Synergizing fertilizer micro-dosing and indigenous vegetable production to enhance food and economic security of West African farmers (CIFSRF Phase 2)

Project Number 107983

Location of Study: Nigeria and Benin Republic

Assessment of the impact of communication strategy (Radio Jingle) on the Awareness of and the Production of indigenous vegetables in Southwestern Nigeria

Communication Team
MICROVEG PROJECT

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Contents

List of Tables

Key Messages:

It is widely acknowledged that Radio is the most cost effective means of building awareness, and supporting the adoption of new farming practices by small scale farmers. Given the reality of the fact that radio is the most popular mass medium, especially for resource-poor population in Nigeria, the IDRC-GAC project on ***"Synergizing fertilizer micro-dosing and indigenous vegetable production to enhance food and economic security of West African farmers" Project 107983*** utilized the radio medium tagged *"Ramo Elefo"* to create awareness about the products and the innovations promoted by the project as well as to effectively mobilize general populace in adopting the innovations made popular by the project. The key messages from the study of impact of communication are:

- The project intensively used three major mass media: radio, TV, newspapers/magazines. The media strategy reached up to 8 million people in Benin Republic and more than 10 million in Nigeria. We targeted international audience media (Canal Monde TV in Benin and Channel in Nigeria) and also local FM radios (Orisun and BCOS in Nigeria) broadcasting in local languages.

- Benin MicroVeg team participated in the Cooperation and Professional Insertion day of the University of Parakou in Nov 2015 and 2016 to inform the public on importance, opportunities of traditional leafy vegetables. Nigeria team participated, promoted UIVs value chain and trained Osun State Youth Empowerment Scheme (/*OYES) members in 2015, 2016 and 2017. The teams also participated to others fora and workshop for promoting traditional leafy vegetables at national and regional levels.

- The *"Ramo Elefo"* radio programme was categorized as "very helpful" by most (63.5%) of the respondents meaning that the radio program is helpful to the respondents in their agricultural activities. Further, 62.33% of the respondents who saw the programme as relevant are females. Hence females, see the radio programme as being more relevant.

- In terms of age groups, those aged between 25 and 50 years categorized the program as being most relevant, on the other hand, those aged below 15 years categorized the radio programme as being least relevant. Thus ***suggesting that the radio programme is not as relevant to children as it is to those within the active productive age.***

- Most (52.11%) of the respondents are satisfied with the contents of the radio programme, while only about 1.58% of the respondents are not satisfied.

- As regards awareness by the respondents, respondents were more aware of bed preparation as an innovation with 36.3% of respondents being aware of it. About 12.5% of the respondents are aware of the UIV innovation on value addition.

- As a result of the awareness creation, ***an increase in cultivation from 1.33% to 39.4% for "igbagba", 12.22% to 45.7% for "ugu" and 3.33% to 39.4% for "teteatetedaye"*** **were recorded.** These increases were obviously due to the awareness created by the radio programmes in addition to the demonstration efforts of the extension services and scaling up.

- In addition, 43.1% of the respondents received support in form of seeds from the Micro-Veg project. Interestingly, ***most (55.9%) cultivated "teteabalaye" while only 39.4% cultivated "Igbagba" thus making teteabalaye the number one vegetable cultivated.***

- The results further show that the ***respondents are most aware of fertilizer micro-dosing (45.1%), land selection (48%) and value addition (52.1%) in ascending order of the Microveg innovations spread through the radio.*** Incidentally, the innovation with the least awareness through the radio was UIV seed production with only 23.4% respondents.

- In terms of gender disaggregation, about 61.64% females are aware of the radio programme *Ramo Elefo* while only 38.35% males are aware, therefore, we assert that ***females are more aware of the radio programme than males***. Also, the fact that 61.58% of the respondents listens to the radio programme who are females confirm that ***females listen more to the programme than males do***. Most (62.52%) of those that are aware are aged between 25 and 50 years, while only 17.35% of those that are aware are aged above 50years, hence, it can be asserted ***that the bulk of those who are aware are the younger and productive respondents.***

- In terms of interest creation, most (42.6%) of the respondents created interest in the UIV value addition component. On the other hand, the innovation that elicited the least interest of 26.1% was bed preparation. On evaluation, the most evaluated innovation is the treatment of seed (by 4.2%) of the respondents, while transplanting innovation was evaluated by (1.8%) of the respondents.

- As regards trial (taking chance), 3.7% of the respondents have actually tried the innovations on land selection and bed preparation respectively, but only 1.8% of the respondents have tried the innovations on harvesting and marketing respectively.

- As per adoption, most (27.4%) of the respondents have adopted the innovation on harvesting UIVs, while bio-chemical pest control was the least (18.3%) adopted. In all, more people have created interest in the innovation on land selection, a good portion have adopted the innovation, a few have either tried or evaluated it. About 10.7% and 10.4% of the respondents who were aware of the innovation on land selection and bed preparation through the radio did adopt the innovations eventually. In summary, ***more people that got aware of the innovations on land selection and bed preparation through the radio have ended up adopting these innovations. This suggests that the radio programme might indeed be living up to expectation.***

- On the depth of exposure of the respondents to the radio programme, ***most (40.53%) of the respondents listen to the programme once a week, while only 3.68% listen to it seven times a week.*** The influence of the depth of exposure to the radio programme on the likelihood of adoption of MicroVeg innovation was explored with the binary probit model. The result of the estimation shows that religion, experience, awareness, satisfaction, membership, family assistance and depth of exposure significantly influence the likelihood of being an adopter. While, religion and awareness may not encourage adoption, satisfaction, membership of Microveg group, family assistance and the depth of exposure to the radio program will likely encourage adoption of the UIV innovations.

1.1 Background

Information dissemination is a key driving force in social and economic development, particularly for both agriculture and extension service delivery (Eboh, 2009; Asogwa *et al.*, 2012). Adequate and accurate information is required by farmers to assist in decision on best production methods and practices, on what to produce, where, when as well as the price to purchase inputs, availability of transportation, and where and how to dispose of produce (Olukosi and Erhabor, 1998; Demiryurek, 2010). The provisions of information enhances the farmer's market access and encourage the use of the most efficient and effective production innovations. Information is needed by marketers too in order to make the best marketing decisions and avoid

losses, making decisions about where to buy, where to sell, how much to buy and how much to sell (Ayeni, 2008). Consumers need it as well, in order to become aware about agricultural products that are of the best bargain and most nutritional value. This information needs must be met in a timely manner as the problem of product surplus or shortages have been attributed to the lack of information (Ayeni, 2008). This information need is normally the responsibility of extension services who serve as the major link between researchers and farmers.

Another major missing link between research and sustainable food production, identified by (Njoku 2016) is the lack of an effective information delivery system. The dissemination of information on innovations offers opportunities for adopting novel developments, which would enhance the productivity of both farmers and marketers (Mohammad Retz Nazn and Hasan Harbullah, 2010). Dissemination of information is usually through the various media – a major one of which is the extension agents. The major challenge with extension agents is that the ratio of extension agents to farmers, in Nigeria, is grossly inadequate. This reasons for this is usually due to the mounting costs of maintaining these staff members especially in the face of diminishing revenue by the government. Therefore, a wide gap exists between available knowledge of improved technology and the actual practice because of the dearth of extension agents (Njoku, 2016). This gap has had negative effects on the attempts to increase food production. This experience was what necessitates the exploration of alternative channels of information dissemination like information and communication technologies (ICTs).

Generally, the information media includes printing and electronic media. However, in the context of providing an alternative medium to complement the role of extension services, the appropriate "information and communication technologies" as defined by several authors is a range of devices including but not limited to mobile phone, television, radio, video, voice information systems, internet and fax (Warren, 2002; Ommani and Chizari, 2008; Ekbia and Evans, 2009). Information and communication technologies are real sources of information and knowledge for the general public including farmers and it reduces the distance among different communities of the world (Herselman, 2003). The use of information and communication technologies plays very effective roles in agricultural development and in the decision making of farmers' communities in different countries (Cash, 2001; Galloway and Mochrie, 2005; Opara, 2008; Taragola and Van Lierde, 2010). Further, the role of ICTs in accessing more information in order to enhance food security and support rural livelihoods has been increasingly recognised and officially endorsed at the World Summit on the Information Society (WSIS) 2003-2005 (IICD, 2007). Of all the information and communication technologies, the cheapest and fastest proves to be the radio.

Radio Broadcasting has long been identified as the medium with the highest potential for effectiveness in the developing countries. Oso (2002) noted that right from the colonial period particularly after the Second World War, the Nigerian government, realising the effectiveness of radio in mobilizing people, invested

huge resources in developing radio broadcasting. It is the cheapest and most accessible mass medium. The power of radio is not limited or peculiar to only Nigeria, but most developing nations. Radio transmission is quick and reaches to a wider population.

Regular transmission of radio programmes related to agriculture gives valuable information about new farming methods. As the farmers receive useful information from the radio, they gradually bring change in farming methods by applying the new techniques so acquired (Ekoja, 2003). Myers (2008) also concluded in her study that radio is the dominant mass medium in Africa with the widest geographical reach and the highest audiences compared with television, newspapers and other information and communication technologies (ICTs). Overall, radio is enjoying a renaissance and numbers of small local stations have exploded over the years, due to democratization and market liberalization and to more affordable technologies.

According to Myers (2008), radio has proven itself as a developmental tool, particularly with the rise of community and local radio stations, which have facilitated a far more participatory and horizontal type of communication than was possible with the older centralized broadcasting model of the 1960s and 70s. The rediscovery of radio in the context of new ICTs has made radio a two-way medium that can help bridge the digital divide by providing a powerful tool for information dissemination and access, especially for hard-to-reach rural audiences (Myers, 2008). Generally, radio stations can be divided into four categories: public radio, privately owned commercial radio; community radio and international radio (Myer, 2008). The types of stations that are best for reaching and empowering the poor depends on the context. Regardless of its weakness and limitations (for instance, its feature of having only audio possibility), all the reliable surveys agree that radio is still the dominant mass medium in Africa, with the widest geographical reach and the highest audiences compared with TV, Newspapers and other ICTs (RIA, 2005; Myers, 2008; Balancing Act, 2008). In addition, the farm radio has contributed in terms of strengthening social unity, enhancing communicative ability, giving knowledge about locality, preserving environment and solving the problems that arise in the communities (FAO, 2005). Studies (Mtega, 2008; Olaleye *et al*., 2009; Sife, 2010) conducted in Nigeria and Tanzania indicate dependence on radio is mostly due to the wide coverage of radio frequencies, availability of many radio stations, and the portability nature of most radio sets.

The radio then serves as a means of passing information. In modern times, this could be a two-way interactive medium. This is in an effort to overcome the weakness of only-audio possibility, where any individual or group with the need of clarifications can call the producers of the programme and interact. The importance of information is clear particularly to the production and marketing of agricultural products, which mostly have the problem of high perishability and require rapid dissemination of production innovations through agricultural programmes. A typical radio-agricultural farmer programme is a joint effort of an agricultural expert and a communication expert (radio-presenter) disseminating agricultural

technologies/information to farmers. It aims at teaching and transferring modern technologies to farmers in order to increase their agricultural production in all the components of agriculture namely, crop, animal, agro-forestry, agro-fishery, and soil conservation. In summary, the rationale for using radio in extension and advisory services came from an understanding that radio is an excellent, cost-effective means of sharing knowledge, building awareness, facilitating informed decision making and supporting the adoption of new practices by small-scale farmers (Chapota *et al*., 2014).

New practices keep evolving in agriculture and this is particularly important in the production and utilisation of certain vegetables that are yet to be fully exploited and may be going into extinction (Weinberger and Msuya, 2004). These vegetables are termed "under-utilised indigenous vegetables" (UIVs) because they are indigenous to a location but may or may not be confined to the location and are under-utilised (Guarino, 1997). Many of these vegetables are resilient, adaptive and tolerant to adverse climatic conditions more than the conventional or improved species (Raghuvanshi, 2001). Although they can be raised comparatively at a lower management cost and on poor marginal soil, they have remained under-utilized, due to lack of awareness of their nutritional values in favour of the conventional ones (Chweya and Eyzaguirre, 1999). Despite the nutritional values of these vegetables, these vegetables are fast disappearing from the average Nigerian dish (Adebooye *et al.*, 2003). In an effort to promote the deliberate and conscious cultivation and consumption of these vegetables, the ***Ni-Can Veg*** Project lasting forty-two months, was launched in 2011, with the aim of creating sustainable production and utilisation of UIVs in Nigeria in order to enhance rural food security and income for resource-poor women farmers. The project provided new management practices, developed new food products as well as changed farmers' attitudes to growing, cooking and consuming UIVs. The project also raised the level of awareness on the nutritional values and usability of UIVs by disseminating information to the resource poor women farmers, scientists, non-governmental organisation and government (Adebooye, 2013).

In realization of the project objectives, radio programme ***"Ramo Elefo"*** - (Ramo the vegetable seller) was initiated in 2012. The intention of the program was to create awareness of the project activities by focusing on the production, processing, marketing and consumption of indigenous vegetables. Initially, the programmes started on two prominent radio stations, Orisun 89.5 FM in Ile-Ife, Osun State and Ekiti 91.5 FM in Ado-Ekiti, Ekiti State (VegNews 2012). It later extended to four (4) other FM Radio Stations, which have signals that extend to the rural/farming communities of the savannah areas of Oyo, Ogun and Kwara States as well as the rainforest of Lagos State (MicroVeg Technical report, 2016).

1.2 Statement of research problem

There is a growing consensus that the key driving forces in social and economic development of any nation are among others: knowledge, technology, information and creativity (Eboh, 2009). This is particularly relevant in developing countries where agriculture is the main occupation of the people and most especially

for highly perishable agricultural products. The need to disseminate innovations to farmers, create awareness on items that will drive profitability and at the same time improve nutrition is of utmost importance. The Ni-CanVEG project started radio program tagged *"Ramo Elefo"* to disseminate information on innovations that will enhance the production and utilisation of UIVs to enhance their economic and nutritional values. The radio program was continued in the scale-up component of the project that started in 2015-tagged MICROVEG which covers seven southwestern states in Nigeria and ten districts in Benin Republic.

Since the commencement of the Radio program and the subsequent implementation of the scaling up component of the project tagged MICROVEG in 2015, there is yet to be any empirical study to provide evidence-based information on how well the Radio programmes have achieved the intended goals. Such information serves as basis for justifying the institution of the Radio program as well as to refine the program for better achievements in future. Research has shown that farmers' exposure to information is an important factor influencing their adoption behavior since greater exposure is likely to enhance awareness about the latest recommendations as well as guide farmers into putting these recommendations into practice (Muhammad and Garforth, 1995; Ayoade, 2010). The MicroVeg project has as one of its objectives the measurement of the impact of the citizens' awareness on behavior towards UIV, its production, utilisation and input provision (MicroVeg technical report, 2016). Therefore, this study seeks to assess the impact of the radio programme on farmers' awareness and subsequent adoption of the new UIV innovations. It will accomplish this by providing answers to the following questions: What is the level of awareness of the UIV innovations? What is the level of adoption of the UIV innovations? What is the effect of the radio programme on the level of awareness of the UIV innovations? Can we link the adoption of the UIV innovations to the awareness? These research questions form the core objectives of this study.

1.3 Objectives of the study

The main objective of this study is to evaluate the impact of the radio agricultural program *"Ramo Elefo"* on small-scale farming community's attitude towards improving their agricultural practices especially as relates to UIVs.

Specifically the study:

a. described the socio-economic characteristics of the respondents
b. assessed the relevance of the *"Ramo Elefo"* agricultural program to the farming communities
c. assessed the respondents' satisfaction with the "*Ramo Elefo"* radio programme
d. determined the level of adoption of the UIV innovations
e. analyzed the effects of the radio programme on the level of adoption of the UIV innovations, and
f. determined the depth of respondents' exposure to the radio program

1.4 Justification for the study

In agriculture, particularly in the production of UIVs, new information and knowledge are utilized to fuel innovation and increase productivity and competitiveness. It is therefore necessary for farmers, marketers and consumers to access such information, since this is what will enhance their awareness about latest production and utilisation methods of the enterprises, and thereby contribute to both food security and economic growth (Soyemi, 2014). The adequate dissemination of such information has been an on-going service, particularly through the formal extension services as well as radio programmes. The dissemination of information on the UIV innovations and ways of utilizing them has the great potential of reviving the status of the vegetables providing nutritionally and economically for farmers and the public. The radio programme in discuss tagged *"Ramo Elefo"* covers the UIV innovations on production and utilisation. The study will be able to show the direct impact of the radio programme on the farmers' practice and adoption of the UIV innovations. The study also intends to provide information on how the radio programme has steered non-farmers and non-vegetable farmers towards UIV production and utilisation.

1.5 Definition of key terms and phrases

Content: specific audio material carried in any particular programme episode

Food security: a situation where all people at all times have access to sufficient, safe, nutritious

food to maintain a healthy life

Small holder farmers: are farmers owning small-based plots of land on which they grow subsistence crops and one or two cash crops relying almost exclusively on family labour.

2.0 Review of Relevant Literature

This study is guided by development media theory, agenda setting theory, diffusion of innovations theory and expectancy value theory. Development media theory presupposes that the mass media should serve as facilitator of development goals among developing countries. Folarin (2002) pointed out the major tenets of the theory as originally propounded by Dennis McQuail. These include the need for the media to accept and carry out positive development tasks in line with nationally established policy, and the media's freedom to be open to economic priorities in line with nationally established policy. He also noted that the media should give priority in their content to the national culture and languages. Similarly, agenda setting theory describes power to the media to determine the issues that should serve as basis of discussion or thought in the public. According to Folarin (2002), "agenda setting theory does not ascribe to the media the power to determine what we actually think but it does ascribe to them the power to determine what we are thinking about. For any issue to become an agenda, it must be frequently reported, prominence should be given to it, with same

degree of conflict generated and must have commulative media specific effects (Folarin, 2002). Diffusion of innovations theory on other hand, as originally proposed by Rogers in the early 1960s, is described as the process in which an innovation is communicated through selected channels over time among members within a given society (Baumann, 2008). The word 'innovation' refers to a new idea, product, technique or practice while the word 'diffusion' refers to the process of spreading such idea within a target group. Rogers (2003) adds that diffusion is a social type of communication process in that the message transmitted are designed to convey a new idea, reduce uncertainty, provide information and promote social change. This social change then leads to modernization in which individuals change from a traditional lifestyle to a more complex technologically advanced and rapidly changing standard of living (Baumann, 2003). The basic elements of diffusion process include the innovation, communicated through a channel, over a period of time and among members of a given social system. For an adopter of the innovation to confirm the innovation, he/she has to go through awareness or knowledge stage, persuasion stage, decision stage, implementation stage and confirmation stage (Rogers, 2003). The acceptance or rejection of the innovation also depends on the characteristics of the innovation, which include the innovation's relative advantage, compatibility, complexity, opportunity to experiment and observe the innovation. Adopters are categorised into five: innovators, early adopters; early majority; late majority and late adopters or the laggards. The concern of this study is not to test the adoption of agricultural innovations through radio in Lagos, but to examine the awareness of agricultural innovations through radio among peasant fish farmers. This covers just a stage in the innovation decision process of this theory. Lastly, expectancy – value theory assumes that personal motivation for media use is based on the idea that the media offers rewards, which are expected by potential members of an audience, based on relevant past experience (McQuail, 2005, p. 427). Put in a simple way, what this theory is saying is that audiences attend to the mass media based on the rewards expected from such media, perhaps due to experiences of rewards derived. Thus, our concern in this paper is to find out the agricultural rewards expected by farmers and the rewards derived, over the period of attending to radio broadcasting. Putting all the four theories together, this study has the aim of understanding the role of radio towards agricultural development, the agriculture-based agenda set so far, the diffusion of agricultural ideas among farmers and the values given to farmers for attending to radio broadcasts.

In Nigeria, the studies conducted by Arokoyo (2003) showed that although video, radio, and television are the major sources of information for the farmers of this country, in the case of establishing the foundations, it is also possible to use other developed equipment.

The Nigeria-Canada Indigenous Vegetables Project (NiCanVeg Project 106511) successfully **developed** new technologies that improved farming practices, post-harvest handling and value addition for indigenous vegetables which offered great opportunities for food security and economic empowerment of the poor rural population, especially the poor rural women of southwest Nigeria.

This project is a synergy of the Nigeria-Canada Indigenous Vegetables Project (NiCanVeg Project 106511) and the Integrated Nutrient and Water Management in the Sahel (INuWaM Project 106516). The promising results of the innovations that were developed by the two projects are being explored for complementarities to accelerate large-scale adoption and impacts of underutilized indigenous vegetable and fertilizer micro-dosing innovations to increase food and nutritional security and economic empowerment of resource-poor farming communities in Nigeria and Benin.

3.0 Methodology

3.1 Study Area

The study was purposively conducted in two states within the Southwestern region, Osun and Oyo states. The study area has a total population of 9,319,687 with a total landmass of 44,222Km^2 and population density of 406 per km^2. It is bounded by Ogun in the south, by Ondo and Ekiti States in the east, by Kwara State in the north and by the Republic of Benin to the west. The study area lies between 7°N and 9°N latitude and within longitudes 2°E and 6°E of the Greenwich Meridian. Its relief is within 100m and 500m above sea level (NPC, 2006).

The region experiences 7 - 8 months of rainfall (April to November) that ranges between 1,600 to 2,400 mm and peaks in July and September respectively while the remaining four months (November to March) is dry. The mean annual temperature is between 23°C and 27°C. The soil types range from the sandy to clayey in texture with soil pH ranging from acidic to slightly basic (NPC, 2006).

The study area is well drained with rivers flowing from the upland in the North-South direction. The vegetation pattern ranges from evergreen rain forest (thick forest) in the south, derived savannah in the central part and savannah towards the north.

3.2 Data collection

The study was carried out to assess the impact of Micro-Veg radio communication tagged *"Ramo-Elefo"* on the listeners. The study covered the demographic and personal data, farm operations, awareness and involvement in Micro-Veg project, their level of adoption of Under-utilized Indigenous Vegetables (UIVs) agronomic practices, value addition and UIV produce and products consumptions.

Accidental sampling method was used to elicit information from the listeners of FM 98.5 Radio Station " Orisun Oke –Itase", Ile-Ife and the FM 89.5 Broadcasting Corporation of Oyo Station (BCOS), Ibadan. The study covered six communities namely; Ibadan metropolis, Osogbo, Iwo, Moro, Ilesa and Ile-Ife, in two

States (Oyo and Osun) based on their proximity to the radio stations. About 300 respondents were interviewed.

The respondents were disaggregated into youth (55%) and adult respondents (45%) based on national demographic statistics. The youths were between the age of 18 and 35 years while the adult respondents were 36 and above years.

Also, an in-depth interview was carried out with The Manager of FM 98.5 Radio Station " Orisun Oke – Itase", Ile-Ife to collect information on the targeted audience, coverage of the jingle, feedback mechanism and impact of the jingle on the audience, so far.

The data collected were analysed using descriptive statistics such as frequency, percentage and pie charts .

3.3 Method of Data Collection

Primary data were collected through the use of well-structured and pre-tested questionnaire. Information was obtained on the socio-economic characteristics of respondents (such as age, gender, family size, education level, marital status, farm size, religion, income and marketing experience) and (such as source of supply, mode of transportation, source of market information and pricing).

3.4 Analytical Technique

The information collected were analysed using descriptive statistics, and maximum likelihood estimation model (Binary probit analysis) on the STATA package. Binary probit regression analysis was used in estimating the relationship between the adoption of UIV innovations and the depth of exposure to the radio programme. In this case, the dependent variable took the form of a binary variable: 1= adopters of the UIV innovations; and 0=non-adopters of the UIV innovations. The model is expressed thus:

$$Y_i = \begin{cases} 1 \text{ if } Y^*_i > 0 \\ 0 \text{ otherwise} \end{cases}$$

$$Y^*_i = X_i B_i + e_i$$

$$\text{Where } Y_i = \begin{cases} 1 \text{ if adopter} \\ 0 \text{ otherwise} \end{cases}$$

X_i = independent variables $X_1 – X_9$

X_1 =sex (male/female)

X_2 = religion (Christian= 1, Muslim=2 and Traditional= 3)

X_3 = experience (number of years)

X_4 = awareness (yes/no)

X_5 = satisfaction (very satisfied = 1, satisfied = 2 and not sure= 3)

X_6 = relevance (yes/no)

X_7 = membership (yes/no)

X_8 = family assistance (yes/no)

X_9 = depth of exposure (times per week)

3.5 Data Collection Instrument

Given the need for cost effective and adequate data collection with the prevalence of ICT in the study area we used the Open Data Kit (ODK) for the survey. Open Data Kit (ODK) is an ICT facility that enables users to capture and instantly digitize information of a variety of formats, eliminating the need for paper questionnaire surveys and data entry. It allows preparing a digitally programmed questionnaire, facilitates intense monitoring of the collection process and gathering of data immediately after survey in a format prepared for analysis. It thus eliminates the need for paper surveys and significantly reduces survey time and time required for data entry. The smart phones and similar devices are equipped to support ODK software.

First we setup our server that is **ODK Aggregate** in our laptop. Then we search for the "**ODK Collect**" app from Google Play on the device. We install the latest version to the mobile device. For more information about ODK Collect and its requirements, visit the https://opendatakit.org/use/collect/. The questionnaires are subsequently saved to the phone‟s SD memory, where it can be accessed without internet connectivity. Questionnaire in ODK Collect is **ODK Form** which is an xml file. There are several ways to create forms for ODK. One of them used in our Project is XLSForm. After completion of XLSForm we convert it into xml file. XLSForm is a standard form created to simplify the authoring of forms in Excel in a readable format even for non-technological persons. They are simple to get started with but also allow for complex XForms by someone familiar with the syntax described below. Here we have inscribed those syntaxes used in the context of our questionnaire.

We loaded the pre tested survey instrument on the smart phones, and conducted a three day training for the enumerators and supervisors on the exercise. We had two levels of quality assurance, first is the supervisors on the field with the enumerators. The supervisors are to monitor the data collection process to ensure that it went on as scheduled. Secondly, we had the ODK team who monitors the data entered and assures first level cleaning in the sense that what was intended was what was entered.

We engaged 8 enumerators and three supervisors with two ODK expert in the survey.


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3.6 Determination of sample size

The sample size required to infer a statistically significant difference between two means was determined using the power of a test approach, which is the most common method for determining sample size (Lenth, 2001). NICANVEG results were used to determine the sample size, taking into account the fact that about 50 percent of the sample could be dropped due to not matching. With a test size (the probability of falsely rejecting the null hypothesis if it is true) of 5% (i.e., 95% confidence that a statistically significant impact is not actually zero) and a test power (probability of correctly rejecting the null when it is false) of 90%, the minimum estimated sample size of the treated groups is observation from each group to detect a 40% increase in income.

4.0 Results

This section presents the results obtained from the study.

4.1 Assessment of the relevance of *Ramo Elefo* programme to the farming community

The Table 1 below show the relevance of the radio programme to the farming community. Relevance is defined as the extent to which the program is helpful to the community. The respondents were requested to

rank the program as to it was whether helpful or not. The radio programme was categorized as "very helpful" to most (63.5%) of the respondents while 0.73% of the respondents are not sure of how helpful the programme is. This suggests that the radio program is helpful to the respondents in their agricultural activities.

We investigated further by disaggregating the respondents by gender. The Table 2 shows that 62.33% of the respondents who saw the programme as relevant are females while 37.66% are males. In summary females, see the radio programme as being more relevant than males.

In terms of being helpful, the results in Table 3 shows that 38.69% of female respondents found the radio programme as very useful compared with 70.83% males. About 29.17% males found the programme useful as opposed to 25.55% females. This result lend credence to that reported in Table 2 below showing that females found the programme more useful.

***Table 1**: Relevance of the radio programme to the farming community*

	Frequency	**Percentage**
Very helpful	87	63.50
Helpful	49	35.77
Not sure	1	0.73
Total	**137**	**100.00**

Field survey, 2017

***Table 2**: Relevance of the radio programme by gender*

	Frequency	**Percentage**
Male	58	37.66
Female	96	62.33
Total	**154**	**100.00**

Field survey, 2017

***Table 3**: Usefulness of the radio programme and gender*

	Male	**Female**

	Frequency	Percentage	Frequency	Percentage
Very useful	34	70.83	53	38.69
Useful	14	29.17	35	25.55
Not sure	0	0.00	1	0.73
Total	**48**	**100.00**	**89**	**100.00**

Field survey, 2017

Relevance of the radio programme by age groups

Relevance of a radio program is expected to differ by age group *a priori* because the priorities of each age cohort are usually different. The Table 4 shows the age distribution of the respondents by relevance of the radio programme. The results on the table shows that only 14.29% of the respondents aged between 25 and 29 years saw the program as being relevant, and 13.64% of age group 40-44 years and above 60 years, respectively also saw the radio program as relevant. The results further show that 12.99% of age group 35 and 39 years as well as between 45 and 50 years, respectively also reported the program as relevant. About 9.09% of age 30 and 34 years, 7.14% between 20 and 24 years, 6.5% between 15 and 19 years, 5.84% between 55 and 59 years, 3.25% between 51 and 54 years while 0.65% below 15 years also reported the program as relevant.

The table shows that the age group that the radio programme is most relevant to are those aged between 25 and 29 years, 35 and 39 years, 40 and 44 years, 45 and 50 years and those aged above 60 years. On the other hand, the age group that the radio programme is least relevant to are those aged below 15 years and those aged between 51 and 54. This means that the radio programme is not as relevant to children as it is to those within the active productive age.

Table 4: *Relevance of the radio programme by age*

Age group (years)	Frequency	Percentage
<15	1	0.65
15-19	10	6.50
20-24	11	7.14
25-29	22	14.29
30-34	14	9.09
35-39	20	12.99

40-44	21	13.64
45-50	20	12.99
51-54	5	3.25
55-59	9	5.84
>60	21	13.64
Total	**154**	**100.00**

Field survey, 2017

4.3 Satisfaction with the contents of the radio programme

We assessed the level of satisfaction of the respondents with the contents of the radio program. The results are presented in Table 5. The results show that that most (52.11%) of the respondents are satisfied with the contents of the radio programme. About 46.32% of the respondents are very satisfied with the contents of the radio programme, while only about 1.58% of the respondents are not satisfied with the contents of the radio programme. In essence, that most of the respondents are only satisfied with the contents of the radio programme suggests that there are likely contents of the programme that may need improvement in line with the expectations of the listeners.

Table 5*: Respondents' satisfaction with Ramo Elefo radio programme*

	Frequency	**Percentage**
Very satisfied	88	46.32
Satisfied	99	52.11
Not satisfied	3	1.58
Total	**190**	**100.00**

Field survey, 2017

Satisfaction of respondents to contents of radio programme

Table 6 below shows the satisfaction of the respondents to the contents of the radio programme by the UIV innovations. The table shows that 15.40% of the respondents are very satisfied about the content of the programme that addresses innovations on harvesting techniques; 15.14% about bed preparation; 14.62% about land selection; 12.53% about seed treatment; 11.75% about seeding; while 11.49% are about nursery preparation and management; 9.40% about transplanting and bio-chemical pest controls; 8.88% about water management, 6.79 about seed production and 3.39 about value addition respectively. In terms of satisfaction, 7.57% are satisfied about bed preparation; 6.79% about transplanting; 6.27% about water management; 5.48% about land selection; 5.22% about value addition and seeding; 4.18 about fertilizer micro-dosing; 3.39% about seed treatment; 2.87 about harvesting techniques and nursery preparation and management; and 2.61% about seed production**,** 2.09% about bio-chemical pest control respectively.

Table 6: *Satisfaction of respondents on the content of the radio programme*

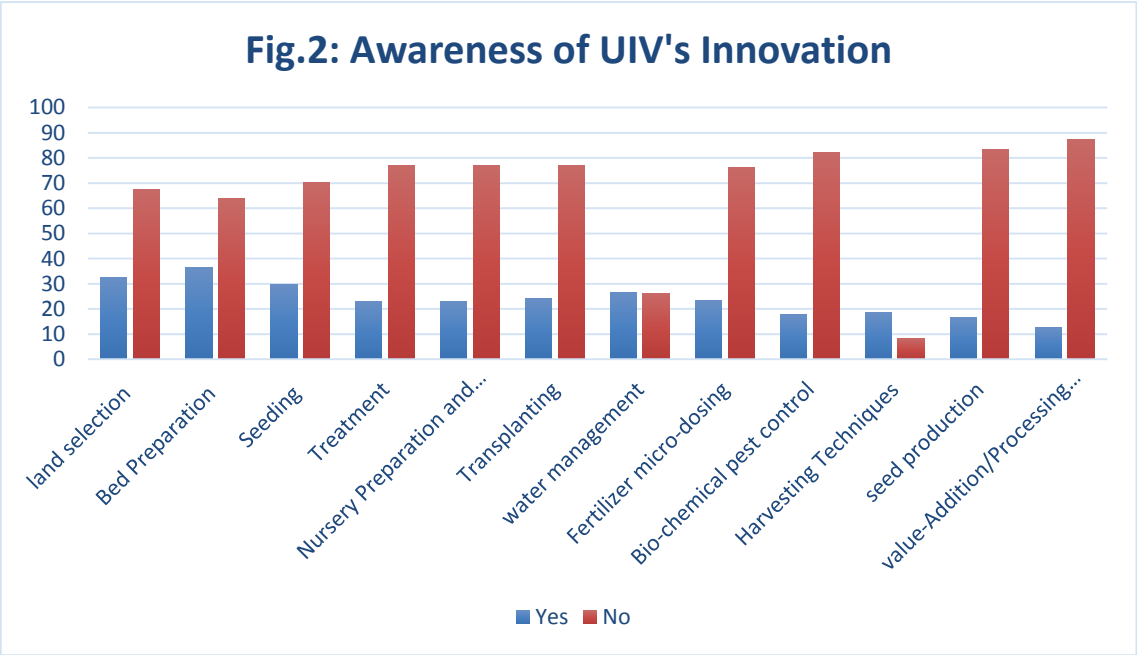
	Very satisfied		**Satisfied**		**Not satisfied**	
	Freq	**Percent**	**Freq**	**Percent**	**Freq**	**Percent**
Land selection	56	14.62	21	5.48	0	
Bed preparation	58	15.14	29	7.57	0	
Seeding	45	11.75	20	5.22	0	
Seed treatment	48	12.53	13	3.39	0	
Nursery preparation and management	44	11.49	11	2.87	0	
Transplanting	36	9.40	26	6.79	0	
Water management	34	8.88	24	6.27	0	
Fertiliser micro-dosing	43	11.23	16	4.18	0	
Bio-chemical pest control	36	9.40	8	2.09	0	
Harvesting techniques	59	15.40	11	2.87	0	
Seed production	26	6.79	10	2.61	0	
Value addition	13	3.39	20	5.22	1	0.26

Field Survey, 2017 *Percentage is over 100 because of multiple responses

4.4 Awareness of UIV innovation

The Figure 1 shows the awareness of respondents to different UIV innovations. The figure shows that bed preparation has the highest awareness with 36.3% of respondents being aware of it. About 12.5% of the respondents are aware of the UIV innovation on value addition. Overall, it can be inferred from the figure that, on the average, the level of awareness has improved from 22.84% during the baseline to 23.69%. It is glaring that the innovations that the respondents are most aware of are the innovations on bed preparation (36.3%), land selection (32.6%) and seeding (29.8). On the other hand, the innovations that have received the least awareness are value addition (12.5%), seed production (16.7%) and bio-chemical pest control (17.8%). About 23% of the respondents are aware of the innovations on seed treatment, nursery preparation and management respectively. About 26.6% are aware of innovations on water management, 24.3% are aware of transplanting, 23.2% are aware of fertilizer micro-dosing, while18.5% are aware of the harvesting techniques.

Fig.1: Awareness of UIV's Innovation

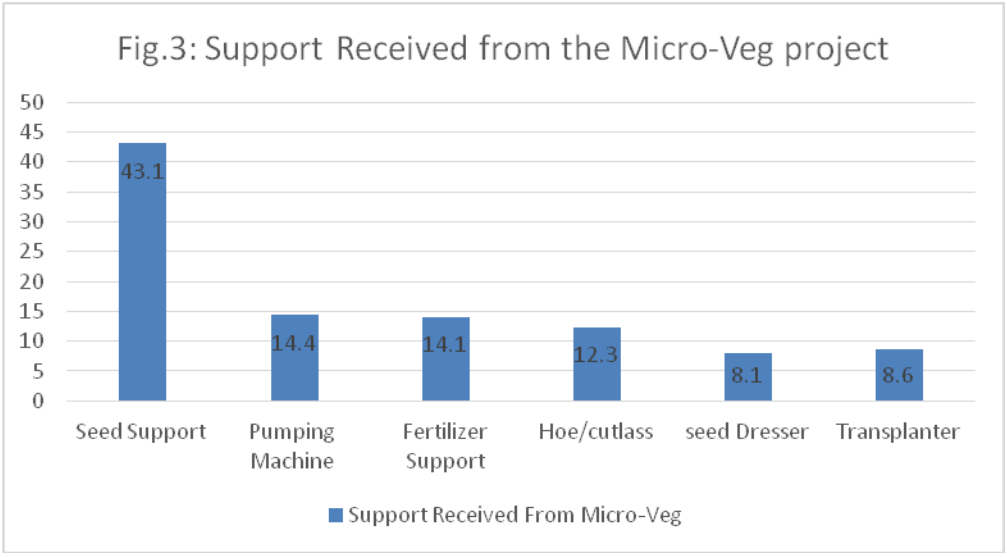


Source: Field survey 2017

Support received from Micro-Veg

Figure 2 shows the various support received by the respondents from the Micro-Veg project. The figure shows that 43.1% of the respondents received seeds from the Micro-Veg project. About 8.1% of the respondents received seed dressers and 8.6% of the respondents received transplanters from the project.

Fig.2: Support Received from the Micro-Veg project



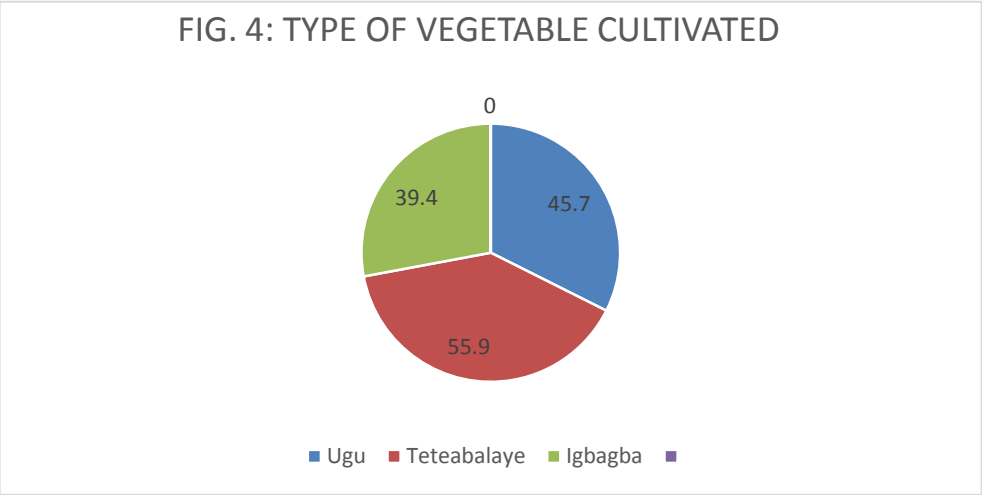
Source: Field survey 2017

Type of vegetable adopted

The Figure 3 shows the types of vegetable being cultivated by the respondents. The table 7 shows that a large portion of the respondents, 55.9% cultivated “teteabalaye”. 45.7% cultivated Ugu while only 39.4%

cultivated "Igbagba". This result shows that there has been an increase in the number of people who cultivate these three vegetables over the life of the project when we compare the figures with that obtained during the baseline study. The results from the table shows and increase from 1.33% to 39.4% for "igbagba", 12.22% to 45.7% for "ugu" and 3.33% to 39.4% for "teteatetedaye". This increase is probably due to the awareness created by the radio programmes and also demonstration through extension services.

Fig. 3: Type of vegetable cultivated



Source: Field study 2017

Table 7: Improvement in level of adoption

Vegetable	Current level	Baseline level	Percent Increase
Ugu	45.7	12.22	374%
Teteabalaye	55.9	3.33	1678%
Igbagba	39.4	1.34	2940%

Sources of awareness

Figure 4 shows the source from which the respondents got aware of each of the UIV innovations. The figure shows that about 52.1% of respondents became aware of the innovation on UIV value addition through the radio. The figure further shows that the innovations with the highest awareness through the radio are fertilizer micro-dosing (45.1%), land selection (48%) and value addition (52.1%) in ascending order. However, 23.4% respondents became aware of the innovation on UIV seed production being the innovation with the least awareness through radio. The figure further shows that the innovations with the least awareness are seeding (30.7%), harvesting techniques (29.6%), water management (26.5%)and seed production (23.4%), in descending order.

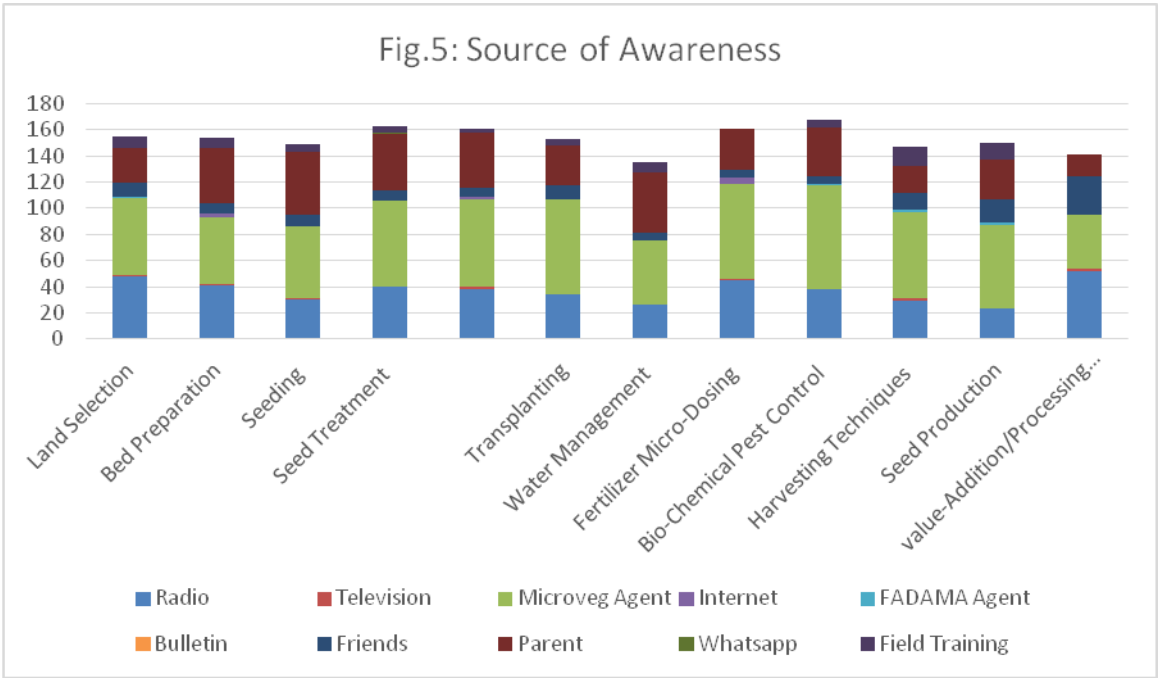
The figure also shows that 79.4% of the respondents became aware of the innovation on bio-chemical pest control through Micro-Veg agents. This innovation received the highest awareness through Micro-Veg agents. The innovations with the highest awareness through Micro-Veg agents are transplanting (72%), fertilizer micro-dosing (72.5%) and bio-chemical pest control (79.4%), in ascending order. On the other hand, innovation 41% respondents became aware of value addition through Micro-Veg agents and this innovation recorded the least awareness through Micro-Veg agents.

About 48.3% of the respondents became aware of the UIV innovation on seeding through their parents. About 46.1% respondents became aware of the UIV innovation on water management through their parents. These two innovations received the highest awareness through parents. On the other hand, 16.8% respondents received awareness through their parents and this innovation recorded the least awareness through parents.

About 29.2% of the respondents became aware of UIV value addition through their friends while the least number of people, 5.9% of the respondents became aware of innovations on water management and bio-chemical pest control through their friends.

The figure further shows that only a few of the respondents became aware of UIV innovations through the television, field training and the internet.

Fig.4: Source of Awareness



Source: Field survey 2017

Awareness of respondents by gender

Table 8 shows the level of awareness of the respondents by gender. The table shows that there are about 61.64% females are aware of the radio programme *Ramo Elefo* while only 38.35% males are aware. It can be inferred that females are more aware of the programme than males.

Table 8: *Awareness of the radio programme by gender*

	Frequency	**Percentage**
Male	84	38.35
Female	135	61.64
Total	**219**	**100.00**

Field survey, 2017

Listenership of respondents to the radio programme by gender

Table 9 shows the listenership of respondents to the radio programme by their gender. The table below shows that 61.58% of the respondents listens to the radio programme who are females while 38.42% of those who listen to the program are males. It is evident from this results that females listen more to the programme than males do.

Table 9: *Listenership to the Ramo Elefo radio programme by gender*

	Frequency	**Percentage**
Male	73	38.42
Female	117	61.58
Total	**190**	**100.00**

Field survey, 2017

Awareness of respondents by age

Table 10 shows the awareness of the respondents by age. It is obvious that most (16.44%) of the respondents that are aware of the radio programme are aged below 25 years, 62.52% of those that are aware are aged between 25 and 50 years, while only 17.35% of those that are aware are aged above 50years. It can be suggested that the bulk of those who are aware are the younger and productive respondents.

Table 20: Awareness of the respondents by age

Age group (years)	Frequency	Percentage
<15	4	1.83
15-19	20	9.13
20-24	20	9.13
25-29	36	16.44
30-34	25	11.42
35-39	23	10.50
40-44	27	12.33
45-50	26	11.87
51-54	8	3.65
55-59	7	3.20
>60	23	10.50
Total	**219**	**100.00**

Field survey, 2017

Listenership to the radio programme by age

Table 11 shows the distribution of the respondents by their listenership to the radio programme according to age group. The table shows that 17.89% of those that listen to the radio programme are aged between 25-29 years; 13.16% are between 35 and 39 years; 11.05% are between 30 and 34 years; 45 and 50 years and above 60 years. About 2.63% are below 15 years and between 55 and 59 years while 4.47% are between 51 and 54 years. The result shows that most of those who listen are youths.

Table 11: Listenership to the Ramo Elefo radio programme by age

Age group (years)	Frequency	Percentage
<15	5	2.63
15-19	16	8.42
20-24	16	8.42
25-29	34	17.89
30-34	21	11.05
35-39	25	13.16
40-44	17	8.95
45-50	21	11.05
51-54	9	4.74
55-59	5	2.63
>60	21	11.05
Total	**190**	**100.00**

Field survey, 2017

4.4 Stage of adoption of UIV innovations

Interest in UIV innovations

The value addition innovation entails processing the UIVs and including them as ingredients in making pastries. Table 12 shows the respondents by stages of adoption of the UIV innovations. The table shows that most (42.6%) of the respondents created interest in the UIV value addition component. On the other hand, the innovation that elicited the least interest of 26.1% was bed preparation.

Evaluation of UIV innovations

The table show that 4.2% of the respondents evaluated the innovation on seed treatment. This means that the most evaluated innovation is the treatment of UIV seed. The results further shows that 1.8% of the respondents evaluated the transplanting innovation which is the least

Trial of UIV innovations

The results show that 3.7% of the respondents have actually tried the innovations on land selection and bed preparation respectively. However, only 1.8% of the respondents have actually tried the innovations on harvesting and marketing respectively.

Adoption of UIV innovations

The results show that most (27.4%) of the respondents have adopted the innovation on harvesting UIVs. While the least (18.3%) of the respondents have adopted the bio-chemical pest control.

It can be seen from the results that more people have created interest in the innovation on land selection, a good portion have adopted the innovation, a few have either tried or evaluated it. These results are similar concerning the innovations on bed preparation, seed treatment, nursery preparation and management, transplanting, water management, bio-chemical pest control, harvesting, seeding, seed production and marketing where most simply created interest, a good portion adopted while only a few either evaluated or

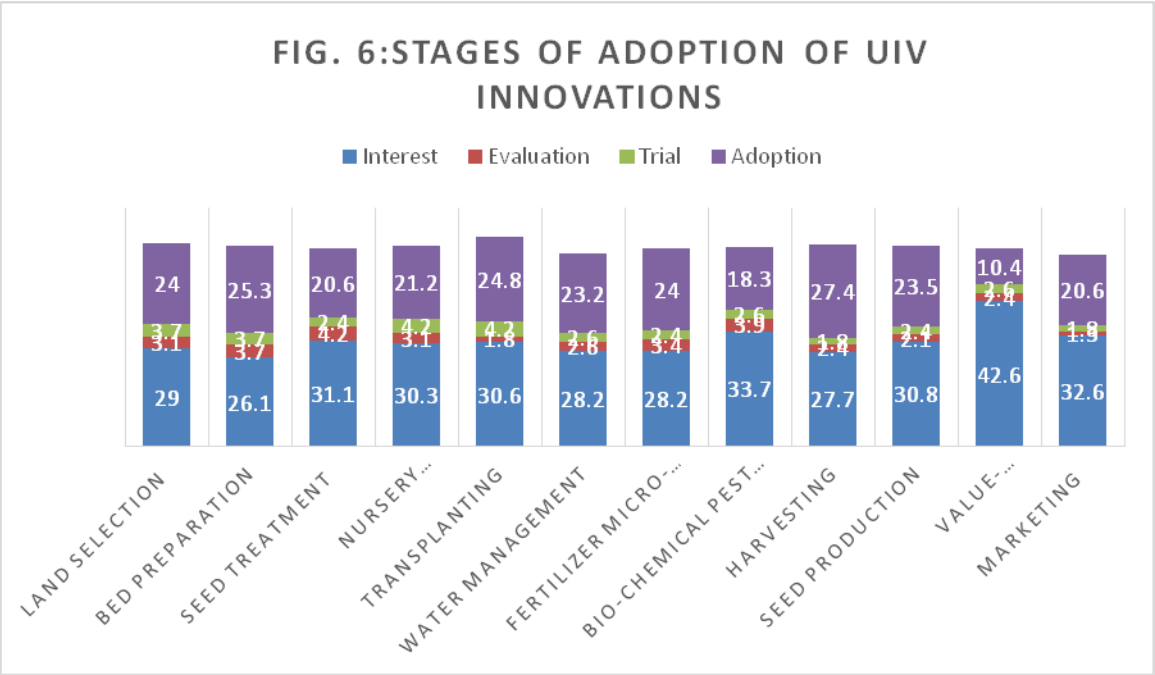
tried these innovations. On the other hand, more people have created interest in the innovation for fertilizer micro-dosing, a good portion have either tried or adopted while only a few evaluated the innovation. More people have created interest in the innovation for value addition while a small percentage adopted and a few either evaluated or tried the innovation.

Table 12: Stages of Adoption of UIV innovations

Stage of Adoption on land selection	**Frequency**	**Percentage (%)**
Interest	111	29.0
Evaluation	12	3.1
Trial	14	3.7
Adoption	92	24.0
Stage of Adoption Bed preparation		
Interest	100	26.1
Evaluation	14	3.7
Trial	14	3.7
Adoption	97	25.3
Stage of Adoption Seed Treatment		
Interest	119	31.1
Evaluation	16	4.2
Trial	9	2.4
Adoption	79	20.6
Stage of Adoption on Nursery Preparation and Management		
Interest	116	30.3
Evaluation	12	3.1
Trial	16	4.2
Adoption	81	21.2
Stage of Adoption on Transplanting		
Interest	117	30.6
Evaluation	7	1.8
Trial	16	4.2
Adoption	95	24.8
Stage of Adoption on Water Management		
Interest	108	28.2
Evaluation	10	2.6
Trial	10	2.6
Adoption	89	23.2
Stage of Adoption on Fertilizer Micro-Dosing		
Interest	108	28.2
Evaluation	13	3.4
Trial	94	2.4
Adoption	92	24.0
Stage of Adoption on Bio-Chemical Pest Control		
Interest	129	33.7

Evaluation	15	3.9
Trial	10	2.6
Adoption	70	18.3
Stage of Adoption on Harvesting		
Interest	106	27.7
Evaluation	9	2.4
Trial	7	1.8
Adoption	105	27.4
Stage of Adoption on Seed Production		
Interest	118	30.8
Evaluation	8	2.1
Trial	9	2.4
Adoption	90	23.5
Stage of Adoption on value-Addition/Processing (Green Bread cookies, pastries UIV's innovation		
Interest	163	42.6
Evaluation	9	2.4
Trial	10	2.6
Adoption	40	10.4
Stage of Adoption on Marketing		
Interest	125	32.6
Evaluation	5	1.3
Trial	7	1.8
Adoption	79	20.6
Stage of Adoption on Seeding		
Interest	126	32.9
Evaluation	6	1.6
Trial	7	1.8
Adoption	85	22.2

FIG. 6: Stages of adoption of UIV Innovations



Source: Data Analysis 2017

Adoption of UIV innovation and radio awareness

The table 13 shows the UIV innovation adopters that got aware of each innovation through the radio. The table shows that about 10.7% and 10.4% of the respondents who are aware of the innovation on land selection and bed preparation through the radio did adopt the innovations, respectively.

About 8.88% of those who became aware of the innovation on fertilizer micro-dosing through the radio have adopted. About 7.05% of those who became aware of innovation on transplanting through the radio have adopted. About 6.27% of the respondents that became aware of the innovations on seeding and nursery preparation and management through the radio have adopted the innovations. About 5.74% and 5.48% of the respondents that became aware of seed treatment and bio-chemical pest control respectively through the radio, have adopted. About 4.96% and 4.43% of the respondents who became aware of the innovations on water management and harvesting respectively through the radio, have adopted. About 3.13% and 0.78 of the respondents that became aware of the innovations on seed production and value addition respectively, through the radio, have adopted. It is shown that more people that got aware of the innovations on land selection and bed preparation through the radio have ended up adopting these innovations. This means that the radio programme is indeed performing the role for which it was intended.

***Table 13**: Adoption of UIV innovation by radio awareness*

UIV innovation	Frequency	Percentage
Land selection	41	10.70
Bed preparation	40	10.44
Seeding	24	6.27
Seed treatment	22	5.74
Nursery preparation and management	24	6.27
Transplanting	27	7.05
Water management	19	4.96
Fertiliser micro-dosing	34	8.88
Bio-chemical pest control	21	5.48
Harvesting	17	4.43
Seed production	12	3.13
Value addition	3	0.78

Field survey, 2017 *Percentages do not add up to 100 because of multiple responses

4.6 Depth of exposure to the programme

The depth of exposure was measured by how frequently the respondents listened to the radio programme (Ridwan *et al*., 2014). The Table 14 shows the depth of exposure of the respondents to the radio programme. The results show that most (40.53%) of the respondents listen to the programme once a week, while only 3.68% listen to it seven times a week. This suggests that most of the respondents have low depth of the programme, which may further translate to low level of knowledge of the contents of the programme. The gender disaggregation of the result is presented in table 25, and the results show that more than 80% of both male and female listen to the program at most thrice in a week. More female (4.1%) listen to the program on a daily basis than male (2.9%).

***Table 24**: Depth of exposure to the radio programme*

Number of times per week	Frequency	Percentage	Mean	Standard deviation
1	77	40.53		
2	59	31.05	2.19	1.48
3	30	15.79		
4	4	2.11		
5	12	6.32		
6	1	0.53		
7	7	3.68		
Total	**190**	**100**		

Source: Field survey, 2017

***Table 15**: Depth of exposure by gender*

Number of times per week	Male		Female	
	Frequency	Percentage	Frequency	Percentage
1	28	40.58	49	40.50
2	18	26.09	41	33.88
3	14	20.29	16	13.22
4	1	1.45	3	2.48
5	5	7.25	7	5.79
6	1	1.45	0	0
7	2	2.90	5	4.13
Total	**69**	**100**	**121**	**100**

Source: Field survey 2017

The influence of the depth of exposure to the programme on the likelihood adoption of the UIV innovations.

The influence of the depth of exposure to the radio programme on the likelihood of adoption was explored with the binary probit model. The Maximum likelihood estimation model of the probit was used because the outcome variable constructed was binary with 1 for adopters and 0 for non-adopters. The explanatory variables used were mainly socio-economics features and the depth of exposure.

The result of the estimation is in Table 16. The results show that religion, experience, awareness, satisfaction, membership, family assistance and depth of exposure significantly influences the likelihood of being an adopter. The overall model is a good fit as obtained from the likelihood ratio, which is not only statistically significant but had good Pseudo R^2 value of 53%.

The results show that the coefficient of religion was negative. This suggests that those who are not religious are more likely to be non-adopters. This looks plausible because the of the influence of religion on the decision of rural dwellers. Most rural dwellers are more likely to be religious and therefore base their decision to adopt on religious directive.

Awareness of the radio programme had a negative but statistically significant relationship with adoption. This result suggests that awareness of the projects' activities through radio programme is not sufficient to move the listeners towards adoption. In order words, mounting the radio programme is not sufficient to convince the respondents to adopt these innovations. In addition, the results suggests that before the respondents would make decision to adopt, some improvements need to be effected on the programme and it may require going beyond the simple jingle to detailed interactive sessions that would add value and motivate listeners to decide to adopt.

The coefficient of satisfaction with the contents of the radio programme suggests that those who are satisfied with the content of the radio programme are more likely to be adopters. This result suggest that the the radio programme as it is currently satisfies her listeners and those satisfied will most probably adopt. The

likelihood of adoption coming from satisfaction is about 37%, thus suggesting that one out of every three satisfied listeners will likely adopt the innovations. However, to improve this percentage the program content as it is now may need to be reviewed to incorporate more of interactive and educative sessions about the products –UIVs.

The coefficient of the membership of Micro-Veg group suggests that those who are members of the group are more likely to be adopters of the UIV innovation. This result points to the overall importance of interpersonal contacts of members of the Micro-Veg group with the researchers and extension workers. The interpersonal contact gives room for capacity building and training on these UIV innovations. Furthermore, membership enables participants to benefit from demonstration effects available to these members through which they can verify the authenticity of the claim by researchers. Indeed, membership increases the likelihood of adoption by about 60%, hence efforts should not be spared to encourage membership of the Microveg group.

The coefficient of receiving family assistance in the vegetable farming operations suggests that those who get assistance from their family members are more likely to be adopters. This could be because the inability to adopt may be more likely to be because of lack of means to put it to practice. In circumstances where there is support from the family members it becomes easier to put to practice all that have been gained from the programme since the resources to implement is now available through the family support. The likelihood of adoption of the innovations by those who receive family assistance is about 12%.

The coefficient of depth of exposure to the radio programme suggests that those who have a higher depth of exposure to the programme are more likely to be adopters of the UIV innovations. This is in line with *a priori* expectation, because the higher the frequency of listening to the program the more understanding the listener will have and thus the more convinced and higher the likelihood of adoption. The estimated percentage likelihood of adoption with deeper exposure is about 6%.

***Table 16**: Maximum likelihood estimation results (Probit)*

Variables	Coefficient	Standard error	Marginal effects	Standard error
Sex	0.0537816	0.2996981	0.0125409	0.06978
Religion	-0.8083519*	0.3208562	-0.1884932*	0.07146
Experience	-0.0143549	0.0135695	-0.0033473	-0.0033473
Awareness	-1.058887*	0.3696185	-0.3010167*	0.11195
Satisfaction	-1.585273*	0.3474471	-0.3696573*	0.07774
Relevance	0.3458786	0.5204746	0.0718506	0.0924
Membership	1.899847*	0.3229925	0.5894394*	0.10219
Family assistance	0.5043938**	0.3229925	0.116748**	0.06985
Depth of exposure	0.2457498*	0.0991651	0.0573045*	0.02431
Likelihood ratio	120.21			
Prob>Chi^2	0.0000			
Pseudo R^2	0.5300			

*=significant at 5%; **= significant at 10% Source: Computer analysis, 2017

5.0 Socioeconomic characteristics

Gender of respondents

Table 1 shows the gender of the respondents. Results shows that 35.25% of the respondents are male while 64.75% are female. This suggests that the vegetable enterprise is a female dominated enterprise. A comparison of the results obtained with the baseline results show that the participation of females in the enterprise has increased from 58.74% in the baseline study to 64.75% in the present study.

***Table 1**: Gender of respondents*

Gender	Frequency	Percentage
Male	135	35.25
Female	248	64.75
Total	**383**	**100.00**

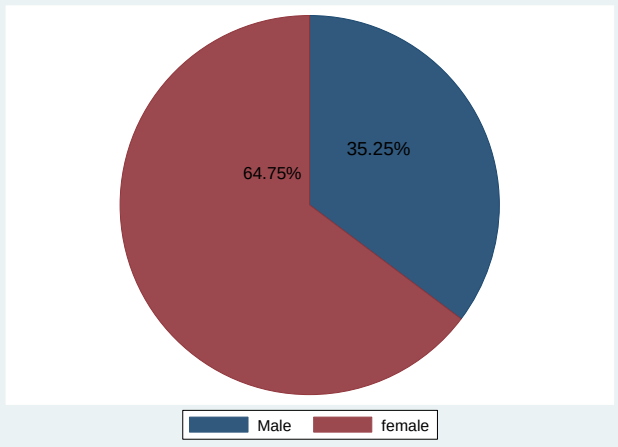


Fig. 1: Frequency distribution of respondents by gender

Age distribution of respondents

Table 2 shows the age distribution of the respondents. Result shows that the mean age is 36.47(±14.23) years. About 54.57% of the respondents are above the mean age while 44.65% of the respondents fall below the mean age. It can be deduced from the table that a good proportion of the respondents are within the productive age. The results from this study complements that of the baseline study that indigenous vegetable production is dominated by young farmers.

***Table 2:** Distribution of respondents by age group*

Age (years)	Frequency	Percentage	Mean	Standard Deviation
<15	8	2.09		
15-19	32	8.36		
20-24	34	8.88		
25-29	60	15.67		
30-34	48	12.53		

35-39	59	15.40	36.47	14.23
40-44	39	10.18		
45-50	45	11.75		
51-54	12	3.13		
55-59	13	3.39		
>60	33	8.62		
Total	**383**	**100.00**		

Source: Data Analysis 2017

Gender of respondents by age

Table 3 shows the results of the gender of the respondents by their age. The results show that 20.56% females are aged below 25 years while 18.40% of males are aged below 25 years. It further shows that 68.15% females are aged between 25 and 50 while 65.60% males are aged between 25 and 50 years. About 24% of the male respondents are aged above 50 years while 11.29% of the female respondents are aged above 50 years. It can be inferred from this results that more females in the indigenous vegetable enterprise are in their young active productive age.

Table 3: *Gender of respondents by age*

Age group	**Male**		**Female**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
<15	1	0.80	7	2.82
15-19	13	10.40	19	7.66
20-24	9	7.20	25	10.08
25-29	24	19.20	36	14.52
30-34	18	14.40	30	12.10
35-39	15	12.00	44	17.74
40-44	12	9.60	27	10.89
45-50	13	10.40	32	12.90
51-54	8	6.40	4	1.61
55-59	5	4.00	8	3.23
>60	17	13.60	16	6.45
Total	**135**	**100.00**	**248**	**100.00**

Field survey, 2017

Distribution of respondents by household size

The table 4 shows the distribution of respondents by household size. The table shows that 56.92% of the respondents have a household size between 1 and 5, 37.86% have a household size between 6 and 10. 4.96% have a household size between 11 and 15 while 0.26% have a household size between 21 and 25. From the table, the mean household size is about 6±2.86. Indeed, most of the respondents have a household size of between 1 and 5.

Table 4: *Household size of respondents*

Household size	Frequency	Percentage	Mean	Standard deviation
1-5	218	56.92	5.57	2.86
6-10	145	37.86		
11-15	19	4.96		
21-25	1	0.26		
Total	**383**	**100**		

Field survey, 2017

Distribution of respondents by years of formal education

The table 5 shows the years of education of the respondents. The table shows that most of the respondents have some form of formal education. About 51.96% have secondary education, 22.19% have tertiary education, and 18.28% have primary education while only 7.57% have no formal education. The mean years of education are 10.17±4.33 years. Obviously then, most of the respondents have some form of formal education. The reason for these results may be due to the fact that the sample was mostly in the towns.

Table 5*: Distribution of respondents by years of education*

Years of education	Frequency	Percentage	Mean	Standard Deviation
No education	29	7.57		
Primary	70	18.28		
Secondary	199	51.96	10.17	4.33
Tertiary	85	22.19		
Total	**383**	**100.00**		

Field survey, 2017

Distribution of respondents by literacy level

The table 6 shows the literacy level of respondents. The table further shows that 78.33% of the respondents can read and write, 81.20% of the respondents can read but cannot write, 18.28% can neither read nor write while 0.26% can write but cannot read. The results show that most of the respondents can read and write.

Table 6: *Literacy level of respondents*

Literacy level	**Frequency**	**Percentage**
Read and write	300	78.33
Can read but cannot write	11	81.20
Can neither read nor write	70	18.28
Can write but cannot read	1	0.26
Total	**382**	**100.00**

Field survey, 2017

Form of Land ownership

The table 7 shows the distribution of the respondents based on the form of land ownership. The table shows that rent is the most common form of land ownership with 26.73% of the respondents, about 23.43% of the respondents inherited the land used for cultivation, 19.14% purchased the land used, 15.84% leased the land while 14.85% got the land as a gift. This is similar with the results from the baseline study where the three major forms of land ownership were by inheritance, purchase and leasing.

***Table 7**: Form of Land ownership*

Ownership	Frequency	Percentage
Inheritance	71	23.43
Lease	48	15.84
Rent	81	26.73
Purchase	58	19.14
Gift	45	14.85
Total	**303**	**100.00**

Field survey, 2017

Gender of respondents by land ownership

Table 8 shows the gender of respondents by their form of land ownership. Results show that 20.43% of females and 28.21% of males inherited the land used for cultivation. About 21.51% of females and about 15.38% purchased the land used. However, 17.20% of females and 13.68% of males leased the land being used. As much as 25.27% of females and 29.06% males rented the land being used. Incidentally, about 15.59% females and 13.68% of males had the land presented to them as gifts. The results show that there are more females who own land than males meaning that females may be more involved in vegetable cultivation than males are. Most respondents rented the land being used.

Table 8: Gender of respondents by land ownership

Sex	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Inheritance	33	28.21	38	20.43
Purchase	18	15.38	40	21.51
Lease	16	13.68	32	17.20
Rent	34	29.06	47	25.27
Gift	16	13.68	29	15.59
Total	**117**	**100.00**	**186**	**100.00**

Field survey, 2017

Marital Status of respondents

The table 9 shows the marital status of the respondents. The results on the table show that 63.71% of the respondents are married with one wife, 25.33% are single, 9.14% are married with more than one wife while 1.31% are widowed. In essence, most of the farmers are married suggesting that marital status is important for agricultural practice.

***Table 9**: Distribution of respondents by marital status*

Marital status	Frequency	Percentage
Married monogamy	244	63.71
Married polygamy	35	9.14
Never married	97	25.33
Divorced	2	0.52
Widowed	5	1.31
Total	**383**	**100.00**

Field survey, 2017

Distribution of respondents by weekly income from vegetable enterprise

The table 10 shows the distribution of respondents by weekly income obtained from their vegetable enterprise. The table shows that about 82.77% of the respondents obtain less than ₦10,000 income from the vegetable production. However, only 0.26% obtain between ₦31,000 and ₦40,000. The average income per week, obtained from vegetable production is ₦4,504.79 (±7608.37), which translates to about N18,000 monthly which is the current minimum wage paid to Federal civil servants in Nigeria.

Table 10: *Respondents' weekly income from vegetable enterprise*

Income (Naira)	Frequency	Percentage	Mean	Standard deviation
>10000	317	82.77	4504.79	7608.37
10000-20000	52	13.58		
21000-30000	9	2.35		
31000-40000	1	0.26		
41000-50000	4	1.04		
Total	**383**	**100.00**		

Field survey, 2017

Farm size of respondents

The table 11 shows the distribution of respondents by their farm size. The table shows that 74.86% of the respondents cultivate ugu farm of between 1 and 10 plots, 22.86% cultivate less than 1 plot while 2.29% cultivate between 11 and 20 plots.

About 65.56% of the respondents cultivate igbagba farm size of between 1 and 5 plots, 32.45% cultivate below 1 plot, 1.32% cultivate between 5 and 10 plots while 0.66% cultivate above 10 plots.

About 67.76% of the respondents cultivate between 1 and 5 plots of Tetatetedaye, 30.37% cultivate less than 1 while 1.87% cultivate between 5 and 10 plots. The table shows that most of the respondents cultivate between 1 and 10 plots of vegetable. From the table, it can be inferred that Ugu has the largest cultivated area in plots however; Teteatetedaye is the most cultivated vegetable.

Table 11: *Distribution of farmers by farm size*

Farm size (in plots*)	Frequency	Percentage
Ugu		
<1	40	22.86
1-10	131	74.86
11-20	4	2.29
Total	**175**	**100.00**
Igbagba		

<1	49	32.45
1-5	99	65.56
5-10	2	1.32
>10	1	0.66
Total	**151**	**100.00**
Teteatetedaye		
<1	65	30.37
1-5	145	67.76
5-10	4	1.87
Total	**214**	**100.00**

Field survey, 2017* a plot is 6mx1m or 3mx2m.

5.1: **OTHER COMMUNICATION TEAM ACTIVITIES**

Microveg Benin and Nigeria Communication Teams were organized with five components which are radio events, TV programmes, Video recording, published information on project and technical notes in 4 newspapers and quarterly bulletins. We targeted nationwide FM Radios (Radio Fraternity) in Benin and 2 regional local FM radios (Orisun and Broadcasting Corporation of Oyo State (BCOS) in Nigeria, nationwide newspapers (Journal Fraternité), international TV channels (Canal 3), Quarterly Microveg Newsletter, local and international Scientist Journals.

Communication tools

The project communication strategy used the following communication tools

1) Printed materials/marketing collateral (brochures, factsheets, posters, branding on sample products, bulletins)
2) Events (fields days and market days, workshops and training programmes, media field trips, press release and web stories, continual engagement with media
3) Stakeholder engagement (project bulleting, email newsletters, testimonials, policy briefs, political and development leaders advocacy, scientific and conference publications,
4) Mass media (radio, TV, newspapers, magazines)
5) Other activities (website and online information, social media, outcome stories, trainings, policy advocates.
6) Satellite Dissemination Approaches (SDA), Innovation Platform and Young Vegetable Scientist Club (YVSC) in Secondary schools.

Printed materials/marketing collateral

The project used various types of printed materials: project profiles, training manuals on scaling up models and technical innovations, extension bulletins. Depending on the tool, 50 to 5000 people were reached in Benin. In Nigeria, in addition to other communication tools mentioned, radio jingle tagged “Ramo Elefo” , Farmers Electronic Learning Platform Centre (SDA) and YVSC were developed and established to reach more than 3,000,0000 people in southwest Nigeria

Table 1: Distribution of printed materials used in Benin and Nigeria

Communication tools	Description	Frequency	Benin		Frequency	Nigeria	
			Number	Total reached, Benin		Number	Total reached, Nigeria
Brochures/fliers/facts heet	Project profile,		1	200		1	750
Training manuals	Scaling up (01), Agronomy (01), Facilitation (01) and Food processing (01), Business (01)		5	51		250	2455
Bulletins	agronomy (03), scaling up (01), food sciences (02),YVSC (01)		9	500		450	8750
Posters	Project overview, students project proposal and results, NGO activities, Entrepreneurs		19	1000		45	5400
Newsletters	January and February 2017	Monthly	2	1000	Quarterly	2	10500
Branding on sample products	Tchayo Juice (01), Seed (03), Dried leaves (03), boiled /freezed vegetables (03), Tchayo enriched Tchintchin (01), Tchayo Sirop (01), Ugu green bread (01), Ogi (01)		14	5000	Weekly	54	10000
Vegetable bread	Vegbread				Weekly	2 Years	30,000
Branded radio jingle (Ramo Elefo)					Daily	2 years	10,000,000
Farmers Electronic Learning Centre (SDA)					1	1 Year	100

Training/Conference/Workshop Events

The project organized various events for information exchange and awareness building: fields days and market days, workshops and training programs, media field trips, press release and web stories, continual engagement with media.

Depending on the tool, 50 to 4000 people were reached in Benin and more than 50,000 people were reached in Nigeria. Benin MicroVeg team participated in the Cooperation and Professional Insertion day of the University of Parakou in Nov 2015 and 2016 to inform the public on importance, opportunities of traditional leafy vegetables. Nigeria team participated, promoted UIVs value chain and trained Osun State Youth Empowerment Scheme (/*OYES) members in 2015, 2016 and 2017. The teams also participated to others fora and workshop for promoting traditional leafy vegetables at national and regional levels.

Table 2: Distribution of organized Training/Conference/Workshop events in Benin and Nigeria

Communication tools	Description	Frequency	Benin		Frequency	Nigeria	
			Number	Total reached		Number	Total Reached
Field days and market days	SDA field visits	2/year	36	3972	3 Years	28	2
Workshops and training programmes	International scaling up (01), national scaling up (01), national agronomy (01), national value addition (01), national facilitation (01), district level value addition (14), LFT business (01), inception, annual review, ISIAB (05)		25	750		60	5
Media field trips	Monitoring tour, Ina experiments (02), IDRC Photographer mission (01), training on innovations (04)		7	50		60	15
Press releases/web stories	International scaling up (01), national scaling up (01), LFT business (01), inception (01), Quebec Science 1st june 2016 (01), CLS communication 3rd august 2016 (01)		6	3000		20	8
Exibitions	ABEVRIT (01), Journée de la coopération Universitaire (02), Women in Agribusiness (AGRF) (01) Local and International Journals		4	800		10	W v
Media tracking	Quebec Science 1st june 2016 (01), CLS communication 3rd august (01)		2	600		6	1

Figure 1: Microveg exhibition stand in an event in Rebublic of Benin

Figure 2: Days of Cooperation and Professional Insertion 2015 and 2016 of the University of Parakou, Benin

Figure 3: Young Professional training in Benin

Figure 4: Cross section of Secondary School Teachers' IVs trainings in Nigeria

Figure 5: Cross section of YVSC training session in one of the Secondary in Nigeria

Figure 6: Cross section of Teacher and students practicalising the trainings in Nigeria

Table 3: Distribution of Communication Team Sstakeholders' Engagement in Benin and Nigeria

Communication tools	Description	Frequency	Benin		Nigeria	
			Number	Total reached	Number	Total reached
Project bulletin, email newsletter, testimonials	Newsletter January, February, March, June and November, 2017	Monthly	2	1000	15	1500
Policy briefs						
Political and development leaders	stakeholder meetings: districts level (34), Development and NGO actors (16)		21	103	37	200
Scientific publications and conference attendance	Publication (12), 25 conferences		18	1000	45	5000

Mass media used for Project Information Dissemination

The project intensively used three major mass media: radio, TV, newspapers/magazines. The media strategy reached up to 8 million people in Benin Republic and more than 10 million in Nigeria. We targeted international audience media (Canal Monde TV in Benin and Channel in Nigeria) and also local FM radios (Orisun and BCOS in Nigeria) broadcasting in local languages. For instance Canal 3 Monde TV is on satellite Canal+ system and has the highest audience and reaches almost of the whole population of Benin (10.0 million) and the Francophone and English

audience in Africa and outside. All supporting documents like audio files, video, and newspaper copies are available on our dropbox sharing medium.

Table 4: Distribution of mass media used in Benin and Nigeria

Communication tools	Description	Frequency	Benin		Frequency	Nigeria	
			Number	Total reached		Number	Total reached
Radio	Radio jingles (Ramo Elefo in Nigeria), documentary, interviewes on Radio Fraternité, Nato, FM Nonsina, Parakou			2 800 000			10,000,000
TV/Video							
Television	documentary, interviewes on E Tele, Canal 3 TV and Channel TV in Nigeria			8 000 000			20,000,000
Video	Agronomy (04), Scaling up strategy (04), food technology (04), Overall project (06)		04	1 000			3,000
Newspapers							
Newspapers	Journal Fraternité, Journal Matinal: Project progress informations, news on project innovations, Punch in Nigeria			500			5,000

Figure 7: Benin Micro-Veg PhD student explaining his research using micro-lysimeter for environmental sustainability, Ina Agronomy Trial site

4 MESSAGE / ACTU

Quotidien FRATERNITE N°3906 du 022 juillet 2015

LANCEMENT DE LA DEUXIÈME PHASE DU PROJET MICRO-VEG

La faculté d'agronomie de l'Up promeut une sécurité alimentaire durable

C'est parti pour la deuxième phase du projet Mise à l'échelle de la microdose dans la production de légumes traditionnels pour améliorer la sécurité alimentaire et économique des agriculteurs Ouest-Africains (Micro-Veg). Ce projet est financé par le Centre de Recherche pour le Développement International (Crdi) et le Ministère des Affaires Etrangères, du Commerce et du Développement de Canada, à travers le Fonds Canadien de Recherche sur la sécurité alimentaire (Fcrsa). Conduit par la Faculté d'Agronomie de l'Université de Parakou, le projet vise principalement l'amélioration des cultures maraichères.

Le Micro-Veg fait suite à l'exécution d'un projet initial de recherche sur la gestion intégrée de l'eau et des fertilisants pour une sécurité alimentaire durable au sahel (INuWaM) de 2011 à 2014 dans les communes de Boukoumbé et de Ouaké. Il concerne les dix communes que sont Boukoumbé, Djougou, Malanville, Karimama, Parakou-N'Dali, Tchaourou, Ouaké, Bohicon et Djidja.

L'atelier de Parakou ayant consacré son démarrage effectif a connu la participation de plusieurs personnalités parmi lesquelles le 2ème vice-recteur de l'université de Parakou, le doyen de la faculté d'agronomie, les responsables du Carder, les autorités communales et locales sans oublier les maraichers et les associations de producteurs telles que la Fupro… Pour le coordonnateur du projet, Dr Irénikatché Akponikpe, vu la pénurie et la flambée des prix qui s'observent durant la saison sèche, le projet de Mise à l'échelle de la microdose dans la production de légumes traditionnels pour améliorer la sécurité alimentaire et économique des agriculteurs Ouest-Africains (micro-veg) développera avec les maraichers ; des paquets technologiques qui permettront à ce que partout, toute l'année, on puisse disposer soit de légumes frais ou de légumes déjà transformés et prêts pour la consommation. Il durera trois ans ; soit de mars 2015 à Février 2018 et vise l'amélioration de la sécurité alimentaire et du pouvoir économique des communautés paysannes à faible ressource à travers l'innovation de la fertilisation à microdose dans la production des légumes-feuilles. Il intègre l'approche genre.

Le coordonateur du projet Micro-Veg/FA/UP, Dr Akponikpè entretenant les participant à l'atelier de lancement

Entre autres résultats attendus au terme des trois années que va durer ce projet, on peut citer l'amélioration de la disponibilité, la qualité des variantes de légumes dans nos marchés et aussi la satisfaction des besoins liés aux légumes en toute période. Ainsi, c'est 50.000 producteurs béninois qui trouveront leur revenu amélioré et 10.000 ménages par commune touchés. Les participants à cet atelier de lancement ont unanimement loué l'initiative car pour eux, un projet s'occupe enfin du sous-secteur maraicher et plus spécifiquement des légumes feuilles puisqu'il existe actuellement très peu d'interventions dans ce domaine.

Aussi, ledit projet entend-il inverser les tendances à travers trois principales composantes à savoir le développement d'innovations liées à l'adaptation de la microdose sur les légumes traditionnels (production, valorisation et semences) ; l'adoption à grande échelle de la production et de la consommation des légumes traditionnels et l'influence des politiques en matière de sécurité alimentaire.

Le projet contribuera à terme à réduire la faim surtout cachée dans nos régions à travers l'adoption de la production et de la consommation des légumes traditionnels dans les dix communes ciblées mais aussi la formation des jeunes scientifiques de nos universités. Trois légumes feuilles traditionnels sont visés : la grande morelle ou aubergine africaine plus connue sous l'appellation Gboma (solanum macrocarpon L.), l'amarante ou fotété ou tété (Amaranthus sp.) et la courge cannelée ou lokpa (telfairia occidentalis L. Hook).

Aubergine africaine ou Gboma *Amarante ou Fotété* *Courge cannelée ou Lokpa*

Figure 8: An example of activity report in the Fraternité newspaper, 02 July 2015

Figure 9: Microveg scientists in Nigeria demonstrating the training proces to Teachers and Secondary students

Other Mass Media used by the Communication Team

The project used complementary tools to increase awareness on TLVs: website and online information, social media, outcome stories, trainings, policy advocates.

Communication tools	Description	Frequency	Benin		Frequency	Nigeria	
			Number	Total reached		Number	Total reached
Website/Online information	Project web site (03), Project facebook (01)		2	572*		2	2,000
Social media	Skype meeting (46), Whatsapp						
Gathering outcome stories for use in all communication products							
Training on communication strategies	Training		1	60		1	30
Policy advocate							

*Active members

Figure 10 : Sahel Entreprise officer being interviewed in Waama local language during the recording of the awareness documentary with Nato Radio in Natitingou, Fev 2016

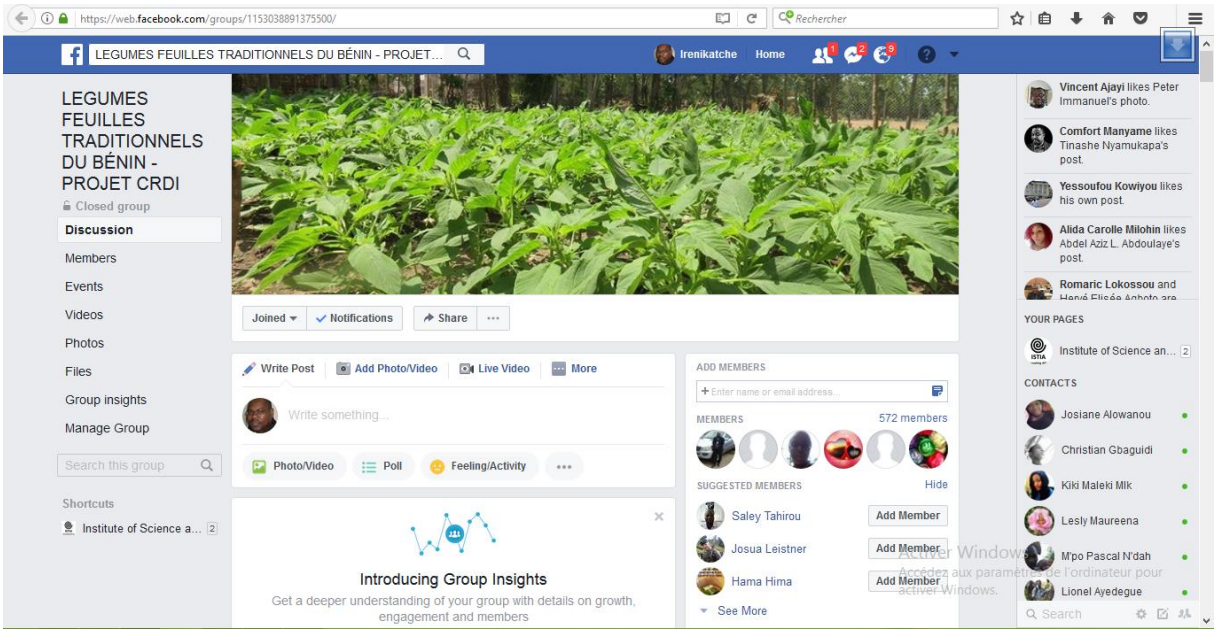


Figure 4: Facebook awareness group in French (***Legumes feuilles traditionnels du Bénin - Projet CRDI***) to share daily information on the activities and importance of TLVs.

REFERENCES

Adebooye, O. C., Ogbe, F. M. O. and Bamidele, J. F. (2003). Ethnobotany of Indigenous leaf vegetable of southwest Nigeria. Delpinoa (Italy) 45:295-299.

Adebooye, O. C., *et al.*, (2013) Underutilized indigenous vegetables for food security and livelihood resilience in Nigeria. PR O JE C T 106511. Africa Agricultural Science Week, Accra, Ghana July, 2013

Arokoyo, T. (2003). ICT's for agriculture extension transformation. Proceeding of ICT's – transforming agriculture extension? CTA's observatory on ICT's. 6th consultative Expert Meeting. Wageningen, 23 – 25 September.

Asogwa, B. C., Ezihe, J. A. C., and Ogebe, F. O. (2012). Agricultural Marketing Information Usage among Soybean Farmers in Nigeria. *International Journal of Innovation and Applied Studies*. 1 (2): 160-170.

Ayeni, A. A. (2008) "Agricultural Information System for West Africa: A Paradigm for Sustainable Development of the Africa Sub-Region," ECOWAS Working Document for the establishment of Agricultural Information System (AGRIS), pp. 21,

Balancing Act (2008) African Broadcast and Film Markets Balancing Act: London (NB. Balancing Act's figures are mainly derived from a series of surveys carried out by Intermedia in 17 countries across the African continent (Algeria, Angola, Burundi, Egypt, Ghana, Kenya, Morocco, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Togo, Tunisia, Uganda and Zimbabwe) between 2005 and 2007. The surveys were carried out through face-to-face interviews with representative samples of adults (normally 15+), the average sample size being about 2,000 individuals, with an average of 95% confidence)

Cash, D. W. (2001). In order to aid in diffusing useful and practical information: Agricultural extension and boundary organizations. *Science Technology and Human Values*, 26, 431–453.

Chapota, R., P. Fatch and C. Mthinda. 2014. The Role of Radio in Agricultural Extension and Advisory Services -Experiences and Lessons for Farm Radio Programming in Malawi. MEAS Case Study No. 8. Urbana-Champaign, Ill.: University of Illinois.

Chweya J. A. and P. B. Eyzaguirre (Eds). 1999. International Plant Genetic Resource Institute (IPGRI). Rome, Italy.

Eboh EC, 2009. Social and Economic Research Principles and Methods. 2nd Edition African Institute for Applied Economist, Enugu,Nigeria.

Ekbia, H. R., and Evans, T. P. (2009). Regimes of information: Land use, management, and policy. The Information Society, 25(5) 328–343.

Ekoja, I. (2003) Farmer's access to agricultural information in Nigeria. Bull. American Society of Information and Science Technology, 29(6): 21 - 23., doi: 10.1002/bult.293

FAO. (2005). FAO Final report. Rome: France.

Galloway, L., and Mochrie, R. (2005). The use of ICT in rural firms: A policy orientated literature review. *The Journal of Policy, Regulation and Strategy for Telecommunications* (7) 33–46.

Guarino, L. (1997). Traditional Africa vegetables. Promoting the conservation and use of underutilized and neglected crops. In: Proceedings of the IPGRI International Workshop on Genetic Resources of Traditional Vegetables in Africa. IPGRI, Rome, Italy.

Herselman, M. E. (2003). ICT in rural areas in South Africa: Various case studies. *In Proceedings of Informing Science + Information Technology Education Joint Conference* 945–955).

IICD. (2007) How ICT can make a difference in agricultural livelihood. The Common Wealth Ministers Reference Book-2007. http://www.iicd.org/files/ICT%20and%20agricultural%20livelihoods.pdf.

MicroVeg Technical report, 2016

Mohammad, R. N., Salleh, M. D, and Hasbullah, A. H. (2010). "Radio as an Educational Media: impact on Agricultural Development" The Journal of South East Asia Research Centre for communication and Humanities,Vol-2.2010,pp.13-20.

Mtega, W. (2008) The Use of Telecentres in Tanzania: A Case Study of Kilosa District. Masters Dissertation, University of Dar es Salaam.

Myers, M. (2008). Radio and Development in Africa: A concept paper prepared for the International Development Research Centre (IDRC) of Canada. Retrieved on May 6, 2013 from www.google.com/pdf

Njoku, J. I. K. (2016). Effectiveness of radio-agricultural farmer programme in technology transfer among rural farmers in Imo State, Nigeria. *Net J Agric Sci*, 4(2): 22-28.

Olaleye, R.S., Gana, F.S., Umar, I.S., Ndanisa, M.A. and Peter, E.W. (2009) Effectiveness of Radio in the Dissemination of Agricultural Information among Farmers in Edu Local Government Area of Kwara State, Nigeria. *Continental Journal of Agricultural Science 3, 1–6.* http://www.wiloludjournal.com/ojs/index.php/cjAgsc/article/viewArticle/866

Olukosi and Erhabor, 1998;

Ommani, A. R., and Chizari, M. (2008). Information dissemination system (IDS) based e-learning in agricultural of Iran (perception of Iranian extension agents*). World Academy of Science, Engineering and Technology*, 38, 468–472. Retrieved from http://www.waset.org/journals/waset/v38/v38-84.pdf.

Opara, U. N. (2008). Agricultural information sources used by farmers in Imo State, Nigeria. *Information Development*, 24(4), 289–295.

Oso, L (eds.). (2002): Communication and Development: A Reader. Abeokuta; Jedidiah Publishers.

Research ICT Africa (RIA!), 2005 Towards an African e-Index The Link Centre, Wits University School of Public and Development Management, South Africa www.researchictafrica.net

Raghuvanshi, R, S. and Singh, R. (2001). Nutritional Composition of uncommon foods and their role in meeting in micronutrient needs. *Int. J. Food Sci. Nutr*., 32: 331-335.

Sife, A.S. (2010) Contribution of Mobile Telephony, Radio and Television to Rural Livelihoods and Poverty Reduction in Morogoro Region, Tanzania. PhD thesis, University of Dar es Salaam.

Taragola, N., Van Lierde, D. 2010. Factors affecting the internet behaviour of horticultural growers in Flanders, Belgium. Computers and Electronics in Agriculture, 70, 2, 369 -379

VegNews 2012. NICANVEG WEBSITE

Warren M.F. 2002. Adoption of ICT in agricultural management in the United Kingdom: the intra-rural digital divide. Agricultural Economics, 48, 1, 1 -8

Weinberger, K., and Msuya, J. M. (2004). *Indigenous vegetables in Tanzania: Significance and Prospects (Technical Bulletin No. 31).* Shanhua: AVRDC - The World Vegetable Center.