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Agriculture Market Information Services (AMIS) in the Least Developed Countries (LDCs): Nature, Scopes, and Challenges

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Abstract. Rural growth is seen as an engine to drive the economy of developing countries and the use of Agriculture Market Information Services (AMIS) is believed to enable this growth. This paper is based on a literature study and investigates the spread and use of AMIS in the least developed countries (n=49) in terms of users, management, funding, infrastructure, and data. We investigate success as well as failure aspects, and discuss the role of new technologies. Findings show that while new technologies can improve dissemination of information, collecting data economically and meeting high quality requirements remains major challenges. The study contributes by providing a comprehensive view of the challenges of AMIS in developing countries and an AMIS project evaluation matrix (IS-PEM) based on the findings, which together contribute to improving the design of future projects.

Keywords: ICT4D, AMIS, agricultural market information systems, LDCs, Rural Development, IS Project Evaluation Matrix (IS-PEM)

1 Introduction

There is a growing consensus that for world poverty to be eliminated, and the Millennium Development Goals to be fulfilled, we need to focus on rural growth [1]. Rural growth is shown to have much higher returns than other sectors and can therefore be seen as an engine to drive the economic growth of the entire nation [2]. One way of facilitating rural growth is through the use of Agriculture Market Information Services (AMIS). AMIS is defined as “A service, usually operated by the public sector (Ministry of Agriculture or a dependent agency or institute), which involves the collection on a regular basis of information on prices, and in some cases quantities supplied, of widely consumed agricultural products, from wholesale markets, rural assembly and retail markets, as appropriate, and dissemination of this information on a regular basis through various means (bulletin boards, radio or television bulletins, newspapers, etc.) to farmers, traders, government officials, policy-makers and others [3, p.1]”. According to a FAO survey of 120 countries during 1995 - 1996 [4], there were 53 government operated AMIS, most of which

were limited to data collection and had little association to the needs of the farmers and traders.

The use of ICT in agriculture especially for information processing is imperative for a country where the economy is dominated heavily by agricultural activities. The need for information is shifting from the use of agricultural technologies towards effective participation and sharing of innovations in national and global markets [5]. This shift is important for economic efficiency, performance, and equity [6]. However, the performance of AMIS upgraded by means of new technologies is yet to be evaluated in a comprehensive and convincing manner. Without such evaluation it is difficult to determine the market efficiency effects, the reductions in transaction costs and the extent of improvement of market integration [7]. This paper therefore contributes to reducing the shortage of such evaluation studies by exploring the nature and presence of AMIS, as well as challenges encountered, in particular among all the 49 LDCs [8]. The research questions addressed in this paper are:

1. What types of AMIS exist in the LDCs in terms of which technologies are used, how they are managed, and what their outreach is?
2. What are the factors critical to success or failure for AMIS projects?

2 Method

In order to achieve a comprehensive charting of AMIS in LDCs two online literature surveys conducted consecutively in May 2008 and December 2009. For locating as many different AMIS as possible, the initial search was very open and conducted by consulting Google (www.google.com) and Google Scholar (<http://scholar.google.com/>). This search generated many cases of AMIS and useful links to websites and portals on the subject. In order to focus particularly on scientific evaluation papers the second search was conducted by an academic search engine which is hosted by Örebro University (Sweden) and covers several academic databases. In addition to these two search methods, the ‘snowball method’ [9] was also used to find relevant cases based on the literature we had found. For that search, saturation was used as the stop criterion: the search stopped when no new or special cases were found. We also consulted the online AMIS database [10] maintained by the Michigan State University (MSU). In addition to MSU, this paper used a working paper [11] on market information sources and AMIS-Africa Online database.

Since this study specifically targets LDCs, we started with a search where each country’s name was combined with a search term – ‘Agriculture Market Information’. In case of unavailability of country specific such services, portals of the related ministries (e.g. agriculture in most cases) of concerned countries had been investigated.

The data from the survey was categorized and analysed based on an evaluation matrix (Table 1) developed by the authors in lack of a commonly used evaluation toolkit in the IS research community. Although AMIS are more or less present in most countries, evaluation or impact studies are yet few [7, 12, 13]. One of the reasons of this lack is the deficiencies in measurement and methodological toolkits.

While it is possible to know the number of information recipients, it is difficult to identify their needs and their uses of information. There are indeed some studies that attempt to quantify some benefits, but these are mostly based on limited empirical evidence [6, 13, 14, 15].

Table 1. Research matrix – Information System Project Evaluation Matrix (IS-PEM)

| Focus dimensions | Who | What | When | How |
|------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Users | (Target) Who are the targeted main user(s) ? | (Needs) What needs are targeted to address? | (Time) When do the users get the service? | (Accessibility) How do the users access the service and how affordable the cost is? |
| Management | (Managers) Who manages? | (Roles) What are the roles of participants? | (Duration) When did it start and end? | (Strategy) How are the targeted needs planned to address or are addressed ? |
| Funding | (Sponsors) Who provides the funds? | (Budget) What is the functional allocation of funding? | (Period) What was the period for funding? | (Sustainability) How the fund has been managed; short & long term perspective? |
| Infrastructure | (Suppliers) Who owns/provides both the supply and demand sides' infrastructure? | (Tools) What infrastructures are considered on both supply and demand sides? | (Availability) When does the infrastructure readily available for targeted operation? | (Use) How the infrastructure is used for targeted operation? |
| Data | (Providers) Who are the actors in data supply chain? | (Data) What are the data? | (Lead-time) When is the data processed and disseminated? | (Process) How is the data processed for operation? |

The research framework used in this study is called the “IS-PEM” model (Table 1). It has five focus dimensions (vertical); Users, Management, Funding, Infrastructure and Data. Each of these dimensions is investigated by means of four strategic and critical questions – who, what, when and how (horizontal). Each cell of the matrix contains a keyword and is associated with queries that would lead to find the most pertinent aspects of a project.

The strategic questions are derived from the well-known 5W2H (Why, What, Who, When, Where, How to and How much) scheme which is frequently used in the discipline of Total Quality Management (TQM). The 5W2H is a systematic root cause analysis technique which is particularly useful when a suspected problem of a

project needs to be better defined and reviewed and overall the project process has improvement opportunities [16, 17]. In our matrix, we assume that the aspect ‘why’ is inherited in all the other aspects while analyzing the situation under a certain context. Furthermore, the ‘where’ is a ‘space’ of the object under analysis which is known already. Finally, ‘how to’ and ‘how much’ are merged together as only ‘how’ [17] which explains simultaneously the ways and extent of resolving the problems. This simplification leaves us with the IS-PEM model in Table 1.

We used the model to investigate each project, looking primarily for success and failure factors. Success and failure is measured as stated by either independent evaluations or self-assessment made by, typically, service providers. We hence do not re-assess projects, but look for factors contributing to success or failure, as found in other people’s research

3 Evolution of AMIS: Past to Present

The history of AMIS, at least theoretically, started with the inception of agricultural trade when the farmers used to trade their surplus produce by considering some degrees of spatial and temporal arbitrages. Such trading appeared in ancient Rome during the 1st century BC and in Muslim Caliphate during the 9th century; however the process of the time in accessing price information is not known. During 1200 AD in England and Wales, there was a recorded and organized price information system [18]. The origin of AMIS, by definition, can be traced about 300 years back to the Canterbury Farmers’ Club where the farmers of Kent used to have regular meetings with the Club Secretary for exchanging views regarding the agriculture prices [19]. As for the first institutionalized AMIS, it was the Office of Markets which was set up in May 16, 1913, in the USA [19].

With the inception of modern innovation after the World war II, AMIS tend to transform from passive (one way and static) to real-time and interactive services. An early implementation of such active services was found in 1956 in Salinas, California when the USDA Agricultural Marketing Service installed the first machine for Instant Market News (IMN). There the reports for lettuce were disseminated via automatic telephone answering devices on a regular basis [20]. Further in the USA in 1980, the Science and Education Administration of US Department of Agriculture introduced a new system called ‘Green Thumb’ which was designed for disseminating commodity, weather, and other agricultural information every day from a special computer system which was hooked-up with home telephones and TV [21].

Outside the developed world, organized uses of price information have also been found in several developing countries since the 1950s. These include the Indonesian price monitoring system in the late 1950s [3], the MIS of Nepal in 1960 [12], the MIS of Mali in 1989 and the AMIS of Philippines in 1991 which was designed for female growers and collectors of various non-timber forest products in Quezon province [22].

Nevertheless, the nature and characteristics of MIS have been changing with the de-regularization of economies in 1980s and subsequent changes of market dynamics, progress of information and communication technologies and subsequent changes in farming techniques. In fact, the definition of AMIS has been changing in terms of its

contents, geographical factors, technology and management. However despite such progressive trends, the impact and sustainability of AMIS remain the teething issues.

4 AMIS in LDCs: A critical evaluation

There have been many AMIS available in the developing countries but their track records are generally not satisfactory as they have most often been about data-gathering for statistical purposes and had very little commercial values to the farming community [23]. Therefore, the following section discusses the success and failure aspects of the contemporary AMIS in the LDCs and subsequently summarizes the major failure factors based on the IS project evaluation matrix (IS-PEM) as discussed (The success factors table had to be excluded for reasons of space).

Table 2. Major Failure Factors of AMIS

| Dimensions | Who | What | When | How |
|----------------|------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------|
| Users | Undefined | Inadequate assessment of user needs | After transaction; not on-demand | Inappropriate channel, high cost |
| Management | Centralized management | Routine work; low commitment, coordination and pro-activeness | Project orientation takes longer time than implementation | Absence of clear strategy , lack of impact evaluation, lack of partnerships |
| Funding | Relying heavily on external funding | Allocated as a sub-component of a different project; insufficient | Short-term and non-persistent | Poor financial management and unrealistic business model |
| Infrastructure | Single source; without partnership | Inflexible and un-adapted technologies (e.g. Websites) | Premature (e.g. Websites) | Underutilization and disruption |
| Data | Inefficient and less committed collectors; Unreliable providers. | Un-updated; time insensitive; sub-standard; Non-qualitative | Long lead time | Non-standardized; delayed collection and dissemination; manual intervention |

Users' perspective

Despite the presence of various forms of market information services, most of the primary stakeholders (e.g farmers, traders) usually obtain the price information through their traditional sources, such as words of mouth from other farmers, neighbors, local schools, price-boards at markets, NGOs and religious or community

leaders and network [13, 14, 24]. However, farmers generally perceive that the information from such sources may not be reliable and trustworthy [25].

Garforth [26] finds that the information seeking behavior of farmers apparently depends on the accessibility of information sources and markets, farming systems and livelihoods. The literature reports a lack of assessment and clarity in AMIS requirement specifications, in particular to identifying the primary stakeholders and their needs within a certain socio-economic, technological and behavioral contexts [24, 27, 28]. Insufficient awareness of the value of the services [25, 29] and reluctance towards a user-oriented approach [24] apparently contribute to low or even no sense of ownership [30] for the AMIS. There are many services which are designed in non-native languages (English in most cases) that ultimately create an access barrier to the rural clients [31]. The AMIS of Mali (OMA), a highly regarded service in Africa, was able to make its services available to 70% of Malian population including farmers located in very remote locations [32]. One of the main reasons behind the success of Malian initiative is its ability to satisfy the needs of the diverse clients. This has been achieved through regular contact with the clients, periodic impact evaluation and updating the services as required [33].

There has been a lack of prioritization among the components of AMIS [28, 34]. For example, rather than having wholesale price information (e.g. Agripricenepal.com), farmers seem to be more interested in time specific and reliable maximum farm-gate, off-lorry and retail prices of the nearest and the main neighboring markets [35]. Here, timely dissemination is defined by the availability of information just before or during the time of business transactions [36]. There is also a complementary relation between access to information and access to extension services. Those who are benefitted with price information services would be interested in other information as well such as weather forecasts, advices for crop production, and uses of appropriate seeds and fertilizers [6, 12, 34, 37].

It has been observed that payment for the services by the poor rural people is a critical issue for the sustainability of AMIS [38]. From a user's perspective, delivery methods need to be low cost [37] as the farmers are often reluctant to pay for the services since they do not see far ahead regarding the value of their investment.

Above all, it has been apparent that most AMIS mainly serve the needs of the policy makers [24], researchers and development offices rather than the ultimate target group such as farmers. As in most of cases AMIS are funded by the donors, they become the ultimate clients and accordingly their needs are valued more than those of the farmers [39].

Management perspective

AMIS is generally initiated by the concerned department of the Ministry of Agriculture [23]. The donors and NGOs in line of their existing agenda of rural development tend to work together or in parallel with the governments in order to make the marketing channel more efficient and effective. However, not all efforts have proven to be successful. In fact, the sustainability of AMIS has always been a challenging issue [38] and the quality of supply-side managerial operation is one important factor in this challenge.

Direct government intervention with the AMIS tends to have limited success [40].

Highly centralized, structured and authoritative governmental administrations in most of developing nations usually work through a complex decision making process and henceforth takes longer time to implement a project. Furthermore, following the lack of accountability and incentives, government officials exhibit inadequate pro-activeness and low motivation to understand the practical contexts of the end users. As a high degree of managerial autonomy contributes to efficiency in the operational processes [41], AMIS need to be decentralized in the areas where there are regional price differences [12]. The decentralization of Mali's MIS (OMA) in 1998 by moving its control to the Malian Chambers of Agriculture from the government has made it an exemplary service among the West African countries [41].

Carrilho et al. [42] found that the price collectors of AMIS are not adequately trained and there were often irregularities in data collection and tabulation processes. Tollens [7] also found that the officials involved in data collection and dissemination processes are not so efficient. Training is generally required for orienting the unskilled operating staff [26]. On the other hand, as FAO reports [29], there is a shortage of specialized MIS trainers. Overall there has been a lack of institutional incentives [29] and therefore a lack of pro-activeness towards smooth operation of AMIS [33].

Most AMIS are projects in nature and funded for two to five years. However, a significant portion of this duration is spent on project orientation and preparation. For example, Cambodian Agricultural Market Information project (CAMIP) was approved for January 2006 until October 2009. Within this period, actual implementation (FM broadcasting) was started only a year before the completion of the project. Such use of the allotted time leaves little time for the systems to settle so that reasonable evaluation of effects can be made.

Finding dedicated and capable partners to provide quality services seems a challenging task [43]. In particular, cooperation from the private sector is a big challenge [44]. This is mainly for lack of perceived mutual benefits among the prospective parties [45]. This situation leads to challenges in the sustainability of projects especially in the issues like cost and finance, technology, promotion and education, and getting the governments involved in the processes [13].

Lack of information and communication management (ICM) policies at the national or project level [25] and absence of a steering committee in order to manage the processes and monitor the service quality [29] are critical failure factors. These deficiencies bring many undesirable consequences, such as inefficient coordination and non-participation among the various agencies [24], weak content management at the local level [29, 46], and reluctance to carry out periodic impact evaluations [7, 12]. Notably, lack of support from upper management and lack of practical commitment in all levels of administration to facilitate timely and accurate data create many sustainability problems. Trust and reliability issues are not given adequate importance in many services, which is crucial for user acceptance of services. For example the 'terms of use' page of eSoko (former TradeNet based in Ghana) states that 'we have no control over, do not guarantee, and you will not hold us responsible for, the quality, safety or legality of any content on the Service; the truth or accuracy of any contention of the Service'.

Funding perspective

Most AMIS, unless it has been a regular job of the concerned ministry, are donor dependent. In this regard, donors generally participate with the governments in cooperation with other local partners. Major AMIS donors include FAO, CTA, USAID, ADB, GTZ, IICD and World Bank. National AMIS are funded through the respective national budgets as part of regular activities of the concerned departments of the ministries. Countries who have such AMIS include, for example, Bangladesh, Myanmar, Liberia and Mozambique. Generally, allocation of funds is done by assessment of relevance for mission or policy, economic and social impacts, urgency, scope of operations, modalities, time lengths and degree of short and long-run prospects of the projects. Such funds are allocated either as one sub-components of a project (e.g. part of second component of the project as entitled “Agricultural Productivity and Food Security Project” in Burkina Faso, supported by the World Bank) or as an independent project (e.g. Cambodia-Canada Agricultural Market Information Project or CAMIP).

Having a realistic financial and business model and efficient financial management are the most important aspects of a project’s financial sustainability. Therefore, there is a need for a realistic economic model for network extension and continuity of a quality service that would ultimately help to strengthen the socio-economic activities of the rural community [47]. In this regard, Roberts et al. [13] suggest that the financial model should have the right mix of subsidy and feasible user fees. For example, Mali’s MIS (OMA) achieves sustainability by having support for its operating cost from the national budget of the government, getting equipments and technical assistances from the donors, and earning revenues through advertisements and selling specialized market information [41, 48].

Lack of, non-persistence, or delayed funding is another root cause of lack of project sustainability [6, 7, 25, 29, 28, 42, 46]. Findings reveal that most projects are discontinued once the funding is phased out (e.g. Lao’s AMIS as funded by FAO for 2001 and 2002). After this phasing-out, the principal initiator (e.g. government) either waits for a new source of funding or starts launching or continuing the AMIS as part of regular function of the concerned ministry (e.g. the AMIS of Bangladesh, Myanmar, Mozambique etc.).

Infrastructure perspective

AMIS infrastructure is defined as the tools required for ensuring uninterrupted connectivity between the content providers and recipients. In general, the quality of infrastructures for AMIS has so far been found poor [25, 29, 38]. For high-quality connectivity, services must be designed in a way so that they can be adapted with the socio-economic and technical profiles of the targeted users [47]. Here ‘adaptability’ is defined as perceived availability, affordability, and accessibility of services and technologies. In this aspect, there would be a possibility of underutilization of a system if it is launched prematurely in a context where the associated technology is relatively new and difficult to access by the end users (e.g. web-based government AMIS in Bangladesh).

There is a variety of technological platforms used for accessing the AMIS across the world. Large networks (e.g. RESIMAO/WAMIS-NET for the West African

AMIS) collects large amount of data for large audience and therefore dissemination of information needs multiple channels. Use of hybrid/multi-channel technologies has been growing in recent time. USAID's LINKS project for East African countries uses multiple platforms: Internet, Satellite, radio and SMS. RASIMAO/WAMIS-Net provides market information via internet, radio, print, email and SMS. Interests for expanding network by the telecommunication companies for rural consumers are also growing. Manobi's Time to Market (T2M) system provides value added services at low cost, uses PDA (Personal Digital Assistant) for collecting market data twice a day, and disseminates real-time information through their specially designed open source Multi-Channel Service Platform (MCSP; web, WAP, SMS, voice). Manobi's 'Xam Marse' ('know your market') service in Senegal uses Wireless Application Protocol (WAP) enabled cell phones which connect to the Internet to check market information and compare the offers of the local buyers in the markets. Mobile handsets and their associated value added services are also getting attention [43]. Nokia has introduced a graphical 'Life Tool' application which is designed for entry-level rural consumers and has been tested successfully in Maharashtra, India.

Radio, especially community/FM band, is historically the most influential medium for information services [3, 13, 14, 23, 48], as it accessible for large populations at a reasonable cost [30, 33]. However, some studies find that radio broadcasting at the local level is often found to be interrupted and unreliable [46].

Though web-based services are used either as the main (e.g. Bangladesh) or compliment to other modes of information dissemination (e.g. Mali), findings show that Web-based AMIS are not accessible by the rural clients because of low internet penetration and lack of ICT awareness and skills [27]. Poor connectivity and low bandwidth in the LDCs are the major technical barriers for web-based services [24, 29, 42, 48]. A study on Africa also finds that web-based AMIS is time consuming and not so user friendly [31].

Moving now to what in effect is the most challenging part, the input side; we devote next section to data collection.

Data perspective

Data collectors and data providers are the two parties involved in the local level data gathering processes. Generally, the data collectors are local, regional, and central level officials, while the data providers are farmers, traders and retailers. Depending on the nature and types of information, officials from the various agencies may work together. For example, OMA of Mali uses officials from multiple agencies - Malian Livestock and Meat Office (OMBEVI) and the International Institute of Soil Fertility (IISF).

Accuracy of data collection and reliable reporting are critical factors for the success of AMIS [24]. However, the data management process especially at the local level has been found weak [29]. There has been a lack of data standardization [12, 24, 29] and quality control [29] as well in terms of methodology, weights and grades of the produce.

On-time dissemination of such information depends on the data acquisition, transmission and tabulation process, and the characteristics of the associated technology [29]. Use of passive (disk, fax, regular postal and print) media in the data

transmission to the central hub and manual intervention for checking and tabulation (e.g. basic spreadsheet or paper) of data delay the final dissemination process [24, 29] and subsequently in long-run reduce the credibility of the services [36]. Regarding the time of data processing and dissemination, there have been huge differences. For examples, in Cambodia information is disseminated every day at 6:00 pm, whereas in Laos it appears only weekly in a radio program. In Benin (ONSA-Infoprix project), data is collected after business hours. In Ethiopia, data entry and analyses take even for two months. These examples may result in a conclusion that late information loses its value to farmers [6] and decreases the credibility of the project administrators in the long run.

5 Conclusions

Our literature survey among the 49 LDCs found that AMIS quality has improved significantly in terms of needs assessment, processes and technology. Out of 49 LDCs, 25 have web-based services and 20 of these services are integrated with SMS mobile technology. The rest remain using traditional methods like radio, newspapers, bulletin and price board.

Findings show that input rather than output is the major challenge today. While new technologies can improve dissemination of information, collecting it economically and meeting users high quality requirements remain major challenges. Knowledge of the right mix of resource mobilization, needs for localization and perhaps personalization, and the logistics of the agricultural marketing systems at the various levels of the marketing chain are critical for project success. On-time delivery of reliable and high-quality information via widely available and adaptable technologies is critical to the acceptance of the services by the end-users. However, ensuring this acceptance mainly depends on the commitment and capability of the management of the services.

This paper has investigated success- as well as failure factors, and discussed the role of new technologies. The study contributes by providing a comprehensive view of the challenges of AMIS in developing countries and an evaluation matrix (IS-PEM) based on the findings, which together contribute to improving the design of future projects.

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