A Development of Inventory Management System for Goat Farm

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Abstract: Goat farming in Malaysia is an industry with bright potential and has its own importance as a contributor to food supply. Supply chain management in this industry is also a key indicator of the relationship of several stakeholders such as manufacturers, suppliers and consumers for efficient production and supply of products. Therefore, inventory documentation for livestock farms is very important for the purpose of continuous farm supply chain management. These include databases of food inventories and stocks of veterinary drugs. Inventory data on goat farms for own or small businesses continue to use conventional methods at present. For the management of stock and inventory data on the farm, paper notes, whiteboard notes or books and physical files are also used. However, methods of storing physical data can cause some difficulties especially in today's fast -paced and technological environment that causes conventional methods to result in process inefficiencies, especially storage and reporting. Therefore, to manage inventory information on goat farms, a web-based inventory system was developed. The system function modules consist of registration modules, human resource module, material modules, account modules also report modules. The functions offered in this system can solve data management problems and generating reports that are beneficial in terms of saving time and accessing information more effectively for business process efficiency. The system is developed with prototype methods and a structured approach to system design. Meanwhile, program code writing is done using PHP and MySQL database. The priority of this system is to optimize computerized systems, databases and Internet technology to support the management of food inventory details on the farm by the relevant parties.

Keywords: Inventory Management, Goat Farm, Web-Based System, Structured

1. Introduction

In Malaysia, the goat breeding industry is small compared to other livestock commodities. Compared to poultry (121.39%), eggs (113.79%) and cattle (24.88%), the subsistence rate of goat and mutton production in 2007 reached only 8.75% [1][2]. Although this industry contribution is lower than

others, it remains important because it contributes to the country's nutritional resources. Good plantation practices include good farms, ensuring that food and water resources for livestock are always adequate [3]. Survival of livestock projects depends on the ability to provide livestock feed that is sufficiently nutrient content and cheap in terms of management costs. This is because more than 70 percent of management costs come from the cost of livestock feed [1][4].

In every technological development today has shown a lot of remarkable progress. This arrival has had a huge impact to bring about changes in human life from time to time. Nowadays, information technology has made it easier for people to explore a borderless world. Management refers to the functions, processes, activities of planning, organizing, leading and controlling the efforts of all members of the organization. The existence of management information systems in various fields has played an important role in the prospects of data management and information worldwide.

In this project, a smallholder goat farm was selected as the case study. BaniJaya Enterprise is a livestock company that conducts goat breeding operations located in Parit Raja, Batu Pahat, Johor. The company raises goat farms on a large scale one acres. Among the main factors of livestock is the presence of potential areas as well as believed to have high resilience and rapid growth rate. A study on the inventory on this farm has been done. Among the problems that arise from the existing system is that the company uses the conversational system irregularly to store all information including controlled information, sales record, food and medicine inventory, health record and other else.

The problem of using the system currently used on the farm to store data requires a long time for employees to review the physically stored information. There is also overlapping information from various locations stored making it difficult for employees to access and update the latest records. Existing systems use Microsoft Access as information storage. This also makes the process of generating analysis reports difficult to complete more quickly. Customer information is also difficult to track to find out who made the inventory and there is a possibility of errors in filling out forms and calculations. Things like this can cause losses to the business.

Therefore, a computerized inventory system for goat farms was developed. The system provides an effective and systematic information storage process. The system is expected to address the problem of farm inventory information management and provide innovation in terms of time savings, as well as accessibility regardless of time limits. Updating records will also be more efficient and orderly, as well as allow control to be performed. Case study for inventory management of this project in BaniJaya Enterprise. The officer involved was the operations manager, Encik Asbanizam bin Samsuri. Users of this system consist of operations managers, clerks and supplier.

This paper is organized into six sections. The background of the project is explained in the first segment. The second section describes a review of the literature. This technique is described in the third segment. In the fourth section, the analysis and design of the device are described. The implementation and testing of the system is described in Section 5. Conclusions are given in the last segment.

2. Literature Review

Smallholders are opening a growing number of new dairy goat farms in Malaysia due to increasing demand for dairy goat products. However most dairy goat farms are not well operated due to inadequate awareness and information on the standard management of goat inventory [2]; [5]. Indeed, the poor performance of dairy goats in terms of growth performance, feed utilization, disease tolerance and milk quality has been correlated with the incorrect breeding protocol, specifically the herd health protocol.

The problem has been identified by studying the current inventory management in goat farm. Defined issues would act as a guide to the implementation of this framework and ensure that the proposed system achieves its goals and is able to address the problems. It is also helpful in planning the

flow of the system [6]. Thus, a management system that is able to store all the stored information to be more systematic is proposed to improve the existing process.

As a solution, an inventory system is employed in the newly develop system. Inventory is the supply of raw materials, partially finished goods called work-in-progress and finished goods, an organization maintains to meet its operational needs [7]. It represents a sizeable investment and a potential source of waste that needs to be carefully controlled. Inventory is defined as a stock of goods that is maintained by a business in anticipation of some future demand [9]. The quantity to which inventory must fall in order to signal that an order must be placed to replenish an item [8]. Inventory is a crucial asset for numerous companies, as it is often a huge asset on the company's financial statements, and it represents a source of revenue in the near forthcoming through sales of the goods [3], [7], [10]. It is the crucial part of every organisation, whether big/small has to keep inventory in the system.

Three equivalent existing systems were studied, mainly in terms of system functionality, inventory methods, system implementation, and other related. E-Warga Application System, Record System Business Inventories and Hardware Inventory System Computer had been chosen to be compared with the proposed system. Table 1 gives the summary.

Table 1: Comparison between existing systems

Features/ System	E-Warga Application System	Record System Business and Inventories	Hardware Inventory System Computer	Inventory Management System in Goat Farm
Registration	Yes	Yes	Yes	Yes
Human Resource Management	Yes	Yes	Yes	Yes
Account Management	Yes	Yes	Yes	Yes
Report Management	Yes	Yes	Yes	Yes
Database	MySQL, SQLite	MySQL	MySQL	MySQL
Programming	JAVA, PHP	Microsoft Access	PHP	PHP
System type	Application	Web-based	Web-based	Web-based

3. Methodology

In this project, the prototype methodology is used as a software development guide. This prototype methodology consists of four main phases namely the investigation and initial planning phase, the system analysis phase, the system design phase, and the system implementation phase. The analysis phase, the design phase and the implementation phase are parallel. These phases are performed repeatedly until the system is stable and complete. Table 2 summarizes the phases of prototype software development and their activities.

Table 2: Software Development Phases and Its Activity

Phase	Task	Output
Planning	Selection of system titles, application and problem domain identification, troubleshooting objectives and suggestion. Specifies the target users for the system.	1. Project Proposal 2. Gantt Chart
Analysis	Analysis of system requirements (functional needs and non-functional needs), analysing inputs and outputs, drawing flow charts and structuring data system requirements.	1. System's Requirements 2. Hardware and software Requirements 3. Data Flow Diagram (DFD) 4. Entity Relationship Diagram (ERD)
Design	Design system process modules, system databases, interfaces and test system modules. Program writing based on system design.	1. System and user flowchart 2. Relationship schemes and data dictionaries 3. User interface
Implementation and Testing	Test modules and databases and test systems	Program code Test cases

Table 3: Functional Requirement

No	Module	Function
1.	Registration module	• The system should allow the new user to register before login. • The system should show error when duplicate username is entered. • The system should display an error message when empty field found. • The system should allow the user to login into the system using username and password. • The system should allow user to input valid username and password to logged in as user. • The system should alert the user for invalid input. • The system should redirect to dashboard once the user successful login.
2.	Human Resource Management module	• The system should allow the user to add/ update/ delete/ search information. • The system should error when empty field found.
3.	Material Management module	• The system should allow the user to add/ update/ delete/ search product.
4.	Account Management module	• The system should show the incoming financial processes. • The system should allow the user to input the incoming process. • The system should show the outcoming financial processes. • The system should allow the user to input the outcoming process. • The system should show the error when unbalanced money flow. • The system should allow the user to edit the money report.
5.	Report Management module	• The system should allow user to generate weekly account, and the goat breeding statistic report. • The system should allow the user to generate the inventory control. • The system should allow the user to create/update/delete the reports. • The system should allow the user to search the report by report category.

Table 4: Non-functional requirement

No.	Requirement	Description
1.	Performances	• The interaction between the user and the system should not be more than 6 minutes. • The system should be able for use anytime.
2.	Operational	• The system should be user friendly. • The system should be easily maintained and updated. • The system should be able to work on any web browser.
3.	Security	• Only the human resources manager can generate a report. • User can only access their own account with user id and password.

4. System Analysis and Design

Analysis of requirements is a technique for determining specifications for a system. This covers all procedures conducted to assess the interests of different stakeholders. Specification analysis for this purpose includes the assessment, documentation, validation, and handling of specifications for the software or system [2]. The functional and non-functional requirement are demonstrated in Table 3 and Table 4.

System analysis is a method of compiling and analyzing the facts, defining the challenges and decomposing the structure into its components. In this project, structured approach is optimized to perform the system analysis. Context diagram is shown in Figure 1. The external entities of the system consist of staff and administrators.
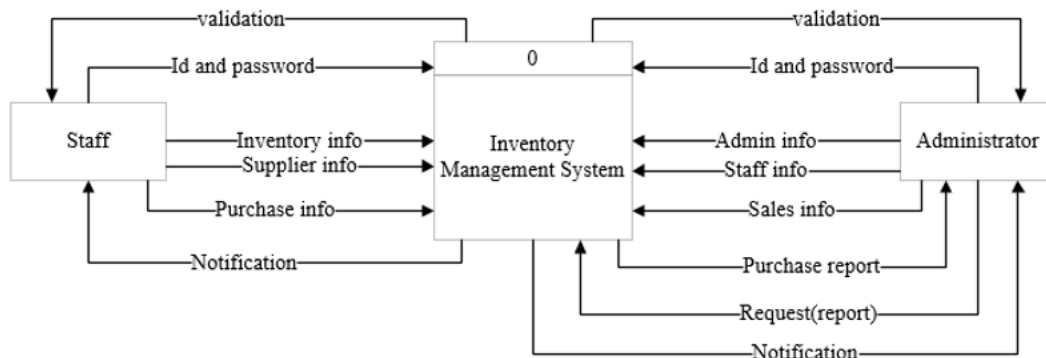

Figure 1: Context Diagram

Figure 2 shows the DFD Level 0 which is a fraction of the Context Diagram where it describes the flow of data for the whole system in more detail. Based on proposed module there are several processes involved including managing staff information, inventory and supplier information, financial statement information as well as well generating reports. Meanwhile, for data storage there are several tables involved including user, staff, inventory, supplier, purchases and financial.
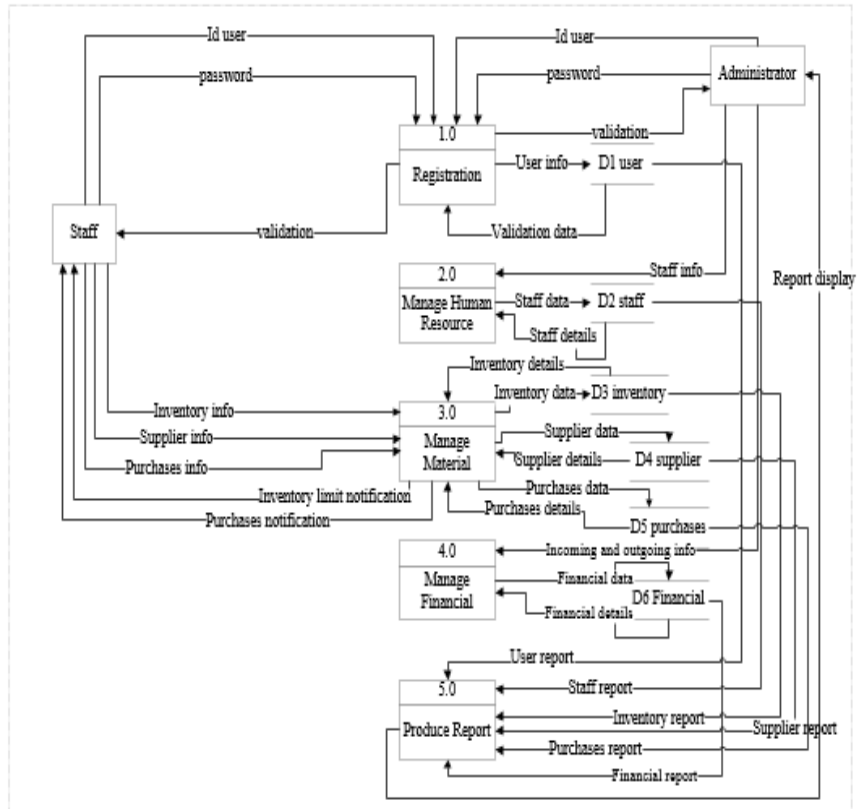
Figure 2: Data Flow Diagram

Figure 3 shows the Entity Relationship Diagram in this inventory management system. The diagram describes the sketch between the entities in the database, where it shows the data used in each process and how the files related to each other. The entities involve are `staff`, `purchases`, `product`, `category`, `media` and `supplier`.
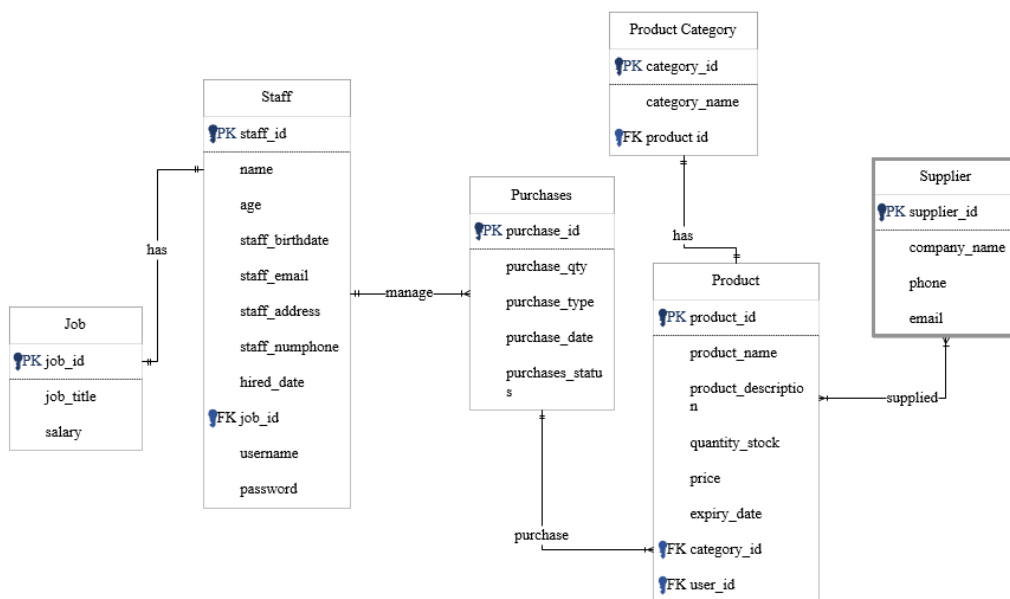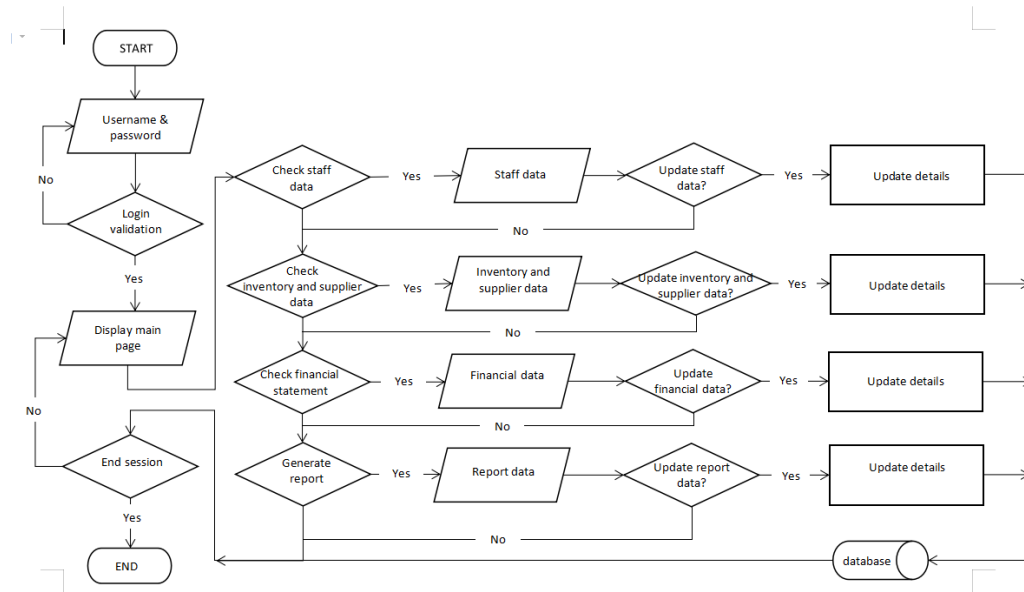

Figure 3: Entity Relationship Diagram

Figure 4: Flowchart for Inventory Management System in Goat Farm

The system flow chart shows the process flow that takes place within the system. The flow chart for the system is as shown in Figure 4, which shows the flow of information in the management of staff, inventory, suppliers, financial statements as well as all report requests issued. Figure 5 shows the process flow for the administrator. Meanwhile, Figure 6 shows a flow chart for staff, which shows the flow of managing inventory limit levels, supplier information and even purchase information.
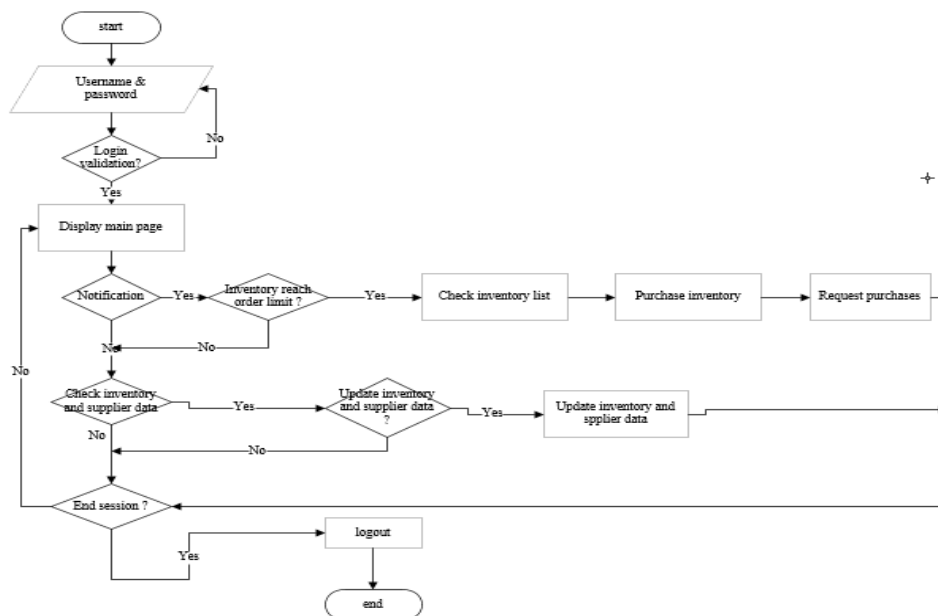

Figure 5: Administrator flowchart

Figure 6: Staff flowchart

Figure 7 shows the design of the main page of administrator. There is a menu button that works to go to the next display page. At each of these menu buttons allows the administrator to access the system according to the criteria of the user whether the administrator or the staff.
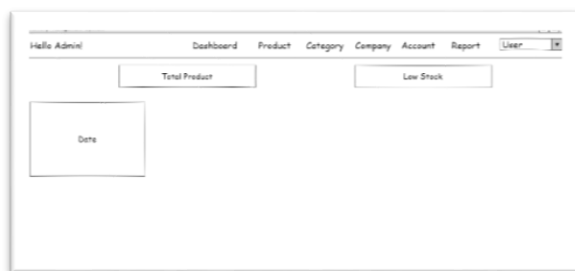

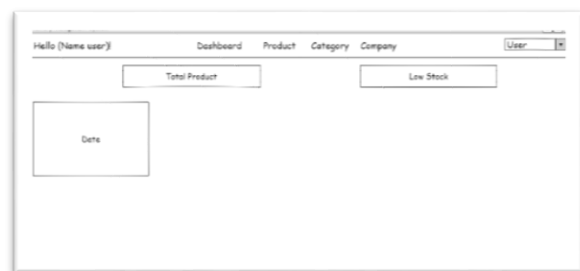**Figure 7: Administrator main page design**

Figure 8: Staff main page design

Figure 8 shows Staff can access the menu button that display at the page. Staff can manage the information of product, category of the product, supplier company and make purchases of the product. Figure 9 shows for the staff users manage a product information. User can access each menu table to edit and delete each information of the product. Hence, the user can add the new product information to update the information.
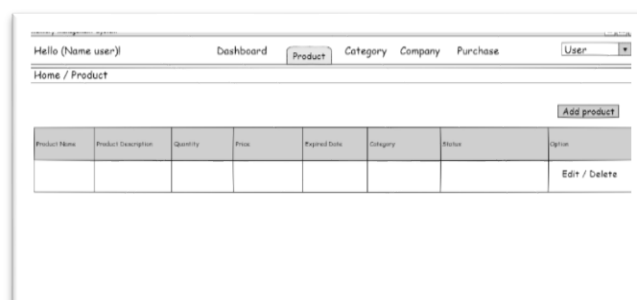

Figure 9: Product interface design

5.   Implementation and Testing

The process of implementing and testing the inventory management system in the goat farm can support the development of the system more efficiently. The overall results of this test may be some suggestions and improvements made by users. This can help make the improvement even better.

5.1   System Development

This section demonstrates functional module development with code segment and the output (interface and function).

a.   Purchase Module

Figure 10 shows the interface of the inventory product purchase list that has been made by the employee into the system. Product purchase information consists of product name, product description, product category, product price, total purchase product price, date of purchase ordered by employees and purchase status as well as add purchase order function, update purchase order and delete information. While to add inventory product purchases, employees can press the "New purchase" button as shown in Figure 11.

Figure 10: Purchase inventory list interface

Figure 11: Add new purchases interface

Figure 12 shows the program code portion of the inventory product purchase list. Next Figure 13 shows the section of program code that adds inventory product purchases.


```
<tbody>
  <?php foreach ($sales as $a_purchase): ?>
  <tr>
    <td class="text-center"><?php echo count_id();?></td>
    <td><?php echo remove_junk(ucwords($a_purchase['product_name']))?></td>
    <td><?php echo remove_junk(ucwords($a_purchase['purchase_qty']))?></td>
    <td><?php echo remove_junk(ucwords($a_purchase['net_price']))?></td>
    <td><?php echo remove_junk(ucwords($a_purchase['date']))?></td>
    <td class="text-center"><?php if($a_purchase['status'] === '1'): ?>
    <span class="label label-success"><?php echo "Approved"; ?></span><?php else: ?>
    <span class="label label-danger"><?php echo "Pending"; ?></span>
    <?php endif;?></td>
```

Figure 12: List of product purchases program code

```
$query = "INSERT INTO purchases (";
$query .="product_id,purchase_qty,net_price,date,status";
$query .=") VALUES (";
$query .=" '{$name}', '{$qty}', '{$total}', '{$dates}','0'";
$query .=")";
if($db->query($query)){
    //sucess
    update_product_qty($s_qty,$p_id);
    $session->msg('s',"Purchases Added! ");
    redirect('purchases2.php', false);
```

Figure 13: Add purchases program code

b.   Supplier Module

Figure 14 shows the interface of the list of suppliers that have been registered into the system. Employees need to fill in the information as in Figure 15. Meanwhile, Figure 16 shows the code section of the supplier add-on program. On this page, updates and deletions of information can be done by employees.

Figure 14: Supplier information list interface

Figure 15: Added supplier information interface

```
$query = "INSERT INTO supplier (";
$query .= "company_name, phone, email";
$query .= ") VALUES (";
$query .= " '{$name}', '{$phone}' ,'{$email}'";
$query .= ")";
```

Figure 16: Add supplier program code

c.   Product Inventory and Category Module

This module is the most important module in this system. Before adding an inventory product, the supplier needs to add a new category first as shown in Figure 17. Meanwhile, Figure 18 shows a section of the category addition program. This category module is built to make it easier for suppliers to segregate according to inventory category classification. Next, after the supplier adds a category, the supplier can access to create additional products as in Figure 19.
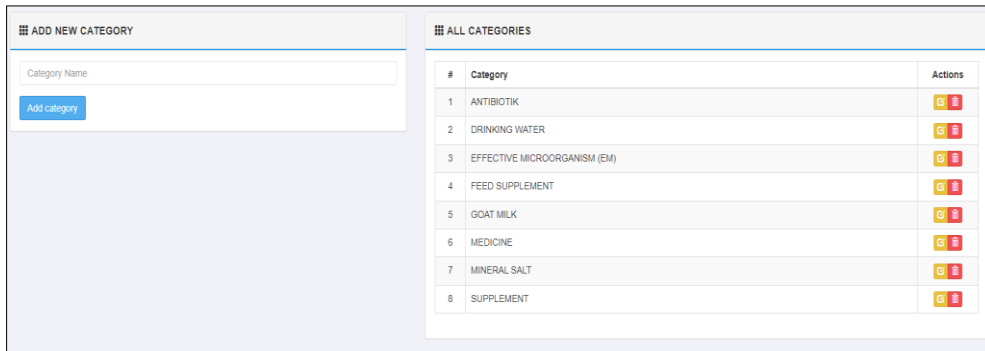
Figure 17: Category list and added interface

```
<div class="panel-body">
  <form method="post" action="category.php">
    <div class="form-group">
        <input type="text" class="form-control" name="category-name" placeholder="Category Name">
    </div>
    <button type="submit" name="add_cat" class="btn btn-primary">Add category</button>
  </form>
</div>
```

Figure 18: Add category program code

Figure 19: Product inventory interface

Figure 20 shows the product add interface and next in Figure 21 shows the product add program code. Updating and deleting information can be done by the supplier.

Figure 20: Product added interface

```
$date        = $db->escape($_POST['date']);
$dates       = make_date();
$query  = "INSERT INTO products (";
$query .=" product_name, product_description,quantity_stock,sale_price,expiry_date,category_id,media_id,date";
$query .=") VALUES (";
$query .=" '{$p_name}','{$p_desc}', '{$p_qty}', '{$p_sell}', '{$p_expired}','{$p_cat}', '{$media_id}', '{$dates}'";
$query .=")";
$query .=" ON DUPLICATE KEY UPDATE product_name='{$p_name}'";
if($db->query($query)){
    $session->msg('s',"Product added ");
    redirect('product.php', false);
} else {
    $session->msg('d',' Sorry failed to added!');
    redirect('product.php', false);
}
```

Figure 21: Add product program code

d.　　　Generate Report Module

Sales revenue reporting is important for the company so that product sales can be monitored from time to time to generate profit. Users only need to press the "By Date", "By Monthly" or "By Daily" button for the product sales report generator, as shown in Figure 22.

Sales Report					
2021-06-01 To 2021-06-03					
Date	**Product Title**	**Buying Price**	**Selling Price**	**Total Qty**	**TOTAL**
2021-06-03	ALBEN		70.00	2	140.00
2021-06-03	BATANG JAGUNG /KG		4.00	1	4.00
2021-06-03	GOAT PELLET		54.00	2	108.00
2021-06-03	MOLASSES 5L		15.00	2	30.00
2021-06-03	MOXILA		54.00	3	162.00
2021-06-03	PREMIER LAMB 1KG		20.00	10	200.00
				GRAND TOTAL	$ 644.00
				PROFIT	$644.00

Figure 22: Generate sales report for supplier

Table 7 : Functional Testing Login and Registration User

No	Test Cases	Description	Results
	TEST_100	User Registration and Login	Pass/Fail
1.	TEST_100_001	The system asks the administrator to enter the information list of new employees	PASSED
2.	TEST_100_002	The system will alert you if the information filled in incomplete	PASSED
3.	TEST_100_003	The system stores employee information into a database data	PASSED
4.	TEST_100_004	The system will display a login page	PASSED
5.	TEST_100_005	The system will ask you to enter the user id and password	PASSED
6.	TEST_100_006	The system will give a message if the user id and password invalid	PASSED
7.	TEST_100_007	The system will take the user to the main page	PASSED

5.2   System Testing

System functionality testing aims to ensure that the modules on the system function properly without errors. This test case involves all the modules available in the inventory management system in the goat farm, namely the Login Module, User Registration Module, Material Management Module, Inventory Purchasing Module and Report Generation Module.

Table 5 includes a list of tests performed for the login process by users. There are seven types of testing performed. The purpose of this test is to test the effectiveness of user login into the system whether successful or otherwise.

Table 6 shows the list of tests performed for the supplier registration process. There were eight tests performed. The purpose of this testing is to test the effectiveness in registering suppliers into the system.

Table 6: Functional Testing Register Supplier

No	Test Cases	Description	Results
TEST_200		Supplier Information	Pass/Fail
1.	TEST_200_001	The system displays the supplier information interface	PASSED
2.	TEST_200_002	The system asks employees to enter new supplier register information	PASSED
3.	TEST_200_003	The system will issue a warning if the text box is not filled in completely	PASSED
4.	TEST_200_004	The system stores supplier information into a database	PASSED
5.	TEST_200_005	The system will give a message if the registration is successfully saved	PASSED
6.	TEST_200_006	The system will allow employees to update supplier information	PASSED
7.	TEST_200_007	The system will give a message if the data update is successful	PASSED
8.	TEST_200_008	The system will give a message if the data deleted is successful	PASSED

Table 7: Functional Testing Purchases

No	Test Cases	Description	Results
TEST_300		Purchases Inventory Product	Pass/Fail
1.	TEST_300_001	The system will ask the employee to fill in the purchase information	PASSED
2.	TEST_300_002	The system stores purchases information to a database	PASSED
3.	TEST_300_003	The system displays purchases information	PASSED
4.	TEST_300_004	The system is able to calculate the number of purchases placed	PASSED
5.	TEST_300_005	The system warns if the text box is not filled in completely	PASSED
6.	TEST_300_006	The system allows employees to make a new "Purchase Order"	PASSED
7.	TEST_300_007	The system will give a message if the data update is successful	PASSED
8.	TEST_300_008	The system will give a message if the data deleted is successful	PASSED

Table 7 shows the list of tests conducted for the inventory product purchasing process. There are eight types of testing performed. The purpose of this testing is to test the effectiveness in adding inventory product purchases into the system.

Table 8 shows the list of tests conducted for the category and product addition process. There are seven types of testing performed. The purpose of this testing is to test the effectiveness in adding categories and products into the system. Table 9 shows the list of tests for generating the report. There are two types of testing performed. The purpose of this testing is to test the effectiveness in the report generation process.

Table 8: Functional Testing Categories and Products

No	Test Cases	Description	Results
	TEST_400	Categories and products	Pass/Fail
1.	TEST_400_001	The system displays to register inventory categories	PASSED
2.	TEST_400_002	The system displays for registration of new products according to existing categories	PASSED
3.	TEST_400_003	The system will give a warning if the text box is not filled completely during the update	PASSED
4.	TEST_400_004	The system stores category information into a database	PASSED
5.	TEST_400_005	The system stores product information into a database	PASSED
6.	TEST_400_006	The system will give a message if the product addition is successful	PASSED
7.	TEST_400_007	The system displays a notification to the user when the product reaches the minimum limit	FAILED

Table 9: Functional Testing Generate Report

No	Test Cases	Description	Results
	TEST_500	Generate Report	Pass/Fail
1.	TEST_500_001	The system displays a report interface	PASSED
2.	TEST_500_002	The system allows users to generate reports	PASSED

6.   Conclusion

Overall, the development of this system has achieved the objectives set in this project. The functionality of the system can be further developed in the future as this system can benefit users in improving the efficiency of storage and analysis of business information. Record keeping of employee information, materials and inventory control can be kept neat and easily accessible. this is important to ensure process efficiency and in turn provide profitability. Through the study, it is hoped to provide useful input in the future on the development of the livestock industry in Malaysia, especially on data management and business information.

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