International Journal of Advanced Culture Technology Vol.9 No.1 177-182 (2021)
DOI https://doi.org/10.17703/IJACT.2021.9.1.177

IJACT 21-3-24

A Case Study on Smart Livestock with Improved Productivity after Information and Communications Technologies Introduction

Gok Mi Kim [1]

[1]*Prof., Yonam College, Korea*
kmkime@yonam.ac.kr

Abstract

The fourth industrial revolution based on information and communication technology (ICT) becomes the center of society, and the overall industrial structure is also changing significantly. ICT refers to the hardware of information devices and the software technologies required for the operation and information management of these devices, and any means of collecting, producing, processing, preserving, communicating and utilizing them. ICT is integrated into industries and services or combined with new technologies in various fields such as robotics and nanotechnology to connect all products and services to the network. The development of ICT, which continuously creates new products and services, has spread to all sectors of the industry, affecting not only daily life but also the livestock sector recently.
In agriculture, ICT technology can reduce production costs by efficiently managing labor and energy because it can improve quality and yield based on data on environmental and growth information such as temperature, humidity, light and soil.
In particular, smart livestock is considered suitable for achieving livestock management goals because it can reduce labor force and improve productivity by remotely and automatically managing accurate information necessary for raising and breeding livestock with ICT devices. The purpose of this study is to propose the need for ICT technology by comparing farm productivity before and after ICT is introduced. The method of the study is to compare the productivity before and after the introduction of ICT in Korean beef farms, pig farms, and poultry farms. The effectiveness of the study proved the excellence of ICT technology through the production results before ICT introduction and the productivity improvement case of livestock farms that efficiently operated manpower management and reduced labor force after ICT introduction. The conclusion of this paper is to present the need for smart livestock through ICT adoption through case study results.

Keywords: *ICT Technology, Livestock Technology, ICT Environment, Smart Livestock,*

1. INTRODUCTION

Through the development of ICT, our society is changing into a 'super connected society'. A hyperconnected society where humans, humans, things, things, and things are connected to the Internet and mobile is also a major feature of the era of the Fourth Industrial Revolution. The Fourth Industrial Revolution is affecting various sectors of society and is no exception in agriculture. (1) Recently, intelligent agricultural systems have been spreading by combining information communication technologies in the production, processing and distribution of agricultural and livestock products. Smart farm technology applied with ICT technology enables analysis of environmental information such as temperature, humidity, light and

Manuscript received: February 20, 2021 / revised: February 26, 2021 / accepted: March 05, 2021
Corresponding Author: kmkime@yonam.ac.kr
Tel:***-****-**** Fax: 041-580-5512
Professor, Yonam College, Korea

soil, and growth information. (2) It can improve the quality and yield of agricultural products to increase profitability. In particular, smart livestock, which manages farms with smartphones, is considered an appropriate method for livestock management goals because it can reduce labor force and improve productivity by remotely and automatically managing accurate information needed for breeding and breeding of livestock with ICT devices. Successful application of Korea's relatively excellent ICT technology to the livestock industry can not only solve the challenges of Korea's livestock industry early, but also secure leadership in the global market. (3) In this study, we analyzed the case of comparing the theoretical background of smart livestock ICT. Based on the research, when smart livestock was applied, it was found that it could efficiently operate manpower management and reduce labor force, and that it improved quality and productivity. The aim is to find the importance of ICT combinations for the competitiveness of the livestock sector and to utilize and expand them.

2. MAIN TEXT

2.1. Background of Smart Livestock

Smart livestock can properly maintain and manage livestock's growth environment using technologies such as Internet of Things, big data, and artificial intelligence, and automatically manage livestock remotely with PCs and smartphones. The 'smart livestock' model based on big data analyzes data, extracts information, and improves productivity through optimal environmental control.

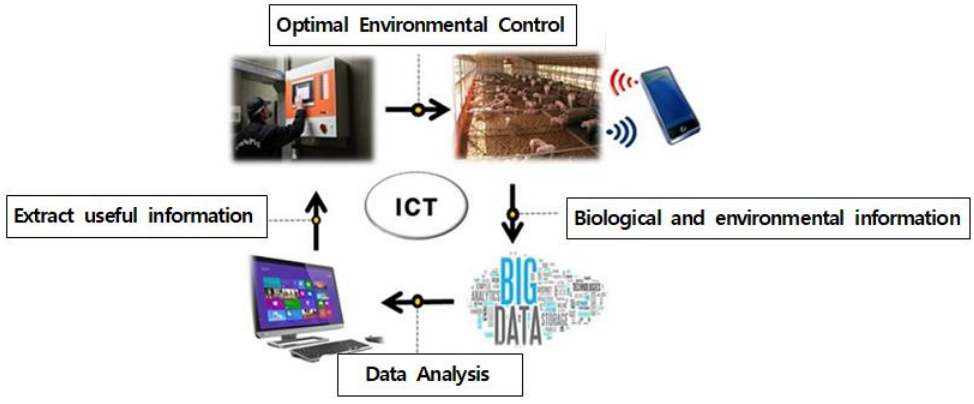

Figure 1. Smart Livestock Models and Integrated Management Systems

< Source: Rural Development Administration >

2.2. Livestock ICT Farm in Yeongyang Country

Smart livestock in Yeongyang-gun, which is managed by smartphones by applying ICT convergence technology, is applying TMR mixers through remote control, automatic feedweights and environmental control to Korean cattle farms. Smart Livestock Corporation is a state-of-the-art farm that combines ICT with livestock farms and livestock facilities to manage livestock environment and livestock with smartphones regardless of time and place. Using smart automation facilities, big data such as growth information, health status by individuals, and environmental information on livestock can be analyzed comprehensively to increase income of farmers as well as prevent and detect livestock diseases early. ICT farms are increasingly increasing through precise management of livestock life cycles in Korean cattle farms, and by reducing labor force.

Figure 2. Livestock ICT Farm in Yeongyang Country < Source: www.pressian.com >

3. CASE STUDY OF ICT

The livestock smart farm encompasses the concept of achieving intelligent systematization for the entire cycle of production, such as remotely diagnosing the growth and growth environment of livestock and conducting proper maintenance and management using ICT technology and automated facilities. (4) In order to check the health status of livestock and improve productivity, biometric and behavioral information of livestock should be monitored using ICT technology and appropriate management as necessary. In order to create an international competitive livestock environment, Seolcheon Farm introduced smart farm equipment to build a money company with modernization facilities after benchmarking advanced overseas cases. Existing equipment includes internal and external environmental management systems, automatic ventilation systems, ventilation fans, livestock weighing machines, air conditioners, CCTVs, and automatic feed mix with new equipment to enable data analysis, money management, and individual class control.

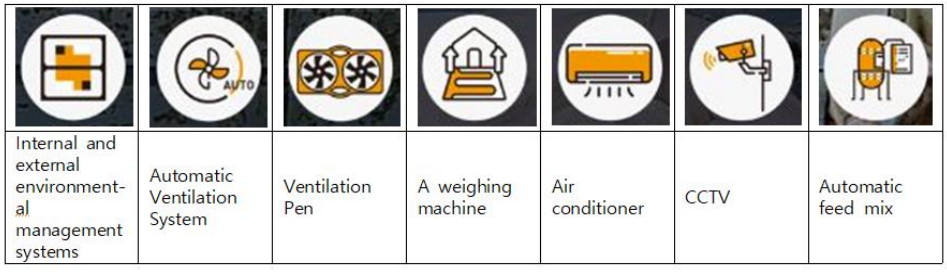

Figure 3. Livestock ICT Equipment < Source: Agriculture ON >

After the introduction, the number of employed workers decreased by 20% from 75 to 60, the number of PSYs per modon increased by 7% from 27 to 29, and the rate of modon turnover (LSY) increased by 4% from 2.35 to 2.45. It is also believed to have affected environmental management.

The selection of ICT smart livestock facilities and equipment can help improve the productivity of farm management.

As a result of strengthening the prevention system at the site and lowering costs through analysis of feed data, Ere Agriculture has improved sales by 15% and shipment performance by more than 30% compared to modon. ICT was introduced to the new pig farm and ventilation facilities were improved for pigs with weak respiratory organs. The ventilation system, which operates in the form of the ventilator automatically

maintaining the proper value after setting the inlet and exhaust levels to the optimal state, is equipped with a system that stops after automatically adjusting the appropriate environment even if a power outage occurs. Through CCTV, the status of the money company can be checked in real time, and if a problem occurs in the system, it can be sent to a smartphone to solve the problem immediately.

Figure 4. Seolcheon Farm < Source: Agriculture ON >

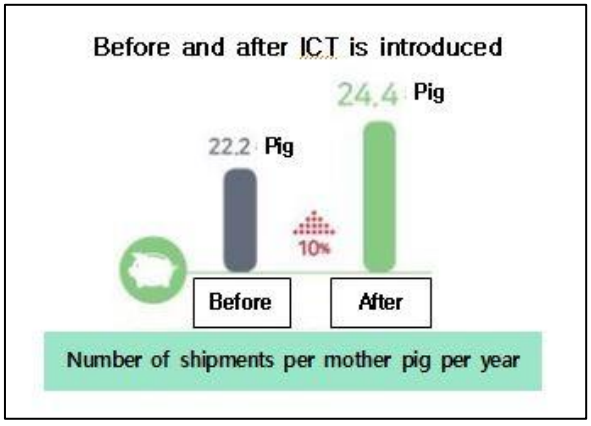

Figure 5. Increased productivity after ICT adoption < Source: Seolcheon Farm >

After ICT introduction, working hours were reduced as a result of automation systems, and productivity was increased. The mortality rate decreased by 0.3%, and MSY (the number of dogs shipped per year per modon) increased from 18 to 24 on average nationwide, showing continued growth. Seolcheon Farm

Figure 6. Information on ICT Case Object Activity at Wooil Ranch

< Source: Wooil Ranch >

Wooil Ranch in Boryeong, Chungcheongnam-do, felt the need to introduce an ICT system as its scale expanded and tried to change it to a smart livestock. The main equipment of the Wail Ranch, It is 'object activity information device' and 'flow recording device for each object'. In other words, breeding should occur frequently to increase milk production. Therefore, it is important to know the exact timing of the rutting, and the "object activity information machine" can be used to detect the amount of activity of cows and measure the timing of the rutting to increase the breeding rate. It also helps check the health of the cow. An irregular stroke cycle means that there is a health problem, so detect and deal with signs of disease in advance. Before the introduction of smart cattle sheds, the flow rate of the entire ranch could not be determined by individual. Looking at the flow data recorded by "flow recorders for each object", the amount and combination of feed is determined, and the combination value of feed that produces the best milk can be found to increase efficiency. The fluctuation of flow rates is also a measure of the environmental conditions of our company, which can be used to detect anomalies in advance. In addition, there are negative information collectors, environmental information collectors, and crude oil storage information collectors. The environmental information collector frequently measures the temperature, humidity, carbon dioxide, and ammonia of our company and notifies them to smartphones if they are out of the normal range. This information is combined to manage the ventilator and fog sprayer to create an optimal breeding environment.

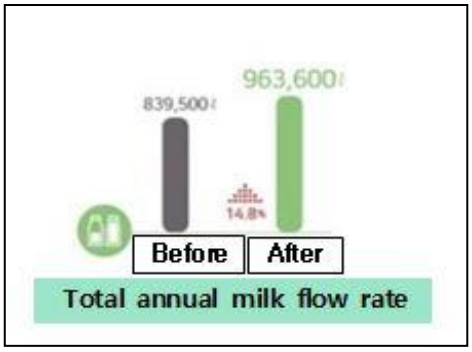

Figure 7. Increased productivity after ICT adoption < Source: Wooil Ranch >

After the introduction of ICT, the total annual milking volume rose *14.8*% through reducing labor force, increasing efficiency in human resource management, improving feed, quality, and productivity.

Figure 8. ICT poultry farm Cadaveric < Source: Rainbow farm >

Rainbow poultry farm located in Chungju has not suffered AI (bird influenza) damage due to a thorough quarantine system after the introduction of smart livestock, and three quarantine teams disinfect it twice a day with thorough automatic quarantine. By introducing state-of-the-art machinery and technology, all facilities are operated as automation systems, producing 400,000 fresh eggs a day, and blocking diseases with thorough hygiene and quarantine systems. It collects data with smart devices and sees the cause of productivity decline as various variables such as lighting time, additives, and chicken varieties, and analyzes them quickly and uses them for production management.

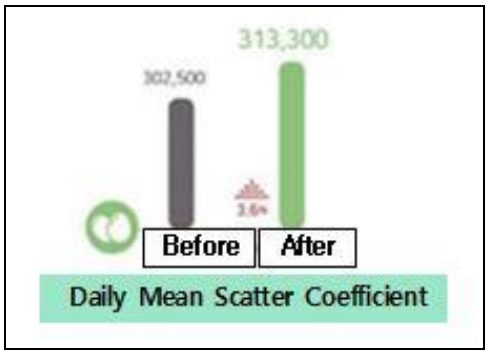

Figure 9. Increased productivity after ICT adoption < Source: Rainbow farm >

After ICT was introduced, the average daily scattering coefficient rose 3.6% from 302,500 to 313,300 through reduced labor force, increased manpower management efficiency, improved feed, improved quality, and improved productivity.

4. CONCLUSIONS

The conclusion of this paper aims to present the need for smart livestock through ICT adoption through the results of the case study. In the agricultural sector, which is classified as a labor-intensive industry, agricultural conditions are getting worse, including the continued decline of the agricultural labor population, aging population, opening overseas markets, and frequent livestock diseases. As an active countermeasure, smart livestock is considered necessary and we want to find strategies and ways to overcome the crisis in the agricultural and livestock sectors, such as developing and evaluating related devices to secure stable and reliable data, and establishing standardization.

In particular, it is time for continuous research on ICT devices suitable for farms to encourage Korean-style smart livestock, and it is necessary to analyze and develop the suitability of design from a user's perspective to see if the form and function of evolving ICT equipment are efficient. In addition, it is necessary to establish an integrated platform and livestock infrastructure to collect various data for information sharing. For the future expansion of smart livestock, we would like to further study the detailed analysis and development of models suitable for the functions of ICT devices that rely on overseas imports.

REFERENCES

[1] Kim Gok-mi, A Study on Smart Design Using ICT Convergence Technology. IIBC General Academic Conference. Korea Internet Broadcasting and Communication Association, 2018.

[2] Sung Kyung-il, Kim Byung-wan, Kim Hee-gap, Han Myeong-hoon, Park Kyu-hyun, Analysis of ICT-based Smart Agricultural Status and Study on the Activation Plan. Ministry of Science, ICT and Future Planning, A Study on the Convergence Activation Policy of Kangwon National University, 2015.

[3] Koo Ji-hee, Lee Sang-rak, Telemedicine plan for Korean beef through ICT convergence with livestock sector. Korea Digital Policy Association. Vol. 14 No. 12. pp.217~224, 2016.

[4] Kwon Kyung-seok, Current status of research and development of livestock smart farms using ICT convergence technology. Rural Development Administration National Livestock Research Institute. Vol.59 No. 2, pp.38-45, May 2017.

[5] Ministry of Agriculture, Food and Rural Affairs, ICT convergence and diffusion project in livestock sector. www.mafra.go.kr