Testing the influence of radio programs on climate change knowledge

A pilot experience from the Congo Basin

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Photo by Kelly Joyce Mbimi
Local population listening to the radio.

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Acknowledgments

Foreword

Climate Change and Forests in the Congo Basin: Synergies between Adaptation and Mitigation (COBAM) is a project coordinated by CIFOR since 2010, in the framework of PACEBCo, the Central African Forests Commission (COMIFAC) program funded by the African Development Bank (AfDB).

COBAM is an action research project that intends to develop an appropriate response to climate change vulnerability in the Congo Basin landscapes by providing policy makers, practitioners and local communities with the information, analysis and tools needed for designing and implementing policies and projects for adaptation to climate change and reduction of carbon emissions in forests, with equitable impacts and co-benefits — including poverty reduction, enhancement of non-carbon ecosystem services, and protection of local livelihoods and rights.

COBAM aims to share knowledge and build capacities on adaptation and mitigation in the Congo Basin forests at local, subnational, national, regional and international levels. In this sense, the media have the potential to reduce local community vulnerability while contributing to the science–policy–practice dialogue. Among other outputs, the project has created a radio-based knowledge exchange platform with radio programming that will ultimately help strengthen the science–policy–practice dialogue involving several stakeholders, among which are local communities.

This report focuses on the impact of a radio experience on local communities' knowledge on climate change responses. It briefly describes how the radio program was produced and broadcast, and it provides the methodology and results used for its impact assessment.

1 Background: State of knowledge and communications in the Congo Basin

There is common consensus that there is a deficiency of information on climate change and forests in the Congo Basin (Kengoum 2011; Tiani et al. 2014). Data and information at the international level are not easily accessible, and regional, national and local data are often insufficient. There is, therefore, an urgent need amongst stakeholders to coordinate research and develop an exchange platform for knowledge and information sharing on climate and the environment.

Tchatchou et al. (2014) observe that climate change information in the Congo Basin is often transmitted through channels such as workshops that are generally adapted to suit government or international actors. Furthermore, these channels are generally characterized by the short life of the information and the low number of individuals that they reach. The Internet is also used quite often. However, poor infrastructure and weak technical capacities in the region mean that the vast majority of people have little or no access to new technologies. Traditional media such as radio and television, however, can narrow the knowledge gap as they are readily available and require less infrastructure and technical capacity. Yet, until now, the widely accessible medium of radio has rarely been used for climate change topics.

Several studies have evaluated the impact of radio on knowledge and behavioral change. DellaVigna et al. (2011) studied how radio was used during the Serbo-Croatian conflict. They find that political propaganda programs disseminating hate messages increase xenophobic behavior and increase the vote for extremist parties. There are also numerous analyses of the impact of radio in Africa. In Rwanda, several authors show that radio can either increase violent behavior, or be used as an educational tool for peace (Staub et al. 2007; Straus 2007; Paluck 2009; Paluck and Green 2009). In Gambia, Uganda and Ghana, radio was used to modify behaviors related to HIV transmission or family planning with positive effects (Valente et al. 1994; Panford et al. 2001; Green et al. 2006).

Radio programs have also commonly been used by African agricultural extension services. Karami

and Mansoorabadi (2008) note an improvement in sustainable practices by farmers who have better access through information-based radio, among other channels. There are fewer studies evaluating the influence of radio on climate change knowledge, but Leiserowitz (2006) finds a differential perception of climate change risks between radio listeners and other groups.

Climate change is increasingly affecting sub-Saharan rural populations who have reduced access to appropriate information on potential responses. Thus, there is an urgent need to evaluate the appropriateness of traditional media such as radio programming for disseminating climate change information, and its potential benefits for adaptation and mitigation through increased knowledge.

2 Conceptual framework

2.1 Linking information flow to sustainable practices

Weiss (1997) highlights the fact that program interventions are designed following a logic of impact and a series of assumptions. Changes toward a desired scenario occur in a series of steps that can be analyzed using different techniques (Figure 1). Knowledge has been recognized as an important element/step in societal transformations (Nutley et al. 2003).

In this sense, research can be used to improve the practices conducted by different stakeholders, but it needs to be adapted in terms of the type of message, the quality of information, its relevance and the channel used for its transmission (Nutley et al. 2003). In this working paper we will evaluate the adequacy of radio as a channel for knowledge dissemination, and the level of climate-related knowledge uptake by rural communities using traditional media.

Local populations have better access to adapted information → Local populations have improved knowledge on climate change responses → Local populations change toward more sustainable and resilient practices

Figure 1. Theory of change of knowledge uptake.

Source: authors

2.2 Rural communities and information

Human capital constitutes the ensemble of skills, knowledge, labor capacity, health and physical conditions (Scoones 1998). It is a key element of poverty reduction and adaptive capacity. It also proves necessary in the process of mitigation. Ackoff (1989) categorizes the different levels of knowledge from data to wisdom, depending on the detail and organizational complexity of its content. Information, knowledge and understating constitute progressive steps toward the transformation of data into actual practices. A series of interrelated variables condition this process, and can be grouped into source, content, medium and user variables (Nutley et al. 2003).

We concentrate on rural communities as the final 'users'. The 'medium' refers to the way the information is packaged and transmitted. In the Congo Basin this can be linked to physical conditions, such as the level of infrastructure surrounding a community, the technical capacities of a community to access a certain channel of communication, or even the financial cost of its utilization. The language of communication is also a key element. The 'content' is judged by its relevance, comprehensiveness or credibility. The 'source' relates to the organization or individual providing the information, which in our case is the scientific community.

In our particular pilot experience, we have worked with radios in several local languages. There are different types of radio stations: public, private and community owned or run. They have different coverage, involve different costs and have different communication priorities.

3   Radio program: Objectives, production and distribution

The project used several communication supports depending on the target audience. Radio was selected for the case of the local community. In the Congo Basin, with the scarcity of basic communication services such as electricity or the Internet, radio has become the most accessible means of spreading information because it is readily available, less expensive and requires fewer technical capacities.

3.1 Objectives and targets

The overall objective of the radio program was to disseminate concepts, policies and practices related to climate change responses. More specifically, it intended to create a platform where the scientific community, policy makers, and national and local practitioners could exchange and share knowledge using common language easily comprehensible to the local communities.

3.2 Program production

In all, 24 radio programs were recorded in French, Lingala, Kituba and Pidgin English during 2013. These languages are some of the most widely spoken in the Congo Basin. Globally, the programs included the following topics: "Climate change: myth or reality?", "The relationship between forest, deforestation, and climate change", and "Pollution, forests and climate change" (see Table 1). Figure 2 shows the complete list of programs in different languages.

Figure 2. CD cover.

Table 1. Phases of the radio programs.

Phase	Period	Language	Number of programs	Broadcasting location	Recording radio station
1st phase: Testing	February – July 2013	French	10	Cameroon	CRTV
2nd phase: Up-scaling	August – December 2013	French	10	DRC, Congo Rep.	CRTV
3rd Phase: Diversification	October 2013 – December 2014	Lingala	6	DRC, Congo Rep.	National Congolese Radio
	October 2013 – December 2014	Kituba	4	DRC, Congo Rep.	National Congolese Radio
	December 2013 – December 2014	Pidgin English	4	Cameroon	CRTV

3.3 Program promotion and distribution

The radio programs were advertised prior to their broadcasting through advertisements on national radio stations, emails to partners, and flyers distributed at conferences. After its production, each radio program was recorded on USB keys and CDs, which were distributed to donors, NGOs, government representatives and radio stations. As a result, 16 broadcasting agreements were signed with national and local radio stations, for a period of 1 year. In addition, his Excellency, Henry Djombo, the Minister of Forest Economy and Sustainable Development of the Republic of Congo, declared he was highly satisfied with the initiative (see Figure 3).

4 Appropriateness and impact assessment methodology

4.1 Site selection

4.1.1 Site production and diffusion

Radio programs were recorded at the national radio stations of Cameroon and the Republic of Congo based on their accessibility and their technical capacity. Broadcasting radio stations were selected based on their geographical coverage and audience numbers, their topics and specific demands coming from local radio stations. The programs were broadcast in Cameroon, Central African Republic (CAR), Republic of Congo and the Democratic Republic of Congo (DRC).

Figure 3. Official handover of the CDs to His Excellency, Henry Djombo. (Photo: Bonne Anne Matomona)
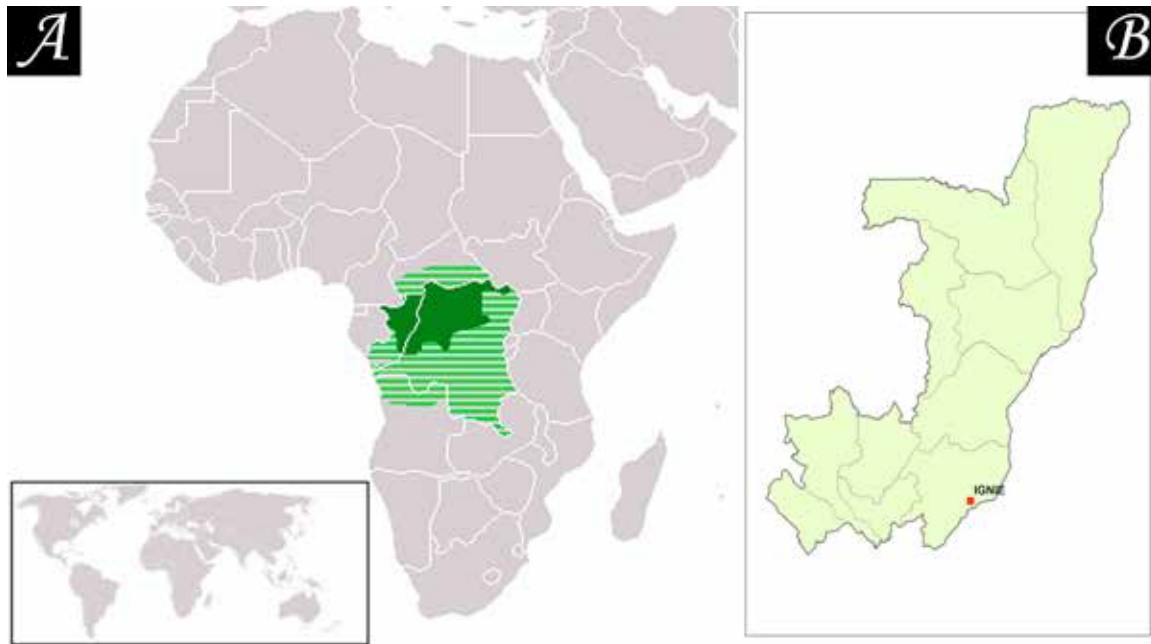
Figure 4. Distribution of Lingala speakers, showing regions of native speakers (dark green) and other regions of use (dashed green). Localization of Ignié is in red.

Sources: A, modified from Wikimedia Commons; B, authors

4.1.2 Evaluation site

The site was selected on the basis of the local language, population size and accessibility. A sample of at least 60 inhabitants who could speak *Lingala* or *Kituba* was needed. The evaluation took place in the village of Ignié in the Republic of Congo. Located 40 km southwest of Brazzaville, the village has a population of 4000 inhabitants (Figure 4).

4.2 Participant selection
4.2.1 Radio recording participants

Participants in the recording of the radio programs included a large number of stakeholders including research and higher education institutions, government, researchers, NGO representatives and farmers. They were selected based on their expertise with regard to each topic, and their representativeness of different sectors in society.

4.2.2 Impact evaluation participants

Participants were selected to ensure the representativeness of socioeconomic variables such as age, sex and level of education. The sample had the distribution shown in Figure 5.

Figure 5. Age and gender distribution and level of education by gender.
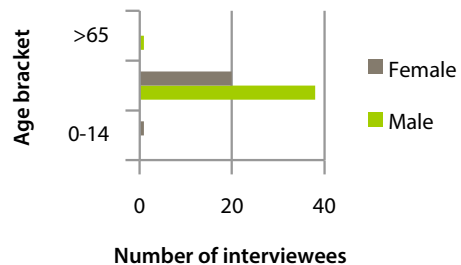
Source: survey

4.3 The monitoring and evaluation system: Approaches used to evaluate the radio pilot experience

The radio programs were monitored and evaluated in four steps at the levels of context, activities, outputs and outcomes. These elements were monitored monthly, and a final outcome evaluation was made where all components were reported on at the end of the process.

4.3.1 Context and activities: Choosing the best formats and channels for diffusion

The production and broadcasting of the radio programs was designed, followed and evaluated by CIFOR researchers and communications consultants. The **objective** of this step was to evaluate the appropriateness of the dissemination of messages and information using radio broadcasts in the Congo Basin (see Table 2).

4.3.2 Outputs: Understanding audience needs and priorities

Outputs were evaluated in terms of feedback and responses received at different levels. The **objective** of this step was to evaluate the outreach of the radio programs (see Table 3).

4.3.3 Outcomes: Assessing the quality and uptake of the message

This section presents the methods used for estimating the impacts of the radio programs in improving local community knowledge on climate change. The outcome level evaluation supposes the more elaborated step of our monitoring and evaluation system. The impact of the radio programs was evaluated using a combination of a "case control" and *ex ante* and *ex post* methodology. The objectives were:

Table 2. Proposed elements of analysis at the activity level.

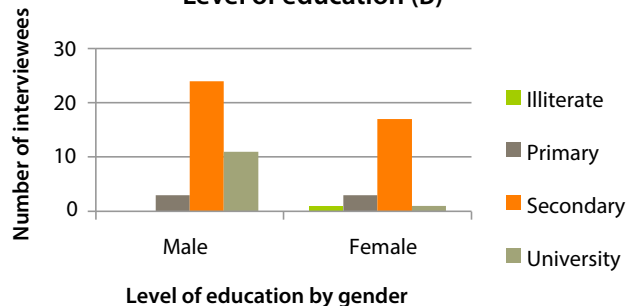| Element	Indicator
> Review/analysis of the number of households having access to a radio	% of households with radio access within the whole population vs. % of households with Internet access
> Review/analysis of the number of speakers/ geographical coverage of each language	Number of people, countries or provinces
> Review/analysis of audience numbers for different radio stations	Audience numbers
> Review/analysis of the geographic coverage of the radio stations	Number of cities and villages; number of inhabitants (for radios stations without data on audience numbers)
> Selection of topics by CIFOR researchers for each program, based on their importance	Topic
> Selection of speakers by CIFOR researchers for each program	Description of the speakers

Source: authors

Table 3. Proposed elements of analysis at the output level.

Element	Indicator
> Collection of broadcasting requests	Number of requests
> Data collection and compilation of public feedback	Number of emails
*Letters from public	
*Emails from public	Number of letters
> Data collection and compilation of articles and publications from other institutions and media making reference to the program	Number of posts; specific links
*Posts on websites	Number of articles
*Press articles	
*Reports from local radio stations after broadcasting	Number of reports where radio programs are mentioned
> Data collection of requests from other institutions to present on or give training about the radio programs	Number of requests/presentations
> Data collection on the traffic on COBAM website's radio section and SoundCloud	Number of visits, downloads, etc.

Source: authors

Figure 6. Radio evaluation survey. (Photo: Bonne Anne Matomona)

- to evaluate whether the message is being phrased in the appropriate manner (*ex ante* and *ex post* components)
- to evaluate the change in knowledge in the targeted populations and to assess the added value of the programs on the listeners' understanding (case-control component).

Data collection

1. **Baseline assessment:** Assessing the level of knowledge of 60 inhabitants before being exposed to the local radio program through an individual structured questionnaire, including 30 participants in the control group and 30 participants in the study group (see Figure 6). This phase is hereinafter termed the 'first round of the questionnaire.'

2. Exposing the 30 participants of the study group to one radio program (see Figure 7).

3. **Impact assessment:** Evaluation of the change in knowledge one week after listening to the radio program through an individual structured questionnaire in both the study group and the control group. This phase is hereinafter termed the 'second round of the questionnaire.'
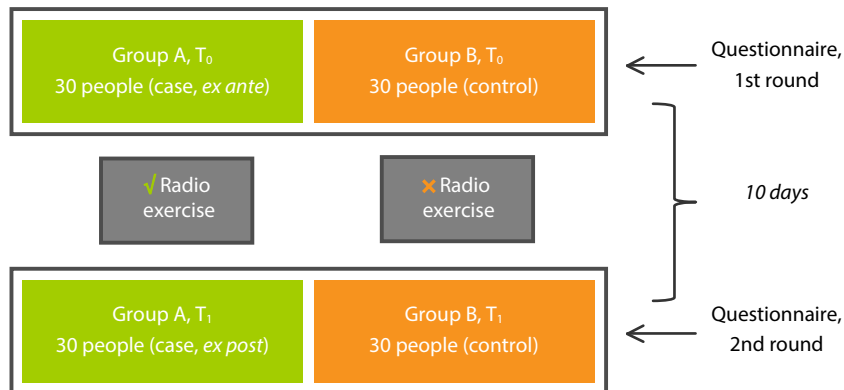

Figure 7. Diagram of the methodology used.

Source: authors

The results of the questionnaires were evaluated using a marking grid for questions 17 to 23, which were then divided into two topics: forest and climate change.

Hypothesis

In summary, the evaluation tested the following hypotheses:

- H1: The climate change knowledge of people listening to the radio (Group A) improves after listening to the radio program (T_0 versus T_1) because the message is phrased in the appropriate manner.
- H2: People listening to the radio (Group A, T_1) have a better knowledge of climate change concepts than people not listening to the radio program (Group B, T_1) because the radio represents an additional source of knowledge, i.e. the radio has added value.
- H3: People not listening to the radio (Group B) have access to climate change knowledge but less so than people listening to the radio (T_0 versus T_1) thanks to other sources such as neighbors.

Data analysis

Descriptive statistics were used to evaluate the change in knowledge globally, both for the study group and the control group. But in order to attribute this change in knowledge to the radio programs, more sophisticated statistics were needed. In this sense, the micro-economic impact evaluation approach developed by Rubin (1974) was selected for this study. This approach was chosen because it reduces bias due to observable characteristics of the study groups.

In using this method, we speak often of 'treatment' (T) to designate the variable whose effect we aim to measure. In our case, it represents exposure to the COBAM radio program. In practice, we evaluate the value of T. In the most simplified version we distinguish between people who have listened to a program (T = 1) and those who have not (T = 0). We measure the effect of listening to the program through a 'quantity of interest' (Y), which in our case is the 'knowledge on climate change.' These variables are never observed simultaneously on the same date for the same individual. Thus, for a treated individual, Y_1 is observed while Y_0 is unknown (Fougère 2010). In this case, the variable Y_0 corresponds to the outcome that would have been obtained if the individual had not listened to the program. It is also considered that Y_0 represents the counterfactual outcome. For an untreated individual, on the contrary, Y_0 is observed whereas Y_1 is unknown. The variable of the observed result can thus be deduced from the potential variables and the treatment variable following the relation:

$$Y = TY_1 + (1 - T)Y_0$$

The innovation here is to consider that each of them has two potential outcomes, depending on whether they listen to the program or not. We name Y_0 for the level of knowledge linked to T = 1 (no treatment) and Y_1 for that related to T = 1 (treatment). The causal effect of exposure to the COBAM radio program is defined for each individual by the gap $\Delta = Y_1 - Y_0$ which represents the difference between the situation of the individual if he or she has been exposed to the program and if he or she has not. The causal effect has two important characteristics (Fougère 2010):

- It is unobservable because only one over two potential variables are observed for each individual.
- It is singular, and thus there is a distribution of the causal effect in the population.

The distribution of the causal effect is nevertheless non-identifiable, simply because the causal effect is unobservable. Nonetheless, thanks to the hypothesis of the joint probability of the triplet (Y_0, Y_1, T), we can identify certain parameters of the distribution of the causal effect based on the density of observable variables (Y, T) (Fougère 2010). Two parameters are generally a matter of specific consideration:

- the mean treatment effect on the population:
$$\Delta^{ATE} = E(Y_1 - Y_0)$$

- the mean treatment effect on the group of individuals who have listened to the program:
$$\Delta^{ATT} = E(Y_1 - Y_0 \bullet T = 1)$$

It is important to mention that we have chosen a 'mixed' data matching method, i.e. an approach that takes into account not only M plus nearest neighbors, ($M \geq 2$), but also the kernel matching.

In addition to this mixed approach, the estimation takes into account the 'propensity score matching' among the observable X (i.e. the probability that an individual listens to the COBAM radio program) and instrumental variables.

The 'match' method available through the 'matching' package of R software (R Core Team 2013) allows using a mixed estimation including the 'propensity score' among the observables, the window and the instrumental variables.

5 Results

5.1 Outlining communication infrastructure and languages in the Congo Basin

Little updated data on radio resources exists for our countries of study. Nevertheless the Central Intelligence Agency (CIA 2004) estimated there were six AM, twenty-five FM and eight shortwave broadcast stations in 2002. In addition, the indicators below can give an approximation of the appropriateness of radio and local languages for communication purposes (see Tables 4, 5 and 6). The countries of the Congo Basin have little access to Internet resources, while a much bigger proportion of the population does use cellular telephones, which have integrated FM radios as a basic feature. The CIA estimated that 20.35 million radios existed in the four countries in 1997.

During the first round of the questionnaire, almost half the participants indicated that they listen to the radio every day (see Table 5). Results showed that 59.0% and 63.9% of participants use the radio to receive information on forest conservation and climate change, respectively.

A large proportion of the population speaks one or more local languages either as native or second-language speakers (see Table 6). During the field survey, 85.2% of interviewees indicated that they understand *Lingala* well or quite well, and 27.9% understand *Kituba.* However, when it came to the official language, French, 6.7% understood it only a little or not at all.

Table 4. Audience statistics.

	Cameroon	DRC	Republic of Congo	CAR
Internet users (%)	5.7	1.7	6.1	3.5
Cell phone users (%)[a]	60.4	30.6	98.8	29.0
Radios (in millions in 1997)	2.25	18.0	0.3	No data available
Inhabitants (in millions)	21.7	67.5	4.4	4.6

[a] Cell phones normally incorporate a radio device.

Sources: CIA 2014; World Bank 2013

Table 5. Frequency at which local people listen to the radio.

Frequency	Respondents (% of sample)
Every day	47.5%
Once a week	23.0%
Sometimes	24.6%
Never	3.3%
No answer	1.6%
	100.0%

Source: survey

Table 6. Native and second-language speakers by local language.

Native and second-language speakers by language	Cameroon	Central African Republic	Democratic Republic of Congo	Republic of Congo
TOTAL POPULATION	22,253,959	4,616,417	67,513,677	4,447,632
French	7,200,000	1,310,000	31,190,000	2,130,000
Lingala	No estimate available	No estimate available.	9,040,000	90,600
Kituba	No estimate available	No estimate available	4,200,000	1,160,000
Pidgin English	No estimate available for native speakers in Cameroon. At least 2,000,000 use it as a trade language, as do at least 30,000,000 in neighboring Nigeria and 5000 in Equatorial Guinea.	No estimate available	No estimate available	No estimate available

Sources: Lewis (2009), Organisation Internationale de la Francophonie (2010) World Bank (2013)

5.2 Estimating the audience

Table 7 provides an estimate of audience numbers for each of the radio stations through which the programs were diffused. It is, however, difficult to obtain the total coverage, as some of these figures could be overlapping.

5.3 Measuring audience interest

The team has received a total of 41 broadcasting requests. The team has likewise received a request from the University of Buea in Cameroon to train students in using the radio for sensitization and capacity building on climate change topics in rural areas. So far, 10 emails have been received from the public, but the number is expected to increase since the broadcast of programs in local languages is only recent. Four press articles have been recorded so far, including printed and online versions, as shown in Figure 8. For more information see:

- Agence d'Information d'Afrique centrale (2014): http://www.lesdepechesdebrazzaville.fr/flex/php/simple_document.php?doc=20140321_DBZ_DBZ_ALL.pdf
- Agence d'Information d'Afrique centrale (2014): http://www.adiac-congo.com/content/changements-climatiques-un-support-radiophonique-diffuse-en-langues-locales-9481

Table 7. List of radio stations with which a partnership agreement has been signed and their audience numbers.

	Media name	Country	Coverage	Audience estimation (# of people)
1	Radio Congo	Congo, Rep.	Congo and abroad	3,000,000
2	Radio Voix Evangélique	Congo, Rep.	Brazzaville and surrounds	3,000,000
3	Radio Divouba	Congo, Rep.	Bouenza, Pool and Lékoumou departments	750,000
4	MN Radio	Congo, Rep.	Brazzaville and surrounds	1,000,000
5	DRTV	Congo, Rep.	Brazzaville and surrounds	3,500,000
6	Radio Magnificat	Congo, Rep.	Brazzaville and surrounds	3,000,000
7	Radio Rurale Congolaise	Congo, Rep.	80–100 km around Brazzaville	2000
8	Radio Communautaire Owando	Congo, Rep.	80–100 km around Brazzaville	1500
9	Radio Brazzaville	Congo, Rep.	Brazzaville and Kinshasa	1,000,000
10	Radio Communautaire Etoumbi	Congo, Rep.	100 km around Brazzaville	1000
11	Radio Communautaire Zoutété	Congo, Rep.	120 km around Brazzaville	1000
12	Radio TV Nationale Congolaise RTVC	DRC	75%–100% of the country area	≤25,000,000
11	RDC's provincial radio stations	DRC	Nationwide	≤25,000,000
12	CRTV	Cameroon	Nationwide	200,000[a]
13	Radio Environment	Cameroon	Yaoundé and outskirts	No estimates available
14	ReRaC (Subregional network of community radios for good governance and sustainable management of natural resources)	Congo Basin	No estimates available	No estimates available
15	Radio NOLA	Central African Republic	No estimates available	No estimates available
16	Radio BISSO NA BISO	Congo, Rep.	Pokola region (forest zones)	No estimates available

[a] This is 80% of the country's audience at broadcasting time.

Source: data from radio stations

Box 1. Feedback from the public

"I would like to congratulate the project team for sharing with the public at large. I hope it will act as a spring board for national stakeholders to have a better understanding of climate change and its impacts."

COMIFAC representative

"Congratulations for the initiative. From now on, I will be giving more attention to your programs."

MINFOF representative

"I write to congratulate you for the great work you are doing in forest conservation. The messages I receive from you have been boosting the content of my radio programs on climate change and the importance of the Kilum-Ijim Forest to the entire community."

Community radio representative

5.4 Describing web traffic

Radio files were located on two Internet sites, namely, those for the Center for International Forestry Resarch (CIFOR) (2014) at http://www.cifor.org/cobam/ and SoundCloud (2014) at http://soundcloud.com. The system of website traffic analysis used for the COBAM subsite on the CIFOR website provides global data on data visitors' characteristics and behavior. In total, this website has received 12,328 page views, with the radio section being among the main 10 subsections of priority (see Figure 9). Website counts on the number of worldwide visitors showed the highest counts, coming from the countries of Indonesia, Cameroon and the United States of America (USA). On the other hand, SoundCloud files were played 760 times, with visitors coming mainly from USA, Cameroon and France. The low visitation from the Congo Basin countries is probably linked to the difficult Internet access in the region.

Figure 8. (A, C, D) Press articles from journals in Brazzaville. (B) Screen shot from the Agence d'Information d'Afrique Centrale website.
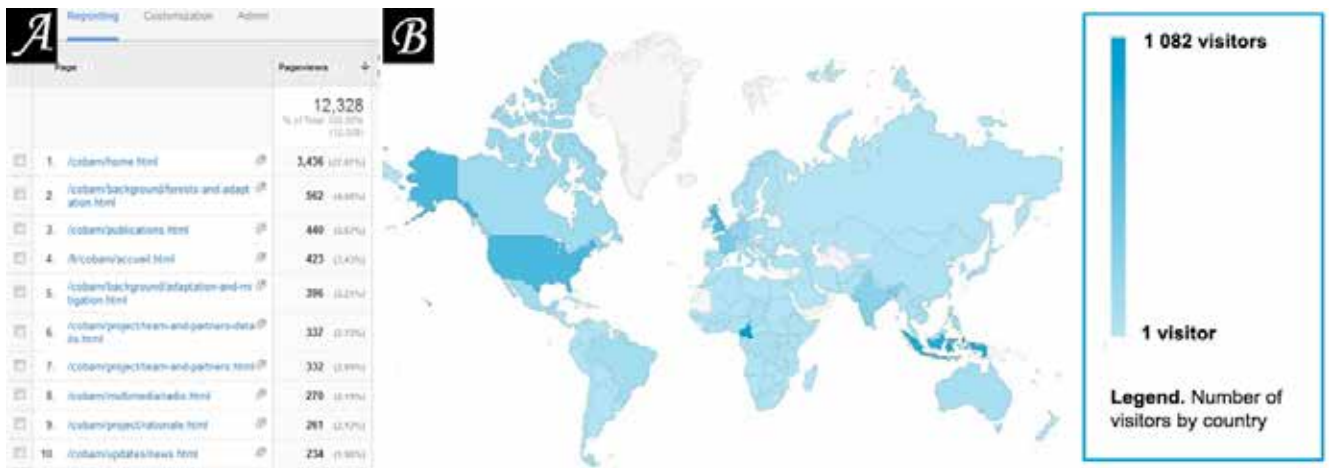
Figure 9. (A) Screen capture of the behavior flow on site content. (B) Screen capture of the audience demographic according to origin.

Source: Google Analytics

5.5 Assessing knowledge improvements

5.5.1 Overall variations

Results from the impact assessment survey reveal an increase in knowledge of 46.5% and 46.8% for forest and climate change topics, respectively (Figure 10). While there was an increase in knowledge for both the control group and the study group, it was greater for the latter. On average, the study group increased their knowledge by 36.0% more than did the control group for questions related to forest, and by 18.5% for climate change issues. Globally, the study group showed 25.9% higher marks than the control group. However, in order to analyze the contribution of the radio program to this change in knowledge, more elaborated statistics are needed (see Section 5.5.2).

5.5.2 The 'Radio — Knowledge link' model

Modeling results are indicated in Table 8.

Table 8. Modeling results.

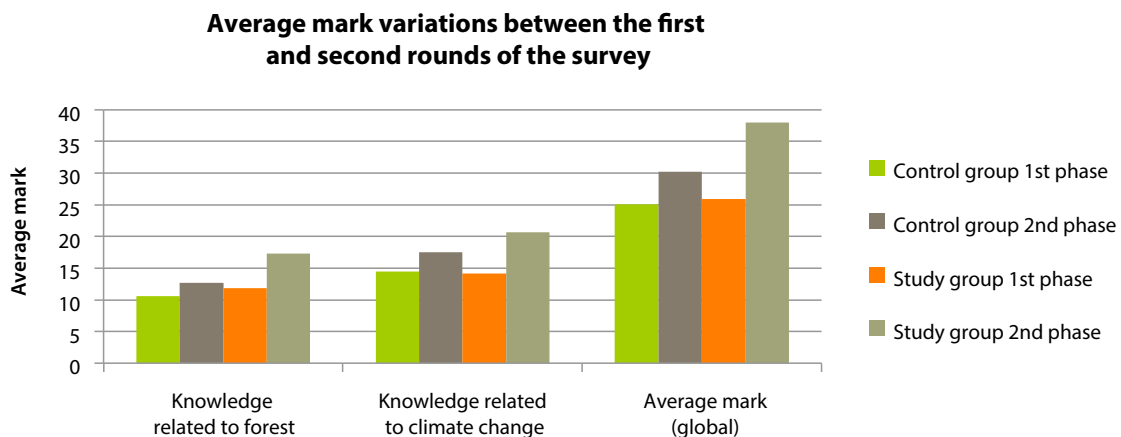| Parameters	Estimation (%)	Error type
On individuals in the study group: Δ^{ATT}	15.8***	0.00083
On individuals in the control group: Δ^{ATU}	26.1***	0.00038
On the whole set of individuals: Δ^{ATE}	22.3***	0.00034

*** Significant at 1%

Figure 10. Mark variations between the baseline and impact assessments.

Source: survey

An improvement in the test scores for climate change-related questions of 15.8% was observed in the individuals who listened to the radio program once (Δ^{ATT}, where ATT is defined as 'Average Treatment Effect on the Treated').

Modeling of the impact that listening to the program once would have had on the individuals who did not listen to the radio program provides an estimation of an improvement in the test scores for climate change issues of 26.1% (Δ^{ATU}, where ATU is defined as 'Average Treatment Effect on the Untreated').

A synthesis of the two previous effects (Δ^{ATT} and Δ^{ATU}), i.e. the mean difference in the level of climate change test scores depending on whether the individual has listened to the program or not, provides the attributable change in test scores caused by the exposure to one radio program (Δ^{ATE}, where ATE is defined as 'Average Treatment Effect'). The model shows that listening to one radio program triggers an improvement in test scores for climate change questions of 22.3%.

5.5.3 Combined sources of information

The model predicted an improvement of 22.3% in test scores attributable to exposure to a single broadcast of a single radio program, which leaves the remaining 24.5% to other sources. Further investigation is needed to evaluate the nature of those sources. In addition, the actual impact of 24 radio programs needs to be assessed more deeply.

5.6 Expanding the results from the knowledge assessment experience

Substantial improvement in the test scores for climate change knowledge was obtained after exposure to one single radio program. Even though it might be difficult to assess the actual impact of the program over the region based on these results, several indicators can be used to provide a rough estimate.

In total, **24 radio** programs were broadcast in **four languages**, of which six were in Lingala, the language used during the evaluation. Table 6 shows figures as high as 34,630,000 French speakers, 9,130,600 Lingala speakers and 5,660,000 Kituba speakers. In addition, at least 2 million people use Pidgin English as a trade language in Cameroon. Todd and Hancock (1986) indicate that it is the most common *lingua franca* in Cameroon (Figure 11).

These programs were broadcast **twice a month** over **24 months**.

Agreements were signed with **16 radio** stations across **four countries**, including Cameroon, CAR, the Republic of Congo and DRC. Among these radio stations, some claim an **audience of 25 million listeners**.

Of the survey respondents, **47.5%** claimed to listen to the **radio daily**.

The four countries had **20.35 million radios in 1997** (World Bank 2013).

The World Bank's estimate of the number of cellular phone users can be used as a proxy for the radio users, since most of the phones have radio devices built in (World Bank 2013). Cameroon, CAR, DRC and the Republic of Congo had, respectively: **70%, 29%, 44% and 105% cellular phone subscriptions in 2013**.

Furthermore, the radio programs are available online at http://www.cifor.org/cobam and http://soundcloud.com/cifor-forests/au-rythme-des-saisons-emission (see Figure 12) The French and English sections of the radio program on the COBAM subsite, which is part of the CIFOR website, have received approximately 1000 page views since its creation in 2011. In addition, the radio programs were played 760 times in SoundCloud, with visitors coming from around the world.
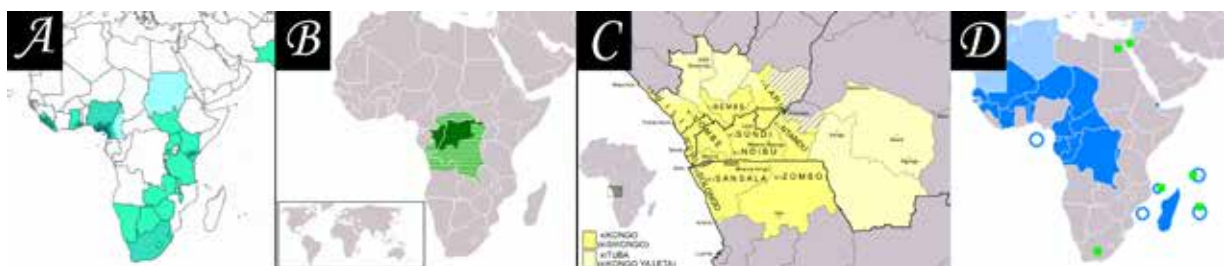

Figure 11. Language coverage in Central Africa. (A) Pidgin English, (B) Lingala, (C) Kituba, (D) French.

Sources: A) Muturzikin.com, (B, C, D) Wikipedia. (Wikipedia contributors 2014a,b,c)
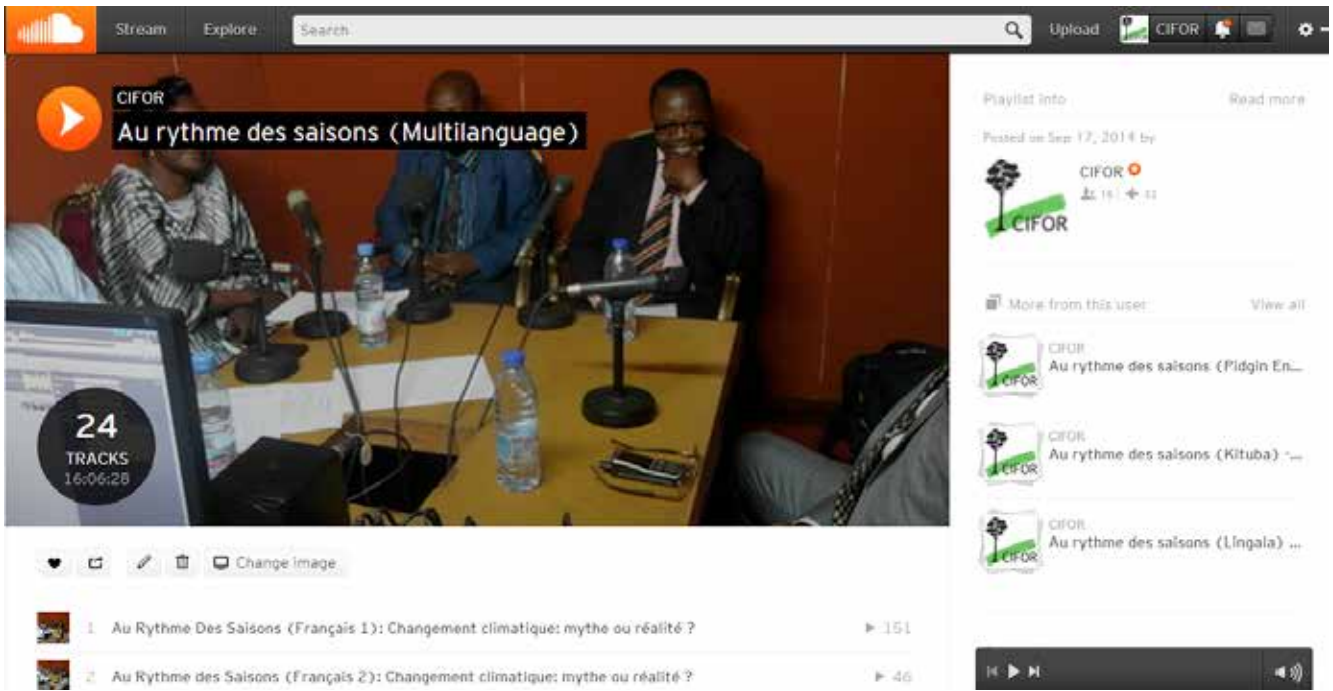
Figure 12. Screen capture from the radio playlist on SoundCloud.

6   Discussion: Radio for climate change responses in Africa

Locatelli et al. (2010) highlight the role of the community as an important player in climate change responses. In this scenario, it is important to understand the particularities of communities in the region. The Congo Basin countries have not yet eliminated illiteracy (World Bank 2013), which continues to be particularly acute in rural areas. In addition, most rural inhabitants communicate using local languages (Lewis 2009), while much of the information regarding climate change circulates in English and French. On this basis, Nutley et al. (2003) underline that the characteristics for the medium used for knowledge transfer are just as important as the content, to ensure its uptake. In this line of analysis, we stress that local languages should be used more frequently during capacity building and awareness raising on climate change topics.

Despite variations among countries in the Congo Basin, the region is generally characterized by weak development of infrastructure. This hampers rural community development, not only because of low access to markets (Platteau 1996) and other facilities, but also because of poor access to information.

In addition, there is limited technology transfer, which also adversely affects the utilization of communication technologies (Bellman et al. 1993). In this context, we argue that the medium of radio has great potential for knowledge sharing and as a driver of development as it requires less complex physical assets and human capacity than do other media, such as TV or the Internet. This is true for production, transmission and reception.

Radio can be transformative not only as a source of communication, but also because of its potential for participation (Fraser and Restrepo-Estrada 2002; Manyozo 2009). During our pilot experience we used a participatory approach that involved local communities in three ways: first, we recorded local communities' experiences during the production; second, several channels were opened during the broadcast for public reaction (these included a phone line, email, and postal mails); and finally, we signed contracts with local community radio stations to re-broadcast the programs. Community radios offer many opportunities. They generally have more flexibility in terms of broadcasting themes, as they are led by the community itself and generally have less material available to them; this means they could be interested in any new material offered to them. In addition, people actively participate during

the process. However, community radios might not succeed in reaching other groups, such as policy makers. In this case, working with national radio stations might better transfer the information, as we did during our experience.

Further to the potential of the radio as a means in itself for community development, our study shows the utility of radio programs for climate knowledge transfer in rural Africa. A number of studies have found common results for other fields, such as conflict resolution in Rwanda (Staub et al. 2007; Straus 2007; Paluck 2009; Paluck and Green 2009), and HIV and family planning in The Gambia, Uganda and Ghana (Valente et al. 1994; Panford et al. 2001; Green et al. 2006).

7   Conclusion and recommendations

This paper covers the production, broadcast and evaluation of a series of radio programs in several languages of the Congo Basin that were designed for sensitization and capacity building on forest and climate change topics within the COBAM project. The results show an average increase of 22.3% on test scores in climate change and forest topics for an individual who listens once to one radio program. Changes in behavior were also noted for several boundary partners, including the media, government organizations and the general public, that contacted or collaborated with the team. In addition, the study highlights the importance of involving the community in climate change responses, and provides some initial reflections on best practices of how to do so. Due to the current status of communications technologies (lack of Internet, limited access to television, illiteracy, etc.) in the Congo Basin, this study suggests that radio as a medium is a powerful tool for capacity building and policy impact when it comes to climate change and forests.

8   References

Ackoff R. 1989. From data to wisdom–Presidential address to ISGSR, June 1998. *Journal of Applied Systems Analysis* 16:3–9

Agence d'Information d'Afrique centrale. 2014. Changements climatiques: un support radiophonique diffusé en langues locales. 18 March 2014. Environnement Brazzaville, Republic of Congo. Accessed 5 December 2014. http://www.adiac-congo.com/content/changements-climatiques-un-support-radiophonique-diffuse-en-langues-locales-9481

Agence d'Information d'Afrique centrale. 2014. Les Dépêches de Brazzaville. L'actualité au quotidien, 21 March 2014. Brazzaville, Republic of Congo. Accessed 5 December 2014. http://www.lesdepechesdebrazzaville.fr/flex/php/simple_document.php?doc=20140321_DBZ_DBZ_ALL.pdf

Bellman B, Tindimubona A and Arias Jr A. 1993. Technology transfer in global networking: Capacity building in Africa and Latin America. *In* Harasim LM, ed. *Global Networks: Computers and International Communication*, Cambridge, MA: The MIT Press. 237–54.

[CIFOR] Center for International Forestry Resarch. 2014. Climate change and forest in the Congo Basin: Synergies between adaptation and mitigation: Multimedia - Radio "Changing seasons." Bogor, Indonesia: Center for International Forestry Resarch (CIFOR). Accessed 9 December 2014. http://www1.cifor.org/cobam/multimedia/radio.html

[CIA] Central Intelligence Agency. 2004. *The World Factbook.* Washington, DC: Central Intelligence Agency.

DellaVigna S, Enikolopov R, Mironova V, Petrova M and Zhuravskaya E. 2011. Cross-border media and nationalism: Evidence from Serbian radio in Croatia. *National Bureau of Economic Research* 6(3):103–32.

Fougère D. 2010. Les méthodes économétriques d'évaluation. *Revue française des affaires sociales* 1:105–28

Fraser C and Restrepo-Estrada S. 2002. Community radio for change and development. *Development* 45(4):69–73.

Green EC, Halperin DT, Nantulya V and Hogle JA. 2006. Uganda's HIV prevention success: The role of sexual behavior change and the national response. *AIDS and Behavior* 10(4):335–46.

Karami E and Mansoorabadi A. 2008. Sustainable agricultural attitudes and behaviors: A gender analysis of Iranian farmers. *Environment, Development and Sustainability* 10(6):883–98.

Kengoum DF. 2011. *REDD+ Politics in the Media: A Case Study from Cameroon.* Bogor, Indonesia: Center for International Forestry Research (CIFOR).

Leiserowitz A. 2006. Climate change risk perception and policy preferences: The role of affect, imagery, and values. *Climatic Change* 77(1–2):45–72.

Lewis MP. 2009. *Ethnologue: Languages of the World.* 16th ed. Dallas, Texas: SIL International.

Locatelli B, Brockhaus M, Buck A and Thompson I. 2010. Forests and adaptation to climate change: Challenges and opportunities. *Forests and Society-Responding to Global Drivers of Change* 25:21–42.

Manyozo L. 2009. Mobilizing rural and community radio in Africa. *Ecquid Novi* 30(1):1–23

Nutley S, Walter I and Davies HT. 2003. From knowing to doing: A framework for understanding the evidence-into-practice agenda. *Evaluation* 9(2):125–48.

Organisation Internationale de la Francophonie. 2010. *La langue française dans le monde.* Paris, France: Éditions Nathan.

Paluck EL. 2009. Reducing intergroup prejudice and conflict using the media: A field experiment in Rwanda. *Journal of Personality and Social Psychology* 96(3):574.

Paluck EL and Green DP. 2009. Deference, dissent, and dispute resolution: An experimental intervention using mass media to change norms and behavior in Rwanda. *American Political Science Review* 103(04):622–44.

Panford S, Nyaney MO, Amoah SO and Aidoo NG. 2001. Using folk media in HIV/AIDS prevention in rural Ghana. *American Journal of Public Health* 91(10):1559–62.

Platteau JP. 1996. Physical infrastructure as a constraint on agricultural growth: The case of sub-Saharan Africa. *Oxford Development Studies* 24(3):189–219.

R Core Team. 2013. R: A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing.ISBN 3-900051-07-0. http://www.R-project.org/

Rubin DB. 1974. Estimating causal effects of treatments in randomized and nonrandomized studies. *Journal of Educational Psychology* 66(5):688.

Scoones I. 1998. Sustainable rural livelihoods: A framework for analysis. *IDS working paper 72.* Brighton, UK: Institute of Development Studies.

SoundCloud. 2014. CIFOR-Forest: Au rythme des saisons (Multilanguage). Berlin, Germany: Center for International Forestry Resarch (CIFOR). Accessed 9 December 2014. https://soundcloud.com/cifor-forests/sets/au-rythme-des-saisons

Staub E, Pearlman LA, Weiss G and Hoek A. 2007. Public education through radio to prevent violence, promote trauma healing and reconciliation, and build peace in Rwanda and the Congo. Amherst, MA: Department of Psychology, University of Massachusetts. http://people.umass.edu/estaub/radio%20article%20--January%202008.pdf

Straus S. 2007. What is the relationship between hate radio and violence? Rethinking Rwanda's "Radio Machete". *Politics & Society* 35(4):609–37.

Tchatchou B, Chia EL, Sufo Kankeu R, Perez-Teran AS, Tiani AM, Sonwa DJ, Kenfack CE, Kengoum F, Munoh A and Locatelli B. 2014. Changement climatique dans le bassin du Congo: Etat des lieux des informations et connaissances échangées entre les acteurs. Working paper. Bogor, Indonesia: CIFOR. Fothcoming.

Tiani AM, Bele MY and Sonwa DJ. 2014. What are we talking about? The state of perceptions and knowledge on REDD+ and adaptation to climate change in Central Africa. *Climate and Development* (ahead of print) 1–12.

Todd L and Hancock I. 1986. *International English Usage.* London, UK: Croom Helm.

Valente TW, Kim YM, Lettenmaier C, Glass W and Dibba Y. 1994. Radio promotion of family planning in the Gambia. *International Family Planning Perspectives* 20(3):96–100.

Weiss CH. 1997. Theory-based evaluation: Past, present, and future. *New Directions for Evaluation* 1997(76):41–55.

Wikipedia contributors. 2014a. *African French.* Accessed 9 December 2014. http://en.wikipedia.org/w/index.php?title=African_French&oldid=634552872

Wikipedia contributors. 2014b. *Kituba language.* Accessed 9 December 2014. http://en.wikipedia.org/w/index.php?title=Kituba_language&oldid=632873074

Wikipedia contributors. 2014c. *Lingala.* Accessed 9 December 2014. http://en.wikipedia.org/w/index.php?title=Lingala&oldid=628832069

World Bank. 2013. *Indicators* [Online]. World Bank. Accessed 7 November 2014. http://data.worldbank.org/indicator

Annex 1. Questionnaire

SUIVI-EVALUATION DU PROGRAMME RADIO EN LINGALA : QUESTIONNAIRE DESTINE AUX POPULATIONS D'IGNIE-CONGO BRAZZAVILLE

La présente enquête est réalisée par le Centre de Recherche Forestière International en abrégé CIFOR pour mesurer l'impact des émissions radiophoniques sur l'amélioration des connaissances des populations au sujet des changements climatiques et les forêts du Bassin du Congo. Le questionnaire est destiné aux populations locales.

1.   IDENTIFICATION DE L'ENQUETE

1.1   A remplir par le facilitateur :

0.   Nom………………...…….……………….
1.   Code de l'enquêté : |__|__|__|
2.   Groupe de l'enquêté : |__|
     1 = Groupe cas   2 = Groupe de contrôle
3.   Timing d'administration du questionnaire : |__|
     1 = Avant écoute de l'émission   2 = Après écoute de l'émission

1.2   A remplir par l'enquêté :

4.   Sexe : |__| 1 = Masculin   2 = Féminin
5.   Age : |__|__|
6.   Situation matrimoniale : |__|
     1. Marié 2. Célibataire 3. Divorcé 4. Veuf
7.   Niveau d'instruction : |__|
     1. N'est pas allé à l'école   2. Primaire   3. Secondaire   4. Universitaire
8.   Profession principale : …………………………………..…………………………………|__|__|
9.   Profession secondaire : …………………………………..…………………………………|__|__|

2.   EVALUATION DU FORMAT DU PROGRAMME ET DE LA RADIO COMME OUTIL DE COMMUNICATION

10. A quelle fréquence écoutez-vous la radio ? |__|
     1 = Tous les jours 2 = Une fois par semaine 3 = De temps en temps   4 = Jamais
11. Si vous écoutez souvent la radio, écoutez-vous souvent des émissions sur la préservation de la forêt ? |__|
     1. Oui   2 = Non
12. Si vous écoutez souvent la radio, écoutez-vous souvent des émissions sur le changement climatique ? |__|
     1. Oui   2 = Non
13. Ordonnez de 1 à 4 par ordre de préférence la langue que vous comprenez le mieux? Encercler le chiffre correspondant à votre réponse (1=la mieux comprise, 4=la moins comprise)

Français	Lingala	Kituba	Autre langue (préciser) ....
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

14. Comment jugez-vous la durée de l'émission que vous venez d'écouter ? |__|
     1 = Trop courte 2 = Correcte 3 = Trop longue
15. Pensez-vous que l'émission que vous venez d'écouter est facile à comprendre ? |__|
     1 = Facile à comprendre 2 = Pas facile à comprendre
16. Comment jugez-vous de manière générale l'émission que vous venez d'écouter ? ……………………..|__|

3. EVALUATION DE LA RECEPTION DE L'INFORMATION TRANSMISE

17. Quelles sont les ressources disponibles en forêts ?

……………………………………………………………………………………………………….……………·|__|

18. Quelles sont les techniques recommandées pour protéger la forêt ?

……………………………………………………………………………………………………….……………·|__|

19. Que peut-il arriver si on coupe trop d'arbres ?

……………………………………………………………………………………………………….……………·|__|

20. Quelles sont les signes du changement des saisons que l'on perçoit au Congo?

……………………………………………………………………………………………………….……………·|__|

21. Connaissez-vous les gaz qui entrent et sortent des feuilles des arbres? Si oui, le quel sort et le quel entre ?

……………………………………………………………………………………………………….……………·|__|

22. Quelles sont les conséquences du changement des saisons sur l'agriculture, les poissons, etc?

……………………………………………………………………………………………………….……………·|__|

23. Qui a la responsabilité de lutter contre le changement des saisons ?

……………………………………………………………………………………………………….……………·|__|

Merci pour votre disponibilité !

This working paper sheds light on the impact of radio programs on the climate change knowledge of local populations in the Congo Basin. We provide an assessment of the change in knowledge of a rural village in the Congo Basin after inhabitants listened to one of the radio programs that were prepared on climate change. The document also provides potential indicators for result up-scaling. After applying a micro-economic model to a case–control experiment, both before and after exposure to one radio program, the results show an increase in knowledge of 22.3% attributable to the radio program. In addition, a series of reactions were recorded from different end users, such as other media, ministries, NGO representatives and researchers, who reacted positively to the broadcasts. We recommend the use of radio programs to increase knowledge and induce behavioral changes with regard to climate change adaptation and mitigation.

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