Formation of Farming Community Resilience Models for Sustainable Agricultural Development at the Mining Neighborhood in Southeast Sulawesi Indonesia

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Abstract: Although the exploration of mineral resources and industry can promote economic development, it can also threaten the resilience and well-being of the environment, health, ecosystems, and the comfort of surrounding communities. Therefore, business entities, through corporate social responsibility (CSR) or other activities, can function to balance negative impacts and strengthen sustainable development that can increase the resilience and welfare of the surrounding community. This study aims to develop a resilience model of the local farming community resilience (FCR), which supports the sustainability of agricultural development. The research will be carried out in a community in Southeast Sulawesi, Indonesia. This study measures the resilience of the farmers’ community. To obtain models and instruments that are valid and reliable, the instrument is tested on 295 respondents in 10 villages adjacent to the nickel mining industry using the Partial Least Square-Structural Equation Modelling (PLS-SEM). Out of the 17 items, five dimensions (e.g., economic, social capital, environmental, community competence, and information and communication) are proposed to measure the FCR. Thus, this work presents a complete scale development and can provide policies for governments, particularly in Indonesia. Moreover, the FCR scale might be utilized by different entities (e.g., NGOs, open experts and social group media) to determine the view of genuine clients regarding the association’s CSR execution.

Keywords: corporate social responsibility; farming community resilience; sustainable agriculture development; mining industry

1. Introduction

Although mining projects can provide community welfare, mining activities can have an impact on community resilience for the future [1]. Several previous studies have examined the impact of mining. For example, Hudayana and Widyanta [2], and Kurniawan, Murayama and Nishikizawa [3], determined the impact on social turmoil and environments caused by the nickel industry. Irawati, Andi Agustang, Muhammad Syukur [4] observed the disturbance in marine life, the turbidity of coastal waters caused by mining activities, increased incidence of soil erosion due to damage to land cover crops that resulted from land clearing activities, and the erosion of topsoil because of nickel mining activities. Furthermore, according to Corral, Melanie and Earle [5], large-scale mining has a negative impact on the environment. Environmental damage occurs in several aspects,
namely: (i) air, (ii) crops, (iii) damage to water catchment areas, (iv) land and main crops, and (v) human health. Coal mining also has a negative impact on land, water, air, worker health, and social impacts [6].

The United Nations (UN) Sustainable Development Goals (SDGs) framework offers further opportunities to explore how the mining sector can operate, taking into account social, economic and environmental values. The mining industry can have both positive and negative impacts on the SDGs. Mining can drive economic development by providing job opportunities for the local community, developing new businesses and the local economy, increasing government fiscal revenues, and leading to the construction of infrastructure. Mining also contributes directly and indirectly to the providing of technology, infrastructure, energy and agricultural materials. Knowledge on the local culture, political, social and economic context is very useful from the perspective of stakeholders, including the local community [7]. Multi-stakeholder participation promotes the sustainability of mining operations and has an impact on community welfare and sustainability [8].

The nickel mining industry is a major national project that has been operating in Southeast Sulawesi since 2015. This company invests as much as USD $1.4 billion or around Rp 19.6 trillion. This investment will be used for the construction of a factory with 15 furnaces with a smelter production capacity of 600,000–800,000 tons of nickel pig iron per year, with a nickel content of 10–12%. This company is the largest nickel smelter in Indonesia. Until the end of 2018, it had contributed 142.2 million US dollars to the exports of the Republic of Indonesia. This mining currently employs 2300 local residents. In addition, nickel mining in Pomalaa, Kolaka Regency, Southeast Sulawesi, produces nickel with low carbon content (below 1.8%) and high grade (above 1.8%), and has a mining area of 6000 hectares (ha). The company has been operating since 1975. The industry has an impact on its surrounding community. This situation has led to changes in the local social, economic, and ecological systems, especially around areas close to group activities, which include 12 villages or mukim areas, which give an immediate impression to the local community, amounting to approximately 33,966 people [9].

The negative impact experienced by the communities around the mining industry is also felt around the world, as reported by previous researchers. Thus, researchers are driven to consider how people can adapt, socially, economically, and environmentally, to the changes in their surroundings. Wilson [10] argued that communities must have resilience and should adapt to environmental changes. Hence, several strategies and approaches are needed. According to Brown and Westaway [11], in terms of the importance of community resilience in the face of disasters, the community must increase its capacity in adapting to a disaster. Many environmental changes will be encountered. Hence, adaptation and learning are needed from within and from other agencies. The literature review has recommended four dimensions. Economic development, community competence, social capital, and information and communication are needed to increase community resilience. Kaye-Blake, Stirrat, Smith and Fielke [12] stated that community resilience tends to be more influenced by economic and institutional drivers rather than social, cultural, or environmental ones. The research was conducted using mixed qualitative and quantitative methods. Mixed methods are useful in policy-based research [13] and resilience research [12]). Meanwhile, Tambo and Wünscherv [14] reported the measurement of climate resilience by measuring household resilience in terms of climate shocks and by assessing the role of farmer innovations in enhancing climate resilience with equal and unequal weights. We recommend an approach that integrates farmer resilience seed systems with the formal system in general, but with a specific focus on strengthening social networks, thereby promoting farmer enterprises and crop adaptation practices at farm scale. Kansiime and Mastenbroek [15], and Tambo and Wünscher [14], reported the measurement of farmer resilience from a climate shock by assessing the role of farmers’ innovation in increasing resilience and considering income and access to food, access to basic needs, services, safety nets, assets, and adaptive capacity.
Simionescu [16] suggested that corporate social responsibility (CSR) practices in sustainable mining can result in social-, economic-, and environmental-based development for the community. In the context of community resilience, Magis [17] and McCrea et al. [18] argued that community resilience was closely related to community welfare. Community resilience is related to the community’s ability to face various changes. That is, community development can be achieved if a group of individuals and communities have the resilience and ability to adapt to change, whether it is caused by humans or natural factors [10]. Therefore, mining activities through the CSR program play a role in building resilience and local communities [19].

Previous studies investigated community resilience, such as community resilience to, and disaster recovery from, natural disasters and bad weather [20]. The strategies used by some small farms to improve resilience include facing economic, social, and environmental disturbances [21], the effect of CSR [1,22], observing community resilience from space using nighttime lights to model economic disturbance and recovery patterns in natural disasters [23], environmental change, and the livelihood resilience of farmers [24]. Given the case in Indonesia, as a nickel mining center in Southeast Sulawesi, this study constructing a farmer resilience model in supporting agricultural development around industrial mining.

2. Theory and Literature Review

2.1. Definition of Individual and Community Resilience

The concept of endurance comes from the physical realm and was originally used to describe the physical properties of objects. Subsequently, the social science field uses the concept of resilience to refer to individuals and communities [25]. Community resilience is currently also discussed in the disciplines of psychology, ecology, engineering, emergency management, public health, medicine, disasters, politics, and geography [26]. The word “resilience” is a term and concept that is generally understood as the ability to recover from a disorder [27]. Resilience research is widely used in four main research areas, namely, psycho-social, ecological, disaster relief, and engineering [27,28]. Resilience includes two related, but somewhat different, ideas. One is the idea that a system can be resilient either by actively rejecting, changing, or by “bouncing back” from the disturbance and restoring it to a previous state, whereas the second idea of resilience is about adapting to change while maintaining a previous identity [27–29].

In a community context, resilience involves the ability of a group or community to cope with external pressures and disturbances as a result of social, political and environmental changes [30]. When resilience, such as sustainability, is considered multi-dimensional [29], then the aspect of resilience also includes economic, environmental, social, and other dimensions. The same thing is interpreted by Pfefferbaum [31], that is, community resilience refers to the ability of community members to take meaningful, deliberate, and collective action to remedy the impact of a problem, including the ability to interpret the environment, intervene, and move on. Resilience is conceptually related to sustainability by involving people, social systems, and institutions that are resistant to disturbance [17,22]. Community resilience also refers to the process that links adaptability after disruption [32]. Thus, community resilience is internally related to community welfare, in relation to quality of life or community function [1,33].

2.2. Dimension of Community Resilience

In the context of environmental change due to global and natural disasters, Cutter et al. [34] reported the dimensions of community resilience assessment, namely social aspects, economic resilience, institutional resilience, infrastructure resilience, and community capital resilience. This opinion is supported by Stewart et al. [35], in which the dimensions of infrastructure resilience, economic and social resilience are the main indicators for increasing the resilience of communities affected by natural disasters. Meanwhile, Berkes and Ross [36] reported nine dimensions of community resilience, namely, social networks,
community infrastructure, economic diversity and innovation, leadership, knowledge, skills and learning, administrative involvement, interpersonal relationships, positive views, values and beliefs, and non-governmental organizations.

In the context of mining activities and mill operations, Walton, McCrea and Leonard [8, 33, 37] reported the three dimensions of community resilience assessment, namely, community action, collective effectiveness, and community adaptation. Meanwhile, Rela et al. [1] tested the dimensions of community action; collective orderliness; and community, social and environmental adaptation. In the context of community resilience in rural areas, Payne et al. [38] and William Kaye-Blake et al. [12] identified and assessed the resilience dimensions and thresholds in New Zealand with five dimensions, namely, social, economic, cultural, environmental, and institutional. Brown and Westaway [11] added the dimensions of Community Competence, Mobility, Information and Communication in addition to socio-economy in a study of agency, capacity, and resilience to environmental change: lessons from human development, well-being, and disasters. Ropp and Belt [39] reported that five individual resilience themes emerged: (1) adversity persistence/perseverance; (2) contextual awareness (e.g., picture making; visualizing and assessing problems and synthesizing decision strategies); (3) self-directed/learning autonomy; (4) change management and innovation, and (5) social connectivity (peer relationships). The farming community resilience (FCR) model (Figure 1) is presented, and the indicators of each dimension can be seen in the Table 1. In this study, a standard scale development process based on the methodology offered by Turker [40], which is a new multi-item scale and indicator for measuring FCR, is designed. This process includes items that are previously used in the literature on FCR. The selection of FCR dimensions refers to the context of community, farming, and livelihood resilience of individuals and households.

Table 1. Resilience dimensions.

| Author (Year)               | Context                        | Dimension                                                                 |
|-----------------------------|--------------------------------|---------------------------------------------------------------------------|
| Kangogo, Dentoni and Bijman (2020) [41] | Farmer Resilience              | Farmer entrepreneurship, membership in farmer organization, and farmer-buyer relationships may influence farmer adaptive capacity and thereby farm resilience. |
| Rela et al. (2020) [1]     | Community Resilience           | Community action, collective, and community adaptation                     |
| Ropp and Belt (2020) [39]  | Individual Resilience          | Adversity persistence/perseverance; contextual awareness (visualizing and assessing problems and synthesizing decision strategies), self-directed/learning autonomy, change management and innovation, and social connectivity (peer relationships). |
| Payne, et al. (2019) [38]  | Community and Rural Resilience | Social and cultural, economic development community competence, mobility, information and communication |
| Chen, McCabe and Hyatt (2017) [42] | Individual Resilience        | Psychological health, individual safety, and psychological well-being    |
| Tambo and Wünscher (2017) [14] | Farming Resilience            | Income and food access, access to basic service, safety net, asset, adaptive capacity, and stability |
| Fan, Yosef and Pandya-Lorch (2019) [43], and Sanginga et al. (2009) [44] | Farming Resilience            | Innovation/information, economic, and environment                        |
| Speranza, Wiesmann and Rist (2014) [45] | Livelihood Resilience of Individual/Household | Endowments/entitlements; human capital—literacy level, knowledge experience, skill, health condition; financial capital—income/yields, labor income; social capital; physical capital; natural capital |
| McCrea, Walton and Leonard (2014) [37] | Community Resilience          | Strategic thinking (planning, visioning, leadership, positioning, learning, harnessing and using information, succession planning), links within communities and bridging links to the community, effective use of resources, commitment and perseverance, trusting and respectful relationships (trust, openness, transparency, mutual respect). |
| Brown and Westaway (2011) [11] | Community Resilience          | Social and cultural, economic development community competence, mobility, information and communication |
| Magis (2010) [17]          | Community Resilience           | Development of community resources, engagement of community resources, active agents, strategic action, collective action, equity and impact |
| Darnhofer, Fairweather and Moller (2010) [46] | Farmer Resilience             | Ecological, economic, and social domains                                 |
| Milestad and Darnhofer (2003) [47] | Farm resilience               | Buffer capacity, self-organize, capacity for learning and adaptability   |
| Koliou et al. (2020) [48]  | Community Resilience           | Physical, economic, social                                               |
2.3. Sustainable Agricultural Development

Sustainable development, including sustainable agricultural development, is a commitment from world countries that must be obeyed and implemented. The implementation
of development in the past, which only emphasized the goal of economic progress, has had an impact on environmental damage and social problems. The sustainable development approach is essentially a development activity that combines economic, social and environmental aspects [49–51] Meanwhile, Salikin [52] stated that agricultural activities are carried out to maximize the social impact of the use of biological resources by maintaining the productivity and production efficiency of the agricultural commodities produced. Sustainable agriculture also pays attention to the importance of maintaining environmental quality and maintaining the productivity of available resources to meet present and future needs. Furthermore, according to Salikin [52], the goal of sustainable agriculture is to increase the quality of life by applying seven types of activities, namely: (1) increasing economic development; (2) prioritizing food sufficiency; (3) increasing human resource development; (4) increasing self-esteem; (5) empowering and emancipating farmers; (6) sustaining environmental stability (safe, clean, balanced, renewable); and (7) focusing on long-term productivity goals. Thus, welfare can be improved by paying attention to economic, environmental, and social aspects. Moreover, Salikin [52] considered the five dimensions of sustainable agriculture development, namely: (1) ecology; (2) economic feasibility; (3) cultural appropriateness; (4) social awareness, and (5) a holistic approach.

The concept of sustainability is now a core element of government policy, university research projects, and corporate strategy [53,54]. Sustainability can also mean dynamic, sustainable development, driven by human expectations about future opportunities, and is based on current economic, ecological, and social (EES) problems and information [55]. “Agricultural sustainability,” which is the sustainability of agricultural systems, is of paramount concern in order to ensure the survival and wellbeing of humans throughout the world. Sustainability is a complex issue involving multiple factors that fit broadly within economic, social and environmental areas [56].

Using sustainable agricultural practices has various economic, social and environmental benefits. Paying attention to farmers’ potential and attitudes to risk is the first step in understanding behavior to reduce environmental risks. In the practice of sustainable agriculture, the aspects of education, labor provision, agricultural extension, attitudes, social capital, risk mitigation attitudes, farming experience, and soil conditions significantly influence farmers’ decisions to adopt sustainable agricultural practices. These practices, together with integrated sustainable practices, increase crop production, income, and household assets [57]. In contrast to the opinion of Aitken et al. [58], the mining industry has caused shortages in the agricultural sector in Chile.

Agricultural and rural development is a very important issue in the European Union, which is not surprising given the fact that around 90% of the EU’s territory is intermediate and mostly rural. Therefore, the sustainable agriculture and development of these areas is a top priority for member states. Thus, the Agricultural Policy contributes to productivity growth, while meeting the needs of the society and preserving the environment. To monitor the impact of implemented actions and respond to change accordingly, a comprehensive set of indicators that covers all three dimensions of sustainable agriculture and rural development—economic, social and environmental—has been developed [59]. Wezel et al. [60] explained that the implementation of this dimension is a prerequisite for sustainable agriculture. It is developed to meet the needs of agricultural production while being environmentally friendly, socially just, and economically beneficial. Referring to the three dimensions, Arham [61] concluded six schemes for sustainable rural development and agriculture, namely: (1) capacity building of farmers in the application of sustainable agriculture; (2) land conversion for the development of superior commodities; (3) application of land intensification innovations that are effective and efficient; (4) conservation of agricultural land; (5) strengthening of farmer institutions/communities; and (6) increasing of support for business capital. Piorr [62] attempted to use the concept of sustainability by integrating various interactions among agriculture, the environment, and socio-economic conditions. However, the greatest attention is paid to the environmental dimension, which is expected considering the very large impact agriculture has on the environment.
Latruffe et al. [63], Bachev [64], and Yu and Wu [65], pointed out that the economic indicators referred to the earnings that had to be received in order to sustain at least the basic necessities of life. The main indicator in this economic dimension is the level of economic efficiency and competitiveness, as well as the magnitude and growth of added value, including profit and economic stability. The social dimension relates to the community’s need for social welfare, which is reflected in a harmonious social life, namely, the prevention of social conflicts and the preservation of cultural diversity and socio-cultural capital, including the protection of ethnic minorities. The dimension of the natural environment emphasizes the need for the stability of natural ecosystems that include biological life systems and natural materials (e.g., the maintenance of biodiversity and biological or genetic resources, water and agro-climate resources, land resources, and environmental health and comfort). The phenomenon of social, economic, and environmental changes is closely related to community resilience [66].

3. Materials and Methods

3.1. Construction of Model and Instrument

In constructing a special community resilience model for farmers, we referred to previous studies that recommended various dimensions and items for measuring community resilience. In the context of industry issues, Magis [17] stated that the community resilience dimension includes community resources, development of community resources, engagement of community resources, active agents, strategic action, collective action, equity, and impact. Then, Walton [67] divided these resources into five dimensions, namely: (1) strategic thinking (planning, visioning, leadership, positioning, learning, harnessing and using information, succession planning); (2) links within communities and bridging links to the community; (3) effective use of resources; (4) commitment and perseverance; and (5) trusting and respectful relationships (e.g., trust, openness, transparency, and mutual respect). Payne, et al. [38] and William Kaye-Blake et al. [12] identified and assessed the five dimensions of community resilience, namely, social, economy, culture, environment, and institutions, whereas Brown and Westaway [11] used social and cultural dimensions, economic development, community competence, mobility, information, and communication. The latest article from Rela et al. [1] examined the dimensions of community action, collective orderliness, and community adaptation. In the context of farmer resilience, Tambo and Wünscher [14] established six dimensions, namely, income and food access, access to basic service, safety net, assets, adaptive capacity, and stability, thereby enhancing resilience to climate shocks through farmer innovation. Based on the above research, we investigate and study the same domain in determining several dimensions and indicators based on the issues that exist in the study.

Based on the dimensions in Table 1, we propose dimensions and indicators that could potentially constitute the FCR model, and this model will be tested in this study. The FCR model can be seen in Figure 1.

3.2. Data Collection

This study was conducted in Morosi District, South East Sulawesi, Indonesia. This research targets communities living around nickel mining and processing industries and have been exposed for 5 years. A total of 10 villages has a population of 1131 people. The sampling frame of the study was based on a village that had benefitted from the CSR program (directly or indirectly benefitted). The initial minimum sample size of the study was 295, which was calculated using Krejcie and Morgan procedures [68]. The family leaders were interviewed face-to-face by researchers with assistance from local enumerators to complete the survey questionnaire. The survey was conducted with 295 respondents within the same characteristics and randomly selected from 10 villages. The proportion of the number of samples per village is based on the population data shown in Table 2. This empirical survey was started in September 2020 and ended in November 2020.
Table 2. Population and samples.

| No | Village    | Family Leader | Number of Samples |
|----|------------|---------------|-------------------|
| 1  | Mendikonu  | 120           | 31                |
| 2  | Wonua Morini | 75           | 20                |
| 3  | Besu       | 117           | 31                |
| 4  | Tanggobu   | 124           | 32                |
| 5  | Paku Jaya  | 150           | 39                |
| 6  | Tondowatu  | 91            | 24                |
| 7  | Morosi     | 104           | 27                |
| 8  | Paku       | 135           | 35                |
| 9  | Puuruy     | 123           | 32                |
| 10 | Porara     | 92            | 24                |
|    |            | 1131          | 295               |

Source: BPS (Badan Pusat Statistik) Kecamatan Morosi [69].

3.3. Data Analysis

Partial Least Square (PLS) analysis aims to obtain latent variable relationships and predict structural indicators of construction. This model was tested using reflective measurement models. According to Hair et al. [70] the criteria that must be considered in reflective measurement models are (a) internal consistency reliability, (b) composite reliability should be higher than 0.70 (in exploratory research, 0.60 to 0.70 is considered acceptable), (c) indicator reliability (indicator loadings should be higher than 0.70); (d) convergent validity (the average variance extracted (AVE) should be higher than 0.50); (e) discriminant validity. The AVE of each latent construct should higher than the construct’s highest squared correlation with any other latent construct and an indicator’s loadings should be higher than all of its cross loadings.

4. Results

This section presents the results of the scale and measurement indicators of the FCR, specifically in measuring the impact of CSR implementation on the surrounding community.

4.1. Profiles of the Respondents

The sex ratios of the respondents were dominate by male: 75.5% and 24.5% were male and female, respectively. Approximately 23.2% were less than 35 years old, and 76.8% percent were aged between 36 and 45. In terms of the educational characteristics of the respondents, 30.4% attended primary and junior secondary schools, and 39.8% attended secondary schools. A total of 87% of those classified as fulltime farmers, and 23% of percent part-time farmers, work as private and government servants.

4.2. Reliability and Validity of FCR Scale

We test the model in two stages. In the first stage, we performed the test by analyzing and considering the AVE value. If the AVE value is less than 0.50, then the outer loading is eliminated. Convergent validity is used outer loading value or loading factor. When referring to Hair et al. [71], to obtain a construct that is reliable, items that had an outer loading that was less than 0.70, but higher than 0.50 must be maintained; nevertheless, it was acceptable. Table A1 (Appendix A) describes the first stage model that has not eliminated the outer loading and AVE assessment.

Table A1 (Appendix A) and Figure A1 (Appendix B) show that many of the constructs must be considered to increase the AVE value. The AVE for the social capital dimension (AVE = 0.356), the environmental dimension (AVE = 0.436), community competence (0.401) and the information and communication dimension (AVE = 0.420) are relatively low and below 0.50. The ideal AVE value for the model is greater than 0.50 [70]. Items of EV-4, EV-6, CC-1, CC-5, SC-1, SC-2, IC-1 will be eliminated in measurement. Kwong and Wong [72] proposed that composite reliability should be greater than 0.70, whereas 0.60
was acceptable, and AVE should be 0.50 or higher [73]. Table A1 (Appendix A) shows that composite reliability is greater than 0.70. Thus, the minimum acceptable values are exceeded and good internal consistency is demonstrated for each latent construct [74].

Table A2 (Appendix A) and Figure A2 (Appendix B) depict a measurement model that has an AVE value more than 0.50. This value is obtained after removing items that have low outer loading values or issuing questions that are irrelevant or redundant [70,74]. The AVE values in Table A2 (Appendix A) are greater than 0.50 for each construct. The values are as follows: construct of economic dimension (AVE = 0.504), social capital construct (AVE = 0.555), environmental dimension (AVE = 0.553), community competence (0.589), and information and communication dimensions (AVE = 0.531). These AVE values qualify [74] for the FCR model. The items that were refined were tested to obtain the factor analysis with convergent validity, which was highly standardized. In this study, AVE was calculated to assess the discriminant validity of the five latent constructs, which ranged from 0.50 to 0.59. These data showed that all AVE values were above 0.50. The AVE value must be greater than 0.50 [75]. Then, we also tested the items using cross-loading analysis, discriminant validity, and reliability for measurement model [74,76–78] after several items were removed. The final measurement model is revealed in Table A2 (Appendix A) and Figure A2 (Appendix B).

Table 3 shows the discriminant validity of the constructs. The results indicate that discriminant validity exists among all the constructs, as observed in the loadings depicted. Moreover, the square root of the AVE between each pair of factors was higher than the correlation projected between factors, thereby ratifying its discriminate validity. Alternatively, the square roots of AVE were compared with those of the other constructs below the diagonal in Table 3. These statistics suggest that each construct is stronger in its own measurement than in the measurement of another construct [79]. The statistics also suggest that the elements of our measurements are reliable, internally consistent, and have discriminant validity.

### Table 3. Discriminant validity.

| Dimension                     | Community Competence | Economic | Environmental | Information and Communication | Social Capital |
|-------------------------------|----------------------|----------|---------------|--------------------------------|----------------|
| Community Competence          | 0.767                |          |               |                                |                |
| Economic                      | 0.220                | 0.710    |               |                                |                |
| Environmental                 | 0.033                | 0.121    | 0.744         |                                |                |
| Information and Communication | 0.189                | 0.224    | 0.139         | 0.729                          |                |
| Social Capital                | 0.269                | 0.050    | 0.116         | 0.251                          | 0.745          |

The comparison of cross-loadings in Table 4 shows that the loadings of an indicator are higher than the other loadings for its construct in the same column and row [80]. Table 4 identified that each indicator in the research variable has the largest cross loading value compared to the cross loading values in other variables.

### Table 4. Comparison of cross-loadings.

| Item  | Community Competence | Economic | Environmental | Information and Communication | Social Capital |
|-------|----------------------|----------|---------------|--------------------------------|----------------|
| CC-2  | 0.808                | 0.135    | 0.004         | 0.176                          | 0.242          |
| CC-3  | 0.849                | 0.184    | 0.077         | 0.132                          | 0.276          |
| CC-4  | 0.627                | 0.198    | −0.022        | 0.131                          | 0.086          |
| CC-4  | 0.627                | 0.198    | −0.022        | 0.131                          | 0.086          |
| E-1   | 0.119                | 0.741    | 0.144         | 0.198                          | 0.017          |
| E-2   | 0.155                | 0.737    | 0.041         | 0.138                          | −0.033         |
| E-3   | 0.140                | 0.664    | −0.023        | 0.189                          | 0.031          |
| E-4   | 0.206                | 0.695    | 0.157         | 0.114                          | 0.113          |
Table 4. Cont.

| Item | Community Competence | Economic | Environmental | Information and Communication | Social Capital |
|------|----------------------|----------|---------------|-------------------------------|----------------|
| EV-1 | 0.083                | 0.045    | 0.748         | 0.169                         | 0.081          |
| EV-2 | 0.000                | 0.029    | 0.790         | 0.051                         | 0.141          |
| EV-3 | −0.018               | 0.152    | 0.748         | 0.128                         | 0.061          |
| EV-5 | 0.028                | 0.136    | 0.685         | 0.053                         | 0.065          |
| IC-2 | 0.146                | 0.166    | 0.212         | 0.745                         | 0.228          |
| IC-3 | 0.154                | 0.161    | 0.048         | 0.760                         | 0.229          |
| IC-4 | 0.109                | 0.165    | 0.015         | 0.678                         | 0.063          |
| SC-3 | 0.249                | 0.131    | 0.112         | 0.283                         | 0.838          |
| SC-4 | 0.165                | 0.003    | 0.068         | 0.113                         | 0.792          |
| SC-5 | 0.175                | −0.098   | 0.073         | 0.119                         | 0.578          |

5. Discussion

This study develops a set of indicators and dimensions for formulating the FCR model through surveys. The constructed model consists of five dimensions—namely, the dimensions of economic and social capital, as well as those of environmental and community competence, and the information and communication dimensions—and indicators using the SMART-PLS approach. The results showed that the five dimensions contributed significantly to the FCR. Only 17 out of the 24 indicators were declared valid and reliable in establishing the model. The dimensions of the FCR are consistent with community resilience established by Rela et al. [1], Payne et al. [38], Walton et al. [67], McCrea et al. [81], Christakopoulou et al. [82] and Sirgy et al. [83]. The economic dimensions are important in the existence of the local community in terms of individual and community resilience. The availability of employment opportunities, income, local economic business, and resources greatly supports the FCR. Darnhofer, Fairweather and Moller [46] also considered the economic dimension in the context of farming resilience. Likewise, Speranza, Wiesmann and Rist [45] identified the economic dimension as a necessity for livelihood resilience. The environmental dimension contributes significantly to the FCR measurement. Important indicators were the quality of the river/well water, the treatment of noise disturbances and preservation of seawater and soil quality. The results reinforced previous research, such as that of Darnhofer, Fairweather and Moller [46]; Speranza, Wiesmann and Rist [45]; and Sanginga et al. [44]. According to them, individuals and communities cannot be sustained without a pleasant environmental ecosystem.

Community cooperation is an element that contributes to the community competencies. With the competencies, a community will be able to overcome its problems, and be creative and productive in its actions. The importance of community competencies for individual resilience was also determined by Brown and Westaway [11]. Likewise, Magis [17] provided community competence indicators, which were validated in this study. Simultaneously, the communication skills of the community, and the availability of information facilities to support its needs and businesses, have played an important role in the FCR. The results were also partly explained by the findings of Walton [67], whose research tested communities around the mining area in Australia. Further, the results were in line with Brown and Westaway [11], specifically in terms of their findings when measuring community resilience to environmental change for community well-being and disaster recovery. This empirical evidence, consistent with Sanginga et al. [44], and Fan, Yosef and Pandya-Lorch [43], used innovation to sustain farming, while Milestad and Darnhofer [47] found that learning and adaptation to the climate change is an integral part of community resilience. In summary, all of the above-mentioned dimensions support the FCR model. Thus, the dimensional FCR provides empirically significant support for community resilience.
6. Conclusions

The importance of sustainable community development, construction and operation of mining must pay attention to the dimensions of sustainable development and the resilience of surrounding community [66]. The formation of the FCR is an authentication of the resilience dimensions of previous studies, such as in the context of community resilience [11], farming resilience [14,43,44] and farm resilience [47], as well as the farmer resilience and livelihood resilience of individuals/households [45]. Thus, the FCR model is formed and adapted into a new formation of farmer resilience models, especially in the context of farmer resilience nearby mining industry activity for sustainable agricultural development. The economic dimensions have also been confirmed by previous researchers, such as [48], in terms of the integration of a “system-of-systems” that includes physical, social, and economic aspects for sustainable community resilience. Similarly, the environmental, community competence, and information and communication dimensions, as indicated by previous researchers, are essential strategies for strengthening the resilience of community [11,18,38,43]. This study integrated the different ideas of previous researchers and empirically verified them with statistical procedures. With a holistic FCR model, the conservation and mitigation of the socio-environmental systems affected by mining activities will enhance the livelihood of the local community, as suggested by United Nations Development Programme (UNDP) through SDG strategies [7,51]. In practice, holistic multi-dimensional strategies should be put into place to strengthen the resilience of the farmer community. This area of study has become an interesting topic and issue for entrepreneurs, governments, and community empowerment institutions in building farmer resilience, when facing environmental health ecosystem risks, in social, economic, and environmental contexts. In summary, mining and industrial enterprises must be balanced and harmonious with regard to natural resources and community resilience, and operate in a sustainable manner.

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Appendix A

Table A1. Construct validity in the first stage of the FCR.

| Construct Dimension | Code | Item | Outer Loading | Composite Reliability | AVE (Average Variance Extracted) |
|---------------------|------|------|---------------|-----------------------|----------------------------------|
| Environmental       | EV-1 | The quality of river/well water is maintained | 0.737               |                       |                                  |
| Dimension           | EV-2 | Noise disturbance can be controlled          | 0.718               |                       |                                  |
|                     | EV-3 | Soil quality is maintained                  | 0.741               | 0.820                 | 0.436                            |
|                     | EV-4 | Uninterrupted fauna ecosystems              | 0.585               |                       |                                  |
|                     | EV-5 | The quality of sea water is maintained      | 0.635               |                       |                                  |
|                     | EV-6 | Forest ecosystem is maintained              | 0.511               |                       |                                  |
| Economic            | E-1  | At this moment, my income is growing        | 0.741               |                       |                                  |
| Dimension           | E-2  | Creating up jobs for the community          | 0.736               |                       |                                  |
|                     | E-3  | Opportunities to establish a business in this village | 0.673 | 0.803 | 0.504 |
|                     | E-4  | Many job opportunities in the village       | 0.688               |                       |                                  |
### Table A1. Cont.

| Construct               | Code | Item                                                                                   | Outer Loading | Composite Reliability | AVE (Average Variance Extracted) |
|-------------------------|------|----------------------------------------------------------------------------------------|---------------|------------------------|----------------------------------|
| **Social Capital**      | SC-1 | The construction of physical facilities (roads, bridges, drainage) in this village has doubled | 0.297         |                        |                                  |
|                         | SC-2 | Improvements in social facilities (education assistance, health) in the village are observed | 0.396         | 0.710                  | 0.356                            |
|                         | SC-3 | Develop better cooperation between the community and government                          | 0.829         |                        |                                  |
|                         | SC-4 | Communication and public relations are improving                                          | 0.751         |                        |                                  |
|                         | SC-5 | The level of religious tolerance is maintained                                             | 0.396         |                        |                                  |
| **Community Competence**| CC-1 | Good strategy and planning are observed                                                 | 0.492         |                        |                                  |
|                         | CC-2 | Villagers can solve their problems                                                       | 0.743         |                        |                                  |
|                         | CC-3 | Mutual cooperation to overcome problems                                                 | 0.810         | 0.759                  | 0.401                            |
|                         | CC-4 | People in the village are becoming creative and productive                               | 0.631         |                        |                                  |
|                         | CC-5 | People in the village accept changes and adapt existing policies                        | 0.576         |                        |                                  |
| **Information and Communication** | IC-1 | The communication networks in the village are maintained                               | 0.519         |                        |                                  |
|                         | IC-2 | More people own and utilize communication media                                          | 0.677         | 0.78                   | 0.420                            |
|                         | IC-3 | Enhanced individual communication skills                                                | 0.737         |                        |                                  |
|                         | IC-4 | Available information to support community enterprises                                   | 0.639         |                        |                                  |

### Table A2. Construct validity in the second stage of the FCR.

| Construct               | Code | Item                                                                                   | Outer Loading | Composite Reliability | AVE  |
|-------------------------|------|----------------------------------------------------------------------------------------|---------------|------------------------|------|
| **Environmental**       | EV-1 | The quality of river/well water is maintained                                           | 0.748         |                        | 0.832| 0.553 |
|                         | EV-2 | Noise disturbance can be controlled                                                   | 0.790         |                        |      |      |
|                         | EV-3 | Soil quality is maintained                                                            | 0.748         |                        |      |      |
|                         | EV-5 | The quality of sea water is maintained                                                | 0.685         |                        |      |      |
| **Economic**            | E-1  | At this moment, my income is growing                                                   | 0.741         |                        | 0.802| 0.504 |
|                         | E-2  | Creating jobs for the community                                                        | 0.737         |                        |      |      |
|                         | E-3  | Opportunities to establish a business in this village                                  | 0.664         |                        |      |      |
|                         | E-4  | Many job opportunities in the village                                                  | 0.695         |                        |      |      |
| **Social Capital**      | SC-3 | Develop better cooperation between the community and government                        | 0.838         |                        | 0.785| 0.555 |
|                         | SC-4 | Communication and public relations are improving                                       | 0.792         |                        |      |      |
|                         | SC-5 | The level of religious tolerance is maintained                                         | 0.578         |                        |      |      |
| **Community Competence**| CC-2 | Villagers can solve their problems                                                     | 0.808         |                        | 0.809| 0.589 |
|                         | CC-3 | Mutual cooperation to overcome problems                                                | 0.849         |                        |      |      |
|                         | CC-4 | People in the village becomes creative and productive                                  | 0.627         |                        |      |      |
| **Information and communication** | IC-2 | People in the village accept changes and adapt existing policies                       | 0.745         |                        | 0.77 | 0.531 |
|                         | IC-3 | Enhanced individual communication skills                                               | 0.760         |                        |      |      |
|                         | IC-4 | Available information to support community enterprises                                  | 0.678         |                        |      |      |

Note: EV-4, EV-6, CC-1, CC-5, SC-1, SC-2, IC-1 are eliminated in measurement.
Appendix B

Figure A1. Preliminary measurement model of FCR. Source: the authors of this study.
Figure A2. Final measurement model of FCR. Source: the authors of this study.

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