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E-Agriculture and Rural Development

Global Innovations and Future Prospects

Blessing M. Maumbe & Charalampos Z. Patrikakis

E-Agriculture and Rural Development:

Global Innovations and Future Prospects

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Preface

The use of information and communication technologies (ICT) in agriculture and rural development has surged in the past decade. Growing attention has focused on the contributions of these technologies to agriculture and rural development. Evidence linking ICT to an increase in Gross Domestic Product (GDP) has spurred a global effort to study the socio-economic benefits, challenges, and policy implications of ICT in agriculture in both developed and developing countries. ICT have transformed agriculture value chains--input procurement, production, processing, storage, distribution, and marketing to the final consumer--and thus global agriculture (e-Agriculture) and the rural development landscape. Yet, despite the proliferation of ICT, their application in agriculture and rural development, enhancing competitiveness of agriculture value chains, modernizing rural service delivery, raising living standards by alleviating poverty remains unclear in many countries. The fragmented and undocumented evidence of successful applications of ICT in agriculture highlights the need to understand the socio-economic benefits that could accrue to governments, rural agribusinesses, and society. This book brings together the results of years of hard work from various scientists from around the world and it makes valuable contribution to new knowledge and our understanding of e-Agriculture and rural development globally.

This publication describes key developments and emerging challenges in ICT use in agriculture and rural development throughout the world. The book covers case studies; conceptual and implementation frameworks; agriculture market information systems; value-added agriculture services, e-agriculture policies, institutions and regulations that facilitate the use of ICT in agriculture and rural development. Collectively, the topics in this book provide readers with a broad perspective and a deeper understanding of global trends in e-Agriculture and rural development. The book documents empirical evidence of leading ICT-led agricultural projects, new innovations, support institutions, and policies driving e-agriculture success. E-agriculture and rural development provides readers with a unique opportunity to learn about the global expansion of e-Agriculture and rural development by drawing upon case studies, theoretical frameworks, best practices, and potential solutions to ICT challenges facing agricultural communities in both developed and developing nations. The authors use context specific case studies, qualitative and quantitative analyses, illustrations, and tables to describe key findings and suggest policy recommendations. This book appeals to a wide range of readers interested in e-Agriculture and rural development, agribusiness management, agriculture value chain management, global agri-food marketing, agriculture management information systems and decision support, agribusiness innovations, e-government service delivery, and sustainable agriculture development.

The diffusion and adoption of ICT in rural areas improves the efficiency of agriculture production and marketing through timely decision making that result in better performance across the agriculture value chain. In the 1990s, the use of computers and Internet to enhance agriculture value chains was concentrated mostly in developed countries. However, the diffusion of modern ICT such as mobile

phones has created new opportunities for developing countries to participate in lucrative global markets. Evidence linking ICT to economic growth and improved access to agricultural markets signals the numerous opportunities for future agriculture expansion and rural development. ICT is an enabler for information sharing and knowledge dissemination, and it has the potential to revitalize rural economies through enhanced access to global markets and resources. The availability of affordable ICT or low-cost access to information infrastructure is a necessary prerequisite for the successful utilization of ICT in rural areas where the majority poor people live. E-agriculture or ICT adoption in agriculture has prompted the development of modern agriculture value chains, and use of new value-added agricultural services. Further, harnessing ICT effectively creates new economic opportunities by improving agricultural productivity, market linkages, and rural employment. Thus, successful integration of ICT in agriculture promotes economic vitality of agricultural communities and is a key driving force for agribusiness competitiveness and sustainability.

Given that the global population is estimated at over 6.5 billion and expected to reach nearly 9 billion in 2050, food production will need to increase by 70 percent in order to feed these 9 billion people (FAO). The effective appropriation of ICT in rural areas is central to meeting the goal of rising projected food demand and alleviating the problem of undernourishment affecting an estimated 1.02 billion people worldwide. Given that mobile networks are now available to 90 percent of the world population and 80 percent of the population living in the rural areas, e-agriculture can be a tool for sustainable food production systems and global marketing strategies. As developed countries adopt the next generation wireless platforms (4G) while developing nations increase their proportion of mobile subscriptions from 53 percent to 73 percent at the end of 2010, e-agriculture will be instrumental in the delivery of sustainability solutions for farmers, agribusinesses, and agricultural communities. The fact that an estimated 80 percent of the population in developing countries is not online implies that commercial opportunities for expanding e-agriculture are yet to be fully exploited. This exploitation of e-agriculture benefits will be possible for as long as key investments are directed towards the development and maintenance of the necessary ICT infrastructure required to support agriculture and rural development.

E-agriculture is happening at a time of profound changes in agriculture. The widespread use of ICT in rural areas coincides with other revolutions in agriculture such as bio-fuels and biotechnology development. In addition, there are heightened global concerns about climate change as ecosystems around the world are being subjected to vagaries of climatic extremes than previously experienced. These include floods, drought, desertification, melting of ice from mountaintops, and rising sea levels, among other changes. As a result, raising the awareness of the role of ICT and its significant contributions in food security, poverty alleviation, and rural development is competing with demands for greener energy technologies, clean water, housing, health, and other basic needs. Although linkages between ICT use in agriculture and food security are improving, connections are still being made on its role in minimizing the effects of climate change. Researchers are investigating linkages between ICT and sustainability, especially its role in reducing carbon emissions. Similarly, the growing realization of the need for effective e-waste management is indicative of efforts to produce ICT that can not only facilitate food production and access to markets, but are environmentally sustainable. As vulnerabilities for agricultural communities increase, especially in developing countries, there is growing focus on ICT use to enhance agricultural productivity, access local and regional markets, and provide quality information services. ICT use in agriculture has gradually become a potent tool designed to improve efficiency of agricultural markets, climatic change management, food security, and rural poverty alleviation, especially in developing countries.

Global experiences in e-agriculture and rural development are wide and diverse. In this book, successful case studies are documented and key lessons drawn for other countries and government policy makers. The book covers three continents, [sub-Saharan] Africa, Europe, and Asia, where some of the innovative uses of ICT in agriculture and rural development have been experienced over the past decade. In sub-Saharan Africa, successful case studies of e-agriculture and rural development are drawn from Ghana, Ethiopia, Nigeria, Kenya, and South Africa. In Europe, e-agriculture and rural development cases are drawn from Greece and Ireland and North America in general. The cases that are reported from Asia are drawn from India, a country that has made huge strides in e-agriculture and rural development. These cases from Indian provide lessons for other emerging economies in the sub-region that are ready to take major leaps in investment in e-agriculture projects and programs. Collectively, the case studies identify patterns of ICT use in agriculture, policy development, social, economic, and technological challenges, and future prospects for an increasingly innovative global economy.

Three key issues emerge from the publication of this book. First, e-agriculture is still in its infancy, and relatively unknown to most people including some government policy makers and agribusiness experts. Second, e-agriculture is a growing global phenomenon and as such both industrialized and developing nations can derive clear opportunities by implementing e-agriculture to enhance the quality of life in rural areas and society in general. Although the transformations in e-agriculture and rural development are still unfolding, long-term prospects suggest the dawning of a new development paradigm that has the potential to redefine the way agriculture and agribusiness is conducted in the twenty-first century. The rest of the book is divided into four sections and seventeen different chapters. The first chapter provides an overall introduction to global e-agriculture and rural development. This is followed by chapters describing case studies or projects from countries in three regions, sub-Saharan Africa, Asia, and Europe and North America, respectively. The following section provides a summary of the chapters in this book.

Chapter 1 provides a general introduction to e-agriculture and rural development around the world. It describes the evolution of e-agriculture and the e-value creation attributed to the use of information and communication technologies (ICT) in agriculture supply chains and rural development. The chapter sets the scene for the next several chapters that document different unique experiences in ICT use in agriculture and rural development globally. This introductory chapter explores briefly the meaning of e-agriculture and it raises fundamental questions around a broader understanding of e-agriculture. Next it highlights global trends in ICT diffusion and examines e-value creation and key characteristics of e-agriculture development. The chapter identifies implementation challenges, emerging lessons, and potential future directions for e-agriculture. This chapter provides an aerial view of the global e-agriculture landscape and it emphasizes the growing significance of e-agriculture in rural development including implications for food security and poverty alleviation. The multiplier effects from e-agriculture projects underscore its strategic importance in socio-economic development, agricultural transformation, and the revitalization of the rural economy.

Chapter 2 describes how the environment in which ICT-based market information services (MIS) affect their performance based on two ICT-based market information service projects, the DrumNet and Kenya Agricultural Commodity Exchange (KACE) projects. The chapter indicates that the need to provide agricultural information to farmers has led to emergence of numerous electronic-based MIS projects in developing country. The experiences from past and present projects that use ICT to link farmers to markets reveal a mixture of success and failure. The chapter reports that a number of environmental factors related to socio-economic, physical, market, and legal environment affect the performance and sustainability of ICT-based projects.

Chapter 3 examines the use of ICT to overcome constraints in the agriculture value chain in Ghana. The chapter indicates that ICT applications in agriculture have brought new opportunities for farmers and traders to reduce transaction costs and increase incomes. The authors highlight that these applications are primarily used for linking actors in the agricultural value chain, accessing real time information on prices, buyers and sellers, transport and haulage, and other relevant information services in the agricultural value chain. Cell-phone applications have resulted in increased incomes, but the impact and sustainability of other ICT applications have been elusive. The chapter observes that ICT applications facilitate supply chain management through sharing of timely and pertinent information on producers, buyers, and other services, thereby helping to promote industry competitiveness. Key challenges to the widespread use and sustainability of ICT remain access to the appropriate ICT tool, poor road and storage infrastructure, and illiteracy among majority of smallholder farmers.

Chapter 4 deals with geospatial data infrastructure for sharing agro-climatic information to agriculture productivity in Nigeria. The chapter argues that geographic information system (GIS) and remote sensing (RS) are increasingly being used in agricultural management since the tools provide more efficiently support for emergency agro-climatic information needed in the 21st century. The authors bemoan the fact that several studies have been carried out on application of GIS and remote sensing for agricultural and rural development in other part of the world, but little research has been done in sub-Saharan Africa in terms of developing geospatial data infrastructure to enhance agricultural practices and especially agricultural risk management in this age of climate change. The chapter examines technological aspects of geographic information sharing as a useful platform for sharing information among agricultural agencies in Nigeria and to formulate useful prescriptions for the future. The study show how an integrated GIS modeling system can allow agricultural producer as well as policy makers to know the impact of variation in climate spastically from one place/region to other for better management, productivity and profitability. The study also develops agricultural GDI prototype for agricultural emergency management. This chapter concludes by suggesting that developing country (i.e. African countries) should embark on agricultural policy reform to enhance investment ICT infrastructure in agricultural production.

Chapter 5 deals with ICT and unemployment in Nigeria. The chapter considers ICT to be veritable tools to tackle the rising unemployment in Nigeria. The chapter argues that increase in mobile phones has led to job creation with telecentres being set up in places like shops, schools, community centre, police stations and clinics. Given that Nigeria has a population of about 140 million according and 60 percent of this number is made up of unemployed youths, resolving unemployment is critical. This chapter examines the effects of unemployment on the Nigerian GDP for the period 2000-2008. Results showed that unemployment has an enormous effect on the Nigerian GDP and there exist an inverse relationship between the model (unemployment) and the GDP. The chapter discusses the role of ICT on unemployment and GDP and proposes using ICT as a tool to combating unemployment corruption.

Chapter 6 presents a discussion on ICT diffusion and adoption in Nigeria's agricultural sector. After the telecom deregulation policy of the Nigerian Government in 2001, the country witnessed an upsurge of private investment in ICT development in the country and the consequential ICT revolution in Nigeria. Empirical survey on diffusion and adoption pattern of ICT in the Nigerian agricultural system showed that mobile phone constitutes the most widely adopted ICT device by the agricultural researchers, extension agents and rural farmers. In addition to this, evidence showed computer and Internet adoption by the researchers, and transistor radio by the rural farmers. All the eight agricultural research organizations and the four extension agencies surveyed had electronic mail addresses and telephone lines for informa-

tion exchanges. Six of the agricultural organizations - CRIN, FRIN, NIHORT, IAR&T, NIOMR and NAERLS, and one of the extension agencies – LSADA, had organizational websites for hosting generated agricultural information. Radio and television were the frequently used media to air farmer programs by agriculture and extension system. Future challenges lie in exploration and widespread use of modern ICT in agricultural system, electricity supply, and human capital development for effective utilization.

Chapter 7 examines the impact of ICT on livestock production by rural farmers in Nigeria. Questionnaire, interview, and personal observation methods were employed to elicit information on the impact of ICT on livestock production on rural areas of Nigeria. The chapter reveals the importance of personal characteristics of the respondents in ICT use. The findings also reveal that rural farmers need to be encouraged by providing them with relevant information and communication technology gadgets in order to enhance effective access to information on veterinary and extension services to improve productivity. The chapter recommends the establishment of Internet facilities in rural communities as a priority for the State and Federal Governments in order to encourage digital literacy.

Chapter 8 deals with marketing efforts by the government of South Africa (GSA) to provide e-services to its citizens. The Batho Pele Gateway Project is the access portal to government information and a key driver of the e-government transformation in South Africa. Although the GSA is determined to make e-government service delivery successful, the average citizen does not fully comprehend the key transformations driving government engagement with civil society and businesses. Therefore, the Cape Gateway Project (CGP) is confronted with the immense task to develop and implement a strategic marketing program for e-government by the Provincial Government of the Western Cape (PGWC) which is not only a portal, but also a call centre and walk-in centre. Various marketing tactics have been deployed, but their efficacy in elevating awareness levels and converting that to actual sustained use of e-government service delivery remains unknown. The chapter proposes an e-government marketing framework and uses CGP experience to examine communication and branding strategies for e-government in a South African context. Key challenges facing e-government market communication strategy are highlighted.

Chapter 9 deals with information security and the risks poised to South Africa's bid to build a broad-based information society. The integration of information security in e-government is no longer an option, but an imperative given the resulting "information overload" and the need to filter "good" from "bad" information. Unless South Africa integrates information security in its e-government development policy and practices, the acclaimed benefits of e-government will not be realized. The moral hazard problems arising from bad information behavior such as human manipulation, withholding information, unauthorized access, and violation of individual privacy and confidentiality heightens the need to combat info-security risks and vulnerabilities. South Africa's readiness to deal with the information security risks has come under scrutiny in the past decade. The information security infrastructure in South Africa is also not clearly understood. The chapter highlights South Africa's information security landscape and describes how institutional and agency coordination could help improve information security in e-government.

Chapter 10 describes the development of Knowledge Management (KM) centers for extension advisory services and communication in rural areas in Ethiopia. The KM centers provide an opportunity for agricultural development organizations to achieve higher efficiency and increased output. With the objective of attaining opportunities in KM at district level, Woreda Knowledge Centers (WKC) were established and used in ten districts in Ethiopia from 2005 to 2010. WKC is a tele-center used to gather, share, classify, access, and use knowledge at district (woreda) level. The chapter explains WKC usefulness, establishment steps, challenges, and opportunities. In ten districts, of the 500 survey respondents, 79%

and 71% agree on an increase in knowledge delivery and availability respectively. Temporal comparison showed that WKC increased staff capacity to document, access, share, and use knowledge leading to improved extension communication. The chapter recommends that WKC must be established by ministry of agriculture and its' strategic partners to enhance KM at district level for agricultural development.

Chapter 11 presents a situation analysis of e-agriculture in India. The chapter provides an in-depth analysis of the existing rural agrarian digital divide in Tamilnadu, India. The UN International Telecommunication Union (ITU) estimates that one billion people worldwide – most of whom depend in some way on agriculture for their livelihoods – still lack connection to any kind to ICT. This chapter assesses the information needs and access to ICT tools by rural farmers. In addition, the chapter provides an overview of ICT-led opportunities for farmers in rural Tamilnadu, and the status of E-Agriculture in Tamilnadu. The chapter also describes the ICT interventions that are available for Tamilnadu farmers and highlights the emerging opportunities for rural farmers to take part in the knowledge society. The chapter offers some guidance on how the farmers can take advantage of ICT and utilize the information management system to derive maximum benefit out of the technology.

Chapter 12 discusses ICT and its potential to transform Indian Agriculture. The chapter indicates that the role of ICT in enhancing food security has been well established and has got recognized at worldwide forums such as the World Summit of Information Society [WSIS] 2004-2005. ICT tools include use of computer, Internet, geographical information system (GIS), mobile phone, and traditional media such as television and radio. The author argues that the information age requires ICT to create an expressway of information interlinking farmers, markets, corporate, agricultural scientists and experts, and buyers of their products. ICT has a responsibility to ensure that producers get maximum share from the price paid by end consumer to purchase the produce. Thus, the two major areas where ICT can create opportunities happen to be, first Creating Information Expressway for Farmers; and second Strengthening Farmers' Linkages to Supply Chain. These two aspects have been discussed with the help of initiatives taken by Government as well as Corporate Sector. The chapter discusses models such as AGMARKNET, NDDB Procurement Process, e-Choupal and EID's Parry's Corner. A sound knowledge of these ICT experiences is expected to deepen understanding of the role and importance of information technology.

Chapter 13 deals with the "E-National Pest Reporting and Alert System" in pulses crops in India. This is a unique ICT based decision support system, which is very effective and easy to operate through a centralized server system at National Centre for Integrated Pest Management, New Delhi. The decision support system is connected with Internet and mobile phones. This system was developed to cater for the needs of rural farmers of India who grow pulse crops. This decision support system collects, stores, processes, and interprets useful information which is then disseminated as appropriate advisory services for registered farmers through a centralized server system. They apply suitable corrective measures as per advisories at the right time and thereby heavy loss caused by various pests can be minimized or kept below economic threshold level. Based on the past experiences and larger response of the stakeholders, Department of Agriculture and Cooperation, Government of India, suggested that this program should be extended and implemented in all pulse growing states. This system is quiet useful for bottom to up level officials or policy makers that are involved in E-Pest Surveillance program.

Chapter 14 describes the role of ICT in agribusinesses in Ireland. The chapter focuses on the opportunities for extranet services to provide information to farmers. This chapter critiques the level of adoption of ICT among the farming community in Ireland and compares this with adoption by the general population. The chapter reports that computer access and Internet use among Irish households have been

increasing rapidly in recent years, but farm households have been lagging behind in adoption of these technologies. Broadband access has been particularly problematic in rural areas, where farm households are located. The chapter also evaluates the development of a novel extranet service by a large agribusiness firm. This service allows dairy farmer clients to access all information relevant to their accounts with this agribusiness through a secure website. A structured survey of clients was carried out and respondents were stratified on the basis of their usage of this extranet service. The readers might find this chapter useful as it provides key insights on ICT adoption in a developed country. The chapter identifies three key factors that constrain adoption and use of ICT among Irish farmers: low levels of computer skills; lack of awareness of the potential of ICTs to contribute to the farm business, and thirdly, access to Broadband in rural areas. Resolving the fundamental problems that constrain broadband penetration and adoption of ICT will enhance opportunities for extranet services for rural farmers and agribusinesses.

Chapter 15 deals with e-learning in forest worker's training for sustainable forest management. This chapter is unique in that it addresses a sub-sector that is closely aligned with agriculture and whose successful uptake of ICT will generate positive spillover effects for sustainable agriculture production. Forest workers' training is recognized as a necessary precondition for sustainable forest management. As sustainable forest management sets higher levels of standards, the adoption of new ICT in forest workers' training and extension systems is a necessity in the Information Age, which will help the current and future workforce to better fit in the increasingly digitalized and demanding world of forest work. The chapter noted that limitations on the use of ICTs do exist and should be seriously taken into consideration. Digital divide is evident both in developed and developing countries, making the implementation of ICT applications difficult, especially in the case of African and Asian countries. Furthermore, the development of e-learning systems for forest professionals must adhere to very specific design standards and educational theories. The chapter suggests research that focuses on the needs of the end-users at regional or national level. The chapter emphasizes the significance of a stable framework of political and financial support; combination of long-term planning, clear target setting and cost effectiveness is critical for the successful promotion of sustainable forest management through e-learning.

Chapter 16 brings in the issue of soft computing modelling of wild fire risk indices. The chapter is based on risk profile of Peloponnesus region in Greece. Forest fire risk estimation is a major issue and the necessity for more efficient allocation of fire fighting resources becomes more and more urgent, especially in the areas located around the Mediterranean basin (Portugal, Spain, France, Italy, Greece). The chapter explains the need to reduce the risk of devastating forest fires that have multiple negative ecological and financial consequences. This preliminary research effort is based on the implementation of an intelligent rule based fuzzy inference system evaluating wild fire risk in the forest departments of Greece. The system uses Soft Computing techniques and it was built in the *Matlab* integrated environment. The research is based on wild fires in Greece during the period 1983-1997 with data coming from the general forest management service. The estimation of the risk indices was done by using fuzzy Triangular membership functions and Einstein fuzzy conjunction T-Norms. Moreover the system produces a profile of the forest departments located in the geographic area of "*Peloponnesus*"- a region located in the southern part of Greece that has a vast number of annual forest fire breakouts. Meteorological, topographic and historical (total burned area and intervention time) features were considered for the determination of the risk indices. The system has shown a good performance which can be improved further if more data is gathered and used. Its main advantage is that it offers an innovative and reliable model that can be employed in any part of the globe as a basis for natural disasters' risk estimation.

Computer applications in wild fire risk estimation have positive implications for agriculture given potential ecological damage that could arise from poor wild fire risk estimation. The chapter highlights the linkages between ICT applications in agriculture and other key sub-sectors.

Chapter 17 discusses the unprecedented growth in information and communication technologies (ICT) through the widespread use of personal computers, Internet, and mobile phones. The chapter examines trends in ICT use in agriculture, identifies key success factors for ICT utilization in agriculture, and investigates the implications of ICT-enabled value chains for the agribusiness industry. The chapter describes the strategic role of ICT in the development of both e-commerce and mobile commerce in agriculture in North America and globally. The chapter identifies the leading areas of ICT use in agriculture and agribusinesses as input procurement, production, marketing, food traceability, and financial service delivery. Producers are increasingly seeking ways to add value to their businesses by integrating ICT in the value chain. Similarly, consumers are becoming more knowledgeable about how they could use ICT to articulate their preferences. The chapter discusses key success factors for ICT applications affecting both the internal and external environment of agribusiness firms. The chapter concludes by drawing implications for ICT use in agriculture and agribusiness value chains.

This book is culmination of a two year-long collaborative effort between Dr. Charalampos, Z. Patrikakis, and me, and indeed our two institutions, the *Informatics Laboratory of the University of Athens, Greece and West Virginia University, USA*. In addition, some of the research works published were a result of collaborative efforts between Cape Peninsula University of Technology and Provincial Government of the West Cape, in Cape Town South Africa. This book marks the beginning of a new chapter on global research collaboration in field that is receiving growing attention from researchers, non-governmental organizations (NGOs), agribusiness experts, policy makers, and other practitioners. Although e-agriculture is not yet considered a field of study, a number of students in developing countries are actively working on various topics and projects that address challenges in this emerging field. We hope that several books, journal articles, and international conferences on e-agriculture will result in an effort to seek new knowledge and understanding of this field. I believe that the publication of this book is a clear demonstration that the effort of many scholars and researchers working in this field is paying dividends by providing new ideas and better understanding of e-agriculture and rural development. I hope that readers will find this global publication useful and exciting, and that it will inspire students and other researchers to do more work in this field in the future.

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despite some projects meeting their goals. This study examines how the environments in which such ICT-based MIS are deployed affect their performance. It specifically uses two ICT-based market information service projects, the DrumNet and Kenya Agricultural Commodity Exchange (KACE) projects, to assess how the socio-economic, physical, and institutional environments in such projects are deployed affect the performance of such projects. The study finds that a number of environmental factors related to socio-economic, physical, market, and legal environment affect the performance of ICT-based projects. Some of these factors exacerbate transactions costs thus undermining the performance and even sustainability of ICT-based MIS projects. It discusses policy implications of these findings.

Development partner efforts and private sector initiatives on ICT applications in agriculture have brought new opportunities for farmers and traders to reduce transaction costs and increase incomes. The applications are primarily used for linking actors in the agricultural value chain, accessing real time information on prices, buyers and sellers, transport and haulage, and other relevant information services in the agricultural value chain. Limited evidence from Ghana and elsewhere show that cell phone applications have resulted in increased incomes but the impacts and sustainability of other ICT applications have proven elusive. The role of ICT in overcoming the key constraints in the agricultural value chain and for making evidence-based decisions will be greatly enhanced if farmers, aggregators, and other stakeholders in the value chain pay attention to their business scope and schedule planning, executing, monitoring and control, procurement, risk planning, and stakeholder communications in a "project management" context. When this is done, ICT applications will facilitate supply chain management through sharing of timely and pertinent information on producers, buyers and other services, thereby helping to promote industry competitiveness. The major challenges to the widespread use and sustainability of ICT remain access to the appropriate ICT tool, poor road and storage infrastructure (particularly in the farming communities) and illiteracy on the part of the majority of smallholder farmers.

Geographic Information Systems (GIS) and Remote Sensing (RS) techniques are increasingly being used in agricultural management to more efficiently support emergency agro-climatic information needed in this century. Although several studies have been carried out on application of GIS and remote sensing for agricultural and rural development in other parts of the world, little research has been done in sub-Saharan Africa in terms of developing geospatial data infrastructure to enhance agricultural practices especially agricultural risk management in this age of climate change. This chapter therefore examines technological aspects of geographic information sharing as a useful platform for sharing information among agricultural agencies in Nigeria and to formulate relevant prescriptions for the future. The study shows how an integrated GIS modeling system can allow agricultural producer as well as policy mak-