**Journal of AgriSearch, 9 (4): 342-346**
An Open Access International Peer Reviewed Quarterly

**ISSN : 2348-8808 (Print), 2348-8867 (Online)**
**https://doi.org/10.21921/jas.v9i04. 11600**

# Development of relational data base management information system on integrated farming

**MANIBHUSHAN*, ASHUTOSH UPADHYAYA, ANIL KUMAR SINGH, SANJEEV KUMAR, AKRAM AHMED AND ARTI KUMARI**

## ABSTRACT

Management information system on integrated farming has been developed using MySQL, PHP and JavaScript. It was tested with farmer's field data in Mirzapur village, Nalanda, Bihar, and shown to be suitable for land allocation among various components of the integrated farming system (IFS), calculation of production cost, gross income, net income, family food demand, and so on. User login and password are used to access this information system. As a result, it is completely secure and can only be accessed by authorised users. MySQL is used to generate databases, whereas PHP and JavaScript are used to create graphical user interfaces (GUIs) and connectivity to the database. Crop, horticulture, livestock, fish and goat are the key components of IFS of 2 acre model in Mirzapur village. He allotted 1.25 acre to crop, 0.48 acre to horticulture crop, 0.01 acre to livestock, 0.01 acre to goat, and 0.25 acre to fish in his 2-acre model. The gross income is Rs.506350 and the manufacturing cost is Rs.279510. The optimum net income from this model is Rs. 267720 when the land allocation is optimised utilising this information system and reallocated as 1.1 acre in crop, 0.48 acre in horticultural crop, 0.01 acre in livestock, 0.015 acre in goat, and 0.395 acre in fish. This is due to fact that the goat and fish components provide greater income than the crop, net income is enhanced by Rs.40880. As a result, if the land allocation is optimised, the income increases by 18%. Farmers may find this information valuable in allocating land among different components to maximise income from their IFS model-based farming.

**Keywords:** Data base information system, integrated farming, Nalanda, MySQL PHP and JavaScript

**ARTICLE INFO**

| | | |
|---|---|---|
| Received on | : | 21.10.2022 |
| Accepted | : | 14.12.2022 |
| Published online | : | 29.12.2022 |



## INTRODUCTION

Information system referred to as management information system (MIS) or information system which processes data and converts it into valuable information. A management information system uses various data as inputs. The information generated by the information system may be used for operational, strategic and long-range planning. MIS is able to provide analysis, planning and support for decision making. This is used in agricultural field for making database for storage of data and computerized mathematical model used to get useful information for planning and development of agriculture in a better way to increase production as well as income to farmers. Information systems play an important role in agriculture. Since last few years the growth of agricultural information systems is very fast. This is reflected in the implementation of systems for the processing and handling of agricultural land and products to enhance agricultural productivity. It can help to take better decisions regarding land, labour, crop production, horticulture, livestock, fish, goat, poultry, mushroom production, capital and management of farm in a better way to produce more with less input. Agricultural productivity may be improved by relevant, reliable and useful data, information and knowledge. Hence, the creation of agricultural information is now managed by agricultural organizations that create information systems to disseminate information to farmers (Demiryurek *et al.*, 2008). So that farmers can make better decisions in order to increase production and also take advantage of market opportunities to sell their produce to get more income. Integrated farming system is a need of hour because in our country there is about 80% is marginal and small farmers. IFS are more suitable to marginal and small farmers to fulfil the basic needs of house hold including food (cereal, pulses, oilseeds, milk, fruit, honey, meat, etc.), feed, fodder, fibre, etc. The goals of integrated farming are to increase and sustain agricultural production, maintain farm incomes, achieve nutritional support and save the environment. Integrated farming system consists of many components/ enterprises such as crop, horticulture, livestock, fish, poultry, goat and mushroom and their integration. The basic principles of integrated farming are the utilization of inter-related farm activities, full utilization of farm wastes as their recycling from one component to another component to reduce input cost and increase income (Pillay, 1990**).** Integrated farming with crops, livestock, and aquaculture can be used for potential yield improvements and monetary advantages as well as positive implications for food security, dietary balance, and nutrition. It reduces the risk of enterprise failure and offers increased protection from disease and pest damage, thus potentially increasing profit. Wastes or by-products from each component are used as inputs for other components to improve productivity and lower the cost of production. Integrated farming is generally beneficial for the farmers. Integrated farming is one good way to optimize the use of resources to maximize income **(**Faridah, 2001**)**.

*Corresponding author Division of land and water management, ICAR Research Complex for Eastern Region, Patna
*Corresponding Author E-mail: mani_patna2000@yahoo.com

This information system is for integrated farming that stores data, update data and get useful information as report. This information system is for 2 acre IFS model in which crop, livestock, horticulture, goat and fish are the main components. Crop contains cereals (rice, wheat and maize), pulses (lentil), oilseed (mustard), green fodder and dry fodder, in livestock component two cows and two calves. Vegetables and fruits come under horticulture component. There are 20 goats which are taken in to consideration in this model and in fish, main varieties are rohu, katla and jasar. With the help of this information system, the land is allocated among different components of IFS such as crop, livestock, horticulture, fish and goat in such a way as to get optimum/ maximum gross/ net income from 2 acre model of IFS. Required data are entered into database through GUIs and calculation is done by internally written formula and computer program for getting required output/ reports such as gross income, net income, cost of production, etc. So it is very useful to farmers for getting maximum income/ return from their land.

## MATERIAL AND METHODS

### Information System

Management Information System (MIS) is defined as a computer based integrated information of man and machine for providing the information to support the operation and the management of data as well as the decision making function in an organization. It consists of a database for storage and retrieval of data as required by an organization. MIS helps in the decision making by employee in their daily operations and also supports managers in decision making to meet the goals and objectives of the organization. Different mathematical models and information technology (IT) tools are used for the design of information system and to take decisions to solve problems in an organization.

### Components of Management Information Systems

1. Resources of people such as system analyst, programmers, data administrators and end users.
2. Hardware that includes computers and its peripheral devices
3. Softwares to develop programs, procedures and models.
4. Data, database and knowledge bases
5. Networks for communications media and network support.

### Relational database management system

A database management system (DBMS) is a collection of data and software programs which manage large, structured sets of data to be stored, modified, retrieved and manipulated in useful ways. Relational databases (RDBMS) are designed as records that are organized around a set of tables with unique identifiers (primary key) to represent both the data and their relationships and the data can be stored in multiple tables, data are retrieved and manipulated in a number of ways without the need to reorganize the original database tables. Tables are interrelated and joined with a relation following normalization rule for which there is no data redundancy and duplicacy. RDBMS is a robust system and it is being used very much in various organizations to maintain a database in an organized and efficient way. A spatial relational database has been created for three districts viz. Patna, Madhubani and East champaran districts of Bihar (Manibhushan and Ahmed, 2019).

### Management information system on integrated farming

Agricultural information system is a computer based system in which agriculture related information is generated and transformed to farmers to do proper agricultural activities to increase crop production. Information system has an important role in improving the operation of land management for agriculture and providing useful information to the users. Through this MIS, evaluation and optimization of already developed IFS has been done for getting more income. Land evaluation is necessary for assessing the total production from available land (Beek, 1978). This approach is based on available land units in a specific area such as one acre or two acre with the requirements of actual land use (Ojeda, 1997). The land evaluation result is useful for proper land use planning (FAO, 1983).

This information system has been developed for the evaluation of already developed integrated farming system models and land allocation among different components of IFS for getting optimized income of farmers from their land using My SQL, PHP and JavaScript in relational database form. Process of management information system is shown (Fig.1). Data are collected from farmers of Mirzapur village, Nalanda, Bihar. Data are entered into database for the storage and retrieval of data in required format. The main components of IFS are crop, horticulture, livestock, fish and goat in 2 acre model. In 2 acre model, the area of land allocated in acre previously was 1.25 in crop, 0.48 in horticulture crop, 0.01 in livestock, 0.01 in goat and 0.25 in fish. The gross income is Rs.506350 and cost of production is Rs.279510. So the net income is Rs.226840. The land allocation is optimized using this information system and reallocated the land among different components and the area in acre as 1.1 in crop, 0.48 in horticulture crop, 0.01 in livestock, 0.015 in goat and 0.395 in fish, the optimized net income is of Rs. 267720. Net income is increased by Rs.40880 because the goat and fish component are more profitable than the crop. The income is increased by 18 % if the land allocation is optimized (Table 1). The main components of IFS at Anantpur village are crop, horticulture, livestock and fish in 2 acre model. Previously, the area allocated among different components was 1.25 acre in crop, 0.3 acre in horticulture, 0.08 in livestock and 0.3 in fish. The net income was Rs.131825 but when the area is optimized and reallocated as 1.0 acre i crop, 0.5 in horticulture, 0.07 in livestock and 0.43 in fish, the net income is Rs.162030. So the

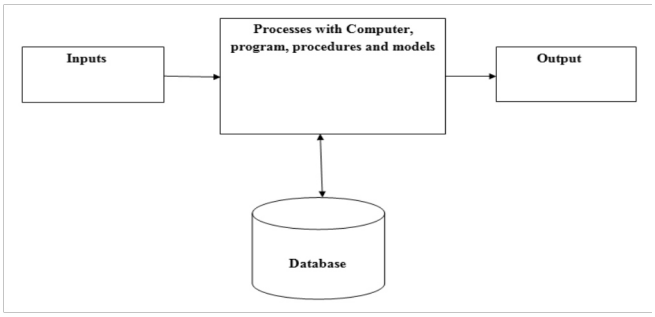


**Fig. 1:** Management Information System (MIS) process

**Table 1:** Components of IFS, area, gross income, cost of production, net income, optimized area and optimized net income from 2 acre model at Mirzapur village, Nalanda, Bihar

| Components/ Enterprises | Area (Acre) | Gross Income (Rs.) | Cost of production (Rs.) | Net Income (Rs.) | Optimized Area (Acre) | Optimized Net Income (Rs.) |
|---|---|---|---|---|---|---|
| Crop | 1.25 | 60700 | 31650 | 29050 | 1.1 | 23850 |
| Horticulture | 0.48 | 133830 | 85870 | 47960 | 0.48 | 47960 |
| Livestock (cow) | 0.01 | 116500 | 86450 | 30050 | 0.01 | 30050 |
| Goat | 0.01 | 98450 | 42700 | 55750 | 0.015 | 79720 |
| Fish | 0.25 | 96870 | 32840 | 64030 | 0.395 | 86140 |
| Total | 2.0 | 506350 | 279510 | 226840 | 2.0 | 267720 |

**Table 2:** Components of IFS, area, gross income, cost of production, net income, optimized area and optimized net income from 2 acre model at Anantpur village, Nalanda, Bihar

| Components/ Enterprises | Area (Acre) | Gross Income (Rs.) | Cost of production (Rs.) | Net Income (Rs.) | Optimized Area (Acre) | Optimized Net Income (Rs.) |
|---|---|---|---|---|---|---|
| Crop | 1.25 | 59425 | 34970 | 24455 | 1.0 | 24490 |
| Horticulture | 0.3 | 78650 | 44645 | 34005 | 0.5 | 46400 |
| Livestock (cow) | 0.08 | 118320 | 78750 | 39570 | 0.07 | 48700 |
| Fish | 0.3 | 68670 | 34875 | 33795 | 0.43 | 42440 |
| Total | 2.0 | 325065 | 193240 | 131825 | 2.0 | 162030 |

net income is increased by 23% when the area optimized and reallocated (Table 2).

Use of information system by farmers provides them empowerment through control over their resources and decision making for their better agriculture practices (Maningas *et al*, 2005).

## Normalization

Database normalization is the process of designing a database as a relational database in accordance with normal forms in order to reduce data redundancy and improve data integrity and consistency. The practise of structuring a database's columns (attributes) and tables (relations) for proper dependencies and database integrity is known as normalisation. So, normalisation is a database design approach that avoids data redundancy and abnormalities in insertion, addition, entry, update, and deletion. Normalization rules divide a larger table into smaller tables and links them through a relation. It is in relational database. The purpose of normalisation in SQL is to eliminate data redundancy/ repetition that ensures data is stored logically and properly. Third normal is very good to design a database because there is no data redundancy and there is data integrity as the third normal form (3NF) of a database is that a table is in 2NF and every non-prime attribute of table is non-transitively dependent on every key of table/ relation. Management and maintenance of data is easy and proper in relational database that is in 3NF. This database on IFS is created in third normal form to eliminate data redundancy and make it a very robust and proper database that fulfils our need and useful to farmers.

## Database and graphic user interface

This information system has been developed using My SQL, PHP and Java Script. The databases are created using My SQL and graphic user interfaces are created using PHP and Java Script. Databases are in relational form. Relation database are created to follow normalization process. We have followed third normal form to create relational databases. Database consists of 45 tables which are interrelated through primary, secondary and foreign key. This database is used for data storage, updation, deletion and data retrieval in the form of reports. CREATE command is used to create tables such as CREATE TABLE TABLE NAME (CREATE TABLE COMPONENTS). This table contains data about components of IFS and their area. Table name 'cost on production' is related to total cost of production and table name gross income contains data about total gross income/ return and net income table contains data about net income.

Table creation commands of table name COMPONENT is as follows:

```
Mysql>CREATE TABLE COMPONENT (
Component_ID INT NOT NULL,
Component_name VARCHAR (15) NOT NULL,
Component_area VARCHAR (5) NOT NULL,
Primary Key (component ID));
Mysql>CREATE TABLE GROSS INCOME (
Component_ID INT NOT NULL,
Component_name VARCHAR (15),
Income_crop VARCHAR (5),
Income_horticulture VARCHAR (5),
Income_livestock VARCHAR (5),
Income_fish VARCHAR (5),
Income_goat VARCHAR (5),
Gross_income VARCHAR (7),
Production_cost VARCHAR (7),
Net_income VARCHAR (7));
```

As usual another required table are created.

In GROSS INCOME table, the primary key is COMPONENT ID but for COMPONENT TABLE, COMPONENT ID is

foreign key and these two tables are connected and related with one another. In this way other tables are also related to each other and a suitable relational database is created in a proper way that there is no data redundancy and duplicacy. The database is very efficient, proper and working satisfactory.

Graphic user interface (GUI) is required to enter data into database, modification of data, updation of data and retrieval of data in report form. GUI is visible to users but database is not visible to users. So database is backend and GUIs are front end tools. GUIs are created using PHP and JavaScript and connectivity is also established between database and GUIs.

## RESULTS AND DISCUSSION

This information system is based on user login and password. So it is fully secured because only authorize user can access and use this system (Fig.2). Twenty five forms (GUIs) are created for data entry, modification, updation, deletion and retrieval of data from database as and when required. One GUI is shown here for data entry of gross return/ income from different components as the gross income from crop component is Rs.60700 (Fig. 3). The crop component contains cereal crop (rice, wheat and maize), pulses (lentil), oilseed (mustard), green fodder and dry fodder. First the income from cereals, pulses, oilseed, green and dry fodder is calculated and finally the gross income from crop component is calculated from this information system. This calculation is very fast. When required data are entered into database through GUI, get the required information in one click. This information system is tested with farmer's field data from Mirzapur village, Nalanda, Bihar and found that it is working in efficient way. First the farmer's net income is of Rs.226840 from 2 acre model of IFS but when the land allocation is optimized using this information system as 1.1 acre in crop, 0.48 acre in horticulture crop, 0.01 acre in livestock (cow 2+2), 0.015 acre in goat and 0.395 acre in fish then the optimized net income is of Rs. 267720 from this model. Net income is increased by Rs.40880. Cow (2+2) means two cows and two calves. This information system is also tested from Ananapur village data and report is found satisfactory as in 2 acre IFS model the net

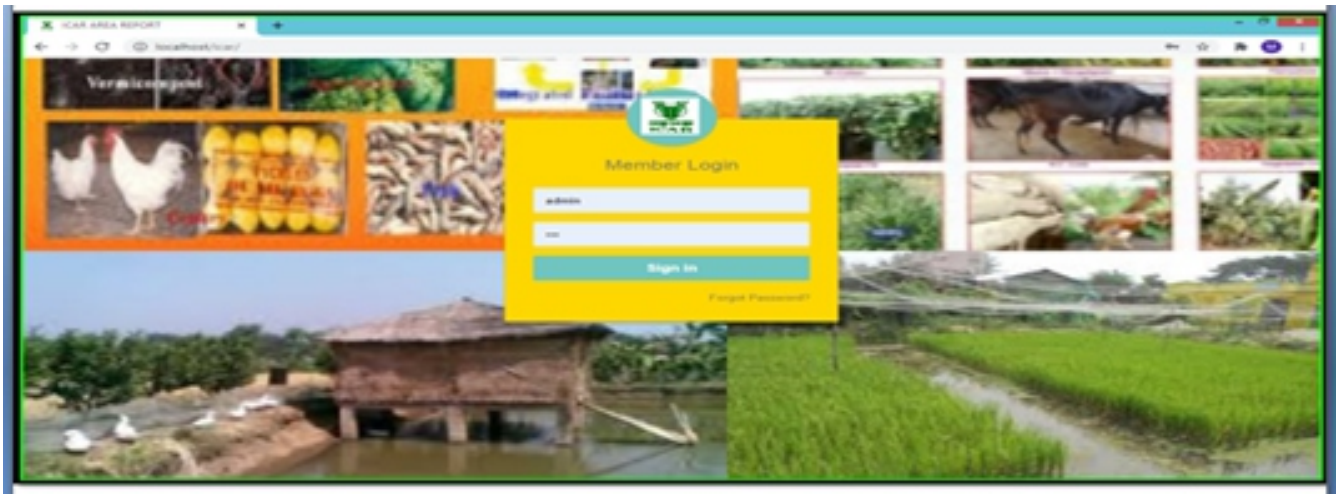


**Fig. 2.** User login and password interface


**Fig. 3.** Graphic User Interface (GUI) for data entry and calculation of gross income/ return

income is increased by 23% when the area optimized and reallocated at Anantpur village, Nalanda, Bihar. So it is observed that the area is optimized among different components, the net income is increased by 18-23% in above two villages.

## CONCLUSION

This information system is for integrated farming system (IFS) to allocate land among different components viz. crop, livestock, horticulture, fish and goat as per availability and requirement of farmers to get optimum/ maximized income from their land of 2 acre model of IFS. This system has a database and graphic user interfaces (GUIs). Database is for the storage of data, modification, updation, deletion and retrieval of data in report form as and when required by users. Database is created using MySQL in third normal form and GUIs are created using PHP and JavaScript. This management information system is tested with farmer's field data and has proven to be effective. So this information system is very useful to farmers to get maximized income from their land. Overall, it was concluded that in the existing integrated farming system practised by small and marginal farmers in the region, there are always integrations at various levels but this developed information system improved food security by allowing poor small farmers with optimum land relocation leads to diversify farm production, raise cash flow/ income, enhance the quality and quantity of food produced and exploit underutilised resources.

## REFERENCES

Beek J. 1978. Land evaluation for agriculture development ILRI. Publication 23. Wageningen

Demiryurek K, Erdem H, Ceyhan V, Atasever S and Uysal O. 2008. Agricultural information systems and communication networks: the case of dairy farmers in Samsun province of Turkey. Information Research, 13(2) paper 343. [Available at http://InformationR.net/ir/13-2/paper343.html]

Faridah A. 2001. Sustainable agricultural system in Malaysia. Paper presented at Regional Workshop on Integrated Plant Nutrition System (IPNS), Development in Rural Poverty Alleviation, 18-20 September 2001, United Nations Conference Complex, Bangkok, Thailand.

FAO. 1983. Guidelines: Land evaluation for rainfed agriculture Soils Bulletin 52. Food and Agriculture Organisation of the United Nations, Rome

Manibhushan and Akram. Ahmed 2019. Spatial analysis of water resources data in selected district of Bihar.*Journal of AgriSearch* **6**(3):134-138.

Maningas R V, Perez V O, Macaraig A J, Alesna W T and Villagonzalo J. 2005. Electronic Information Dissemination through the Farmers Information and Technology Services (FITS)/Techno Pinoy Program. Bringing Information and Technology within the Reach of the Farmers. From http://jsai.or.jp/afita/afita-conf/2000/part08/p231.pdf, 2000.

Ojeda-Trejo, Enrique. 1997. Land Evaluation and Geographical Information Systems for Land Use Planning: A case study of the municipality Texcoco, Mexico, conference on Geoinformation for sustainable land management, Netherland, 509, 1-12.

Pillay TVR. 1990. Aquaculture: Principles and Practices. Fishing News Books, London.526-542.

**Citation:**

Manibhushan, Upadhyaya Ashutosh, Singh Anil Kumar, Kumar Sanjeev, Ahmed Akram and Kumari Arti .2022. Development of relational data base management information system on integrated farming. *Journal of AgriSearch* **9**(4):342-346