

# Farmers' Rationality and Skill Preparedness to Answer the Challenges of Industrial Revolution 4.0 towards Society 5.0: A Case Study in Serang

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## Abstract

Industrial revolution 4.0 towards society 5.0 in the agricultural sector creates complex challenges that demand preparedness of farmer human resources that possess certain rationalities compatible to current development and skill preparedness with various cultural adaptation efforts. The study aims to explore the farmers' rationality and skill preparedness to answer the challenges of industrial revolution 4.0 towards society 5.0. The research was conducted in Serang City. The research results indicate that the application of agriculture 4.0 is still in the preparation stage. Socio-economic-cultural changes foster agripreneurship system amongst farmers and become an initial capital to answer challenges of the agricultural 4.0. Commercialization and modernization of agriculture brought by social changes and development have shifted the farmers' rationality map from value rationality to means-end rationality following several development stages passed. Farmers' creativity is still limited due to the lack of competitiveness and knowledge capacity with productivity-improvement orientation, but not yet efficiency-based. The farmers are relatively adaptive and flexible with the existing changes.

## Keywords

farmer; rationality; skill; industrial revolution 4.0; society 5.0

## INTRODUCTION

Industrial revolution has been known by society since the 19th century that marks a crucial social change at that time as well as the beginning of the industrialization era and the creation of industrial society. Several industrial revolution eras have been passed from industrial revolution 1.0, industrial revolution 2.0, industrial revolution 3.0, and now we are in the era of industrial revolution 4.0 (da Silveira, et al., 2021; Deguchi, et al., 2020; Fukuyama, 2018). The main characteristics of the 4th generation of the industrial revolution are the introduction

of intelligent systems and automation in industrial systems with the involvement of technology and artificial intelligence (AI), with inter-connected computerized system, cyber-physical system, and Internet of Things (IoT) that turn the systems into smart systems (Prabowo, 2019; Rahmawati, 2021; Klerkx et al. 2019; Araujo et al. 2021; Kovacs et al. 2018; da Silveira & Amaral, 2021; Arvanitis & Symeonaki, 2020).

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In the agricultural sector, the development of agricultural 4.0 is a synergistic condition from the development of the industrial revolution 4.0 where agriculture is in precision with several introductions of technology such as sensors, microprocessors, high bandwidth cellular-based communication systems, information technology, and cloud-based computerized, and big data (Harper, 2017; da Silveira, et al., 2021; Haggag, 2021; Ikhsani, et al., 2020; Kashapov, et al., 2019). This era started in the 2010s although its implementation is not concurrent in some parts of the world. The agricultural 4.0 operationalizes the operation network in a digital information system in the whole agricultural processes where processes, transmission, and data analysis run automatically. Smart Farming, smart agriculture, and digital farming are terms referring to the development of agriculture 4.0. Agriculture 5.0 will be based on robotic systems and artificial intelligence (CEMA, 2017).

Indonesia has an unequal implementation of agriculture 4.0. Several areas have agricultural system application with the fourth generation of agricultural characteristics, whereas other areas have agricultural 3.0 characteristics (Latang, 2017; Madinah, 2020; Ningrum, 2021). The agricultural sector survives with its own rationality which on the one hand can become an obstacle to progress, but on the other hand becomes a strength to be able to survive the impact of external changes (Putri, 2017, Ali et al. 2018, Fortune, 2019, Sumianto et al. 2019). The implications of capitalism and commercialization in the agricultural sector of course also have positive and negative impacts on the development of the agricultural sector (Zed, 2010, Ritawati, 2019, Rohmah, 2020, Fathurrahman, 2021). Implementing agricultural 4.0 requires big and fast changes. Agricultural revolution requires efforts of technology systems and socio-cultural transformations suitable to the development that demands new systems so that it encourages farmer society as an actor to perform changes and adaptation in various life aspects. The era creates opportunities

as well as challenges for the communities to make changes aiming at achieving quality and prosperity in the future.

Society 5.0 is a society formed through an evolution of technology systems and information and communication systems with the digital transformation that creates new value systems. It is a human-centric society where every element in society could enjoy economic development and quality life that is realized with a mix of cyberspace and physical space (Fukuyama, 2018; Wongkaren, 2019; Deguchi, et al., 2020; Sari, et al., 2021). A challenge to be coped with is how to come up with solutions to challenges and various problems that occurred from every development and transformation that has been passed to create a super-smart society (Fukuyama, 2018)

The challenges of the industrial revolution 4.0 in the agricultural sector create complex challenges that are not only in technology and economic contexts. The challenges are also in agricultural human resource capacity as the main actor in the agricultural sector management, in this case, farmers. The fourth-generation revolution calls for farmers' readiness to answer the complex challenges. At the ideological level, human resources with certain rationalities are required that is compatible to further industrial development as well as skill preparedness with various cultural adaptation efforts to be able to adjust to the existing development.

The study aims to explore farmers' rationality and skill preparedness to answer challenges of the industrial revolution 4.0 towards society 5.0 in transition farmers located in areas that experience social, economic, and cultural development. This study is important in the way it contributes in providing empirical facts about the rationality and skills of farmers to face the era of the agricultural revolution 4.0.

This research gives nuances to the existing literature on farmers and digitalization which are largely conducted in European contexts (Kashapov, N. F., Nafikov, M. M., Gazetdinov, M. K., Gazetdinov, S. M., & Nigmatzyanov, A. R., 2019; Rolandi, S., Bru-

norri, G., Bacco, M., & Scotti, I. 2021; Haggag, W. M. 2021; Magagula, B., & Tsvakirai, C. Z. 2020). It gives an empirical illustration on the stages of implementing agricultural development and how the growth of the farmer agripreneurship system and the changes in farmers' rationality and skills of farmers. It is important to explain this empirical fact to policy makers and others, so that they can formulate more realistic policies in the agricultural sector in accordance with empirical facts and existing conditions for answering the challenges of industrial revolution 4.0 towards society 5.0. The research finds that the application of agriculture 4.0 is still in the preparation stage. Socio-economic-cultural changes foster agripreneurship system amongst farmers and become an initial capital to answer challenges of the agricultural 4.0. Commercialization and modernization of agriculture brought by social changes and development have shifted the farmers' rationality map from value rationality to means-end rationality following several development stages passed. Farmers' creativity is still limited due to the lack of competitiveness and knowledge capacity with productivity-improvement orientation, but not yet efficiency-based. The farmers are relatively adaptive and flexible with the existing changes.

## METHOD

The research was located at an agricultural village in Serang City Banten Province, which is Sawah Luhur Village. The research location was randomly selected due to the existence of a transition farmer community in the village. The agricultural system applied in the location is rice field agriculture which plays a crucial role as a supplier for the Serang community's needs. The research employed a qualitative research method beneficial to deeply and completely understand how the changes in farmers' rationality and culture in the industrial revolution 4.0 towards the society 5.0. A case study research strategy was applied to explore the contemporary phenomenon that occurred in the community that corresponded to the

research problem characteristics.

The data collection methods consisted of observation, in-depth interview, and literature study. A thorough observation would be conducted on the farmer community as an individual as well as a system that possesses unique certain characteristics. The in-depth interview was with key informants, either farmers, government, business sector, or other stakeholders. The literature study aimed at exploring reference sources as the theoretical and conceptual base as well as deepening of previous studies.

## RESULTS AND DISCUSSION

### Introduction of Agricultural Development in the Research Location

Based on the performance report of the Program of Assessment and Acceleration of Agricultural Technology Innovation Dissemination, several programs have been implemented in the Banten areas in 2010-2014, among others: (1) the application of agricultural technologies by considering location characteristics that include an indicator of the number of applicable technologies. (2) creation and dissemination of agricultural innovation; the indicator was the number of innovations produced and disseminated to the farmers. (3) implementation of regional strategic programs at micro-level with dissemination mentoring activity. (4) technical mentoring and operational policies of regional agricultural development with cooperation in research, development, and utilization of agricultural innovation. (6) Coordination and synchronization of assessment operational and development of agricultural innovation, with the main indicator of the number of synergy in the examination operational and agricultural innovation development. (7) efforts to improve institutional management with the application of ISO 9001:2008. (8) efforts to enhance capacities and competencies of agricultural human resources, (9) improvement of websites and database management, with the main indicator of the number of websites and databases sustainably updated.

In 2015-2019, the agricultural development activities are set following the general policies and strategic plans. Several activities and programs focusing on agricultural technology development are (1) developing agricultural technology that could produce market-oriented agricultural commodities/products and is based on local resources development, (2) developing information techniques and computing and institutions to improve information quality and media to disseminate the agricultural innovation, (3) improving partnership and cooperation to expand business network and institutions, (4) optimally enhancing efforts in creating agricultural innovation and its implementation. (5) enhancing the effectiveness and efficiency of agricultural business and insti-

tutional management.

The introduction of development and agricultural development strategies that have been planned are far from the micro-level. The program of agriculture 4.0 in the research location seems to be in the preparation stage, with no implementation occurring. Based on the main identifying factors of agriculture 4.0, such as agricultural digitalization, no plan is available for full implementation. The implementation activity is merely a trial of agricultural digitalization in a limited business scale and relatively small scope. Likewise, efforts to develop integrative internal and external networks have not been fully conducted. Agricultural automation is merely a trial and not in a mass application. AI and Robotic utilization are far

**Table 1.** Introduction of Agricultural Development based on Its Stages in the Research Location

Agricultural Stages	Identifying factors (CEMA.2017)	Implementation in the Research Location	Description
Agrocultural 1.0	Labur intensive and low productivity	√	Applied in an era before the green revolution program from the government
	Agrricultural intensification	√	Agricultural intensification has been applied in the 70s
Agricultural 2.0	agronomic management		The implementation of agronomic management in small scale
	Product increase orientation	√	Introduce new technology to increase production, such as fertilizers and the use of pesticide
	Efficiency orientation	√	Production orientation is directed to maximize profit
Agricultural 3.0	Profit and business orientation	√	Introduction of commercial agricultural culture that replaces the subsistence agricultural culture
	Quality control exists	√	Quality control is applied to maintain commodity/product competitiveness in a market
	Product differentiation orientation	√	Business condition encourages farmers to try product differentiation
	Agricultural digitalization	-	It has not been fully implemented, the implementation, if exists, would be on a trial scale and small scope
Agricultural 4.0	Integration of internal and external network	-	A sufficient network system has not been built
	Agricultural automation	-	No mass implementation in terms of agricultural automation
	Data communication and transmission	-	Data communication and transmission has not been managed in a sufficient data system
Agricultural 5.0	Robotic	-	No robotic technology utilization
	artificial intelligence	-	AI has not been applied
	emerging new technologies	-	Technology utilization has existed, yet no robotic and AI-based technology application

from execution due to limitations in modern technology and human resource capacity.

### **The Growth of Farmer Agripreneurship System: the Shift in Subsistence Ethics into Commercialization**

Historically, Banten Province cannot be separated from the glory of the past due to the existence of the famous Banten Sultan (15-17 century). The main economy of the Banten Sultanate was the maritime economy/trade; however, agricultural sector development received considerable attention from the Sultanate in terms of fulfilling food necessities and various agricultural commodities that became crucial trading commodities at that time. Rice Field/field agriculture is subsistence agriculture aiming at fulfilling the local need for food. Agricultural development, however, has been technically conducted since the sultanate era. During the Banten Sultanate, according to the historical notes, Sultan Ageng Tirtayasa had built irrigation and opened 16 areas for rice fields, including those in the research location. Rice fields are potential in the area since it is supported by irrigation availability that has been constructed since the Sultan Ageng Tirtayasa era and is still well maintained up to now.

Social-economic changes that occurred in the area are due to several important historical events. In the past, Serang city was the center of the Banten Sultanate. It was the center of government that opened opportunities for regional development. In the perspective of the regional economy, Serang was a port city thus it became the main route of cross-regional and overseas trade. During Dutch and Japanese colonialism, Serang was appointed as a residency under the Dutch East Indies. From 1926 up to the Indonesian post-independence era, Banten was within the area of West Java Province. In 2000, Banten became a province separated from West Java province with the issuance of Law No. 23/2000. Serang City was established with the issuance of Law No. 23/2007 on August 10, 2007, on the establishment of Serang City, which was previously part of the Serang Regency area. The establishment

of Banten Province became an important milestone of social and economic changes in Serang city indicated by the rapid development in Banten. Sawah Luhur village, Kasemen sub-district is in the area of Serang City. The village has a unique development history. The area is in the Banten Lama area which becomes the center of government of the Banten Sultanate. At that time, rice fields in the village became the food barn of the Banten Lama area.

From the colonialism era to the Indonesian independence era, the village was left behind and forgotten. This was due to the agricultural sector in the area that was managed based on subsistence agriculture characteristics. Agricultural activities were conducted merely for activities in fulfilling family's or household's food necessities (rice). Since becoming part of Banten Province, the economy of Sawah Luhur village has rapidly developed. Besides becoming one of the largest rice producer areas in Serang city, the village has developed a religious or historical tourism sector, particularly in the area around the Keraton Surosuwon and Banten Lama Grand Mosque, which are the historical heritage of Banten Sultanate. The opening of the area, tourism development, and the entry of tourists from other areas are among the reasons for the emergence of new value cultural systems in the community economy, including agriculture. The new value includes agripreneurship values among farmers. This is possible due to the changes in the agricultural system from subsistence to commercial.

Since the 2000s, the rice field agricultural system in Sawah Luhur village has applied commercialization principles although in its early stage. The subsistence ethics remain, yet it is gradually eroded and is replaced by commercialization ethics. Several changes related to the changes from subsistence rice field agriculture to commercial rice field agriculture occur.

Mr. Dm (64 years old) states:

Before it became the capital, the village was quiet, remote, and people who migrated to Banten Lama were mostly in the

Keraton and the mosque. Farming was aimed at fulfilling family needs; thus, the farming activities were conducted modestly. Family members were the main workers and no paid workers were employed. Neighbors could also help and in turn, we will help them in working on their rice field. Banten Lama is getting busier, people here have understood about money; everything was valued by money; therefore, farming is aimed at generating money. If the results will be used to buy rice, that will be another problem. Gaining money is the priority.

The rapid development of religious tourism in the Banten Lama area provides employment alternatives for the villagers. Employment orientation, therefore, is not merely to the rice field agriculture but also the non-agriculture sector. This means that it creates an opportunity for technology implementation in farming that changes the previously labor-intensive agricultural condition.

According to Mr. P (49 years old) :

Workers in ricefields in this village no longer consist of family members. Although only 2-3 workers from family members used the farm, it is sufficient since plowing has used a hand tractor machine as well as harvest tool in harvesting activity. Paid workers are only used during planting. People in this village can do the

math if it does not bring any profit then it is better to work in Serang or sell in the Banten Lama area.

Rice field agriculture performed has considered commercial benefits and based on business/commercial calculation. Therefore, economic transactions conducted are profit-oriented. Some farmers make use of their capital power to market their rice yield.

According to Mr. K (57 years old)

We depend on rice to eat; however, household necessities are not just rice. Kids need school, we need to buy a motor vehicle, and want a nice house. These are the reasons why farming must generate profit. So we have to think about how we can get profit from farming instead of loss? So it depends on us to seize opportunities to gain profit. We cannot depend on other people. For example, if the rice grain price is low, don't sell them, sell them as rice at retail price (in 20-25 kg sack). Many Serang people are willing to buy freshly harvested rice since it tastes better.

Farmers at Sawah Luhur village, in this case, are able to grasp commercial business opportunities for their rice farming. This suggests that the sense of agripreneurship has started to grow and develop in the community. The growing sense of agripreneurship among the community becomes

**Table 2.** Identifying Factors of the Change from Subsistence Agriculture to Commercialization

Identifying Factors	Subsistence Agriculture	Commercial Agriculture
Economic activity orientation	Fulfilling subsistence needs	Commercial profit orientation
Relation and economic transactions	Mutually beneficial and not merely an economic consideration	Commercial/business consideration
Economic Interaction	Mutually need and fair exchange	Mutually need to gain maximum profit
Production surplus	Accumulated as critical time reserves	For investment and saving
Labor	Labor intensive	Capital intensive
Capital	Not important	Important
The use of technology	Traditional	Modern/machine technology
Productivity	Emphasize sustainability	Maximum production
Business competition	Almost none	Competition exists
Value system	Subsistence ethics	Apply Agripreneurship

an initial capital to answer the challenges of the industrial revolution 4.0. The existing change condition must be encouraged and aligned to digital technology development based on the internet of things; hence, industrial revolution 4.0-based agricultural development can answer all existing problems.

### **The Changes in Farmers' Rationality and Skills: Answering the Challenges of Industrial Revolution 4.0 towards Society 5.0**

The challenges of industrial revolution 4.0 in the agricultural sector led to the arrangement of the technology system of agricultural industry 4.0 for the achievement of optimum efficiency from the utilization of agricultural resources with more specific area targets through the support of modern/advanced technology applications. The goal is to create a more precise, profitable agricultural system that takes environmental sustainability into account. Challenges encountered in the context of agricultural resource development include the challenge to accomplish food security, how to overcome climate change and water scarcity, energy need problems, and other matters related to demography, environmental issues, and so on (Satria, 2018).

These challenges require human resource preparedness that can be analyzed from the aspects of rationality and culture underlying the community's behavior and action. The analysis of farmers' rationality changes is related to the changes in and development stages of the agricultural system and determines the farmer community's dynamic in the research location. The changes in farmers' rationality also lie in the cultural context that characterizes and underlies the community's economic activities. Comparison to such literature sources as Boeke (1973), Redfield (1985) and Hayami Kikuchi (1987), and Scott (1992) is an effort to snapshot the dynamics of farmer community as well as to explore how the changes in farmer rationality are placed in the cultural frame. Although they lie their analysis in diffe-

rent perspectives, they basically suggest a "rationality struggle of farmers' economic actions". Hayami Kikuchi, for example, indicated dilemmas faced by farmers in rural areas between traditional economic institutions and substitute institutions brought by modernization (capitalism). Boeke also illustrated the rural community condition that was "split" between keeping the existing economic tradition and involving it with the substitute of economic tradition. Similarly, Redfield described rural community culture that squeezed between small and big traditions. Scott also depicted the fight of morality economy vs capitalist. In the current research subject, the rural area experienced the situation and conditions depicted by Boeke, Redfield, Hayami Kikuchi, and Scott. It is important thus to link or compare the discussion to identify a similar pattern. It is argued that the farmer community's dynamic is often situated in a collective act frame based on culture, which is actually the result of individual actions stated by Weber as a rationality realm or a "thought process" in individuals' minds that becomes the driver. The rationality realm is a vehicle of emotional, value system (old and new), goals, and morality struggles.

The farmer community in Sawah Luhur presents a rationality map and clash of rationality from the roles the individuals play that generate socio-collective actions. The problems of rationality change link to an economy that refers to individual interest to explain a tendency of individual decision making and behaviors. To describe the rationality map of the community of Sawah Luhur Village, several points to note from the "display" of the typical transitional economic culture, among others (1) the opening access of the area and location that becomes part of the capital area of Banten Province unlock the opportunities for the application of commercial agriculture, (2) commercial and capitalistic economic culture start to internalize, (3) the opening access of the area provides employment alternatives outside the agricultural sector that leads to sharing labors from agriculture to other sectors, (4) an initial fact is that Sawah Luhur commu-

nity has a consumption pattern that tends to be homogeneous with subsistence income, yet it has changed into pursuing surplus income for both investment and saving goals, (5) the opening access of the area encourages in-migration and out-migration of productive labors. The out- and in-migration opens an opportunity for accumulated capital from outside the area for investment in the agricultural sector, (6) increased human resource capacity in the agricultural sector, (7) development of the religious tourism sector in the area allows households to apply a *straddling* strategy to make a living in different sectors as a source of income and open opportunity for capital accumulation for the agricultural sector. The implementation of agricultural modernization is consistent with agricultural development program that applies new agricultural systems, among others: (1) the changes in farming techniques with technology implementation, (2) increased agricultural commodity value through value-added, (3) the open of market for agricultural products, (4) increased trained agricultural labors.

The point is that the tendency of economic changes can be elaborated by Weber's rationality theory. According to Weber (1958), economic and social actions are related to individual actions where the rationality realm works in an individual's complicated and complex mind. There are two types of rational act, namely (1) means and rationality, which is rational actions encouraged by expectations that hang in the minds of individuals who perform the act. The expectations become a requirement and means to achieve calculated ends, (2) value rationality, which is an action that is encouraged by conscious beliefs to achieve certain goals, including aesthetic, moral ethic goals, or other behaviors beyond the non-calculated ends. Four types of rationality-based social actions exist, namely: (1) instrumental rationality-based social/economic actions that are based on conscious consideration and option and are tied to the action goals as well as tools used to achieve them. Goals, tools, and secondary consequences are rationally calculated, (2) value-oriented ratio-

nality-based economic/social actions. This rationality is oriented to important values. A means is merely a consideration object, goals are related to an absolute value system that is irrational. (3) Traditional economic/social action. This is a non-rational action and behaviors are based on habit without conscious reflection or planning and it will be gone with increased instrumental rationality, (4) effective social/economic action. This action is based on feeling or emotional dominance without intellectual reflection or conscious planning. The action is truly irrational due to the lack of logical, ideological consideration or other rationality criteria.

The agricultural commercialization and modernization brought by social changes and development, considering the studied farmers' rationality, have changed farmers' rationality map from value rationality to means-ends rationality based on several development stages passed. In value rationality, the basis of social/economic action tends to apply subsistence agriculture. The condition is visible when farmers still employ subsistence agriculture. Morality value system prioritizing safety and avoiding risks has always been placed in the efforts to maintain collectivity and the modesty of farmer life. When an agricultural system changes into a modern one, the individual farmer becomes a rational individual who always "seeks for individual existence" with profit orientation. The goal of individual existence thrives as modernism provides opportunities and media that allow individuals to compete to obtain them. For example, "farmers" who consider agriculture as "the way of life" will consider economic morality as a "rational action", whereas "profit-oriented action" becomes irrational action. Modern farmers at present have the opposite argument. In the stages of agriculture 4.0 and agriculture 5.0, the rationality underlying the instrumental economic/social actions tends to move towards means-end rationality. The current study indicates the phenomenon of rationality clash that occurs when farmers are unable to disconnect with collective cultural roots in a part of their life that continuously look for harmony and

**Table 3.** Agricultural Development Stages and Changes in Farmers' Rationality

Development Stage	Identifying factors [EAM.2017)	Farmer Rationality			Instrumental/ means end rationality
		Affective Rationality	Traditional rationality	Value rationality	
Agriculture 1.0	Sufficient food with subsistence requires active labor intensive in the primary agricultural production process	√	√	√	
Agriculture 2.0	Agricultural intensification is widely known through the expansion of various green revolution programs	√	√	√	
Agriculture 3.0	Introducing more advanced and mature stages Precision Agricultural Technology. Pay attention to efficiency and orientation profitability creatively and rely on intelligence as the key base			√	√
Agriculture 4.0	The main focus is the existence of smart technology in agriculture consisting of smart devices consisting of sensors, actuators, digital brain and communication technology				√
Agriculture 5.0	Based on robotics and (some forms) artificial intelligence				√

sustainability of an attachment, whereas the other part is encouraged by rational actions to search for individual existence.

Despite the implemented agricultural development activities and programs in the research location community, agriculture 4.0 as part of the industrial revolution 4.0 has not been fully applied due to several obstacles. The obstacles are related to the human resources aspect, uneven scale of farming (small scale on average), the low mastery of technological capacity. In terms of formal education, the highest level of education of the farmers, on average, was senior high school (SMA) but most of them graduated from junior high school. Insufficient formal education thus demands non-

formal education support. On the other hand, the application of machine technology in farming requires a certain business scale to achieve efficiency. Nevertheless, the local farmers have tried to create innovations following the current condition in order to increase productivity, both in its quality and quantity. The process of advanced and modern technology transfer has not been fully implemented in the research location. Some farmers still apply traditional methods. This is due to limitations in literacy, knowledge, and capital amongst farmers that force them to be unable to access advanced technology in the quality sector. Moreover, the research location does not have the infrastructure to apply agriculture digitalization and the

Internet of Things (IoT) in the agriculture sector.

The implementation of agricultural 4.0 towards society 5.0 demands farmers with certain skills who are capable of keeping up with current development and possess the skill capacity needed in answering modern technological challenges and a new way of life. The goal is to have farmers achieve better life quality and the agriculture sector can be a sector that fully supports quality food necessity for modern society. The preparedness in terms of rationality, skills, and culture will determine the success of the needed changes. On the contrary, unpreparedness will lead to social problems and even rationality and cultural clashes. A community that has qualified skills can prepare

itself to enter an era that can promote the occurrence of socio-economic-cultural transformation towards advancement. Based on the category of skills to be prepared for the industrial revolution 4.0 era towards society 5.0, the existing and required skills for farmers can be analyzed to identify a gap as a basis to compile change efforts.

In terms of literacy skills, farmers have no ability to collect data as a basis to understand facts; therefore decision making has not been based on the data. Consequently, the risk borne from decision-making is bigger. Farmers lack skills in operating and utilizing statistical analyses and information technology due to their insufficient mastery of basic computing and the less optimum internet network infrastructure.

**Table 4.** Preparedness of Farmers' Skills for the Industrial Revolution 4.0 Era towards Society 5.0

Category of Skill	Skills	Farmer's skills needed	Existing Farmer's Skills
Literacy Skills	Information Literacy	Farmers understand facts, numbers, statistics (simple), and data. The understanding helps them to process data, separate fact from non-fact, avoid misinformation, retrieve useful information	Farmers are not familiar with collecting data, understanding facts based on data. Farmers have no skills in operating and utilizing statistic analyses for their interest
	Media Literacy	Farmers can identify credible sources of information to find correct information	Farmers have a lack of access to sources of information due to limitations in information technology mastery
	Technology Literacy	Farmers understand information technology and computing requirement to facilitate them in continuously connecting with each other, following technological methods and applying the technology as part of a lifestyle, and adapting to the technology	Farmers are unable to embed with computing and information technology-based lifestyle
Learning Skills	Critical Thinking/ problem solving	Farmers have the critical thinking, solve problems, and can change problems into opportunities	Some farmers have possess critical thinking skills, especially those who have higher knowledge capacity. Others, however, choose 'go with the flow' way of thinking (fatality)
	Creativity	Farmers have creativity and innovation power	Some farmers have creativity and innovation, yet it is limited to the simple appropriate technological invention for small scale and locality
	Communication	Farmers have the ability to express ideas and communicate with each other to achieve common goals	Good interpersonal, intergroup and intercommunity communication has existed. However, farmers' skill to convey ideas and wills is limited by a culture of unwillingness to compete to maintain harmony
	Collaboration	Farmers have skills in cooperation, compromise, and utilizing existing collaboration	Farmers have shown skills in collaboration with the existence of some collaboration with stakeholders.

Category of Skill	Skills	Farmer's skills needed	Existing Farmer's Skills
Life Skills	Initiative	Farmers have the initiative and working ethics to do something using new and more efficient methods	A new initiative is limited to a few creative farmers. Some farmers struggle on how to work based on the efficiency principle
	Productivity	Farmers have productivity with efficiency as a base, understand strategies and the best way to achieve productivity	Less understanding of efficiency, less optimum efforts to improve productivity
	Adaptability/flexibility	Farmers can adapt to changes, be flexible in facing challenges, open up to new experiences	Local farmers are relatively adaptive and flexible
	Leadership	The establishment of professional leadership that can guide the achievement advancement	Local farmers have a good leadership system, both formal and non-formal, that can be utilized for the common advancement
	Social dan cultural Skills	The formation of social and cultural skills for sustainability and the achievement of long-term goals	Social and cultural skills are constructible for the implementation of agriculture 4.0 and 5.0

Some farmers possess critical thinking skills, especially those who have higher knowledge capacity. However, others choose the 'go with the flow' way of thinking (fatality). Therefore, creativity and innovation are limited. Communication skills and skills in expressing ideas are inhibited by an unwilling culture to maintain harmony; although some farmers are capable of establishing cooperation and collaboration with external parties for the common interest.

Farmers' creativity is limited due to the lack of competitiveness and knowledge capacity; however, creativity is shown among forward-thinking farmers who want to create a new initiative. Farmers already have productivity improvement orientation yet they have not fully applied efficiency principles. This results in less optimum profit. The improvement of local farmers' competitiveness and creativity is possible since they are relatively adaptive and flexible.

The situation demands roles from all parties to provide education and literacy for farmers to overcome the gap of mastery of skills and to have rationalities in advancing the agricultural sector in the industrial revolution 4.0 era. To answer the challenges of the industrial revolution 4.0 towards society 5.0 will require efforts to enhance literacy

skills, learning skills, and life skills to create reliable agricultural human resources. This is related to agricultural development efforts with direction and strategy that focus on answering current development challenges.

## CONCLUSION

The implementation of agriculture 4.0 in the research location is in the preparation stage. Agricultural digitalization is in the form of trial in limited scale and relatively small scope. Likewise, efforts in developing an integrative internal and external network have not been fully conducted. There is no utilization of AI and robotics due to limited modern technological implementation and human resources capacity.

Rice Field farming has considered commercial profit based on business/commercial calculation. Economic transactions are done with orientation to achieve maximum profit. Farmers have been able to seize commercial business opportunities for their rice field farming. The agripreneurship system has started to grow and develop in the community and becomes an initial capital to answer challenges of agriculture 4.0. The existing agricultural development requires

support for the implementation of internet of things-based digital technology so that industrial revolution 4.0-based agricultural development can be carried out.

Agricultural commercialization and modernization brought by social changes and development have changed the farmers' rationality map from value rationality to means-ends rationality based on several development stages passed. In the agriculture 4.0 and agriculture 5.0 steps, the rationalities underlying farmers' economic/social actions tend to be a move towards means-end rationality. The rationality clash phenomenon occurs when farmers are unable to detach some of their lives from the collective cultural roots that continuously search for harmony and sustainability of value system attachment, whereas another part of their life is forced by rational action to find individual existence.

Regarding literacy skills, farmers have no skills in collecting data as a basis to understand facts as well as skills in operating statistical analyses and computing-based information technology. Critical thinking skills have existed yet creativity and innovation are limited. They already have skills in communication, cooperation, and collaboration with other parties. Farmers' creativity is limited due to the lack of competitiveness and knowledge capacity. They possess an orientation to productivity improvement without an efficiency principle basis. Farmers' skills can be improved since they are relatively adaptive and flexible with the current changes. To answer the challenges of industrial revolution 4.0 towards society 5.0 will require efforts to improve literacy skills, learning skills, and life skills to create reliable agricultural human resources.

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