

Description Of Agricultural Economic Development And Poverty Alleviation Through The Use Of Information And Communication Technology

Hariki Fitrah^{a*}, Helmi^b, Hana Mauludea^c, ^aDepartment Geography Education, Faculty of Teaching and Educational Sciences, Al Muslim University, Aceh, Indonesia ^bDepartment of Physics Education, FTK Universitas Islam Negeri Mataram, Mataram, Indonesia, ^cDepartment of Historical Education, Faculty of Education and Social Science, Teacher Training, and Education, Institute PGRI Pontianak, Indonesia. Corresponding author: hafith240@gmail.com

Technology has developed rapidly, but its utilization has not been maximized, especially for farmers. This research was conducted to obtain information about farmers' understanding related to the use of ICTs to develop the agricultural economy. In addition, this also relates to poverty alleviation efforts. Based on this research it is expected to be able to obtain opportunities and challenges to find solutions related to the use of ICTs in an effort to develop the economy of farmers and alleviate poverty, especially in Indonesia. This study uses literature studies from several related journals. Based on the results of the study it can be said that ICTs play an important role in assisting farmers, especially in terms of decision making. In addition, ICTs also play a role in deciding when to plant and harvest. ICT services have also increased the productive capacity of farmers so that they can reduce poverty. In Indonesia, ICT facilities cannot be fully utilized by farmers, both for agricultural business development and access to information. This is because their education level is still low. Therefore, it is necessary to involve farmers in the field of extension services, accelerate the provision of telecommunications facilities, and continuously provide support to farmers in improving their businesses.

Key words : *agricultural economics, poverty alleviation, information and communication technology*

Introduction

The Asian Development Bank (2003) explains that Information and Communication Technology (ICT) is a series of activities that utilize electronic facilities for information display, transmission, and processing. ICT is use of technology to assist in obtaining, processing, storing and retrieving, and communicating information (text, numeric, picture, and sound) (Rahman, Abdullah, Haroon, and Tooheen, 2013). ICT can be used to connect information technology

devices (such as computers) with communication technology (such as telephones) and telecommunications networks (Greenidge, 2003). In its development, ICT has taken a broader dimension which includes many media such as television, telephone, video, radio, fax, telex, voice information systems, internet, and computers (Adeniyi, 2010). ICT plays a role as an enabler in socio-cultural transformation in various aspects of community life and is a major driver of community economic growth. ICT will assist in efforts to open up the isolation of rural areas to market information, capital, agricultural innovation, and other supporting facilities and infrastructure. ICTs facilitate (a) information dissemination and access to information that has added value; (B) the process of sharing knowledge; (c) skills, capacity and competency development; (d) development of communication networks; and (e) agricultural and rural economic development (Lawal-Adebowale, and Akeredolu-Ale, 2010). Efforts to develop Indonesia from the periphery and increase economic competitiveness, as well as efforts to empower people in rural areas must be accelerated through the use of ICTs.

ICT can be a solution for farmers' problems in accessing various sources of relevant, affordable and reliable information (Madukwe, 2006). ICT facilitates the delivery of counseling on time by utilizing the speed of electronic processing, such as storing, transmitting, protecting data, and retrieving information (Madukwe 2006). ICTs can help farmers in the process of making decisions, ownership of agricultural land and leasing agreements, running the economy, and marketing products (Leary and Berge, 2006). ICTs help farmers create and fight agricultural pests and diseases. This, if managed properly, will increase agricultural output, increase income, and alleviate the poverty of farmers (Leary and Berge, 2006).

Most poor people live in rural areas and make a living directly or indirectly from agriculture. Therefore, support for agriculture is a high priority for rural development (Harris, 2002). Poverty is not only an expression of a person's living conditions, but also a state of self-perception and thought in society (Leary and Berge, 2006). Poor people are those who not only do not have resources (material), but also do not have the opportunity to change the resources they have (skills, labor, and physical resources) in the activities of creating value, thus generating other valuable income for their livelihood (McNamara, 2003). Farmers need knowledge and information on various topics, such as agricultural management and production technology, the experience of other farmers, market developments and production inputs, and government policies. ICTs in the agricultural sector that are timely and relevant provide appropriate information to agricultural business households for decision making in agriculture, so that they are effective in increasing productivity, production, and profits (Lawal-Adebowale, and Akeredolu-Ale, 2010).

Information and knowledge are important components of poverty alleviation strategies. ICTs offer easy access to a large amount of information that is useful for the poor (Harris, 2002). Utilization of ICTs in the agricultural sector will be a driver in creating opportunities for agricultural and economic development so that poverty reduction occurs. In addition, the world of agriculture is increasingly dense of knowledge. Access to adequate and timely agricultural innovations supported by other relevant agricultural information can be used as input in the decision-making process for agricultural development. However, the use of ICTs and access to information for the development of the agricultural economy may face a number of challenges because agriculture in Indonesia is controlled by small farmers in rural areas with varied agricultural products and quality and they are mostly in poverty. Small farmers, among others, have limited accessibility to capital, knowledge, market information and agricultural innovations, as well as limitations in land tenure, skills, and bargaining position with the market (Mulyandari, Sumardjo, Panjaitan, and Lubis, 2010).

The low level of farmers' ability to open themselves to a renewal and / or information related to the renewal element also worsens the condition of farmers in making decisions to reject or accept innovation (Mulyandari, Sumardjo, Panjaitan, and Lubis, 2010). In addition, the results of a survey of access and use of ICT by households and individuals in Indonesia in 2014 showed that the majority of ICTs, such as the use of radio and television are still more widely used for entertainment purposes. The internet is also more widely used to access social media. This behavior is almost evenly distributed in every type of work. The use of ICTs for entertainment purposes, the greater the respondents with low education (Ministry of Communication and Information of the Republic of Indonesia, 2015).

Agriculture is a mainstay of the rural economy so it is important to find ways to reduce the poverty situation of farmers in rural areas by addressing all the problems they might face in productive activities. ICTs offer solutions to reduce information gaps by providing information suitable for rural farmers. This study was conducted to obtain information related to the use of ICT by farmers in several developing countries for efforts to develop their economies and reduce poverty. So that solutions can be found to advance agricultural output and resolve poverty, especially in Indonesia.

Research Method

This study uses a literature study method sourced from research results published as journal articles that can be accessed online, including: (1) the role of ICT in efforts to reduce poverty of farmers in Nigeria; (2) poverty alleviation through information and communication technology: Case studies in Nigeria, (3) mobile phones and farmers marketing decision-making processes in Ethiopia; (4) the impact of ICTs on rural socioeconomic conditions in Bangladesh; and (5) the use of ICTs to obtain information for agricultural businesses in Halongonan Regency, Indonesia.

Results and Discussion

The Role of ICT in Farmers Poverty Alleviation Measures in Nigeria

Isife, Nnodim, and Albert (2013) report on the role of ICTs in poverty alleviation of rural farmers in Abia State, Nigeria. Abia State is a geopolitical zone in South East Nigeria, bounded by three agricultural zones Aba, Ohafia and Umuahia. The population in this study consisted of extension workers and farmers in the State of Abia. Farmers were deliberately chosen from two regions (the local government of East Ukwa and North Fillalangwa) from a total of nine regions. At random, ten farmers from each community were selected (a total of 40 farmers) and ten extension workers were also selected so that the number of respondents was fifty surveyed. There are several findings from this research, namely:

- 1) the role of ICTs in rural development and agriculture. The findings of this study indicate that ICT has a role in gaining access to markets that are outside the region directly (52%), predicting weather (50%), developing capacity so that it can reach larger buyers and receive information easily (40%) .
- 2) types of hardware and software available in the region. Respondents believe that the main ICT components that are usually used are television as much as 76%, radio as much as 80%, and GSM phones as much as 70%. Other components are the computer as much as

- 10%, video as much as 16%, DVD / CD as much as 22%; projectors as much as 20% and films as much as 2%. While internet and e-mail services did not get a response.
- 3) the number of uses of ICT in the region. The level of use of ICT by farmers and extension workers has a statistical analysis value of 2.5. The level of use of ICTs include radio with a value of 3.00, televisions with a value of 3.00, GSM phones with a value of 2.80 and SMS messages with a value of 2.80. For the use of computers and projectors, each is rated as low, amounting to 0.70 and 0.60. And for the use of CDs / DVDs and films, the values are 2.40 and 0.50 (low), respectively. For internet and email use there is no response.
 - 4) the effect of ICTs in poverty alleviation among farmers. Respondents think that a) ICT can facilitate easy access to markets outside their area by using online transactions, the value is 64%; b) can negotiate directly with the buyer (without intermediaries), the value is 66%; c) increase their access to markets, the value is 64%; d) increase profits of small farmers, the value is 68%; e) ICTs can facilitate communication between farmers, sellers and buyers, the value is 66%; f) ICTs can facilitate the dissemination of information about market conditions, the value is 62% and the coordination and systematization of agricultural information, the value is 60%.

From this study it can be concluded that a) the existence of ICT hardware and software already exists in the study area (radio, television, cell phones, main telephone and SMS messages); 2) there is an adequate level of use by the community, especially radio, television, GSM phones and SMS; 3) ICTs are used to predict weather, market access, easy communication and effective mobilization; 4) rural farmers can increase productivity, increase negotiation power, and access to the online market.

Furthermore, Abiodun and Sunday (2013) report the results of their study related to poverty alleviation efforts in Nigeria through ICT. Over the past decade, there has been ongoing debate about the role of ICTs in development and in the areas of improving living standards, and poverty alleviation in most countries (Mohammed, 2009). The specific role that ICTs must play in community development depends on financial, administrative, security objectives, and so on (Maung, 2007). Poverty is a huge challenge to be resolved at this time and its alleviation is a necessary condition for sustainable development in developing countries. Having the right information at the right time can help find solutions to the problem of poverty and ICT is one solution.

In this study it was concluded that 1) strong cases could be used to support the use of selective ICTs in poverty alleviation so that the government encourages this sector to cover all aspects of ICT so as to ensure countries are able to use it in fighting poverty; 2) the use of ICTs in efforts to reduce poverty will be more effective if it is embedded and adapted to policies and other resources; 3) national poverty reduction strategies, ownership by local communities, partnerships and broad networks are important keys in reducing poverty; 4) the government must develop a program to make farmers aware of the benefits of ICT and make them aware of how to utilize ICT facilities to the full; and 5) a supportive, practical and affordable environment can make it possible to use ICT so that it can benefit the poor.

Abiodun and Sunday (2013) recommend that the best practice in using ICTs to reduce poverty for the country is to develop the ICT industry and its facilities. The industry can ensure that ICT support facilities are available to support poverty alleviation programs. The active ICT sector is also a powerful driver for positive price communication, supporting poverty alleviation and becoming an ICT-based solution. A good ICT sector is an "enabler" that allows the use of ICTs in poverty alleviation. In addition, the ICT sector must be able to meet other needs in all sectors. it is an "enabler" for participating in the face of an ICT-based global economy.

Impact of ICTs on Rural Socio-Economic Conditions in Bangladesh

Rahman, Abdullah, Haroon, and Tooheen (2013) conducted a study aimed at exploring the impact of ICT on the socio-economic development of villagers in Bangladesh. According to them, the rural population of Bangladesh has very minimal access to resources and public space because of their social and economic conditions. Rural populations experience discrimination, in large part because of the very lack of access to information sources. ICT has the potential to reach rural communities and answer knowledge and information needs. Furthermore Rahman, Abdullah, Haroon, and Tooheen (2013) reported the results of their research related to the impact of ICT on rural economic conditions in Bangladesh, namely the coverage of ICTs in rural Bangladesh, precisely at the Bangladesh Complex Annual Growth Rate (CAGR) on telephone lines was 10.9 % and cellular subscribers are 97.8%. The mobile market share of the total phone in the case of Bangladesh, the CAGR was 8.6%. This finding implies that in Bangladesh, the growth rate of cellphone use is in the very high category and has a very significant influence on the social and economic sector of the country. The results of this study also showed several other results.

- 1) Current statistics on the use of ICTs in Bangladesh show a) an increasing tendency to use computer facilities in rural Bangladesh; b) the most prominent information from this survey is that although mobile phones were introduced in the country in the early nineties, there has been a substantial growth in cellular phone use in rural communities along with urban dwellers; and c) internet usage has greatly increased in both urban and rural areas in the survey. The use of ICT facilities is much higher in urban areas compared to rural areas.
- 2) ICT and overall awareness in their survey results showed that a) of 520 respondents, 56.15% were male and the remaining 43.85% were female; b) the age group below 18 years mostly uses mobile phones to spend time, the age group over 18 years mostly uses it for socialization and business purposes, the 18-30 year age group also uses it for entertainment purposes, and it is very interesting to know that more 90% of people tend to use ICT facilities for their daily communication needs; c) in rural areas, ICT is not limited to cell phone calls, its value is more than 90%, rural communities have strong mobile internet users (28.5%) and email (35%) although computer use is somewhat limited to below 10% because of the high initial purchase cost, but other options are less available and less popular; and d) 90% of them also use cell phones to make calls, 28% of them use the internet, 35% of them use email, only 9% of the total respondents use computers.
- 3) The impact of ICTs in reshaping the rural economy. In rural areas, ICT services have had a role in economic development through a number of ways, including a) the use of ICTs that allows sellers to learn about new products in the market, to anticipate demand for existing and new products, and to understand pricing strategies, and innovating; b) rural communities obtain the necessary information and market prices from the website with the help of entrepreneurs provided by community information centers throughout Bangladesh that are spread through ICT facilities; c) 70% of people think that using a cellphone alone saves travel and communication costs for all daily needs; d) above 80% support that ICTs save their working hours which they can use for more productive activities and help improve their economic conditions; e) the flow of sending foreign money has become easier and faster for rural communities.
- 4) Bridging the gap. People do not need to travel more than 30-35 km to the district headquarters to get information about education, health, employment, government services, and so on. ICTs have saved their time and money thereby reducing the risk of travel. Residents can also open bank accounts using mobile phones and send money, and apply for their passports from the Upazila headquarters. Each Upazila headquarters has a website as

full support for residents. Even in the 90s it was clear that villages were left behind by cities in terms of development, health facilities, education, and so on. But with the advent of ICTs, all the necessities of living standards in rural Bangladesh are increasing and helping to bridge the gap between urban and rural.

From the results of this study it can be concluded that data access services enable users to learn about local services such as health, agriculture, education, and knowledge standards. Data access also allows an institution to convey important information such as information on dangerous conditions such as bird flu and other diseases. Cellular services can also be extended to the entire population and that will contribute to improving socio-economy.

Cellular Phones and Marketing Decisions for Farmers in Ethiopia

The use of cell phones in making marketing decisions for farmers in Ethiopia (Tadesse and Bahiigwa, 2015). Access to information is an important input for making agricultural decisions in the fields of finance, marketing and production in South Africa. Farmers must find the right price, the right buyer, the right standard and the value of the product. Farmers have to travel frequently, repeat and unload goods to show off their crops to buyers and brokers. Small farmers in Ethiopia sell their products to traders, both in their villages or in distant markets that require large costs. Village markets are characterized by price information that is more widely known by traders than farmers (Tadesse and Shively, 2013), which makes searching for information very expensive. Expansion of cell phone coverage is considered as one solution to the information problem. This survey was conducted to empower farmers to form cooperatives and introduce ICT as a marketing medium for agriculture.

Samples were interviewed using structured and pretest questionnaires. The questionnaire used to collect data is very much and contains many things related to information search, market access, marketing, and selling points. Mobile phones are used to find information to find out the role of ICTs in the process of accessing markets. Other information such as socioeconomic and demographic are also collected. The results and conclusions from Tadesse and Bahiigwa's (2015) research include:

- 1) interpreting technological opportunities as economic benefits becomes a big challenge in the development of small-scale agriculture. Many farmers have cell phones but the extent to which they help farmers make decisions in marketing strategies is an important issue that they want to understand. The results vary. In general, the impact is not very apparent that mobile phones really help farmers in making marketing decisions. This finding provides information that cell phones may be useful for certain farmers and under certain circumstances. In the study area, cellular telephones are not an important medium for being able to access information.
- 2) cell phones are not an effective way of accessing price information because of their limited use, especially in accessing information. There are only a few farmers who can use cell phones to reduce costs in finding information. This happens because the source of information is still lacking so that it cannot convey relevant information. Tadesse and Bahiigwa (2015) recommend establishing an information center both at the farmer's cooperative center as a source of information and knowledge.
- 3) the weak impact is also related to the fact that cellphone efficiency can be better utilized by traders than farmers.

Utilization of ICTs as Information for Agricultural Businesses in Indonesia

In Indonesia, research related to the use of ICTs for other agricultural businesses was conducted by Harahap (2016). Utilization of ICT in fulfilling information for agricultural business households in Halongonan District, Padang Lawas Utara Regency, North Sumatra Province is motivated by the condition of the region which is largely hilly. The livelihoods of the people are farmers. To meet agricultural information needs, in addition to getting it from field extension workers (PPL), village households hope to gain access to information from ICT developments. The development of ICTs such as television, radio and internet should be able to improve the quality and quantity of agricultural products. This study aims to describe the use of ICTs in fulfilling information for agricultural business households in Halongonan District in fulfilling agricultural information for agricultural business households in the study location.

This research uses a descriptive quantitative approach with survey methods. The location of the study was based on village representatives whose hilly topography by lottery included Sitabola, Japinulik, Sit Weaving, Sandean Tongan, Tapus Jae, and Sandean Julu Halongonan Districts. The research data collection was carried out in July 2015. The study population numbered 134 households in the study site. The sampling technique was determined by the number of samples calculated by the Taro Yamane formula of 100 respondents. The respondent selection technique used the Kish Grid method. Harahap's research results (2016) provide information, namely:

- 1) ICT ownership. ICT ownership for agriculture business households in Halongonan district, namely: 75 television respondents (75%) and 25 respondents (25%) do not have television, radio ownership are 25 respondents (25%) and 75 respondents (75%) do not have a radio, and ownership of internet access (cellular phones, tablets, PDAs / smartphones) as many as 12 respondents (12%) and 88 respondents (88%) who do not have.
- 2) TV utilization. Utilization of television in the amount of time used to watch television every day is 65 respondents (86.7%), 2-3 times a week as many as 7 respondents (9.3%), at least once a week as many as 3 respondents (4.0%).
- 3) radio utilization. The use of radio in the amount of time used to listen to radio with a frequency of 2-3 times a week is 12 respondents (48%), at least once a week as many as 8 respondents (32%) and every day as many as 5 respondents (20%).
- 4) utilization of internet access. Utilization of internet access by respondents is very minimal, which is more than once a week as many as 8 respondents (66.7%), every day as many as 3 respondents (25%) and at least once a week as much as 1 respondent (8.3%).
- 5) interest in reading newspapers. Interest in reading newspapers from as many as 100 respondents (100%) only 16 respondents (16%) and buying newspapers only 6 respondents (6%). That is, the use of newspaper media is not optimal by agricultural business households.

Based on the findings of this study it can be interpreted that the use of ICT (television, radio, Internet media) in fulfilling information for agricultural business households in Halongonan District, Padang Lawas Utara Regency is still very low. ICTs have not been used optimally for agricultural development. According to Harahap (2016) the cause is the low level of education in agricultural businesses and low access to information on the internet media. To overcome the information gap for rural households / communities especially villages with hilly topography especially Halongonan Subdistrict, Harahap (2016) suggests to make staff effective field extension agents and the development of telecommunications infrastructure in the context of strengthening telecommunications signals.

Lessons Learned: Opportunities and Challenges of Utilizing ICT for Agricultural Economic Development and Poverty Alleviation

Based on lessons learned from the results of research on the use of ICTs for agricultural economic development and alleviation in several developing countries lessons can be taken, including:

- 1) by increasing the market for their products, farmers have the power to negotiate better, increase their income, and thus improve their standard of living. This finding seems to agree with the views and expectations of stakeholders in rural development that various forces are working to change agricultural development from the process of technology transfer to the process of facilitating various communication, information and advocacy services, with the ultimate goal of improving the living standards of all rural communities;
- 2) in terms of weather forecasts, ICTs play a role in assisting farmers in making decisions, in relation to planting and harvest time because this is important in agricultural development. In this case, ICT empowers farmers with productive assets and marketing, increasing their productive capacity, thereby reducing their poverty status;
- 3) although there was a tendency to use the internet and e-mail via cell phones, in different research locations, farmers in the regions generally did not have the capacity to use e-mail or internet services for communication. The inclusion of include radio, television, telephone as ICTs used for dissemination, transfer and sharing of development information. Through radio, television, telephone (GSM and main lines) and communication via SMS messages, farmers have many opportunities to access important development information related to their livelihood activities. ICT may be a solution to the problem of accessing various sources of information that are affordable, relevant and reliable by farmers;
- 4) it is very interesting to know that most people tend to use ICT facilities for their daily communication and entertainment needs;
- 5) ICT components are used primarily to predict weather conditions, market access (for inputs and products), communicate easily to a longer audience and for effective mobilization of people to act. When this happens rural farmers can increase their productivity, access markets online, increase their negotiating power through direct contact with buyers which will manifest into increased income and welfare;
- 6) cellular services can be extended to the entire population and in turn contribute to improving all socioeconomic indicators. Developing countries can use ICTs to transform microfinance mobility into macro mobility into middle-income countries from the poor level;
- 7) mobile phones do not have a strong impact in helping farmers marketing decisions. Empirical analysis on the price of agricultural gates clearly shows that the impact of mobile phones is not significant. This shows that cell phones might be useful but for certain farmers and under certain conditions;
- 8) cell phones are not an effective way to access information. This may be due to the limited use of cell phones in search of agricultural information. Only a few farmers are able to use mobile phones to reduce costs in information seeking. This seems to be caused by a lack of information sources so there is a need for the establishment of a reliable information center;
- 9) the use of ICTs in efforts to alleviate poverty will be more effective if embedded and adapted to policies and other resources.;

- 10) the government must develop programs that create awareness of the benefits of ICT and make people aware of the best ways to utilize ICT facilities they have. With a supportive, enabling, practical and affordable environment, the use of ICT is beneficial for the poor;
- 11) especially in Indonesia, the use of ICTs (television, radio, internet media) in fulfilling information for agricultural business households in Halongonan District, Padang Lawas Utara Regency is very low. The reason is the low level of education in agricultural household households and low access to information on the internet media.

Conclusion

ICT can help farmers to be able to make a decision, some of which are related to planting and harvest time. ICT can also empower farmers by increasing productive capacity and productive marketing so as to reduce the problem of poverty. The ease of ICT services in rural communities can have a good impact on boosting the economy, especially the rural economy. Information access can be done through television, radio, telephone and short messages. ICT can be a solution to the problem of accessing various information that is relevant, affordable, and reliable. Thus, ICT has the potential to become a very effective instrument in poverty alleviation programs. Utilization of ICTs in alleviating poverty will be more effective when embedded and synchronized with other policies and resources.

In Indonesia, the use of ICTs (television, radio, Internet media) in fulfilling information for agricultural business households in rural areas is still relatively minimal. ICTs have not been used optimally for agricultural business development. This is because of the low level of education and low access to information on the internet media. To overcome the information gap for rural communities (especially villages with hilly topography), it is more effective for extension workers, accelerates the development of telecommunications facilities to strengthen signals, and provides ongoing support to farmers. The government must start programming the creation of public awareness of the importance of ICTs and provide insights on how to use ICT facilities.

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