AGRICULTURE EXTENSION IN THE ERA OF INFORMATION TECHNOLOGY

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AGRICULTURE EXTENSION IN THE ERA OF INFORMATION TECHNOLOGY

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ABSTRACT

Agriculture extension of the new era has come because the need of participatory approach starting of the identification of problems, planning, implementation until the evaluation phase. the research method is descriptive use data of 2013 to 2018 related to agricultural extension in indonesia. it was concluded, agricultural extensionist in the era of information technology must have advantage to support the role as agents of change in the rural areas. Strategies to achieve these goals: first, change the conventional agricultural extensionist as a consultant able to analyze the potential of agriculture, open up opportunities for agribusiness, and play an active role in the agricultural business. second, the center of modern agricultural extension as information and innovation center based on technology and internet. third, encourage and accelerate the economic institutional of farmers with business orientation, and entrepreneurial skills. The three transformation prerequisites are met became the breakthrough for developing online agriculture extension as an effort to revitalize the function of agricultural extension services to provide information, education and support the farmers decision-making process. Therefore, the conventional agricultural extension paradigm should change immediately in the era of information technology, and leaving the old patterns of government or top down, as a driver of agricultural extension.

Keywords: agricultural extension, extension system, information technology

INTRODUCTION

The main challenge facing agricultural extension today is how to develop a sustainable approach with excellent services and to expand the message through the role of key agents of agricultural changes in rural areas. Marsh and Pannell (2002) argue that current and future extension challenge is to integrate public sector extension activities with private sector workers. Some efforts to integrate is needed: (1) developing education, training and professionalism for the public sector; (2) developing efficient and sustainable institutions to minimize transaction costs;

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Volume:03, Issue:07 "July 2018"

and (3) establishing institutional structures that ensure the effectiveness of linkages between the public and private sectors.

Such approach is needed to improve the learning and innovation of farmers to increase their capacity to organize themselves in order to produce more efficiently and market competitive products (David 2007; Davis et al. 2009; Leeuwis and van den Ban 2004). The new paradigm of extension considers that farmers are important actors in achieving sustainable development, so the extension approach used is participatory. The participatory approach provides a high role for farmers to work with extension workers or researchers to develop development programs from the stage of identifying problems, planning, implementing and evaluating them. Rhoades (1990) develops a participatory model that made the program relevant to local community conditions (Figure 1).

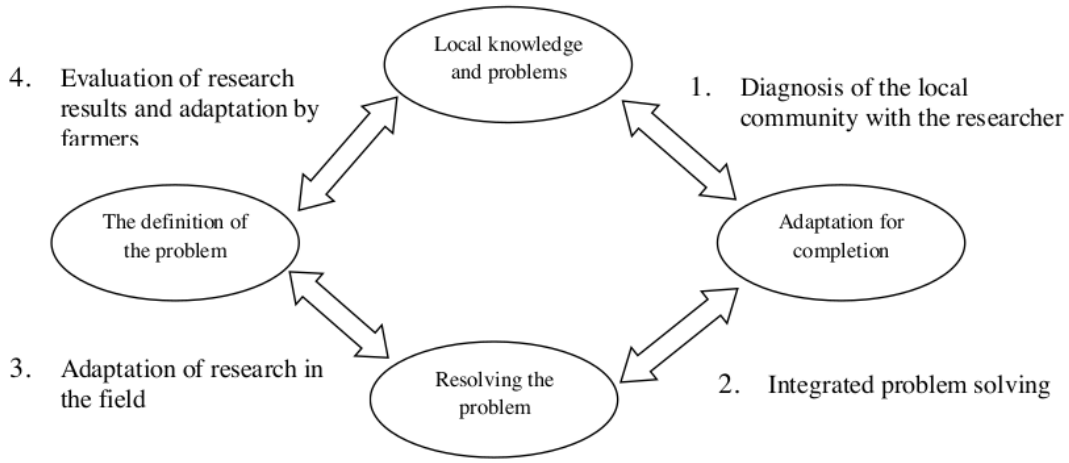

Figure 1: Farmer to Farmer Model (Rhoades 1990)

Along with the demands of the new paradigm of counseling, extension workers should be able to involve and to present in the middle of farmers to build self-reliance of farmers. Currently, the role of government agricultural extension is considered merely as a disseminator of technology and information. Whereas agricultural extension workers are demanded more towards as motivators, dynamics, facilitators and consultants for farmers (Tjitropranoto 2003; Subejo 2009). Lippitt et al. (1958) and Rogers (2003) argue agricultural extension workers should be able to diagnose problems faced by clients (farmers), establish and maintain relationships with client systems (farmers), consolidate adoption, and prevent the cessation of adoption.

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Volume:03, Issue:07 "July 2018"

Facing a variety of changes agricultural extension workers need to reform themselves to the extension agent who is able to provide solutions not just cultivation but various things related to farming. This is because the current farmers do not need an advisor, but a companion who is willing and able to provide knowledge, and involves in encouraging farmers' farming activities (Syahyuti 2014). The extension paradigm must also be shifting with demands in the millennium era that has put forward information technology as the basis of information channel and innovation and the need for extension agents to transform into consultants who have the ability to analyze farming farmers agribusiness opportunities. Based on this, it is necessary to provide new thinking about the concept of extensions in the era of information technology that are matched with current agricultural extension conditions in Indonesia.

METHODOLOGY

This research uses descriptive data from the year 2013-2018 which includes the institutional farmers, institutional extension, agricultural extension and farmers in Indonesia to shows the potential and challenges of agricultural extension in the information technology era.

RESULTS AND DISCUSSION

Agricultural Extension Conditions in Indonesia

The number of agricultural extensionist in Indonesia has decreased significantly. Agricultural extensionist of civil servants in 2001 to 2008 reduced 25 percent because of retirement, over the position, and government policy for the moratorium. Agricultural Extension Center in the Indonesian Ministry of Agriculture (2018) noted only 43,046, consisting of agricultural civil servants and contract workers (Table 1) The declining number of current government agricultural extension workers has resulted in gaps, so that thus limiting agricultural extension services in rural areas. Meanwhile, the number of farmers requiring extension services in rural areas currently reaches 57.8 million people (Table 1).

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Table 1: Number of Agricultural Extensionist and Farmers

No	Category	Agricultural Extensionist (Government and Contract) (Person)	Farmers (In Million)
1	**Quantity**	43.046	57.8
2	**Education**		
	- Basic	0	21.5
	- Junior High School	14.950	9.8
	- Senior High School	20.537	0.4
3	**Skills**		
	- Food Crops	16.971	20.4
	- Horticulture	1.025	11.9
	- Livestocks	3.660	14.7
	- Plantation	2.106	14.1

Sources: Central Bureau of Statistics (2013), Agricultural Data and Information Center (2017) and Ministry's Agricultural Extension Center

Estimates from Table 1 show that from the quantity aspect of one extension officer builds 736 farmers, from the quality aspect one expert extension builds 15 skilled and 4,200 farmers as well as on the skill aspect of one professional extension coaches 20 extension workers and 8,160 farmers. This condition illustrates that agricultural extension is no longer possible to reach farmers in extension activities, coupled with the condition of the increasing number of villages and sub-districts due to the expansion of the territory (*Permendagri* No. 39 of 2015 recorded there are 74,093 villages and 8,412 districts), so the mandate of the Act No. 19 of 2013 on the Protection and Empowerment of Peasants which states that the provision of extension workers at least one extension agent for each village is difficult to fulfill.

The same thing happened to institutional extentions of agriculture and farmer institutions. Currently the information center and extension control at the sub-district level is 5,631 units to provide guidance on farmers 'and farmers' economic institutions 660,047 units or with the assumption that one unit of sub-district level extension establishes 117 units of farmer institution in the form of farmer group or farmer group combination (Table 2). This suggests that if it continues to be enforced with the conventional function of the sub-district counseling agencies, it will have an impact on the lack of extension activities as the reach of the farmers is smaller. Limitations of extension workers as a result of the constraints of the number of farmers who are too much, the terrain is difficult to reach, the lack of operational funding extension, lack of knowledge information and the number of field extension tasks in conveying information technology innovation knowledge sustain again with the institutional conditions of counseling

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that not all have a standard together, requires a fundamental transformation effort from the government to face this challenge.

Table 2: Agricultural Extension and Farmer Institutions

No	Category	Agricultural Extension Institutions	Farmer Institutions
1	**Quantity**	34 Provinces, 536 Districts/Cities and 5.631 subdistricts	583.211 farmer groups, 63.517 farmers' groups combined, 13.266 economic institutional of farmers
2	**Quality**	54 major agricultural extension centers	6,208 economic institutions are legal

Sources: Central Bureau of Statistics (2013), Agricultural Data and Information Center (2017) and Ministry's Agricultural Extension Center

The development of extension approach that has been applied through institutionalized farmers, is expected to be a vehicle of learning and can lead to progress that moves independently. However, if not developed by a potential standardized extension agency will only be a discourse because the organizational functions of the farmer's institution cannot run, especially in organizing between farmers, extension workers and other stakeholders in the field. This is in line with Suradisastra (2009) which states that one of the functions of farmer organizations and institutions is to help establish relationships between farmers, extension workers and field researchers and improve farmers' access to information sources. Therefore, both extension counselors and extension agencies need to transform themselves to face increasingly tough challenges by using information technology that continues to grow today.

Paradigm Agriculture Extension In The Era Of Information Technology

The rise and decline of agricultural extension in Indonesia began when successfully rice self-sufficiency in 1984. Success in producing rice has brought a catastrophe for agricultural extension, because unconsciously many people perceive that agriculture extiontion is a tool to increase production like fertilizer and insecticide, in other words agriculture counseling perceived as effort aimed to increase production, and not aim to improve farmer's prosperity (Slamet 2001). Agricultural extention, which initially emphasizes guidance to farmers in good farming, turns into pressure on technology transfer, which tries to enable farmers to increase productivity and production, and emphasizes on achieving rice production targets, both national, local and local targets (Tjitropranoto 2003).

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As changes and developments in information technology continue to grow and criticism by experts, one of them is Swanson and Rajalahti (2010) who criticize that the technology transfer extension model (Technology Transfer Extension Models) tend to be narrow and narrow is a classical extension approach that arises from the government too dominating extension activities. Singh (2009) mentions that agricultural extension has been using a "provider mentality" approach which only focuses on the information to be disseminated, as well as too broadcasting information, the information submitted is sometimes unreal and not in accordance with local needs, and has not departed from the demand of farmers (demand driven). Finally, counseling begins to shift from technology innovation transfer to more participatory involving farmers as axis in extension activities.

This also happens to the extension of Indonesia which is still a lot of sector oriented extension, with the characteristics of promoting commodities, promotion of certain inputs, promotion of agricultural credit utilization, and promotion of sustainable development based on natural resources (Syahyuti 2014). Era of the 1990s various parties in the world are busy talking about concept changes and paradigm of counseling. This is compiled, for example, in the FAO (2000) book entitled "Strategic Vision and Guiding Principles for Promoting Agricultural Knowledge and Information Systems for Rural Development" (Rivera et al., 2001). The AKIS / RD model (Figure 2) has a vision of changing the institutional reform of extension by considering aspects of pluralism, cost-effectiveness, cost of privatization, decentralization and subsidiarity, and emphasis on participatory approaches participatory approaches).

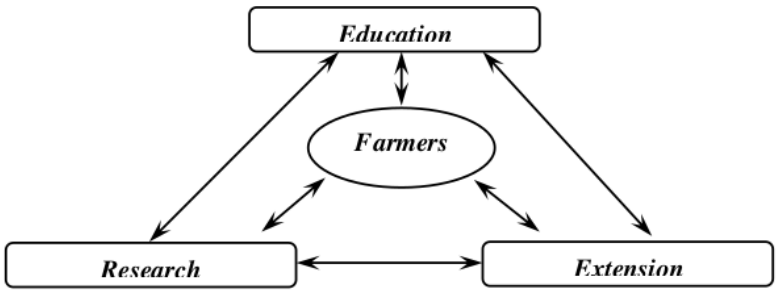

Figure 2: AKIS MODEL (FAO 2000)

This new paradigm is developed by realizing the changes in the world environment that are issues of globalization, rapid change, transportation and communication, and the tendency for the establishment of so-called corporations that change the strength of government dominance into the private sector. The new paradigm of extension according to Rivera et al. (2001) is based on

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Volume:03, Issue:07 "July 2018"

market power with agribusiness orientation. In addition, counseling should be able to answer a variety of needs so as to better answer the specific objectives, specific targets, and special needs.

Extensions should apply the pattern of AKIS in order to occur interactive communication of the four components of education, research, counseling, and farmers as key. Therefore, communication patterns that are professional, egalitarian, equal and understand each other become important to ensure the sustainability of innovation communication itself so that the welfare of farmers can be realized (Amanah 2009).

Many experts have contributed their thinking, how should agricultural extension work forward. This new paradigm is generally structured for a broad context of extension of rural development. According to Kerka (1998), a new approach to extentions is needed because we face the newly born societal character of various international issues. Kerka (1998) sees that diversity is the core value of future agriculture, so we must be prepared with a variety of audiences as well. Kerka (1998) also delivered a new method called "New Delivery Methods" in which the counselor has a key role in facilitating community access. This method uses new concepts of work and learning.

Extensions, both as a concept and a development approach, has undergone many transformations, both due to factors of policy change, demand demands and the development of science. Extension transformation also occurs due to technological developments, one of which is cyber extension (Sumardjo et al., 2010). Also known as the term empowerment-based communication and information technology (techno-empowerment). According to Khan and Rahman (2007) technology is not only a product of creative culture (techno creative) but also a weapon of mass empowerment. The technology in question is the current technology, which by Habermas (2002) called convergence technology, technology centering, technology in hand. Concrete manifestations include the use of hybrid media, media convergence and social media.

Patterson (1998) adds that new counseling should pay attention to the system, not just people, and help achieve the vision of the community. The results of Punjabi (2001) find that most farmers are willing to pay for extension services. That is, the presence of extension workers in the current era has been considered as important for the development of their business and its role is considered as a consultant to help overcome the problems of farmers. Based on the current extension in Indonesia and research studies with various aspects related to the education paradigm, things to build agricultural extension system in the information technology era are:

1. Agricultural Extension

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Volume:03, Issue:07 "July 2018"

Listiana (2018) states that farmers' satisfaction with extension activities is low due to interaction with extension workers related to the limited number and quality of extension workers. The gap in number and quality of extension workers at the farmers' level seems to require an actual source of information quickly. This is where the role of information technology is needed to fill that gap and it is important to see how far the role of this technology to strengthen the capacity of extension agents.

The effort is done to answer the current extension challenge of integrating government-run counseling with counseling based on the needs of the community itself. Counseling based on the needs of the community can be managed by agricultural extension workers who come from the internal youth or farmers who can be a source of inspiration of other farmers (Haryanto 2018).

Potential owned by farmers and the younger generation is one of the development of independence of agricultural actors which is a real picture of the long process through which the brain gainers, long-educated and skilled youth migrated to urban areas, then returned to their home regions (rural) and ruralized as indicated by high levels of cosmopolitan and access to information technology resources (Haryanto 2018). This is in line with Setiawan's research (2015) which confirms that there are already young actors with higher education who return to the village and become examples of farmers in the business in West Java.

The figure of the extension is needed in the future is a figure who has the ability to understand and be a solution to the problem faced by farmers, so it is necessary to prepare the figure mainly from aspects of knowledge and skills in using information and technology. This is in line with Helmy et al (2013), agricultural extensionists need to be supported readiness in the field of information technology applications in order to have a positive attitude towards the use of information technology and can be a motivation to continue to learn to develop its ability.

2. Agricultural Extension Institution

Agricultural Extension Institution is an extension functional institution that is expected to be able to bridge the information and innovation control center from the government to farmers who have urgent importance to the development of agricultural extension. The advancement of a farmer group is influenced by the large contribution and activation of agricultural extension officers coordinated by the extension institution, so the Agricultural Extension Agency becomes the leading institution at the sub-district level which becomes the main node in the management of human resources management especially in agriculture. In addition to

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Volume:03, Issue:07 "July 2018"

the development management human resources, Agricultural Extension Center plays a role in improving the quality of service to agricultural stakeholders involved at the sub-district level so that the wheels of agricultural development at the *kecamatan* (subdistrict) level can move in accordance with their respective duties. Therefore, to create ideal conditions, it is necessary to change the current condition of Agricultural Counseling Centers with so many farmers' institutional reaches both managerial and organizational so that Agricultural Counseling Center can be: (1) data and information center (2) training center, (3) center of program and activity integration, (4) agribusiness consultation center and (5) appraisal center.

To implement the modern Agricultural Extension Center is done by standardization of agricultural extension institution both facilities and infrastructure supported by technology and internet devices. The presence of technology and internet in Agricultural Counseling Center to facilitate the application of various application systems can mobilize agricultural extension activities so that the scope of its activities can become more widespread not limited to the target area of the Agricultural Counseling Center.

In line with this, Helmy et al (2013) also affirmed that the Agricultural Counseling Center became an extensionist in the execution of its duties that need to be supported by the institution others such as research institutes to provide renewable information from research results, which are then repackaged by agricultural extension workers. Further readiness to make modern Agricultural Extension Centers is the fulfillment of facilitation of facilities and infrastructure which is also supported by continuous socialization and training, both technical training of network system management and training of extension methodology, so that innovation can be more quickly accepted and utilized.

3. Farmer Institution

The importance of farmer institutions is recognized in agricultural development in Indonesia, it is proven to be recognized and used farmer groups as the most effective approach to agricultural development (Law No. 19 of 2013). But the reality shows the tendency of weak farmer institution in developing country, and the obstacles in creating institutional optimal role in farmer society. The role of farmer institution as learning class, cooperation vehicle and unit of production until now still not functioning optimally (Prawiranegara 2016).

Institutionalization of farmer with various kinds of its function, can become container and means of coordination between subsystem in agribusiness system. Institutional farmers need to continue to be developed functions and roles in supporting the strengthening of the economy of the state and society. One of the agricultural institutions in the development of agribusiness systems and business is a group of farmers and group of farmers. The functions

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Volume:03, Issue:07 "July 2018"

of the group and the combined groups are expected to support economic activities in rural areas. It is realized that the group and the group of farmers are required to transform themselves so that in the future it can become an institution that suits the ever-evolving needs.

Efforts that can be done to transform the farmer institution into economic institutions to accelerate the development of the economy based on rural agribusiness that is changing the behavior of farmers in order to develop the business productive products that are managed together in a business scale to meet the needs of a profitable and efficient market. This is in line with Prawiranegara (2016) which states that the institutional competitiveness of farmers depends on members who can utilize the knowledge and information within the institution.

Realizing the institutional transformation of farmers into economic institutions is done by prioritizing the actors most involved and influential in formulating policies. The government as a regulator is advised to always encourage and facilitate the growth of insightful and entrepreneurial entrepreneurship. Furthermore, it is suggested to conduct training or other non-formal education with more intensive to inspire entrepreneurship spirit from farmer institution, so that able to transform become institutional of farmer having good entrepreneurship capability.

Agricultural Extension System

Until now the extension is still confined with old traditions that always use the Training and Visiting (LAKU) system. Extension agents as government officials still with conventional functions only convey information about agricultural development policy to farmers. The current and future conditions of farmers demand more on the existence of extension agents who are able to provide solutions to various challenges in accordance with business development and the development of information technology.

Advancement of information technology today, providing convenience to farmers to be able to access information sources related to farming technology innovation, prices, markets, and information on the availability of production facilities, and others, can be easily obtained by farmers and groups only by using mobile internet service devices. All information required by farmers can be easily downloaded to be learned, tried and applied.

This is in line with Adekoya (2007) that the use of information technology has an important role in an agricultural extension system because it can provide extension services from various agricultural sectors and play a role important in rural development. Even Alemna and Sam's (2006) research, in India and Ghana, states that with the exchange of information through the utilization of electronic equipment has revitalized the role of extension services in the preparation of information, education and assist in the decision-making process for farmers.

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Volume:03, Issue:07 "July 2018"

Therefore, the breakthrough of the system agriculture extension with the development of information technology needs to be done. These efforts can be accomplished by imitating an online service model focused on one network application system. The application system connects agricultural extension workers, other experts (Lecturers, Researchers, Private Investigators, Banking) within a sub-district agricultural extension agency, so that farmers or farmers in need of agricultural extension services only make calls to the extension service sub-district level extension and subsequent competent officers will come to the farmers according to the problem (Figure 3).

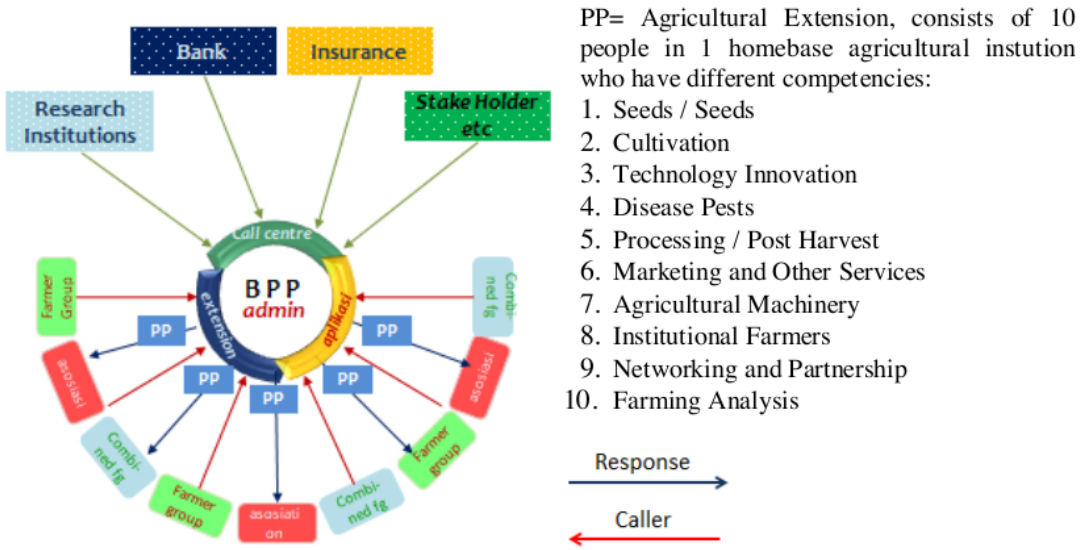

Figure 3: Model of Agricultural Extension System in Information Technology Era

The hope with the presence of information technology-based extension services that online system, the agricultural extension agencies can provide services through agricultural extension workers who need to be deployed to farmers/ farmer groups, village or even other districts in one district, so the problem of decreasing the number of extension workers, extension coverage and other access shortcomings can be resolved. However, to realize this need commitment and government support to encourage the availability of standardized infrastructure facilities owned by agricultural extension agencies. In addition, continuous thematic education and training needs to be done also to agricultural extension workers in order to increase their insights and competencies. Therefore, the transformation effort can be done by changing the paradigm of conventional extension agent who is now an assistant like a consultant who is able to analyze the potential and business opportunity of farmer agribusiness and overcome the problem. In addition

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Volume:03, Issue:07 "July 2018"

to being a companion of farmers, agricultural extension in the future should also be an active business actors that become an example to farmers in running their agricultural business.

CONCLUSION

The present presence of information technology can provide alternative solutions to the various challenges faced by counseling. The paradigm shift of counseling with the presence of information technology is addressed by transforming the three things that became central in the current extension activities to realize the information-based agricultural extension system. First, transforming conventional agricultural extension workers into consultant-level consultants capable of analyzing farmers' agribusiness potential and business opportunities and becoming active participants in the agricultural business. Second, to prepare the institute of modern agriculture extension which become information and innovation center with technology and internet base. Third, encourage and accelerate the institution of farmers into institutional economy of farmers who have business orientation and entrepreneurial skills. Fulfillment of these three prerequisites of the transformation can be a breakthrough in the online agricultural education system as an effort to revitalize the role of extension services in the preparation of information, education and assist in the decision-making process of farmers.

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