



**THE UNIVERSITY OF ZAMBIA
SCHOOL OF NATURAL SCIENCES
DEPARTMENT OF COMPUTER STUDIES**

AGRO INFORMATICS SYSTEM

Submitted to
The University of Zambia
School of Natural Sciences
Department of Computer Studies

AGRO INFORMATICS SYSTEM (AIS)

By

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A thesis submitted in partial fulfilment of the

Requirements for the degree of

Bachelor of computer science

University of Zambia

AUGUST 2014

Supervisor: Mr Sam Chibuta

DECLARATION

I, the undersigned, do solemnly declare that the work presented herein is entirely mine and that to the best of my knowledge, has not been published anywhere else.

Signed.....

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Computer number: 29000653

Signed:

Supervisor : Mr Sam Chibuta

ACKNOWLEDGEMENTS

First of all, I would like to thank God Almighty for having enabled me to come this far. For sure he is a faithful God.

My gratitude goes to Mr Sam Chibuta my supervisor in this project. I am profoundly grateful to him for the direction, guidance, help and support he offered in this project.

I also want to appreciate the staff of the Computer Studies Department, their timely advice also affected the outcome of the project greatly.

Last but not the least, I say thank you to my family, friends and classmates for their time shared and encouragement given to me during my course of study at The University of Zambia.

DEDICATION

Dedicated to the memory of my parents Mr and Mrs Velemu

APPROVALS

Thesis Number:

Agree to Advise:.....
(Project Supervisor)

Date Submitted:

Approved By:.....
(B.Sc in CS Committee)

Date Approved

ABSTRACT

Agriculture can be defined as the science or practice of farming, including the growing of crops and the rearing of animals.

Agriculture is one of the most important sectors in Zambia's economy and could benefit tremendously with the application of information communication technology.

Due to tremendous advances during the last decade, information technology is today affecting all the spheres of human life. We can exploit these advances to design a cost-effective system to provide expert advice to farmers and the general public.

This project focuses on how information communication technology can be used to better improve agriculture in Zambia.

This will be done by implementing an online electronic Agro trading system, a livestock and vegetable farming information repository, a google maps implementation showing crop distribution in different farming areas of Zambia and an electronic records management system for local cooperatives and associations.

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ABBREVIATIONS

ACRONYM	DESCRIPTION
AIS	Agro informatics System
FRA	Food Reserve Agency
G-API	Google Application Programming Interface
PHP	Hypertext Pre Processor
SQL	Stand Query Language

CHAPTER 1

INTRODUCTION

This project focuses on how information communication technology can be applied to advance practises in agriculture. This chapter introduces the aims and motivation of the project. The system to be developed will run a web browser so as to have a large user number.

1.2 Motivation

The importance of farming to Zambia and its citizens cannot be over emphasized. However the majority of the Zambian farmers face a number of related problems.

- 1.2.1 Firstly and foremost Zambian farms are run by ordinary people with little information on farming and farming trends. Farming techniques are passed on from generation to generation and some of these methods are outdated and not very effective. This creates problems with the technical aspect of the day to day operations of the farm. When a disease breaks out on either the livestock or crops, most farmers tend to wait for advice from local experts from the ministry of agriculture and livestock. But these experts do tend to take long and the problem may have escalated before the information is made available. A case in point is the Army worms attack that destroyed huge hectares of maize fields. Farmers had no information on how to deal with these pests.
- 1.2.2 Secondly, farmers in Zambia lack the marketing opportunity to market their products. This implies that the general public who are the would be buyers do not know which farmer is producing which product and this leads to low sells and profits for the farmers. This has led to the farmers creating informal markets such as Roadside shops and local Commercial shows which only come once in a year. A good example is the agriculture and commercial show which happens in August in Lusaka.
- 1.2.3 Thirdly, the government of the republic of Zambia does give subsidized fertilizers and inputs to the farmers. Farmers are required to register with a local cooperative. Unfortunately the farmer's records at these cooperatives are saved manually in books. This gives raise to corrupt activities as some farmers are tempted to register twice with different cooperatives so as to get double these inputs. This implies that some farmers do not get the much needed inputs.

1.3 Problem statement

This project will seek to answer the following problems

- 1.3.1 Is it possible to improve farming in Zambia by providing reliable expert agriculture information to the local farmers?
- 1.3.2 It is possible to have a faster way of advertising, buying and selling of farm products online?

1.3.3 Is it possible to show the type of farming that is happening around the Country on a Google map?

1.3.4 Is it possible to have the food reserve agency locations mapped on a google map

1.4 Objectives of Project

The objectives of the Agro informatics system are to help booster Zambia's agriculture capability with the use of information communication technology.

This will be achieved by meeting the following Objectives.

1.4.1 Database Objectives

- a. The database of the Agro Informatics System will allow the System administrator to insert, modify and delete data more efficiently.
The rights to perform the above mentioned actions are only granted to the Administrator.
- b. The database will also provide integrity check of data to ensure consistency and reduce redundancy of the data that is stored in Agro informatics.
- c. The database will provide a level of security to all its users as sensitive information such as passwords will be encrypted in the database by using the MD5 encryption algorithm.
- d. Activities of each user will also be logged in order to know who has done what and when. The system will prevent records from being misplaced since the records are electronically stored.
- e. The database will provide reliability functionality in that data will be protected from being lost to natural calamities or theft as it can be easily backed up in other forms such as Standard query language (sql) files.
- f. The database will also prevent data loss which might arise if paper was to tear or wear.

1.4.2 Application Objectives

- a. The application will give farmers and the general user a variety of information relating to farming.
- b. The application will provide the user with a geographic information system that is practiced in the different areas of Zambia.
- c. The system will provide user with an online trading mechanism were user can select products of their choice and a price indicated on the price. This price will be totaled in relation to the number of products that a user selects.
- d. The system will provide its user with a registration panel were the user can enter their unique name and password. A user's email and password will also be requested from the user for a feedback.
- e. To make sure that the data integrity is enforced, users will be given passwords according to their levels which will specify what activities a given user can do with the system. There will be two levels that is; Ordinary users and administrators according to their rights.

1.5 SCOPE

The scope of the Agro informatics system will be a full functional software system that will provide the following functionality.

- a. A complete Electronic Commerce System that will allow farmers and Consumers that are separated by geographic barriers carry out trade online. Electronic commerce will be used to trade in agriculture and related products. The system will enable buyers and sellers carry out trade transactions online. A catalogue system will be developed to show products and the prices at which these products are being sold at.

The Electronic commerce system will provide a mechanism in which a catalogue of the products that the user selected will then be sent to the supplier together with the contact details of the buyer.

An online user can select multiple or a single product. The products selected will have price tags and once the user selects the

For example a user can select on agriculture related products like pigs (or pork meat) and the list of farmers that sell pigs in Zambia is returned. This hopes to solve the complexity of physically having to visit farms just to check if they sell pigs.

- b. The Electronic system will provide an efficient search mechanism that users online will use to search for the farming products and the location of the farmer together with the farmers physical address. It is hoped that this will greatly improve farming trade as user have direct information on which farmer is offering which products.
- c. An inventory system will be developed that will contain agriculture related information such as crop data and farming techniques.
- d. Other forms of multimedia such as images will be added to the proposed system that will enable farmers in Zambia get the much needed expert information on agriculture.
- e. A geographic map view of Zambia including the food reserve agency locations.

1.6 Expected Outcome

This final year project will strive to produce a system that will be agriculture centered. The Agro informatic system will contain all agriculture related data.

The system is expected to provide the following:

- 1.6.1 An online Electronic Commerce based system that will be used to trade in agriculture products. This system will enable a user to select a variety of zambian agriculture products on offer together with the prices. An online market will be developed that will enable buyers and sellers carry out trade in zambian agriculture.
- 1.6.2 This will show commodity prices in agriculture as listed by the zambian national farmers union.
- 1.6.3 A farmer database management system will be developed that will capture information related to specific farmers. The database system will store information on farmers such as the type of products they produce and the location of these farmers. It is hoped that when this kind of information is readily available, customers and would be buyers can easily contact these farmers if and when they need the product. This will boost agriculture trade in zambia.
- 1.6.4 An agro geographic content system that will be embedded in the system. This will show specific rainfall patterns on each zambian province. This will also contain soil properties that each province has and what type of agriculture thrives in the same said conditions of zambia.
- 1.6.5 A records management system for local cooperatives

CHAPTER 2

2.1 LITERATURE REVIEW

2.1.2 Introduction

Agriculture or farming is the backbone of Zambia's economy, as two-thirds of the population live in rural areas and depend (directly or indirectly) on agriculture for a living.

With Information Technology revolution (mainly the database and web technology), it is possible to provide latest expert advice in a timely manner to the farmer and thereby reduce the effect of the factors that disturb the crop or livestock productivity. By exploiting the advances in Information Technology, we can enable the Agricultural Experts to know about the status of the crop in a cost-effective manner. That is, rather than taking the Agricultural Experts to the crop, the status of the crop is brought to the Agricultural Experts through the Internet using both text and images. In this way we can build a cost-effective Agriculture information distribution to provide advanced agricultural advice to the farming community.

2.1.3 E Commerce in agriculture

Whether agriculture or not, we define E –Commerce simply as business transactions conducted over the internet. This definition allows for many different ways of conducting business.

Transactions may involve material goods, immaterial services, or rights and obligations. Payment may be online or off the internet. Access to Internet communication channel used in e-commerce is often open to everyone but is sometimes restricted, and the messages exchanged may be rigidly standardized, as in Electronic Data Interchange (EDI).

E-commerce transactions are often classified according to the partners involved –consumers, business, and government. With three types of partners, six combinations are possible but only two are presently important: business-to-consumer (B2C) and business-to-business (B2B). Of the two, B2C e-commerce currently receives most public attention.

Participation in e-commerce requires that both the buyers and the sellers have access to the Internet, and that they are able to use the required hardware and software effectively. Furthermore, the part of e-commerce that is observed to third parties is conducted on the World Wide Web of the Internet, Where at least one party to a transaction must operate a web site. Most often the web site is run by the more specialized party in particular types of transactions, such as the sellers of the farm inputs or the buyers of farm outputs. The less specialized party, such as the farmer, need only have access to the internet in order to participate in e-commerce on the web

2.2 Research Methodology

In this project, the waterfall model will be used. The waterfall model is a sequential design process, often used in software development processes, in which progress is seen as flowing steadily downwards (like a waterfall) through the phases of Conception , initiation ,Analysis , Design ,Construction.

The stages in the waterfall model will include requirements collection, Design, implementation, verification and maintenance. [10]

The advantages of using the waterfall method are that design errors are captured before any software is written saving time during the implementation phase.

The other advantages that the waterfall model has are that testing is easier as it can be done by reference to the scenarios defined in the functional specification.

The limitations that the waterfall model has are that the model does not cater for the possibility of requirements changing during the development cycle. [8]

To obtain data about the farmers and what products they produce, the national farmers union (ZNFU) will be contacted. It is hoped that this union will give much of the data about agriculture related information in Zambia.

Other trade data and tariff data will be sourced from available databases.

The other impediments to greater Zambia trade will be examined with reference to available literature and discussions that authors with greater trade experience and policy makers have contributed.

2.3 Review on several software development methodology

A systems development life cycle (SDLC) is a framework for describing the phases involved in developing information systems. Some popular models of a systems development life cycle include the waterfall model, the spiral model, the incremental build model, the prototyping model, and the Rapid Application Development (RAD) model. These life cycle models are examples of a predictive life cycle, meaning that the scope of the project can be clearly articulated and the schedule and cost can be accurately predicted.

2.3.1 The Waterfall life cycle

The waterfall life cycle model has well-defined, linear stages of systems development and support. This life cycle model assumes that requirements will remain stable after they are defined.

2.3.2 The Spiral life cycle model

The spiral life cycle model was developed based on experience with various refinements of the waterfall model as applied to large government projects. It recognizes the fact that most software is developed using an iterative or spiral approach rather than a linear approach.

2.3.4 The Incremental build life cycle

The incremental build life cycle model provides for progressive development of operational software, with each release providing added capabilities.

2.3.5 The prototyping life cycle

The prototyping life cycle model is used for developing software prototypes to clarify user requirements for operational software. It requires heavy user involvement, and developers use a model to generate functional requirements and physical design specifications simultaneously. Developers can throw away or keep prototypes, depending on the project.

2.3.6 Rapid Applications Development

The Rapid Application Development (RAD) life cycle model uses an approach in which developers work with an evolving prototype. This life cycle model also requires heavy user involvement and helps produce systems quickly without sacrificing quality. Developers use RAD tools such as CASE (Computer Aided Software Engineering), JRP (Joint Requirements Planning), and JAD (Joint Application Design) to facilitate rapid prototyping and code generation. 2.4. Review of possible tools and software to be used.

2.4.1 Integrated Development Environments

Integrated Development Environments or IDEs are used by developers to create and maintain code for embedded systems. IDEs usually provide enhanced functionality beyond typical text editor capabilities such as file organization, syntax checking, integration with compilers/simulators, and advanced debugging capabilities. IDE's may provide other features such as modeling capabilities and may be tightly integrated with other tools on the market. Commonly used IDEs used for embedded systems include the Eclipse development environment, Adobe CS5 Work Suit, Wind River Workbench, and Microsoft Visual Studio.

2.4.2 System Design and Modeling Tools

System Design and Modeling tools are used to design, document, and model the hardware and/or software components in an embedded system.

These tools often use a model of the system to perform activities such as mapping communication channels of an embedded system, assigning tasks to processors in a multi-processor system, rapid application development, and generating code for the application. Other features these tools may have include code optimization, system monitoring, and reverse engineering. UML is one of the more popular modeling languages used by embedded developers with organizations such as IBM Rational and ILogix. providing model driven development (MDD) tools based on UML. (Krasner, 2005)

2.4.3 Embedded Operating Systems

Embedded Operating Systems act as an abstraction layer between the hardware and system and usually provide additional capabilities such as increased instruction sets, performance optimized routines, and real time processing.

Embedded operating systems can also increase interoperability between systems by supporting standard protocols and web services standards. Embedded Operating systems can be available commercially, via open source initiatives, or home grown. VxWorks, one of the most popular embedded operating systems is one example of a tool in this category. Other embedded operating systems include Windows CE, Red

2.5 Related Works

2.5.1 Smart Farmer Application

Smart farmer application is an android application that was developed at that university of Zambia by Athony Mpanga. This application which runs on android phones lets the user have access to farming information. The application has crop and livestock data.

2.5.2 Agriculture Information Distribution System (AgrIDS).

Agriculture information distribution system is a system that was developed by P Krishan Reddy and R Ankaiah. AgrIDS is a scalable system which can be incrementally developed and extended to cover all the farmer's crops of India in a cost-effective manner. It enables the farmer to cultivate a crop with expertise, as that of an agricultural expert, by disseminating both crop and location-specific expert advice in a personalized and timely manner.

The system makes use of computer networks between the farmer and the agriculture experts where information is sent between the farmer and the experts.

2.5.3 Farmers Email Marketing System.

Farms email marketing system is a software system that was developed in the United States of America for farmers and potential buyers.

US Farm Data has over 400,000 emails in its database. This database has information on the farmers in the different towns that the users have searched and the produce that this farmers produce. If the user finds a suitable user near their location, they simply send the farmer an email of the products that they simply want to buy. This is a faster and convenient way to trade online.

2.5.4 Germany Agricultural Market and Information System (GAMIS)

This system collects, compiles and disseminates information about agricultural commodities traded in local and regional markets. The GAMIS is designed to enable producers, purchasers and traders have the latest information on markets.

CHAPTER 3

SYSTEM ANALYSIS

Introduction

This chapter focuses on the study of the interacting entities of the system and the activities of the system so as to have a system that meets its desired objectives. This chapter will study both the functional and non-functional requirements of the system.

3.2 Software development process of choice

In this project, the waterfall model will be used. The waterfall model is a sequential design process, often used in software development processes, in which progress is seen as flowing steadily downwards (like a waterfall) through the phases of Conception ,initiation ,Analysis , Design ,Construction.

The stages in the waterfall model will include requirements collection, Design, implementation, verification and maintenance. [10]

The advantages of using the waterfall method are that design errors are captured before any software is written saving time during the implementation phase.

The other advantages that the waterfall model has are that testing is easier as it can be done by reference to the scenarios defined in the functional specification.

The limitations that the waterfall model has are that the model does not cater for the possibility of requirements changing during the development cycle. [8]

3.3 Results and Surveys

A survey was carried out in the Chongwe kanakatampa farming block D on the 12th January 2014 so as to assess how many local farmers had a mobile device that had an internet access to it. It was discovered that only a small and insignificant number of farmers had these devices. It was also discovered that the local farming scheme managers had a mobile devices that had internet access to it.

3.4.1 Database Requirements

- The system shall provide a search mechanism that will enable users of the system search into a database information relating to an item that the users has searched for. This information will be agriculture related information.
- The system shall provide a secure access to the database. The database will allow users to modify, delete and edit records.
- The database shall be able to store geographic information on the different provinces of Zambia. This information will include the lines of longitudes and latitudes of the towns, locations of the food reserve agency (FRA).
- The database shall provide a mechanism to save images that the system will display. This will be achieved by saving the file directories of the images in the database.

3.4.2 Interface requirements

- The system shall provide a user interface that will display information relating to agriculture. This information shall include text and images.
- The system interface shall provide hyperlinks to other pages that will enable a quick access and fast navigation of the system.
- The system interface shall provide a consistent color and display mechanism to enable uniformity and a user friendly interface.
- The interface shall provide alternatives to the images that will be displayed. This will enable screen readers have an alternative view.
- The interface will enable that the user passwords as they are entered are hidden from view. This is a security measure.
- The interface shall be able to display the Zambian geographic map and its major towns. These towns will have links on them for a closer view.

3.5 Non Functional Requirements

3.5.1 Performance

The system shall provide a fast performance and response time. Operations such as search, delete, modify, update will occur in real time fast.

Hyperlinks will provide a quick navigation from one page to the next

This will be achieved by using images that are of minimal storage space (kilobytes).

3.5.2 Reliability

The Database of the system will be located on a central repository database server, with the clients accessing the records of the database via a database management system (DBMS) software located on each workstation with each individual workstation being connected to the database via a network. To increase reliability the database server will support RAID (Redundant Array of Independent Disks) technology and regular backups of the system will be conducted to prevent vulnerability in the case of a system crash.

3.5.3 Availability

The system shall be available to its users around the clock. Any transaction on the system shall be performed from anywhere by the user provided the user has a network connection.

3.5.4 Usability

The system shall have a simple and user friendly interface design that shall not be hard to get around for the users that will be using the system, so as to allow for free flow of the day to day business operations in a faster manner compared to the previous manual system, maintain optimal results when using the system and the training on how to operate the system should be less complicated and fully interactive to allow more user involvement

3.5.6 Maintainability

The system will be designed in a way that it will have a clear and easy to understand design accompanied with a well elaborated documentation that will allow any person or user trying to maintain it to do so with minimal technical knowhow. Dialog boxes will be developed for user updates.

3.5.7 Portability

This web application system will be developed using java which is platform independent meaning it can run on different platforms. The PHP and html script will allow the system to be executable on most browsers.

3.5.8 Hardware requirements

This application will run in a web browser and any device that has a web enabled browser that supports java Script will be able to fully utilize the application. Examples of such devices include personal computers, Personal digital assistants and smart phones.

(a)Client Specifications

The client must have internet access and a java enabled web browser to access the application.

(b) Server specifications

The server processor speed required to run the application should have a minimum of 1.6GHZ a minimum of 1GB in the local storage and a RAM of 512 MB for optimal performance.

3.6 Development tools

To implement this project, technologies such as JAVA, PHP and Mysql will be used.

3.6.1 Java programming language

Java programming language was chosen in this project because java is platform independent.[6] This means that java has the ability to run on the same program on many different Systems on the World Wide Web software and java succeeds at this by being platform independent at both the source and binary level.

Java is an object oriented language which allows to create modular programs and reusable code.[9]

3.6.2 JavaScript

To add interactivity to the agro informatics system, JavaScript will used. JavaScript is an object oriented computer programming language that is used to create interactive effects within web browsers that run on servers.

3.6.3 PHP

A hypertext preprocessor that is used as scripting language will be used. This PHP script will act as the intermediate code between the databases and the user interfaces. PHP is cross platform and therefore enables operation across various operating systems.[14]

3.6.4 MySQL

MySql will be used to create the back end database system. The reason why MySQL was chosen in this project is that the database server is a high performance, low maintenance, remote database server that permits you to build and deploy client /server applications and web-based application. MySQL is the most popular among application developers as a client/server backend solution for shared, networked, standalone, mobile and internet database applications.[15]

3.6.6 Wamp Server

Wamp server will be used for database hosting and testing. Wamp server will be used because of its flexibility to allow scripts written in different languages to run without much difficulty. Wamp server is a collection of programs you can use to turn your regular desktop PC to a fully compatible web server with HTTP, PHP, MySQL, PHPMyAdmin, SQLBuddy applications. The advantage is that it is easy configurable with the built-in tools. Also it is structured in the way that you have everything you need at a click distance. The configuration screens provide extra information how settings should look like. Another thing would be that the packed applications are configured to be compatible between them, all being automatic configured, you just unpack your script, database, application, run the installer (if it has any) and that's it.

CHAPTER 4

SYSTEM DESIGN

This chapter focuses on the design of the system which included defining the architecture , components , modules , interface and data for the system so as to satisfy the specified requirements.

4.2 use case diagrams

4.2.1 USE CASES

4.2.1 Electronic Commerce module Use Case

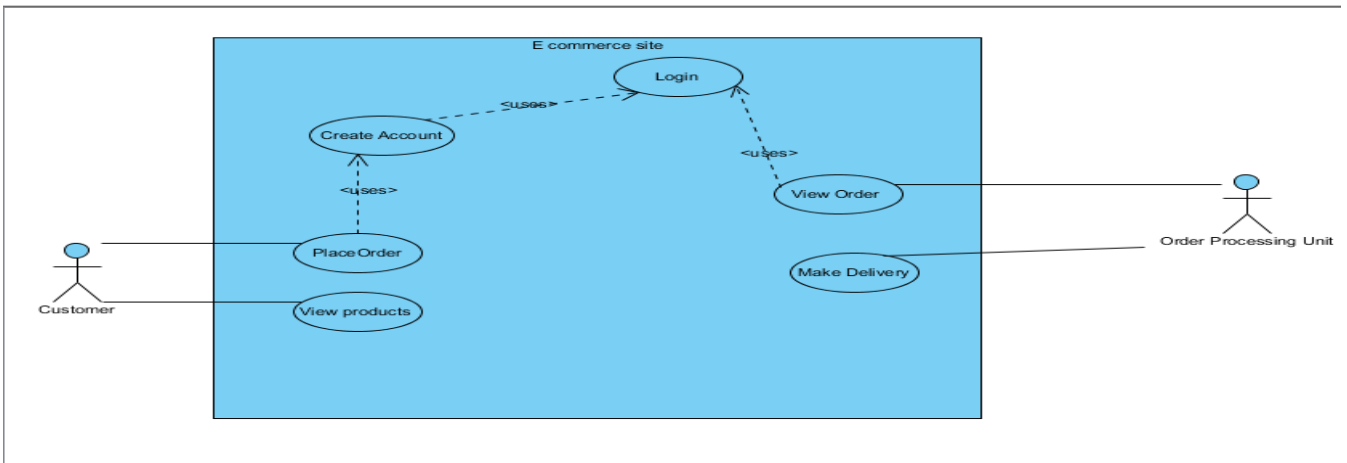


Figure 1-E commerce use case

Figure 4.1 shows the electronic commerce module use case diagram. The diagram module shows the how the different actors of the system interact with each other. The customer can view products on offer and who is offering those products, place orders on that product by creating an account and then login into the system.

The other actor in the system is the order processing unit which checks for orders from the customer and makes a delivery of products.

4.2.2 Farmer Directory Use case

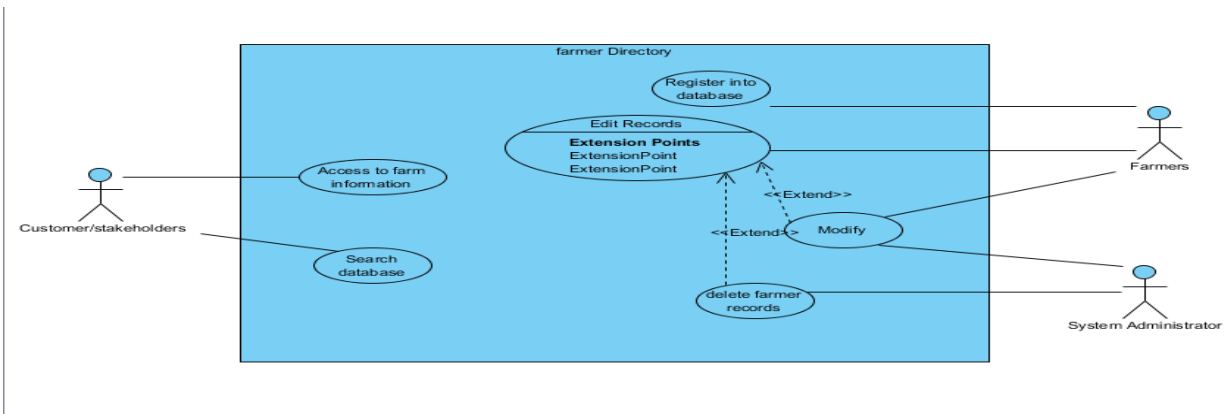


Figure 2-Farmer directory use case

The figure above shows how the different actors interact in the farmer directory module. The different actors in the system include the farmers, system administrator, and the general public. The general public have access to a front end database that shows the names of farms and what products are produced plus the contact information. The other actors are the system administrator and the farmers. These actors have rights to modify, delete and update records.

4.2.3 Geo maps use case

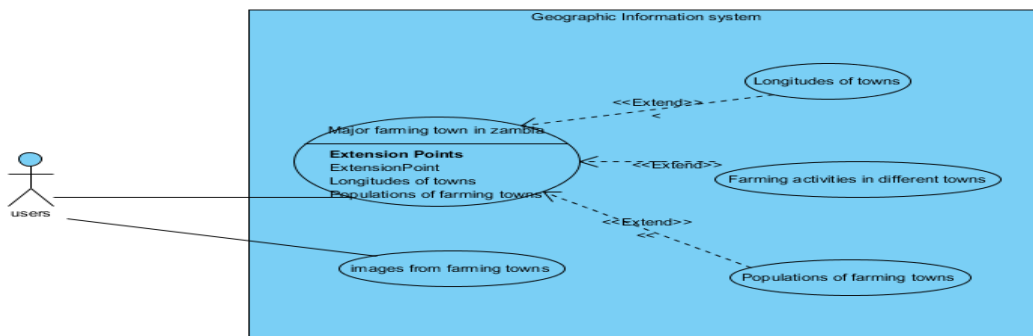


Figure 3-Geo maps use case

Figure 4.3 shows the geographic information system that will contain information on the farming activities that are practiced in different towns of Zambia. This geographic map will also show the location of FRA stations and contact details.

4.2.4 Vegetable and Livestock farming use case

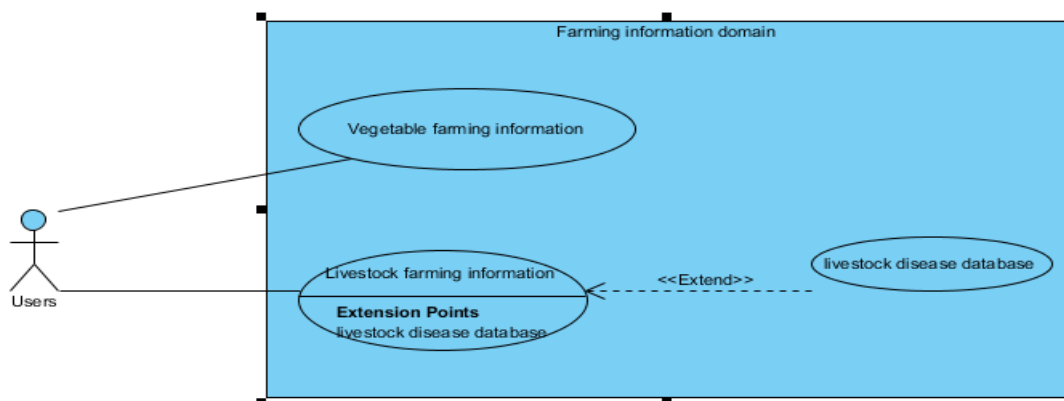


Figure 4-Vegetable and livestock use case

Shows how the actor interacts with farming information that includes vegetable farming and livestock farming.

4.3 Class Diagrams

4.3.1 Agro Shops Class Diagram

Visual Paradigm for UML Community Edition [not for commercial use]

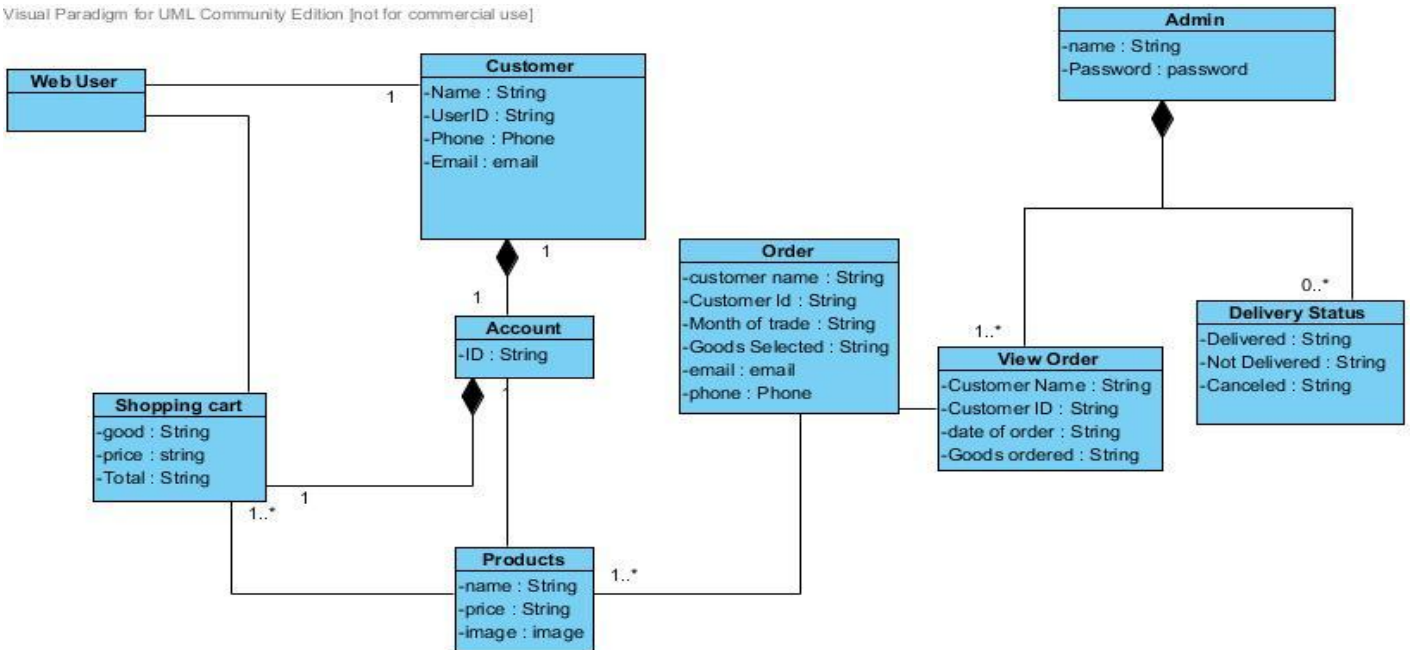


Figure 5-Agro shops class diagram

Figure 4.5

The above diagram shows the different classes that exist in the agro shops.

4.3.2 Farming Information Class Diagrams

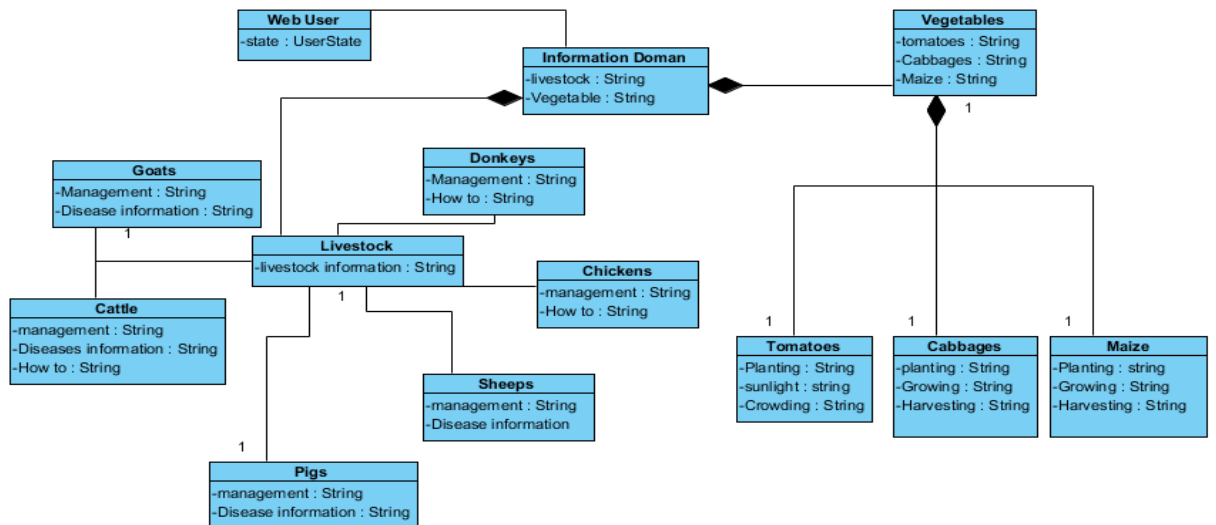


Figure 6-Farming information class diagram

4.3.4 Geo Maps Class Diagrams

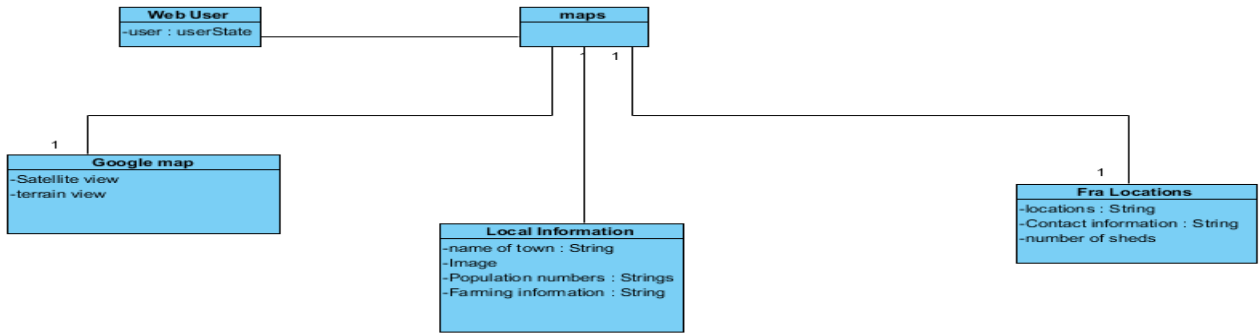


Figure 7-Geo maps class diagram

4.4 Sequence Diagrams

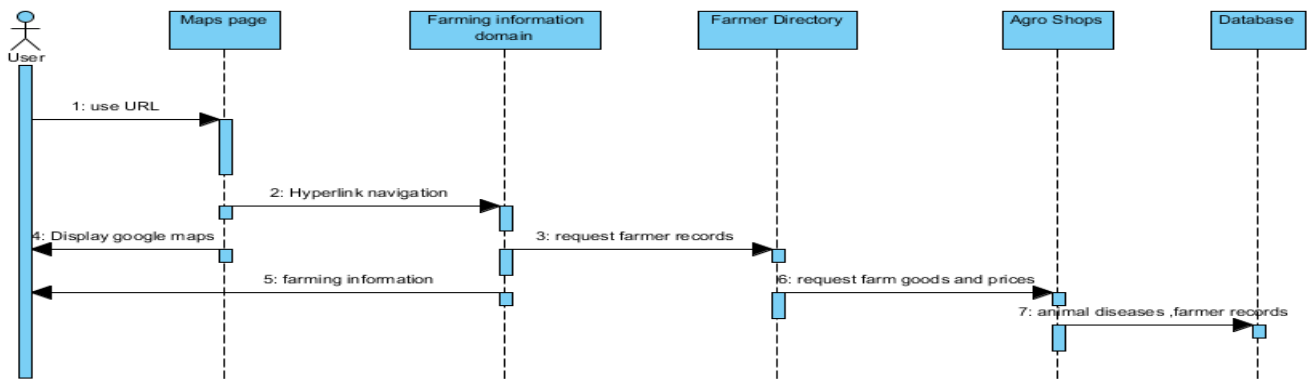


Figure 8-system sequence diagram

4.5 Story board

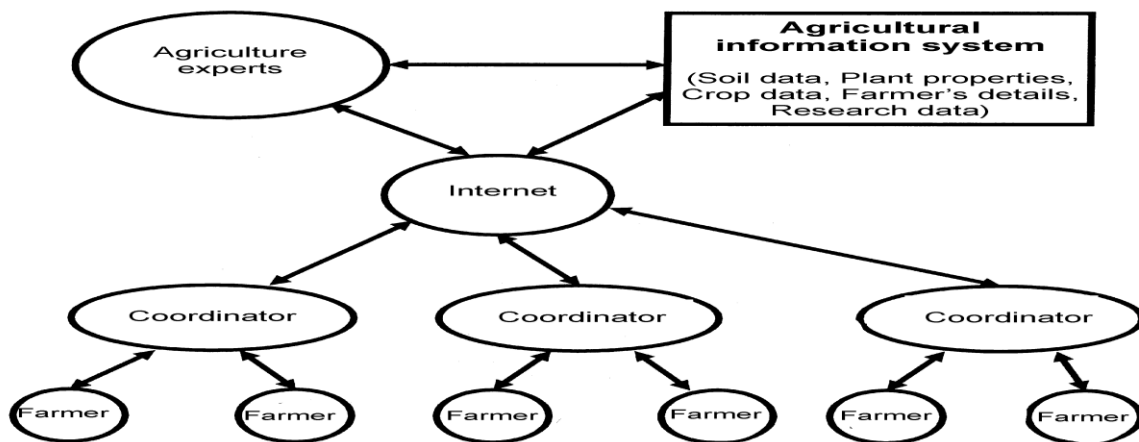


Figure 9-Story board diagram

CHAPTER 5

SYSTEM IMPLEMENTATION

This chapter focuses on how the system will be implemented. It will include screen shots of the developed system, a full description of the system and a detailed implementation of the system.

5.2 Geographic maps of Zambia

To implement this component php, Mysql and java are to be used.

This component consist of a MySQL database that contains 2 tables namely categories and locations.

5.2.1 Databases of maps

(a) Categories

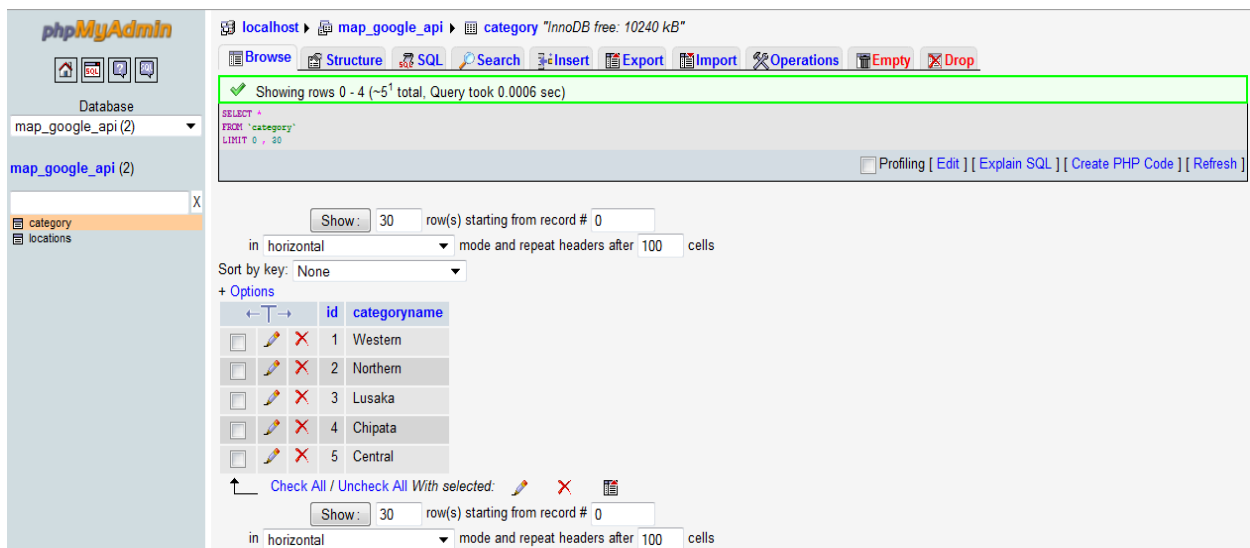


Figure 10-Database

Figure 5.1

The table category contains the names of the major points that are to be used in the maps. These categories help in selecting the different color markers for the system. A category with id number 1 lets a marker with color red to be displayed on the map , id number 2 displays a marker of color blue and so on.



Figure 11-map markers

The categoryname column specifies in which route folder the specified marker is located. Examples of folder name as used in the system include western ,Chipata, Lusaka and so on.

(b)

id	title	short_title	aimage	categoryid	lapt	long
1	Lusaka	Lusaka is the capital city of Zambia.It has a tota...	images/Lusaka/1.jpg	3	-15.403089	28.260595
2	Chipata	Chipata has a population of 98,416. it is the capi...	images/Chipata/1.jpg	4	-13.632370	32.645470
5	MONGU	Mongu is the capital of the western province. Acc...	images/Western/2.jpg	1	-15.277490	23.131861
6	Kasama	Kasama is the capital of the Northern Province of ...	images/Northern/1.jpg	2	-10.208400	31.182529
4	Kabwe	kabwe is the capital of the central province of za...	images/Central/1.jpg	5	-14.447180	28.446529
3	Siavonga	Siavonga is located in the southern province of Za...	images/Western/1.jpg	1	-16.533333	28.716667
7	Mwinilunga	Mwinilunga is a town in the North-Western Province...	images/western/4.jpg	1	-11.746144	24.423274
8	Mazabuka	Mazabuka is a town in the southern province of Zam...	images/Western/8.jpg	3	-15.822838	27.775452
9	Kaoma	Kaoma is located in the western province of zambia...	images/Lusaka/7.jpg	5	-14.811940	24.797398
11	Mansa	Mansa is the capital of Luapula province. It has a...	images/Lusaka/mansa.jpg	3	-11.189205	28.888806
16	Livingstone	livingstone was until 2012 the capital of southern...	images/Lusaka/L.jpg	3	-17.851979	25.828515

Figure 12-geo maps database

The locations table contains information on the different marker points to be displayed on the map. Information on each point will include the population of each town, the farming activities of each town plus an image of each town.

The lapt and long columns in the table are for the lines of longitude and latitudes of the different towns of zambia. The aimage column specifies the route folder where an image to be displayed on the map is located.

When a user runs the application in an environment with internet access, a google maps javascript is executed. This javascript displays the map that is focused on the country Zambia as the application is set to focus on the lines of longitude and latitude of Zambia.

This map reads information from the MySQL database. This then displays the maps including the markers as shown below.

5.2.1 View of Map

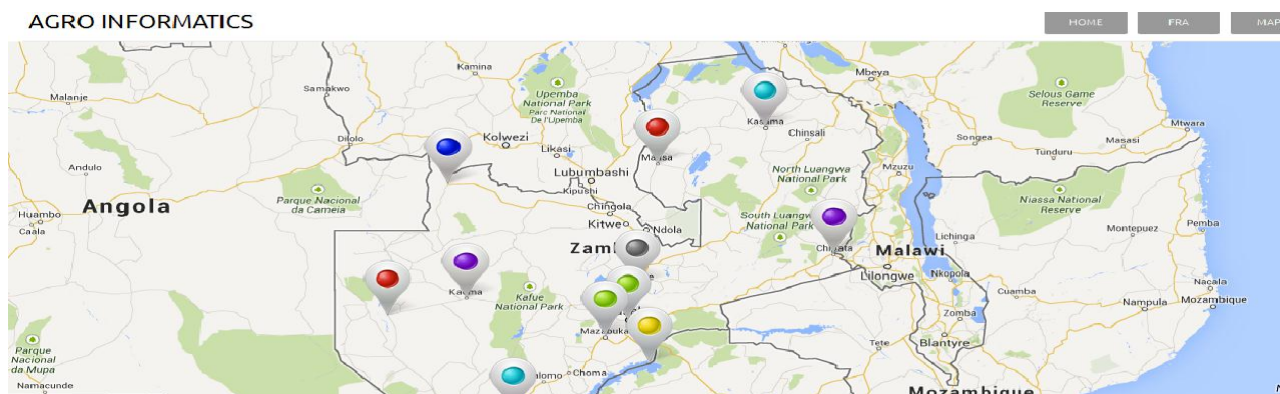


Figure 13-Zambian map

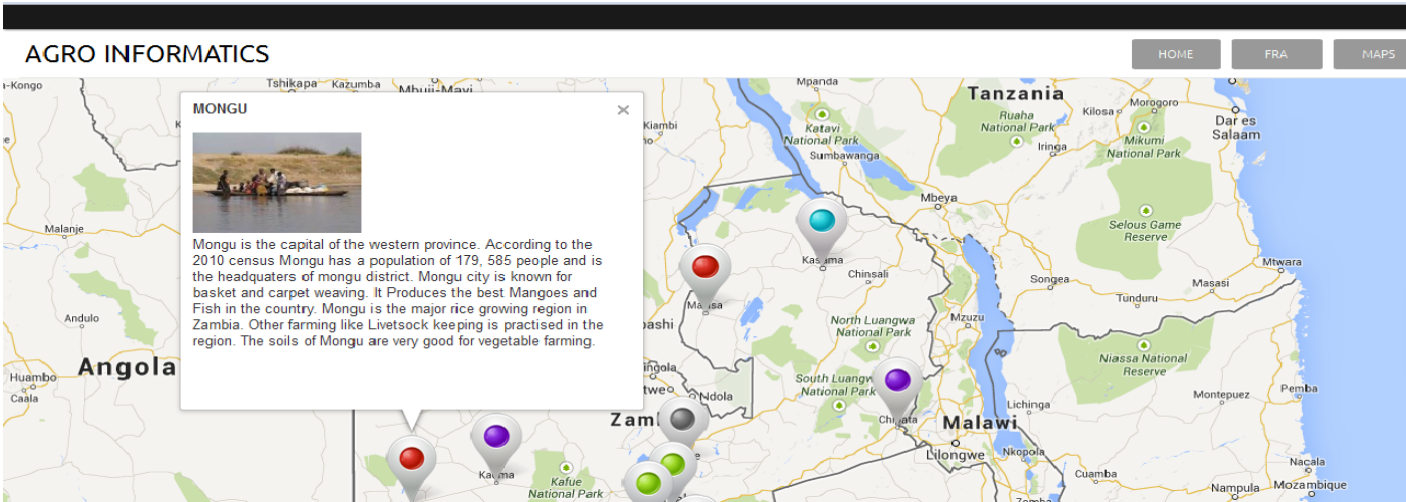


Figure 14-map after click

When a user clicks on the marker icon, an information window showing an image from the town clicked and specific information regarding that town is displayed.

The same mechanism is implemented when displaying locations of the food reserve agency. A different map is displayed when a user clicks on the FRA button. This map contains information on the number of sheds in the province, contact details of the provincial marketing officer and the capacity of the shed.

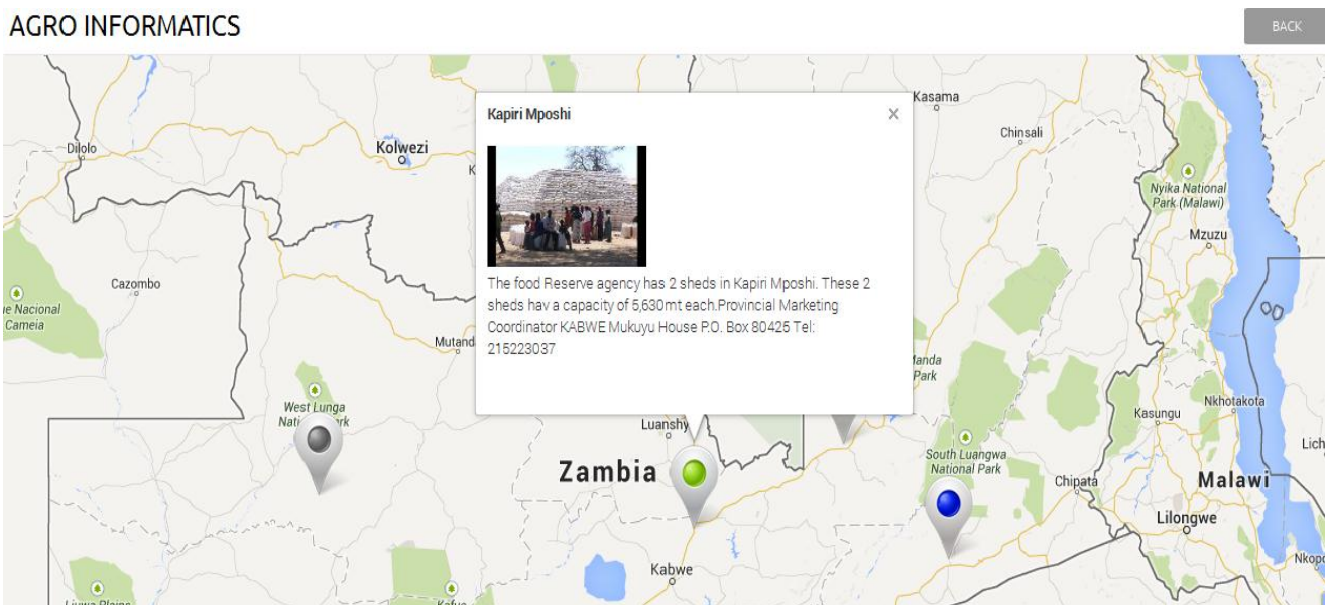


Figure 15-FRA map locations

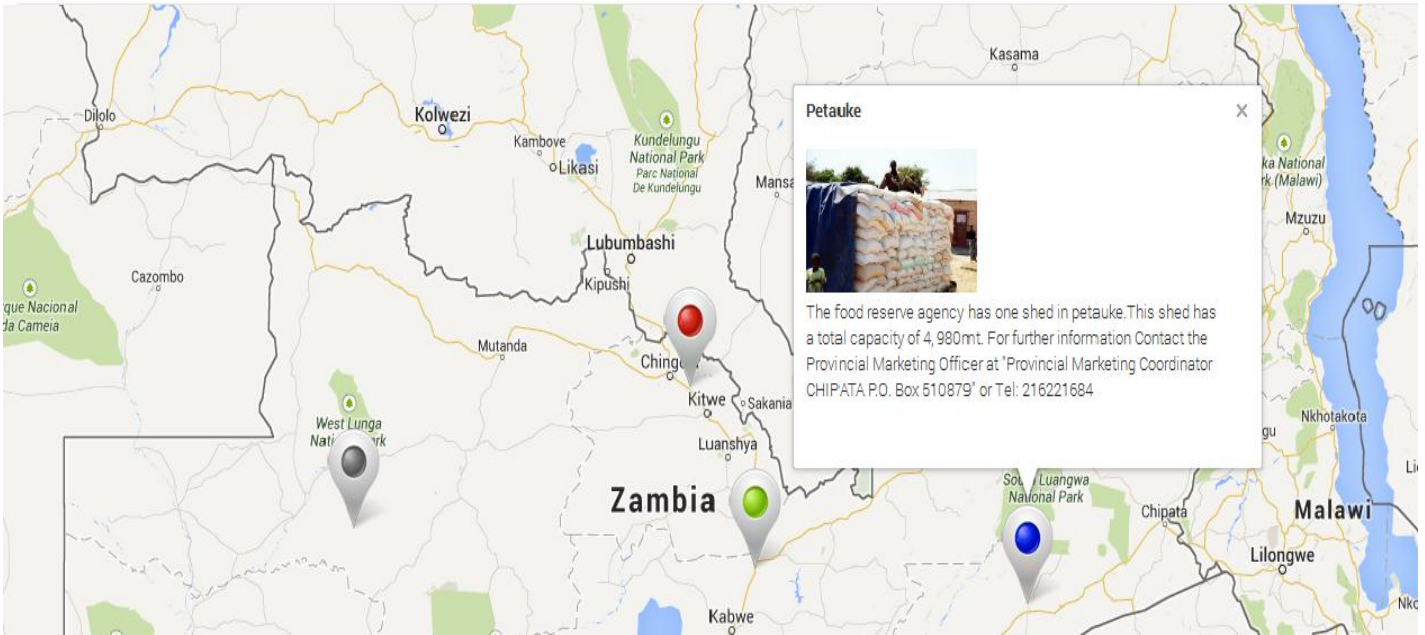


Figure 16-FRA locations

The system has a component that will allow users have a satellite view of all the places in Zambia. This component will have a earth view.



Figure 17-Google earth view

Users of the system will navigate through the use of the buttons that are provided on the interface. This buttons have an option to view the terrain of the different places in Zambia or they can have a satellite view which shows the houses and roads.

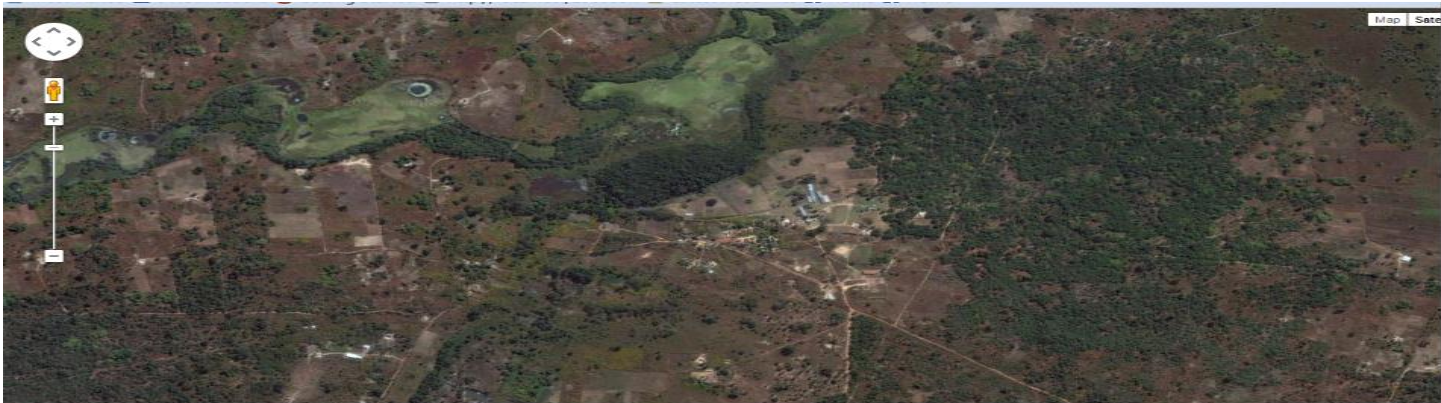


Figure 18-Google earth view

5.3 Electronic commerce System

The electronic commerce subsystem will enable users place orders on agriculture products that they need. The system then calculates the final product and the total amount at which these products were bought at.

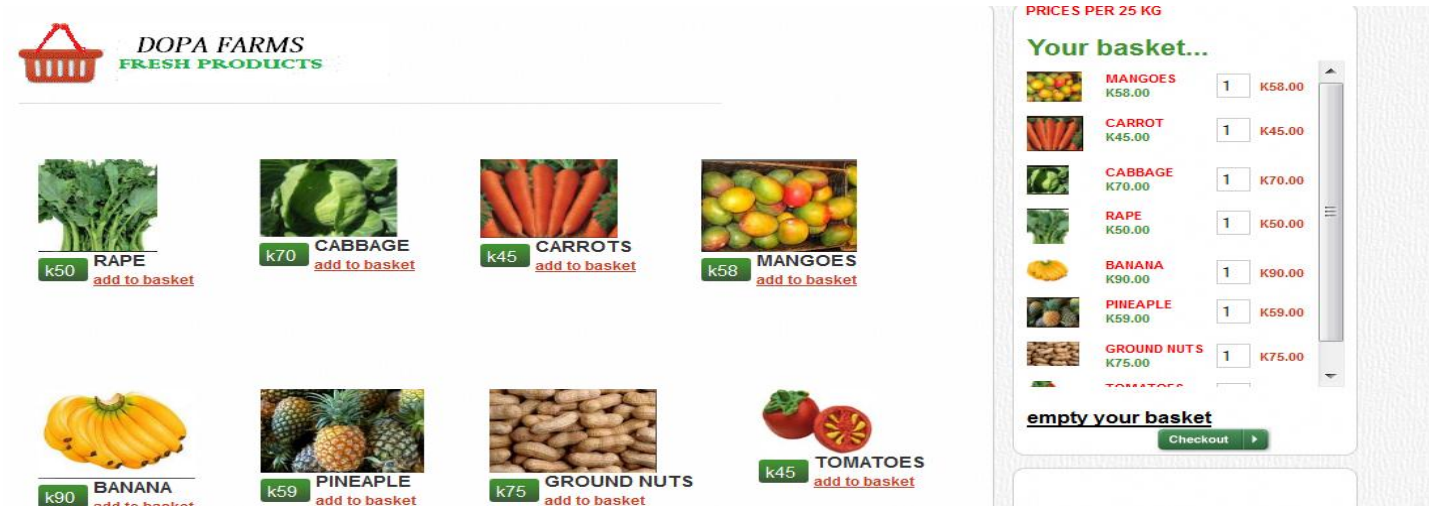


Figure 19-online Shops
1

The system gives the user an invoice of the goods that the user has bought.

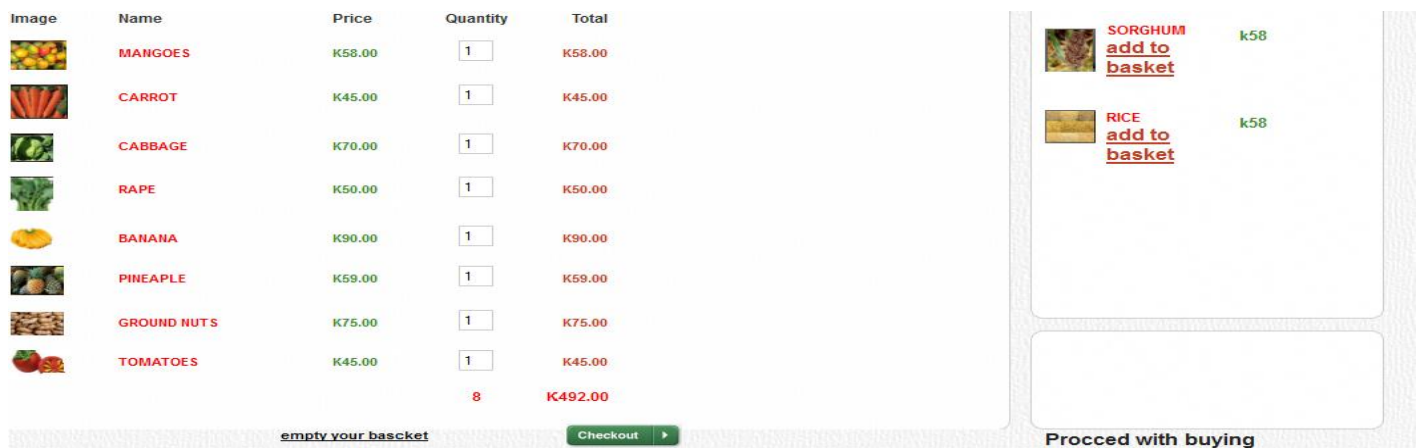


Figure 20-Agro shops cart

When the user is content with the products and would want to place an order, the user can click on the proceed with buying link and the system redirects the user to a registration interface.

BACK

CUSTOMER'S NAME Charles Velemu

PASSWORD ●●●●

Confirm Password ●●●●

EMAIL cvelemu@gmail.com

Month of Sale

PHONE

GOODS BOUGHT

Figure 21-agro shops registration

This information is saved in a database. The transaction processing unit has information that will enable the right products are delivered to the correct people. The transaction processing unit has information of the customer and the goods that the customer needs and the date these goods were bought.

Agro Informatics

ORDER PROCESSING UNIT

Name of Customer***	Customer ID***	Email***	Phone Number	Products	Month	Delivery Status
admin1	0c7540eb7e65b553ec1ba6b20de79608	cvelemu@gmail.com	0			
johns	d2f9c828e6c1abdb3fcc32909d6c27f6	cvelemu@gmail.com	976846451	maize(2) , carrots (2)	January	Not Delivered
johns mwewa	2e422e0e31a7426c33bb1a781bfae270	banda@gmail.com	93736533	mangoes	February	Delivered
johns Mulenga	4d07cd0157cb9c3e5b6edb850337d493	b@gmail.com	987345454	maize (1) Mangoes	March	Not Delivered
Dee velemu	4d07cd0157cb9c3e5b6edb850337d493	dE@gmail.com	987766776	mango	December	Delivered
velemu mwale	4d07cd0157cb9c3e5b6edb850337d493	f@gmail.com	98832333	mango	June	Delivered
johns maz	4d07cd0157cb9c3e5b6edb850337d493	j@gmail.com	98783334	mango	January	Delivered
Dany Mwanza	4d07cd0157cb9c3e5b6edb850337d493	dms@gmail.com	98787687	maize	March	Delivered
James Bwalya	2e422e0e31a7426c33bb1a781bfae270	jbwala@gmail.com	976865423	Maize(2 bags), Rape (3 bags)	July	Delivered
Simon Bwalya	4d07cd0157cb9c3e5b6edb850337d493	SB@gmail.com	975345363	Maize (2 kg) Carrots (3 kg)	June	Delivered
MuSonda	4d07cd0157cb9c3e5b6edb850337d493	MS@gmail.com	93478444	Maize 5	January	Delivered

Figure 22-Order processing unit

The administrator of the transaction processing unit has rights to update to information of the order.

ORDER PROCESSING UNIT

Name of Customer	<input type="text" value="johns Mulenga"/>
Customer ID	<input type="text" value="4d07cd0157cb9c3e5b6e"/>
Month of Transaction:	<input type="text" value="March"/>
Delivery Status:	<input type="text" value="Not Delivered"/>
<input type="button" value="Update Records"/>	

Figure 23-Processing unit

5.4 Farmer Online Directory

The farmer directory is an online directory that will enable farmers advertise their product information online to the general public.

Farmers will have their details plus the products that they produced saved in a database. A user shall search for either products or locations and list will be displayed on the screen.

AGRO INFOMATICS SYSTEM

LOCAL FARMER DATABASE

Name_Of_Farm***	Location_Of_Farm***	Contact_information***	Produce
Zambeef Farms	Chipata	(+260) 216222123	Beef and Beef Products , Chickens ,Prork ,Milk
Kwazulu Farms	Lusaka ,Chongwe	0976846454 , KwaFarms@gmail.com	Beef and Beef products , Maize grain , pig and pig products
Dopa farms	Lusaka , Chongwe	0978438278	Chickens ,Pigs maize and soya beans
Parmalat Zambia	Livingstone	+260 21332273	Diary Products
jones mwey	Lusaka , Chilanga	09898947	Maize
Moba Farms	Siavonga ,Southern Province	Moba@gmail.com	Maize , Cattle ,Pigs and goats
Sheni Agri Suppliers	Chipata	+260 216 221529	Maize ,GroundNuts , Beef
Zamleather Farms	Lusaka	+260 211241519	Maize ,Cattle and Cattle products

Figure 24-Farmer online directory

The farmer database shall allow editing by the users.



INSERT

to enter a new farmer record to database...

DELETE

to delete a farmer record from database..

MODIFY

to modify a farmer record in database...

ABOUT

BACK

HOME

DEVELOPED BY VELEMU CHARLES--ALL RIGHTS RESERVED



Figure 25-Directory Editing

When a user clicks on insert button, the page below comes up



Name of Farm: James Mwale and Sons
Produce arrots ,Sweet Potatoes2
Contact Details 09383832

Location of farm

- Chadiza
- Chadiza
- Chama
- Chavuma
- Chibombo
- Chiengi
- Chililabombwe
- Chilubi
- Chingola
- Chinsali
- Chipata
- Choma
- Chongwe
- Gwembe
- Katanga

BACK

DEVELOPED BY VELEMU CHARLES--ALL RIGHTS RESERVED

Figure 26-Inserting new farmer records

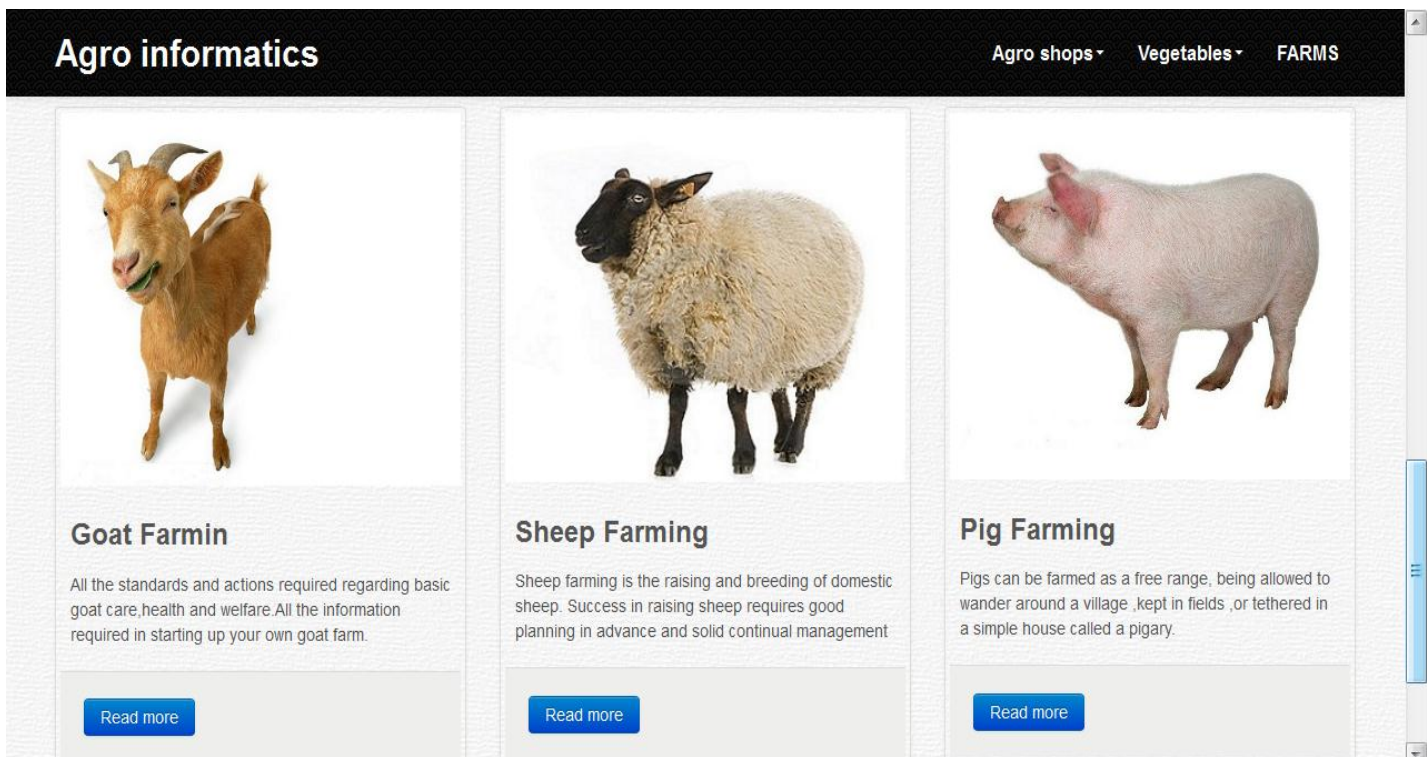
The user can then register their products together with their contact information online. The system administrator can delete a user record from the system. The system administrator shall press on the action button labeled delete to remove a user record from the system.



Name_Of_Farm	Location_Of_Farm	Contact_Information	Produce	Action
Zambeef Farms	Chipata	(+260) 216222123	Beef and Beef Products , Chickens ,Prork ,Milk	DELETE
Kwazulu Farms	Lusaka ,Chongwe	0976846454 , KwaFarms@gmail.com	Beef and Beef products , Maize grain , pig and pig products	DELETE
Dopa farms	Lusaka , Chongwe	0978438278	Chickens ,Pigs maize and soya beans	DELETE
Parmalat Zambia	Livingstone	+260 21332273	Diary Products	DELETE
jones mwey	Lusaka , Chilanga	09898947	Maize	DELETE
Moba Farms	Siavonga ,Southern Province	Moba@gmail.com	Maize , Cattle ,Pigs and goats	DELETE
Sheni Agri Suppliers	Chipata	+260 216 221529	Maize ,GroundNuts , Beef	DELETE
Zamleather Farms	Lusaka	+260 211241519	Maize ,Cattle and Cattle products	DELETE

Figure 27-Deleting Records

5.5 General Farming Information



The screenshot shows a website interface for 'Agro informatics'. The top navigation bar includes 'Agro shops', 'Vegetables', and 'FARMS'. The main content area is divided into three columns, each representing a different type of animal farming:

- Goat Farming:** Features a photo of a brown goat. The text below the image states: 'All the standards and actions required regarding basic goat care, health and welfare. All the information required in starting up your own goat farm.' A blue 'Read more' button is located at the bottom of the section.
- Sheep Farming:** Features a photo of a white sheep with a black face. The text below the image states: 'Sheep farming is the raising and breeding of domestic sheep. Success in raising sheep requires good planning in advance and solid continual management.' A blue 'Read more' button is located at the bottom of the section.
- Pig Farming:** Features a photo of a pink pig. The text below the image states: 'Pigs can be farmed as a free range, being allowed to wander around a village, kept in fields, or tethered in a simple house called a pigsty.' A blue 'Read more' button is located at the bottom of the section.

Figure 28- Animal farming

A user has access to links that redirects them to a livestock domain repository. This repository has information relating to specific animals plus the diseases that affect that animal including its treatment and signs.



Cattle farming

Cattle farming is a type of farming that involves large tracts of land along with facilities that are needed to raise livestock. It is potentially appealing to people who....

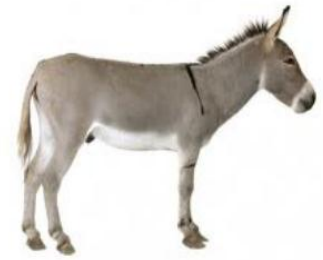
[Read more](#)



Poultry Farming

Raising chickens is becoming more and more popular with small farmers ,urban farmers, homestead and others. aChickens are also beneficial in diversified farming operations.

[Read more](#)

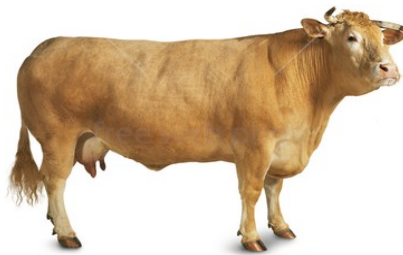


Donkey Farm

Donkeys are primarily used to transport farm produce such as Maize and other crop residues. Donkeys are usually used when the cowhed is calving out and there is a big poppulation of predators..

[Read more](#)

Figure 29-Animal farming



Disease Name	Symptoms	Treatment
Anthrax disease	The affected cattle stop eating suddenly. They do not ruminate. Temperature of their body can be up to 41 ° Fahrenheit. They suffer much while breathing. The germ of this goat disease can survive for up to 40 years and can infect humans and other animals. Anthrax disease causes in goats due to a bacteria named bacillus anthracis. This virus enter into the body of goat through their feed, water, breath and wound places. And start showing symptoms within 1 to 5 days. Sometimes goat may die without any symptoms. Blood may come out from the nose, mouth and anus of goat. The disease is more prevelent in Southern , North Western and	Apply antibiotic medicine like penicillin, ampicillin, tetracycline etc. according to the suggestion of a veterinary surgeon. Apply anthrax disease preventive vaccine once to the goat.
Contagious Bovine	The disease occurs inn Western province ,North Western Province and Southern Province. The disease occurs through direct contact between an infected and a susceptible animal which	.Treatment is bassed on vaccination campaigns. Treatment of infected animals

Figure 30-Cattle disease database

The disease database has information relating to different types of livestock. When a user searches for either a sign or symptom of a disease the system checks for a match in the data base and a result is displayed when a match is found.

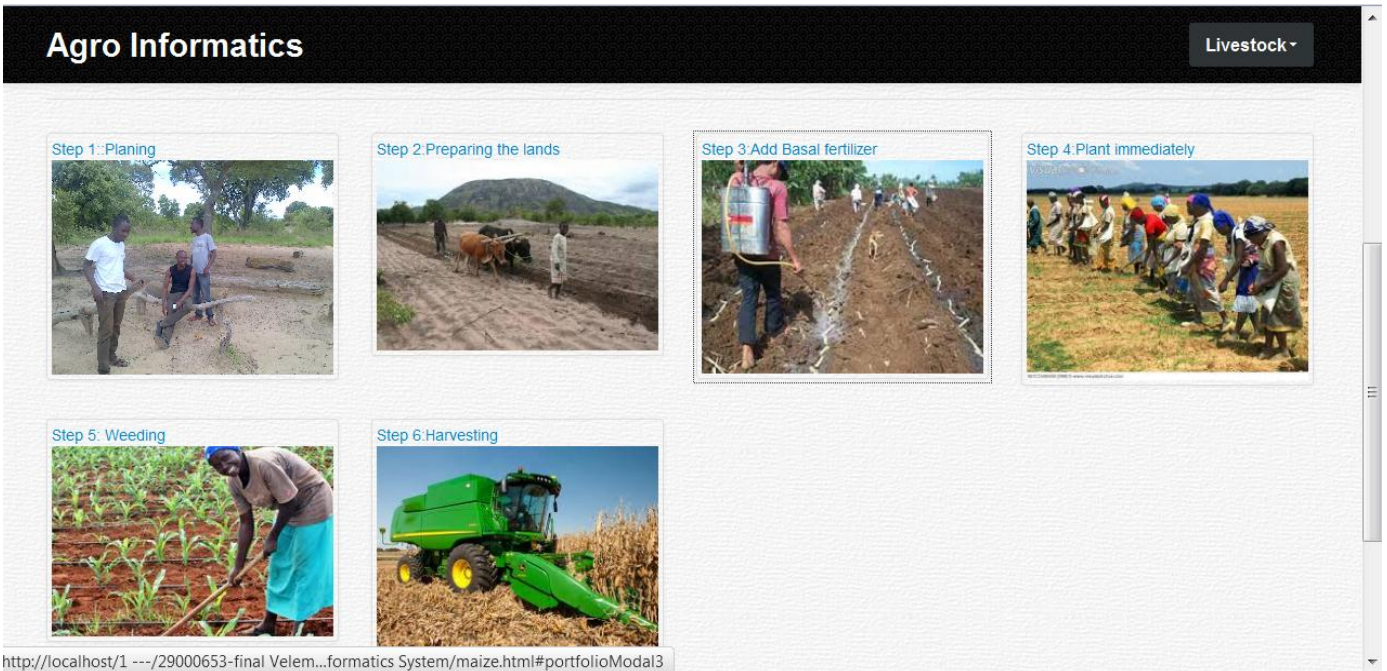


Figure 31-Vegetable farming

Figure 8.5

The vegetable links redirects the farmer to a vegetable domain repository that contains information on how to plant the said crops. A click on the images focuses the screen on the planting tip.

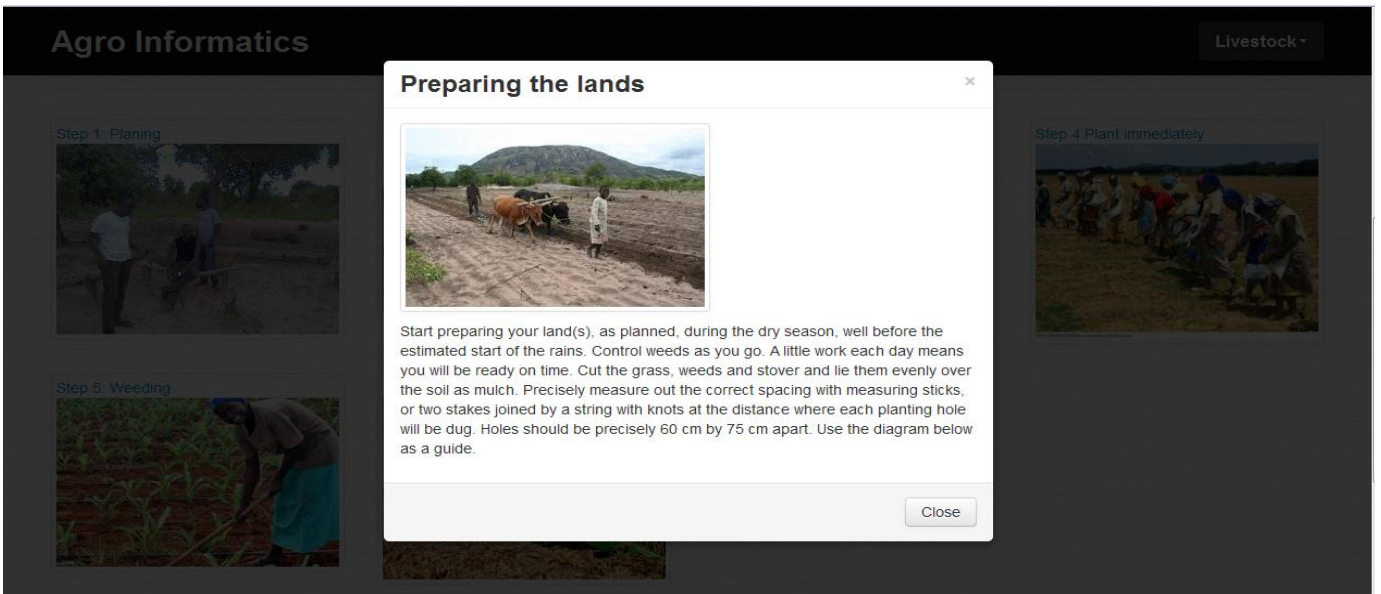


Figure 32-Vegetable farming

Figure 8.6

5.6 Local Cooperatives

The local cooperatives module has the login form as the first user interface. This creates a security mechanism that will allow only authorized user have access to the system.

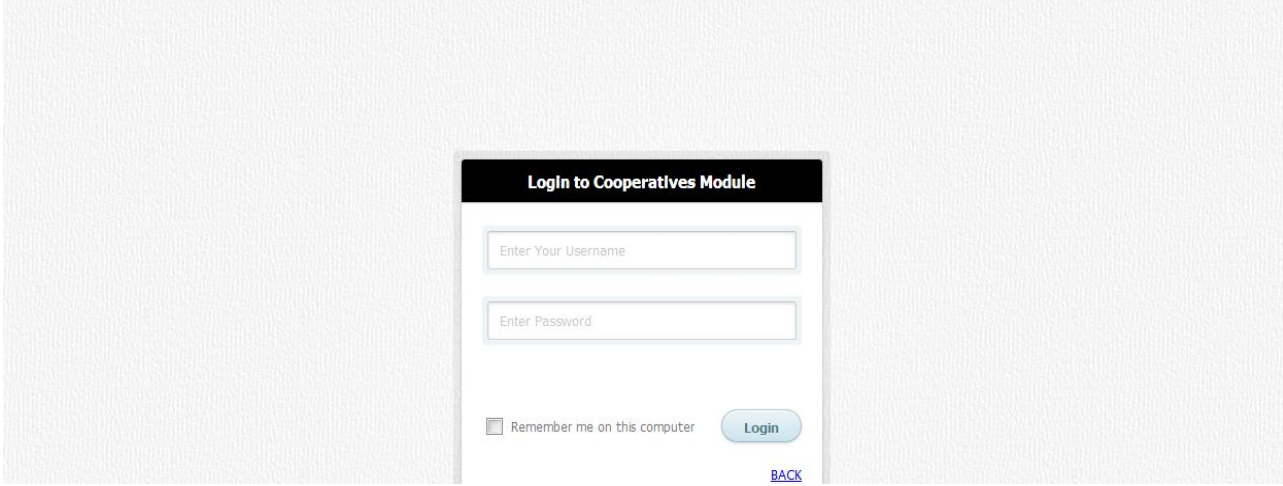


Figure 33-Login to local cooperatives

After a successful login, a user of the system will be able to store information related to a specific farmer and their associations to cooperatives. Details such as the farming inputs they receive will be stored in the cooperatives database as shown below.

Figure 34-Cooperatives member’s information

The information in the database will allow user actions such as delete and edit functionality. When the user clicks on the edit button a pop up window is displayed showing the information in the database that the user can edit as shown below.

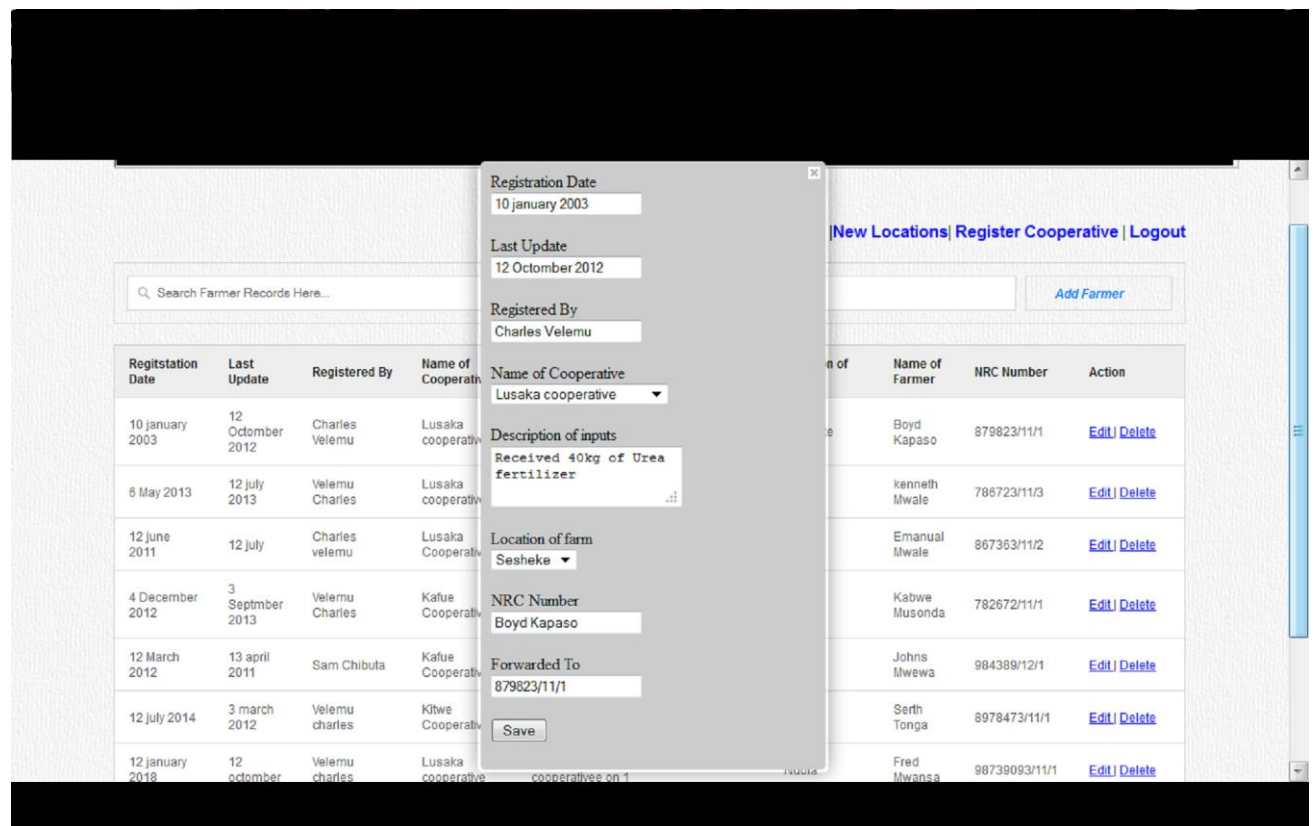


Figure 35-Editing farmer records

To add farmer records into the system, the farmer has to provide his user name, location of the farmer and his/her national registration number so as to avoid duplicates in the system. A Farmer can only be registered with one cooperative.

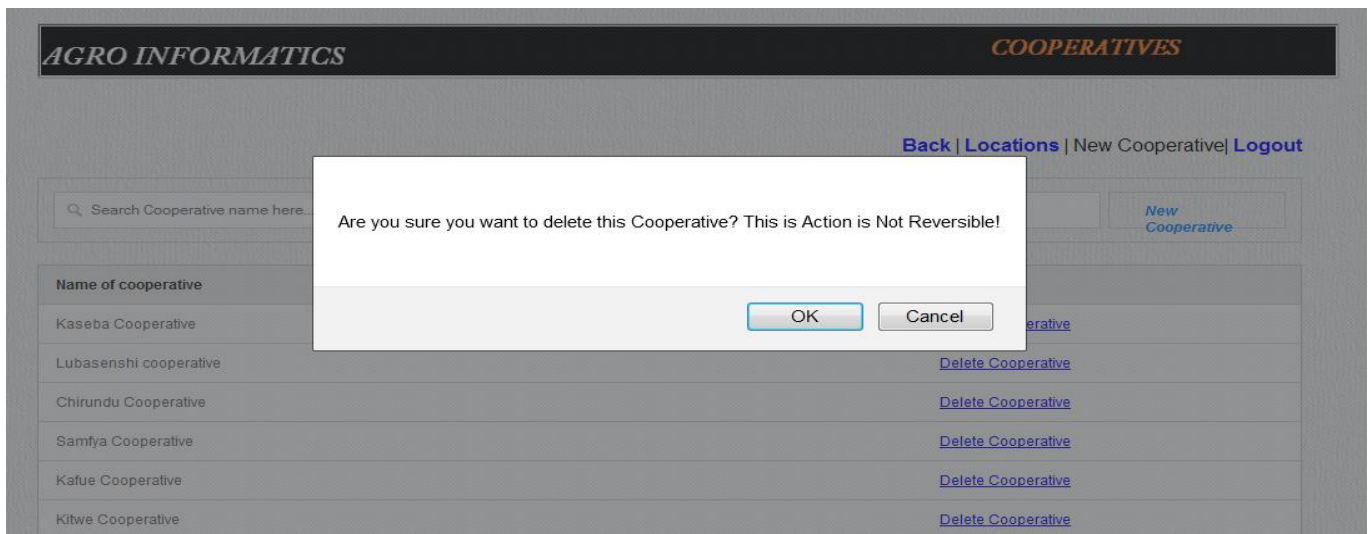


Figure 36-Deleting farmer Records

A pop window will be displayed whenever a user wants to delete a farmer record from the database so to avoid an intended delete actions as shown in the above figure.

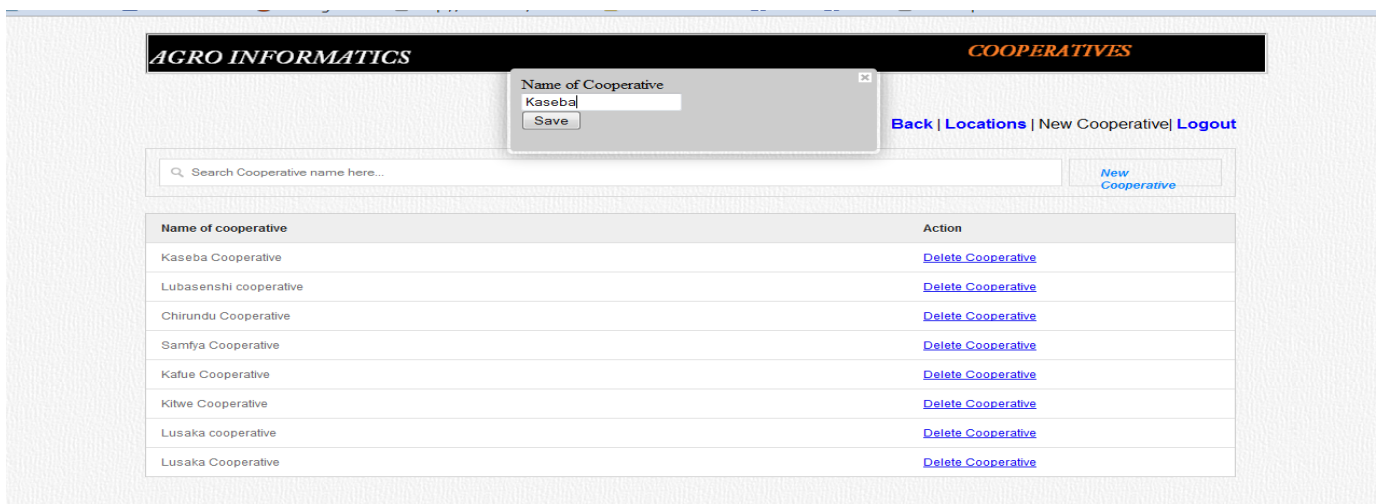


Figure 37-Saving new cooperatives

Users of the system will have privileges of adding new cooperatives and locations of the farms into the database as shown above.

CHAPTER 6

6.0 Introduction

This chapter focuses on system testing and validation tasks. Testing of the system will enable the developer discover errors that might have been overlooked during the development process.

6.1 System Testing

This application is a web based application and the testing tasks included the following testing dimensions.

6.1.2 Content Testing

The content of this application was tested at two levels which are the semantics and syntax levels.

- Syntax testing: spelling, punctuation and grammar were assessed for this application. A random user read the content of this application to discover if they were any errors and those errors were corrected.
- Semantics testing: The correctness of information presented, consistency across the entire content and lack of ambiguity were all assessed. The farming information was obtained from reliable sources such as agricultural books and journals.

6.1.3 Function Testing

The function of the application was tested for correctness, instability, and its general conformance to appropriate implementation standards. The application is written in java, Standard query language and PHP and all the language standards were observed.

6.1.4 Structure Testing

Structure testing of the application was accessed to ensure that this application delivers content and function properly.

6.1.5 Usability Testing

Usability of the application was tested to ensure that the different kinds of users of the system were supported. Images in this application have alternatives which will enable screen readers have an alternative view of the information.

6.1.6 Navigability Testing

Navigability was testing to ensure that all the navigation syntax and semantics did not have errors. The system was tested to uncover any dead links and these errors were corrected.

6.1.7 Performance Testing

The system was tested under different operating systems which included Windows 7 operating system and Linux based Ubuntu operating system. When the java script was enabled in these environments the system performed as expected.

6.1.8 Security Testing

The system was tested to uncover any security vulnerabilities. The passwords in the system were encrypted using the MD5 encryption algorithm to improve on security.

6.2 System Validation

To validate the system, a system validation test was carried out which included running the scripts in the WWW.Validator.com validator to help discover any errors that could have been overlooked during system implementations such as unclosed tags.

6.3 User Feedback

We let a group of users have a feel of the system and some of the captured feedback from users are listed below.

❖ Sydney Banda.

I found the maps of the system interesting as I was able to navigate and learn about the different towns that are shown on the maps. It's a good idea as I can access the google earth from my computer without having an android phone.

❖ Moddy Masenga Kapembwa

The system is okay. I can learn on how to carry out farming by just clicking on the product I want and the images of farm products help to in understanding the different processes.

CHAPTER 7

CONCLUSION

7.1 Discussion

I strongly believe that, particularly in the case of agriculture, there is a great potential to benefit from information communication technology.

The use of electronic gadgets has increased in Zambia and local farmers are no exception to this growing trend. It is this fact that this project wishes to take advantage of by developing an online agro informatics system that will be used by the Zambian farmers.

A case in point is a situation that occurred in Zambia where Army worms destroyed large hectares of agriculture fields within days and farmers had little or no information on how to combat these insects. If information is put online farmers that are in the rural areas will no longer have to wait for agriculturalist and expert to visit them with information ,instead small devices like phones and PDA will be used to gather this information faster.

An improvement in information dissemination and management is thus imperative.

The framework for an information technology based agriculture information dissemination system is thus proposed by exploiting progress in information technology.

7.2 Results

The aims and objectives of this project have been achieved. These can be summed up as

7.2.1 Geo Maps

A fully functional geographic map view of Zambia that supports user interaction has been developed. The map has information relating to farming

This map can be used also outside its scope to monitor deforestation in Zambia.

7.2.2 Agro Shops

An online agriculture shopping cart was created that will enable an online transaction to take place. Buyers of agriculture products can now place orders on the goods and services that are offered.

7.2.3 Farmer Directory

An online farmer directory was created. This directory will enable farmers advertise themselves online by providing their contact details and the goods that they produce. Potential buyers can then look up these details for a trade.

7.2.4 Farming information Domain.

A domain that contains farming information was created. This domain contains information on the best farming practices. The domain focuses on livestock and vegetable farming. This domain has a livestock disease database.

7.3 The Problems faced

The problems faced in this project can be listed as follows:

7.3.1 Internet problem

A component of this project runs on a google maps application programming interface. This interface can only run in an environment that had an internet access. This created an internet dependability problem during development and testing.

7.3.2 Lack of existing online farmer domain.

When the project was developed there was not an existing farmer domain where information could be obtained. The only existing domain was for large farming companies and not that individual farmers.

7.3.3 Cost of project

The cost of this project was also another problem faced in the development of this application. Costs that included printing and binding of the documents introduced financial problems.

7.4 Limitations

The limitation of the project is that the project is highly dependent on internet. This application requires the user to have an internet access for them to fully benefit from its services.

7.5 Future Works

Future works on this project will include a language translation of the best farming methods. These languages will include Bemba and Nyanja to help the local community better understand the services that the application provides.

Other components that will be added in the future will include marking of tip tanks locations on a google map for easy access by the local farmers.

Future works will also include a messaging system that will be used by the farmers and the agriculture experts to exchange information in real time between themselves using a USSD communication system which is a free service.

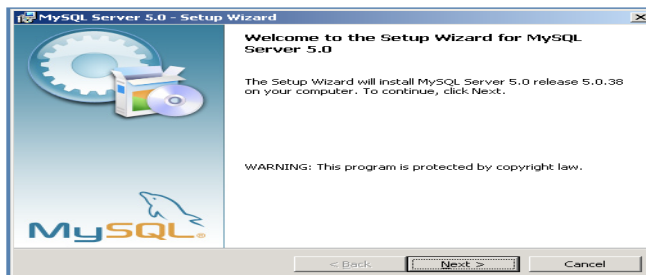
7.6 REFERENCES

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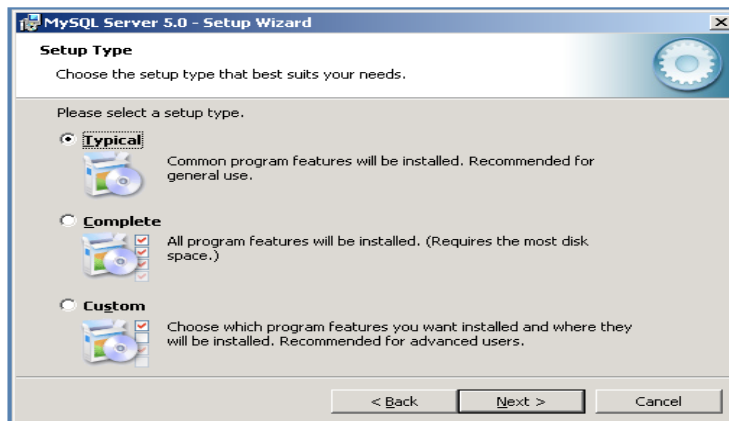
8. APPENDIX

INSTALLING MySQL

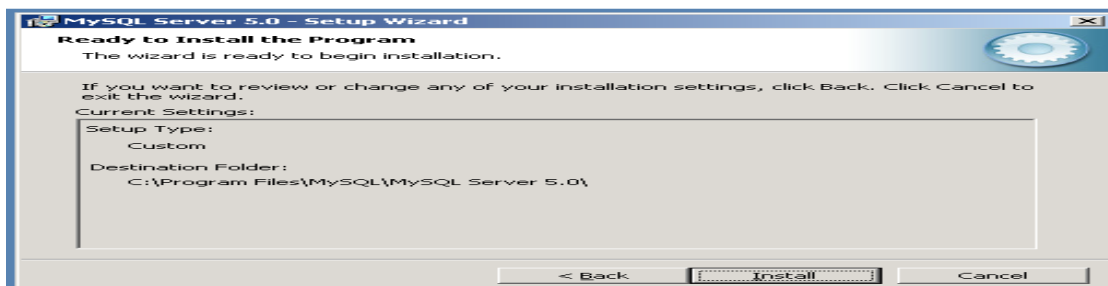
1. **Determine whether MySQL runs and is supported on your platform.** Not all platforms are equally suitable for running MySQL, and not all platforms on which MySQL is known to run are officially supported by MySQL AB. For a list of platforms on which MySQL Community Server runs, see [“Operating Systems Supported by MySQL Community Server”](#).
2. MySQL installation packages can be downloaded from <http://dev.mysql.com/downloads/>. If the package you download is contained within a Zip archive, you need to extract the archive first.



Choosing an Installation Type: There are three installation types available: **Typical**, **Complete**, and **Custom**.



The Confirmation Dialog: Once you choose an installation type and optionally choose your installation components, you advance to the confirmation dialog. Your installation type and installation path are displayed for you to review.



SOURCE CODE

Index.php

```
<!-- Author: VELEMU CHARLES
```

```
    CSC:4004-FINAL YEAR PROJECT
```

```
    Computer Number:29000653
```

```
    AGRO INFORMATICS SYSTEM
```

```
-->
```

```
<?php
```

```
include "includes/header.php";
```

```
?>
```

```
    <div id="ss-container" class="ss-container">
```

```
        <div id="map_canvas">
```

```
            <div id="map">
```

```
                <div id="ss-container2" class="ss-container">
```

```
                    <div id="map_canvas2">
```

```
                        <!-- Map will display -->
```

```
                        <div id="map2">
```

```
                            <!-- Fullscreen Loading & Fullscreen Buttons area -->
```

```
                            <span style="color:Gray;">Loading map...</span></div>
```

```
                </div>
```

```
                    <!-- The Google Map javaScript since this project will run on the Google
```

```
Map API -->
```

```
                        <script type="text/javascript" src =
```

```
"http://maps.google.com/maps/api/js?sensor=true">
```

```
                        </script>
```

```
                        <script type="text/javascript">
```

```
var locations = [
```

```
<?php
```

```
$query="SELECT * from locations";
```

```
$result=mysql_query($query);
```

```
{
```

```
    if ($num=mysql_numrows($result)) {
```

```
    $i=0;
```

```
    while ($i < $num) {
```

```

$Id=mysql_result($result,$i,"id");
$title=mysql_result($result,$i,"title");
$lapt=mysql_result($result,$i,"lapt");
$long=mysql_result($result,$i,"long");
$aimage=mysql_result($result,$i,"aimage");
$categoryid=mysql_result($result,$i,"categoryid");
$short_title=mysql_result($result,$i,"short_title");
echo      "["<div      class=info><h4>$title</h4><br><a      /id=$id><img
src=$aimage></a><br><p>$short_title</p></div>', $lapt, $long], ";
$i++;
}
}
else
{
echo "<h3 align='center'><font color='#ff0000'>No Content Found</font></h3>";
}
}
?>
];

// Setup the different icons and shadows
var iconURLPrefix = 'images/';

var icons = [
iconURLPrefix + 'marker1.png',
iconURLPrefix + 'marker2.png',
iconURLPrefix + 'marker3.png',
iconURLPrefix + 'marker4.png',
iconURLPrefix + 'marker5.png',
iconURLPrefix + 'marker6.png',
iconURLPrefix + 'marker7.png'
]
var icons_length = icons.length;

var shadow = {

```

```
anchor: new google.maps.Point(5,10),  
url: iconURLPrefix + 'msmarker.shadow.png'  
};
```

```
var map = new google.maps.Map(document.getElementById('map'), {  
  zoom: -5,  
  center: new google.maps.LatLng(-13.133897, 27.849332),  
  mapTypeId: google.maps.MapTypeId.ROADMAP,  
  mapTypeControl: false,  
  streetViewControl: false,  
  disableDefaultUI: true,  
  panControl: false,  
  zoomControlOptions: {  
    position: google.maps.ControlPosition.LEFT_BOTTOM  
  }  
});
```

```
var infowindow = new google.maps.InfoWindow({  
  maxWidth: 400,  
  maxHeight: 350  
});
```

```
var marker;  
var markers = new Array();
```

```
var iconCounter = 0;
```

```
// Add the markers and info windows to the map  
for (var i = 0; i < locations.length; i++) {  
  marker = new google.maps.Marker({  
    position: new google.maps.LatLng(locations[i][1], locations[i][2], locations[i][3],  
locations[i][4], locations[i][5]),  
    map: map,  
    icon : icons[iconCounter],  
    shadow: shadow  
  });
```



```
markers.push(marker);
```

```
google.maps.event.addListener(marker, 'click', (function(marker, i) {  
    return function() {  
        infowindow.setContent(locations[i][0]);  
        infowindow.open(map, marker);  
    }  
}))(marker, i));
```

```
iconCounter++;
```

```
// i only have a limited number of possible icon colors, so i decided to restart the counter
```

```
if(iconCounter >= icons_length){
```

```
    iconCounter = 0;
```

```
}
```

```
}
```

```
function AutoCenter() {
```

```
    // Create a new viewpoint bound
```

```
    var bounds = new google.maps.LatLngBounds();
```

```
    // Go through each...
```

```
    $.each(markers, function (index, marker) {
```

```
        bounds.extend(marker.position);
```

```
    });
```

```
    // Fit these bounds to the map
```

```
    map.fitBounds(bounds);
```

```
}
```

```
AutoCenter();
```

```
</script>
```

```
</div>
```

```
</div>
```

```
</div>
```

```
</div>
```

```
<script type="text/javascript" src="js/jquery-1.7.1.min.js"></script>
```

```
<?php
```

```
include "includes/footer.php";
```

```
?>
</body>
</html>
```

Include.php

```
<?php
define('INCLUDE_CHECK',1);
include "classes/dbconnect.php";
?>
<!DOCTYPE html>
<html lang="en">
  <head>
    <title>AGRO INFORMATICS</title>

    <link rel="stylesheet" type="text/css" href="css/demo.css" />
    <link href='http://fonts.googleapis.com/css?family=Ubuntu' rel='stylesheet' type='text/css' />
    <script type="text/javascript" src="js/jquery-1.7.1.min.js"></script>
    <script
      src="http://maps.google.com/maps/api/js?sensor=false"
type="text/javascript"></script>

  </head>
  <body>
    <div class="container">
      <div class="fixed">
        <div class="header">

          <strong>PROJECT 4004: </strong><a href="http://www.zed-agro.com">ZED AGRO.com
        </a>
        <span class="right">

        </span>
      <div class="clr"></div>
    </div>
    <div id="ss-links" class="ss-links">
```

[HOME](29000653-final_Velemu_charles/Final_work/Agro_Informatics_System/index.html)

[FRA](FRA/index.php)

[MAPS](chazy.html)

[AGRO INFORMATICS](http)