

# RURAL DIGITAL BRIDGE (RDB): Opening Access to Internet Information for Smallholder Farmers in Nigeria

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## Abstract

Generally, two sets of problems aggravate rural people's already poor connectivity situation in Nigeria, national issues pertaining to information and communication technology (ICT) and community issues associated with socioeconomic status of individuals. At national level, lack of rural computer education program, ICT infrastructures and unstable network service by providers while at rural level it is high computer illiteracy and poor Internet awareness. Impact of the national issues propel ICT ignorance among rural communities and when combined with high computer illiteracy and effect of poverty, the unavoidable outcome crystallized to 'digital divide'. The consequences of digital divide on agriculture have direct negative impact on food security and income of rural people. There is need for progressive access and dissemination of Internet information at the rural level so as to coordinate farmers' situation in manner stakeholders can make sense of it. Mobile technology is an opportunity for connecting rural community to Internet sources of occupational information to achieve (a) awareness about global input/output farmers market (b) behavioural change towards management and control of local resources (c) diversified livelihood options (d) stimulated market competition through technology seek and adopt and (e) identification of potential collaborators. In Nigeria rural farming communities bear the brunt of digital divide with no appropriate response. A recent rural connectivity study in productive agricultural areas of rural Nigeria has led to the discovery of digital divide, 'digital isolation' and 'digital vacuum' situations which prompted development of the rural connectivity scale and led to launching the Rural Digital Bridge (RDB) model, a pilot project aimed to address prevailing absence of occupational information for rural smallholder farmers. The RDB model proved a success by empirical improvement of smallholder farmers' connectivity for food security options and income as well as present new window for future digital rural extension.

## Introduction

Kano River Irrigation Project (KRIP) commissioned 1974 is a gigantic smallholder surface irrigation scheme with year round irrigation water flow via concrete channels to irrigate 22,000 hectares of smallholder plots owned and cultivated by over 1500 farmers' cooperatives that cover three adjacent local government areas (LGAs) of Kano State in northern Nigeria. Over one million farm family benefits from KRIP's potentially sustainable production base for horticultural export and communities in the area are well supplied with social amenities such as good road, schools, clinic, electricity, water and is less than one hour drive to Kano international airport. However, for occupational advancement KRIP communities lack Internet connectivity, no processing facility for their farm produce and commercial farm extension to overcome subsistence farm operation is equally non-existent. Horticulture and cereal production is the main livelihood engagement for KRIP communities which, despite vast agribusiness potentials coupled with ICT versatility, the communities continue to loose out from drivable benefit of the Internet due to lack of connectivity. This means the farmers face danger of marginalization by connected business partners in day to day transaction involving their farm produce. The consequences are far-reaching, including continued use of outdated farming techniques, limited choice of farm inputs at exorbitant price, continued absence of commercial farm extension, middlemen monopoly which all condenses to increasing agribusiness uncertainties, dwindling income and inability to meet social responsibilities at family level. The ultimate is thriving subsistence living amid abundant natural resources. The RDB model launched pilot activities in KRIP area with the objective to facilitate smallholder farmers' access to the Internet for information exchange within e-agriculture community to enhance commercialization of subsistence farm operation.

## Rural connectivity situation

A recent study on connectivity situation in rural northern Nigeria discovers five levels of connectivity situations:

- *Full Internet service*, where Internet service providers, Internet cafés, Business centres, Internet wireless activities, Internet to mobile phone applications etc, exist
- *Mobile Phone domain*, where mobile service networks together with different choice of mobile phone models (original and imitation) of various quality and sophistication exist
- *Digital Divide*, where there is no Internet activity but several mobile phone service networks are available
- *Digital Isolation*, connectivity situation where mobile phone communication is made possible only through partial connectivity via makeshift wire antenna erected on pole
- *Digital Vacuum*, the worst connectivity scenario, where communities do not have even the makeshift wire antenna thereby impossible for them to communicate with the ICT world! This is ‘Digital closure’ with zero connectivity for contactivity.

The discovered rural connectivity difference is an opportunity to present the situation on linear scale for reference purpose and problem solving in future. The mobile phone-Internet connectivity potential as presented on the scale holds significant promise to improve connectivity for contactivity from ‘digital vacuum’ through to Internet and also Internet to digitally divided communities via appropriate ICT devices arrangement. The digital divide experienced by KRIP communities could thus improve by applying this assumption to access Internet information from the bottom-up. Traditional methods such as verbal communication (especially retrieved Internet information) between individual to individual; public announcement in high street, or individual to peoples gathering on market day, social event or even worship grounds could combine with ICT devices to address remote contactivity problems faced by farmers in the KRIP area. Most essential is effective communication to substantiate communication relationship from digitally divided to Internet communities so as to maintain accuracy of up-going information. It is from the rural connectivity scale that the rural digital bridge (RDB) model conceptualized. The rural connectivity scale is therefore highly significant for spot assessment of rural connectivity situation for designing future rural agricultural development projects; it helps ICT software developers with primary evaluation tool they need to assist with new devices to complete rural connectivity, and is an opportunity for designers of mobile phone, project SimCard and even airtime for future agricultural projects.

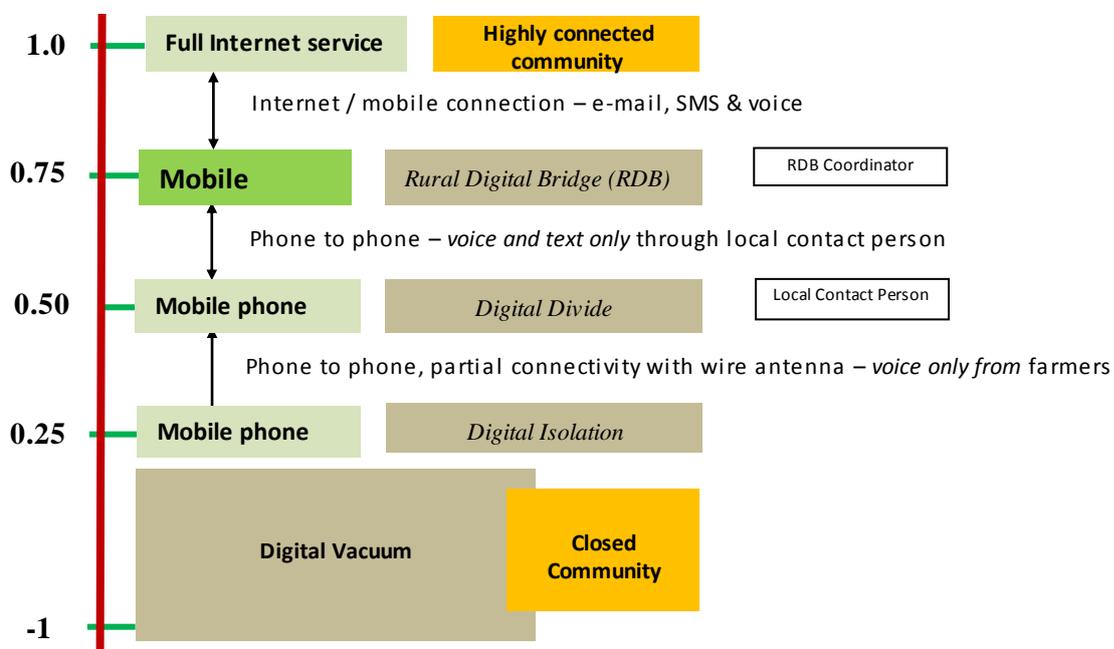


Fig.1. Rural Connectivity Scale

## Rural Digital Bridge (RDB)

Rural Digital Bridge is the process that enhances access, retrieval, coordination, and dissemination of utilizable information between high and low connectivity backgrounds to reduce the ‘digital gap’ and achieve social and economic transformation in the lowly connected community. The rural digital bridge operates on two distinct ICT connectivity backgrounds, highly connected Internet / mobile technologies and lowly connected environments where mobile and traditional methods employed for communication. The objective of RDB is to facilitate rural access to the Internet through customized ICT devices arrangement/application for digitally disadvantaged community. The advantage of the RDB model over Internet cafés, Business centres, radio and TV include

- Enhanced access to utilizable Internet information for poorly connected and computer illiterate communities
- Less costly, requires no fixed location and easy to operate and manipulate
- Combines conventional ICT technology with traditional communication methods
- Replicable anywhere in Nigeria
- New window for future ICT-based rural extension

The benefit of the RDB model embeds in guiding rural community to improve their own livelihood through Internet exchange irrespective of education background, giving rise to higher occupational incomes and improved food security options. The RDB model consists of a coordinator who coordinates information exchange between high and low connectivity backgrounds through web and mobile technologies. A local contact person who comes from within low connectivity domain and maintains accurate information exchange between the lowly connected community and RDB coordinator by using mobile and traditional technologies. The coordinator equipped with Internet-ready Laptop and mobile phone shuttles between the different connectivity situations capturing and disseminating information. This means the RDB model need not be fixed in one location provided the required ICT devices arrangement is correct and functioning very well. Main activities in the RDB model include the followings:

- *Regular farmer interactive (RFI) session* to capture topical issues for Internet research. RFI is where local contact person and RDB coordinator extract information from local community that requires Internet research to address certain problems. Local contact person could hold separate RFI session deep in remote rural areas to extract grassroots information; alternatively voice or text message can be sent to the local contact person on matters that require addressing by Internet resources. RFI session is the end-product of RDB model where digested Internet information is presented to local audience in understandable format that is good enough to trigger social and economic change.
- *Information retrieval, digestion and dissemination.* Capturing information for coordination to appropriate target, Internet or grassroots community.
- *Participatory production of local extension material.* In the absence of appropriate Internet content (pictorial images) the local community is organized to participate in production of appropriate extension material for RFI session, based on interpretation of downloaded Internet text resources
- *Community mobilization for participation.* Local community participation in all project phases is advocated during RFI session
- *Collaboration.* Identifying business development partners from e-agriculture community for smallholder farmer’s advancement is one of the RDB underpins

## ICT devices arrangement in the RDB system

### *Laptop computer*

Laptop computer with Internet modem (preferably wireless) is required for ease of movement in remote areas where there is compatible mobile phone network service. The RDB coordinator uses this computer to exchange local information for downloadable Internet resources for digesting into consumable format and dissemination to local audience during RFI session

### *Mobile phone*

Mobile phone is the most significant connectivity device in the RDB devices arrangement for its dual function of connecting divided and connected communities. It is used to communicate by voice and text message from the bottom up through local contact person to the RDB coordinator.

### *Digital projector*

This is the device that is required for showing pictorial contents developed either from Internet resources or through participatory recorded events in the local environment. The show also conducted during RFI with farmers.

### *Digital Video Camera*

A digital camera is required for capturing pictorial images for RDB local content development for extension service to farmers.

### *DVD player*

This portable device is for playing back locally recorded CD audiovisual extension material.

### *Recordable CD-R plate*

Recordable CD-R is required to record RDB programs for future use as extension material

### *Hand loudspeaker (battery)*

Battery hand operated loud speaker is required to communicate digested Internet information to remote rural community that fall under the 'digital isolation' and 'digital vacuum' marks on the connectivity scale

*Wire antenna (makeshift) for partial connectivity*, that may not necessarily be required in every RDB location or situation, but it is equally useful especially in rural areas where there is limited mobile phone connectivity.

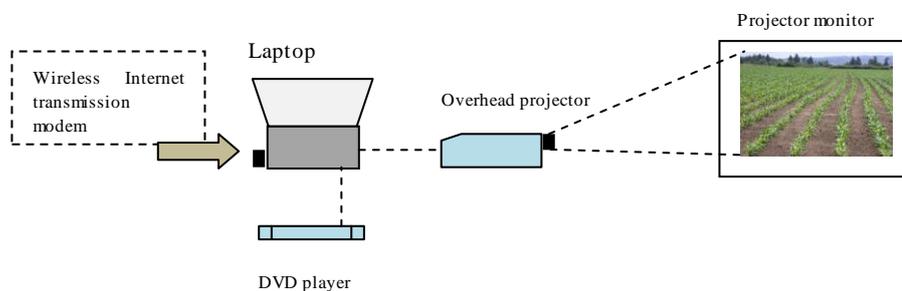


Fig.2. ICT devices arrangement in RDB model

## RDB user content

Beneficiaries of RDB operation are rural farming community with problems of connectivity for contactivity that range from digital divide to digital vacuum as represented on the rural connectivity scale. Smallholder farmers in the project area are computer illiterate and they require commercial farm extension to move from subsistence to commercial agriculture. Most appropriate required extension approach is showing pictorial content that demonstrate best farm management practices. This means video or still images in pdf /ppt formats. The Internet is a good source of these extension materials, but in the absence of required images from Internet, text documents retrieved and digested to produce extension material through participatory film production. Typical example is the recording of farmer participatory tomato variety trial conducted in the KRIP area. This means the RDB model holds significant promise for many development interventions in rural areas, for example maternity clinics, primary schools, HIV/AIDS campaign, climate change campaign, etc.

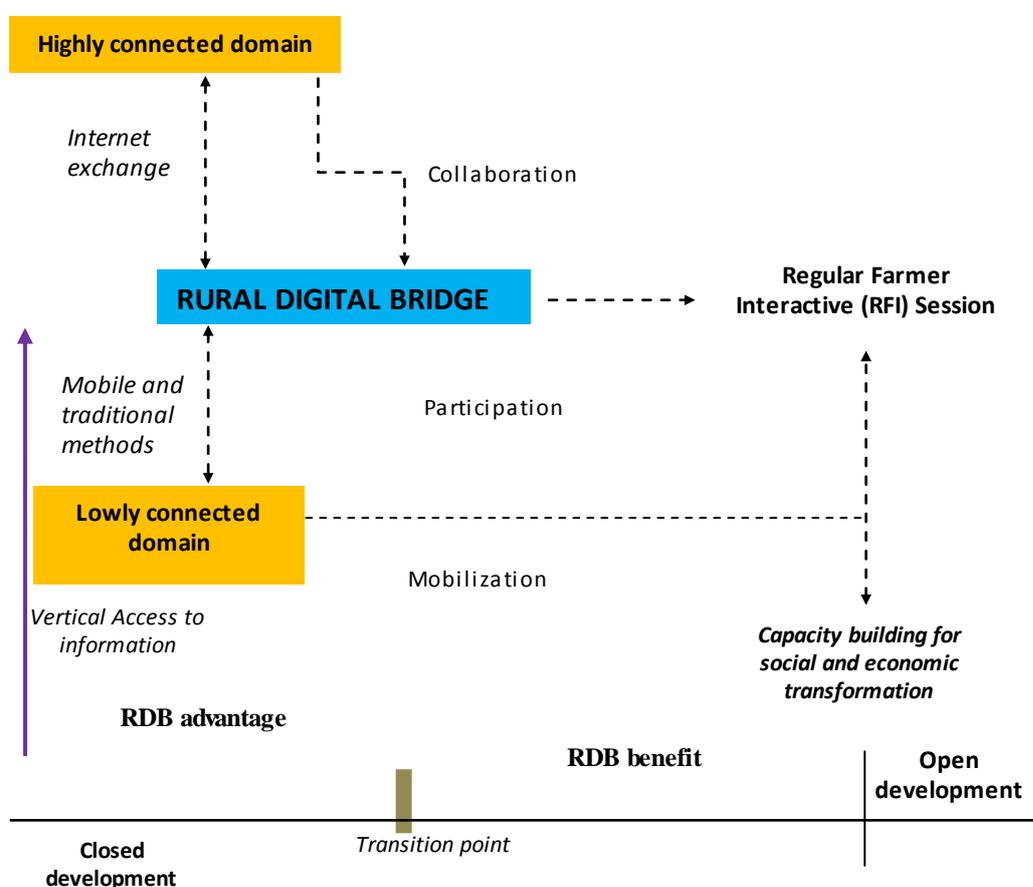


Fig.3. Diagrammatic RDB model

The level of socioeconomic transformation of the local community where the RDB functions reflects adequacy of participation and collaboration inputs which also defines the quality of access and information accessed. Effectiveness of RDB output on community is determined at the advantage/benefit transition point where the input activity (digital organization, community mobilization and capacity development) converts to transformative output for direct impact on target community. If there is no participation and collaboration the RDB system becomes irrelevant to communities. This concludes that, rate and quality of community transformation is a reflection of the level of accuracy in identifying and selection of local information that guided access and retrieval

of the required information. Closed development' is a local situation that stagnates to the level of awareness for change propelled by affected community. On the digital connectivity scale, closed development community exists within the confines of digital isolation and digital vacuum. Vertical access to information in digitally divide environment is the opportunity that drives community decision in the direction of searching for utilizable Internet information to change a closed development system. The advantage-benefit transition is the rate and quality through which the advantage of access to information converts to benefits for the acquiring community. The determining factors are participation and collaboration that reflect the quality of access to information. The combined coordination of access to information, participation and collaboration expressed in terms of digital organization for community mobilization drives the need for effective capacity enhancement through the regular interactive session for transformation. The primary aim of the RDB system in the KRIP area is to leverage access to Internet information for smallholder farmers with poor connectivity.

The principal source of information in RDB is the Internet followed by local sources. This implies that for effective RDB function, a growing open-ended list of information sources must be maintained for constant interaction. The on-going RDB pilot activities maintain local and Internet information sources that are relevant to local farming community for livelihood improvement. The local sources are usually public sector agencies and private organizations including NGOs some of which are online while others are not. The required information from the public sector agencies is policy and incentives, provision of infrastructure and fiscal support to farmers. Required information from international community is to do with technology transfer, development research, capacity building, networking, collaboration bid, funding, sharing of idea and updated global agribusiness trend, as well as for international media promotion.

### **Connectivity for food security**

Connectivity brings awareness through information and knowledge development that leverage attitudinal change toward the urge to know more for participation which also culminates to pursuit of information through available accessible means. The sudden appearance of RDB connectivity intervention in KRIP area presents a highly effective cheap access to Internet information that focuses occupational activities for smallholder farmers. This connectivity opportunity primarily achieved two significant results:

- Farmers exposure to ICT potentials aroused more interest among the farmers
- Access to commercial farm extension which they were not getting from local sources before

This means farmers are now closer to vital sources of required information to manage a shift from subsistence. Commercial farm extension sourced through the RDB model has profound impact on local farmers' food security activities. Examples are

*Crop management practice especially adoption of improved farm inputs and techniques like seed, safe farm chemicals, soil and water management, quality control application, production technique etc. Shifting from traditional to improved seed variety contributes to higher yield output which also means more food production achieved.*

*Post-harvest value addition which reduces waste at farm level, increase farmer income and preserve food for future use. Better market price achieved for farm produce consequent of connecting farmers to sources of value addition techniques and tools.*

*Distribution strategy provide KRIP farmers with market trend update that drives commodity supply in controlled quantity to check market glut situation and stabilize good price. Distribution of food commodities to non-producing areas improves food security situation in the affected area.*

*Efficient business organization and coordination such that enhanced by ICT application contributes to increased farmer trust because of his deep involvement in production and*

*marketing of his farm produce. Real time update on market situation in various locations communicated to farmers regularly.*

*Collaboration activities with international stakeholders on local farmers field increases farmer chance of disengaging from subsistence farming operation through enhanced capacity building*

All these are positive impact of the RDB model approach to improve connectivity for contactivity for increased food security by smallholder rural farming communities, which KRIP farmers were not getting before.

### **RDB success stories**

After a farmers' meeting that deliberate on the issue of lack of processing facility, and strategies to reduce post-harvest losses in tomato production and activities of selfish middlemen in KRIP area, the RDB coordinator started scrabbling for solution to assist the farmers. In Kano, the coordinator came across an e-mail address on a used tomato paste package and communicates by e-mail to the marketing Company based in Lagos, Nigeria. Few weeks later, the outcome of subsequent communications between the marketing company and the RDB coordinator crystallized to collaboration with KRIP farmers to conduct variety selection trials on their fields, using 15 different processing tomato entries sourced from various international seed companies. The marketing company supplied the required inputs including seeds, fertilizers, chemicals, soil analysis and posted an agronomist based in Lagos and field supervisor based in Kano to handle the trial. KRIP farmers are to grow the tomato varieties under normal crop management practice familiar in the area. After the usual protocol and formalities, the trial took off successfully in November 2008 (beginning of irrigation season) with last tomato fruit picking accomplished in April 2009. All the entries performed above expectations and during a farmers' field day farmers were overwhelmed about their own effort.

In addition to the field selection trial, hygienic sun drying test also conducted using best performing tomato selection and a highly qualitative dried tomato product was obtained with comparative shorter drying time, user convenience, better hygiene, natural colour retention and marketability in relation to the normal product obtained from traditional tomato variety processed under un-hygienic method of natural drying in open unguarded space in the bush.

Astonishing ICT power!, all the activities were facilitated by the RDB coordinator moving with laptop and mobile handset from Internet café in Kano to limited connectivity locations in the KRIP sectors. The RDB coordinator now accumulates digital images of the tomato trial activities as farmer participatory digital extension material that could be used to enlighten farmers groups anywhere in the country. The tomato processing variety trial is a multifaceted success story because it encapsulates the following specific events:

- Empirically proved RDB application and effectiveness
- Collaboration with international seed companies
- Farmer participation in conducting the trial
- Sourcing improved inputs from global farmers market
- Post-harvest value addition
- Better hygiene for good health and nutrition
- Smallholder business improvement
- Product development for export
- Better management of local resources

The recent impact of awareness in Nigeria that culminates to official recognition of international scientific discoveries about Moringa Oleifera (miracle tree) and the remarkable appreciation of the market value of various Moringa products constitute one of the tangible results of the RDB activities that involves Moringanews (international NGO) for information sharing, membership networking and business development which initially

started from localized RDB activities that targets policy makers in Kano and gradually spread to other parts of the country. Most benefitting community is the womenfolk that have for long been in Moringa leaf trade chain comprising leaf sourcing from remote rural areas, preparation, cooking, and delivery of the cooked leaf to city market as early as 6am in the morning. Price of cooked Moringa leaf has almost doubled consequent of the heightened awareness on nutrition and traditional health economy potentials associated with the Moringa tree. Serious advocacy is going on now to step up Moringa activities in various learning institutes in the country.

## Conclusion

The pilot RDB model activities in KRIP area had been great success for many reasons derived from several indicators: (a) local farmers' understanding of systematic application of ICT devices in the RDB (b) high volume purchase of improved vegetables seeds monitored through a local seed dealer (c) wide spread appearance of high quality fresh vegetables produce (especially tomatoes) in local farmers markets. Already farmers in the area formed partnership with identified local vegetables seed dealer for reliable supply of required seeds to farmers. Also there has been growing interest and clamour for more ICT activities among the farming communities which is an opportunity to step up computer literacy campaign by the authorities concerned and or with international donor programs. Thus the RDB model could be used to introduce various computer literacy training programs for rural women, children, adolescents and even on-the-job farm hands of various age groups. The RDB model could also lend itself for use in different mode such as for sanitation with education program, waste to money recycling campaign, climate change situations, HIV/AIDS intensified community alert, scourge of polio disease, maternal health campaign and several other development intervention possibilities.

## Reference:

Matthew Smith, Nathan J Engler, Gideon Christian, Kathleen Diga, Ahmed Rashid and Kathleen -Flynn-Dapaah, 2008, *Open ICT4D working draft*, International Development Research Centre