International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 1 Jan-Feb 2021, pp: 1021-1032www.ijprajournal.com ISSN: 2249-7781

Farm Management

***Gajanan Maroti Hundekar 1) Hingane.L.D (M.Pharm PhD Scholar) 2) Tushar.P.Akhare**

ABSTRACT: Agricultural production management is entering into a new era where every day farmer‘s decisions are supported by highly sophisticated Farm Management Information Systems (FMISs). The latter have evolved from simple record keeping software into complex systems that can manipulate large amounts of data and provide decision support capabilities. In this
paper, the development of an FMIS, which utilizes new technologies, such as those which were introduced by the European initiative Future Internet Public-Private Partnership Program (FI-PPP), is described. The developed application is focused upon individual farmers or farmer cooperatives, who wish to perform precision agriculture via the usage of mobile devices and modern technology. The main focus is to perform farm financial analysis based on all farm transactions but also estimating profitability based upon fixed values that the farmer imports. The application was successfully tested on a winter wheat crop (Triticum aestivum L.) for one season, where all related costs were recorded.

I. INTRODUCTION :

Farmers lack the tools to make informed decisions related to financial management of their business, taking into account cost and profit margins and profitability analysis.

Farm Management Information Systems (FMISs), which are systems for storing and processing farm-related collected data, provide support to farmers for decision making in every-day farm management. Various types of system structures and software architectures have been proposed in the literature (Nikkilä, Seilonen, & Koskinen, 2010; Sørensen, Pesonen, Bochtis, Vougioukas, & Suomi, 2011; Tsiropoulos, Fountas, Gemtos, Gravalos, & Paraforos, 2013; Ampatzidis, Tan, Haley, & Whiting, 2016) .

The European Commission launched in 2011 the Future Internet Public-Private Partnership Program (FI-PPP4), in order to provide innovative ICT tools. The overarching aim of the FI-PPP is to create a library of software components that are called Generic Enablers (GEs). The GEs should be public and open-source and allow developers to create mashup applications by implementing innovative FI functionalities such as Cloud Computing, Internet of Thing (IoT) connectivity, and Big Data analytics. All GEs are developed and described in detail as a set of Application Programming Interfaces (APIs) in the FIWARE5 plat .

The demand for animal identification and traceability is constantly increasing, driven by the need for quality control and welfare management in agricultural animals.

Furthermore, the dramatic effectsofInfectious diseases in the environment (fauna) and the agricultural economy have highlighted the importance of wellorganized monitoring platforms of animal capital. The outbreak of bovine spongiform encephalopathy (BSE), commonly known as mad cow disease (Johnson and Gibbs, 1998), is a characteristic example that reveals the necessity of such systems. Concerns about safety and quality, which have also increased during the last two decades, constitute yet another argument for the use of state of the art, electronic means of identification and traceability of agricultural animals (McKean, 2001; Saa et al.,2005).

Technological evolution, on the other hand, has provided a comprehensive toolset, far surpassing traditional methods of traceability and identification. The wide adoption of RFID technologies and the progress made on standardization, has established the use of RFID technology for providing the technological framework, over which accurate and highly sophisticated management of animal capital can be performed.

Farmers, and especially diary ones, have been keeping animal records for over 100 years. Apparently, different means of identifications have already been used, such as branding, ear notches, paint marks (temporary identification), tattoos and ear tags (Wismans, 1999). Branding is a technique for marking individually livestock using either hot iron (traditional branding) or dry ice/liquid nitrogen (freeze branding). Ear notching has been used mainly to identify swine and it is referred to particular shaped notches, placed somewhere in the ears, while for tattooing, inked numbers are put permanently in the skin (most commonly in the ear) with a special tool .

In order to fully exploit the technological advances in information and communication technologies, in the context of the FARMA project, the use of mobile computing, combined with RFID technology and wireless and mobile networking have been adopted. The driving force behind the design of the system was the integration of state of the art mobile devices with a comprehensive data information management system that allows for distributed storage and processing of animal and animal production related data. But apart from the practical goal, directly linked to the provision of a fully functional and possibly commercially exploitable result, the project has investigated the possibility of having animal related, renewable data on the animal (in the form of a rewritable RFID tag). In this way, mobility of data related to the animal (in the sense of an electronic ID and the corresponding identification information) was evaluated and the benefits this could introduce to an animal tracking scheme were identified. The rest of the paper is organized as follows: in Section 2, the FARMA platform is presented, identifying the subsystems from which it consists of. Each subsystem is explained in details. In Section 3, apracticalimplementation of the platform is presented. The paper concludes with Section 4, where the results of the evaluation that took place in the context of the project are discussed and future directions towards the use of RFID enable devices in livestock management are given.

Moving on to an introduction to Radio Frequency Identification, it should be mentioned that RFID tags can be separated in different categories according to both use and technology criteria. There are three main types of tags used for animal identification: boluses, ear tags, and injectable glass tags, which are injected under the skin. Boluses are capsules, incorporating a radio frequency transponder, which are retained in one of the first two stomachs of the ruminants and it has been proven to be a safe choice for ruminant identification (Caja et al., 1999). They can be administered even to lambs after weaning at the fifth week and the retention rate can reach 100% (Garin et al., 2003).

II. THE FARM PLATFORM:

Data:

Through the use of the FARMA platform a large amount of animal related data could be managed. First of all, holding and animals identification parameters can be stored. These parameters can supply all the necessary information about the identity of the holding, as well as the identity of every single animal. In addition, the platform can control animal movement parameters, divided into two categories: ingress and egress activities.

Ingress is related to all new animals entering the farm, whereas egress activity characterizes all animals leaving the farm or dying. Moreover, productive andreproductive data can be stored. The former concern milk, wool and meat production whereas the latter refer to all the information needed to evaluate the reproductive performances of the animals. In addition, data concerning ethology and nutrition arerecorded.

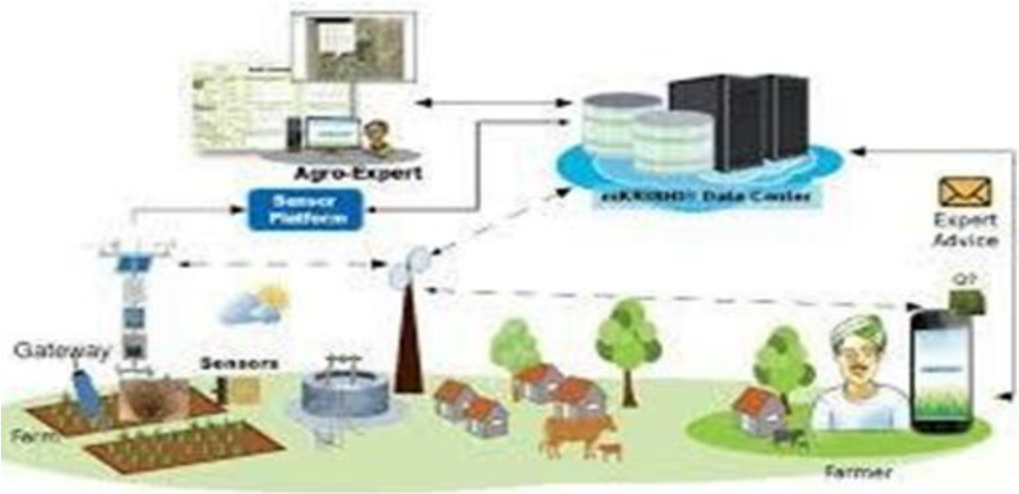

Fig. (Farm Platform)

Finally, animal health parameters, such as controlling infectious diseases, vaccination program and medication can be stored, so as to provide valuable information to the owners and to the vets of the holdings. Finally, a minimum set of animal identification data that can be used in order to identify the animal and its behavior can be stored on the RFID tag on the animal, provided that rewriting of the tag is possible. In this way, if an animal is found, the information about its identity, the farm where it belongs and some useful dataabout his behavior towards humans, other animals or premises can be read, thus allowing for proper handling of the animal.

Platformarchitecture:

The philosophy on which the design and implementation of the FARMA platform is based is graphically depicted in Fig. 1. The scope of the platform lies in the storage and management of information regarding various categories of animals (sheep, cattle, pigs, etc.), using various types of RFID tags (boluses, injectable glass tags, button tags/ear tags) to identify the animals. The entire platform involves various kinds of workstations, such as desktop computers Fig. 1. The general philosophy of the platform. (servers, databases), laptops, handheld mobile devices (PDAs, PocketPCs, smartphones, UMPCs), and comprises a number of different subsystems, which interact via multiple kinds of connectivity, i.e. wireless connection, mobile network technologies (2G, 2.5G, 3G), and wired link access.

Fig. 2 shows the three main subsystems that constitute the system:

- The centraldatabase.
- The local database.
- The mobile—RFIDsubsystem.

Central database subsystem:

The central database system is responsible for storing all information related to the management of animal tracking and monitoring at central level. Since the focus of the presented platform is given on the processes that can be applied at local (farm) level, this subsystem contains only the necessary information for keepingtrack of the assigned RFIDs, the available farm units and the corresponding registration information. Another reason that the central database system was not designed into details, was the fact that such a system will usually be under the control of state mechanisms, and the information included in the database should follow state or national regulations. For this, only the necessary information for linking to the local database system isdescribedfor the central database in the context of this paper, while expanding this information withmore data on farms and animal capital does not affect the design of the platform.

Following the above discussion, the central database is in fact a repository of all farms that are registered to the animal RFID tracking system, and therefore, it includes information about the identification of each farm such as type of animals, owner information, RFIDs associated with the farm, and (if available) corresponding veterinarian. Through this information, association of each animal to the corresponding farm and veterinary is possible, without the need for communication with the local database. Furthermore, communication with veterinarians regarding orders for treatment, submission of reports and collection of statistical information is possible. To support the above, the central database needs to communicate with the local database, in order to assign RFID numbers, and to collect information about changes in the number of animals (births, deaths, transfers). Further collection of information such as data about diseases can be easily supported through the existing interfaces.

Local database subsystem:

The local database system is based on an animal data management application. It includes information regarding the detailed data of a farm unit that relate to the management of livestock. Focus is given on the tracking of animals‘ welfare through their history data. In detail, the database stores and manages information about the farm units, the stockbreeders, the veterinarians and their visits to the farms. Fig. 3 shows a scheme of the local database. Access to the database is allowed for authorized users, through the use of username and password. The main functions offered by the database are:

Management of data regarding the farm, such as name of owner, geographical position, number and type of animals, products being traded, etc.

Management of RFIDs assigned to the farm, based on the batch insertion of RFID codes included in an ASCII file received from the central database for animal RFID management. Apart from the insertion of RFIDs assigned to the farm by the central database, the farm database administrator should complete the information about the RFIDs by inserting date and record numbers, as well as activate the RFID codes, so that they are available to be assigned to animals. Insertion of an animal record to the database, which is the result of the assignment of an RFID tag to the animal.

There are three distinct cases here: birth of an animal (in the farm), purchase of an animal already associated with an RFID, and purchase of an animal not associated with an RFID (e.g. from abroad). Whenever data about a new animal are inserted in the database, a complete record including animal type, description, data of birth, date of purchase, ID of the farm from where it was purchased, old animal identification code, data about parents, etc., is formed. Batch insertion of data regarding a group of animals, usually applied when animals already having an RFID (or even not), are registered in the farm database after a purchase from another farm. In this case, all data related to the originating farm and transport of the animals including date of transfer, number of animals, dates of transfer, name of transporter and identification of transporting equipment are recorded.

Removal of an animal from the farm records due to death or transfer to another farm. Here, the reason for removal and the related dates are recorded. In the case of death, the reason of death, and the data of the related veterinarian are recorded. If there is a default veterinarian for the farm, the corresponding data are recorded automatically. In the case of transport to another farm, the information recorded is the same as in the case of insertion of an animal from another farm.

Mobile computing—RFID subsystem:

The mobile computing—RFID subsystem comprises four‑interfaces‖: User Interface, RFID Management, Database Interface, and Network Communication Management. Fig. 4 shows the architecture of the subsystem in a more analytical way.

Network communication management:

Given that the applications offered by the platform require communication with the central and local databases of the system, it is of crucial importance to ensure seamless connectivity and to provide for the cases where network communication is temporarily not available. This requirement leads to the need for various connectivity alternatives, so that in each case the feasible or most appropriate configuration is chosen. There are two main categories of connectivity:

III. A PRACTICAL IMPLEMENTATION:

In this section, the details of a practical implementation of the proposed framework are provided. For reasons of support of large number of users, security, credibility, and expandability, a 3-tier architecture model was chosen for the central database subsystem. This architecture allows the separation into presentation tier, logic tier, and data tier, thus contributing to scalability, re-usability, access and data security and manageability. For the needs of the presentation tier, the ASP (Active Server Pages) model was used. ASP technology (ASP Technology Feature Overview) is an ideal environment for web application development. The ASP pages are executed by the web server, which in our case is Microsoft Internet Information Server, therefore constituting the application server of the architecture. Microsoft .NET Framework was used as the programming platform of the ASP pages. Microsoft .NET Framework contains extended libraries, which are required for the development of the web application. Microsoft SQL Server was used for the needs of the data tier, thus being the database server. Access to the central database is permitted only to registered and authorized users, whereas access in different parts ofthe central database depends on the category of the user (e.g. a veterinarian does not have permission to update data about the existing farms, but can only view related information). Search (among farms, veterinarians, farmers, etc.) can be performed using various criteria.

Regarding the mobile subsystem, the application is based on the Microsoft .NETFramework and written in C# programming language. The mobile devices (PDAs, PocketPCs) run Microsoft Windows Mobile 5 or 6 operating systems. For communication with the local database, the ADO.NET set was used. ADO.NET includes a number of programming interfaces, such as Connection, Command, DataReader, DataTable, DataView, etc., which act as a level of abstraction between the application and the database and allow data managing in a common way, regardless of the specific database implementation. As for the RFID reader/writer devices, the following three alternatives were available:Search (among farms, veterinarians, farmers, etc.) can be performed using various criteria .

- CF (compact flash)card

- SD (secure digital)card
- Embedded in a mobiledevice.

Each one of these solutions has both advantages and drawbacks. Since an SD card LF reader was still not available in the market at the time of the platform's implementation, only the other two solutions were adopted. Nevertheless, as soon as this type of RFID reader/writer is released, incorporating it to the platform will be a very simple process, since the platform is designed so that it can support many different configurations.

IV. FIELD TRIALS :

The field trials took place in a small ruminants' farm of the county of Attica, where livestock comprises sheep and goats. In detail, concerning sheep, tags were applied at 3 ewes, 1 ram and 5 lambs. Taking into consideration the caprine population, 5 female goats, 2 male goats and 2 kids were tagged, respectively. It was decided to placethe RFID tags in two different species, where both groups consisted of animals of different sex and age, so as to have a preliminary evaluation of the system's performance under actual, everyday conditions. The aim of the trial was the evaluation of the everyday use and effectiveness of these RFID tags, in the context of the entire system. These field trials took place in the winter of 2007 and the experiment lasted 1 month. Since the RFID ear tags were selected, it was decided that summer should be avoided for their application, as it is not the period of choice even for the compatible ear tags, due to problems that may follow, such as auricle infections. During the experimental period, serious problems werenot

detected. Animals responded well to the tags' application and no effect on the animals' welfare was observed. Moreover, animal's health status was not affected by the devices and common problems that usually follow ear tag application were avoided. Overthe

period of 1 month, data from the farm were collected and stored. The owner of the holding was able to follow every step of the field trials, being able to understand the procedure.

This system was especially intriguing for the owner, as it was easily understood that it can replace handwritten records, with electronic ones, able to maintain a larger amount of valuable information for the animals. Furthermore it was realized that the RFID reader/writer devices were easy to cope with and in some cases facilitated the acquisition of the data, compared to the compatible ear tags. Moreover, during the field trial a vet was present, configuring welfare and health status of the animals. The veterinarian was kept informed with every step of the system's implication and was able to comprehend easily details about data's recording, showing a fairly positive reaction.

V. EVALUATION ANDFUTUREWORK :

The platform described in this paper, based on the corresponding implementation of Section 3, has been evaluated in the context of field trials. The rationale behind the evaluation was the assessing of different methods of RFID tagging in relationto the use of mobile devices and the performance of mobile devices in (rural) environments. As regards the use of the different types of tags, the selection of the ear tags seems to be the most appropriate since it can be used in all types of animals (sheep, goat, cattle), in contrast to the boluses, that are best suited for cattle. Furthermore, since there is the need for low consumption of the reader/writer device, the use of ear tags is again better than that of boluses, since the reading/writing distance is significantly smaller, while the tag is visible. The use of injectable glass tags, though it has the same advantages as the ear tag, is best suited for pets. As regards the use of communication technologies, through the evaluation tests of the project, different scenarios have been tested in order to test the conditions for network access availability in rural areas. In details, access throughWireless LAN technology and IP connections over mobile networks (i.e. GPRS) was tested. The availability of a wireless LAN can be only assumed in areas near the farm, and provided that the farm already has the requiredinfrastructure.

VI. FARM PRODUCTION MANAGEMENT :

The objective function is aimed to maximize the crop production, considering different variables and constraints. The method CPLEX is used to define the variables, restrictions, parameters, mathematical functions, and so on to calculate and generate the maximum resource performance at proposed solutions.
In the case of the Farm Production Management we have defined a set of parameters: Crops,

- Months ofproduction
- Yield cropproduction,
- Land availability,
- Fraction of land occupied bycrops
- Annual average salary,

International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 1 Jan-Feb 2021, pp: 1021-1032www.ijprajournal.com ISSN: 2249-7781

- Annual average salary for permanentworkers,
- Hourly average salary of temporaryworkers,
- Workinghours,
- Annual water availability,
- Total water,
- Crop water requirement,
- Waterprices.

For this problem, the variables are proposed as: The amount of crops planted.

- Recruitment of permanentstaff
- Recruitment of temporarystaff
- Sales
- Fractional approximate consumption.
- Moreover, it is necessary to consider the problem constraints: Landlimits,
- Work requirements,
- Water requirements (time andamount)
- Average familyconsumption.

VII. FARM MANAGEMENT METHODS :

Fig. (Farm Management Method)

) Groups of respondents:

We were keen to assess attitudes towards IFM across the supply chain. Farmers from different farming sectors across England and Wales were included in the research design, as well as agronomists, business, and environmental advisors. It was important to gather the views of farm advisors because they have been shown to play an important role in the adoption of new ideas, not least because they develop close and trusted relationships with farmers (ADAS, 2012; AIC, 2013; Dampney et al., 2001; Ingram, 2008; Prager and Thomson, 2014; Rose et al., 2018a) 2 . The chance for successful implementation of agricultural policy is enhanced if the advisor community is receptive to the idea. Furthermore, we included industry representatives from the supply chain since we noted that a requirement to practise integrated farming was part of some produce assurance schemes (e.g. LEAF Marque, M&S Field to Fork).

In the UK, there are various advisory groups in addition to individual agronomists, vets, and other types of advisor. In the UK, groups include theFarming Advice Service (England and Scotland), Farming Connect (Wales), Rural Payments and Services (England), The Farming and Wildlife Advisory Group, Organic Research Centre, and many more. Elsewhere in Europe there is the Farm Advisory System, and Teagasc Advisory Services in Ireland. In the USA, there are rural extension services such as the Agency for International Development. It is clear that advisory structures in a particular country must be well understood since they are a crucial component of knowledge exchange with farmers .

Focus groups:

Five focus groups lasting approximately

International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 1 Jan-Feb 2021, pp: 1021-1032www.ijprajournal.com ISSN: 2249-7781

one hour were held across England and Wales with arable farmers (two groups in Norfolk), arable advisors (agronomists based across East Anglia), dairy farmers (based in East Sussex), and sheep/beef farmers (lowland and upland, in Central Wales). The locations of these focus groups were chosen based on known contacts and also to cover a breadth of farming enterprises and environments. Focus groups with farmers formed part of existing knowledge exchange activities performed by various organisations - NIAB-TAG for arable farmers, Farming Connect for red meat farmers, and DairyCo for dairy farmers. Our focus groups represented one of the activities in each outreach workshop run by the aforementioned organisations and were always led by the same lead researcher on our project. The arable advisor focus group was held with advisors based at Agrii. Focus groups were primarily used to inform the content of semi-structured interviews, but primary data from the focus group discussions was also used. They were attended by 10– 15 participants, and were recorded and transcribed. As part of a wider discussion of sustainable intensification, respondents were asked to discuss the following twoquestions;_what do you understand by the term integrated farm management?‘ and _do you practise/encourage integrated farm management?‘. The discussion between participants was allowed to flow and develop with little intervention from the facilitator.

Semi-structured interviews :

For a more in-depth analysis of attitudes towards IFM, 78 interviews lasting up to an hour were conducted with farmers and advisors across England and Wales (all conducted by same researcher). The sample was drawn from a wider survey undertaken by the Defra and Welsh Government funded Sustainable Intensification Research Platform (see Rose et al., 2016), which had focused on seven study regions across England and Wales, including farmers from six enterprise types (cereals, general cropping, dairy, mixed, lowland livestock, and Less Favoured Area [LFA] livestock)3 .

These study regions were selected to provide a cross-section of agricultural landscapes in England and Wales. From the 243 farmers who responded to this survey, we employed a purposeful sample to target a range of different farming enterprises and farm sizes.

Overall, we interviewed 45 of these farmers (14 arable in Norfolk; and 31 with LFA/lowland beef/sheep or dairy enterprises in Devon/ Conwy). Thirty-three advisors who offered technical, business, or environmental advice within the broad study areas (Wensum in Norfolk, Taw in Devon, and Conwy in Wales) were also interviewed.

The sample, incorporating a mixture of both commercial and independent advisors, was formed with assistance from ADAS (agricultural consultancy). The list of advisors was identified through existing contacts known to ADAS consultants, as well as web-based searches to capture other smaller organisations or independent advisors.

Workshops:

Three workshops were held as part of the wider Defra project, undertaken between October 2014 and March 2015, with separate workshops held for the arable, dairy, and red meat sectors. Several groups were represented at these workshops, including agronomists/ advisors, policy-makers, advisory boards, technology firms, and the food industry. The wide spectrum of attendees allowed us to assess the understanding ofIFM across the farming food chain (see appendix 2 for attendees and numbers). As part ofa one-day programme, delegates were split into groups of 4–5 people (4 separate groups for arable/red meat, 3 groups for dairy) and were asked by a facilitator to discuss what they understood by the term _integrated farm management‘. Intervention by the facilitator was kept to a minimum with discussion driven by the participants. A rapporteur was elected to capture the key elements of the discussion. All group members were encouraged to provide their definition of IFM and these were recorded by therapporteur.

VIII. DISCUSSION:

When measured against Gerring‘s (1999) framework for judgingthe strength of a concept, IFM performs well in some areas, but poorly in others. Although there were differences between farming types and roles, our respondents generally found IFM to be a coherent, familiar concept. In other words, both farmers and advisors recognised the general principles of IFM, namely more sustainable methods of agricultural production by thinking about how different aspects of the farm business link together.

Overall, respondents felt that the components within the IFM diagram worked together, with the notable exception of community engagement in many cases, and accounting for the irrelevance of some aspects for specific farm enterprises (e.g. animal husbandry not relevant for an arable enterprise).

If we take the claims of farmers at face value, there does appear to be significant implementation of integrated practices across the study areas. The depth of the concept was sometimes criticised by participants, many of whom wondered whether profitability should be more obviously associated with IFM. Furthermore, if we compare the commonly used IFM diagram in the UK (the one used by LEAF) with EISA‗s version, we see that ‗climate change‗ is not highlighted as a key consideration in the former case, nor is ‗human and social capital‗ nor ‗crop nutrition‗. The concept of IFM performed poorly against Gerring‗s (1999) framework in terms of resonance, parsimony, differentiation/field utility, and theoretical utility.

These failings have implications for research and policy on IFM. Clearly, the label‗integrated farm management‗ was not well-recognised by many farmers, particularly in the livestock sectors, and workshop representatives were not widely aware of it. As illustrated by a number of the quotes, several farmers found the concept to be unnecessarily complicated; in essence, some respondents felt that it was just an overcomplicated name for something that all farmers did without thinking in IFM terms. Advisors had generally heard of the concept, although arable advisors struggled to differentiate it from IPM, which is different. Furthermore, there do not appear to be standard practices, or a set of indicators, associated with IFM, which makes it difficult to judge whether farmers are actually doing it. In its current form, it seems difficult to form testable hypotheses for IFM, which presents challenges to those who seek to monitor its adoption. If IFM is to be int themerpreted as a set of guiding principles only, this will have implications for monitoring.

which we now explore in more detail. 4.1. Appropriate agricultural extension Morris and Winter (1999) and Cook et al. (2009) found limited awareness of integrated farming amongst UK arable farmers. One of the key recommendations of the former paper was to invest in a system of agricultural extension (a system where high-level advice can be communicated to farmers in a more personal way, for example, with farm visits, demonstration events, or tailored information) which communicates the concept clearly and effectively to farmers. Through training exercises, farm advisors have already widely heard of the concept, which suggests that some progress has been made in communicating the idea to this audience (notwithstanding the problems of differentiation). The fact that, at the time of our fieldwork, IFM is still not widely resonant with many farmers suggests that there are some problems in the chain of communication. This could be due to a number of reasons; firstly, our wider research from this project suggested that many farmers were not regularly using paid professional advice, and it is advisors that are often influential in bringing knowledge of new ideas (see Rose et al., 2016). This was particularly true in theupland livestock sector where it was deemed less cost-effective to use paid professional advice.

Thus, in many cases it is immaterial if advisors know about IFM, if those advisors are not regularly engaging with all farmers. Good dissemination of IFM principles is further complicated if some advisors are confusing it with IPM. Morris and Winter (1999) found semantic confusion between similar terms two decades ago, and thus there appears to have been little progress. This is a concern because Rose et al. (2016), amongst many other studies (e.g. AIC, 2013; Prager and Thomson, 2014; Ingram, 2008; Rose et al., 2018a), have identified advisors as a key trusted source of information for farmers. In fact, they are a key component in the adoption of practices and technologies (Knowler and Bradshaw, 2007; Rahm and Huffman, 1984) if the dissemination is effective, accurate, and appropriate (Agbamu, 1995). Certainly in England, farmers no longer have the same level of free advice available to them as in the past (Murphy, 2007). This undoubtedly makes it harder for policy ideas to be communicated across the farming community. Other countries who similarly do not support agricultural extension could also reflect on the value offered by advisors, while those countries who do support such activities should try to maintain themerpreted as a set of guiding principles only, this will have implications for monitoring.

IX. RESULTS :

Resonance :

Resonance related to whether farmers could recall hearing the term before, but did not test understanding of the concept. Awareness of the concept was lower amongst farmers than advisors, although there were differences between farming enterprises.

Upland livestock farmers in LFA areas of

International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 1 Jan-Feb 2021, pp: 1021-1032www.ijprajournal.com ISSN: 2249-7781

Conwy and Taw were generally not aware of the concept, with just four out of nineteen being confident to say that they had heard of it. The main sources of awareness were the farming media and farmer networking events. When asked about IFM in a focus group, LFA farmers reacted to the question with silence as the term was not known. Awareness of the concept was also low amongst lowland livestock farmers in Conwy and Taw (including dairy). Only four out of twelve farmers in this group were confident that they had heard of the term, with the farming media and Defra guidance booklets being the main source. Of these four farmers, only one could remember what the term meant with confidence. In the dairy farmer focus group, respondents were generally unaware of the concept. Arable farmers were comparatively more aware of IFM than livestock farmers, including in the two focus groups. In total, eight out of fourteen arable farmers had definitely heard of IFM mainly through crop assurance schemes, Basis training, other farmers, and the farming media. One farmer, for example, stated that they had heard of it and _had been doing it for several years now. Everything that is in [crop assurance] plans has to be written down.‘ (arable farmer, Wensum, 510506). Many farmers had _filled in several integrated farm management questionnaires for cropassurance‘ (arable farmer, Wensum, 51007). Another reason for the greater awareness of IFM may be because LEAF (who have developed the most well-known IFM framework in the UK) were perceived by the arable focus group participants as being more focused on arable farmers, rather than the livestock sectors. Arable advisors were aware of the concept of IFM. All respondents said that they had heard of the term (although two were slightly unsure), but there was some confusion over the precise definition (see next section). The most dominant source of knowledge about IFM came from professional training courses(e.g. Basis points), whilst others had learnt about it through ADAS, LEAF, or Defra. The LEAF diagram used in the interview was familiar to respondents because many had been trained with the same framework on training courses (e.g. arable advisor, 5). Many advisors traced the long history of IFM back to the 1980s .

) Familiarity :

Fig. (Familiarity)

The general idea that farmers should be aware of the links between different aspects of the farm, how they link together, and the consequences of these interactions for productivity and the environment was well-known. Livestock farmers, who were generally unaware of the term IFM, understood the general principles behind it. In fact, all farmers interviewed across all enterprises claimed to practise some elements of IFM, showing that they recognise the management style but not

IJPRA Journal
International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 1 Jan-Feb 2021, pp: 1021-1032www.ijprajournal.com ISSN: 2249-7781

the banner.

This is a notable result given the high proportion of livestock farmers who had never heard of the concept. For example, a lowland livestock farmer (Taw, 10012) said that he had_always been doing that', while a LFA livestock farmer (Taw, 10027) said that _we wouldn't necessarily call it that, but most probably that idea is partly what we try to do'.

Furthermore, an arable farmer (Wensum, 51011) thought that it was _engrained ineverything we are doing, it just happens in a sense'. Other farmers, who had initially reacted negatively towards the concept, said that _maybe we do do integrated farm management' (arable farmer, Wensum 52076) once they had been presented with the principles behind it. Overall it was clear that farmers understood the principles,but _wouldn'tnecessarilyrecogniseitinthoseterms'(arablefarmer,Wensum,51003).

) Depth:

Based on our interpretation of IFM from definition and diagrams by LEAF and EISA, the main components would seem to cover economic, environmental, and social aspects of farm management. Yet, the LEAF version of the diagram stresses only nine aspects of integrated farming, as compared to EISA, which adds three further components – climate change/air quality, human and social capital, and crop nutrition . . While IFM is designed to improve productivity, farmers argued that this was useless if production was not profitable. One arable farmer argued that the aspects in the diagram were _all great but there is little around the financial side and the crop marketing which is what you are in business for' (arable farmer, Wensum, 52076). He went on to argue that if IFM could be better linked to financial benefits, then it would be a more attractive idea.

This point was supported by an arable advisor who argued that a _profitable farm business needs to be around the outside of that diagram because you can't have any of that if the bank pulls the plug on you' (arable advisor, 1). Furthermore, livestock advisors argued that _most people wouldn't get excited about the whole integrated side of things' unless it related to the _fundamentals of the business .

) Theoretical utility:

This section is based on our own scientific judgment and treats IFM as a theory (see discussion for caveat). When considering an integrated systemic approach to farm management as a concept, the most basic scientific question is: does the approach improve environmental, social or economic outcomes from a farm, whencompared to a farm not following the approach? It is relatively straightforward to definespecific outcomes to test, to formulate hypotheses. For example, for an environmental outcome you might state the null hypothesis H0 : IFM farms do not have more bird species than non-IFM farms, with the alternative hypothesis H1 that IFM farms have more bird species than non-IFM farms. One can imagine many similar hypotheses for a range of possible measurable outcomes. For these hypotheses to be testable.

It would have to be managed in a way that did not take account of different elements of the business at the same time, which seems unachievable, or extremely artificial. This is in contrast to the _IPM' concept that was confused with IFM in our study. In this concept, different biological and chemical approaches to controlling pests are combined together (Birch et al., 2011), and used in a hierarchical manner with the least environmentally damaging first. Non-IPM farms are easily defined as those that only employ chemical pest control methods stable .

) Differentiation and field utility:

Since many farmers were unaware of the concept of IFM and did not use similar terms to label their practice, there was little confusion with other terms (e.g. those in Table 1). One LFA livestock farmer (Conwy, 20031), however, did think that IFM was _the same thing as sustainable agriculture'. The most significant confusion surrounding IFM was highlighted by arable advisors, who widely struggled to differentiate it from Integrated Pest Management (IPM). While IPM may be a part of the holistic concept of IFM, they are not the same. For example, IPM has been very clearly defined by the Food and Agriculture Organisation (FAO) of the United Nations (http://www.fao.org/agriculture/crops/core-themes/ theme/pests/ipm/en/) and the European Commission (Directive 2009/128/EC). In contrast to the holistic nature of IFM, IPM is entirely focused on one part of the farming system - crop health and protection. Integrated pest management is defined as an _ecosystem approach to crop production', in which all available measures are used to discourage the development of pest populations, with an emphasis on non-chemical practices such as crop rotation, crop variety selection, hygiene,habitat management for natural enemies and biological control. Chemical pesticides should only be used as a last resort, in response to threshold pest densities identified by monitoring. When asked about IFM, many arable advisors conflated the concept with IPM. In response to a question about IFM practice, an arable advisor (4) said that ‗we have to do that now, under the new directive that has come from Europe, we have to concentrate on integrated farm management, or integrated pest management to be precise.' Others (e.g. arable advisor 7) thought that they were qualified to offer advice on IFM because they had an ‗IPM certificate'.

X. CONCLUSIONS:

The development of an FMIS that utilizes FI technologies was described. The application proved to be capable of performing a profitability analysis based on the recorded cost transaction but also based on the performed tasks and standard values given by the user. Although the focus of this paper was mainly on the farm financial analysis, the described FMIS can also support further FIfunctionalities.

Since the developed App requires that all data are imported by the farmer, future work would include to automate the process of importing data to the FMIS by using tractorimplement communication information such as ISO 11783 (ISOBUS) data (Fountas, Sorensen, et al., 2015). Furthermore, the capabilities of FIWARE could be further utilized by connecting and accessing in-field sensors under .

REFERENCES;

[1]. Ampatzidis , Y., Tan, L., Haley, R., & Whiting, M. D. (2016). Cloud-based harvest management information system for hand-harvested specialty crops . Computers and Electronics in Agriculture, 122, 161–167.

[2]. 2) Bass, P.D., Pendell, D.L., Morris, D.L., Scanga, J.A., Belk, K.E., Field, T.G., Sofos, J.N., Tatum, J.D., Smith, G.C., 2008. Review: sheep traceability systems in selected countries outside of North America. Professional Animal Scientist 24 (4), 302–307.

[3]. Bowling, M.B., Pendell, D.L., Morris, D.L., Yoon, Y., Katoh, K., Belk, K.E., Smith, G.C., 2008. Review: identification and traceability of cattle in selected countries outsideof North America. Professional Animal Scientist 24 (4).

[4]. Caja, G., Collin, C., Nehring, R., Ribo, O., 1999. Development of a ceramic bolus for the permanent electronic identification of sheep, goat and cattle . Computers and Electronics in Agriculture 24 (1),45–63.

[5]. Caja, G., Hernandez-Jover, M., Collin, C., Garin, D., Alabern, X., Farriol, B., Ghirardi, J., 2005. Use of ear tags and injectable transponders for the identification and traceability of pigs from birth to the end of the slaughter line . Journal of Animal Sciences 83, 2215– 2224 .

[6]. Collin, C., Caja, G., Nehring, R., Ribo, O., 2000. Effects of injection position and transponder size on the performances of passive injectable transponders used for the electronic identification of cattle. Journal of Animal Sciences 78, 3001–3009.

[7]. Collin, C., Caja, G., Nehring, R., Ribo, O., 2002. The use of passive injectable transponders in fattening lambs from birth to slaughter: effects of injection, position,age,and breed. Journal of Animal Sciences 80, 919–925. Electro-com, Electro-com white paper–LF 134kHzvs.HF13.56MHz for LivestockIdentification .‖(n.d.)RetrievedJune 30, 2008 from http://www.rfid.com . au/pdfs/LF%20vs%20HF%20Livestock%20ID%20whitepaper.pdf.

[8]. Eradus, W.J., Jansen, M.B., 1999. Animal identification and monitoring . Computers and Electronics in Agriculture 24, 91–9 .

[9]. Silva, K.O., Naas, I., 2006. Evaluating the use of electronic identification in swine . Engenharia Agrícola 26 (1),11–19.

[10]. Stanford, K., Stitt, J., Kellar, J.A., McAllister, T.A., 2001. Traceability in cattle and small ruminants in Canada . Revue Scientifique et Technique 20, 510–522. Trevharten, A., Michael, K., 2008. The RFID-enabled dairy farm: towards total farm management. In: 7th International Conference on Mobile Business, Barcelona,Spain.

[11]. USDA, 2008. Pushes plan to move NAIS forward (n.d.). Retrieved June 30, 2008, from RFID Journal: http://www.rfidjournal.com/article/view/4001. Wismans, W.M.G., 1999. Identification and registration of animals in the European Union . Computers and Electronics in

Agriculture 24,99–108.
[12]. Alejandro Fuentes-Penna, Jorge A. Ruiz-Vanoye, Ocotlán Díaz-Parra, Joaquín Pérez-Ortega, Sócrates López-Pérez. 2016. Nursing Process Characterization for Patien Dagnosis. Año: Marzo 2016 Volumen 91 Revista Dyna Ingeniería e Industria. ISSN: 0012- 7361. DOI:http://dx.doi.org/10.6036/7855
[13]. Alejandro Fuentes-Penna, Jorge A. Ruiz-Vanoye, Ocotlán Díaz-Parra, Joaquín Pérez-Ortega, Sócrates López-Pérez. 2015 Nursing Process Problem: una nueva propuesta NP-HARD Año: Enero 2015 Volumen 2 Número 1 Revista Dyna New TechnologiesISSNDigital: 2386-8406 DOI: 10.6036/DYNANT .
[14].) Alejandro Fuentes-Penna, Jorge A. Ruiz-Vanoye, Ocotlán Díaz-Parra, Joaquín Pérez-Ortega, Sócrates López-Pérez. 2016. Nursing Process Characterization for Patien Dagnosis. Año: Marzo 2016 Volumen 91 Revista Dyna Ingeniería e Industria. ISSN: 0012- 7361. DOI: http://dx.doi.org/10.6036/7855.
[15].)Alejandro Fuentes-Penna, Jorge A. Ruiz-Vanoye, Ocotlán Díaz-Parra, Joaquín Pérez-Ortega, Sócrates López-Pérez. 2015 Nursing Process Problem: una nueva propuesta NP-HARD Año: Enero 2015 Volumen 2 Número 1 Revista Dyna New Technologies ISSN Digital: 2386-8406 DOI: 10.6036/DYNANT .
[16]. Ocotlán Díaz-Parra, Jorge A. Ruiz-Vanoye, Beatriz Bernábe Loranca, Alejandro Fuentes-Penna, and Ricardo A. Barrera-Cámara. 2014. A Survey of Transportation Problems. Journal of Applied Mathematics. Hindawi Publishing Corporation. Volume 2014, Article ID 848129, 17 pages http://dx.doi.org/10.1155/2014/848129 .