Implementation of land and water controlling: case study in Sriharjo Village, Bantul District, Yogyakarta

D S Jayanti1,2*, S S Arif3, S Susanto3, L Sutiarso3

1 Doctoral Program in Agricultural Engineering, Agricultural and Biosystems Engineering Department, Faculty of Agricultural Technology, Universitas Gadjah Mada, Jl. Flora No. 1, Bulaksumur Yogyakarta 55281, Indonesia
2 Department of Agricultural Engineering, Universitas Syiah Kuala, Darussalam, Banda Aceh 23111, Indonesia
3 Agricultural and Biosystems Engineering Department, Faculty of Agricultural Technology, Universitas Gadjah Mada, Jl. Flora No. 1, Bulaksumur Yogyakarta 55281, Indonesia

*Email: sigitsupadmoarif@ugm.ac.id

Abstract. The concept of knowledge management is required to implicate the management of human resources, natural resources, and information technology to raise the consciousness of agricultural performers of the importance of knowledge-based concepts and strategies. The problem is how to increase knowledge of human resources sustainably to improve performance and competitiveness and create a decision-making process as the first step to implement agricultural management in a more focused and measurable. Knowledge management in Sriharjo Village has begun to be developed but has not been implemented and managed optimally as a knowledge asset. This research used a qualitative approach to identify knowledge gaps and a SECI model approach to determine the implementation and knowledge management strategy. This research aims to implement a knowledge management system strategy based on water and land resources in Sriharjo Village. A Collecting data with questionnaires and interviews with respondents and taking samples of respondents in the purposive sampling method. Knowledge will disappear if only stored in tacit form, but sharing knowledge and implementing knowledge management through the transformation of tacit knowledge into explicit knowledge can increase understanding, a consciousness of managers and users, and minimize gaps. The application of KM is necessary to share knowledge with each member of the organization, such as organize meetings, discussions, socialization, using internet media, counseling, and training to improve the performance and sustainability of the organization.

1. Introduction
Controlling is an effort to acquire, select, organize, store, present, create, disseminate and utilize knowledge, share and apply the accumulated knowledge so that each member can increase mastery of specific knowledge. The role of knowledge sharing is needed to build a knowledge-based organization, manage and document knowledge [1]. Knowledge will be lost if it is only stored in tacit form, but sharing knowledge and implementing knowledge management through the transformation of tacit knowledge
into explicit knowledge will increase understanding, awareness of managers and users and minimize gaps.

To overcome these challenges does necessary to increase and develop resources programmatically and sustainably. So that with resource development efforts will be able to optimize the use of resources through a knowledge-based organizational concept approach to realize sustainable agriculture (sustainability), the application of innovations and breakthroughs in the field of agricultural technology. Sriharjo village is a fertile lowland in the west and a dry, infertile hilly area, and there are few rainfed rice fields, moor, and forest in the east. Knowledge management in Sriharjo Village has not been implemented and managed optimally as a knowledge asset. All this time, knowledge management, especially in the farmer's organization (WUA) in Sriharjo Village, has not been carried out properly; it is still passed from one individual to another verbally and undocumented. This research aims to implement a knowledge management strategy based on water and land resources in Sriharjo Village.

This research is expected to be a strategy in applying personal knowledge, organizational learning, and knowledge sharing to organizations (farmer's organization /WUA, youth communities/Karang Taruna, and farmers' group association/Gapoktan) in Sriharjo Village to improve individual performance, organizational competitiveness, and the ability to convey information and knowledge better.

According to [2], knowledge is a structured experience, value, contextual information, and expert insight that provides a framework for evaluating and combining new experiences and knowledge that produces in actions, better decisions, and organizational creativity. [3] states that knowledge will be more valuable if tacit knowledge is embedded in complex organizational dynamics and developed through experience. [4] declared that knowledge management is a concept and process of knowledge management by converting information into knowledge, both explicit and implicit, based on views, understanding, experience, and practice of knowing how (know-how), which focuses on the existence of information that converted into knowledge that actionable, applied, easily accessible and available in various forms so that users can improve their mindset and insight. Operational knowledge management is an organizational activity that focuses on developing and utilizing knowledge within an organization. While strategically, it is a step to strengthen the efforts of every individual and organization to become a knowledge-based organization where knowledge is an asset to carry out every continuous process in the organization [5].

The application of KM as a knowledge management system is very much needed for an organization to empower human resources, apply organizational culture, organizational structure, and technological support that is regulated within the framework of a knowledge-based organization model [6,7] in order to obtain a sustainable competitive advantage, [8] as well as creating value and generating competitive advantage on an ongoing basis by optimizing the process of creation, communication, and implementation [3]. Organizational culture is the key to success and plays an essential role in increasing competitiveness, obtaining sustainable advantages, being a barrier in sharing knowledge [9], and improving group or organizational performance [10]. Organizations' main challenges are change management, culture and behavior, and context creation [11].

The application of knowledge sharing requires a system that can store all activities. It can be reassessed at any time to build a good KM concept, especially the readiness of human resources, reducing uncertainty, increasing effectiveness and efficiency, individual learning [8], as well as achieving optimal and competitive conditions [12,13]. Implementation of KM strategy in the organization by combining the Socialization, Externalization, Combination, and Internalization (SECI) model approaches. [14] stated that the SECI model could be considered a cycle of transformation of existing knowledge in organizations to increase excellent and practical values. The implementation of KM can preserve the knowledge and information possessed by every person and group in the organization to be disseminated evenly [15]. [16] declared that new knowledge arises because of the continuous interaction between explicit (actualized) and tacit (hidden) knowledge. Actualized knowledge is a form of documented or formalized knowledge that is easy to store, reproduce, disseminate and study, such as manuals, reports, documents, and letters. In comparison, hidden knowledge is a form of knowledge still stored in the human mind, such as ideas, perceptions, ways of
thinking, insights, expertise or skills, etc. The continuous interaction is called the SECI Model, which includes four stages, namely socialization (tacit-to-tacit), externalization (tacit-to-explicit), combination (explicit-to-explicit), and internalization (explicit-to-tacit).

2. Materials and methods
The parameters or indicators in this study are to identify the factors that influence the development of knowledge management on the performance of irrigation network services. Influential variables will be compiled into a structural equation model using the SmartPLS model [17]. The variables in this study include five aspects of the assessment of the pillars of irrigation modernization as follows: (1) Reliability of irrigation water supply; (2) irrigation facilities and infrastructure; (3) irrigation management system; (4) irrigation management institutions; and (5) irrigation management human resources.

2.1. Likert scale
Likert scale is a scaling method used to measure attitudes, opinions, and perceptions of a person or group of people about events, symptoms, or social phenomena that have been specifically defined (research variables) and translated into dimensions, sub-variables, and indicators that can be measured. For multiple-choice instruments, the answer is given a score where the respondent must describe, support the statement for the selected answer [18]. Interval data is obtained by calculating the average answer based on the scoring of each respondent's answer. The level of achievement of respondents can be calculated by comparing the average score of respondents' answers divided by the total score.

2.2. Measurement model test analysis
Cronbach's alpha is a measuring model to assess internal consistency based on the intercorrelation of the observed values of the indicators. Cronbach's alpha and average variance extracted (AVE) formulas are as follows [19]:

\[
\text{Cronbach' alpha } (r_{11}) = \frac{N}{N-1} \left( 1 - \frac{\sum_{i=1}^{N} s_{i}^2}{s_{t}^2} \right)
\]

\[
\text{AVE} = \frac{\sum_{i=1}^{N} l_{i}^2}{N}
\]

Where: N = number of indicators; \( s_{i}^2 \) = variance of indicator i of a particular construct; \( s_{t}^2 \) = variance of the sum of all N indicators of a construct; \( l_{i}^2 \) = the value of the outer loading of the i-th indicator to the corresponding construct.

2.3. PLS algorithm
The variables used in this study are dependent variables (Y) and independent (x), with indicators in the form of exogenous and endogenous variables. The stages of the SmartPLS analysis are as follows: making a model of measurement models, making a structural model design, creating and constructing path diagrams, calculating path and cross-loading coefficients, and hypothesis testing. PLS algorithm is used to calculate the path coefficient (β). To make a path diagram using SmartPLS 3. software [17]. Illustration of PLS algorithms designed as shown in Figure 1.
3. Results and discussion

Measurements for the implementation of knowledge management carried out in the form of questionnaires and interviews aimed to determine the level of understanding possessed by Sriharjo Village farmers in order to create better knowledge management as actors and managers with human resource indicators concerning supporting the management of the Bendung Tegal Kiri irrigation area (D.I Bendung Tegal Kiri) and WUA in a comprehensive manner maximum. The level of understanding of the respondent's knowledge of the criteria of the irrigation pillar is then converted into five Likert scales to facilitate the provision of understanding criteria. The questionnaire result obtained the average score, and the percentage of respondents' understanding of knowledge were obtained. The results of respondents' answers are shown in Figure 2.

Figure 2. Average score and percentage of respondents' understanding of knowledge
The graph above shows the lowest average answer of respondents in the human resources category with a value of 2.60. That is caused to several factors, including the Water User Association (WUA) not implementing a fee system and the absence of farmers who own more than 2 ha of land. Most of the farmers have a land area of around 400-1000 m$^2$. Besides that, some farmers have inherited and sold their previously owned land. The category of irrigation management occupies the category of the second-lowest average respondent's answer with a value between 3.87. Based on the respondents' opinion for the management category due to poor drainage, farmers' water distribution by farmer groups set their schedule according to the Javanese calendar. The other thing is that officers rarely filled out information boards, and information boards began to rot. The results of the outer model test before the indicator test and after the indicator test are shown in Figure 3.

The performance of irrigation services has a more significant indirect effect than the direct effect. That is due to the contribution between variables in the provision of irrigation services. Based on the analysis of the value of Cronbach's alpha (r11) for the respondents' understanding, the value obtained is 0.82, which means that the reliability coefficient value is very high (valid). Meanwhile, the AVE (Average variance extract) value shows a higher value compared to other variables so that the tested indicators have good discriminant validity, which is 0.65. The AVE value of 0.5 explains that the construct is more than looking at the variance derived from the indicators [20]. The results of the outer model on convergent validity have invalid indicators because the outer loading value is smaller than $= 0.05$, so the outer model test must be repeated by removing invalid indicators. After testing, it is found that all indicators have a validity value greater than $= 0.05$; in other words, convergent validity is feasible.

The development of farmer knowledge management and WUA Sriharjo Village can provide information about tacit knowledge in irrigation management, especially in the D.I Bendung Tegal Kiri, but not yet in the form of explicit knowledge. All this time, if water distribution problems happen or the other problems concerning irrigation and land management, WUA will hold confluences, meetings, or discussions to resolve these problems. Farmers also used these activities to share information and experiences. However, it has not reached the stage yet of documenting both notebooks and videos so that other irrigation managers cannot easily access new knowledge from the results of these activities. Through this knowledge management, it will be expected that farmer groups and farmer cadets in Sriharjo Village can become motivators and main actors in efforts to implement land and water-based knowledge management so that later they can become knowledge assets and can be accessed, utilized, and shared with all users. The development of the SECI model in this study is presented in Table 1.
### Table 1. Development of the SECI model

| SECI Process  | Application Form | Debriefing Results                                                                 | Improvement Efforts                                                                 |
|---------------|------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Socialization | Sharing knowledge| 1. Coordination between Water User Associations (WUA) and Farmers is not entirely running.  
2. Socialization (meetings and training) between irrigation managers at the WUA level at D.I Bendung Tegal Kiri has not been active yet  
3. Knowledge possessed only by individuals (farmers) | Socialization between irrigation managers is more activated by coordination between irrigation managers and fellow stakeholders, holding meetings, training for sharing, and sharing among irrigation managers to broaden their knowledge. |
| Externalization| Documented discussion forum | 1. Socialization and routine meetings are not actively carried out, so that activities are not documented.  
2. Documentation of organizational structure is only available at the branch office | 1. Increased tacit knowledge in socialization activities and meetings can be stored as documentation in books and videos to be shared and accessed by users.  
2. To see the results and development of irrigation management services based on the book of meeting results for documentation and recapitulation |
| Combination   | Media meeting forum | 1. The application of media to access knowledge does not yet exist.  
2. Irrigation managers assume management activities as routines and habits so that there is no need for searching for information and other knowledge.  
3. The manual is not fully read by the irrigation manager. | 1. Knowledge contained in the book and video documentation can be disseminated through online media to be accessed and applied by individuals, groups, and communities.  
2. The current manual should be read and applied by irrigation managers in the field. |
| Internalization| Knowledge has been acquired and applied in the field | Farmers’ knowledge has been applied in the field through meetings and socialization. | The knowledge that has been accessed by irrigation managers (farmers and WUA) can be applied to all irrigation managers, especially (WUA) in D.I Bendung Tegal Kiri, with counseling and training so that all knowledge is not only in the form of tacit. |
4. Conclusions
SECI-based knowledge management development can be used as a knowledge asset to access, utilize, and share with the managers and users, especially for Sriharjo Village. Efforts to improve by applying the SECI model include the process of socialization, externalization, combination, and internalization through sharing between WUA members and farmers in Sriharjo Village. In addition, the Leadership and Culture process also can be applied as a form of appreciation for irrigation managers, farmers, and WUAs who have high performance and create a more integrated and documented culture of sharing. Further research is needed to determine the effect of implementing knowledge management strategies using the SECI concept in WUA organizations by combining Knowledge Management Diagnostic (KMD) and Identification, Reflect, Share, and Application (IRSA) approaches.

Acknowledgements
The author wishes to acknowledge Gadjah Mada University, which has supported the granting of research funding in the 2021 Final Project Recognition Program (RTA) Number: 3190/UN1/DITLIT/DIT-LIT/PT/2021. Also, the author would like to thanks farmer's organizations and youth communities in Sriharjo Village for their cooperation.

References
[1] Davidson C and Voss P 2003 Knowledge Management: An Introduction to Creating Competitive Advantage from Intellectual Capital (New Zealand: Tandum Press, New Zealand)
[2] Davenport T H and Prusak L 1998 Working Knowledge: How Organizations Manage What They Know (Harvard Business School Press, Boston)
[3] Tiwana A 2000 The Knowledge Management Toolkit (Prentice Hall, Inc, United States of America)
[4] Dalkir K 2005 Knowledge Management in Theory and Practice (Burlington: Elsevier Inc., Burlington)
[5] Ramadhan S, Tjakraatmadja J H and Thoha N 2012 Knowledge management maturity level assessment (Case Study of PT. XYZ) Indones. J. Bus. Adm. 1672–9
[6] Rahmawati S N 2017 Strategi knowledge management untuk meningkatkan pengetahuan berdasarkan knowledge-based organizational model (Studi kasus PT Telekomunikasi Indonesia Jakarta) Inf. Syst. Educ. Prof. 1 115–24
[7] Setiawati B 2006 Pengelolaan pengetahuan (knowledge-management) dan modal intelektual (intellectual capital) untuk pemberdayaan UKM) Prosiding Konferensi Nasional Teknologi Informasi & Komunikasi untuk Indonesia pp 187–92
[8] Raharso S and Tjahjowati S S 2016 Organisasi Berbasis Pengetahuan Melalui Knowledge Sharing (Bandung: Penerbit Alfabeta, Bandung)
[9] Hendryadi, Suratna, Suryani and Purwanto B 2019 Bureaucratic culture, empowering leadership, affective commitment, and knowledge sharing behavior in Indonesian government public services Cogent Bus. Manag. 6 1–12
[10] Tobing P L 2012 Knowledge Management: Konsep, Arsitektur dan Implementasi (Yogyakarta: Graha Ilmu, Yogyakarta)
[11] Neto R C D de A, Souza R R, Neves J T de R and Barbosa R R 2008 Strategic knowledge management: In search of a knowledge-based organizational model Comport. Organ. e Gest. 14 247–56
[12] Setiawati B, Harjanto N, Triyono and Subagyo H 2009 Penerapan Knowledge Management pada Organisasi (Yogyakarta: Graha Ilmu, Yogyakarta)
[13] Assa R H, Rengkung L R and Pakasi C B D 2017 Knowledge management pada Kelompok Tani Karya Bersama, di Desa Tombasian Atas Kecamatan Kawangkoan Barat, Kabupaten Minahasa Agri-Sosio Ekon. Unsrat 13 271–82
[14] Nonaka I and Takeuchi H 1995 The Knowledge-Creating Company: How Japanese Companies
Creating the Dynamics of Innovation (Oxford University Press, Inc, New York)

[15] Aulianto D R and Kustanti E 2019 Implementasi manajemen pengetahuan pertanian pada Perpustakaan Khusus Pustaka Kementan RI Seminar Nasional MACOM III Universitas Padjadjaran 2019 “Communication and Information Beyond Boundaries” pp 820–9

[16] Erden Z, von Krogh G and Nonaka I 2008 The quality of group tacit knowledge J. Strateg. Inf. Syst. 17 4–18

[17] Ringle C M, Wende S and Becker J-M 2015 SmartPLS 3.

[18] Sugiyono 2019 Metode Penelitian Pendekatan Kuantitatif, Kualitatif, R & D (Bandung: Penerbit Alfabet, Bandung)

[19] Santosa P I 2018 Metode Penelitian Kuantitatif, Pengembangan Hipotesis Dan Pengujianannya Menggunakan SmartPLS (Yogyakarta: Penerbit Andi, Yogyakarta)

[20] Hair J F, Sarstedt M, Hopkins L and Kuppelwieser V G 2014 Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research Eur. Bus. Rev. 26 106–21