African Research Review

An International Multi-Disciplinary Journal, Ethiopia
Vol. 4 (1) January, 2010
ISSN 1994-9057 (Print) ISSN 2070-0083 (Online)

Appropriateness of Information and Communication Technologies (ICTs) Toward Rural and Agricultural Transformation of Nigeria (Pp 529-546)

Fadiji, Taiye O. **-** Institute for Agricultural Research (I.A.R.), Samaru, Ahmadu Bello University (A.B.U.), P. M. B. 1044, Zaria, Nigeria

E-mail: tofadiji@yahoo.com

Omokore, Dave F. **-** Institute for Agricultural Research (I.A.R.), Samaru, Ahmadu Bello University (A.B.U.), P. M. B. 1044, Zaria, Nigeria

Abstract

The importance and relevance of Information and Communication Technologies (ICTs) towards rural and agricultural development of nations of the world (including Nigeria) is discussed here. There is abundance of evidence laying credence to the usefulness, application and effectiveness of ICTs to development of many advanced and developing countries of the world. As an integral component of Science and Technology (S & T), ICTs has become a veritable instrument to combat underdevelopment, poverty, illiteracy, ignorance and stagnation. Some examples of countries where ICTs are widely applied are cited. Some evidences of significant stride made in Nigeria toward ICTs adoption and application are presented. This paper pleads for the creation of enabling environment for adequate application and adoption of ICTs and S & T by underdeveloped countries and developing countries including Nigeria. The paper highlights some considerable opportunities that could be exploited for realization of pro-poor growth. It emphasizes and illustrates some contradictions associated with S & T application and adoption, especially in the less developed countries (LDCs).

It concludes its thesis by stressing the obvious that every nation has potential for growth and development and Nigeria is no exception, and recommended positive steps for ICTs application.

Key words: Information, Communication, Technologies, Transformation, Rural, Nigeria

Introduction

Information and Communication Technologies (ICTs) is a relatively new means of disseminating information among people worldwide. ICTs have been defined and it comprise processing and transmission of information by electronic means such as radio, television, telephones (fixed and mobile), computers, Pocket PCs and the internet (CTA, 2003). ICTs are useful in exchange of information in agriculture by the stakeholders, namely; farmers, extension agents, researchers, administrators, policy-planners, non-Governmental organizations (NGOs) and other agencies. The role of ICTs toward securing improvement of the resource-poor farmers through a synergy of access to telecommunications and socio-economic development has been emphasized (Kiplang'at, 2003). Contemporary agricultural practices can yield significant result and attain sustainability through effective use of information exchange mechanism like ICTs. The components of ICTs includes the following; Radio, Television, Multi-media systems (e.g. VCDs, DVDs, VHS, Over-head projectors), Telephones (Land-lines and Mobile phones), Internet (E-mailing, Web-browsing, telephoning, etc), Computers and Pocket devices.

The important role ICTs have played in both advanced and developing countries like Chile, Peru, South Africa, India, Mexico, Bangladesh and Uganda have been well documented, particularly in terms of information exchange in rural communities (ADB, 2003; and Munyua, 2000). Extension information can provide a tremendous impetus to rural farmers, and indeed to the generality of rural populace. Zijp (1994) has identified Information and Communication Technologies (ICTs) as very useful to support the improvement of the apparent inadequate extension and education services particularly for the development of rural areas. The diversity of livelihood strategies among small-scale family farms and the importance of non-farm income have magnified the need to develop differentiated rural development strategies (Berdegue and Escobar, 2001).

The Role of Information and ICTs

ICTs could be used as a strong linkage for development between the rural areas and the developed societies of the world thereby facilitating the former's interaction with the latter resulting in growth. By so doing, the digital divide would be closed up eventually and the general people of the world would be better of than before. Diffusion processes (i.e. the stages between when the farmer first hear about favourable innovations and the time he adopts them), according to Van den Ban and Hawkins (1993), takes the following stages, namely; (1) Awareness (2) Interest or information (3) Evaluation or application (4) Trial, and (5) Adoption. These outlined stages take time, and a great deal of persuasion and effort to accomplish before the farmer is convinced to adopt a technology or innovation.

Blench (1998) has indicated that the adoption of new crop varieties in West Africa had been facilitated by the use of information in achieving agricultural development. The importance of information in the contemporary world could be described as an indispensable tool for growth and development of any people. Identification of the relevant and appropriate sources of extension information on the one hand, and the extent of utilizing the information received from such sources, can be optimally used in achieving the so much desired productivity, has been associated with constraints for rural farmers (McAnany, 1980).

Usefulness and Application of ICTs

There are abundant literature resources available on the subject of ICTs. Chapman and Slaymaker (2002) had carried out an extensive review of ICTs stressing its capacity to exceed the physical distance, linking communities and "integrating with wider social and economic networks". Unfortunately, some countries are yet to consider the importance of knowledge transfer via reviewed extension services in spite of the apparent fact that knowledge and capital are strong catalysts for success within the globalization paradigm being promoted (Rivera, 2001). ICTs have been found to be very relevant and applicable toward the general rural poor and the transformation of the agricultural sector.

The following are feasible areas where ICTs have been identified and applied for the benefit of rural people and the farmers:

- ✓ Technology awareness and diffusion
- ✓ Technology adoption
- ✓ Pest and disease identification and control

- ✓ Training of farmers on their activities; from planting to harvesting and post-harvest activities.
- ✓ Weather report, raising of alarm on bush burning, earthquake, famine, drought, flooding, volcanic eruption, etc
- ✓ Sending and receiving of extension messages, news, appointments, etc
- ✓ Distance learning for a large population

Lobo (2007) reported a classical example and success of rural development efforts by DNER communication campaigns in informing and training farmers and diffusion of appropriate technologies in Monzambique through the employment of various available media (radio, television, theatre, posters, brochures, meetings, etc).

Another case was reported in the Cambodia ICT4D National Education Policy 2005 (Visit http://www.comminit.com/ict/ictpolicies/ictpolicies-20.html). This policy document was developed to focus on Cambodia's "Education for All" vision of ensuring all citizens equal access to basic quality education, and to prepare them to participate actively in Cambodia's reconstruction and integration into the knowledge-based global community. The policy places emphasis on the role of ICT in distance education, the training of professionals, non-formal education, and the quality of education at the upper-secondary and post-secondary levels, in recognition of the importance of ICT skills in a knowledge-based society.

The trend toward e-agriculture is fast gathering momentum. The pilot Launch of E-Forum has taken place and preparation for the official Open launch is on-going and it is scheduled to take place in September, 2007. E-agriculture.org is a dynamic space for those interested in shaping e-agriculture policies and practices to network, share information, experiences, and opinions, and to find out about new and useful systems, tools, and methodologies. (Please visit:http://www.e-agriculture.org/)

Indeed, in a wider spectrum, there is virtually no sector where ICTs cannot be used: Agriculture, education, health, transportation, communication, science and technology (S&T), Security, Legal and Policy, e-commerce, e-economy, e-Government, etc.

Some ICTs Application in Nigeria

Ekong (2003) had contended that there were generally inadequate communication facilities in Nigeria as people depended largely on face-to-face communication even in cities. Interestingly, Nigeria has grown from mere 500,000 telephone lines in 1999 to 35 million lines in teledensity in

2007 (Fanawopo, 2007). There is still more rooms for growth as the estimated 140 million populations deserve the benefits accruable from this infrastructural facility. Specific to Nigeria, some remarkable improvements and policy measures have been made toward making Nigerian telecommunication environment up-to-date with the existing 21st century demand. Some examples include (Fanawopo, 2007):

- ∇ The approval of IT Policy in 2001 by the Nigerian Government and its implementation with the establishment of National Information Technology Development Agency (NITDA). The policy is essentially aimed at making IT useful in the areas of education, wealth creation, poverty eradication, job creation and global competitiveness.

- ∇ The approval and issuance of licenses by the Nigerian Communications Commission to over 25 companies for Fixed Wireless Operations (FWO). NCC approved operation of 3G mobile telecommunications services to MTN, Celtel (now called Zain), Globalcom and Alheri Engineering Limited. Other telephone services providers (both fixed and mobile) existing in Nigeria are: Celcom, Starcom, Multilinks, Reltels, O'net, Etisalat, MTS First Wireless, etc.

- ∇ Provision of environment for job creation and investment through support services like banks, media houses, estate agents and advertising agencies, etc.

- ∇ During the eight years of Obasanjo Administration (1999 - 2007), the Government took the giant step by encouraging local entrepreneurs to set up local PC assembly plants in Nigeria. In this connection, Government directed its Ministries, parastatals, departments and agencies to patronize only-made-in-Nigeria computer sets. In addition, assembly plants for production of hand-sets are being set up.

- ∇ Similarly, the Obasanjo Government established a Computer for All Nigeria Initiative (CANi) through which about 35,000 Nigerians have been given highly discounted price for computer products.

- ∇ Efforts toward establishment of rural telephoning through launch in 2004 by Nigerian Government the details of a National Rural

Telephony Programme (NRTP), which proposes to connect 500,000 new lines in 343 local government areas within twelve months.

- ∇ The launch of the Nigerian Communication Satelite-1 (NIGCOMSAT-1).
- ∇ Radio Nigeria has now elevated its reach as it is now online and could be reached on the internet via www.Radionigeriaonline.org/

No doubt, Nigeria is fast becoming a fertile ground for application, utilization and production of communications facilities, especially ICTs, and the trend is in such a pace that it is difficult to stop or reverse. Indeed, the role of private organizations participation in the telecommunication delivery has become a national phenomenon (Lawal-Adebowale, 2009). Furthermore, a recent report has it that a US company (Recellular), a specialist company in discarded cell phone is currently providing recycled phones in Kenya and Nigeria, and sold at one-third or one-half of their original prices and are made available to African farmers to enable them access agricultural information (Spore, 2007).

ICTs and Its Impacts on African Communities

In Sub-Saharan Africa, it has been estimated, according to Painting and Wesseler (2004), in 2001, only one in one hundred owns a personal computer. Specific to internet use, in 2000, only 0.4% of total population use the internet compared to 53.3% in the USA (see table 1). Therefore it has been seen that the gap in information flow between the developed and underdeveloped countries is still wide, not only in the urban areas but more pronounced in the rural settings.

Creating conducive atmosphere, environment and infrastructure for the development of many rural communities could be hastened through appropriate engagement of information gathering and dissemination. Our world today is still confronted by the problems of illiteracy and ignorance coupled with lack of flow of information. The importance of information on research and development cannot be over-emphasized. Indeed, the usefulness of information and credibility of information source have been found to be positively and significantly related to adoption of improved cassava production technologies (Matthews-Njoku, 2003).

Introduction of tele-centres or phone shops has been found to provide tremendous success in places like Burkina Faso, Senegal, Mali, and Uganda

(Painting and Wesseler , 2004) even though largely in the urban areas. Their extension in the rural areas, no doubt, would provide an impetus of opportunities and improvement to larger populations. For instance, an IDRC (2003) report gave a comprehensive assessment and study on the use of ICTs in Kenya, Senegal, South Africa and Uganda drawing from cases of projects executed in some of their communities.

From Table 1, Nigeria is 39th (with 9,147,200 users) among the top 40 countries using cell phones worldwide. This may sound impressive and encouraging. However, when critically compared with leading countries like China 2nd (with 334,824,000 users) and United States of America - 4th (with 194,479,364 users), Nigeria is still by and large, lagging behind. Some other realist want to put the Nigerian figure up to 40 million users as at 2007, it is nevertheless contestable, and if it is acceptable and true, it is very doubtful if the Nigerian position would have been changed when compared with other countries of the world. The phenomenal growth rate of Nigeria may be her remarkable credit and there is opportunity for improvement.

In spite of the foregoing remarkable progress (in cell phone usage) being made in Africa, when compared with other regions, as far as internet usage was concerned, it is still far behind. Information on Statistics of Internet Usage by World region (2007) shows that Asia, Europe and North America dominate the internet users' world while Africa, Middle East and Australia/Oceanic region are at the bottom of the ladder (**Source:** www.internetworldstats.com/.)

Furthermore according to the same source, it is self evident that internet usage growth between 2000 and 2007, Africa (643.1%) experienced phenomenal increment followed by Latin America/Caribbean (508.6%), followed by Middle East (494.8%, and Asia (265.7%), while the lowest was Oceania/Australia (146.7%).

Radio for Rural Development

Radio has been found to be an effective means of disseminating agricultural information to farmers. It is widely used as a means of communication - sending and receiving information by people. Similarly, rural farmers in particular in many regions of the world find radio as a veritable source of deriving extension related information.

Some studies have showed the some significant roles radio have played in sourcing agricultural information (Yazidu, 1973; Voh, 1981; Chikwendu *et al*.,1996; Arokoyo, 1998; Omokhudu, 1999; and Fadiji, 2000). Chikwendu and Omeneza (1997) have established that disseminating agricultural information in a result-oriented manner could be achieved through the instrumentality of established effective and efficient channels of communication among researchers, extension workers and farmers In another related study, Omeneza (1997) stated that radio is one of the most important media of transmission of information to the grassroots in Nigeria.

Onyibe *et al*., (1999) found media support (radio and television) as strategic for passing extension information to farmers who produced maize in marginal zones of Nigeria. Media houses in northern Nigeria have contributed to the dissemination of agricultural information to farmers. Also, agricultural institutions like the National Agricultural Extension and Research Liaison Services (NAERLS) of Ahmadu Bello University (ABU), Zaria, Nigeria, have, for over three decades, produced programmes for farm broadcasts in both radio and television (Igunnu and Zaria, 1988) for the benefit of Nigerian farmers. Hence, a carefully planned radio programme, aired at an appropriate time, directed at the rural farmers, could provide an invaluable impetus to adoption process.

The Widening Gap between the Rich and Poor

The concern for the poor is gaining momentum particularly in the rural areas where most of them are found. The plight of the down-trodden, the oppressed, the have-nots, the neglected, the mass of the unfortunate people with little or no resources, is attracting a web of concern for the good people of the world, beckoning for one form of assistance or the other.

The gap between the rich and the poor continues to enlarge, reaching elastic point of divergence. The phenomenon is apparent; the rich are still getting richer while, sadly though, the poor continues to be poorer and worst of. Unfortunately, opinion still differs; perspectives are numerous on the best solution to employ for the plight of the poor around the world. It is therefore difficult for many to agree with the statistics on development in countries of the world when, in reality, out of the estimated 6 billion people, about 1billion are living in abject poverty, the growth rate of the world is mere 2% and the mortality rate of many developing countries is still on high side (The World Bank, 2006). In the underdeveloped countries, the poverty is highly

pronounced in the rural areas. The proportion of the very poor are found among children, women and elderly.

Interestingly enough, in the global context, it is equally evident that there is a wide disparity in the level of development between the countries of the North and South. Unfortunately, the failure of the South to harness the enormous and potential benefits of the technological breakthroughs in the North has put the developing countries in a perpetual disadvantaged position (Brigdes, 2001). It has been advanced in many quarters over the years that technologies could be transferred from the advanced countries (ACs) to the less developed countries (LDCs). It has also been argued strongly in some quarters that no matter the fancy in a technology, if it is not appropriate and applicable for the recipient country, it would translate to huge waste of efforts and resources. It has been noted by Dasgupta and Mäler (1991) that, in the course of economic development, it is pertinent to make close correlation between environmental preservation and the well-being of the poor, taking into cognizance, in particular the most vulnerable among the poor.

Importance of Science and Technology

The developed countries (e.g. the United States, Russia, China, Britain, Japan, France, Germany and Italy) have attained their respective status of development variously with evidences of industrialization, technological growth, modernization and urbanization. On the contrary, the countries with poor growth have been faced with problems of tradition, culture, illiteracy, unemployment, lack of human resource base, poor capital, lack of capacity for industrialization, incidences of diseases, epidemic and pandemics syndromes, etc.

The significant and continual growth being experienced in the advanced countries has largely been attributed primarily to research in science and technology. They are manifested in many areas and the list seem endless; industrialization, bio-technology, hybridization of crops, corn revolution, genetically modified (GM) crops, modern medicine, surgery, *in vitro* fertilization, automation, and information and communication technologies (ICTs). Others include sophistications in publishing, textile designing, architecture, transportation, energy, transportation, education, commerce, banking and engineering. Man has reached the advanced point in development in human gene/DNA research, antibiotics, irrigation development, building of high-speed boats and ships, supersonic aircrafts, automated rail-lines, intercontinental and ballistic missiles, submarines, laser

technology, microelectronics, satellite communications, space travels, photovoltaic power, artificial intelligence software, wind and solar power, etc.

With a casual perspective, the impact of S & T may be seen in human development in general, and considered as tremendous. It has, however, not reached the poor as it should. The search for improvement in S & T is a continuous demand in many countries. A ground-breaking study was reported on china (IDRC, 1997) stressing societal reform in the areas of; basic research, the high-technology sector, traditional state-owned enterprises, agricultural research and rural development, and environmental-social development. Another panel's report by IDRC/UNCTAD (1997) dwelt more specifically on the role of S & T in poverty eradication in providing sustainable human development. The report strongly advocated for the creation of conditions in which the poor can generate, understand, have access to, and creatively use technologies to satisfy their basic needs through; education, access to information, participation, health, basic infrastructure, and small-scale economic activities.

Connection between Poverty, Inequality, and Growth

The World Bank had defined measurement of poverty in terms of purchasing power parity (PPP) figures. People living on less than $1 per day are over 1 billion (The World Bank, 2006). In addition to poverty, inequality exists in both developed and underdeveloped countries. Pattillo *et al* (2006), citing the examples of countries like Burkina Faso, Ghana, Uganda, Senegal, and Zambia, have illustrated aptly the relationship between inequality and poverty. They have shown, using reliable statistics, some growth which led to reduction in poverty (between 1994 -2001) as changes in inequality is intensified. Saavedra and Arias (2005) had earlier explored the avenues for combating persistent poverty and inequality in the Latin America, yet about 96 million people living in extreme poverty level, and the growth achieved, had not been centred on the poor generally. Similarly, Ferreira and Walton (2005) argued for equality as *sine qua none* for attainment of development.

The Problems with Transfer of Technologies

www.Bridges.org(2001) provides an example of an organization promoting the application of ICTs with proactive programme, which care for the communities by providing, through its Collecting Exchange of Local Agricultural Contents (CELAC), sending via SMS messages as guides, on how to plant maize and prepare fertilization beds, breeding birds or animals

to communities in their local languages (CTA, 2006). It need to be stress quickly though that, as promising as ICTs is in e-agriculture, a lot of improvement is still desirable if its full potentials is to be appropriated by the rural people and especially the poor. Science and technology are, in the ordinary sense, good developments. However, their adoption and application would require some measure of consideration and guided caution. There is an irony in the use and application of science and technology. Jibowo (2000) had observed that so much attention is paid to the study of technology at the expense of the study of the population who will use it.

Some Attempts for Growth

Alexandratos (1997) described the use of public employment schemes, especially during periods of drought and famine for rural unemployed and underemployment which have reduced income variability considerably in some countries. These are palliative measures for pro-poor growth. For full realization of poverty alleviation measures to be realized, drastic programmes should be introduced, and integrated into the rural development mechanisms. The World Food Programme (WFP) has made elaborate effort and agreement in providing food aid and assistance to the hungry poor (Jury, 2004). WFP depends so much on voluntary contributions, and from records, in 2002, a total of $1.59 billion USA Dollars worth of aids were carried out for emergency and development projects. The question we might need to ask is; Must we wait for emergency period before aid is considered for and delivered to the poor? One may easily assume that aid is a panacea for poverty and a catalyst for growth. The desirability of aid notwithstanding, it is not certain that loads of aid could guarantee growth and economic independence for the poor.

Some Recommendations for Growth

For a meaningful pro-poor growth to be achieved through a combination of science and technology and ICTs, and indeed, with the application of ICTs, the following specific areas require adequate and urgent attention in the scheme of human development;

- Pragmatic and systematic transformation of the poor intellectually and educationally. For the ICTs to be fully applicable, adoptable and meaningful for the rural areas, their education level needs to be improved upon tremendously. The poor need to be given right orientation and outlook to life and what it offers him/her.

- ICTs could be employed to pass relevant information to the rural populace on the birth control measures so as to avoid population explosion. Introduction of intensive programme to stop or discourage the high rate of fertility and population growth among the poor. The poor need to be enlightened that he is doing himself/herself and the community more harm than good with uncontrolled birth rate.
- Improvement in the standard of living of the poor by provision of income-generation activities and credit facilities. Rural people could be encouraged to engage in small scale businesses on ICTs like; sale of recharge cards, GSM and their accessories, telephone services etc. A total package for the poor should be centered on teaching them "how to catch fish" and not just giving them fish to eat. If the poor is thought how to be economically independent, hardworking and self-sustaining, his world would be made better and the societies would be improved.
- Improvement of the productive sectors like electricity, fuel, oil, solar energy, transportation, roads, rails, airlines, etc - all of which would provide enabling environment for the poor to grow and be transformed. Improvement in these infrastructural facilities will consequently improve the condition of the rural communities.
- Entrenchment of stable Governments world-wide and continuity of good governance and good policies on ICTs. It could be used to foster stability in nation building and continuity in government. In addition, Governments and leaders of countries of the world should embark on expenditures and public investments that would impact on the general population and improve their gross domestic products (GDPs).
- Creation of feed-back mechanisms between the designers and producers of ICTs and the users, especially the poor, in order to facilitate smooth and effective technology transfer and application. The use and employment of ICTs and information dissemination mechanisms in order to foster development of the poor. Such information mechanisms should be made available and useful to the public good and development at less cost with less stress. It should be made accessible to all without prejudice whatsoever.

- Acceptance of the fact that globalization could only be true and realized by actual overall development and growth of all peoples in the planet Earth.

Conclusion

It would be a good omen to plan for the total eradication of poverty, in a global scale, in the next few decades with appropriate introduction and adoption of ICTs as a vehicle. It would be a great achievement of man, in the present age and dispensation to reduce the gravity and preponderance of poverty in our world to the barest minimum, or at best, banish it from our midst. This is not a utopian dream. The thesis here is a plea for an enabling mechanism in providing a sustainable growth of the poor using science and technology, indeed the instrumentality of the ICTs, as a veritable catalyst for rural and agricultural development.

References

Alexandratos, N. (Ed.) (1997). *World Agriculture: Towards 2010, An FAO Study*. Published by the Food and Agriculture Organization of the United Nations and John Wiley & Sons, New York, U. S. A. P. 488.

Arokoyo, T. (1998). Agricultural Technology Development and Dissemination: A Case Study of the Ghana and Nigerian Experiences. An Exploratory Survey report prepared for ISRA/CTA Workshop on Effective Utilization of Agricultural Research Results in Western and Central Africa, Dakar, Senagal, held 5-8 November, 1996.

Asian Development Bank (ADB) - (2003). A Strategic Approach to Information and Communication Technology toward e-development in Asia and the Pacific Asian Development Bank, Nov. 2003.

Berdegue, J. and Escobar, G. (2001). Agricultural Knowledge and Information Systems and Poverty Reduction. World Band Discussion Paper. Washington, D.C: World Bank, U.S.A.

Blench, R. M. (1998). "The Introduction and Spread of New World Crops in Nigeria: A Historical and Linguistic Investigation". In: Chastenet, M. (1998). *Plantes et Paysanges d'Afrique: Une histoire a explorer*. Paris: Karthab.

Bridges.org (2001). Spanning the Digital Divide: Understanding and Tracking the Issues. Available at: www.bridges.org/spanning/report.html/

Chapman R. and T. Slaymaker. (2002). ICTs and Rural Development: Review of the literature, current interventions and opportunities for action. In: Working

Paper No.129, published by Overseas Development Institute (ODI), London, U.K.36p.

Chikwendu, D. O., Ubi, E.O. and Onyibe, J.E. (1996). Adoption of improved technologies for millet production by farmers in Borno State of Nigeria. *Samaru J. Agric. Res*., 13:73-81.Published by Institute for Agricultural Research (I.A.R.), A.B.U., Zaria, Nigeria.

Chikwendu, D. O. and Omeneza Z. E. (1997): Financial implication of radio and television agricultural broadcasts in Nigeria. *Journal of Agricultural Extension*, Vol. 1:9-16. Published by Agricultural Extension Society of Nigeria (AESON).

CTA (Centre for Agricultural and Rural Cooperation)(2003). ICTs – Transforming Agricultural Extension? An e-discussion held 20th August, - 29th Sept. 2003 Edition.

CTA (Technical Centre for Agricultural and Rural Cooperation in ACP-EU). (2006). VIEWPOINT: ICTs, Bridging the digital divide. In: *Spore*, Issue 123: 16.

Dasgupta P. and K. Mäler (1991). The Environment and Emerging Development Issues. In: *Proceedings of the World Bank Annual Conference on Development Economics*, 1990. Pp. 101-131.

Ekong, E. E. (2003). *An Introduction to Rural Sociology* (Second Edition). Dove Educational Publishers, Uyo, Nigeria. Pp.403.

Fadiji, T. O. (2000): Sources and Utilization of Extension Information Among Farmers of Improved Maize in Two Villages of Kaduna State. Unpublished M. Sc. Thesis, Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University (ABU), Zaria, Nigeria, 90pp.

Fanawopo, S. (2007). ICT Development: The gains, the pains, the prospect. In: The Obasanjo Years (1999 – 2007) - What Legacy? DAILY SUN, Tuesday, May 29. Pp. 48.

Ferreira, F. H. and Walton, M. (2005). The inequality trap. In: *Finance & Development* (www.imf.org/fandd/). A Publication of the International Monetary Fund, Volume 43, Number 1: 34-37.

Igunnu, J. B. and Zaria, M. B.(1988): Audio-visual extension support services in the early years. In*: AERLS: 25 Years of Extension Specialist Support Services in Nigeria.* Published by National Agricultural Extension and Research Liaison Services, A. B. U., Zaria, Nigeria, pp. 17-28.

IDRC (International Development Research Centre) (1997). A Decade of Reform. A report jointly carried out by IDRC and the State Science and Technology Commission, People's Republic of China (1997). Available at http://www. Idrc.ca/). P.178.

IDRC/UNCTAD (1997). An Assault on Poverty. Report of Panel; on Technology for Basic Needs of the United Nations Commission on Science and Technology for Development (UNCTAD). And IDRC/UNCTAD publication. P.300.

IDRC (International Development Research Centre) (2003). Information and Communication Technologies for Development in Africa (Volume 1): Opportunities and Challenges for Community Development (Edited by Ramata Malo Thioune). Jointly published by the International Development Research Centre (IDRC), Canada and the Council for Development of Social Research in Africa (CODESRIA). Also available online at: www.idrc.ca/

Jibowo, G. (2000). Essentials of Rural Sociology. Gbemi Sodipo Press Ltd., Abeokuta, Ogun State, Nigeria. P244.

Jury, A. (2004). The World Food Programme: Reaching the Hungry with Food Aid. In: Agriculture & Rural Development, 2(2004): 32-33.

Kiplang'at, J. (2003). "Does Agricultural Extension have a new beginning because of ICTs?: Reflection on Experiences in Sub-Saharan Africa". A Keynote paper presented at the 6th Consultative Expert Meeting on CTA's Observatory on ICTs. Wageningen, Sept., 23 – 25, 2003.

Ladele, A. A. (2005). Rural Development Process and Practice. In; Agricultural Extension in Nigeria: A publication of Agricultural Extension Society of Nigeria(AESON). Edited by S. Fola Adedoyin. Pp. 139-144.

Lawal-Adebowale (2009). Information and Communication Technologies: Its Potentials for Enhanced Agricultural Extension Service and Rural Development. P214-258. In: (Ed. Agbamu, J. U. Perspectives in Agricultural and Rural Development, Pp393).

Lobo A. (2007). VIEW POINT: Getting the message across with multi-media. In: CTA's SPORE Publication, No. 128, April, Pp.16.

Matthews-Njoku, E. C. (2003). Farmers' personal and farm enterprise characteristics and their adoption of improved cassava production technologies in Imo

State, Nigeria. *Journal of Agriculture and Social Research*, Vol 14, 2003 3(1):90-104.

McAnany, E. G. (1980). The role of information in communication with the rural poor: Some reflections. In: *Communications in the Rural Third World* (Ed. By Emile G. McAnany). Praeger Publisher, U.S. A. Pp3-16.

Munyua, H. (2000). Application of Information Communication Technologies in the Agricultural Sector in Africa: A Gender Perspective. In: *Gender and Information Revolution in Africa* (ed. By Rathgeber, E. and Adera, E. O.) A publication of IDRC/ECA, Pp. 85-123.

Omeneza, Z. E.(1997): Rural Agricultural Radio in Nigeria: An Overview of the National Agricultural Extension and Research Liaison Services (NAERLS) Farm Broadcast. *Journal of Agricultural Extension,* Vol. 1: 74-81. Published by Agricultural Extension Society of Nigeria (AESON).

Omokhudu, C. A.(1999): A study of various agencies communicating Agricultural Information among selected Farmers in Owan East Local Government Area of Edo State. In: Proceedings of the Fifth Annual National Conference of the Agricultural Extension Society of Nigeria (AESON), held 12-14th April, pp.99-105.

Onyibe, J. E. Arokoyo, J. I. Daudu, C. K. Akpoko, J. G. and Gbedegesin, R. A. (1999). Challenges of maize technology transfer in marginal zones of Nigeria. *The Nig. J. of Agric. Ext*., Vol. 12, No 1: 28-37.

Painting, K. and Wesseler, G. (2004). Digital Villages – A dream revisited. In: *Agriculture & Rural Development*, Volume 11, No. 2: 50-53.

Pattillo, C. Gupta, S. and Carey, K. (2006). Growing Pains. In: Finance & Development (www.imf.org/fandd/). A Publication of the International Monetary Fund, Volume 43, Number 1: 32-35.

Rivera, W. (2001). "Agricultural and Rural Extension: Options for Reform". In collaboration with Extension, Education and Communication Service, SDRE, FAO, Rome, Italy.

Saavedra, J. and Arias, O. S. (2005). Stuck in a rut. In: *Finance & Development* (www.imf.org/fandd/). A Publication of the International Monetary Fund, Volume 42, Number 3: 18-22.

The World Bank (2006). *World Bank Development Indicators* 2006.

Przeworski, A. and Teune, H. (1972). *Logic of Comparative Social Inquiry: Comparative Studies in Behavioural Sciences.* Wiley-Interscience, Wiley & Sons, New York, (Edited by Robert T. Holt and John E. Turner). P.153.

Spore (2007). In Brief: A new lease of life for old phones. *A Bi-monthly magazine of CTA*, No.128, April issue.

Van den Ban, A.W. and H.S. Hawkins (1993). *Agricultural Extension.* Modified English Edition reprints. John Wiley and Sons, In., New York, U.S.A., p.29.

Voh, J. P. (1981) Information sources and awareness of selected recommended farm practices: A study in a village in Kaduna State of Nigeria. In: *African Journal of Agricultural Sciences,* Vol. 8, Nos 1 & 2: 77-87.

Williams, S. K. (1978). *Rural Development in Nigeria.* University of Ife, Ile-Ife, Nigeria.

Yazidu, I.(1973). The study of Radio as a means of communicating Agricultural Information to Farmers in Northern States of Nigeria. An unpublished M. Sc. Thesis, submitted to the Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria.

Zijp, W. (1994). *Improving the transfer and use of Agricultural Information: A Guide to Information Technology.* The World Bank, Washington, D. C. U. S. A.

http://www.e-agriculture.org

http://www.internetworldstats.com/stats.html/: INTERNET USAGE STATISTICS - The Big Picture - World Internet Users and Population Stats. Accessed in August, 2007)

WWW.INFOPLEASE.COM/: Cell Phone Usage Worldwide, by Country (2000 – 2007).

http://www.comminit.com/ict/ictpolicies/ictpolicies-20.html):
http://www.comminit.com/ict/ictpolicies/ictpolicies-20.html).

Table 1: Top forty (40) cell phone usage worldwide, by country (as at 2007)

Rank	Country	Cell phones (numbers)	Date of information
1	World	1,752,183,600	2004
2	China	334,824,000	2004
3	European Union	314,644,700	2002
4	United States	194, 479,364	2004
5	Japan	91,479,364	2004
6	Russia	74,420,000	2004
7	Germany	71,300,000	2004
8	India	69,193,321	2006
9	Brazil	65,605,000	2004
10	Italy	62,750,000	2004
11	United Kingdom	61,091,000	2004
12	France	44,551,800	2004
13	Spain	38,646,800	2004
14	Mexico	38,451,100	2004
15	South Korea	36,586,100	2004
16	Turkey	34,707,500	2004
17	Philippines	32,935,900	2004
18	Indonasia	30,000,000	2004
19	Thailand	27,379,000	2005
20	Taiwan	25,089,600	2003
21	Poland	23,096,100	2004
22	South Africa	19,500,000	2004
23	Australia	16,480,000	2004
24	Canada	14,984,400	2004
25	Netherlands	14,800,000	2004
26	Malaysia	14,611,900	2004
27	Egypt	14,045,134	2005
28	Ukraine	13,735,000	2004
29	Argentina	13,512,400	2004
30	Czech Republic	10,782,600	2004
31	Colombia	10,400,600	2004
32	Portugal	10,362,100	2004
33	Romania	10,215,400	2004
34	Sweden	9,775,000	2004
35	Chile	9,566,600	2004
36	Morocco	9,336,900	2004
37	Greece	9,305,700	2004
38	Saudi Arabia	9,175,200	2004
39	Nigeria	9,147,200	2004
40	Belgium	9,131,700	2004

Source: http://infoplease.com/world.html/