Strengthening Role of Farmer Institution in Enhance of Innovation Capability Based on ICT in West Java Province, Indonesia

Darojat Prawiranegara
IAARD
Indonesian Agency for Agricultural Research and Development
Ministry of Agriculture

Sumardjo

Djuara P. Lubis

Sri Harijati
Institute of Bogor Agricutural
Bogor, West Java
Indonesia

Abstract

Strengthening role of farmer institutional was intended to address the complexity of the opportunities and challenges of agricultural development in the future, advances in information technology, the convergence of communications, future innovation, access to markets, access to productive resources, counseling cafeterias, and farmers institutional competitiveness. This study aimed to describe role of farmer institutional, factors, which influenced and strategies to strengthening role of institutions in enhancing farmer innovation capabilities. The object of this study is the 243 farmers who are members of the vegetable farmer institutional in the highlands of West Java. Structural Equation Modeling/SEM was used to analyze and develop strategies. The results show that strengthening role of farmer institutional was achieved through the role of managing information, mediation of information, education of user, rides of cooperation and business units. Almost 80 percent of variance farmers institutional role affected by group dynamic (65 percent), individual characteristics (25 percent), external institutional support (9,5 percent) and quality of information (4,2 percent), and others factors (20 percent). Innovation strategy to increasing the farmer's capability can be done through strengthening of farmer institutional role, innovative behavior characteristic, quality of information and external institutional support.

Keywords: Farmer innovation capabilities, farmer institutional role.

1. Introduction

Strengthening role of farmer institutional in enhanching innovation capabilities based on information technology is essentially intended to address the issue of competitiveness of horticultural products, especially vegetables, economy globalizations, minimize dependence of farmers on the information formal channels (government), the effectiveness of information services for farmers, to break information stag, bridging of farmer which low acces, the realization Law No. 16/2006 (System of Agricultural Extension), No. 19/2013 (Empowerment of Farmer Protection), Regulation of The Minister of Agriculture No.82/Permentan/OT.140/8/2013 (Guidelines on Farmer Group and Farmer Association Development) and No.14 of 2008 (Disclosure of Public Information). Specifically, strengthening role of farmer institutional is crucial in the face of the complexity of opportunities and challenges of agricultural development in the future, advances in information technology, communication convergence, frontier innovation, markets and others resources access, counseling cafeterias and farmer institutional competitiveness. Farmer institutional strengthening should be designed as an effort to improve and to help farmer personal quality. Institutional position and functions of farmers are part of social institutions that facilitate social interaction (social interplay) in a community. Such conditions can be used as a technology dissemination efforts entry point (Suradisastra 2008). Farmer as a social creature life is not free from the influence of others.

They are individuals who grow and develop, not only influenced by biological factors but also more precisely determined by the social environment. Institutional farmer is a forum for the farmers gathering. It will take effect on the development of life. However, behaviorism agreed that farmers are also not being passive or controlled solely by the instinctive impulse and driven by environment, but can be actively designing even changing environment. Innovation dissemination through farmer institutional mediation is an important activity in driving the innovation capabilities of farmer. The ability of a person can evolve through a process of information flow from the surrounding environment. To that end, the strengthening of the farmer institutional role should be seen as a strategic instrument to achieve farmer innovation capabilities. A dynamic, adaptive farmer institutional and capable of applying information technology in the global information utilization (internetworking) is one answer to be reckoned to capture growth opportunities of information and communication technology / ICT for increased farmer innovation capabilities. Strengthen farmer institutional effort is to make it as a source of information and technology services for businesses in general and specifically in farmer group members (Regulation of The Minister of Agriculture 2013).

The advantage of internet network connected information is the continuously availability, almost without limit, borderless (international scope), results-oriented approach to the recipient, personal, and costs, time, and power saving (Adekoya 2007). Leeuwis (2010) confirms that the information and communication technology / ICT, especially the internet and social networking were a potential alternative for the empowerment of rural communities. Information technology helped to collect, store, retrieve, process and disseminate the information needed by farmers (Vivek 2011). ICT has built a social system to be more simple, practical, spacious, fast and multitasking. Through multimedia, wireless networking, mobile technology, internet and digital world access, everyone in the world can connect, communicate, collaborate and do business online or through instant messenger and social networking (like Facebook, Friendster, Linked, Coprol, Twitter, Whatsapp and etc). The improvement of infrastructure support, the increasing efforts of socialization and internalization of ICT into various spaces, the rural communities that previously-access vulnerable to information about the outside world and the development of science and technology, has more become open interaction, especially with massive use of ICT, such as mobile phones and internet. Based on these conditions, opportunities and problems encountered in the utilization of ICT based information; it takes some strengthening farmer institutional role effort or strategy in improving farmers' innovation capabilities based on ICT.

1. Conceptual Framework

Farmer institutional as mandated by Empowerment of Farmer Protection Act No. 19 of 2013 requires the agency to provide service access to knowledge, information and technology to the public. Farmer Institutional as a group of public information is formed by society, from society and to society as independent and creative activity information management, information mediation, and education of information man. Suradisastra (2009) stated that one of the functions of the farmer is to help establish the relationship between farmers, extension workers and field researchers and improving farmers' access to resources. Utilization of farmer institution elements is the entry point for farmers' new information inflow that will give better results if there is a positive interaction between local norms and values with biophysical conditions and nature of the introduced technology or information. Farmer institutional expected to bridge the weak information access of farming communities from the information control dominance of rural elite's minority. ICT based farmer institutional can be used as a means of extension systems integrator (research-extension-farmers-market) and knowledge sharing remedial in the increased farmer capability.

In the era of information technology, as now, the competitiveness of the farmer institutional presence must be in line with the needs and development of society. The rapid information dissemination through the internet connected network, allowing farmers to have institutional competitiveness through the way they create, adopt, validate, diffuse, store, and use information (knowledge management) to achieve goals more quickly and effectively. It is as reported by Mchombu (2007) "... Knowledge management as a cross-disciplinary practice that enables Organizations to improve the way they create, adopt, validate, diffuse, store and use knowledge in order to ATTAIN Reviews their goals faster and more Effectively" .Knowledge sharing can speed up the process of individual innovation capabilities. Hilmi *et al.* (2009) reported one of effective effort that are considered in improving a person's innovation ability is through knowledge sharing activity development, because through these activities, knowledge can be deployed, implemented and developed. The next question is arise, why should the farmer institution?

The possible answer is because: (1) institutional closest to the farmer / inlet of information from various sources and informants; (2) farmer institutional have a member with unique and capabilities variation; (3) Farmer institutional can directly select and customize the information needs / members innovations (effectiveness in avoiding overload information); (4) farmer institutional have resources to educate their members and (5) enable self-reliance of farmer institutional to challenge information stagnation and formal extension officer shortcomings. The farmer institution role comprise in managing information, mediation of information, education of information man, cooperation and business unit forum. Without intending to be "antipathy" toward other extension institutions included in the network information, it is time now regard farmer institution as a system integrator media institutions based extension information and communication technologies so that foster and accelerate the process of renewable information dissemination / innovation.

It is not easy to realize this kind of farmer institution. However, these roles should be considered in formulating agricultural policies that take advantage of farmer institutional as agent in the dissemination of information by taking account into various factors that influence it, these are: (1) farmer characteristics; (2) information quality; (3) farmer institutional dynamics; and (4) external institutional support. This study principle had contrast with previous research about innovation capability and farmer institution. Its' include, first, integrate approach to knowledge management in the farmer institutional role and function in managing information, mediation of information, education of user with farmer institutional as a forum for cooperation and unit business. Secondly, put the farmer innovation capabilities as indicators of farmer innovative size behavior change. Third, analyzing the factors that affect the farmer institutional role strengthening in improving farmer innovation capabilities. In substance, this study makes the institutional farmers as a strategy to improve farmer innovation capabilities based on ICT.

2. Research Methods

This study was designed to quantitatively and qualitatively (mixed method), using a survey method. The study was conducted in the highlands of West Java is located in Cianjur and West Bandung regency. The research conducted from March 2014 through January 2015. Vegetable farmer research sample totaled 243 people (114 people in West Bandung regency farmers and 129 farmers in Cianjur). In-depth interviews were purposively selected officers and members of each group. Primary data were obtained through structured interviews, in-depth interviews, focus group discussions (FGD) and observation. Secondary data were collected from relevant institutions through technical literature studies (desk study). The data gathered are then tabulated and analyzed descriptively. Determination of the strategy of strengthening the institutional role of farmers in increasing farmers' innovation capabilities are based on the results of the Structure Equation Model/SEM analysis.

3. Results and Discussion

4.1 Role of Farmer Institutional

Stating about farmer institutional, both as a system and as an extension approaches, institutional farmers have proven adaptive paradigm of agricultural development in Indonesia. Associated with the development of information technology, farmer institutional are also required in order to anticipate the opportunities, challenges and impact of globalization of information through the development of ICT. Specifically, farmer institutional prosecuted as a solution to overcome inequality, the gap / biased information to farmers in the countryside. Consequently, farmer institutional now and in the future are required to manage information, mediation of farmers information and education for each member. Modernity and competitiveness will force farmers to the dynamic role of institutions, truly adaptive, accommodative, predictive and anticipative to the changing of environment. Farmer institutional role in the era of globalization characterized by the ability of information other than as a cooperation and value added creation forum to its member.

Besides that its' also characterized by its ability to manage information, information mediation capabilities and the ability to educate information man. Simultaneously the farmer institutional role in West Java has had a considerable role based on the validity value of manage information role (0.91), mediation of information (0.81), education of information man (0.64), cooperation forum(0.63) and business unit / increase value added (0.64). Figure 1 shows that the role of managing information can be viewed on: (1) search or exploration for information by the group (92.28%); (2) simplification of information (93.39%); (3) dissemination of information to members (93.88%); and (4) storage of information (91.74%).

The mediating role can be seen from the group's role in (1) mediating information between members (95.58%), (2) members with institutional mediation extension (90.52%), (3) mediation members with research institutions (81.26%), (4) mediation members with education and training institutions (89.98%) and (5) member mediation with outside members (other groups) (93.44%). Figure 1 shows that role of farmer institutional as an educational institution for farmers through training (84.79%), field trials (85.03%), supervision (90.52%), and facilitation (84.92%). In addition, farmer believed that the groups have been able to play a role in increasing the production (89.85%) and income (88.92%).

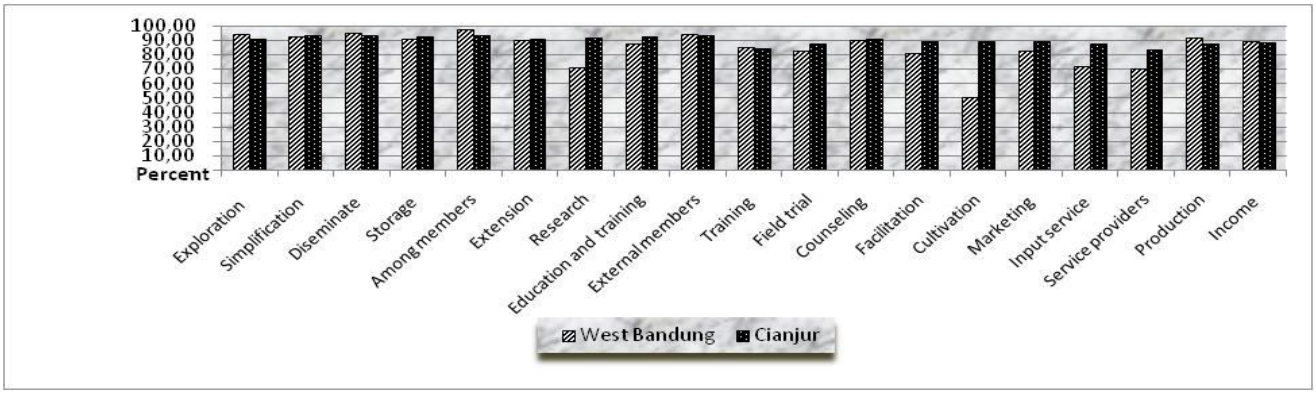


Figure 1 The role of vegetable farmers institutional in West Java

Role of information management, mediating and education in addressing the extension constraints as a result of great number of assisted farmers, hard topography to reach, the lack of education operational funding, lack of information knowledge and the many tasks of field extension in conveying technological innovation information knowledge is requires of the complementary role by institutional farmers. It is also requires farmer institutional to participate in the process of agricultural innovation dissemination. However, based on the analysis, there are aspects that should be improved; (1) the role of information management primarily in terms of search and storage of information (database information); (2) the information mediating role between research institutes with educational and training institutions; (3) educational of information man beings in terms of technology training and testing in the field; and (4) cooperation forum in terms of cultivation cooperation and capital partnership.

3.2 Factors Influenced

Based on the value of standardized loading factor (λ) in Figure 2, at 5% significance level (t = 1.97) factors that affect the strengthening of farmer institutional role is individual characteristic and group dynamics. Dominant indicators of individual characteristics that affect the strengthening of farmer institutional role is the level of education (0.66), the ownership of resources of ICT (0.77), the existing of other members with the ability to access the information (0.78), cosmopolite in obtaining and disseminating information to other members (0.79), attitude toward change (0.98). Age, farming experience and membership status indicator is not valid. Almost all group dynamics variable was valid. Its' include dominant indicator; purpose of the group (0.80), structure (0.73), role functioning (0.75), development (0.74), compactness (0.94), atmosphere (0.74), pressure (0.50) and effectiveness (0.71).

Table 1: Significant factor affected the vegetable farmer institutional strengthening role in West Java

Exogenous variable	Endogenous variable	Beta (β)	t-Values	Significances*)
Characteristics of farmer	institutional role	0.250	5.89	Yes
Information quality	institutional role	0.042	1.20	No
Group dynamics	institutional role	0.650	10.21	Yes
External institutional support	institutional role	0.095	1.21	No

*) Significant at 5% level

Based on the analysis, the farmer institutional role strengthening rely heavily on members who can take advantage of the knowledge and information that is within the institutions as well as institutional farmers who can follow the development / community dynamics. The importance of group dynamics improvement in the group will give effect to the farmer institutional role in the era of globalization of information. The elements of the group forces should receive attention.

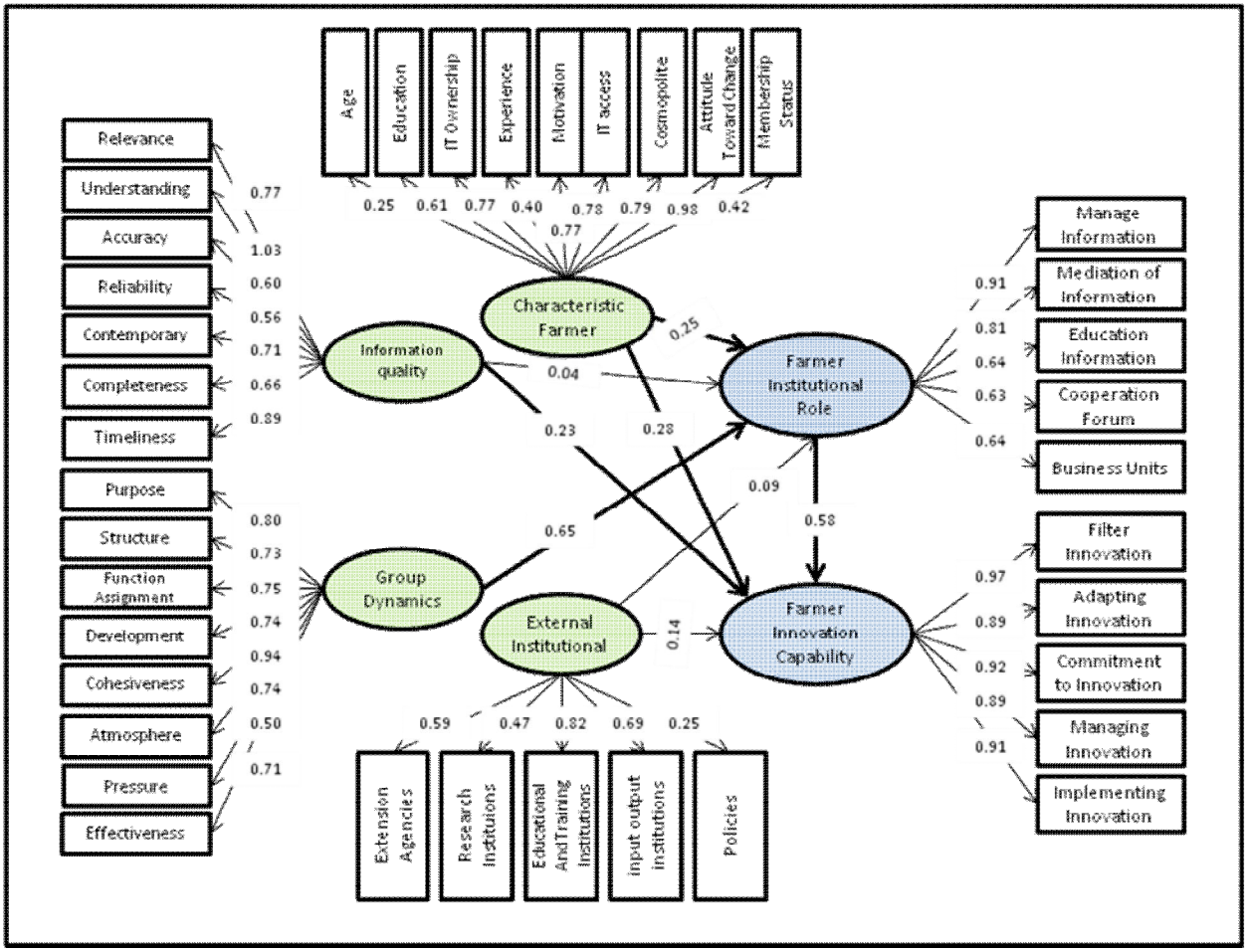
The dynamism of the group in addition to his ability is characterized as a cooperation and value added creation forum to its members. It is also characterized by its ability to manage information, information mediation capabilities and the ability to educate information man. With the support of farmer institutional dynamic with the average of productive age (43 years), motivation to be a group is high (> 90%), experience of farming (> 7 years), readiness to change (> 69.77%), ownership of the infrastructure of information technology and communication (93.80%), ability to access the internet (> 52.71%), high level cosmopolite (> 90%), ease of sharing information among farmers (> 82%) provides opportunities for farmers to be able to improve the institutional innovation capabilities of all its members.

Regression model of factors that influence the farmer institutional role is: Y1 = 0.25*X1 + 0.042*X2 + 0.65*X3 + 0.095*X4, error variance = 0.23 and R2 = 0.77. The value of R indicates that 77% variance from the farmer institutional role, 25% affected by individual characteristics, 4.2% by the quality of information, 65% by the group dynamic and 9.5% by external institutional support. Lack of effect of the quality of information on the farmer institutional role due to: (1) the low quality of the information displayed; (2) weak direct access to the internet; (3) the lack of guidance and training use of the media; and (4) the information is not in accordance with the needs. However, the positive coefficient of the value of internet information quality about the role of media institution, indicates that information technology (especially the Internet) have critical implications for the competitiveness of farmer institution. To survive and excel in the market competition, farmer institution need to pay attention and able to exploit the opportunities of technology to support the farming strategy and to improve information services to its members. In an effort to improve the farmer institutional role, farmer institutions have an ability (capability) to maximize the utilization of information technology to improve innovation capabilities of its members.

Similarly with external institutions, the positive value of external institutional support factors can be used as a variable force farmer institutional role if extension institutional and research institutions has support. Partially, farmers feels that external institutional presence is strongly supports the existence of the network infrastructure and the existence of institutional input / output. This institutional (traders/suppliers/facilitators) almost all the time in contact with farmer institutional. This form of institutional support ranging from procurement of inputs (seeds, fertilizers, pesticides), process (guidance technology through a facilitator and several field trials) to marketing (partnership).

3.3 Strategy to Enhancement Farmer Innovation Capability

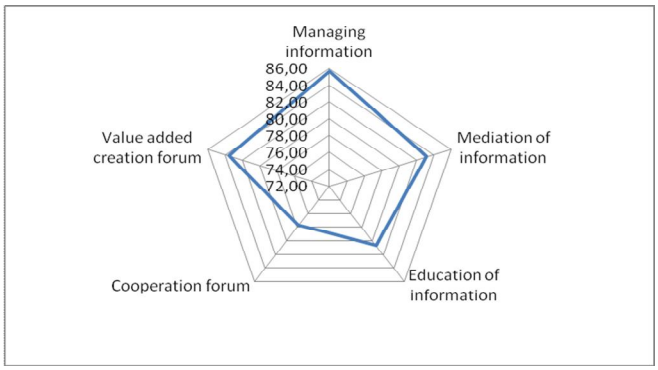
Based on the results of Confirmatory Factor Analysis (CFA) validity measurements, it is identified that individual characteristics, information quality, group dynamics and external institutional support has good validity on goodness models RMSEA 0.099, GFI 0.91, CFI 0.92 and NFI 0.9 (model can be continued / good fit) for analysis. Results of SEM analysis (Figure 2) identified characteristics and dynamics of the group members have real impact on improvement of the farmer institutional role. Although the quality of information and external institutional support is not significant, but if these two variables to be improved it will be able to increase the role of institutions, it is seen from the positive value of each coefficient of 1.20 and 1.21. Farmer institutional role ($t_{8.59}$> 1.96), farmer characteristic ($t_{6.68}$> 1.96), information quality ($t_{9.56}$> 1.96) have significant effect to the improvement of farmers' innovation capabilities. Size capability in this study refers to the five core capability (Baser and Morgan 2008) is shown by: (1) the ability to adapt to innovation; (2) the ability to filter innovation; (3) the ability of the commitment to innovation; (4) the ability to manage existing resources; and (5) the ability to implement innovations.



Chi-square=2392.13; df=710; P-value=0.0000; RMSEA=0.099

Figure 2: Structural model of factors influenced toward farmer innovation capabilities (Standardized loading factor)

Based on the validity of the measurement results by using Confirmatory Factor Analysis (CFA) measurement of innovation capabilities of individual farmers can be done with these indicator: (1) the ability to adapt to innovation (0.89); (2) the ability to filter innovation (0.97); (3) the ability of the commitment to innovation (0.92); (4) managing the behavior of existing resources (0.89); and (5) the ability to implement innovations (0.91). Here's a general overview of the role of farmer institutional and innovation capabilities in West Java.



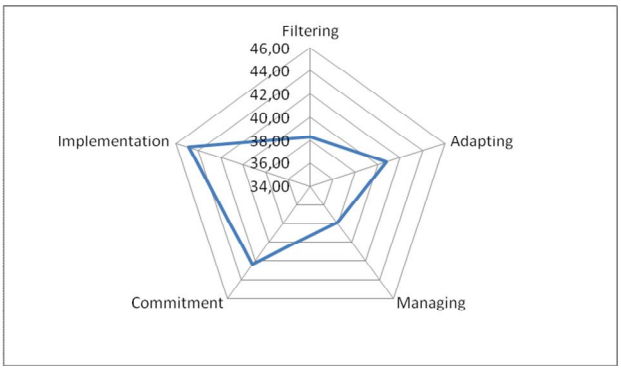


Figure 3 Farmer Institutional Role **Figure 4 Farmer Innovation Capability**

Empirical evidence in the research field (Figure 4) shows that the overall level of farmer innovation capabilities is still low. It can be inferred that most farmers do still not enjoy the excess of innovation benefits.

Most farmers do not necessarily apply the rules of farming innovations due to; (1) low of innovation knowledge; (2) farmers are risks averse; (3) lack of capital; (4) lack of resources supporting innovation; and (5) lack of guidance and training from sources of innovation. However, some farmers make adjustments toward innovation (40.74%), the actions of farmers lead to an adjustment to any kind of newness about commodities, management of farming techniques or new marketing opportunities. If there is a new information, farmers initially take these action; (1) internal dialogue to implement novelty, they think by combining their experience, knowledge and competencies; (2) begin try to learn adjustment by thinking more deeply on one or two innovations; (3) started to think to incorporate the ideas of novelty in farming; (4) reposition and reconfigure to establish novelty; and (5) charted novelty for the next farming.

Farmers who filter innovation (38.27%) are seen from farmer actions in managing the balance between diversity (existing versus innovation). It is indicated by: (1) the ability to assess novelty, farmers with this ability will always assess the merits of their novelty capability of various aspects; (2) the ability to communicate with other people's innovations, reassurance good and bad innovation; and (3) the ability of diversity management innovations, farmers are able to think of innovation with existing resources. Farmers who are committed to innovation (42.39%) are take action and engage with the provisions of novelty. These including (1) awareness of innovation; (2) belief in innovation; (3) willingness to maintain novelty; (4) the sacrifices of innovation; (5) willingness to seek innovation sustainability; and (6) to focus on the purpose of innovation. Behavior that focuses on resource management (37.86%) indicated by regulatory action potentials possessed in carrying out the novelty. These including (1) confidence in the ability to manage the resource; (2) the credibility and legitimacy of the resource settings of another person; and (3) the amount of exploited resources and potential. Farmers who implement innovations (44.86%) can be seen from the implementation of the work action. It is measured in performance and results. These including (1) applying the overall innovation; (2) provide innovation services to other parties; and (3) the percentage of successful implementation of innovation output.

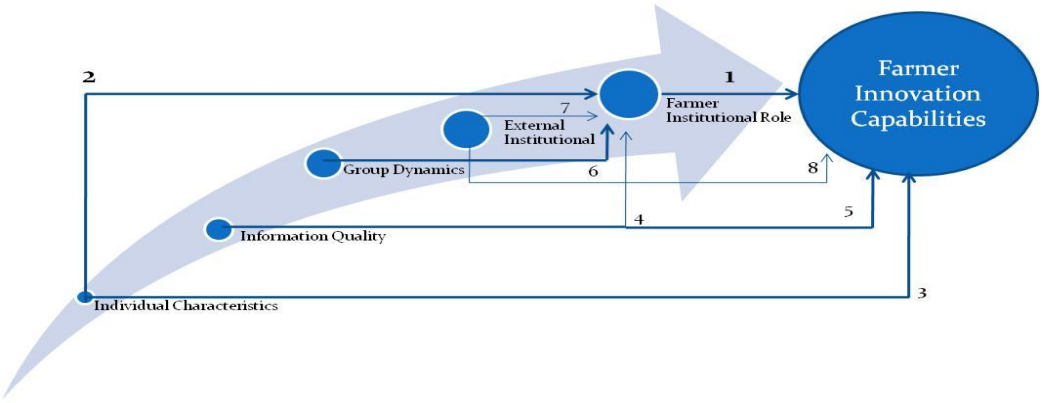


Figure 5: The eight alternative path toward increased farmer innovation capabilities

Generated model from SEM shown in Figure 2. This model indicates 8-influence path towards farmers' innovation capabilities (Figure 5). A total of five-path effect occurs through farmer institutional role strengthening and the remaining three-path through the direct effect of changes in the characteristics of individual farmers, improving the quality of information, group dynamics and improvement of external institutional support. Besides directly influence towards improvement of farmers' innovation capabilities, farmer institutional have role as a bridge of the indirect effect from other variables.

Based on the results of quantitative analysis (SEM), the formulation of strategies for improving farmer innovation capabilities can be done through four strategies: (1) the internal farmer institutional improvement; (2) increased innovation capabilities of individual farmers; (3) improving the quality of information; and (4) the increase in external support institutional of farmer group.

The first strategy, carried out through the improvement of internal farmer institutional, these are: (1) increase the role of the group through the strengthening of all aspects of the tasks and functions of the group as manager of information, user education, strengthening cooperation and make the group as a cooperation and business corner; (2) The group must be able to mobilize all unique members for the sake of equity; (3) make a dynamic group; (4) groups encourage and facilitate forms of creativity member; (5) facilitate and encourage the use of information technology by the group; (6) increasing the capability of the group of innovation through knowledge management functions (exploration, simplification, storage, packaging and delivery); and (7) improving human resources through training of farmer institutional members, open and facilitate access of farmers and their family members (information, market).

The second strategy built through many efforts to improve the character/behavior of farmer innovations, these are: (1) efforts to uncover self from all forms of innovation; (2) an increase in creativity (innovation); (3) repositioning or attitude change; (4) the adjustment learning with innovations; (5) thinking of trying; (6) efforts to safeguard the sustainability of innovation; (7) always communicates innovation; (8) always seeks to establish a connection; (9) combine or balance the innovation versus local potential; (10) building the spirit of awareness, confidence, willingness, willing to sacrifice for an innovation; (11) always willing to implement innovations; and (12) give innovation services.

The third strategy, by improving the quality of information, these are: (1) the provision of simple information easy to read and understand; (2) information that address the needs (advantages); (3) information that can be accounted (regarding trusts); (4) renewable information; (5) complete; and (6) information that is easy to access. The fourth strategy, by improving to the presence of external institutions, including: (1) build a pilot innovation partnership farmer-extension-research institute-agency input-output farming; (2) an increase in the capacity of extension services; (3) research institutions is providing cheap, easy and mass innovation (which touched all layers of farmers); and (4) the financial support innovation cooperation local level test.

3.4 Policy Implication

The globalization of information through the use of ICT, enabling global content entering and globalize local content. In such conditions, the competitiveness of farmers is characterized by uniqueness and creativity becomes the main weapon to win the competition. Therefore, improvement of the source agency to provide cheap, easy and comprehensive quality information and innovation to be important in achieving sustainable competitiveness, increase farmers' income and welfare. Optimizing advocates institutional support farmers can be done through extension institutional performance improvement, increase the offense / relationship farmer-extension-research-input / output on the field.

The central government should design a policy to improve innovation capabilities based on ICT such as the need for the agency source to provide quality information, technical farm training and training of utilization of information and communication technologies, regional policies related to the revitalization of extension services, enterprises and educational institutions and training need to take advantage of the farmer institutional advantages as the media entry point to increase individual innovation capabilities. The low innovation capabilities of farmers require concern all relevant parties, both government and private sector to facilitate the growers to innovate, providing resource to support innovation, provide extensive knowledge for innovation, giving guidance skills innovation training so that farmers will be willing to take decisions and risks in implementing innovation.

4. Conclusion

Strengthening role of farmer institutional based ICT can be done through information management, information mediation, user education, cooperation and value creation corner. The level of vegetable farmer innovation capabilities in West Java is low category. Almost 80 percent of variance farmers institutional role affected by group dynamic (65 percent), individual characteristics (25 percent), external institutional support (9,5 percent) and quality of information (4,2 percent), and others factors (20 percent). Innovation strategy to increasing the farmer's capability can be done through strengthening of farmer institutional role, innovative behavior characteristic, quality of information and external institutional support.

References

Berns M, A. Townend, Z. Khayat, B. Balagopal, M. Reeves, M.S. Hopkins and Nina K. 2009. Sustainability and Competitive Advantage. MIT Sloan Management Review Fall Vol. 5 No. 1.

Adekoya AE. 2007. Extension Cyber Communication: A Strategic Model For Agricultural and Rural Transformation in Nigeria. International Journal of Food, Agriculture and Environment ISSN 1459-0255. Vol. 5 (1), 366-368.

Baser Header and P Morgan. 2008. Capacity, Change and Performance: Study Report. European Centre for Development Policy Management.

Hilmi Aulawi, Rajesri Govindaraju, Kadarsah Suryadi, Faith Sudirman. 2009. Relationship of Knowledge Sharing Behavior and Individual Innovation Capability.

Leeuwis C. 2010. Communication for Rural Innovation: Thinking Back On Agricultural Extension. Translation. Yogyakarta (ID): Canisius.

Mchombu K, J. 2007. Harnessing Knowledge Management for Africa's Transition to the 21st Century. Information Development (ISSN 0266-6669) Copyright @ 2007 SAGE Publications Vol. 23, No.1.

Regulation of The Minister of Agriculture No.82/Permentan/Ot.140/8/2013. Guidelines on Farmer Group and Farmer Groups United Development.

Suradisastra. 2008. Farmer Institutional Empowerment Strategy. Center for Economic and Social Analysis of Agricultural Policy. Agro Economic Research Forum. Volume 26(2) December 2008, 82-91.

Laws of the Republic of Indonesia. No. 14 of 2008. Disclosure of Public Information.

Laws of the Republic of Indonesia. No. 16 of 2006. System of Agricultural Extension, Fisheries and Forestry.

Laws of the Republic of Indonesia. No. 19 of 2013. Empowerment of Farmer Protection.

Vivek Ahuja. 2011. Cyber Extension: A Convergence of ICT and Agricultural Development. Global Media Journal. Indian edittion / ISSN 2249 to 5835. Winter Issue/December 2011. Vol.2 (2).