

Information Management Needs among Smallholder Farmers: The Case of Poultry Farmers in Arusha of Tanzania

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ABSTRACT

Thirty-seven (37) smallholder poultry farmers from four Arusha and Meru district villages in the Arusha region were interviewed to gather insight into their farms' information management needs and challenges. The farmers were interviewed to obtain information regarding their farming system, mobile phone usage and record-keeping behaviour. The primary aim was to acquire the smallholder poultry farmer's needs regarding information management and gather the possible requirements to assist in the system development process. The farmers interviewed kept 300 to 1000 chickens for either meat or egg production. The interviews revealed that 30% of the farmers kept records of varying quality in farm logbooks. The main interest in record-keeping was on three farm production, sales, health, and finances. All farmers owned at least one mobile phone and used its primary communication function to run their businesses, and 75% of the farmers kept their records in diaries and notebooks for a short period. None of the farmers used the cell phone to record detailed information on the farm, although some used the calendar for vaccination reminders and mobile money transactions. With observed farmers' information management needs, the system that will help them record their data and manage the information, give back analyses reports, and register their farms is required by the farmers to satisfy the needs.

Key Words: Farm management, Information management, Records keeping, Smallholder farmers.

1. INTRODUCTION

Information is power, enabling those who possess it to make informed decisions and those without it to make unsupported decisions with possible undesirable outcomes. Therefore, one needs up-to-date, accurate, and relevant information to make sound and informed decisions. An enterprise acquires the correct information through good record keeping of business activities such as sales and expenditure. Therefore, good record keeping is a necessary component of good enterprise management. Most enterprises' common records are financial records (both income and expenses), production, customers list, and sales. These records are used for financial planning decisions, government administrative and extension purposes, and evaluating the enterprise's overall activities [1,2]. Based on that, it is essential to regard information as a critical input to the successful operation of any enterprise, such as farming, regardless of its size [3]. Most enterprises in Tanzania are small and medium holder operations enterprises [4]. One of those enterprises is poultry farming, which plays a virtual role for many smallholder farmers by providing a source of income and significantly contributing to countries' GDP [5].

Globally, smallholder farmers keep farm records in their memory, paper books and only a minuscule fraction of them keep their records on a computerised system [2]. Although the importance of good farm record keeping, such as proof of farm income, expenses, and inventory items, is known [6], farmers find it difficult to do. Record-keeping and information management have been recognised long ago as improving smallholder farming performance since farm records are considered a vital tool in farm management [3]. However, since the means of recording, storage and analysing recorded data the farmers are inadequate and beyond the standards of the average farmer; it is not just that the computers are expensive; it is also that most farmers are illiterate and cannot do the analysis of the recorded data and therefore the decisions they make are guided by vague estimates and guesses

based on their experience of farming [7]. In agriculture, capturing, storing, and exploring the information is essential for farm performance evaluation. Therefore, poor record-keeping can result in these enterprises' poor performance [8].

Most farmers who keep their records on paper-based tools use sheets of book and books, and some keep receipts. Most of these farmers are held back from profitability because of this lack of adequate, accurate, timely and consistent data recording, storage or/and analysis using modern tools [9]. It has been reported by [10] that one of the reasons why farmers do not keep records about their enterprises is that 30% have no time. Even if they get the time, they might not be interested in the activity, and 15% do not see any benefit in keeping the records because they are not using the data later. Still, even if they saw the value of recording, they might not be interested in the activity. There is no definitive study on the record-keeping behaviour of farmers in Tanzania. However, there is no reason to assume that they differ from those studied by [10]. This study aimed to establish the underlying assumption that the remaining half of the farmer's population finds record-keeping exciting and they have time to do record keeping, and that is the primary targeted population which is likely to use a modern tool such as mobile phones/mobile gadgets for documenting their enterprise data.

Taking advantage of advancements in the increased adoption of mobile phone technologies, with comprehensive network coverage and competition among telecommunication companies which lessen the operation cost to the users, makes mobile phones the best alternative to paper-based data recording tools. With the recent low-cost mobile phones, penetration of telecommunication infrastructure in most places, and increasing literacy levels, mobile-based application systems offer the opportunity [11]. Since farmers carry their mobile phones all the time, it is easy to do record keeping anywhere without waiting for them to come back home and do the recording in the papers or computers. They can also access any information anywhere with minimal risks. With the increase in mobility and computability usage in most of the developing world, mobile phone application-based systems can address information dissemination and management and record-keeping problems to provide an easy solution to improve poultry enterprise performance [12].

Tanzania had about 56% of the population subscribed to mobile phone usage by 2012; the number is expected to increase [13]. Because paper record-keeping has been observed to have many challenges, the solution is to use electronic record-keeping, which can be done through computers and mobile phones; as shown in Table 1, electronic record-keeping is better than paper recording. But computers are expensive, and only a few farmers own them. Then mobile phones are the best option for electronic record keeping. With half of the population subscribed to mobile phone usage, agricultural information management and record-keeping will be improved because mobile phone tools are available, and the necessary infrastructure is also in place. Apart from calling and texting, mobile phones can be used for record-keeping, information storage, and dissemination. However, while mobile phones are devices most farmers own nowadays, only a few use them for information management.

Table 1. Comparison between Electronic and Paper-based record-keeping system

Characteristics	Electronic	Paper
Storage	Requires small physical spaces	Needs Large archive for paper storage
Mobility	Unlimited mobility. Electronic data can be accessed anywhere	Limited Mobility. Data can be accessed where it is stored.
Editing	Easy to edit electronic data without affecting the original work	Editing is messy because you have to rewrite a new sheet of paper for data to be clean
Access	Easy to access- using the internet where data can be stored in the cloud and can be accessed anytime and by a different group of individuals at the same time	Collaboration complex- to access paper data from different places from the storage area, it should be mailed or scanned and then sent through the internet.
Damage	Resistance to damages - Electronic data can be stored locally in a device such as a flash drive and computer hard disks, or it can be stored in the cloud in duplicate copies, so with all those possible ways of storage, the damage to data can be difficult	Vulnerability to damage - With paper records, duplication is difficult and frustrating most of the time.
Security	More secure with the use of encryption techniques	Less secured- easy to break the door and safes.

Legibility	The typeface is clear and standardised and saves time for the reader	Challenging to be read by other people, especially when the writer has bad handwriting. Or if the photocopy made, the colours might appear to be faint.
Data analysis	Integrates data analysis with storage access and retrieval	Data analysis is difficult because data might be stored on different sheets of paper or books
Time	In today's environment can have on-demand anywhere and time, so electronic data can serve that	Time-consuming to access data, and sometimes if you are far from the storage unit then you cannot access the data

Lack of user-friendly applications in the mobile handset is among the factors that make them not use mobile phones for record-keeping, information collection, dissemination and management [14]. With all the drawbacks of using paper to keep records in our enterprises, the immediate solution is to develop appropriate systems into which individual farmers can deposit data recorded about their farms through the mobile application. Farmers can then retrieve reports about any aspect of their enterprises on-demand. Overall, the effect is to put the most influential analyses in the hands of the farmers so that they can make decisions based on information that is only limited by their own ability to collect it [15]. The expectation of the study will be a progressive increase in the quality of data collected as the value of good input is recognised. The record to be saved might be the number of birds, the price of buying the birds and all the other expenses spent on them from the first day to the sales date. Then when the chicken is vaccinated, the farmer should record what they are vaccinated for, the medicine provided, and the date they are vaccinated so the farmer can track things like when the next vaccination will be and what type of vaccination to be done []. After that, the farmer has to record the revenue, which can then be compared with the expenses to identify the enterprise's profitability. That is how and why record-keeping is essential in poultry enterprises' production stages. Farm records are a necessary tool in farm management [16]. The main reason why an agribusiness needs to keep proper records is that it is a fundamental management tool [17]. Accurate records allow for analysing business decision problems and generating the information required to make appropriate decisions. Appropriate decisions are crucial for the efficient running of agribusinesses, which is the only way to guarantee profitability in a highly competitive global economy [18]. Accurate production data enables a good understanding of financial records [19].

Poultry farming is one of the agricultural subsectors practised by most smallholder farmers in Tanzania. Yet, it is not well addressed regarding mobile phone application services to facilitate its activities. Regarding the whole process of poultry products production, from the first day the farmer brought in the chicks, there is a need to keep records, which requires a tool that can better record management. Smallholder poultry farmers are the leading producers of poultry products, eggs and meat in many developing countries. Improving the small farmers' skills requires unique strategies to move from "no-input" scavenging poultry keeping to profit-oriented egg and meat production [20]. According to Food and Agricultural Organization (FAO), 68% of the total livestock population in Africa is of poultry by 2011, while 46% of Tanzania's livestock population is covered by poultry by the end of 2011 [20]. Most poultry farming is practised at the household level, and a small number are kept on ranches for eggs and meat consumption. Consider that Agriculture is a significant economic activity in Tanzania, contributing about 28% of total GDP.

The sector employs about 75% of the labour force (FAO). The industry being among the central economic pillars of the country, several initiatives have been made to promote and address its challenges. One of those initiatives is the Green Revolution with the motivating slogan "Kilimo Kwanza" (Agriculture First). The success of this initiative requires, among other factors, technological invention. Information Communication Technology (ICT) advancement is one of agriculture's technical opportunities to harness. It isn't easy to imagine a country seeking agricultural development that does not attach considerable importance to record-keeping by farmers as a critical component of such action.

Therefore, this study aims at identifying smallholder poultry farmers' information management needs and the requirements to satisfy those needs. Different studies show a lack of Information Management systems to help smallholders store and retrieve information. Though accurate information management and record-keeping are essential to profitable farming, farmers consider it time-wasting to record their enterprise's activity. This study explores the role of mobile-based applications in changing the behaviour of smallholder poultry farmers concerning recording and the impact on productivity.

2. METHODOLOGY

To gain insight into smallholder farmers' information management needs, poultry farmers were selected from two (2) administrative wards of Meru district and three (3) administrative wards of Arusha City in the Arusha region. These locations were chosen because these areas are considered to keep chickens the most in the two districts. Farmers were selected by referral means. Farmers selected were those with chickens from 100 -1000, and the priority was layers of any breed keepers for business purposes.

Structured questions were designed and administered using an interview through an Open Data Kit (ODK) tool. ODK is a free and open-source tool suite that allows data collection using mobile devices and submission to an online server, even without an Internet connection or mobile carrier service in the data collection [21].

The designed questions were administered using an interview with a guided approach. This intended to ensure that the same public areas of information are collected from each interviewee and provides more focus but still allows a degree of freedom and adaptability in getting the data from the interviewee [22]. The interview was used because the information collected is entirely accurate and reliable. The interviewer can clear and cross-check the doubts, also helps gap the areas of misunderstandings, and help discuss future problems. The questions were divided into three main sections: farming information, mobile phone usage, and record-keeping tendencies, as shown in Table 2.

Table 2. Question design and distributio

	Questionnaire Section	Attributes to be Identified
1	Farmer's Demographics	Gender Education level Other Occupation Farming experience
2	Information about the farm	Location (Geographic Positioning System data), Number of chickens kept Type of chicken kept (product, predominantly eggs or predominantly meat)
4	Record keeping behaviour	Record keeping tendency Tools used for recording The willingness of using the mobile phone to keep records is such option was available

3. RESULTS AND DISCUSSION

Thirty-seven (37) poultry farmers from five Arusha and Meru district wards, Moshono, Tengeru, Usa River, Kisongo and Njiro, were interviewed. The geographical location of the interviewed farmers is plotted on the Google maps shown in Figure 1. The main aim of interviewing these farmers was to gain insight into how they practise farm management and record keeping. The sampling method used is judgmental sampling because it was assumed that the selected population would represent all the other farmers in the region based on the fact that the actual number of all the poultry farmers in the area is unknown.

3.1 Study Site

Figure 1 shows a map of the approximate locations of the respondent’s farms in four wards.

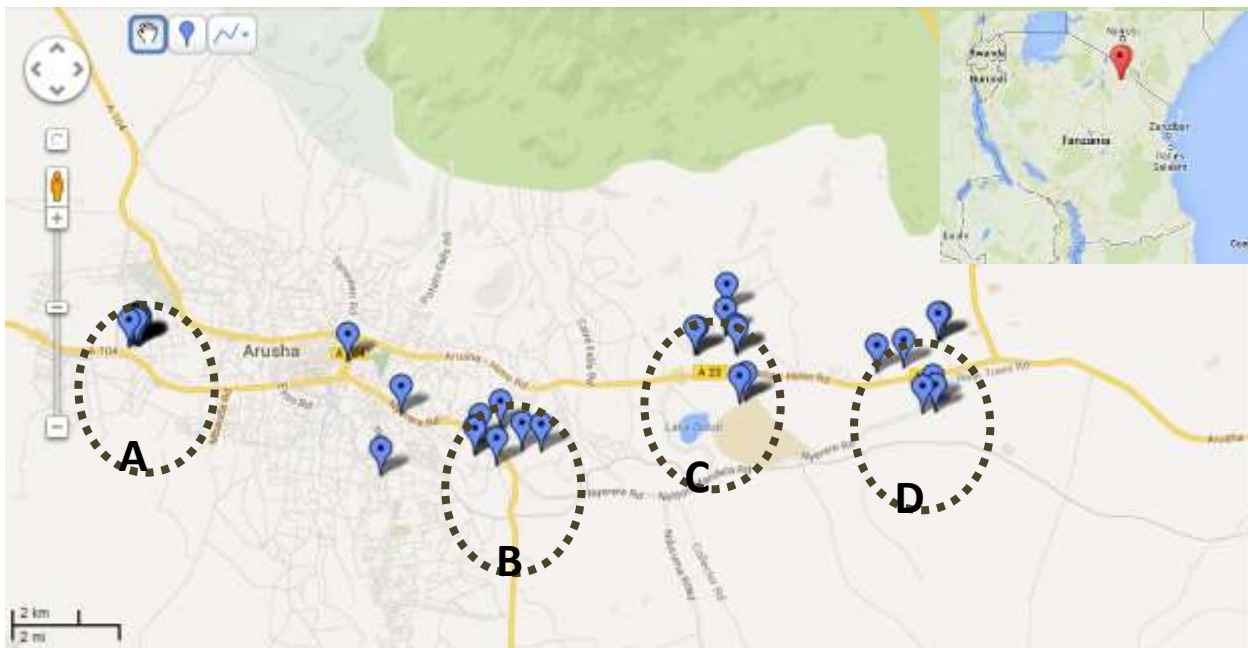


Figure 2. A map showing the approximate locations of the respondent’s farms in four wards (A = Kisongo, B=Moshono, C =Tengeru, and D = Usa River) of the Arusha and Arumeru districts. Inset is the map of Tanzania; the red spot is the Arusha region. Map showing the study site.

3.2 Farmers Demographic Information

The study found that 83% of the farmers have at least a basic level of education for attaining at least secondary school education, as shown in Table 3. The story of formal education indicates that the respondents have the essential ability to maintain written records. It has been observed that more than 80% of the smallholder poultry farmers are not doing poultry farming as their full-time job and are engaged in other economic activities such as crop farming, teaching and nursing. Others are doing entrepreneurial activities such as selling clothes in the market and owning shops.

Table 3. Elaborates on the demographic information response from the questionnaire

1	Gender	Elements	Number of responses out of 37 respondents	Percentage (%)
		Female	26	70.3
		Male	11	29.7
2	Education Level	No school Education	1	2.7
		Primary	5	13.5
		Secondary	17	45.9
		Tertiary	14	37.8
3	Occupation	Business	19	51.4
		Civil servant	12	32.2
		Farming	5	13.5
		Veterinary	1	2.7

3.3 Farming Information

The survey indicated that (82%) of the farmers interviewed have experience in poultry keeping for more than five years and are pretty experienced in managing their business. With these results, the challenges can be to change farmers' practice habits, but it is also good because it means they understand what they need to have. Apart from that, 93% Of the farmers keep from 300 to 1000 chickens, mostly chickens for eggs production and hybrid chickens for hatchery of new chicks. This proves that these farmers are keeping the chickens for business purposes. Therefore, the likelihood to accept interventions to increase the profitability of their enterprises severely as long as it improves their performance; hence increasing income is high.

3.3 Record-Keeping Behaviour

With record keeping, 31% of farmers admitted that they do not keep records of any kind regarding their farms. One of the primary reasons was that the farmers didn't see the need to keep the records. In contrast, others said that the record-keeping activity is only enjoyable when the chicken batch is new. Apart from that, the farmers also admitted they recorded only some farm issues. The concentration remains on the vaccination date and some initial expenditures of the farm. Still, later they do not find it helpful to keep recording because they are primarily used with the enterprise's operations. The study observed that poor tools are used in record-keeping for farm management, as exhibited in figure 2.

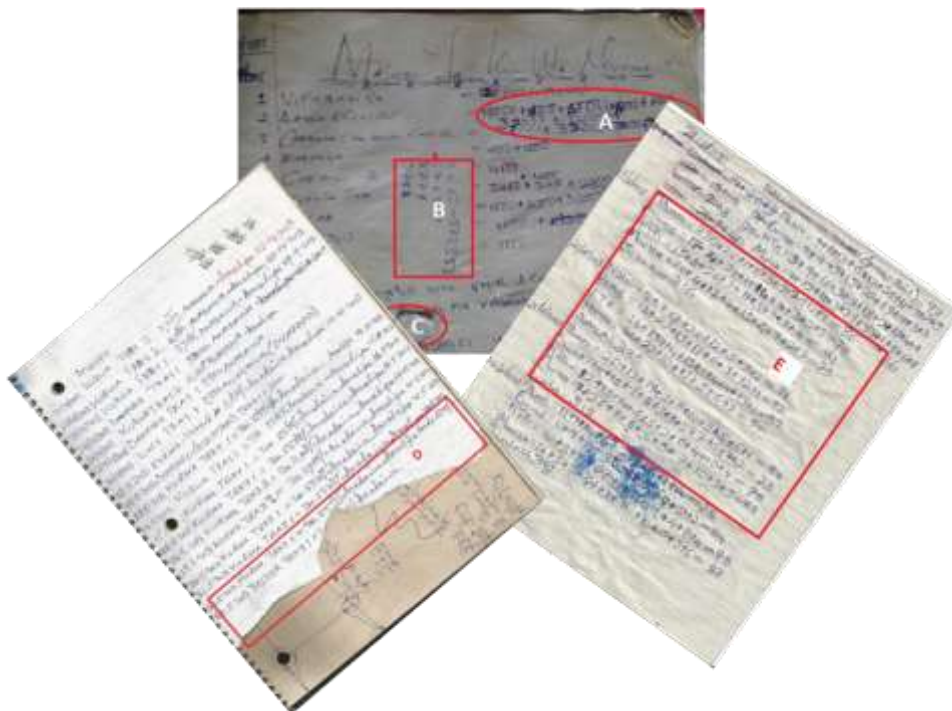


Figure 3: Record-keeping books.

This means that farmers lose interest in record-keeping because they are not with their paper notebooks most of the time. Another observation was that all the farmers were willing to use the record-keeping system since it might help them overcome limited time to keep the records. However, although most farmers were ready to use the system, they anticipated some challenges such as the system's cost, the system's knowledge, reliability of the system, and safety of their recorded data.

3.5 Farm Records

In the categories of record-keeping, 81% of the farmers were highly interested in keeping production and sales records, followed by health, 62% and 54% in expenditure records, as indicated in table 4. Again, the observation was the interest of items to record matches with forms that directly connect to the farm's profitability.

Table 4: Preferred Information to be managed by the Farmers

	Elements	Number of responses	Percentage (%)
Record-Keeping Needs	Production	30	81.1
	Sales	30	81.1
	Farm Expenditure	20	54.1
	Health	23	62.2
	Hatchery	11	29.7

3.6 Mobile Phone Usage

As was expected, all the respondents owned a mobile phone, and they used the phones to make voice calls or send short messages (SMS) or texting. Since 90 % of the farmers use their phones for texting/SMS, they will be able to enter the records and retrieve information [24, 25]. Apart from that, 95% of farmers used mobile money transactions, meaning they already used their mobile phones for different purposes besides calling. Therefore, they appreciated how that service helped them. Thus, this analysis indicates that if farmers were using devices like mobile phones, which most of them carry with them most of the time, it would enhance them to keep their farm records and manage well the information regarding their enterprises. Furthermore, although some respondents owned “feature phones” with the capacity to access the internet, 20% of the farmers used their mobile phones to access the internet.

4. CONCLUSION

After careful consideration of the data collected in the interviews, it was clear that record-keeping was inadequate; few of the respondents kept records that were continuous and not of high quality, and those who kept any records targeted points of vulnerability especially calendar for vaccination and also during the early phases of stages of a stocking cycle. Nevertheless, there was an expression of interest in keeping production, finance and health records. Regarding cell phones in record keeping, the idea appeared new. The needs and challenges farmers face that limit their need to record their business transactions were identified. It is convinced that some of the challenges can be addressed by electronic data recording using cell phones as the input-output terminal that is widely available to farmers. The results from this study act as a system requirement specification and need assessment for the record-keeping system. We have designed a system that addresses the challenges identified during the interviews and fulfils the needs.

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