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Agricultural Extension Approaches and Climate Change Communication Within the Ndop Rice Sector, North West Region, Cameroon

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Abstract:

Climate change communication is a pre-requisite for proper adaptation. This article seeks to examine the agricultural extension approaches used in the Ndop rice sector within the context of climate variability and change. Using a mixed research approach, questionnaires were administered to 216 purposively sampled rice farmers, interviews conducted with 16 extension agents and three focus group discussions were organized. Results revealed that extension workers have been using farm demonstrations, capacity building of farmers through training and participatory approaches. However, these approaches have proven to be limited and inefficient. Challenges in climate change communication are attributed to factors such as; low ratio of extension workers to rice farmers, inadequate communication in the mass media (7.14%), no access to internet (4.17%), low competencies of extension staffs (68.75%) and limited access to weather elements. Given that climate change communication is complex and requires a mastery of the climatic systems, the extension services need to continuously upgrade capacities of their staffs and strengthen the link between research institutions, extension workers and farmers.

1. Introduction

Climate change has effects on both natural and human systems, especially agriculture. The putting in place of sound adaptation options require proper communication. Climate change communication has been given attention since the Paris Agreement whose objective was to limit global temperature rise by 2°C. Farmers in developing countries are highly vulnerable to the impacts of climate variability and change. The high degree of vulnerability raises the need to identify news paths and services that can educate and inform farmers on the challenging conditions. In Africa, lack of access to reliable communication networks has been shown to have limited adaptation endeavors (IPCC, 2007b; Manalo et al, 2017). Studies by Prokopy et al, (2017), depict that agricultural extension approaches have changed from a top-down to a more participative approach. The participative approach helps in the valorization of indigenous knowledge.

In most developing countries, smallholder farmers have insufficient opportunities to learn about new technologies and improved agricultural methods (Tsafack et al, 2015). This is because agricultural extension services are unable to develop low-cost sustainable approaches to providing information and services. Speranza et al, (2009) portrays the importance of extension services in agriculture. It ensures the transmission of innovations from research institutions, build farmer's capacities and enable them share their experiences. With climate change and other environmental stressors, the extension approaches, the methods adopted and the type of information communicated needs to be improved upon. This is a research gap that we seek to bridge in this work.

In Cameroon, extension services are provided by the government through the Ministry of Agriculture and Rural Development (MINADER) (Chindong, 2008). Extension workers who are mostly agricultural engineers are attached to agricultural structures at the base. Due to their limited numbers, it has been observed that Non-Governmental Organizations and Farmer Organizations are developing diverse strategies to get agricultural information, one of such being the employment of their own extension workers. Their activities include the transfer of innovations, farming techniques, dissemination of new seeds and guide farmers on the application of fertilizers and other farm inputs. It is important to examine the effectiveness with which these activities have been carried out, especially in the face of climatic aberrations. A number of authors; Mkisi, (2014), Odeleye (2018) and Zikhali et al,(2019), have demonstrated the importance of information and knowledge sharing and have argued that it can help farmers to properly adapt to climate change and increase food production. Promoting adaptation techniques and practices among rural farmers, especially with the use of modern

communication systems and the mass media could act as a panacea to the food production crisis in developing countries (Mkisi, 2014).

Rice cultivation is an important economic activity and source of livelihoods for about 60% of the population in Ndop. They rely of it for food and income. However, production has been falling over the years due to the adverse effects of climate variability and other environmental and human stressors on the rice fields (Nkiene et al, 2016; Moye and Yemmafouo, 2019). Rice production have experienced a falling trend in production which is attributed to low coping options. The Divisional Delegation of Agriculture and Rural Development for Ngoketunjia (DDARD) is in charge of agricultural extension in Ndop but the rice sector is supervised by the Upper Nun Valley Development Association (UNVDA) and the Japanese International Crop Agency (JICA). (Nforniwe, 2015; Kometa and Mua, 2017). They recruit, train extension workers and put them at the disposal of rice farmers. This article therefore seeks to evaluate the effectiveness of extension workers in communicating climate change information in the Ndop rice sector.

2. Research Methodology

2.1 Geographical Location and Context

Ndop plain is located between latitudes $5^{0}37^{1}$ and $6^{0}14^{1}$N of the equator and from longitude $10^{0}15^{1}$ to $10^{0}50^{1}$E of the prime Meridian. With an estimated surface area of 1151km^{2} and an average altitude of 1100m above sea level, it presents vast marshy swamps for flooded rice cultivation (Figure 1). Ndop falls within the humid tropical climate with two distinct seasons. A short dry season that runs from November to February and a longer rainy season that lasts for 8 months, from Mid-March to late October. (Nforniwe, 2015, Kometa and Mua, 2017)

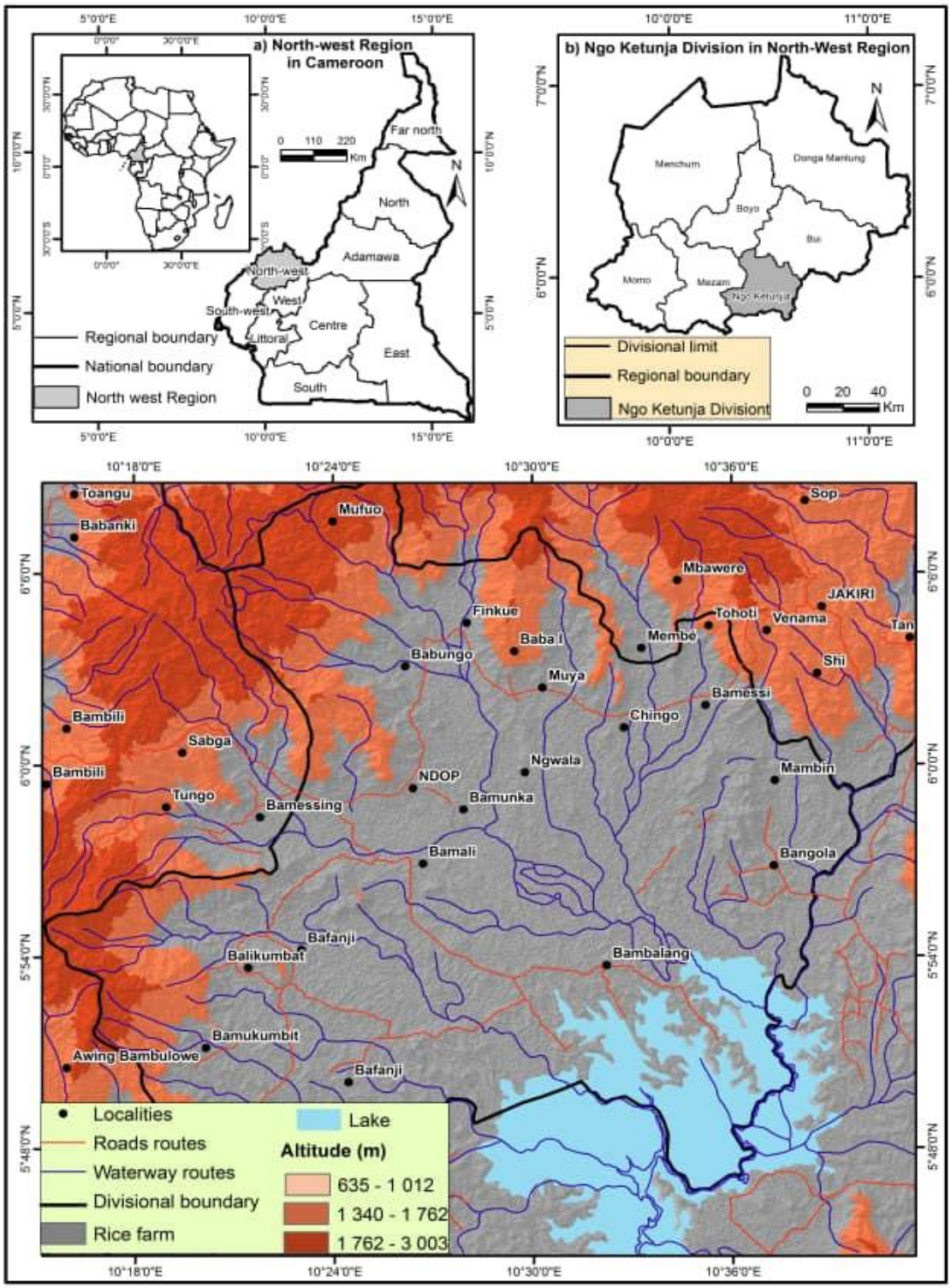

Figure 1: Location map of the Ndop Plain and its environs

Source: Author's realization (2020)

The flood plain of the river Noun has not only attracted rice cultivators but have favoured diverse agricultural practices. The dense hydrographic network, fertile alluvial soils and an active farming population of about 200.000inhabitants has made some authors to qualify Ndop

plain as the "cereal breadbasket" of the Western Highlands agro-ecological zone (Mphoweh,2007; Ndzeidze, 2008).

2.2 Data Collection and Analysis

Using a mixed research approach, qualitative and quantitative data for this study was collected from farming households, farmer groups, government agencies and extension workers. Research tools employed were semi-structured questionnaires, in-depth interviews and discussions in focus groups. Questionnaires were administered to 216 purposively selected rice farmers in the various rice production sectors (Table 1)

Table 1: Number of questionnaires per rice production sectors of Ndop Plain.

Sectors	Number of rice farmers	Target population	Number of Questionnaires	% of farmers
Upper Bamunka	5121	2048	67	31.1
Lower Bamunka	3452	1381	59	27.3
Bangolan	1188	475	45	20.8
Babungo	1524	610	45	20.8
Total	11285	4514	216	100

Source: Fieldwork, (2018)

The number of questionnaires per village was proportional to the target population. In-depth interviews were conducted with extension workers, UNVDA authorities, Divisional Delegate of Agricultural and Rural Development for Ngokentunjia and some head of farmer organizations Focus group discussions were organized in three selected sites (Bamunka, Babungo and Bangolan). Data was analyzed using the statistical Package for Social Sciences (SPSS) and Micro-Soft Excel. In-depth interviews and focus group discussions were subjected to content analysis.

3. Results and Discussions

3.1 Socio-Demographic Characteristics of Rice Farmers

The population of Ndop have been using traditional methods to cultivate and irrigate their rice farms. Modern communication on smart agricultural practices and adaptation measures are

perceived as innovation by most farmers. As such, effective climate change communication warrants a sound knowledge of the socio-economic and demographic characteristics of the farmers (Table 2)

Table 2: socio-demographic characteristics of rice farmers

Variables	**Frequency**	**%**
Sex		
Male	95	44
Female	121	56
Age structure of respondents		
Less than 30 years	26	12.0
30 to 35	24	11.11
35 to 40	49	18.98
40 to 45	25	11.57
45 to 50	32	14.81
50 t0 55	37	17.13
55+	23	14.35
Marital status		
Married	168	77.7
Single	42	19.44
Divorced	6	2.77
Household size		
1 to 2	58	26.825
3 to 5	66	30.56
5 to 7	40	18.52
7 to 10	33	15.28
11+	19	8.78
Level of education		
Never went to school	27	12.5
Primary level	94	43.52
Secondary level	37	17.13
High school	17	7.87
First degree	4	1.38
Professional training	37	17.59
Farming Experience		
<10	60	27.78
11 to 15	53	24.54
16 to 20	49	22.69
21 t0 25	20	9.25
26 to 30	13	6.10
31 to 35	14	6.48
36+years	7	3.24

Source: Fieldwork, (2018)

Table 2 shows that majority of rice farmers in Ndop are women (56%). The farming population is relatively ageing (above 30 years), indicating that youths are not fully implicated in rice farming. These ageing farmers who are heads of households (77.7%) have low educational levels which may affect their level of participation and understanding of climate change information. Though, majority have been cultivating rice for more than 10years, field surveys revealed that they are still strongly attached to their local practices, such as the cultivation of local seeds of Tainan 5 and Tox.

3.2 Agricultural Extension in The Ndop Plain

Transmission of information and techniques to rice farmers in Ndop is ensured by UNVDA extension service. The UNVDA is a government Institution charged with the main function of developing the rice sector. This institution works in collaboration the Japanese International Crop Agency that has been actively involved in this area since 2010. Besides developing rice farms and distributing to farmers, these institutions provides technical know-how, carry out demonstrations, organize rice farmer schools, purify seeds and supply to farmers.

Field surveys indicated that technical assistance from extension services and associative groups are very important in increasing agricultural output and in ensuring proper climate variability adaptation through education, training and information transmission. Investigations indicate that three main approaches are employed; Transfer of Technology, Training and Visit and the participative approaches.

In the Transfer of Technology approach, it was revealed that, extension workers get information from research institutions and private researchers and communicate to rice farmers. The Ministry of Scientific Research and Innovations (MINRESI) through the Institute of Agricultural Research for Development (IRAD) develop new techniques which are transferred to farmers by extension services. This is the top-bottom approach which has been criticized by many farmers.

In the Training and Visit approach, capacities of lead farmers are strengthened, and they move from sector to sector to advice farmers. They arrange visits on the farms of lead farmers and their neighbours do benefit from the knowledge that was communicated. In this approach, the UNVDA put in place demonstration farms in which they exhibit sound farming practices for local farmers to emulate. Demonstrations targets stages such as; field preparations, planting, weeding and water control. Demonstrations equally involve seed multiplication, irrigation and water management systems (Plate 1)

Photo A: Seed multiplication plot

Photo B: Demonstration farm

Photo C: Water canalization

Photo D: Water control method

Plate 1: Upper Bamumka UNVDA demonstration and seed multiplication farm

Source: Moye, (2018)

Plate 1 is a landmark indication of the extension approach adopted by the UNVDA to educate farmers on better farming techniques. Photo A shows seed multiplication and experimental site while photo B is a farm demonstration on the cultivation of the lowland NERICA species introduced in 2010. Photos C and D are best irrigation practices. This demonstration farm is coordinated by extension workers and rice farmers visit the plot to learn from their experiences. These practices are reported to have curbed the adverse effects of climate variability on rice yields, especially floods.

The Participatory Agricultural Extension Approach is equally used in this area. It assumes that farmers have skills and indigenous knowledge that can permit them cope with the vagaries of weather. As such, a close collaboration between extension services and farmers will permit

them exploit these traditional know-hows and use them in mainstreaming adaptation. This approach enables the combination of indigenous knowledge with science. With this approach, which is already proving sustainable, the extension services of the Ndop plain work in close collaboration with Farmer Groups, Common Initiative Groups, Cooperatives and Non-Governmental Organizations at the local level.

Focus Group Discussions depicted that the number of extension workers per sector depends on the surface area under cultivation and on the number of farmer groups in that area. In our study zone, 56.6 % of producers have visits from extension workers and 70.5 % of these workers come from the UNVDA. Rice farmers have formed associations where they share their experiences.

3.3 Sources of Climate Related Information in The Ndop Rice Sector

Farmers were asked to indicate where they get climate related information. Their responses revealed a wide range of sources (Table 3)

Table3: Sources of climate related information for Ndop rice farmers

Sources of climate change information	**Frequency**	**% Frequency**
TV, Radio and Newspapers	16	7.41
Internet(websites)	9	4.17
Workshops and Conferences	56	25.93
UNVDA technical services	187	86.57
JICA extension workers	102	47.22
DDARD	78	36.11
Farmer organizations	203	93.98
Neighboring farmers/friends	216	100
Others	13	6.02

Source: Fieldwork, (2018)

Farmers get climate related information from their neighbors and friends (100%), lead workers from UNVDA and DDARD (86,57%), mass media (7.41%), internet (4,17%), farmer organizations (93.98%), workshops and conferences (25.93%). This result demonstrates that the use of the mass media in information sharing is very limited. As such, farmers depend mostly on indigenous knowledge which is developed from their past experiences and shared with their neighbors and farmer organizations.

The type of information communicated targets adaptation measures (Figure 2). This is because climate variability is identified as causing a reduction in the yields of rice in the Ndop plain as opined by Nkiene et al, (2016); Moye and Yemmafouo, (2018).

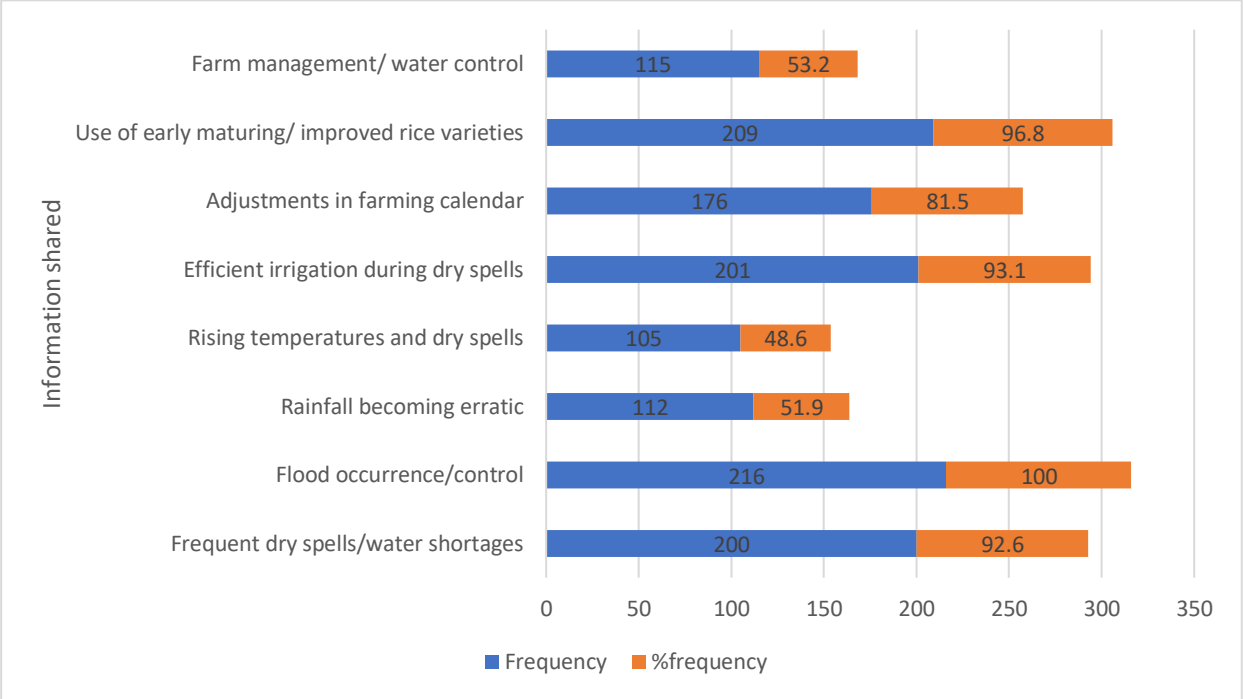

Figure 2: Type of information shared to farmers by lead workers

Source: Fieldwork, (2018)

Findings in figure 2 show that information on flood control (100%), adoption of improved and resistant rice varieties (96.8%), efficient irrigation systems (93.1%), dry spells and water shortages (92.6%) and adjustments of the farming calendar were among the information widely diffused by extension workers. This is aimed at improving the coping mechanisms and reducing the adverse effects of climatic aberrations on rice. Nevertheless, their efforts in communicating and informing farmers are limited.

3.4 Challenges in Communicating Climate Change Issues

Communicating climate change issues in the Ndop rice sector is challenged by a number of factors. Field surveys indicate a wide range of challenges (Figure 3)

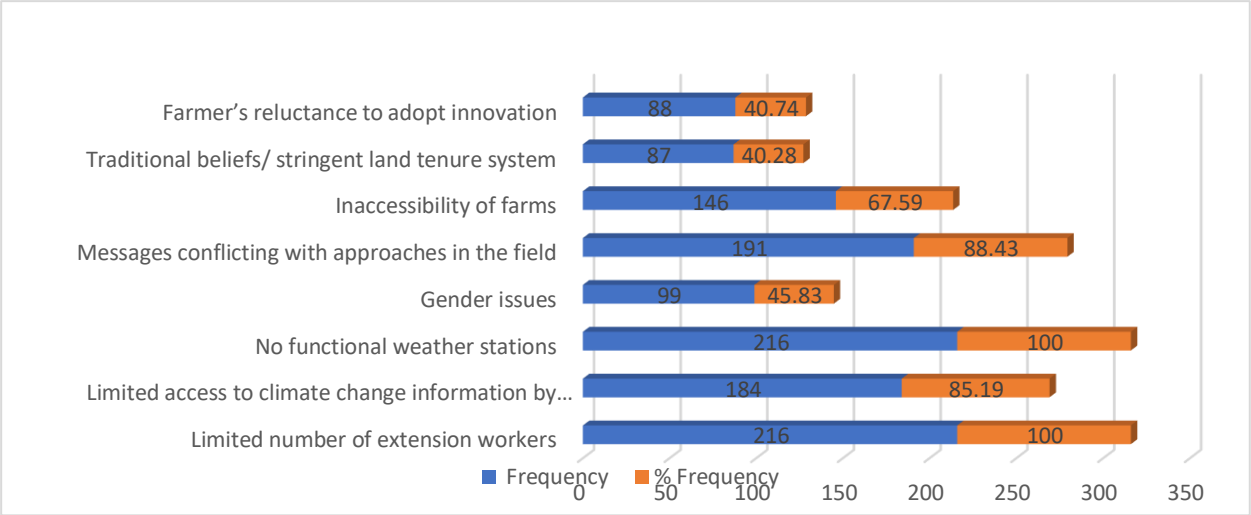

Figure 3: Challenges in climate change communication

Source: Fieldwork, (2018)

Following a multiple response question, figure 3 shows that limited number of extension workers(100), lack of weather stations(100%), limited access to weather information(85,19%), inaccessibility of farms (67.59%), gender issues(45.83%), traditional beliefs (40.28%) and farmers' redundancy to adopt innovation have hampered the acquisition and circulation of climate related information. The number of UNVDA lead workers is very small as compared to the total number of rice farmers under their control. The relationship between lead farmers and rice farmers presented in table 4.

Table 4. Relationship between UNVDA lead farmers and rice farmers in Ndop

Rice sectors	Number of rice Farmers	Number of lead farmers	Lead farmer/ rice farmer ratio
Lower Bamunka	2521	4	630
Upper Bamunka	2530	5	506
Babunga	789	2	395
Bangolan	982	3	327
Monoun	981	2	490
Total/Average	7939	16	496

Source: UNVDA, (2015)

Table 4 shows that by 2015, UNVDA has only 16 extension workers to take care of 7939 registered rice farmers. This implies that, averagely, one lead worker had to work with 496 farmers. Larger production areas of Upper and lower Bamunka have 4 and 5 extension workers to work with 2521 and 2530 farmers respectively. The ratio is too low and many farmers never get to benefit from their services, especially those in inaccessible zones.

Besides their limited numbers, it was equally noticed that lead workers lacked the necessary competence to acquire and effectively transmit climate information to farmers. Level of education and professional training were used as yard sticks in measuring competence (Table 5)

Table 5: Competency level of extension workers

Competence Assessment	**Educational Level**	**Professional training**	**Frequency**	**% Frequency**
Very good	-	-	0	0
Good	First Degree	Agricultural engineering	3	18.75
Average	Advance Level	Agricultural engineering	2	12.5
Limited	Advance Level	-	8	50
Very limited	Advance Level	-	3	18.75
Total			16	100

Source: Fieldwork, (2018)

Table 5 depicts that extension workers with a higher qualification and a professional training (18.75%) were liable to communicate effectively than those with limited (50%) and very limited (18.75%) training and lower levels of education. It is not possible to communicate climate change effectively without understanding how climatic systems functions. Understanding the principles of the climate system and knowing how and where to scientifically access climate information is paramount in communication. This is the situation in Ndop with no functional weather station and limited access to climate data.

The role of education and training in extension was confirmed during an interview with Mr Buba, an agricultural engineer in charge of the Mile 25 demonstration farm in the following excerpt;

"……Most of our farm demonstrators here lack the basic knowledge and skills to Communicate complex issues as climate change to farmers. I was sent to Japan for training on triability of new seeds and purification of existing local seeds to improve their resistance to environmental changes. Water shortages are becoming a severe problem but we are gradually introducing upland NERICA. Farmers believe in what I am doing and that is why they come here on daily basis to seek advice and also see what we do…"

This conversation is a testimony to the fact that proper knowledge sharing comes with education and training. The adoption of drought and submergence tolerant rice species in Ndop is an

adaptation to changing weather events. However, it was observed that farmers in the hinterlands, such as the Bangolan sector had low rates of adoption as compared to those in Bamumka. The reason is the lack of demonstration farms in such areas as farmers have been keen in practicing what they have observed not what they are told.

Gender issues, traditional beliefs and farmers' reticence in adopting innovation are also a call for concern. About 56% of rice farmers in Ndop are women with low economic powers and limited social networks. The traditional set up is equally discriminatory as women are not allowed to own land. It is thus very problematic and difficult to come to terms with the fact that women who spent almost 80% of their time in the rice fields are not allowed to own land. These elements have negative outcomes for climate change adaptation.

4. Discussions

4.1 Extension Approaches in Climate Change Communication

The results of this study indicate that in the Ndop rice sector, three main approaches are used to disseminate climate related information to farmers; The ToT (Transfer of Technology), T&V (Training and Visit) and the participative approaches are frequently used. These approaches have been studied by many researchers working in agricultural extension. They include the works of Chindong P, (2008); Tsafack et al, (2014); Odeleye G, (2018) and Zikhali et al, (2019). While appreciating the importance of these approaches, these authors indicated the desire to consider local people's experiences and combine them with scientific knowledge. In the perspective of building local capacities, Shende S and Mua E, (2017) consider training by the Community Education and Action Centre (CEAC) Ndop as an important component in agricultural development within the Plain.

Results equally revealed that field visits and demonstrations were the main methods employed by extension workers and that there was little use of modern information and communication tools. Farmers share information and techniques with their neighbors and in their groups and associations. Less than 10% of rice farmers got information from TV, radio and the internet. The power of the internet and the media in climate change communication was recognized by Speranza et al, (2009) and Tumbo et al, (2018). Given that lead farmers in Ndop do not use the mass media to communicate with farmers, the supply of information is delayed and may increase the level of vulnerability. These results corroborate those of Agholor et al. (2013), who opined that late delivery of information had negative drawbacks on the implementation of adaptation in South Africa.

4.2 Challenges in Climate Change Communication

Circulating agricultural information in the Ndop plain is limited by inadequate number and poor quality of extension workers(100), lack of weather stations(100%), limited access to weather information (85,19%), inaccessibility of farms (67.59%), gender issues(45.83%), traditional beliefs(40.28%) and farmers' redundancy to adopt innovation. This result reflects the situation in many developing countries. Zikhali et al, (2019) stipulated that education and training had positive relationships with the provision of proper extension services.

The competency of agricultural extension agents in relating climate information has been considered low. This has affected efficient information flow to farmers. Easton M and Faulkner W, (2016) stipulated that is difficult to understate the complexity and scale of the global climate system and climate change as the subject matter often involves concepts very different from those typically presented by agricultural educators. This has reduced their ability of delivering correct and timely information to farmers. It is a crucial problem as extension educators often hold the respect and trust of local formers for delivering reliable information. This view was supported by Odeleye G, (2018), who considers lack of information to small-scale farmers on mitigating measures to limit and control climate change and blamed it to the poor extension service.

The ratio of extension workers to farmers in the Ndop plain is very low, averagely 1:496. To remedy this situation, there is need to augment the number of extension workers and/or empower the local organizations and individual farmers. Prokopy et al, (2017) stated that in Mozambique, the extension services also strengthened farmer organizations, which helped women's participation such that women gained access to inputs, including credit and markets. Their study concludes that the partnership between communities and the National Association of Rural Extension has helped the communities understand their degree of vulnerability and take measures to adapt to risk and build resilient livelihoods.

One other aspect of the extension service in Ndop is that it is made up of mostly men. This is posing a gender gap (Tsafack et al., 2014). The motivations to become and remain an extension worker were the same for women and men. Focus group discussions revealed that when working with groups, women mostly associated with one group only while men worked with many groups. Most men used motorbikes and cover larger areas to meet farmers.

5. Conclusion

This article aimed at evaluating the effectiveness of extension workers in communicating climate change information in the Ndop rice sector and propose best practices when attempting

to communicate climate change issues. Using a mixed research approached, it was revealed that the Transfer of Technology, Training and Visits and the participatory approaches are used. In all approaches, capacity building for extension services is essential. Extension workers in Ndop cannot effectively communicate climate related information to farmers due to their low competency, limited numbers and poor access to information. Inaccessible sectors have low innovation adoption rates because they have less contact with extension agents. As such, in increasing the number of extension workers, it is essential to move extension from a top-down program to a program that uses a co-production approach and lay emphasis on farm demonstration. However, it necessitates new competencies and roles. Some of these skills are not taught in agricultural training programs, nor in the traditional role for extension and thus there is need for more recycling programs for extension workers. Finally, recognizing and incorporating indigenous knowledge in climate change communication will boast adaptation and improve yields.

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