



Information Communication Technology Training Design for Agricultural Extension Workers in the Industrial Revolution 4.0 in Bali Province



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*extension worker's competence;
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Abstract

Agricultural productivity is closely related to farmer behavior that supports productivity and can be developed by providing the necessary agricultural innovation information. Communication of agricultural innovations in extension can utilize software and hardware based on information and communication technology (ICT). The purpose of this study was to analyze extension workers' responses to ICT developments, the training materials needed, and design training designs to increase extension workers' competence. The research was designed using a survey method. Respondents were determined by random sampling obtained through a structured interview technique using an online instrument with the Google Form format. The data were processed using cross-tabulation techniques and analyzed using descriptive methods. Validation of the training design through a focus group discussion approach. The results showed that: (1) the response of extension workers to the development of information and communication technology was quite good; (2) training materials for increasing the competency of extension workers include digital-based ICT operations, making digital extension materials, digital-based ICT operational principles, and assembling digital-based ICT devices. (3) ICT training design is a series of detailed and sequential activities from preparation to identifying training needs, implementation, evaluation, and finally design reconstruction.

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1 Introduction

The potential of agricultural resources is still very much to be developed to achieve maximum productivity. Efforts that can be made are to improve farmer behavior so that they have knowledge, attitudes, and actions that support agricultural productivity achievements. Meeting the information needs for agricultural innovation is important to changing farmer behavior. The agricultural innovation communication process can utilize information and communication technology (ICT), which is increasingly developing in the Industrial Revolution 4.0 era (Krishnayana et al., 2019).

The dissemination of information about agricultural innovation in the agricultural extension system relies on the role of instructors as communicators. The effectiveness of extension is largely determined by the instructor's communication competence, including his competence in utilizing information and communication technology to transfer agricultural innovation information. Thus, the ICT competency capacity of extension agents should be an important policy for extension institutions (Faheem et al., 2018).

Extension institutional policies should be able to accommodate the implementation of ICT in the extension. In the context of the development of smart farming, whose activities tend to utilize the advantages of digital technology, the ICT competence of instructors is increasingly needed. Extension instructors' mastery of ICT competency can be achieved through a series of education and training programs that are carried out regularly, in stages, and are always upgraded by extension institutions (Verma & Sinha, 2018; Kassem et al., 2021; Bernet et al., 2001).

Organizing digital-based ICT training for extension workers can be carried out well and effectively achieve its objectives if it follows a training format designed based on the needs of the training participants. The instructors' need for ICT training can be reflected in their intentions and enthusiasm for participating in the training. Based on the identification of instructors' interest in participating in training and their need for ICT substance, the training design that will be implemented can be designed. This article presents the results of the study as an answer to problems related to instructors' responses to ICT, materials needed in ICT training, and ICT training design (Leong et al., 2020; Alaloul et al., 2020).

2 Materials and Methods

This research was designed as survey research, where researchers interacted intensely with respondents to understand the context of the research variables. The operation follows survey research principles as stated by Singarimbun & Effendy (1989), Kerlinger (2000), and Birowo (2004). The research location is at the Bali Province Agriculture Service, where extension workers carry out their main duties and functions as State Civil Apparatus. Determining the research location was based on the purposive method (Kerlinger, 2000; James & Dean, 1992; Singarimbun & Effendi, 1989).

The research population was all extension workers in Bali Province, totaling 543 people, while 120 people were designated as respondents, namely those who filled out the questionnaire completely and sent it back to the researchers. Resource persons in the FGD include extension experts, extension workers with main functional

positions, agricultural practitioners, and other stakeholders who understand the training and development of agricultural extension.

The main research variables include instructor responses, training materials, and training design. These variables are explained by their indicators in a reflective manner based on the measurement of their respective parameters. Research data includes primary data and secondary data. Primary data was collected from the main respondents who had been determined, and secondary data was obtained from documents and archives related to the research area. Data collection using online interview techniques using a structured questionnaire instrument in Google Form format. An in-depth interview approach was also carried out with key informants using an interview guide. The data obtained is processed and displayed in cross-tabulation, then interpreted and described using descriptive methods. Confirmation and validation of the training design through a focus group discussion approach (Aceto et al., 2018; Spanos et al., 2002; Hilty et al., 2006).

3 Results and Discussions

Extension officers' response to ICT

The response of extension workers to ICT developments shows a fairly good trend. They are aware of the rapid development of ICT with its various advantages, so they intend to understand and utilize it in extension activities. This response is the initial stage of interest in ICT objects until they are used to obtain use value.

Developed from the Innovation Adoption Process Theory (Rogers & Shoemaker, 1971), the instructors' responses to the substance of ICT include: (a) general, like the general public, that the instructors have heard, have read, and have seen the existence of ICT; (b) benefits, realizing from the information obtained that ICT can provide convenience and increase the effectiveness of counseling; (c) urgency, extension agents realize that ICT is important to immediately apply in extension activities; (d) selective, instructors use ICT tools according to their understanding and skills; and (e) pragmatic, extension workers only use existing ICT, available in the office, and which are owned personally. The suitability of the relationship between the stages of the innovation adoption process and the level of instructor response to ICT and educational training themes is shown in Table 1.

Table 1
Extension officer responses and training themes for increasing the competency of extension agents in Bali Province

No	ICT Adoption Process Stages	The substance of the Extension Officer's Response	ICT Education-Training Theme
1	Awareness	General	Principle of application
2	Interest	Benefit	Use value
3	Evaluation	Urgent	Success story
4	Trial	Selective	Practice deepening
5	Applied	Pragmatism	Facilitation - supervision

Source: Suardi & Parining (2020)

ICT Training Materials

Theme

Based on the level of response of instructors to ICT developments and to meet the need for increased mastery of ICT and its applications, educational and training materials to increase the competency of instructors can be offered with themes that include: principles of ICT application; ICT use value; ICT success stories; deepening of ICT practices; and ICT facilitation and supervision.

Principles of ICT application. In the initial stages of introduction, instructors are aware of and understand ICT, similar to their understanding of society in general. However, because instructors are

professional officers, they are obliged to understand in more detail matters relating to ICT. The important principles of ICT application must be understood, which include: (a) the importance of ICT in carrying out the duties of extension workers; (b) why should you use ICT; (c) what must be prepared for ICT operations; (d) manual system constraints and ICT convenience; (e) ICT penetrates space and time; and (f) ICT leads to community independence.

The use value of ICT. The use of ICT provides many conveniences in carrying out extension activities because the working capabilities of ICT can help overcome operational obstacles that were previously difficult to solve. The substance of the theme of the usefulness of ICT can include (a) the benefits of using ICT in carrying out extension tasks; (b) the cost and time efficiency of ICT utilization; (c) the ease of implementing counseling with ICT support; (d) the attractiveness of extension using ICT; (e) manipulation of the counseling space with ICT; and (f) access to big data with ICT.

ICT success story. Generally, farmers, extension workers, or any student will find it easier to understand and trust the learning material if they can see directly the impact caused by the application of certain methods. ICT work achievements can be shown to students or training participants so that they can know the results that can be obtained by utilizing ICT in their work processes. Examples of success, often referred to as best practices, are often introduced by instructors or trainers to participants to foster the motivation to strive to achieve success. In training to increase ICT competency, the relevant substance is provided regarding the successes of its application (success stories) in the world of work.

Deepening of ICT practices. The substance of training that can strengthen instructors' skills in using ICT is practice working on and trying to carry out items of ICT operational activities related to software and hardware aspects. More training participants are assigned to work on the ICT application modules. Apart from being carried out in the classroom in a classroom format (in-door training), the deepening of this practical material should also be carried out on-site visits where ICT is widely used, providing convenience in the process of carrying out work and being able to double productivity. With this format, training participants gain more practical experience that can strengthen their psychomotor domain, so that they have adequate skills to operate ICT.

ICT facilitation-supervision. When the instructor has determined the choice of ICT tools to be used in extension, this is when facilitation and supervision are needed. Facilitation in the preparation and procurement of ICT equipment is very much needed because this will determine the level of application in counseling. Likewise, the application of ICT must be accompanied by monitoring and supervision; this is important to ensure that instructors can use it precisely and with high effectiveness.

Topic

Responding to ICT developments in the Industrial Era 4.0 and to improve their professional competence in extension, it turns out that all extension respondents need ICT training, and even 29% of them stated that they need this training (Reynolds & Dolasinski, 2019). They need training to increase their knowledge and skills in applying ICT effectively to extension activities. Data on instructor interest in participating in ICT training is shown in Diagram 1.

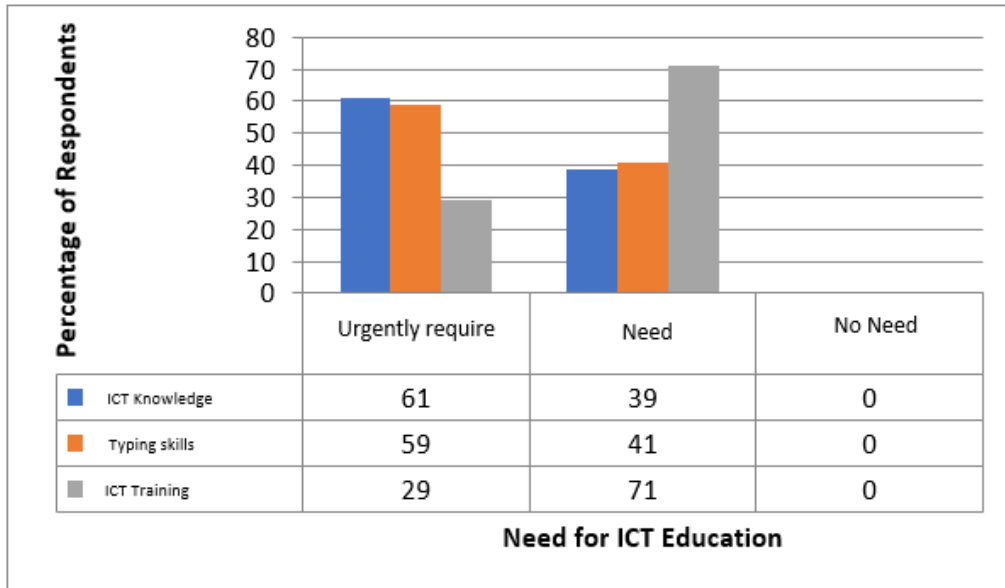


Diagram 1. Enthusiasm for Instructors Participating in ICT Training in Bali Province (Suardi & Parining, 2020)

To meet the interest of the instructors, the relevant training materials provided can be elaborated on the themes offered (in Table 1) so that they become more specific training topics according to the instructors' needs to increase their competence regarding ICT. Based on the results of the online survey, it turns out that there are four topics that instructors are interested in in ICT training, as shown in Diagram 2.

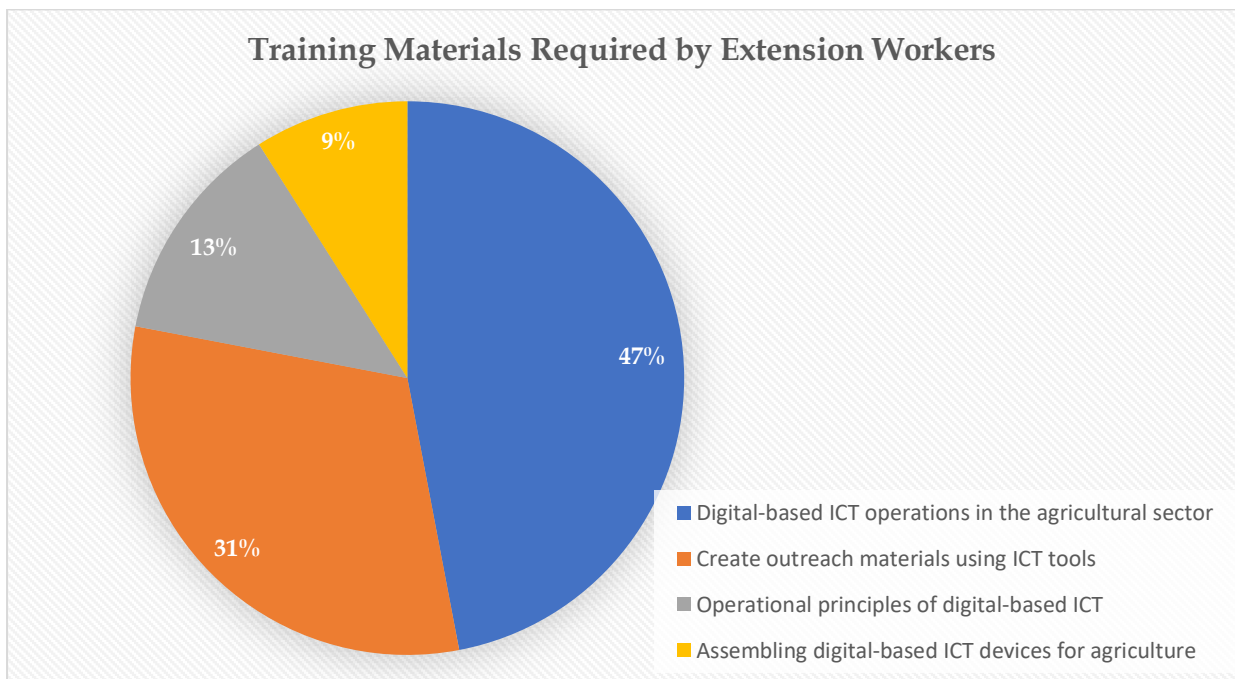


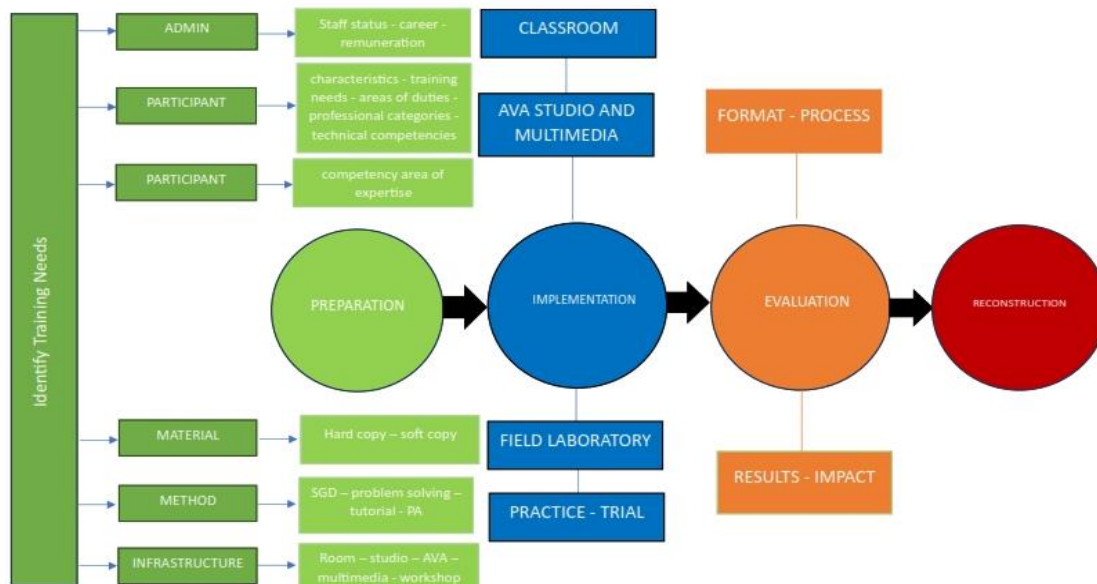
Diagram 2. ICT Training Materials in Bali Province (Suardi & Parining, 2020)

Based on research results, most extension workers think pragmatically, namely that after training they can immediately apply digital-based ICT in agricultural activities (47%). Then they can create ICT-based outreach materials (31%), and they can assemble digital-based ICT devices (9%). Meanwhile, 13% think the ideal is wanting to understand the operational principles of digital-based ICT. Paying attention to the interests of the extension workers, these four topics should be the main material in the education and training to increase the competency of the extension workers that will be implemented.

ICT Training Design for Extension Workers

The provision of education and training for extension workers, whether programmed in a gradual manner or incidental-situational, should be packaged to suit the needs of increasing the competency of the extension agents themselves. Extension workers certainly know what knowledge and skills they need to deal with developments in farmers and agricultural problems in their work areas. When instructors are participants in education and training, they are adult learners who tend to display character following the concept of andragogy, namely learning to develop their capacity, learning with a clear orientation, being ready to learn with various consequences, and learning based on experience. The enthusiasm of extension workers to take part in training to increase ICT competency with the required training material topics can certainly complement the requirements, criteria, and arguments of extension institutions for holding training.

Training to increase the competency of instructors regarding ICT can be designed in such a way that, in general, it is a series of sequential activities from **preparation**, namely detailed identification of training needs, which includes: administration, participants, resource persons, materials, methods, facilities, and infrastructure. Next, **the implementation stage** provides participants with a comprehensive experience through learning interactions using the classroom method, personal activities in the audio-visual aids and multimedia laboratory (AVAM Lab), field practice, and skilled trials in selected groups. Next is **the evaluation stage**, where training performance is assessed through formative evaluation, process evaluation, results evaluation, and impact evaluation. The final stage is **design reconstruction**, namely modifying the training design to adapt to developments in field problems, the competency needs of instructors, extension resources, and the dynamics of extension institutional relations. The training implementation mechanism can follow the sequence shown in the following figure.



Training Design to Increase the Competency of Extension Officers Regarding ICT
(Suardi & Parining, 2020)

Training with this design emphasizes output that truly masters aspects of understanding and skills in applying ICT to implementing extension activities. Thus, prospective training participants must be selected strictly in light of the need to increase their capacity to master ICT. The grouping of participants is absolutely carried out on the basis of the field of work, status, category of staff, and technical background. This is important so that it is in accordance with the main task areas handled and the competency function in optimizing performance.

Training organizers must select and assign resources with competencies appropriate to the material to be presented. Resource persons must meet the criteria as experts, designers, and ICT practitioners who come from extension institutions, research and technology assessment institutions, universities, and the ICT equipment industry. The resource person prepared the material in the form of a soft file, and the organizers packaged it in the form of a training manual book as a guide for the participants. Resource persons also direct and facilitate training using a tutorial class approach in the form of small group discussions, problem-solving, and personal and group activities. The availability of adequate training facilities and infrastructure is an important requirement so that participants can train individually or in groups.

At the time of training, all training equipment and infrastructure are in functional condition. Classrooms, studios (workshops), laboratories, and experimental gardens (pilot project plots) are well arranged (conducive layout), including the availability of multimedia devices connected to the internet network with a stable and strong signal. All of this can make training participants feel comfortable and motivated to increase their capacity.

The effectiveness of training can be determined through evaluation, which must be carried out as an important stage in organizing training. Evaluation in the form of a pre-test before training is carried out as a basis for determining the training format. Followed by monitoring, namely monitoring carried out throughout the training process. Evaluation of this process can maintain the training implementation mechanism under the scenario that has been planned, to avoid deviations in activities that can cause training to be ineffective. The final evaluation can be carried out after the training has been completed. This post-test is carried out to ensure that the training objectives are achieved. After attending the training, the participants should experience changes in behavior towards ICT. Participants' final competency regarding ICT must be measured based on training achievement indicators that have been explicitly defined in the training planning document.

Based on the evaluation results, it can be seen that a series of training activities have been implemented. The preparation, implementation, and evaluation mechanisms are confirmed by the evaluation results. All weaknesses in training implementation are identified and become important notes as a basis for making improvements and revising the training design. Design revision, namely the activity of reconstructing the design, is intended to improve the training design so that the implementation of subsequent training is truly effective. Design reconstruction can involve elements of preparation, implementation dynamics, and evaluation techniques.

4 Conclusion

Based on the discussion that has been described, it can be concluded as follows: the instructor's response to ICT developments concerns five dimensions, namely: general, useful, urgent, selective, and pragmatic. By the response level, the relevant ICT substance training themes (in order of response) are application principles, use values, success stories, deepening of practice, and facilitation-supervision.

ICT training topics chosen by extension agents include: (a) the application of digital-based ICT in the agricultural sector; (b) creating ICT-based extension materials; (c) assembling digital-based ICT tools; and (d) principles of digital-based ICT operations. ICT training design describes sequential activities and details of the four main components of the training process, namely preparation, implementation, evaluation, and design reconstruction.

Recommendation

The topic of instructor competency training regarding ICT must be adjusted to the level of response and needs of instructors regarding the substance of ICT. Organizing training to increase the competency of extension workers must be guided by a training design whose process components are intact and complete, including preparation, implementation, evaluation, and design reconstruction.

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