Information and Knowledge Management
ISSN 2224-5758 (Paper) ISSN 2224-896X (Online)
Vol.8, No.4, 2018

Information Needs and Seeking Patterns of Farmers within the Changing Information Environment: A Case of Sri Lankan Vegetable Farmers

M.G.P.P. Mahindarathne [1, 2*] Qingfei Min [1]

1. Faculty of Management and Economics, Dalian University of Technology Dalian, 116024, China
2. Faculty of Animal Science and Export Agriculture, Uva Wellassa University, Sri Lanka

* E-mail of the corresponding author: prasadkandy@yahoo.com

Abstract

Information plays a pivotal role in today's agriculture whilst the ICTs have largely influenced the agriculture information and communication systems. In this context, gaining an in-depth knowledge of farmers' information needs and seeking patterns is central to designing and executing prolific agriculture information systems. With respect to the vegetable farmers in Sri Lanka, recent and sufficient informational studies have not been carried. Thus, this study sets out to explore information needs and seeking patterns of vegetable farmers within the contemporary information environment. Data were gathered by interviewing 289 vegetable farmers and were analyzed by computing the relevant informational indices. The findings show that the majority of vegetable farmers exhibit a medium to a high level of information needs. Market-related information found to be the most prioritized informational need among vegetable farmers followed by information related to crop production, the environment, climate and policies, new technologies, and training and development, respectively. Furthermore, traditional sources and channels remain the most trusted and adopted sources and channels of the vegetable farmers, while the use of modern means of communication seems remarkably low. In selecting sources and channels, vegetable farmers look for the ones that are capable of delivering specific, localized, credible and up-to-date information in local languages.

Keywords: Agricultural information needs, Sources and channels, Information indices, Vegetable farmers, Sri Lanka

1. Introduction

Agriculture of developing countries remains central to food production, generating incomes and employment. Agriculture entails complex decision- making that requires a vast amount of information to be gathered from various sources and channels. Furthermore, agricultural systems in the developing countries are becoming more knowledge-intensive than resource-intensive, thus the role of information becomes further crucial.

The world over, ICTs have tremendously revolutionized information and communication systems across many fields and disciplines. Over the past three decades, ICTs have been widely applied to the agriculture and food sectors. Consequently, agricultural information systems in developed countries have transformed over the past two decades through increasing digitization. However, in developing countries, the successful implementation of ICT-mediated agricultural information systems is hindered by a set of design-related, economic and sociocultural factors (Kughur et al. 2014 and Aubert et al 2012). Consequently, finding the right information within the context in which information is required in a timely manner is still being a challenge in developing world agriculture (Walisadeera et al. 2015).

Sri Lanka has introduced several initiatives to promote ICTs in agriculture over the past two decades. The use of CD-ROMs as crop-based information materials (2004), cyber extension (2004), the Toll-Free Agriculture Advisory Service (2004) and the Cyber Agriculture "Wikigoviya" website (2013) are some significant interventions made by the Department of Agriculture of Sri Lanka. Meanwhile, the mobile phone-based agri-produce price information service launched by the Ministry of Agriculture together with Mobitel Sri Lanka (Pvt) Ltd and the Dialog TradeNet agri-price service introduced by Dialog Axiata, the largest mobile service provider in the country aim the enabling access to the market prices of agricultural commodities. However, on the whole, these initiatives have not been able to significantly impact on the country's agricultural information and knowledge dissemination process due lack of appropriate digital contents, ICT proficiency, training, level of trust on ICT, technology infrastructure, cost of technology and, accessibility (Walisadeera et al. 2015 and Pavitrani et

al. 2011).

In designing an information system, the emphasis should be placed less on design and more on learning what the farmers do and how they act, and not only letting researchers design their own views of farm management decisions (McCown 2002). Further, learning about informational needs, intended users, user characteristics and tasks and analysing physical and social environment are some key best practices in user-centred designing (Johnson et al. 2005). Therefore, regular studies are important for updating farmers' information needs (Kalusopa 2005). Such longitudinal studies are necessary because the levels of need for similar information may differ over time and between persons or groups depending on a variety of factors (Kaniki 2001). However, despite the vitality, there is a knowledge gap with regard to agricultural information needs when rural farmers from the developing countries are considered (Elly & Silayo 2013).

Several studies in relation to information use in agriculture have also been carried out in Sri Lanka. Majority of studies have focused on assessing ICT adoption by farmers in general (e.g. Dissanayake & Wanigasundera 2014 and Pavitrani et al 2011) and developing and evaluating ICT-enabled information systems and applications (e.g. Walisadeera et al. 2015 and De Silva & Rathnadiwakara 2010). The literature analysis further shows that, despite the vitality, recent and sufficient studies have not been carried to explore the information needs and seeking patterns of Sri Lankan farmers. Acknowledging this existing knowledge gap, this study sets out to explore the contemporary information needs and seeking patterns of vegetable farmers in Sri Lanka. Accordingly, the study was designed gaining adequate insights from previous studies conducted in similar contexts.

2. Literature Review

2.1 Agricultural Information Needs

In the existing literature, there are studies dealing with information needs of farmers in developing countries. Aina (1990) categorized the various types of agricultural information, as technical/scientific, commercial, social-cultural and legal. Ozowa (1995) suggests that information needs may be grouped into the following five types: agriculture inputs, extension education, agriculture technology, agriculture credit, and marketing. De Silva and Rathnadiwakara (2010) whereas grouped agricultural information needs into six groups based on the stages of farming life cycle, as at the crop selection, seeding, preparing and planting, growing, harvesting and storage and selling stages. Furthermore, several studies have been carried out to investigate the information needs of different farmer groups in developing countries. A survey performed by Kumar (2014) in Uttar Pradesh of India reported that the information priority of farmers constituted crop related, seed related, fertilizer, pesticides, government policies and storage, respectively. Kabir et al. (2014) studied the information needs and seeking behaviour of Bangladesh farmers and found that information related to crop protection, marketing, and climate were the prime information needs of the farmers. Elly & Silayo (2013) reported that information need of 70 per cent of rural farmers in Iringa district of Tanzania is about crop and livestock husbandry, marketing, funding options and value addition. In a cross-country survey conducted by Lokanathan & Kapugama (2012) revealed that amongst smallholder farmers of Bangladesh, India, Sri Lanka and Thailand, the main information needs over an entire crop cycle were information on fertilizers, market prices, and pesticides, while informational priorities varied depending on the stages of the crop cycle. A study conducted by Aziagba & Okede (2011) to investigate the information seeking behaviour of Cassava farmers in Nigeria found that farmers have a high information need for procurement of planting materials, produce price and loan facilities for sustaining their farming activities. Moreover, environmental, health, legal and policy information have also been identified as important in today's agricultural environment (Kabir et al. 2014; Aubert et al. 2012 and Lokanathan & Kapugama 2012).

2.2 Information Sources and Channels Used in Agriculture

In research into information seeking, information sources and channels have received indispensable significance. Agricultural information disseminates through various channels like; mass media channels such as radio broadcast, print media and traditional media and interpersonal channels such as face-to-face contacts, group contacts and demonstrations (Kughur et al. 2014). The information sources used by farmers and rural communities have been categorized into personal localite, personal cosmopolite and mass media. Personal localite sources include family members, neighbours, friends, contact farmers and local leaders. Extension officers, field demonstrators and other relevant officers in contact come under personal cosmopolite sources. Mass media sources cover newspapers, extension bulletins, radio, and television. Today, ICT has tremendously influenced the form and function of agricultural information sources and channels (FAO 2013; Brewster et al 2012; Aker 2011 and Qaisar et al. 2011).

Several studies have been carried out in developing countries to explore information sources and channels used by the different farmer groups. Studying the mobile-based communication interaction among major agriculture stakeholder in Sri Lanka, Dissanayake & Wanigasundere (2014) reported that a considerable number of farmers used mobile phones to contact input suppliers, buyers, agriculture extension officers and other farmers. In another study, Adikari (2014) reported that among the mass media sources used by the farmers in Sri Lanka, television ranked first followed by radio and printed media respectively. Kumar (2014) observed that the major information sources of farmers in Uttar Pradesh of India were friends, relatives, leader farmers, radio and television, and extension officers. According to the study of Kabir et al. (2014), farmers in Bangladesh have greatly relied on pesticide dealers, seed dealers, neighbours and friends and the mass media in accessing the farming information. In studying the information sources used by the rural farmers in Tanzania, Elly & Silayo (2013) found that a large extent rural farmers get their agricultural information (in their order of preference) through interpersonal communication, social gathering, farmers' groups or associations, village or cell leaders, cell phones, input suppliers or agro-dealers, extension officers, and radios, public addressing systems, agricultural exhibitions, reading on village sign boards, and NGOs. Other knowledge sources used by the farmers included farmer groups, personal experience, village leaders, NGOs, district officials, radio, village meetings, middlemen, and farmer cooperatives. The study of Lokanathan & Kapugama (2012) reported that the main information sources of the smallholder farmers were self-knowledge, family and friends, government extension workers, input suppliers, traders and collectors and mass media. The authors further noted that the extent of utilization of above sources varies depending on the stage of crop life cycle and the country concerned. As shown by Aziagba & Okede (2011), Cassava farmers of River state, Nigeria desiring information from colleagues, extension workers, agricultural institutions, news media and banks in order to sustain, organize and expand their efforts in profit making. Okwu & Daudu (2011) observed that relatives, friends, and neighbours constituted the most regularly available, accessible and used interpersonal channels by the farmers in Benue state, Nigeria. In addition to sources and channels, social networks, participation in farmer groups, and sharing experiences are important practices in agriculture through which farmers access useful information (White & Selfa 2013 and Llewellyn 2007).

2.3 Information Seeking Behaviour of Farmers

Information seeking is a process in which humans purposefully engage in order to change their state of knowledge and which is closely related to learning and problem- solving (Marchionini 1995). Meanwhile, Wilson (1999) specifically used the term "information seeking behaviour" and elaborated it as the purposive seeking for information as a consequence of the need to satisfy some goal.

Several studies have been carried to investigate farmers' information seeking behaviours. Kavithaa et al. (2014) performed a study to investigate the information seeking behaviour of dairy farmers in Erode district of Tamilnadu, India and found that socio-economic variables had influenced the information seeking behaviour of dairy farmers. Dhayal et al. (2013) approached to measure the ISB of farmers in Jaipur district of Rajasthan, India and revealed that the majority of farmers (76%) shown a medium level of ISB, followed by 13% having low and only 11% having high ISB.

Findings of above empirical studies show that information needs, sources and channels and information seeking behaviour of farmers are specific to the context. Therefore, conducting investigations on a regular basis become vital to update the knowledge of the information needs, sources/channels and seeking behaviour of farmers.

3. Methods

3.1 Study Population and Sampling

Commercial vegetable farmers were selected for this study given their high levels of dynamism, innovativeness and information use in the present context of high production and marketing uncertainty. Most of vegetable production of the country comes from Dambulla, Nuwara Eliya, and Keppetipola areas, and 80 percent of vegetable trading takes place through the Dambulla, Nuwara Eliya and Keppetipola Dedicated Economic Centres (DECs). Thus, the study population was set as the small and medium scale commercial vegetable farmers (farm size of 0.25 acre to 2 acres) from the feeder areas of the above three DECs. Stratified random sampling technique was employed wherein in proportionate to the area under cultivation (about 65 per cent from Dambulla and about 35 per cent from Nuwara Eliya and Keppetipola), a total of 325 vegetable farmers were recruited with the assistance of government extension officers and farmers' societies.

3.2 Data Instrument and Data Collection

A self-administered survey questionnaire was designed to collect the required information from the respondents. The content of the questionnaire concerned the demographic data, information needs, sources and channels of vegetable farmers. To ensure the reliability and validity of the questionnaire, a pilot survey was conducted with 20 randomly selected vegetable farmers from the defined study area. The refined questionnaire was used in the main data collection survey. On the list of 325, a total of 289 interviews were completed (177 (61%) interviews from Dambulla and 112 (38%) from Nuwara Eliya and Keppetipola). The study was carried out from March 2016 to February 2017.

3.3 Data Analysis

In order to determine the information needs, sources and channels of vegetable farmers, relevant information indices, such as the information need score (INS), information need index (INI), total information score (TIS) and information channel use index (ICUI), were determined following the methods described below. Furthermore, the criteria used in selecting information sources/channels by the vegetable farmers were also evaluated.

3.3.1 Determining the Extent of Informational Need

Based on the findings of preliminary discussions with farmers and previous research, twenty-four information dimensions were identified under five information need categories (Table 2). These information dimensions were presented to the respondent farmers, who were asked to rank each dimension in the order of degree of need on the five-point Likert scale (0 to 4). The INSs of respondent farmers were computed by aggregating the scores obtained for the 24 informational dimensions. Accordingly, the INSs of the respondents ranged from 0 to 96. In order to determine the extent of information need of the farmers, they were categorized into three groups using the mean and standard deviation of the INS ($\bar{X}$ = 64.91, SD = 11.49); low need (<$\bar{X}$-SD), medium need ($\bar{X}$-SD to $\bar{X}$+SD) and high need (>$\bar{X}$+SD). The results are presented in Table 2.

3.3.2 Determining the Types of Information Needs

To determine the relative importance of each information need, the information need index (INI) was calculated using the following formula presented by Kabir et al. (2014). Thus, the calculated INI values ranged from 0 to 1,156.

$$INI = INvh \times 4 + INh \times 3 + INm \times 2 + INl \times 1 + INn \times 0$$

Where:

INI = information need index

INvh = number of respondents with very high need

INh = number of respondents with high need

INm = number of respondents with moderate need

INl = number of respondents with low need

Inn = number of respondents with no need

Next, the standardized information need index (SINI) was computed using the following formula adopted by Kabir et al. (2014) to make the comparison and expression meaningful. Calculated SINI values are presented in Table 3.

$$SINI = \frac{\text{Computed INI} \times 100}{\text{Possible highest INI}}$$

3.3.3 Determining the Use of Information Sources

To analyse the information sources used by vegetable farmers, 22 sources of information that categorized into four groups were identified based on the findings of the preliminary discussions held with the farmers and the relevant past studies. The frequency of contact with information sources has been widely used to evaluate the information sources used by farmers (e.g., Kabir et al. 2014; Kumar 2014; Adikari 2014 and Lokanathan & Kapugama 2011). However, the present study adopted the total information score (TIS) proposed by Demiryurek (2010), which is a variable that combines the frequency of contact with the information sources and their usefulness. Hence, the TIS reflects not only the quantity but also the quality of information contact. Accordingly,

the farmers were presented with the 22 sources of information and were asked to rate each source of information in terms of 'frequency of contact' and 'degree of usefulness' on the five-point Likert scale (0-4). The information score for a given information source was calculated by multiplying the score obtained for the frequency of contact and the degree of usefulness. Then, the TIS for each information source was computed by aggregating the respective information scores of all respondent farmers. Accordingly, the calculated TISs of the information sources ranged from 0 to 4,624. To make the comparison and expression meaningful, the standardized total information scores (STIS) were computed (Table 4) following the same procedure adopted in calculating the SINI.

3.3.4 Determining the Use of Communication Channels

Farmers use multiple channels to access information sources in order to satisfy their information needs. For this study, 10 information channels encompassing both interpersonal channels and mass media channels were identified by referring to the reflections of preliminary discussions held with farmers and the past studies carried out in a similar context. The respondent farmers were presented with the selected information channels and were asked to assess them based on the 'frequency of use' and 'degree of usefulness' on the five-point Likert scale (0 - 4). Next, the information channel use index (ICUI) was determined following the same procedure adopted when computing the TIS. Accordingly, the calculated ICUIs of the information channels ranged from 0 to 4,624. Then, standardized ICUI values were computed (Table 5) to make the comparison meaningful following the same procedure adopted above.

Farmers, as rational human beings, apply different criteria when selecting information sources and channels. It has been shown that the availability, accessibility, quality, context-specificity, convenience, and credibility, have impacted on the selection of information sources and channels by the users (Elly & Silayo 2013; Llewellyn 2007 and Savolainen & Kari 2004). Accordingly, the farmers were presented with the 10 information sources/channels selection criteria and were asked to evaluate them based on their perceived level of importance on the five-point Likert scale (1-5). The evaluation results are given in Table 6.

4. Results and Discussion

4.1 Demographic Profile of the Farmers

Table 1 summarized the demographic characteristics of the respondent farmers, i.e., gender, age, education, telecommunication use, farming experience, farmland size and monthly income.

4.2 The Extent of Informational Need of the Vegetable Farmers

The findings presented in Table 2 show that the majority of vegetable farmers exhibited a medium level of informational need (73.7%; 213), while 14.5% (42) had a low informational need and only 11.8% (34) exhibited a high level of informational need. These findings indicate that the respondent farmers are informed on the importance of information in making robust farming decisions.

4.3 Types of Informational Needs among Vegetable Farmers

Calculated SINI values given in Table 3 show that, of five information need categories, the market-related information category was first in the ranking order with an average SINI of 80.2. The market-related information category consisted of eight information dimensions; of which seven dimensions recorded SINIs above the category average (avg. SINI 80.2). Information related to fertilizer supply (SINI 88.1) was first in the category, as well as in the overall ranking. Furthermore, vegetable farmers seek information on seeds and planting materials, the current price of produce and agrochemicals, labour supply, forecasts of produce prices, and irrigation supply with a relatively high priority. However, information needs relating to credit sources resulted in a relatively low SINI (54.8), indicating that vegetable farmers at present give less priority to credit information. Lokanathan & Kapugama (2012) have also found that market prices of crops and sources and cost of inputs were the top-two information needs of the Sri Lankan farmers.

Table 1. Demographics of the Vegetable Farmers (n=289)

Characteristic	Number	%
Gender		
Male	243	84.0
Female	46	16.0
Age (in years)		
Below 25	04	01.4
26-45	93	32.2
46-55	135	46.7
Above 56	57	19.7
Education		
Not attended school	14	04.8
Up to Grade 8	119	41.2
Up to Ordinary levels	107	37.0
Up to Advanced levels	40	13.8
Diploma/degree	09	03.2
Telecommunication use		
Newspaper	211	73.0
Radio	254	87.5
Fixed telephone	112	38.8
Mobile	251	86.8
Internet	19	0.06
Farming experience		
Up to 10 years	55	19.0
11-20 years	110	38.0
Above 20 years	124	43.0
Avg. farm acreage	1.8 (SD =1.37)	
Avg. monthly income (LKR)	20,011 (SD=10,417) (USD 135)	

Table 2. The Extent of Informational Need (n=289)

Informational need	Number	%
Low (<53.42)	42	14.5
Medium (53.42-76.4)	213	73.7
High (>76.4)	34	11.8

$\bar{X}$ = 64.91, SD = 11.49

Table 3. Scores and Ranks of Informational Needs (n = 289)

	Information need	SINI	Rank
1	Fertilizer supply	88.1	1
2	Seeds/planting materials	86.6	3
3	Current produce price	84.3	4
4	Price of agrochemicals	84.0	5
5	Labour information	81.5	7
6	Produce price forecasts	79.8	8
7	Weather/irrigation water	82.4	6
8	Credit information	54.8	17
Market-related (average of 1+2+3+4+5+6+7+8)		*80.2*	*1*
9	Pests and diseases	88.0	2
10	Agro-waste management	78.8	9
11	Soil fertility management	75.1	10
12	Safe agro-chemicals use	71.7	12
13	Agronomic practices	53.1	18
14	Post-harvest technology	52.5	19
Crop production-related (average of 9+10+11+12+13+14)		*69.9*	*2*
15	Occupational health	73.7	11
16	Climatic change	65.8	15
17	Natural disasters	63.7	16
18	Eco-friendly farming	52.2	20
19	Policy and regulations	40.7	23
Environment, climate and policies (average of 15+16+17+18+19)		*59.2*	*3*
20	New farm equipment	50.6	21
21	Innovative technologies	66.8	13
New technology-related (average of 20+21)		*58.7*	*4*
22	Government technical trainings	66.5	14
23	Agri-business trainings	49.0	22
24	NGO programme/support	33.1	24
Training and development (average of 22+23+24)		*49.5*	*5*

Crop production-related information came second in the ranking order with an average SINI of 69.9. This category included six information dimensions, of which four dimensions recorded SINIs above the category average. Information related to pests and diseases came first in the category with high SINI value of 88.0 (second in the overall ranking). The findings further revealed that information related to agro-waste management, soil fertility management, the safe use of agrochemicals, other agronomic practices, and post-harvest technology came second, third, fourth, fifth and sixth, respectively, within this category. At present, Sri Lanka is concerned about a chronic kidney disease of unknown etiology (CKDu) spreading mainly across farming communities. According to Jayathilake et al. (2013), the age-standardized prevalence of CKDu among farming communities in North Central and Uva Province (that covered the entire study area) was 12.9% in males and 16.9% in females. It has been argued that agrochemicals are the main cause of this disease, due to their excessive, unsafe use and disposal. In backdrop, these findings speak for themselves, in the sense that vegetable farmers are increasingly looking for information related to the safe use of agrochemicals and effective soil fertility management practices.

The category of information needs relating to the environment, climate, and policies came third in the ranking order (avg. SINI 59.2). In this category, information related to occupational health came first (11 in the overall ranking), while information related to climate change, natural disasters, eco-friendly farming, and information on policies and regulations came second, third, fourth and fifth, respectively. These findings also indicate that the respondent farmers may be increasingly looking for information on the environment, climate and policies partly because of the undermentioned disease prevalence and partly because of the recent experience of climate change

and natural disasters.

The category regarding new technology-related information was ranked fourth (avg. SINI 58.7) which was marginally beaten out of third place. This indicates that vegetable farmers are continuing to look for new technologies in order to improve the productivity and profits. Furthermore, vegetable farmers have given the least priority to information related to training and development programs (ranked fifth with avg. SINI 49.5). That said, government technical training programs have received exceptional levels of interest (average SINI of 66.5, i.e., 14th out of 24 places), indicating that the vegetable farmers are enthusiastically looking for these programs to enhance their technical skills.

Findings of this study with respect to the farmers' information needs are broadly in agreement with studies carried out in developing countries (e.g., Kumar 2014; Kabir et al. 2014; Elly & Silayo 2013 and Lokanathan & Kapugama 2012) given the fact that information needs are context specific. Typically, agricultural information sources and channels largely carry information related to agronomy and technology, but relatively less information on marketing, the environment, climate, occupational diseases, etc. The above findings accentuate the need to provide information relating to marketing, the environment, climate and occupational health to farmers with a sense of urgency. Furthermore, these findings exemplify the dynamic nature of vegetable farmers' information needs. Therefore, exploring these needs on a regular basis is vital if existing information systems are to be updated and new agricultural information systems are to be designed.

4.4 Information Sources Used by the Vegetable Farmers

Table 4 shows that the category comprised of personal and social information sources was ranked in the first position with an average STIS of 66.7, which is exceptionally higher than the second in the list. There were five information sources in the personal and social category. According to the findings, self-experience was ranked first within the category (also in the overall ranking), while successful farmers, neighbouring farmers, family members and farmers' societies were ranked second, third, fourth and fifth, respectively. These observations reiterated the fact that developing world farmers continue to trust and rely greatly upon personal and traditional sources when accessing information to inform their farming activities (e.g., Elly & Silayo 2013; Lokanathan & Kapugama, 2012; Aziagba & Okede 2011; Okwu & Daudu 2011 and Gunawardana & Sharma 2007).

The category of market-based information sources, which was ranked in second place (average STIS of 32.5), consisted of four sources: chemical company agents, agro-chemical traders, collectors/buyers and informal credit sources. The inclination among vegetable farmers to use these market-based information sources indicates the dependency of farmers on intermediaries, particularly when accessing market information. Studies of Kabir et al. (2014), Elly and Silayo (2013) and Lokanathan & Kapugama (2012) have also made similar observations in developing world agriculture.

The category of professional and technical sources of information was third in the ranking order (average STIS of 28.6). This category included eight sources, out of which, government training centres (overall rank: fifth place), government information centres (overall rank: eight place), government extension officers and agricultural publications exhibited a relatively high significance, while private extension and agri-exhibitions/seminars were of medium significance and government circulars and banks were of low significance. Similar observations, especially with respect to extension officers, have been made by Lokanathan & Kapugama (2012), Aziagba & Okede (2011) and Gunawardana & Sharma (2007). Findings of this study suggest that, when it comes to professional and technical information/knowledge, vegetable farmers are likely to have a greater preference for government interventions.

Despite significant advancements in mass media and telecommunication sector in the country, the findings revealed that vegetable farmers have the least preference for mass media sources (average STIS of 25.8) when seeking to acquire agricultural information. Lokanathan & Kapugama (2012) also revealed that the use of mass media as an agricultural information source was quite low among Sri Lankan farmers. However, among the mass media sources, television enjoys a remarkably high level of significance (overall rank: seventh place) over newspapers and the radio. But, there is a very low preference placed on modern mass media sources, such as mobile agri-information services (overall rank: 19th place) and the Internet (overall rank: 22nd place). Studies of Kabir et al. (2014), De Silva & Rathnadiwakara (2010) and Boz & Ozcatalbas (2010) also revealed that small scale farmers in developing countries displayed a low preference on modern media particularly over the internet in accessing agriculture information.

4.5 Communication Channels Used by the Vegetable Farmers

According to the findings presented in Table 5, the category of interpersonal channels was ranked first (average

SCUI of 48.2), suggesting that vegetable farmers frequently and confidently use interpersonal channels to access sources/information. Similar observations have been made in many studies carried out in developing countries (e.g. Kabir et al. 2014; Elly & Silayo 2013; Lokanathan & Kapugama 2012 and Okwu & Daudu 2011).

Table 4. Scores and Ranks of Information Sources (n=289)

	Information sources	STIS	Rank
1	Self-experience	82.1	1
2	Successful farmers	77.6	2
3	Neighbouring farmers	74.9	3
4	Family members	60.4	4
5	Farmer societies	38.5	9
Personal and social (average of 1+2+3+4+5)		*66.7*	*1*
6	Agro-company agents	50.6	6
7	Agro-chemical traders	37.9	10
8	Collectors and buyers	23.1	16
9	Informal credit sources	17.8	18
Market-based sources (average of 6+7+8+9)		*32.5*	*2*
10	Government training centres	54.6	5
11	Government information centres	39.7	8
12	Government extension officers	34.0	11
13	Agriculture publications	30.0	13
14	Private extension	26.6	15
15	Exhibitions/seminars	22.8	17
16	Government circulars	11.0	20
17	Banks	10.1	21
Professional/technical (average10+ 11+12+13+14+15+16+17)		*28.6*	*3*
18	Television	47.7	7
19	Newspapers	33.2	12
20	Radio	27.2	14
21	Mobile agri-information service	15.1	19
22	Internet	5.9	22
Mass media sources (average of 18+19+20+21+22)		*25.8*	*4*

Table 5. Scores and Ranks of Communication Channels

	Communication channel	SCUI	Rank
1	Discussing with family	70.7	1
2	Attending trainings	34.2	6
3	Visiting people/places	39.9	4
Interpersonal (average of 1+2+3)		*48.2*	*1*
4	Television	58.5	2
5	Radio	22.1	8
6	Telephone	45.4	3
Mass- electronic media (average of 4+5+6)		*42.0*	*2*
7	Agri-publications	38.4	5
8	Newspapers	27.8	7
Mass - print media (average of 7+8)		*33.1*	*3*
9	Mobile AIS	8.7	9
10	Browsing internet	4.2	10
11	Emails	2.7	11
Mass- modern media (average of 9+10+11)		*5.2*	*4*

In the analysis, mass media channels were considered under three categories; electronic media channels, print media channels, and modern media channels. As for the findings, electronic mass media channels were ranked second, with an average SCUI of 42. However, the television and telephone, which were considered under this category, became second and third, respectively in the overall ranking by demonstrating their excessive use. The study of Adikari (2014) also found that television as the most preferred mass media channel of Sri Lankan farmers. Print mass media channels became third (average SCUI of 33.1) in the ranking order, indicating their relatively limited significance in disseminating agricultural information to vegetable farmers and Adikari (2014) also made a similar observation. Meanwhile, modern mass media channels turned out to be the last in the ranking order, with a very low SCUI of 5.2. Accordingly, the use of mobile-mediated agricultural information systems, the Internet, and email in accessing agricultural information within the present context was remarkably low.

Thus, despite the increased availability of modern means of communication in the country, this study revealed that the vegetable farmers in Sri Lanka continue to be relied more on the traditional information sources and channels. Studies of Kabir et al. (2014), De Silva & Rathnadiwakara (2010) and Boz & Ozcatalbas (2010) have also revealed the same tendency in the developing world agriculture.

4.6 Selection of Information Sources and Channels by the Vegetable Farmers

According to the findings presented in Table 6, information specificity (4.81), localized information (4.74), credible information (4.62) and information on local languages (4.60) were identified as the first four important criteria in selecting sources/channels by the respondent farmers. These four criteria are very much connected to the contents of information. The design related features such as accessibility (4.54), updating (4.50), ability to feedback (4.23), ease of use (3.44) and ability to store and reuse information (3.04) were ranked at fifth, sixth, seventh, ninth and tenth position respectively, while cost (3.44) was ranked at the eighth position. Overall, the findings show that the respondent farmers are concerned much on the contents of information than that of the design related features of the sources/channels. Thus, these empirical findings support the view of McCown (2002) who stressed that in designing information systems, the emphasis should be placed less on design and more on learning what the farmers need and how they act.

Table 6. Selection Scores for Information Sources/Channels

	Selection criteria	Mean scores
1	Specific information	4.81
2	Localized information	4.74
3	Credibility	4.62
4	Local languages	4.60
5	Accessibility	4.54
6	Up-to-date	4.50
7	Ability to feedback	4.23
8	Cost	3.93
9	Ease of use	3.44
10	Ability to store and reuse	3.04

5. Conclusions

It can be concluded from the findings of this that the respondent farmers have a medium to a high level of information needs. Moreover, market-related information was found to be the most felt information need among the vegetable farmers, followed by information related to crop production, the environment, climate, and policies, new technologies and training, and development, respectively. With regards to the information sources, the vegetable farmers display an increased preference for the personal and social information sources, followed by the market-based information sources and professional/technical sources while the least preference on the mass media sources. When it comes to information channels, the vegetable farmers have a higher preference for the interpersonal channels than that of mass media channels. Of mass media channels, the vegetable farmers use electronic and print media channels to a certain extent, but the use of modern mass media channels, such as mobile agri-information services, the Internet and, email is remarkably low. The study further revealed that, when selecting information sources/channels, the vegetable farmers place more attention on the contents of information than that of the design aspects of the information sources/channels.

Findings of this study will inform the policymakers, information systems/ applications designers, and researchers. Thus, the findings on farmers' information needs and seeking patterns will be useful to the relevant agriculture institutions of the country for recognizing, generating and disseminating of agricultural information among vegetable farmers. Moreover, the study findings will provide useful design insights (e.g., what information needed, what sources and channels used and how they are selected, etc.) to the information systems and applications designers to come up with usable solutions to cater to the information demand of farmers. Furthermore, this study will help and stimulate studies on information needs and information-seeking patterns among farmers in developing countries.

References

1. Adikari, M.P. (2014). Usage of mass media by farmers in Sri Lanka. *Developing Country Studies,* 4(4), 2-5.
2. Ania, L.O. (1990). The Provision of Agricultural Information to Farmers and Extension Advisers in Africa: The Catalyst for Increased Agricultural Production, Budapesi. 28-31 May, 1990. *8th World Congress of International Association of Agricultural Librarians and Documentalists*, Hungary.
3. Aubert, B.A., Schroeder, A. & Grimaudo, J. (2012). IT as enabler of sustainable farming: An empirical analysis of farmers' adoption decision of precision agriculture technology. *Decision Support Systems,* 54 (1), 510–520.
4. Aziagba, P.C. & Okede, G.W. (2011). Information seeking behaviour of cassava farmers in Upata Clan, Ekpeye community of rivers state, Nigeria. *Journal of Research in Education and Society,* 2 (3),1-7.
5. Boz, I. &Ozcatalbas, O. (2010). Determining information sources used by crop producers: a case study of Gaziantep province in Turkey. *African Journal of Agricultural Research,* 5(10), 980–987.
6. Demiryurek, K. (2010). Information systems and communication networks for agriculture and rural people. *Agricultural Economics–Czech,* 56(5), 209–214.
7. De Silva, H. & Rathnadiwakara, D. (2010). ICT policy for agriculture based on a transaction cost approach: some lessons from Sri Lanka. *International Journal of ICT research and Development in Africa,* 1 (1): 51–64.

8. Dhayal, B.L., Khan, I.M. & Jangid, M.K. (2013). Analysis of information seeking behaviour of the Ber growers. *Indian Research Journal of Extension Education*, 13(2).

9. Dissanayake, U. & Wanigasundera, W.A.D.P. (2014). Mobile based information communication interactions among major agriculture stakeholders: Sri Lankan experience. *The Electronic Journal on Information Systems in Developing Countries*. 60 (1):1-12.

10. Elly, T. & Silayo, E.E. (2013). Agriculture information needs and sources of the rural farmers in Tanzania. *Library review,* 62: 547-566.

11. Gunawardana, A.M.A.P.G & Sharma, V. (2007). Preferential Information Sources of Farmers in Udaipur District of Rajasthan, India on Improved Farm Practices. *Tropical Agricultural Research,* 18.

12. Jayathilake, N., Mendis, S., Maheepala, P. &Mehta, F.R. 2013. Chronic kidney disease of uncertain aetiology: prevalence and causative factors in a developing country. *BMC Nephrology*, 14.

13. Johnson, C.M., Johnson, T.R. & Zhang, J.A. (2005). User-centered framework for redesigning health care interfaces. *Journal of biomedical informatics,* 38,75-87.

14. Kabir, K.H., Roy, D., Sarker, A. & Kuri, S.K.(2014). Information Seeking Behaviour of the Farmers to Ensure Sustainable Agriculture. *European Academic Research*, II (3), 3723–3734.

15. Kalusopa, T. (2005). The challenges of utilizing information communication technologies for the small-scale farmers in Zambia. *Library hi tech*, 23 (3), 414-424.

16. Kaniki, A.M. (2001). Community profiling and needs assessment. In C. Stilwell, A. Leach and S. Burton (Eds.) *Knowledge, information, and development: an African perspective*. University of KwaZulu-Natal, Pietermaritzburg, 187- 199.

17. Kavithaa, N.V., Rajkumar, N.V. & Lakshmi, C.M.S. (2014). Information seeking behaviour of dairy farmers. *International Journal of Science, Environment and Technology,* 3(4), 1502–1506.

18. Kughur, P.G., Daudu, S. & Akua, E.M. (2014). Different sources of information on adoption behaviour of farmers in Logo local area Government of Benue State, Nigeria. *Asian Journal of Biological and Life Sciences,* 3(2),133–136.

19. Kumar, M. (2014). Information Seeking Behaviour of the Farmers in Unchahar - Raebareli, Uttar Pradesh: A Survey. *Global Research Analysis*, 3 (3),74-76.

20. Llewellyn, R.S. (2007). Information quality and effectiveness for more rapid adoption decision by farmers. *Field Crop Research*, 104,148-156.

21. Lokanathan, S. & Kapugama, N. (2012). *Smallholders and micro-enterprises in agriculture: Information needs and communication patterns.* LIRNE Asia, Colombo, Sri Lanka,1-48.

22. Marchionini, G. (1995). *Information seeking in electronic environments*. Cambridge University Press, Cambridge.

23. McCown, R.L. (2002). Changing systems for supporting farmers' decisions: Problems, paradigms, and prospects. *Agricultural Systems,* 74,179–220.

24. Okwu, O.J. & Daudu, S. (2011). Extension communication channels' usage and preference by farmers in Benue State, Nigeria. *Journal of Agricultural Extension and Rural Development*, 3(5), 88–94.

25. Ozowa, V.N. (1995). The nature of agricultural information needs of small scale farmers in Africa: the Nigerian example. *Quarterly Bulletin of the International Association of Agricultural Information Specialists*, 50(1),15-20.

26. Pavitrani, A.D.S., Cooray, K.K.H., Sivatharshini, S. & Ekanayake, Y. (2011). *The effectiveness of existing ICT modules in addressing issues of Farming community in Sri Lanka: Empirical Study*, 2011. National Information Technology Conference, Colombo, Sri Lanka,44-46.

27. Savolainen, R. & Kari, J. (2004). Placing the Internet in information source horizons: A study of information seeking by Internet users in the context of self-development. Library and Information Science Research. 26,415– 433.

28. Walisadeera, A.I., Ginige, A. & Wikramanayake, G.N. (2015). User-centered ontology for Sri Lankan farmers. *Ecological Informatics,* 26,140–150.

29. White, S.S. and Selfa, T. (2013). Shifting lands: Exploring Kansas farmer decision-making in an era of climate change and biofuels production. *Environmental Management*, 51, 379–391.

30. Wilson, T.D. (1999). Models in information behaviour research. *Journal of Documentation*, 55(3), 249–270.

First Author - M.G.P.P. Mahindarathne is a doctoral candidate at Faculty of Management and Economics, Dalian University of Technology, China. He holds Bachelor of Science degree and Master of Business Administration degree from University of Peradeniya, Sri Lanka. His research interests include information management, technology management, innovation management and value addition to agriculture resources. He is a mid-career researcher who have published several papers in Journal of Documentation, Journal of International Food & Agribusiness Marketing, International Journal of Research in Commerce & Management and also in some Sri Lankan academic journals and proceedings.