

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) AND RURAL AND AGRICULTURAL DEVELOPMENT IN SRI LANKA

Dr. G.M. Henegedara
Senior Lecturer in Economics ,
University of Kelaniya, Kelaniya
Former Senior Research Fellow (HARTI)
email: mahinta2002@yahoo.com

Abstract

Along with the rapid globalization, Information and Communication Technology (ICT) has been used as one of the effective methods to speed up rural agricultural development in many countries. Sri Lanka has also used ICT for rural agricultural development, particularly for the sake of improving livelihood of farming community and the food security of the nation. As an emerging economy, Sri Lanka's position in knowledge economy indicators such as innovation, education and information infrastructure are substantially low compared to developed nations, but slightly better compared to developing nations in South Asia. The government of Sri Lanka realized the importance of using ICT and knowledge based development and implemented various policies and programs at national and local levels during the 2004-2014 period. It included rural and agricultural development programs i.e. Upgrading communication and wifi facilities, initiating several ICT programs such as Nenasala, Vidatha and cyber extension programs at rural and community level. This paper intends to examine various ICT initiatives and its impact on rural agricultural development in Sri Lanka. Thus, the analysis was focussed on reviewing ICT initiatives for improving knowledge based development indicators and its impact on rural agricultural development in Sri Lanka. The paper is consisted of five sections i.e. present status of ICT use in Sri Lanka, ICT initiatives, the need, prospects and the impact on improving rural agricultural sector. The paper concludes that still Sri Lanka has not gained all potential benefits of using ICT despite the fact that the country possesses relatively higher knowledge economic indicators in the South Asia region.

Key words: ICT, Rural Development, Knowledge base economy and Agriculture.

1. Introduction

Information and Communication Technology (ICT) is a unified communication method that merges computer based electronic media with telecommunication network for wider use of information among various users through internet, Facebook, telephone, television, radio and other media networks and audio video techniques. The ICT becomes an effective method of disseminating information among wider range of users involved in rural and agricultural development in the world. Thus, many developing countries use ICT as an instrument for increasing productivity and competence of rural agricultural projects initiated for the benefit of small producers. ICT could be used widely as knowledge based instrument of minimizing moral hazard and imperfect market signals that prevailed in rural agricultural sector (Kreps, 1990). It is used for various purposes such as forecasting agro climatic conditions, identifying vulnerable locations, communities and resources while linking credit and marketing institutions for agribusiness. Earth-observing satellites play an important role in evaluating the extent of

degradation and depletion of renewable natural resources. The improvements in computer technology provide new tools for analyzing satellite imagery and geographical information. Once data is converted into a digital format, it could be integrated with available tables and maps so as to build predictive models under the GIS system. Similarly, availability of reliable market information would minimize the bad effects of adverse selection (Kreps, 1990).

At the same time, ICT is used for planning and management of agriculture, rural development and agri-business projects in many countries. For instance, agricultural producers in USA, Australia and New Zealand use ICT for agro business management. Some provincial governments in India such as Maharashtra, Bangalore and Andra Pradesh have used it effectively for minimizing risk of small producers through the proper land use planning and providing market information despite low literacy rates among rural communities (Chambers, 2006). Similarly the tendency of using social media i.e. face book and internet facilities for rural agricultural development has increased. Thus, Sri Lanka has also been taken some initiatives to use ICT for rural agricultural development. But its effectiveness in overcoming rural backwardness is rather sluggish in spite of relatively better literacy rates among rural communities compared to other South Asian countries. In spite of rapid economic growth in the recent past, regional disparities are widening in the country indicating negative effects of urban biased development. This situation is visible in the western province and coastal areas of the country (Central Bank of Sri Lanka, 2010). Dual economic features inherited from colonial administration have further widened the gap between rural and urban sectors.

Therefore the objective of this paper is to review the present status of rural agricultural development in Sri Lanka with special reference in ICT policy initiatives and their impact on rural agricultural development. The paper explains the present status of Sri Lankan economy by reviewing ICT facilities and knowledge economy indicators and their impact on rural agricultural development. It also highlights the main socio- economic issues and constraints that affected in this regard.

The methodology of the study is based on deductive method and the whole paper was based on secondary sources of information published by the various institutions such as World Bank, Central Bank of Sri Lanka and the Department of Census and Statistics. Some micro research studies done by the Hector Kobbkaduwa Agrarian Research and Training Institute (HARTI) were used to substantiate the macro data. The review was based on simple statistical methods such as trend lines and charts. Computer literacy ratio, household's ownership of computers and other ICT instruments were used as key indicators assessing in access to ICT.

Similarly, Knowledge Assessment Methodology (KAM) and the Knowledge Economy Index (KEI) designed by the World Bank (2003) were used as the key instrument of assessing ICT level of countries. KAM consists of 80 structural and qualitative variables that serve proxies for the four pillars that critical to the development of a knowledge economy. Thus, the Knowledge Economy Index (KEI) has prepared by considering three indicative variables in each of four pillars that indicate a country's overall position. It includes:

1. Economic and institutional regime that provides incentives for the efficient use of existing and new knowledge and flourishing of entrepreneurship
2. An educated and skilled population that can create, share and use knowledge
3. Dynamic information infrastructure
4. An efficient innovation system of firms, research centers, universities, consultants and other organizations

The impact of using ICT for rural agricultural development was assessed by considering key indicators i.e., cost of production, risk factors in relation to water availability, credit and marketing.

The paper consists of five sections. Section one reviews the present status of information and communication technology in Sri Lanka in comparison with South Asian countries. The government policy and ICT initiatives for rural development in Sri Lanka were discussed in the second section. It highlights the government policy and programs of ICT initiated for rural development. The need and potentials of using ICT in Sri Lanka was examined in the third section and the effects of using ICT for rural agricultural development in Sri Lanka were presented in the fourth section. The paper concludes with some recommendations in the fifth section.

2. The Present Status of ICT in Sri Lanka

According to world Development Report (2009), Sri Lanka belongs to middle income countries. Its population is nearly two billion and the majority (72 percent) live in rural areas. The agricultural sector is still important as the main source of employments and the food production. The agricultural sector alone contributes 30 percent of labour force though the share of agriculture to the GDP is only 11 percent compared to the industrial sector (29%) and service sector (58%) respectively (Central bank of Sri Lanka, 2012). The main feature of agricultural sector in Sri Lanka is its dualistic nature of cultivation i.e. plantation crops and non-plantation (food crops) crops (Snodgrass, 1966). Thus tea, rubber and coconut are grown in the plantation sector and paddy, vegetables, tubers and other field crops are cultivated in food crops sector. The government recognized the importance of rural agricultural sector as the key sector of economy as it contribute directly to the nation through providing food (food security) and generating foreign exchange and employment to the nation.

The economic performance of the country in the past six decades since independence in 1948 indicates that the economy has transformed from the status of a low income country to middle income country (World Development Report, 2006). Thus, the per capita income of the country has increased from US \$ 150 in 1960 to US \$ 3280 in 2013. The Gross Domestic Product (GDP) of the nation was also increased from Rs. 6711 million to Rs. 8674 billion during the respective period. The GDP share of the agricultural sector has declined from 37.8 percent in 1960 to 10.8 percent in 2013 and the shares of industrial and service sectors were changed respectively from 16.8 to 30.0 and 45.4 to 59.2 during the respective period. However, the economic disparities and income inequalities of the country have widened indicating a clear difference between urban and rural sectors. Nearly 70 percent of total population of the country still lives in rural areas and are occupied mainly in the agriculture and the related activities. Though the poverty line has declined from 43 percent in 1963 to 7.2 percent in 2013, its gravity is still high in the rural sector compared to the urban sector. The rural sector characterizes low productivity, low income and subsequent Poverty and malnutrition (Dias, 1986).

The macroeconomic policy structure of the country has changed from inward looking policy framework that have been followed since independence in 1948 to outward looking policy framework that is based mainly on liberal policies in 1977. The international trade, foreign direct investment and business activities were developed and Information and Communication Technology (ICT) was developed simultaneously as an instrument of economic development (Henedara, 2011).

The high level of literacy rate (92 percent) and welfare oriented education and health services in Sri Lanka are very impressive for the promotion of ICT and thus the government has taken some initiatives for expanding ICT facilities such as e governance, e commerce, e banking, e education and Internet based virtual education. But compared to other developing countries, necessary basic facilities for knowledge based economic investments are yet to be developed. Nonetheless, Sri Lanka has been able to develop her basic infrastructure facilities such as electricity and telecommunications to nation. Almost 90 percent of total population living in rural areas are able to access electricity that required using ICT instruments i.e. computers and servers.

Table 1: Enhancement of Telecommunication Services

Telecommunication service	2012	2014
Fixed Access Services (No)	3,449,391	2,679,000
Wire line Telephone in service	900,354	1,179,000
Wireless local loop telephone (CDMA)	2,450,037	1,556,000
Cellular phones (no of subscribers)	20,324,070	22,123,000
Telephone density (telephone per 100 Persons including cellular phones)	116.95	120.5
Internet and Email (no of subscribers)	1,365,655	3383,000

Source: Annual Reports, Central Bank of Sri Lanka (2012 and 2014)

As indicated in table 1, the number of persons who possess Landline phones has declined over the years and the number of cellular phone users has increased continually indicating around 120 per 100 people. At the same time, access to Internet facilities were increased as increase the broad band and wifi facilities during 2000-2014 periods. According to latest computer literacy survey conducted by the Department of Census and Statistics of Sri Lanka in 2015, computer literacy ratio and the number of desktops and laptop owners have increased substantially. Thus, table 2 indicates that computer literacy ratio of Sri Lanka in 2015 is 26.8 and nearly 25 Percent of population own either desktop or a laptop.

Table 2: Computer Literacy Ratio and the Number of Households Own Computers

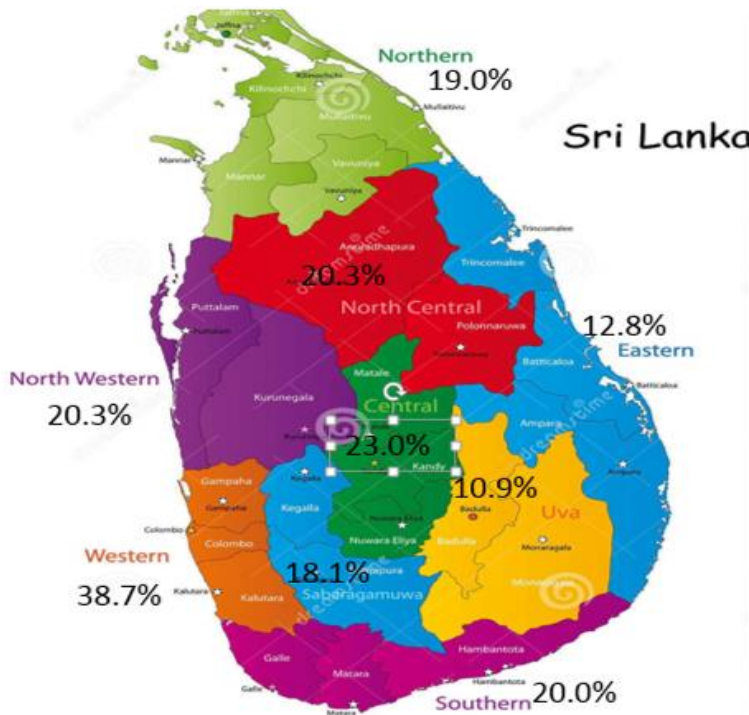
Literacy/ Computer owners	2000	2014	2015
Computer Literacy Ratio (%)	7.96	25.1	26.8
Household Owners of Desktops and Laptops	-	22.4	24.6

Source: Computer Literacy Statistics, Department of Census and Statistics (2015)

Computer literacy statistics (2015) reflects that computer owned households were mainly concentrated in urban sector than the rural and estate sectors of the country. Thus, 42 percent household owners were from urban areas and 22 percent were from rural sector. Only 5.4 percent household users were reported from estate sector. So it implies that the majority of rural and estate sector dwellers were not used ICT.

The map 1 illustrates spatial distribution of household owners of computers according to administrative provinces in Sri Lanka. As shown in map 1, 38.7 percent of computer owned households were concentrated mainly in the Western Province where administration and commercial centres established. Ownership in in Uva and Eastern provinces where poverty pockets concentrated is very low and situation in Northern and Sabaragamuwa Provinces are also low. However, computer ownership in all other provinces is above 20 percent.

Map1: Computer Ownership According to Administrative Provinces in Sri Lanka



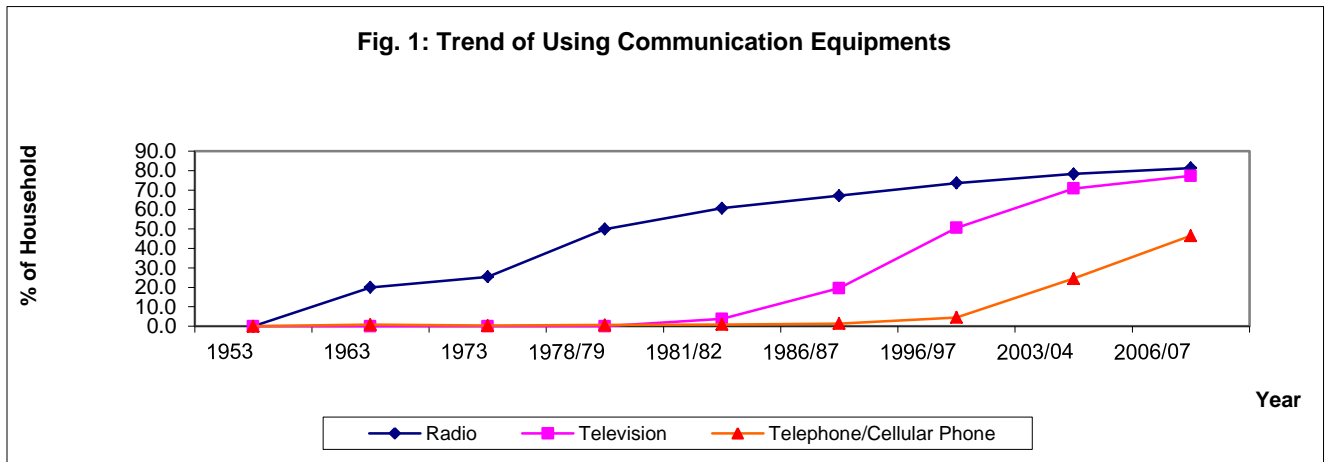
Source: Department of Census and Statistics (2015)

According to World Bank's Knowledge Assessment Methodology (KAM) and the Knowledge Economy Index (KEI), Sri Lanka ranks at 82 out of 149 countries (Central Bank, 2010). Sri Lanka's position in 2002-03 was 3.76 and it is an increase from 3.26 in 1995. A successful knowledge economy is characterized by close relationship with technological innovations and rapid development. According to KEI status in 2002-03, Sri Lanka is the second highest in the South Asian region, the first being India. The biggest improvement in Sri Lanka is in the economic incentive regime and the innovation and information infrastructure variables are yet to be improved as G7 countries and East Asian countries (table.3).

Table 3: Knowledge Economy Indicators and Main Components in 2002-03

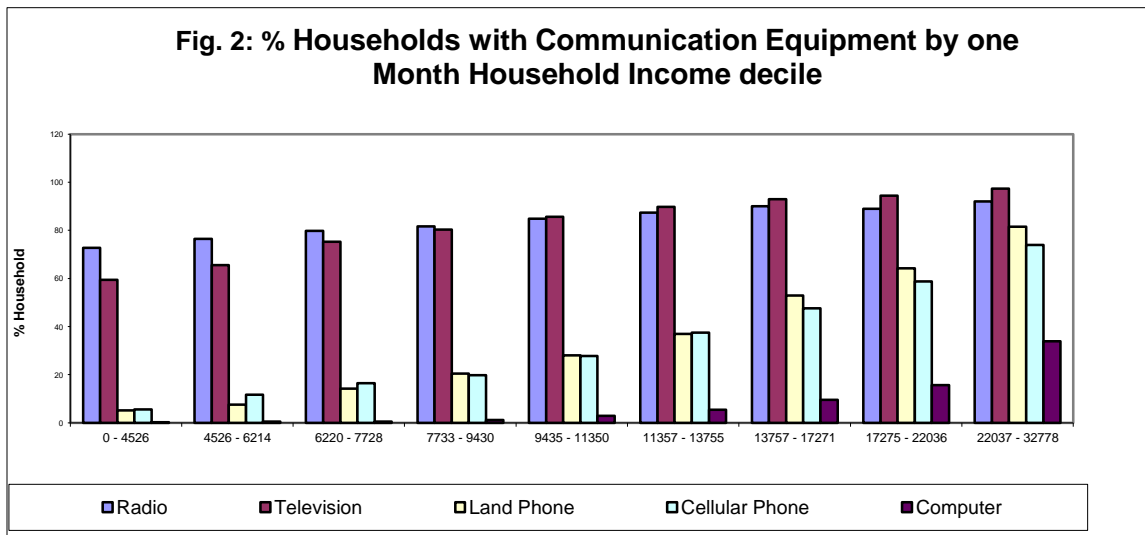
Country	KEI	Economic Incentive Regime	Innovation	Education	Information Infrastructure
G7 Countries	8.55	7.85	9.49	8.21	8.64
East Asia	5.44	4.95	6.39	4.96	5.48
India	3.97	2.91	8.59	2.33	2.06
Sri Lanka	3.76	5.08	3.67	3.90	2.39
South Asia	2.70	2.44	4.90	2.10	1.34

Source: www.worldbank.org/kam

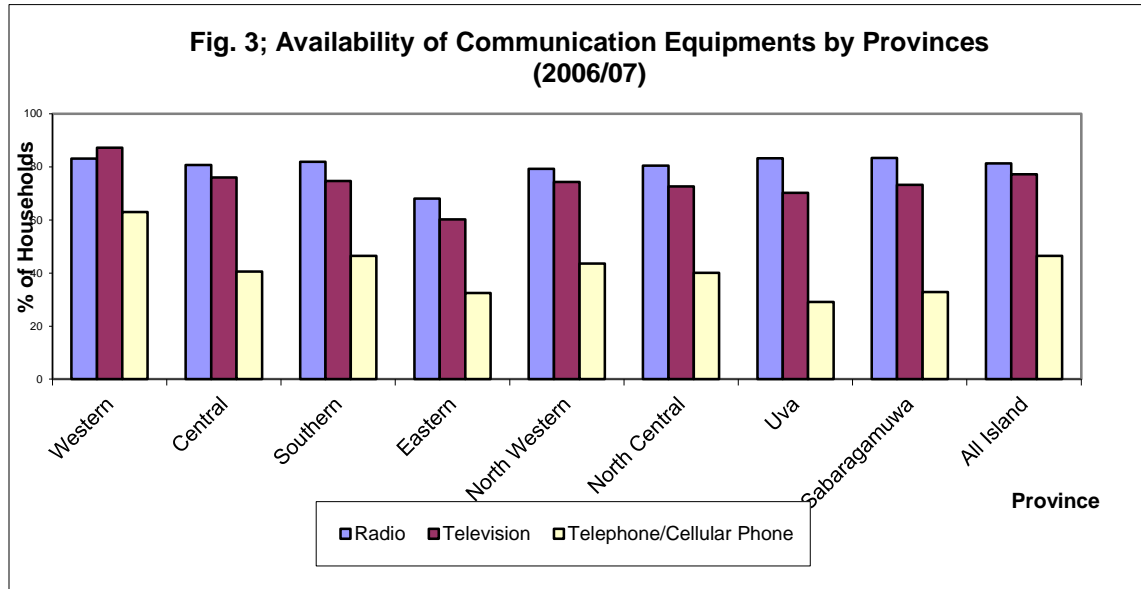


Source: Department of Census and Statistics (2007)

As shown in figure 1, the trend in using radio, television and telephone/cellular phones has increased during the past six decades. However, the use of these items has varied according to income deciles indicating that the lower income decile groups used mainly radios and televisions. The higher income categories above Rs. 11350 are used all equipment i. e. radio, television, land phones, cellular phones and computers (Figure 2). Thus, use of telephone and cellular phones among low income groups are not significant when compared to the use of radios and televisions.



Source: Department of Census and Statistics (2007)



Source: Department of Census and Statistics (2007)

Figure 3 indicates the availability of communication equipments by provinces such as Western, Central, Southern, Eastern, North Central, North Western, Uva and Sabaragamuwa. As shown in figure 3, though there is no significant difference between administrative provinces in using radio, television and phones some disparities can be observed between Western province and other provinces.

Irrespective of the high literacy ratio in the country which was 94% in 2014, computer literacy rate even among educated persons stands at 26 per 100 persons. This number is very low when compared with the world and regional statistics in relation to ICT users. Like some other developing countries, Sri Lanka also faces challenges in applying ICT for rural and agricultural development. These challenges were related to two factors (Asian Development Bank, 2007; Lurdu, 2011).

1. Use of ICT is still limited to modern banking, commerce and service sectors that are linked with wider global market network.
2. The majority of small producers who spread in the rural agricultural sector belong to a low income category and their ability to access ICT facilities is limited. Lack of facilities, awareness, financial difficulties and less enthusiasm were recognised as the core factors in this regard

3. ICT Initiatives in Sri Lanka

The government of Sri Lanka also recognized the importance of ICT for rural regional development and implemented several programs for upgrading telecommunication industry and ICT (Chintana, 2006-2016). Since early 1990s, the government of Sri Lanka commenced Information Technology (IT) projects in relation to Geographical Information Systems (GIS) projects for land use planning and watershed management and regional development. At the same time, e-commerce, e-banking and e services were introduced. E-services cover a wider range of services i.e. education, health care, government services and agricultural extension. The objective of these initiatives was to increase efficiency of respective services and provide information to various users. As a result, users were able to access on line services such as

receiving examination results and other on line education and training facilities. Many state agencies have established their own websites to provide necessary information. According to the survey on ICT usage in the government sector in 2010, 35 percent of government organizations having completed websites and 9 percent were under preparation (ICTA, 2010). Of the completed websites, 65 percent were in the ministries, 78 percent were in the departments and 63 percent were in statutory bodies. Services provided by the government institutions are varied in providing information, application form downloads, interactive citizen services and web portal (table 4).

Table 4: Type of ICT Services Provided by the Government Institutions

Type of Services	Ministries	Departments	Statutory bodies
Information only	65 %	78%	60%
Application forms down loads	38%	39%	31%
Interactive citizen services	15%	15%	8%
Web portal	9%	7%	10%

Source: Survey on ICT usage in the government sector (2010) by the ICTA

In addition to the websites maintained for public use, some Departments like Agriculture and Agrarian development have established cyber units through selected Divisional Agrarian service centers as the on line extension service. As a result of improvements in ICT based public service provision, Sri Lanka's performance in the UN E-Government Development Index (EGDI) advanced with Sri Lanka's rank increased to 74 in 2014 from 115 in 2012 (Central Bank, 2014). Under Mahinda Chintana, the ten year horizon development framework of the former government for 2006-2016 envisaged a new era in information and communication technology (ICT). The government established a new agency called Information and Communication Technology Agency of Sri Lanka (ICTA) in order to expand ICT facilities over the country. The ICTA functions directly under the presidential secretariat, to facilitate integration of information system of government organizations. The expected outcomes of ICTA initiatives were four fold (ICTA, 2010).

1. Assure more effective citizen centered and transparent government.
2. Empower rural poor, women and youth through increased and affordable access to ICT
3. Develop leadership and skills through ICT
4. Employment creation through ICT industries and IT related services and enhanced competitiveness of user industries and services.

I. e-Sri Lanka initiative

The e Sri Lanka initiative was implemented by the ICTA with a broader perspective of linking rural Sri Lanka with global society. It uses Information and Communication Technologies (ICT) to develop the economy of Sri Lanka by reducing poverty and improving living standards of the people. Therefore, the essence of the ICT was aimed to achieve five strategic objectives such as building the implementation capacity, building information infrastructure and an enabling environment, developing ICT human resources, modernizing government and delivering citizen services, and leveraging ICT for economic and social development, through public-private partnerships (ICTA, 2013). The e-Society Program is the most innovative program introduced in this regard. It covers three aspects:

- 1 e Society development initiative
- 2 e Village Program
- 3 Corporate Social Responsibilities through ICT

All ICT programmes were based on the above themes and implemented several projects in remote rural villages as community beneficiary projects targeted on fulfilling immediate and essential needs of the respective villages. According to the ICTA website, five strategies were followed in moving knowledge and information to rural masses. It includes raising awareness within civil society, developing multi holder partnership, establishing a fund for rural poor, providing opportunity for economic growth and quality of life and enhancing the capacity of stakeholders. Though realizing program objectives of ICTA initiatives is somewhat difficult in the short run, upgrading knowledge and skills of rural masses is a very important step for transforming rural community for modern world transformation.

II. Nena Sala Program

As the program initiated by ICTA, the Nenasala expects to achieve two prime objectives i.e. educating rural community through ICT and improving their living standards. By the end of 2015, 800 Nenasala Centers had been established of the total target of 1000 to be established. These centers were located in common places of the village such as temples, churches, Kovils and community centers where easily accessible to rural youths and students. The Nenasala implements several models such as Rural Knowledge, e libraries, distance learning and e learning Centers and tsunami camp computer centers. It provides computers, internet connection and a fax machine to each center. After 2 years, the center should be able to be independent. In addition to ICT initiatives of the ICTA, some other ICT initiatives were initiated for rural agricultural development by other government institutions too. It includes;

I. Cyber Extension Units

The Department of Agriculture initiated Cyber Extension Units (CEU) in 2004 in order to deliver extension services to rural farmers. Accordingly, 55 (CEU) were established in selected Agrarian Service Centers in 2004. There were two phases of the project: Interactive multimedia based digital extension method was initiated in the first phase by using CDROMs on agriculture subjects. Both extension workers and farmers can use the CDROM as self-learning package under the project and accordingly extension workers become e- extensions workers and farmers become e-farmers when use of information technologies in agriculture (Weerakoon, 2015). The second phase of CEU, with real cyber extension connected to Internet and telecommunication facility was introduced in 2007, in order to provide improved research and extension knowledge to a wide verity of farmers. Accordingly, small farmers in selected Agrarian service centers were able to solve their immediate problems through on line services of the CEU.

II. Gamidiriya Information Centres

Gamidiriya is a World Bank funded poverty alleviation project and promoted applying ICT for rural communities through Nenasala program. Thus, 650 Gamidiriya Information Centres have established separately as the part of Gamidiriya development programs implemented. These centres were collaborated with Gamidiriya village companies for the needs of their members. Basically, these centres provide agricultural and business information to clients while conducting training for youth and students. Many of these centres were implemented effectively for provision of information required for marketing and job opportunities (www.gemidiriya.org).

III. Vidatha Centres

The Ministry of Science and Technology has established ICT centers at divisional level in order to disseminate new technologies to small and medium enterprises involved in agricultural, industrial and service industries. It was expected to establish 330 such centers in the all Divisional Secretariats Divisions of the country. More than half of the units have been already established and equipped with computers and trained staff to cater requirements of clients.

4. Need and Prospects

Like in many Asian countries rural agricultural development become a prolonged issue in Sri Lanka. Rural and agricultural sectors are closely linked each other and greatly influence on human activities and their livelihood (Sandaratne, 2004). Therefore, improving productivity of agriculture was become eternal effort and various innovative activities were followed since ancient time. Once globalization spread over the world since the 1950s, improved information and communication technology is used by many countries as an effective instrument of minimizing enormous risk faced by small producers (Henegedara, 2011). As the country that consists of a large number of small producers, Sri Lanka is also faced with many difficulties with respect in low production, marketing and agribusiness. The uncertainty and the production risk is the main factor faced by small producers in rain fed farming relied on the monsoons (Henegedara, 2002). Thus, the nature of uncertainty in the paddy dominated rural peasant sector in Sri Lanka is associated with climatic factors, adverse selection of cropping pattern, farm credit and lack of reliable information for input and output prices (Aheeyar, Henegedara & Rupasena, 2007). Thus, the need for strengthening ICT facilities at rural grassroots level could be justified on several factors.

1. Climatic Changes and High Risks for floods and droughts

As a tropical monsoon country, small paddy producers in Sri Lanka are often faced an uncertainty for getting adequate water throughout the cultivation season due to rainfall changes, floods and droughts. Therefore, the existence and the success of paddy dominated rural agriculture in Sri Lanka always rely on the manageability of said factors. As shown in table 5, nearly 45% of cultivable lands in Sri Lanka are grown under minor irrigation. The balance 55 percent lands are cultivated under minor irrigations (20.9%) and rain-fed (24.1%). Cultivation of these minor irrigations and rain fed lands throughout the year become high uncertainty and subsequently many paddy lands in those areas are cultivated only in one season with assured water availability. When the water supply is assured by irrigation development, many small producers face problems in obtaining credit and marketing facilities. The effect of uncertainty has been reflected in increased abandoning of farm lands and transferring them into non farming activities. This phenomenon has badly affected the living standards of rural communities (Nurrks, 1953; HARTI, 1980). Table 4 shows how paddy lands in Sri lanka were distributed according to Source of water.

Table 5: Distribution of Paddy extent according to Source of Water

Source of water	Extent (Hectares)	%
Major Irrigation	515683	55
Minor Irrigation	195483	20.9
Rain-Fed	226009	24.1

Source: Department of Census and Statistics:

It is evidenced that Andra and Hariyana provinces in India effectively used satellite imagery and geographical information system (GIS) for lessening bad effects of physical and climatic uncertainties. Thus, many countries use earth observing satellite and space technology to observe and forecast agro climatic changes and to avoid some of the bad effects of climatic changes. Sri Lanka also could be used ICT techniques for minimizing farming uncertainties through the same technology.

2 The information gap, technological gap and Increased Cost of production

The recent trends in cost and returns of paddy and other field crops (OFC) cultivation have implied that paddy and OFC cultivation in Sri Lanka is profitable only in extensive irrigated and commercial farming areas (Henegedara, 2014). Many paddy farmers in rain-fed farming areas are unable to cover the cost of production by even leaving out input value for family labour and own resources such as tractors and buffalos (Department of Agriculture, 2004, 2005). The average land holding size of small-scale paddy producer is around 0.5 acres and the average yield is around 70 bushels/acre. Thus, the average farm income of a small scale paddy farmer is determined on size of land holdings, water availability (irrigated and rain fed conditions) and type of crops cultivated.

According to Table 6, Gross income of cultivating one acre of irrigated paddy land in the Anuradhapura district was Rs. 69,910 in 2009/10 Maha season but its net return was Rs.35,275 after deducting the cost of production Rs. 34,644. The situation in rain fed areas is not attractive as in irrigated areas. Thus, the net returns from cultivating one acre in Kandy district was only Rs. 598/ compared to its gross return of Rs. 39460/ and Rs. 38862/ cost of production respectively. Though the productivity per acre has increased during 2003/04-2009/10 period, net returns were not increased due to high cost of production. (Table 6).

Table 6: Cost of Production, Productivity and Returns of paddy Cultivation (Rs/Acre)

District and Type of farming	Cost of production (Rs/Acre)		Productivity (Kg/Acre)		Gross Return (Rs/Acre)		Net Return (Rs/Acre)	
	2003/04	2009/10	2003/04	2009/10	2003/04	2009/10	2003/04	2009/10
Irrigated Farming Anuradahapura	20372	34644	1598	2221	25812	69919	5440	31275
Rain-fed farming Kandy	23117	38862	1214	1227	16644	39460	-	598

Source: Cost of Production Surveys, Department of Agriculture (2012)

On the other hand, it was evidenced that labor intensive paddy cultivation cannot practiced profitably due to labor scarcity and high labor cost. Thus, labor requirement for paddy cultivation has declined in irrigated areas and use of farm machineries, such as tractors and harvesters has increased (Henegedara, 2008). Use of new technology has effectively

contributed to increase the labour productivity and to reduce total labour requirement for paddy production. But the effects have varied from location to location as adopted of new technologies as mechanical, biological and chemical innovations. The output per worker is high in irrigated areas where extensive cultivation is practiced than the rain-fed areas where largely subsistence farming is practiced. Similarly, labor requirement for paddy cultivation is somewhat higher in rain-fed farming areas than in the irrigated areas which adopted improved technology.

Thus rain-fed farming has become an inefficient and unproductive industry and has tremendous ill effects on rural livelihood in respective areas. The production efficiency of small paddy farming could be increased by adopting new techniques disseminating through ICT.

3. Asymmetric information in relation to Value Addition, marketing and agribusiness.

One of the notable features in rural agriculture in Sri Lanka is that its production process is not sufficiently established with value added products and agribusiness that linked either with production inputs or product outputs (Kumara et al., 2008). The production channel is entirely based on the producer to consumer through middlemen, despite lot of potentials of developing agribusiness are available both in terms of input delivery and output delivery. ICT can be applied to solve this problem by providing accurate and reliable information that related to consumer needs, marketing opportunities and effective agribusiness management practices.

5. The Effect

The effect of ICT on general public is very significant, particularly in terms of positive externalities that caused to increase the efficiency and effectiveness of production process and communication. Thus, rapid expansion of international trade and reduction of transportation and communication cost tempted possible avenues to increase the volume of goods and services traded at international market (Ikerd, 2004). On the other hand, the exposure of rural community to modern society is inevitable and their participation in world development becomes active. It happened over the history as it transforms economies from agriculture to industrial and service sectors or transform from under developed country status to developed country status. Hence, the any effect of using ICT for rural agricultural development reflects the change of rural life pattern both in terms of positive and negative effects. Sri Lanka is also in the process of transition from low-income country to emerging economy indicating potentials for rapid growth. Thus, the ICT would essentially contribute to double the GDP per capita income by 2016 as anticipated by the policy makers.

According to World Bank assessment on disseminating existing knowledge to the very large traditional sector in the South Asian countries, four types of problems were identified and suggested some remedies accordingly. Thus, lack of information of existence of knowledge, lack of understanding of its relevance, lack of education or skills and lack of access to complementary supporting infrastructure and institutions were identified as key issues. Provide more technical information through print, radio, television and Internet, educate people, value of different type of knowledge, provide finance facilities and supportive environment were suggested as remedies in this regard (<http://goworldbank.org/10>).

With regard to past performance of ICT interventions in Sri Lanka, it shows that ICT has effectively contributed to overcome the constraints and difficulties faced by small farming sector, particularly for agricultural extension, marketing and credit disbursements (Lurdu,

2011). According to Central Bank's annual reports for 2011-2012, agricultural credit disbursements by commercial banks have increased from 13% in 2011 to 21% in 2012. Improved modern banking facilities by the commercial bank have effectively caused reduced informal credit transactions, defaulters and higher interest rates (Central Bank of Sri Lanka). Easy access to farm services through ICT had made immense benefits to rural mass particularly in reducing price oscillations and subsequent effects of decline farmer's terms of trade and income (Henegedara, 2014).

However, some negative effects were also observed with respect in using irrelevant information. Thus, farmers become slaves of modern technology rather than using ICT better way for tackling human problems (Akhter, 2006). According to performances of ICT initiatives in Sri Lanka and the socio economic status in rural areas, three basic constraints could be identified with respect in ICT application for rural agricultural development.

1. Gaps between concepts and reality: A large number of rural communities in some parts of the country still live in desperate position, which lacking essential needs such as electricity, water and roads. What these people really need is not the ICT facilities but to survive under least facilities
2. Gaps between needs and application; Even though the government implemented various ICT initiatives targeting small farmers / producers, youth and school leavers, hardly it used by targeted beneficiaries. It was observed that use of Nenasala and Vidhata centers were limited for learning and education purposes other than receiving information for product development or improving livelihood.
3. Knowledge and capacity: As observed in rural areas, the majority of farmers and small producers belong to elders above 40 years old. Many of these farmers got through only primary education are not interested in using Computer based technology. On the other hand, younger generation who knows the use of ICT is not involved in farming.

In addition, deceiving poor rural farmers is visible in many rural areas indicating that they become slaves of using CDMA phone and cellular phone, even without fulfilling their basic needs such as housing and sanitation facilities. Some of these observations were empirically proved by recent studies (Lurdiu, 2011). According to performance of rural ICT centers, following limitations were identified as constraints for promoting ICT in rural agricultural sector.

1. Lack of coordination among government institutions and officers that were involved in supplying ICT facilities to rural community
2. Cyber extension centers established at Divisional Agrarian Service Centers were not utilized directly by farmers. Nonetheless, Agriculture Instructor and field extension staff were able to get the information and educate farmers accordingly
3. Still the ICT facilities like cyber cafes or email centers are limited to urban areas and places near higher education institutions.
4. Online data bases of many government institutions are not updated regularly.

6. Conclusion

Though many developed and newly developing countries have used ICT as effective device to minimize the risk and uncertainties of agriculture and to increase productivity of farming and rural development, Sri Lanka is not able to gain the potential gains from ICT effectively. For rural agricultural development, water scarcity, climatic changes, Lack of market information for

farm inputs and outputs, inadequate farm support service i.e. credit and extension are existed as the core barriers in rural agriculture development. On the other hand, though education, innovation and infrastructure facilities were improved relatively better than some South Asian countries, ICT facilities are yet to be improved in rural areas enabling small producers to involve more conveniently in farming, agribusiness and agroindustry. The issues in relation to low access of ICT are associated with gaps between the concept and reality, need and application and knowledge and capacity of users. So the policy makers should address these issues if improving productivity and livelihood of rural agricultural sector. Knowledge base factors such as education, innovation dissemination and application are to be improved. Social and physical infrastructure development programs are also required for many rural areas as the pre-conditions of promoting ICT. Thus, policies should be formulated with a clear vision for upgrading rural agricultural sector.

References

- i. Aheeyar, M. M., Henegedara, G. M. & Rupasena, L. P., 2003. *Cost of Production of Paddy: Kurunegala and Kegalle Districts, NSF/HARTI Joint Study*. Colombo: NSF.
- ii. Asian Development Bank. 1997. *Remote Sensing and Geographic Information System for Natural Resource Management*. ADB, Manila.
- iii. Behera, M. C. (ed.). 2006. *Globalizing Rural Development: Competing Paradigms and Emerging Realities*. Sage Publication: New Delhi.
- iv. Central Bank of Sri Lanka. 2002a. *Annual Reports*. Central Bank, Colombo.
- v. Central Bank of Sri Lanka. 2002b. *Consumer Finance & Socio Economic Survey*. Central Bank, Colombo.
- vi. Central Bank of Sri Lanka. 2008. *Annual Reports*. Central Bank, Colombo.
- vii. Central Bank of Sri Lanka. 2012. *Annual Reports*. Central Bank, Colombo.
- viii. Central Bank of Sri Lanka. 2014. *Annual Reports*. Central Bank, Colombo.
- ix. Chambers, R., 2006. The State and Rural Development Ideologies and an Agenda for the 1990s. In Behera, M. C. (ed.) *Globalizing Rural Development: Competing Paradigms and Emerging Realities*. Sage Publication: New Delhi.
- x. Chintana, M., 2004. *The Government Policy Framework for 2004-2016 and Beyond*. Colombo: Government Press.
- xi. Chintana, M., 2010. *The Government Policy Framework for 2004-2016 and Beyond*. Colombo: Government Press.
- xii. Department of Agriculture. 2006. *Annual Cost of Production Surveys for Paddy Cultivation*. Department of Agriculture, Peradeniyaa.
- xiii. Department of Census and Statistics. 2006. *Household Income and Expenditure Survey*. Colombo.
- xiv. Department of Census and Statistics. 2007. *Household Income and Expenditure Survey*. Colombo.
- xv. Department of Census and Statistics. 2015. *Computer Literacy Survey and Statistics*. Available from: www.statistics.gov.lk/ [Accessed: December 17, 2015]

- xvi. Dias, H. D. & Silva, W. P. T., 1986. *Strategy Without Ideology*. AIT: Bangkok.
- xvii. Hector Kobbekaduwa Agrarian Research and Training Institute. 1986. *Sri Lanka, Vocational Publications on Five Irrigation Tanks in Dry Zone Areas (1981)* HARTI, Colombo.
- xviii. Henegedara, G. M., 2000. *Economics of Paddy Cultivation in Two Selected Districts with Special Reference to Resource Use and Profitability*. Colombo: HARTI.
- xix. Henegedara, G. M., 2008. *Study on Recent Trends in Labour Market in Food Crop Sector in Sri Lanka*. Colombo: HARTI Publication.
- xx. Henegedara, G. M., 2011. Agricultural Globalization: WTO Policies and Domestic Agriculture in Sri Lanka. In Wijithapure, W. (ed.) *Agriculture and Rural Development in Sri Lanka*. Colombo: University of Colombo, pp. 1-27.
- xxi. Henegedara, G. M., 2014. *Study Price Instability and the Change of Terms of Trade in Small Farming Sector in Sri Lanka*. Vidyalandara Press.
- xxii. ICTA. 2010. *The Survey on ICT Usage in the Government Sector*. A Survey carried out for ICTA of Sri Lanka by MG Consultant (pvt) ltd.
- xxiii. ICTA. 2013. *E-Society Program*. Available from: www.icta.lk.
- xxiv. Ikerd, E. J., 2004. *The Globalization of Agriculture: Implication for Sustainability of Small Horticultural Farms*. Available from: <http://www.ssu.missouri.edu>.
- xxv. Kreps, D. M., 1990. *Micro Economic Theory*. New York, London, Toronto, Sydney and Tokyo: Harvester Wheatsheaf.
- xxvi. Kumara, S. K., Weerakkody, P. K., Epasinghe, S. & Epakanda, N. S. B., 2008. *Viability of Rice Processing at Household Level*. Colombo: Hector Kobbekaduwa Agrarian Research and Training Institute, pp. 26-38.
- xxvii. Lurdu, S., 2011. *A Process Evaluation of Cyber extension Programme*. Hector Kobbekaduwa Agrarian Research & Training Institute.
- xxviii. Nurrrks, R., 1953. *Problems in Capital Formulation in Underdeveloped Countries*. Oxford University Press.
- xxix. Sandaratne, N., 2004. Agricultural Development: Controversial Issues. In Kelegama, S. (ed.) *Economic Policy in Sri Lanka*. Sri Lanka: Vijitha Yapa Publications.

- xxx. Snodgrass, D. R., 1966. *Ceylon an Export Economy in Transition*. Homewood: R. D. Irwin, pp. 1-23.
- xxxi. Weerakoon, W. M. W., 2015. *Future of Self-sufficiency, Food Security and Food safety in Sri Lanka*. A Paper Presented at the National Consultation Workshop on Key Challenges and Opportunities for Food Security Policies in Sri Lanka, Organized by Institute of Policy Studies of Sri Lanka and International Food Policy Research Institute (IFPRI), 16-17 July, 2015, Colombo