convergence is done to encourage the creation of an agrotechnology climate. In line with the study of (Medta, Yulida, & Arifudin, 2021), it has been proven empirically that the behavior of communication convergence has an impact on increasing the capacity of horticultural farmers.

Change Management

Change management is a factor that becomes peculiar to a zone with a high physical hazard, such as an active volcano area. One of the critical characteristics of capability is change management, flexibility needed to bridge unpredictable variables due to changing conditions of the natural environment, national macroeconomic changes, and the emergence of new technological trends in agriculture. The prominent thing is the flexibility in the event of an eruption, where conditions become uncontrolled, like crop failure, agricultural land damaged by eruption material, uninterrupted access to road distribution, and unexistent market access. Agribusiness actors should immediately define alternative measures to bridge production sustainability so that change management is the essential pillar in shaping agricultural capability in disaster-prone areas. The Cross Tabulation shown in Table 5 analyzes the relationship between agricultural land distance and Mount Merapi with a Chi-Square value of 18.994 with a P-Value value of 0.001 or more than 0.05. It can be concluded that there is a relationship between the distance and recovery speed of harvest.

Table 5. Flexibility Cross Tabulation of Changed Management

The distance from ricefield to merapi mountain (the point of hazard)	Distance	Disaster Recovery Acceleration of Harvest			Total
		0-4 Month Fast Recovery	5-8 Month Medium Recovery	9-12 Month Long Recovery	
	Near	2 (3.10%)	11 (16.90%)	16 (24.60%)	29 (44.60%)
	Medium	9 (13.80%)	10 (15.40%)	8 (12.30%)	27 (41.50%)
	Long	7 (10.80%)	1 (1.50%)	1 (1.50%)	9 (13.80%)
	Total	18 27.70%)	22 (33.80%)	25 (38.50%)	65 (100.00%)

The agricultural land with the most significant distance is 75 km from Merapi, and the closest farmland distance is 1 km from Mount Merapi. The most relative distance is between 0 km to 25 km, the medium distance between 26 km to 50 km, and the farthest distance from Mount Merapi is 51 km to 75 km. It reaffirms the importance of change management by agribusiness actors since physical hazard phenomena such as volcano disaster is unpredictable. In line with the opinion (Niroa & Nakamura, 2022; Van Manen, 2014), the ability of farmers is needed to respond flexibly to the presence of a disaster with readiness to change capabilities that will have a reliable impact

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on agribusiness in disaster volcano affected zones. Farmers must create ways and access to finance and sufficient knowledge to build change management.

CONCLUSION

The capability of agricultural production in zones with volcanic disaster risk, as in Magelang Regency, is a crucial aspect to be revealed. It is related to the survival and sustainability of agribusiness farms. Volcanic disasters of volcanic eruptions, producing long-term volcanic ash fertilizing the soil, will also impact crop and infrastructure damage when a disaster occurs. The result of the research concludes the reliability of agribusiness production in the zone with a physical hazard of disaster occurrence built by four determinants in the form of support of production modernization, knowledge management, communication convergence, and change management. The four factors are theoretical implications in the body of knowledge in the agribusiness disaster management areas. The practical implications for maintaining food supply during a disaster, policymakers must ensure that the road infrastructure that connects supply sources and agribusiness markets is not broken. It also needs to repair damaged irrigation lines immediately, ensure access to communication channels is available, and provide a stock of commodity management knowledge by deploying an agricultural counseling team.

LIMITATIONS & FURTHER RESEARCH

The limitations of this paper only stop at creating constructs that are relevant to the needs of disaster management in the agribusiness sector in areas affected by volcano disasters. The constructs produced in future research need to be further tested as variables in the empirical model to determine their impact on agribusiness performance.

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