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Role of Agricultural Extension in Climate Change Adaptation in Cameroon

Defang Taku Julie[1*], Amungwa F.A[2], Manu .I[1]

[1]Department of Agricultural extension and Rural Sociology, Faculty of Agronomy and Agricultural Sciences, University of Dschang, P.O Box 222 Dschang-Cameroon
[2]Departmentof Sociology and Anthropology, University of Buea-Cameroon
*Corresponding Author

Abstract— *Worldwide climate change is being acknowledged and climate governing bodies have documented the means through which it is manifesting itself. Adaptation helps farmers guard against losses resulting from climate change. Adaptation depends on the stock of knowledge of farmers as a result of exposure to media, other farmers and especially extension agents. This research seeks to ascertain the role of agricultural extension in building adaptive capacity of farmers to ensure their livelihood. A sample of 680 farmers and 15 extension agents in Tombel, Muyuka and Konye subdivisions of southwest region-Cameroon were administered questionnaires. Some adaptation measures outlined by farmers were change in crop variety, agro-forestry, treatment of suckers with mocap chemical, replanting failed farms, use of fertilizer and picking up black pods and capsids of cocoa. The adaptation measures were mostly learned from other farmers as farmers affirmed that extension was not assisting them in adaptation. Extension agents attributed their passive commitment to absence of an extension package on climate change for MINADER. Also, absence of seminars or workshops for capacity building of agents limits their knowledge on adaptation measures to disseminate to farmers in regard to the different climate change indicators.*

Keywords— Climate change; Extension; Adaptation; Knowledge; Livelihood.

I. INTRODUCTION

Worldwide climate change is being acknowledged and climate governing bodies have documented the means through which it is manifesting itself. Impacts are evident and serious challenges to ensuring food security especially in developing countries are underscored. Adaptation measures help farmers guard against losses due to increasing temperature, decreasing precipitation, increasing sunshine intensity, drought, flood and prevalence of pests and diseases. However adaptation depends on the stock of knowledge of farmers as a result of exposure to media, other farmers and especially extension agents. Agricultural extension, the bridge between research and farmers plays key roles in agriculture by providing farmers with information, new technologies and education on how to mitigate GHGs and cope with climate change so as to increase production and ameliorate living standards **(**Singh and Grover, 2013). Extension's major activities over time has been dissemination of useful information from research to farmers and taking farmer's problems to researchers and this is even more important in the light of climate change and its impact on agriculture (Obiora, 2013). Exposure to extension services influence the capacity of farmers to adapt to climate change (Maponya and Mpandeli, 2013) because they educate farmers for example on how to develop and disseminate local cultivars of drought resistant crop varieties with information about the crops' advantages and disadvantages. According to Maponya and Mpandeli, (2013), climate change and its associated uncertainties implies that agricultural extension services need to regularly access new knowledge and disseminate it in an adequate and timely manner to the farmers. Extension has the advantage over other sources of information on adaptation that it necessitates follow-up from thesender to receiver and feedback mechanism. The role of Agricultural extension in adaptation cannot be under-estimated as they initiate changes in knowledge, attitudes, resilience capacities and skills of the people. However why some studies have shown that extension is effectively carrying out this role of information dissemination (Maponya and Mpandeli, 2013,) others have simply stated that is not doing enough especially in providing farmers with adaptation information (Ugwoke*et al.,* 2012). This research therefore seeks to ascertain the role of agricultural extension in building adaptive capacity of farmers to ensure their livelihood.

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II. METHODOLOGY

The study involvedMuyuka,Konye and Tombelsubdivisions in Meme, Fako and Kupe-manenguba divisions of southwest region -Cameroon. Geographically, the region is situated between latitude 5° 25' 00" N and longitude 9° 20' 00" E. Its fertile soil assured by the presence of mount Cameroon makes it an agricultural magnet attracting many into the area to practice farming for sustenance and commercial purposes. Tombel, Muyuka and Konye subdivisions have 9, 8 and 7 agricultural posts respectively**.** The population of the study was constituted of farmers and agricultural extension agents of the selected agricultural posts rendering extension services to the farmers belonging to CIGs and cooperatives. A total of 680 farmers and 15 extension agents were drawn from the population to constitute the sample size for the study. Questionnaires administered were analysed and results presented using tables, bar and pie charts in form of frequencies and percentages.

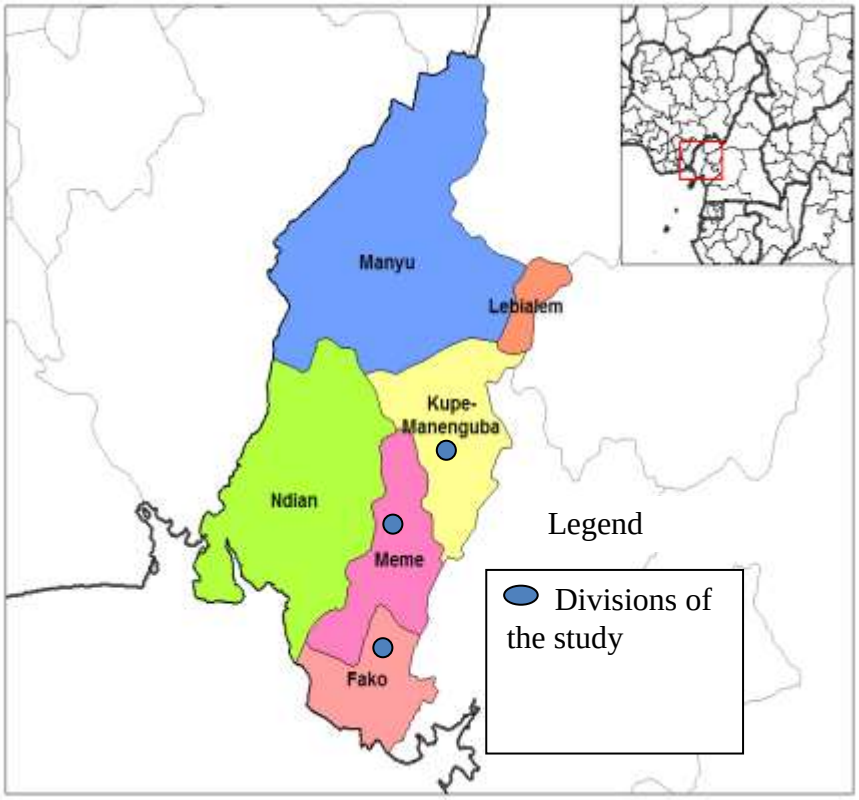

Fig.1: Map of South-west showing different divisions and the selected divisions of the study
Source: https://commons.wikimedia.org/.../File: Southwest_Cameroon_divisions.png 2006

III. RESULTS AND DISCUSSION

Social characteristics of respondents

Social characteristics of farmers and extension agents are presented on tables 1 and 2. Male and female composition of farmers was 71% and 29% respectively. The extension agents were 80% male and 20% female. Regarding academic qualification of farmers, 54% had primary school qualification, 27% had attained secondary school, 9% tertiary education while 10% had never attended school. A low level of education of farmers is generally observed in the study area.Enujeka*et al*., (2012) noted that education is expected to influence the perception of farmers on climate change and enhance adaptation of innovation among farmers. On the other hand, 80% of agents had agricultural technician diploma while 20% had Bsc degree in agriculture**.** Moreover,30% of farmers had been into farming for <10 years, 32% for 10-19 years and38% for 20 years and above. This signifies most of the farmers have been farming long enough to have experienced climate change and are therefore convinced of their perceptions. For working experience of agents, 67% had been working for 1-15 years and 33% for more than 15 years.

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Table.1: Social characteristics of farmers

Variable		Frequency	Percentage
SexMale		481	71
Female		199	29
Total		680	100
Academic qualificationNever attended school		71	10
	Primary	364	54
	Secondary	185	27
	Tertiary	60	9
Total		680	100
Farming experience< 10 years		207	30
	10-19 years	218	32
	20 and above	255	38
	Total	680	100

Source: Field survey 2016

Table.2: Social characteristics of extension agents

Variables		Frequency	Percentage
Sex Male		12	80
Female		3	20
	Total	15	100
AcademicAgricultural technician diploma		12	80
Bachelor of Science degree in agriculture		3	20
Total		15	100
Working experience	1-15 years	10	67
	More than 15 years	5	33
	Total	15	100

Source: Field survey 2016

Role of agricultural extension in farmers' adaptation to climate change impacts

Role of extension in adaptation was captured by asking farmers to mention the different climate change adaptation measures employed, the source of knowledge of the adaptation measure and whether or not extensions was assisting them in adaptation process. Extension agents were also asked to define the role they play in farmers' adaptation to climate change impacts.Even though climate change had negatively affected farm yields, very few farmers had taken measures to adapt. Similarly, Gbetibouo (2009) pointed out that despite the fact that most farmers perceived climate to have changed, very few have actually taken measures to adapt.Coping measures outlined to overcome the negative effects of climate change on cocoyam were; Change in cocoyam variety, mix cropping, agro-forestry, change from cocoyam cultivation to cassava, treatment of suckers with mocap before sowing and mulching. Coping measures linked with plantain were; increasing land under cultivation, replanting failed farms, treatment of sucker with Mocap before and after sowing, use of fertilizer and manure. Farmers mentioned selecting and planting only unaffected cuttings, Change in cassava variety and replanting failed farms as measures put in place to overcome the negative effects of climate change on cassava. Adaptation measures associated with cocoa were reducing spraying interval, change in pruning date, picking up black pods and capsids to prevent further expansion and agro-forestry.

Regarding source of knowledge of adaptation measures related to plantain, farmers mentioned extension agents, other farmers and personal experience as shown on table 3.

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Table.3: Source of adaptation knowledge on Plantain

Crop	Source of adaptation measure	Frequency	Percentage
Plantain	Extension agent	28	16
	Farmer to farmer	102	**57**
	Personal experience	49	27
	Total	179	100

Source: Field survey 2016

The table reveals that just 16% of farmers mentioned they learned the adaptation measures regarding plantain from extension agents. Majority (57%) learned the coping strategies from other farmers while 27% made reference to their personal experience.

Concerning source of knowledge on adaptation associated with cassava, table4 reveals that 56% of farmers learnedthe measure from other farmers, 33% from personal experience and the contribution of extension to famers' adaptation was 11%.

The adaptation measures regarding cocoyam were mostly learned from other farmers (55%). However, 36% said it was out of experience and 9% paid attribute to extension agents (table 5).

Table.4: Source of adaptation knowledge on Cassava

Crop	**Source of adaptation measure**	**Frequency**	**Percentage**
Cassava	Personal experience	19	33
	Extension	6	11
	Farmer to farmer	32	**56**
	Total	57	100

Source: Field survey 2016

Table.5: Source of adaptation knowledge on Cocoyam

Crop	**Source of adaptation measure**	**Frequency**	**Percentage**
Cocoyam	Personal experience	67	36
	Farmer to farmer	102	**55**
	Extension agents	16	9
		185	100

Source: Field survey 2016

The principal source of adaptation knowledge regarding cocoa was farmer filed school as stated by 53% of farmers. Extension agents were mentioned by 40% of farmers while 3% and 4% made reference to farmer to farmer and personal experience as reflected on table 6.

Table.6: Source of adaptation knowledge on Cocoa

Crop	Source of adaptation measure	Frequency	Percentage
Cocoa	Extension agents	57	40
	Farmer field school	75	**53**
	Farmer to farmer	4	3
	Personal experience	5	4
	Total	141	100

Source: Field survey 2016

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From the results we realize thatextension agents who were expected to educate farmers on the crop variety suitable for the climate of their zone, when and how to plant for example were not seen to be doing much in the adaptation process. They were very passive in their role of information brokerage on climate change.On the contrary, farmer to farmer extension was an important source of information dissemination on climate change adaptation. Farmers in the area have created a network of information sharing with one another as regards actions taken in order to cope with climate change. Information diffusion channels have been self-help groups and meeting houses. Maddison (2006) noted that on the basis of what they observe their neighbours doing and the success that they have, farmers can update their own farm practice. Tying to the expression of experience been the best teacher, farmers with time have developed skills to ameliorate their farming practices so as to cope with threatening climate. Farmers were further asked if extension was assisting them in adaptation. To this effect, 81% affirmed that extension was not assisting farmers as expected in climate change adaptation as shown on table 7. This finding corroborates that of Ugwoke*et al.,* 2012 that extension is not assisting farmers in climate change adaptation.

Table.7: Extension assistance to farmers on climate change adaptation

Extension assisting farmers in climate change adaptation	Frequency	Percentage
Yes	107	19
No	455	81
Total	562	100

To Further determine the role of extension in adaptation, agents were asked to enumerate the adaptation measures they advised farmers to use for increasing temperature, low rainfall, early start of rain, late start of rain, early end of rain, late end of rain and increasing sunshine intensity. Results showed that even though they were knowledgeable of climate change coping strategies like change planting date, use of fertilizer, use of improved seeds, agro-forestry, they were unable to link the adaptation measure to increasing temperature and low rainfall for example. This implies that the advices given to farmers were generalized and not specific to a climate change indicator. When asked to mention the source of the adaptation measures, 86% extension agents emphasized they learned about these measures from media as shown on figure 2. There are no seminars or workshops for extension agentsto build their capacity on climate change and the information given to farmers is based on personal research made by the extension agents. Agents further underscored that their non-engagement was due to the fact that climate change has been limited to the Ministry of Environment and Protection while theMinistry of Agriculture and Rural Development (with French acronym MINADER)sensitizing farmers on measures to increase agricultural yields and ameliorate living standard is cut-off with no climate change package. Since MINADER has no programme on climate change, there are no seminars organized in relation to this. There is no activity linked to climate change on their seasonal plan of activities and this makes it difficult to precise the kind of advice given to overcome impacts of increasing temperature, low rainfall and increasing sunshine intensity.

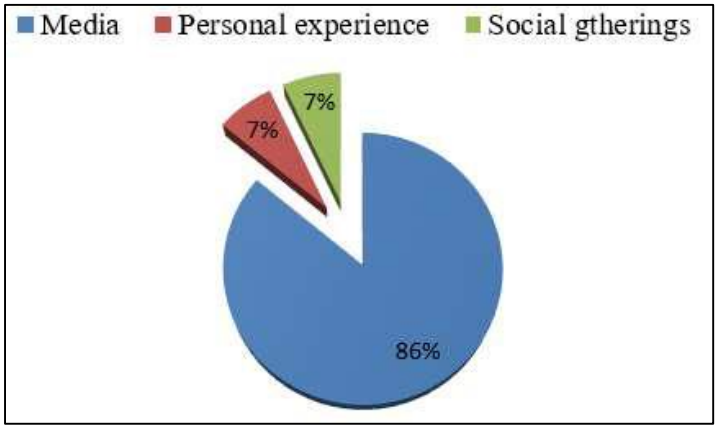

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Fig.2: Source of knowledge of adaptation measures known by extension agent

IV. CONCLUSIONS

Despite the negative impacts of climate change on crops, many farmers have not taken measures to adapt. Common adaption measures were change in planting dates, agro-forestry, change crop variety, treatment of suckers with mocap chemical before sowing, increasing land under cultivation and replanting failed farms. Farmers were categorical that extension was not assisting them in climate change adaptation as they over-emphasized learning the adaptation measures out of experience. Farmer to farmer extension emerged to be the principal actor in information dissemination. The passive engagement of extension agents has been underscored to absence of a climate change package for MINADER creating a handicap in information brokerage on climate change. It is imperative for the government to include MINADER just like MINEP in its climate change policies and put in place a climate change package for Agricultural Extension. Education of extension agents on the adaptation measures for specific climate change parameters. This can only be feasible if government develops its NAPA and specifies actions to be taken relative to a climate change parameter.

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