

**MEDIA FOR ADVANCEMENT ON THE E-ESTRUS APPLICATION AS AN ANDROID
BASED ESTRUS TIME REMINDER SYSTEM IN POLBANGTAN MALANG
CATTLE FARM****Muhammad Fatlilah¹, Setya Budhi Udrayana², Andi Warnaen³**

Politeknik Pembangunan Pertanian Malang, Indonesia

Email: muhammadfatlilah6@gmail.com

Submitted ...; Approved ...

ABSTRACT

The Directorate General of Animal Husbandry and Animal Health, through the SIKOMANDAN program, a continuation of the UPSUS SIWAB program, seeks to increase the population and production of cattle and buffalo, to reduce the rate of import dominance through optimizing reproduction. The main period in cattle reproduction is when the cow comes into heat to become pregnant. Detecting cow heat must be done on time and immediately reported to the inseminator so that the cow can become pregnant with one conception. So the aim of the research is to create and test the feasibility of an application that provides warnings in the form of notifications during important periods of estrus. The method used is ADDIE (Research and Development). The samples in the application trial were dairy farmers in Polbangtan Malang and farmers assisted by KUD Dadi Jaya Purwodadi Pasuruan, totaling 9 people with an average livestock ownership of more than 3 heads. The application feasibility data obtained was analyzed using a qualitative interpretation formula for scores on the application media feasibility test aspect with Likert scale assessment criteria. Data on responses from breeders' opinions to the application were analyzed using a percentage formula with Guttman scale criteria. The results of the study show that the application was successfully developed and named E-Estrus. The stages of creation using the ADDIE model are analysis, design, development, implementation, and evaluation. The media expert's assessment of the application received a score of 4.4 in the "Decent" category. Meanwhile, the respondent's assessment of the feasibility of the application based on the level of acceptance received a score of 4.24, including in the "Very Feasible" category. Meanwhile, breeders' response to the E-Estrus application received a score of 100% in the usability aspect and 67% in the convenience aspect. So the media implication of the E-Estrus application is that it is successful in controlling the cow's reproductive cycle by providing notification alerts and recording reproduction and is quite easy to operate.

Keywords: *repeat breeding, deteksi berahi, ADDIE, dan media aplikasi.*

BACKGROUND

The Directorate General of Animal Husbandry and Animal Health through the SIKOMANDAN (Cattle and Buffalo Mainland Commodity of the Nation) program which is a follow-up program to UPSUS SIWAB (Special Efforts for Compulsory Pregnant Breeding Cows) seeks to increase the population and production of cattle and buffalo as well as reducing the dominance of Indonesian cattle imports through optimizing livestock reproduction. In implementing this program through artificial insemination (AI) in female cows. The success of this program is influenced by human resource factors, namely livestock breeders, paramedics, satisfactory service, and support from the local government (Islami et al., 2022). However, there are still many cases of cows mating repeatedly, so that the goal of increasing the cow population is hampered. According to Drh. Deddy

F Kurniawan (2020), an animal health practitioner, stated that 96% of the factors influencing cow pregnancy are treatment and environmental management, 3% in male cows, and 1% in female cows. So the free right that influences livestock pregnancy factors is the farmer himself who acts as a manager of the environment and treatment of his cattle. The incidence of pregnancy in cows is closely related to reproductive management. One part of critical reproductive management is knowledge regarding estrus or heat detection. Failure of artificial mating is usually caused by farmers not knowing when the cow is in heat, mistakenly guessing when the cow is in heat, or realizing too late that the cow is in heat (Ervandi et al., 2023). Oestrus is a sign that the animal is asking for mating and this phenomenon occurs continuously every ± 21 days after the uterine involution period. Uterine involution is a condition where the uterus in cows returns to the size and function before pregnancy. The ideal uterine involution period in cows is 40 – 45 days, marked by the cow coming into heat or asking to mate. Detecting the time of heat is the most important factor because the accuracy of detecting heat will affect the timeliness of mating and the success of pregnancy. One factor in the occurrence of repeated mating is inaccuracy in estrus detection due to poor understanding of the estrus and diestrus cycles (Beaden., et al. 1997). The characteristics of a cow in heat or asking to mate are usually shown by clinical symptoms of a swollen vulva, red vulva and if touched it feels warm and clear, thick mucus comes out of the cow's vulva. Therefore, researchers are interested in creating and testing the feasibility of an application as a tool (media) to remind farmers of important periods in the notification-based cattle reproductive cycle. The tool is in the form of a reminder application media for important periods in cattle reproductive management. The aim of this research is to build application-based outreach media that has an instructional design on cow reproductive control including estrus, pregnancy checks, and birth estimation..

RESEARCH METHODS

The research was carried out at Polbangtan Malang and KUD Dadi Jaya Purwodadi Pasuruan in conducting application trials. This research uses the Research and Development (R&D) method. According to (Sugiyono, 2013) R&D research is a research method used to produce certain products, and test the effectiveness of these products. The R&D research model used is ADDIE. The ADDIE model R&D method is a model that is commonly used to develop multimedia applications (Abdul Rokhim, 2020). The stage procedures in the ADDIE model consist of (1) Analysis, (2), Design, (3) Development, (4) Implementation, (5) Evaluation. The data collection methods used were survey, interview and literature study methods. Interviews and observations use instruments in the form of questionnaires to test the feasibility of the application and determine the response of breeders' opinions to the application media. There are 3 variables for testing application feasibility, namely (1) Software engineering variables, (2) ease of use of the application, (3) usability of the application, and (4) response to breeders' opinions regarding the ease and usefulness of the application. Before the application was tested, it was tested by a validator in charge of software design and agricultural extension media, namely Yudi Rustandi, S.ST., M.Sc. Measuring the feasibility of the application uses a Likert scale with the highest score being 5 and the lowest being 1, while the opinion response to the application uses a Guttman scale measurement with the statements "YES" and "NO".

Respondents for the application trial were the Polbangtan Malang dairy farm and the Dadi Jaya Purwodadi Pasuruan KUD breeders, totaling 9 respondents. Data analysis using the formula (Sukardjo, 2012 in Enik Widiastuti, 2017) below :

Table 1. Value conversion criteria

Value	Formulating	Range	Classification
5	$\bar{X} \geq Xi + 1,8 SBi$	4,21 – 5,00	Very worthy
4	$Xi + 0,6 SBi \leq \bar{X} \leq Xi + 1,8 SBi$	3,41 – 4,20	worthy
3	$Xi - 0,6 SBi \leq \bar{X} \leq Xi + 0,6 SBi$	2,61 – 3,40	Not worthy
2	$Xi - 1,8 SBi \leq \bar{X} \leq Xi - 0,6 SBi$	1,81 – 2,60	Not feasible
1	$\bar{X} \leq Xi - 1,8 SBi$	0 – 1,80	Totally not worth it

Source: Sukadrjo, 2012 in Enik Widiastuti, 2017.

Information:

Maxiumum value = 5

Minimum value = 1

Ideal maximum value = number of indicators x highest score

Ideal minimum value = number of indicators x lowest value

$\bar{X}$ = average value ($\frac{\text{number of values}}{\text{number of test subjects}}$)

Xi = $\frac{1}{2}$ (Maxs Value + ideal minimum value)

SBi (Simpangan baku ideal) = $\frac{1}{6}$ (Maxs Value - ideal minimum value)

Meanwhile, in the analysis of responses to the application, data from the Guttman scale questionnaire was used as a percentage. If the value is $\geq 65\%$ then the response is considered positive (Sunoto, 2007 in Leni Yulianti 2018). The percentage is calculated using the following formula:

$$\text{percentage of each number(\%)} = \frac{\text{Number of breeders who answered "YES"}}{\text{total number of breeders}} \times 100$$

RESULT AND DISCUSSION**Analysis**

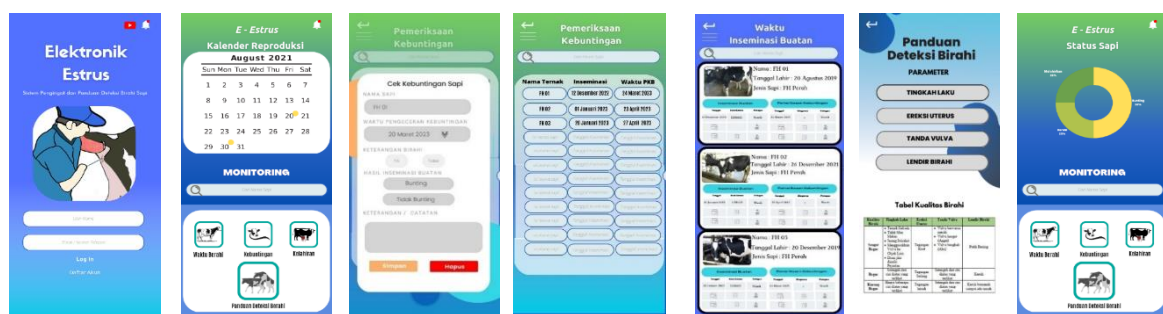
The analysis process is the initial stage of data collection used to analyze information needs as a reference for application design. The data collected includes the application concept, application name, material in the application, device specifications, and other supporting assets based on the results of potential identification. Next, an analysis of the media and materials is carried out, an analysis of the hardware and software needed to make the product (Abdul Rokhim, 2020). The results of the analysis stages of target and device needs are as follows:

Kebutuhan	Penyuluh	Peternak	Hasil
Application concept	Access farmer data (population and farm status)	Intensive recording of cow reproductive status and storing livestock data	1. Profile and register features 2. Livestock recording feature 3. Estrus future
	Knowing the results of livestock business (productivity)	Access certificates of livestock cycles, productivity and history of cattle	Features of livestock productivity
	Actively interact without being hampered by time or place and answer problems right away	Carry out active consultations with extension workers without being hampered by time or place	Consultation, notification and discussion features
Application Name	Easy to Remember and never before	According to the use of the application	Elektronik Estrus (<i>E-Estrus</i>)
Instructional Design	Provide communication notifications with breeders and answers	1. Notification of estrus, PKB, and birth	Features of estrus, PKB and birth
		2. Recommendations for the best commands on the cow's condition in status reproduksinya 3. Evaluate one livestock reproduction cycle	
Material	Instruksional	Easy to understand in the form of instructions	Instructions according to each feature in the application and notifications
Device Specifications	RAM ; < 3 GB	RAM : < 2	RAM : > 1 GB
	Versi Android : 4.3	Versi Android : 4.3	Versi Android : > 4.3
	Memori : 200 MB	Memori : 100 MB	Memori : > 100 MB

Based on the needs analysis, the application design contains functions including: profiles, recording cattle reproduction, productivity features, consultation features, heat check features, and instructional, as well as warnings in the form of notifications during important periods of cattle reproduction. The application was made to have RAM specifications > 1GB, Android version > 4.3, memory > 100MB, with the dominant color blue.

Design

The design stages of the ADDIE model mean designing media which includes mock ups, creating logos, backgrounds, images, tool functions, materials and icons as well as display design. The following are the design results based on the stages of software requirements:



Because the target users are cattle farmers, the system interaction design with users is aligned with responsive analysis components that do not make the application space congested. A good user interface concept has aspects of clarity, conciseness, easy recognition, consistency, responsiveness, and aesthetic content (Arfianto, 2022). The application function design focuses on the input menu in the form of cow population data, heat time, heat check, and heat detection guide. Meanwhile, the output design is notification of the time to check heat again, check pregnancy, estimate livestock births, and record reproduction. The source of the application function design is the reproductive cycle of cattle. So at every important period in the reproductive cycle you will get a warning from this application based on the time of data input. The following is an overview of the application's functions based on the reproductive cycle of cattle:

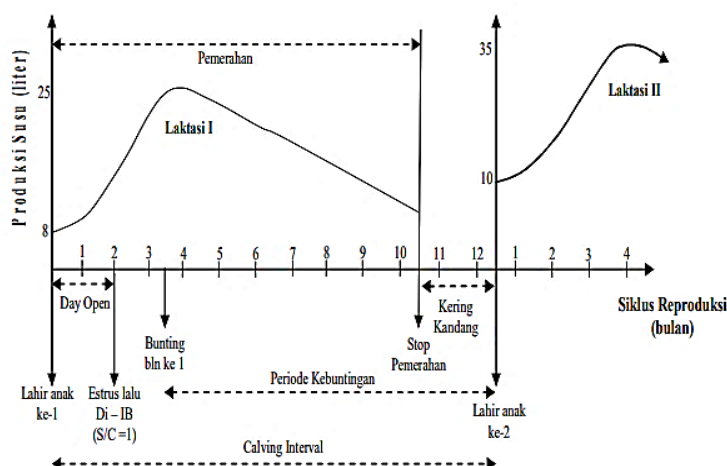


Figure 1. Female cow reproductive cycle

Development

Development is the stage of system implementation which is realized based on database and interface design contained in the Flutter Dart programming language, one of the modern programming languages developed by Google. Development is carried out by translating the needs of the target into an application system according to coding rules with supervision by the developer. The output from this development stage is in the form of interactive application media in terms of places, facilities or tools for storing information. Media presentation that combines all multimedia elements makes information acceptable to the senses of sight and hearing, closer to its original form in the real world (Fatimah & Nuryaningsih, 2018). The following are the results of application media development from the analysis and design stages:

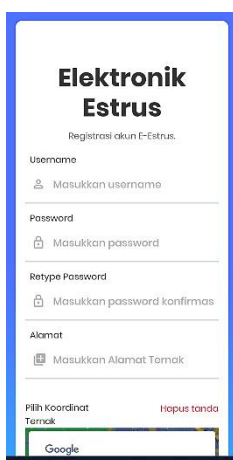


Figure 2. Registration page

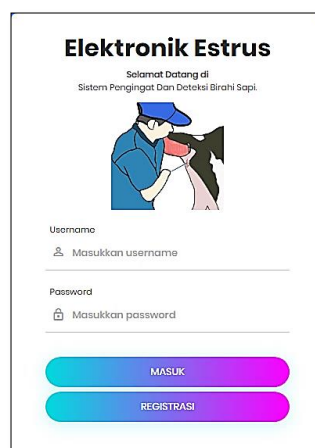


Figure 3. Login page



Figure 4. Profile page



Figure 5. Reproduction calendar

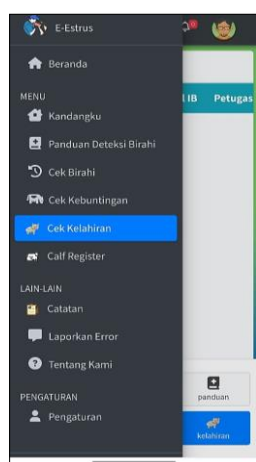


Figure 6. Sidebar



Figure 7. Guide to estrus detection

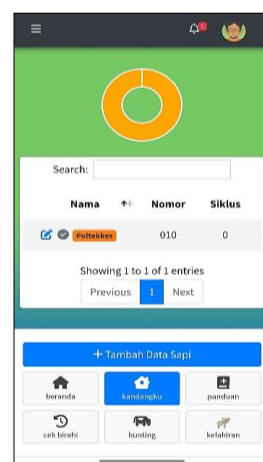


Figure 8. Population page

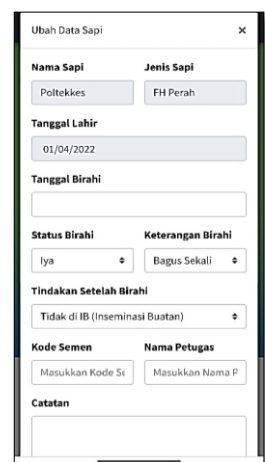


Figure 9. Estrus check feature

Implementation

The implementation stage is to apply directly to the actual activities resulting from the development. Implementation has the aim of achieving the results set at the analysis stage. The experiment was carried out through outreach activities to provide a description of the application. Next, application operation training was carried out using a mentoring method for all respondents. The selection of mentoring methods is able and successful in increasing the effectiveness of counseling in implementing activities, increasing skills and sustainability of program implementation (Yeti et al., 2022). The media used at the implementation stage is the smartphone owned by each cattle farmer. The use of smartphones makes it easier to receive information channeled through applications. In line with research (Sirajuddin & Lis Kawati Kamba, 2021), smartphones have quite large potential for use in agricultural extension because access is quite high among farmers. Ownership of smartphones by farming families in villages is profitable, apart from accessing information from cyberspace (the Internet), basic functions are also used. Smartphones are also a communication tool, namely as a mobile phone. With smartphones, farmers not only have internet access equipment, but also to communicate with other people. Apart from that, farmers have far more access to using smartphones than computers.

Evaluation

Evaluation is the stage of assessing the feasibility of an application. The aim is to see whether the conceptual system built is successful according to initial development expectations or not. Before the application is disseminated through outreach activities, the application that has been developed is first evaluated by a validator, the results are as follows:

Table 2. Media Expert Validator Test Results.

No	Indicator	Scor
Aspects of Software Engineering		
1	Application file size is appropriate	4
2	The installation and account registration process is easy	5
3	Application media does not hang (Freezing)	5
4	Media can be managed or maintained easily	4
5	Ease and instructions for using the application	3
Total Scor		21
Average		4,2
Criteria		Worthy
Indicator		Scor
Aspects of Visual Communication		
6	User interaction with the application is understandable	5
7	The application appearance is attractive and neat	4
8	All app features function according to their instructional design	5
9	The app feedback works fine	5
10	Design suitability (attractiveness, neatness, and choice of colors and letters)	4
Total Scor		23

Average	4,6
Criteria	Worthy
Total Score	44
Average	4,4
Criteria	Worthy

Based on the table above, it can be seen that the media expert's assessment of the software engineering aspect obtained an average score of 4.2 in the "Decent" category. In the visual communication aspect, the average score obtained was 4.6, this score is in the "Very Decent" category. The overall average score by media experts was 4.4, included in the "Decent" category. Judging from the positive response results which are greater than the negative response results, the application media is declared feasible and can be continued by adding things that are considered lacking and ready to be tested in the field.

The results of application implementation in the field visualize the application's suitability for use. The assessment by respondents is an expression of the feasibility of the E-Estrus application as a tool for heat detection and notification reminders for important events related to cow reproduction. The following are the results of the application feasibility assessment by respondents:

Table 3. Results of Application Feasibility Testing by Respondents

Aspects of Ease of Use of Applications	Total Score	Scor Average	Category
The app design and function flow are not confusing	37	4,11	Worthy
I understand the features and functions of the E –Estrus application	40	4,44	Very worthy
I can easily enter cow estrus data	37	4,11	Worthy
The language used in the E – estrus Application is easy to understand	42	4,67	Very worthy
The E – estrus application is easy to use	35	4,00	Worthy
Total	192	4,20	Worthy
Application Usability Aspects			
The E – estrus application displays notifications for estrus detection	32	4,0	Worthy
It is easier for me to determine when a cow is in heat with the help of the E –Estrus application	37	4,6	Very worthy
I was able to detect estrus with the E – estrus application correctly	33	4,1	Worthy
Timely reporting of artificial insemination (AI).	34	4,3	Very worthy
My cows have their heat cycles monitored	36	4,5	Very worthy

Total	191	4,24	Very worthy
Aspects of Software Engineering	Total Scor	Scor Average	Category
The application does not hang (stop) during operation	37	4,11	Worthy
The application does not cause the cellphone to hang (stop)	41	4,56	Very Worth
The application installation process is easy	40	4,44	Very Worth
This application has clear problem help	33	3,67	Worth
All features in the app work	39	4,33	Very Worth
Total	190	4,20	Worthy
Total Score		12,64	Very
Average		4,21	Worth

Evaluation by respondents on the feasibility of the E-Estrus application in the aspect of ease of application obtained an average score of 4.20 which is included in the "Feasible" category. Ease of use of the application shows that the system design and user interface are easy to recognize and not confusing for users. A good user interface is prepared by knowing the user's characteristics, understanding goals, skills and preferences (Jesse, 2011 in Muhammad Rizky Afrianto, 2022). Convenience trust is the level of someone's belief that using a system will improve their work performance (Nurlifa, Kusumadewi and Kariyam, 2014).

In the usability aspect, the application obtained an average score of 4.24 which is included in the "Very Decent" category. The application's usefulness in helping detect heat, pregnancy checks, and estimating livestock births becomes precise by providing time estimates in the form of notifications. The presence of notifications on mobile devices can remind users of tasks that must be carried out and provide a good user experience, both in terms of attractiveness, clarity, efficiency, accuracy, stimulation and novelty (Faried, Mulwinda and Primadiyono, 2017).

The feasibility aspect of applications in software engineering received an assessment with an average score of 4.20, included in the "Feasible" category. The easy-to-know nature of the application makes it easy for farmers to quickly learn about the cycles in the application according to the cow's reproductive cycle. In accordance with the opinion of (Sumarsono & Sugiyanto, 2019), good learning media is something that can be used to stimulate thoughts, feelings and attention to encourage the teaching and learning process. This means that the software engineering aspects are in accordance with the target needs. (Irmayani, 2019) states that the characteristics of quality software have the characteristics of (1) Maintainability, (2) Depenpability, (3) Efficiency, (4) Usability.

Meanwhile, farmers' responses to the application regarding the usability aspect of determining the cow's estrus time with the application, the efficiency of estrus detection, reporting the time of artificial insemination, and warnings in the form of notifications received a response percentage of

100%. The implementation approach through counseling and mentoring is said to be successful in introducing and training respondents regarding how to use it. So the E-Estrus application is stated to be positively useful in helping smallholder scale farmers and company scale farmers based on cow population in helping farmers record important events, determine the time of detection of estrus, and remind them of actions during estrus. Meanwhile, breeders' responses to the ease of use aspect of the E-Estrus application included ease of use, getting a score of 67%. There are still some features that respondents may not understand and some other functions. Therefore, an introductory video and procedures for using the application have been added to the login page or start page.

CONCLUSION AND SUGGESTION

Based on the data analysis that has been carried out on the feasibility of the E-Estrus application media, several conclusions and suggestions can be put forward as follows

Conclusion

- 1) Analysis of the needs for designing an Android-based oestrus time reminder system application for cows including the needs of instructors as education media, animal health officers, and breeders to function as a place of communication with instructors and animal health officers through the application.
- 2) The second stage, namely the software design stage, includes making mock ups, feature functions, function flow design and user interface and user experience, then continued with the development stage to realize the application in mobile form. Implementasi aplikasi dilakukan ke peternak sebagai responden yang berjumlah 9.
- 3) Evaluation of the feasibility of the application shows that the application is feasible as a medium for providing information on the reproductive cycle of cattle which is interpreted in instructional form in the application with an application feasibility test value of 4.21, including the "Very Feasible" category. Meanwhile, breeders' response to the E-Estrus application received a score of 100% in the usability aspect and 67% in the convenience aspect. So the media implication of the E-Estrus application is that it is successful in controlling the cow's reproductive cycle by providing notification alerts and recording reproduction and is quite easy to operate.

Suggestion

- 1) The E-Estrus application can be redeveloped with a more interactive design with more features for large ruminant livestock management.
- 2) Support from authorities and institutions is needed to make farmers aware of the low birth rate in livestock and encourage the use of technology to support cattle farm management and there are certain institutional entities that need to manage applications so that interactions remain up to date.
- 3) Further research is needed regarding the effectiveness of comparative testing of beef reproductive management systems with and without the use of E-Estrus.

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