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Information and Communication Technology Roles in Agricultural Value Chain Promotion Among Peri-Urban Women Farmers in Imo State, Nigeria

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Abstract

Farmers do not make/maximize profits when they stop at the production level only. To make more profits, they need to add value to their products. This paper examines the roles of ICTs in promoting agricultural value chain among women farmers who reside in the urban fringes of Imo State. The specific objectives were to identify value chain information needs of women farmers; ascertain ICT devices used by the women farmers and determine perceived roles of ICTs in promoting agricultural value chain. A total of 250 women farmers were randomly selected and interviewed using questionnaire complimented with oral discussion. Date collected were analyzed using descriptive tools such as percentages, mean and standard deviation. Results showed that respondents need agricultural value chain information on production and storage as shown by 98% response, marketing/business development (100%), financial services (98.8%), processing/packaging (88%), transportation/trading/distribution (93.6%). The following information devices/sources played vital roles –radio (84%), mobile phones (100%), television (62%), newspaper/magazines (55.4%), extension agents (49.6%) among others. On the roles of information sources/devices in value chain promotion, ICT device/sources provide information on time of planting, availability of seeds/input, reducing time of business transactions, financial services provision and market prices among roles.

Key words - Agriculture, value chain, information, peri-urban, farmers, ICTs

Introduction

The importance of agriculture as a source of livelihoods cannot be overestimated: half of the world's population works in agriculture and approximately 2 billion people gain their livelihoods from small farms in developing countries(UNDP, 2015; IFAD, 2013; FAO,2009). It is estimated that smallholder farmers provide over 80 percent of the food consumed in sub-Saharan Africa, despite remaining the poorest and most food-insecure people in the world. Increasing the productivity of smallholder farming in a sustainable manner holds great potential for boosting the incomes and securing the livelihoods of smallholders themselves(IFAD, 2013; FAO,2009).

The productivity of agriculture and smallholder farming is far below its potential. This is the result of many challenges facing smallholders and the companies working with them. Smallholder farmers often lack skills and knowledge; have limited access to credit, inputs and market information; and increasingly face climate-related risks, which threaten their yields.The potential benefits of using mobile phones to connect these diverse stakeholders along the agricultural value chain speak for themselves. For rural populations, geographically dispersed and isolated from knowledge centers, the information and communication capabilities of the mobile phone can be even more valuable. Close to 6 billion phones are in use today and are accessible to the 70 percent or so of the world's poor whose main source of income and employment comes from the agricultural sector (World Bank 2012).

The above situation shows that market access is one of the most important factors influencing the performance of smallholder agriculture in developing countries, and in particular least developed countries (Barrett, 2008). Access to new and better-paying markets for agricultural products is vital in enhancing and diversifying the livelihoods of poor subsistence or semi-subsistence farmers (Barrett, 2008). Such markets can be local (including village markets), catering for the local populations, regional markets that serve regional consumers in counties/districts/provinces within one country or between countries, and international/export markets in both developed and developing countries.

Smallholder producers form the majority of both the total and rural poor in many developing countries, especially Africa. Most smallholder farmers are engaged in subsistence and semi-subsistence agriculture with low productivity, low marketable surplus (hence low

returns) and low investment, a situation described as low equilibrium poverty trap (Barrett & Swallow, 2006; Barrett, 2008). Enhancing returns from agricultural production through improved access to markets can therefore be a vital element of poverty alleviation strategy and livelihood improvement in these countries. Improved market access results in commercialization of agriculture, which has short, medium, and long-term benefits to farmers. In the short term, market access can result in the production of marketable surplus and hence gains in income from agriculture. In the medium to long-run, the surplus from improved market access can result in higher revenues, savings and hence investment in productivity enhancing technologies. The effect of market access for smallholder farmers is even greater for high-value commodities (i.e., non-traditional, non-staple crops such as high-value fruits and vegetables and organic products). Access to markets for high value commodities has multiple benefits to smallholder producers (Okello, 2005; Okello & Swinton, 2007). Such benefits include direct income for smallholder producers and the indirect impacts at both the household and community levels in terms of employment.

Despite its importance, market access in many developing countries remains severely constrained by poor access to agricultural and market information. Poor access to market information results in information-related problems namely moral hazard and adverse selection which in turn increase transaction costs and hence discourage participation in the market by some farmers (Omamo, 1998; Fafchamps & Hill, 2005; Shiferaw, Obare & Muricho, 2009). Recent attempts to resolve the problem of poor access to better performing markets by smallholder farmers have thus focused on promoting information transfer through ICT-based innovations (Tollens, 2006; Aker, 2008). These innovations include mobile telephony, internet/web-based means, and interactive video and CD-ROM programs as well as older ICT-based technologies namely the radio and television (Munyua, 2007). The promotion of these mostly new generation ICT tools especially the mobile phones stems from its rapid penetration in Africa and increased ownership by rural households (Okello *et al*.,2010).

The increased focus on modern ICT-based methods of information provision comes from the realization that they can play a major role in i) communicating knowledge and information to rural farmers, ii) delivering education and training modules to farmers at low cost, iii) improving smallholder farmers' access to markets and agricultural credit, iv) empowering farmers to

negotiate better prices, and v) facilitating and strengthening networking among smallholder farmers especially women farmers.

ICTs can be a powerful tool to empower women. Women empowerment is a current global issue and discussion on women right is at the forefront of many formal and informal campaigns worldwide. The first state of women empowerment is women awakening to the facts of their existence. The concept of women empowerment throughout the world has its root in women's movement (Sharma and Maheshwari, 2015). Empowerment is a process that enables women to gain access to and control of material – intellectual and human resources. Empowerment is the redistribution of power that challenges patriarchal ideology and male dominance.

Despite the great enthusiasm by development agencies in promoting the application of ICT tools in transferring agricultural information to farmers, little is known about the use of these tools for agricultural value chain promotion and transactions among women farmers in peri-urban areas of Imo State. This study examines the agricultural value chain information needs of peri-urban women farmers; information technology tools/devices available to them and ICT roles in promoting agricultural value chain in Imo State, Nigeria.

Brief literature on agricultural value chain and peri-urban

Value chains are relationships where actors are linked in production, processing and distribution to make available a final product for consumption (Methu, Nyangaga, Waweru, Akishule ,2013). Value chain structures are important because they help system actors (including the poor) exploit markets through specialization, comparative and competitive advantage, economies of scale as well as dynamic technological, organizational and institutional changes. In essence, value chains consist of business actors directly related. These include providers of raw materials (input suppliers) who serve producers (farmers in agricultural systems), who in turn deliver their products to processors, distributors, and wholesalers and retailers who finally sell to the ultimate consumers (Methu, Nyangaga, Waweru, Akishule, 2013). Value chain functions are performed by business actors with each having objectives focusing on maximum returns or benefit, that is, to get the highest possible value for their function. This is sometimes referred to as earning the highest possible rent for their contribution to the chain.

An agricultural value chain is usually defined by a particular finished product or closely

related products and includes all firms and their activities engaged in input supply, production, transport, processing and marketing (or distribution) of the product or products. Kaplinsky (2000) defines the value chain as 'the full range of activities which are required to bring a product or service from conception, through the intermediary phases of production, delivery to final consumers, and final disposal after use. An agricultural value chain can, therefore, be considered as an economic unit of analysis of a particular commodity (e.g. milk) or group of commodities (e.g. dairy) that encompasses a meaningful grouping of economic activities that are linked vertically by market relationships. The emphasis is on the relationships between networks of input suppliers, producers, traders, processors and distributors (UNCTAD 2000).

Peri-urban agriculture, as used here, refers to farm units close to town which operate intensive semi- or fully commercial farms to grow vegetables and other horticulture, raise chickens and other livestock, and produce milk and eggs (FAO,2015). Urban and peri-urban agriculture occurs within and surrounding the boundaries of cities throughout the world and includes products from crop and livestock agriculture, fisheries and forestry in the urban and peri-urban area. It also includes non-wood forest products, as well as ecological services provided by agriculture, fisheries and forestry. Often multiple farming and gardening systems exist in and near a single city. According to Iaquinta and Drescher,(2000) peri-urban agriculture is generally defined as agriculture undertaken in places on the fringes of urban areas.

The Food and Agriculture Organization of the United Nations (FAO (2015) defines peri-urban agriculture as "agriculture practices within and around cities which compete for resources (land, water, energy, labour) that could also serve other purposes to satisfy the requirements of the urban population. It encompasses the cultivation of crops and rearing of animals for food and other uses within and surrounding the boundaries of cities, including fisheries and forestry. It comprehends a multifunctional of food production activities, as well as herbs, medicinal and ornamental plants for both home consumption and for the market. It contributes to fresh food availability of the urban dwellers, as well as to the greening of the cities and the productive reuse of urban waste (European Parliamentary Research Services,(EPRS) 2014). In developed countries, urban and peri-urban agriculture is recognized for this provision of local food, as well as recreational, educational and social services. In developing countries, urban and peri-urban agriculture provides income and employment and contributes to local economic development, poverty alleviation and the social inclusion of the urban poor and women. This type of

agriculture mostly remains an informal sector that is not well integrated into agricultural policies or urban planning.

Methodology

The study was carried out in Imo state. Imo State lies within latitudes 4°45'N and 7°15'N, and longitude 6°50'E and 7°25'E with an area of around 5,100 sq km (IMSG, 2010). It is bordered by Abia State on the East, by the River Niger and Delta State on the west, by Anambra State to the north and Rivers State to the South. The state is rich in natural resources including crude oil, natural gas and others (IMSG, 2010). However with a high population density and over farming the soil has been degraded and much of the native vegetation has disappeared. This deforestation has triggered soil erosion which is compounded by heavy seasonal rainfall that has led to the destruction of houses and roads. The rainy season begins in April and lasts until October with annual rainfall varying from 1,500mm to 2,200mm (60 to 80 inches). An average annual temperature above 20 °C (68.0 °F) creates an annual relative humidity of 75% with humidity reaching 90% in the rainy season.

The estimated population is 4.8 million and the population density varies from 230-1,400 people per square kilometer. The population for the study comprised all the peri - urban women farmers in the three agricultural zones, Owerri, Orlu and Okigwe in the State (peri – urban here refers to the adjourning local area councils, undergoing transition to urban, inhabiting the fringe of the urban council and supplying food to the urban market). Purposive sampling technique was used in selecting respondents for the study. The peri-urban areas includes Avu, Obinze, Nekede, Umuguma, Egbeada, Naze, Umuobaa and Ihiagwa. A list of all peri-urban women farmers who are registered with various cooperatives was obtained from the resident extension workers for the surrounding areas. From the list totaling 2500 women farmers, a simple size of 250 women farmers representing 10% was randomly sampled to provide information for the study. Data were collected using structured questionnaire. Objectives 1 and 2 were analyzed descriptively using percentages presented in tables. Objective 3 was achieved on a 4 point likert scale type of strongly agree, agree, strongly disagree and disagree assigned scores of 4,3,2,and 1. The scores were added and divided by 4 to give 2.50. Any mean score of 2.50 and above was accepted as ICTs roles.

Results and Discussion

Agricultural value chain Information needs of Respondents

Table 1 showed that producers need vital agricultural value chain information which helps identify entry points to support resources poor actors in the production, processing and marketing of their agricultural products. The information includes **production and storage services with a multiple response of 98.8%**. Production and storage services include input supply, genetic and production hardware from research, farm machinery services and supply, extension services, weather forecast, storage infrastructure, etc. Another information area is **marketing/business development (100%),** which involves market information, market intelligence, technical and business training, facilitating linkages of producers with buyers, organization and support for collective marketing. Others were **infrastructure services (84.4%),** involving market place development, roads and transportation, communication, energy supply, water supply; **financial services (98.8%),** which entails supporting access to credit and other financial services (banking, accounting, etc.) such as savings, risk insurance; **policy and regulatory services (75.6%)**, which ensures that the environment institutes rules and regulations that are supportive of poor actors property rights, market and trade regulations; **input supply and technical assistance (69.6%),** here we have quality of inputs, acquisition at favourable prices; training: building, building and providing capacity; **sorting and grading services (65.6%)**, food sorting and grading involves the inspection, assessment and sorting of various foods regarding quality, freshness, legal conformity and market value. Food grading often occurs by hand, in which foods are assessed and sorted. Machinery is also used to grade foods, and may involve sorting products by size, shape and quality; **processing/packaging (88%),** packaging is the science, art and technology of enclosing or protecting products for distribution, storage, sale, and use. Packaging also refers to "the process of design, evaluation, and production of packages; and **transportation/trading/distribution(93.6%),** products move from farm to production site and processing areas till it gets to the market and final consumers.

Table 1 Agricultural Value Chain Information Needs of Respondents

Information Needs	Frequency	Percentage
Production and storage services	245	98.0
Marketing and business development	250	100
Infrastructure services	214	84.4
Financial services	247	98.8
Policy and regulatory services	189	75.6
Input supply & technical assistance	174	69.6
Sorting and grading services	164	65.6
Processing/packaging	220	88.0
Transportation/trading /distribution	234	93.6

Field survey data, 2017

Information Devices/source used for agricultural value chain promotion.

Table 2 showed that many information services devices/sources are available for promotion of agricultural value chain in the study area. They are mobile phones (100%), radio (84%), television (62%), newspaper/Magazine (56.4%), other farmers/relatives (44%), extension agents (49.6%), input suppliers (32%), seed companies (26%), smart phones (14.8%) global positioning system (GPS) (3.2%), talking book (4%), handheld video/digital camera(10%) and tablets (19.6%). The above shows that most farmers have access to a variety of information sources that they consult for regular agricultural information, even though these may not be the most up-to-date, accurate or beneficial sources. Many farmers do not have a single channel that serves as a comprehensive source for all their information needs. The most common sources are still TV, radio, newspapers, other farmers, government agricultural extension services, traders, input dealers, seed companies and relatives.

Radio can act as an information and knowledge broker. This means that radio stations can pass on information about value chains to their listeners. Radio can help farmers understand the benefits of upgrading their involvement in the value chain. Radio can also pass along information about effective and innovative ways to be involved in value chains. Radio can advertise marketing opportunities or contract opportunities that could help small-scale farmers. Radio can publicize success stories, and help farmers understand the benefits of linking with other firms and businesses in the value chain. Radio can also provide a way for different actors in the value chain to interact. One of the major challenges in value chains is the lack of dialogue and understanding between different actors. Radio offers the opportunity for farmers to discuss

issues with processors, traders, policy makers, and other actors. This opportunity not only gives voice to farmers but also empowers them as key actors in the value chain.

Singh *et al* (2015a; 2015b) reported that Agriculture Information System (AIS) is a computer based information system which contains all the interrelated information which could really help farmers in managing information and policy decision making. The ICT devices that help facilitating farming activities encompassed applications like radio, television, cellular phones, computers, tablets and networking, hardware and software, satellite systems (Munyua and Adera 2009; Pande and Deshmukh 2015). In the same way, (Yimer, 2015; Munyua and Adera 2009) reported that radio is extensively used to inform users on agricultural topics, including new and upgraded farming techniques, production management, and market information..

Table 2: Information services devices/sources for agriculture value chain

Information Tools	Frequency	Percentage
Radio	210	84.0
Television	155	62.0
Newspaper	141	56.4
Mobile phones	250	100
Other farmers/relatives	110	44.0
Extension agents	144	49.6
Input supplies	80	32.0
Seed companies	65	26.0
Smart phones	37	14.8
Global positioning system (GPS)	8	3.2
Talking book	10	4.0
Handheld video/digital camera	25	10.0
Tablet	49	19.6

Field survey data, 2017.

Roles of Information services devices/ sources in agricultural value chain promotion.

Information devices and sources offer a growing number of ways to exploit opportunities for agricultural value chain growth and competitiveness. Table 3 showed how ICT devices/sources are doing these. ICT tools/devices provide information about time of planting to the producer with a mean (M)score of 2.53, source and availability of seed/inputs (M=2.60) and availability of pesticides for pests/diseases treatment (M=2.84). These are production specific practices which begins the agricultural value chain process functions. Devices like mobile phones are used to

inquire about time of planting, where to purchase seeds, and farm input and during mid season of planting, mobile phones are used to inquire about pesticide availability. The ability to access agronomical and market information remains one of the key constraints to farmers. ICT solutions can overcome this challenge by ensuring that large numbers of farmers get information about agricultural practices to increase skills and adoption rates, and/or provide access to current market information, thus reducing information asymmetry and bypassing intermediaries. Some of the most common knowledge and information transfer uses include: market demand and price information; weather, pest, and risk-management information; and best practices to improve agricultural efficiency and meet quality and certification standards.

Oral Interview with farmers revealed that farmers used mobile phones to call other farmers and extension agents to enquire about general information on new agricultural practices, crop varieties and disease. Farmers also use mobile phones to get specific technical information on how to treat a plant disease, describe disease. Farmers also use mobile phones to get specific technical information on how to treat a plant disease, describe disease symptoms and receive advice over the phone.

Other areas of information on agricultural value chain includes improving the functioning of producer groups(M=3.01), reducing time of transactions (M=2.52), prevailing market prices of agricultural commodities (M=2.60), negotiating and sale of farm produce at good time and price (M=2.59), market demand and better prices realization (M=3.60), and finding new buyers of produce (M=3.10). These are value chain market services for improved income, better sales and economic empowerment of produces and actors along the value chain process. Market access ICT services comprise any service that provides beneficiaries, especially farmers, with access to information on pricing of agricultural products (inputs and outputs) and on finding and connecting to suppliers, buyers or logistics providers, such as storage facilities and transport companies (FAO,2013). Such services include simple pricing services, virtual trading floors (matching services or full commodity exchanges) and holistic trading services. Market access services also cover ICT solutions that help the typically larger upstream and downstream firms, such as processors or exporters, to manage their operations and the quality of their produce better – here called downstream administration

Farmers agreed that they used mobile phones to send and receive payment from buyers. Calls are made to middlemen to inquire about market prices and other calls are made to customers, buyers/transporters. By calling fellow farmers and relatives in the network area, farmers can connect with buyers and other actors to sell their products in a timely manner and gain information to improve their farming business. All of these make them get better bargaining power and sell at good times where they will make more profits. Mobile phones use identifies additional buyers and having multiples buyers available is advantageous to producer. New buyers are willing to pay a higher price, may wish to buy higher volumes of product and may offer other terms of trade favorable to the producer.

Other areas of agricultural value chain promotion were co-coordinating transportion of produce (M=3.29), this helps to deliver/distribute goods at the right time, better ability to produce and compliance with safety rules control of produces and protect actors from market disruptions and danger. Reduction of transaction and information cost (M=2.86) are reduced by use of information devices. Rather than having to walk miles to a local market to meet a trader, farmers can make a voice call to establish whether price and quantities demanded for a product that day are worth the travel effort.

Another important aspect of the value chain process is financial services provisioning and account recording with a mean score of 3.07. With the use of mobile phones and other ICT devices, farmers can now access financial services from their location uninterrupted. FAO (2013) said that the primary types of financial services offered through ICT solutions for value chains are transfers and payments, credit, savings, insurance and financial derivatives. ICT can help improve rural communities' access primarily by convincing financial institutions to enter potential rural markets through unconventional methods. These methods typically involve a reduced need for high-cost branches, improved productivity of the staff in place, and a cost model that generally emphasizes variable costs by paying agents on the basis of transaction volumes instead of salaries. Informal financial services, such as savings groups, often meet two critical needs of the rural poor: convenience (e.g., door-step service), and flexibility (e.g., ability to save and withdraw small amounts). However, these informal services typically lack another key criterion – security. Security is where formal financial institutions generally excel. So ICT

enhancements for financial inclusion services can either entail making informal providers more secure or making formal players more convenient and flexible.

Table 3: Roles of Information tools for Agricultural value chain promotion

Roles of information tools	Mean	SD
Provision of information about :		
Time of planting	2.53	0.506
Source and availability of seeds/inputs	2.60	0.496
Availability of pesticides for pests/diseases control	2.84	0.987
Improving the functioning of producer groups	3.01	0.860
Reducing time of business transactions	2.52	0.647
Prevailing market prices of agricultural commodities	2.60	0.490
Negotiating and sale of farm produce at good prices	2.59	0.487
Market demand and price realization	3.60	0.667
Finding new buyers	3.10	0.514
Coordinating transport/deliver goods at good times	3.29	0.760
Reducing transaction and information costs	2.86	1.020
Better traceability of produce/compliance with safety/quality	2.84	0.931
Financial services/Recording financial accounts	3.07	0.960

Field survey data, 2017. Mean 2.50 and above accepted

Conclusion

A well informed farmer/producer makes sound business decision for profit maximization. Information is important in the agricultural business marketing and value chain process. Famers need information on production/storage, marketing/business development, financial services and distribution. Mobile phones and other ICT tools are very useful is agricultural value chain promotion. ICTs provide timely information on the farming such as time of planting and other agronomic services. It provides information on market access and financial services opportunities.

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