

Design and Implementation of the IT based Hog Breeding Management Application

Hoseok Jeong, Meonghun Lee, Jeonghwan Hwang, Hyun Yoe*

Dept. Of Information and Communication Engineering, Sunchon National University,
Suncheon, Jeollanam-do, Republic of Korea
{hsjeong, leemh777, jhwang, yhyun}@sunchon.ac.kr

Abstract. Korea hog industry has grown with the biggest product scale. However, the current circumstance is that it is lagging behind in market share by imported livestock products as the market has opened as a result of the recent FTA signing, and it is experiencing difficulties due to increased production cost that resulted from the increase in international grain price. In addition, productivity of farms is not being improved due to low level management technology. To solve such problem, this paper proposed IT-based hog breeding management application. The proposed application has been developed at the eye level of farms for conveniently and easily managing the items required by hog farms. In this application, items were determined by focusing on the sow, market pigs and feed feeding directly connected to the income of hog farms, and shipment prediction item was inserted to allow users to pay attention to business management by being aware of income for each month. In addition, feed cost that currently occupies 60~70% of production cost could be reduced through feed feeding management. Based on this, it is expected to improve the productivity of hog farm and increase the competitiveness of domestic livestock products through systematic breeding management.

Keywords: IT, Application, Breeding, Hog, Management

1 Introduction

Korea hog industry has been continuously growing by becoming a main protein supply source of people[1]. In addition, it has grown into most competitive industry with largest production scale in livestock industry next to rice in agriculture[2].

In spite of this, hog industry of our country is experiencing many difficulties domestically and internationally[3]. First off, the market share is lagging behind due to the incoming of cheap imported livestock products. And 60~70% of business cost is being spent for feed due to the increase in feed price as a result of the increased international grain price[4][5].

In addition, productivity of farms is low due to insufficient level of facilities and breeding management technology compared to that of livestock advanced countries[6].

To overcome such situation and increase the safety and profitability of farms, there is a need to improve productivity and reduce production cost. For the purpose of

improving productivity, it is necessary develop hog breeding management program that is easy to use by farms. Hog management programs have been developed domestically by integrating IT but they were very inconvenient to use by actual hog farms as their IT part has been emphasized. Accordingly, they should be developed as the eye level of farms to allow them to conveniently and easily use while managing the items that hog farms actually need.

This paper proposed IT based hog breeding management application according to such situation. Through the proposed application, sow and market pigs information can be seen via smart phone, as well as the market pig information of farms per month through shipment forecast. In addition, it can reduce the loss in feed by setting food intake amount according to each entity. Based on this, it is expected to provide convenience to hog farms and reduce production cost.

2 Related Research

2.1 Sow Breeding Management

The first goal of a pig farm is to produce a large number of healthy pigs. To do so requires a systematic management of sows breeding, and this breeding management is directly related to farm productivity[7]. High productivity and nursing ability of sow is made through the systematic management of breeding[8]. In this paper, I assumed that the breeding environment is same, and focus on the breeding date and farrowing date.

2.2 Piglet Breeding Management

Subcutaneous fat in piglets are physiologically less dense and they have weak temperature control capability for the external environment. And do not have immunity against the disease. Also should be keep optimum environment always because piglets is exposed to digestive and respiratory disease.

Especially when temperature is falling because of wide daily temperature range, piglets are very dangerous. Thus, the weight is light and weak piglets must be managed carefully according to temperature and humidity shown in table 1[9].

Table 1. Date or weight condition

Date or weight	Titration temperature range(°C)	Optimum temperature(°C)	Humidity(%)
Immediately after birth	30 ~ 35	35	60 ~ 70
1 week	25 ~ 30	25	60 ~ 70
Before weaning	20 ~ 25	20 ~ 25	60 ~ 80

Date or weight	Titration temperature range(°C)	Optimum temperature(°C)	Humidity(%)
Immediately after birth	30 ~ 35	35	60 ~ 70
Weaning	25 ~ 30	25	60 ~ 80
Weaning ~ 45kg	18 ~ 22	21	50 ~ 80
45kg ~	15 ~ 20	18	40 ~ 60

Growth of piglets change according to nursing ability of sow and breeding environment. In particular, after birth piglets must manage to intake of colostrum. Because the creation of immunity antibody is to provide from colostrum. In addition, sanitary management of hog farm is very important. If farm is dirty or the humidity is high, piglets increased the risk about disease.

2.3 Market pig Breeding Management

The immunity system of finishing pigs has been strengthened than that of piglets. However, those should be well raised and should be shipped in accordance with shipping schedule. Therefore, special care is necessary. Because the shipping of finishing pigs has a great effect on the monthly management of farm, it should be systematically managed. The environmental factors that have an effect on the productivity and health of pig include temperature, humidity, ventilation, wind velocity, and stocking density, and so on. And the factors that have the greatest effect on the productivity and health of pig at the turning of seasons are temperature and ventilation among these surroundings. Generally, sufficient ventilation should be possible besides temperature in consideration of a point that the maintaining of temperature inside the pigpen is greatly influenced according to the outdoor temperature and facility environment of each farm. And in case of finishing pigs, appropriate temperature of 17 ~ 20°C is set up, and then they should decide whether temperature and ventilation volume is set again and whether the pigpen is heated and should check whether something is wrong with machine on occasion by surely measuring the concentration of ammonia gas and carbon dioxide gas. If a draft comes in the pigpen at the turning of seasons, and pigs are exposed to the condition of extreme temperature variations between day and night, a great effect is produced on the feed intake, and moreover, productivity is decreased. Generally in case of finishing pigs, if temperature is 1°C below the appropriate temperature, one pig takes more feed by 25 g a day. On the contrary, if the remaining feed is not taken, weight gain is decreased by 11g. And a major contributor to the decrease of pig productivity is a respiratory disease under the confined environmental condition. And the respiratory disease of pigs may generally occur when temperature is low or diurnal temperature variation is large. Generally in case of growing pigs, if temperature inside the pigpen is 5°C and below, or diurnal temperature variation is 10°C and above, the incidence of respiratory disease severely increases. Together with this ambient temperature, what is important is sensible temperature that pigs feel. And if the skin of pigs is directly exposed to the cold wind, pigs have more stressed than that of low

temperature in the pigpen. Therefore, pigpen management requires careful attention at the turning of seasons[10].

2.4 Korea Smart Phone Subscriber Present Condition

The number of smart phone terminal users domestically is over 36 million people as of August 2013, as shown in Table 1. It is continuously rising as about 500,000 users as of 2009 increased exponentially to 20 million users as of October 2011[11]. In developing and applying livestock raising IT convergence technology using mobile application, it is very effective with many advantages in our country since there are many users. According to such domestic condition, IT convergence technologies are being developed by using smart phone application in various areas.

Table 2. Korea smart phone subscriber present condition (Unit : Person)

Division	2011.12	2012.12	2013.8
SKT	11,085,192	15,978,717	17,756,369
KT	7,653,303	10,250,998	11,012,233
LGU+	3,839,913	6,497,534	7,552,372
Total	22,578,408	32,727,249	36,320,974

3 Application Design

3.1 Application Configuration

The hog breeding management application proposed in this paper has been composed as shown in Figure 1. First off, hog information entered by user is saved in Database to distinguish between sow and market pigs.

In the case of sow, entering crossbreeding date will automatically calculate and display farrowing date. In the case of fertilization failure, it has been developed to display crossbreeding once again. As for farrowing date, it was set as 115 days after crossbreeding upon inquiring Korea Pork Producers Association and calendars currently being used by hog farms.

In the case of market pigs, shipment forecast has been set as 24 weeks after weaning. Market pigs are shipped when they are about 110~115kg and when they pass this range, their price decreases thereby affecting the income of farms. Accordingly, they should be shipping according to the condition of market pigs by conducting feeding management for 24 weeks.

The shipment forecast allows users to know market pigs per month according to the date of shipment. Shipment forecast allows users to manage their business to become aware of their farm fund that is sufficient or lacking in a particular month for

advanced preparation by manager. In addition, feed loss can be reduced through feeding amount adjustment menu to adjust the feed amount of sow appropriately.

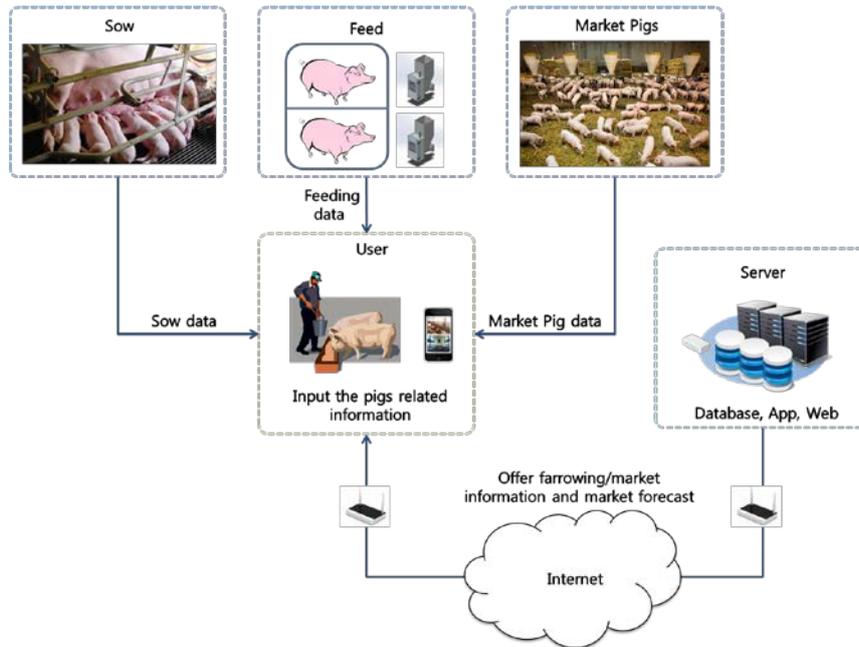


Fig. 1. Configuration of the hog breeding management application

The number of smart phone terminal users domestically is over 36 million people as of August 2013, as shown in Table 1. It is continuously rising as about 500,000 users as of 2009 increased exponentially to 20 million users as of October 2011[11]. In developing and applying livestock raising IT convergence technology using mobile application, it is very effective with many advantages in our country since there are many users. According to such domestic condition, IT convergence technologies are being developed by using smart phone application in various areas.

3.2 Service Process

The proposed hog breeding management application operated through the process shown in Figure 2. First off, when user enters data information on the pigs at pigsty through application, it is stored in database. Stored data is distinguished in server on its type and calculated according to situation to display necessary information.

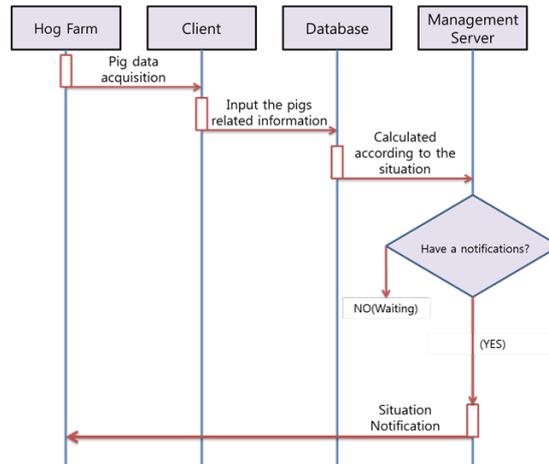


Fig. 2. Process of hog breeding management application

In the case of data on crossbreeding date of sow, farrowing date is calculated and shown and in the case of data on piglet after weaning, shipment forecast date is calculated and shown. When time passes and farrowing date or shipment forecast date approaches, it notifies user to take necessary action.

In the case of data on the feed feeding amount of sow, it allows user to check the date to reduce feed loss by adjusting feeding amount according the intake amount of sow.

4 Implementation and Result

Specifications of system used to collect pig data in the proposed system are as shown in Table 2.

Table 3. Development environment

Type	Version
Windows 7	Ultimate K 32 bit
Java	JDK 1.7.0.2
Eclipse	Kepler
Android	4.1.2 Jelly Bean
Tomcat	7.0.42
Database	Mysql 5.6
VM ware	5.0.2
Smart Phone	LG optimus G pro

Figure 3 is the hog registration screen of the hog breeding management application that has been developed. The hog registration consists of entity number, gender, hog classification and feeding amount, and user needs to directly enter the initial data.

Entered data is stored in Database server and the registered content is shown at bottom of screen that can be revised and deleted.

No	Pig Num	Division	Registration date	Note	Change/Delete
1	13 100123 0001	Sow	2013-11-21		Delete

Fig. 3. Hog registration screen of application

Figure 4 is a screen of sow information. The success or failure of crossbreeding can be seen by selecting the registered sow order number, entity number, feeding amount, expected date of crossbreeding and crossbreeding status after crossbreeding, and it notifies expected farrowing date based on the registered expected date of crossbreeding.

DB_NO	Pig num	Cross-breeding date	Cross-breeding success	Farrowing date
6	13 100123 0001	2013-07-08	0	2013-10-31

Fig. 4. Sow information screen of application

Figure 5 is a screen of market pig information. Registered market pig's order number, entity number, expected date of weaning, expected date of shipment and feeding amount can be seen, and it notifies expected date of shipment and weekly unit based on registered expected date of weaning. Market pig that has undergone shipment processing can be deleted from the screen using shipment completion button.

DB_NO	Pig Num	Weaning date (Week)	Shipment date (Week)	Shipment disposal (Week)
6	13 200123 0006	2013-06-01 (21)	2013-11-16 (45)	Shipment disposal

Fig. 5. Market pig information screen of application

Figure 6 is a screen of shipment management. It shows the number of hogs being shipped each month by calculating expected shipment date based on the registered market pig information. Based on this, user can manage the business of farm based on the number of market pigs per month.

2013	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	oct	Nov	Dec
	0	0	0	0	0	0	0	0	0	0	1	0

Fig. 6. Market pig information screen of application

5 Conclusions

This paper proposed IT based hog breeding management application. The purpose of this paper was to allow user to use breeding management that is currently being written manually with application in a convenient way. In addition, application items were selected based on the fact that the most important area of the proposed application is to increase the productivity and reduce production cost of hog farms.

To verify hog breeding management application, test was conducted at actual hog farm. The rest result showed that the manger of hog farm was able to easily adapt to it because it was much more convenient to use than the existing breeding management program. In addition, it was also very helpful in business management by allowing user to identify the number of hogs being shipped each month upon adding shipment forecast function.

The hog breeding management application can meet the needs of farms, improve the productivity of hog farms and provide convenience, and it is expected to reinforce the national competitiveness of domestic livestock products through systematic breeding management.

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