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Full Length Research Paper

Rural Farmers' perceived level of need of Agro-Climatic information for managing climate change risks in Owerri Agricultural Zone of Imo State, Nigeria

Chikaire, J.U.*[1], Anaeto, F.C.[1], Orusha, J.O.[2], Unam, D.N.[2] and Nwoye, E.O.[2]

[1]Department of Agricultural Extension, School of Agriculture and Agricultural Technology, Federal University of Technology, Owerri, Nigeria.
[2]Department of Agricultural Science Education, School of Vocational and Technical Education, Alvan Ikoku Federal College of Education, Owerri, Nigeria.

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The study examined rural farmers' level of need of agro-climatic information for managing risks posed by climate change in Imo State, Nigeria. The specific objectives were to describe the socioeconomic characteristics of respondents; identify perceived risks occasioned by climate change variability in the study area; examine perceived level of need of agro-climatic information by respondents; ascertain agricultural risk management strategies used by farmers; and to determine factors militating against use of climate information by the respondents. Multi stage sampling technique was employed in selection of respondents. Data were collected through structured questionnaire and by personal interview. A list of all registered farmers in the 18 extension blocks was obtained from the ADP office in the zonal headquarters. The list has a total number of 2500 farmers and 10% was selected which gives a total sample size of 250 farmers. Data were analyzed using descriptive statistical tools such as percentages, presented in tabular forms. Majority, (45%) were in the age group of 51 years and above, 62.4% were males, 57.2% had a family size of 1-4 people, 33.6 percent of the respondents have secondary education, 45.7% had more than 31 years in farming experience. The risks caused by climate change were long period of drought with mean response of 3.34, excessive rainfall at harvest (M = 3.25), insufficient rainfall, insect infestation of produce (M = 3.06) among others. Farmers need information on temperature, forecasting and monitoring of floods information on causes of climate change, information on erosion and flood control. The respondents employed strategies such as crop diversification, proper financial planning, use of resistant varieties. The problems included poor communication skills, untrained climate information communicator, lack of communication facilities, poor access to timely information among others. It was recommended that government and concerned agencies educate farmers properly, train them and provide access to communication facilities.

Key word: Rural farmers, agro-climate, information, risk management, Nigeria.

INTRODUCTION

Agriculture is arguably one of the most weather/climate sensitive sectors in our global economy. Many developing countries remain heavily dependent on agriculture for national income, while agriculture occupies a special place in the national psyche of many developed nations. Hence, any effort that helps to reduce the vulnerability to weather or climate related risks is likely to lead to considerable global benefits, both economic and

*Corresponding author e-mail: akjamin2010@gmail.com.

social (Hammer et al., 2000, Sivakumar, 2000). Climate risks are a consequence of unforeseen variability and hidden trends that often impact negatively on agricultural systems. Although floods, droughts, storms, heat waves and frosts have always been an integral part of human existence, our collective coping strategies have so far been limited by our ability to quantify the impacts arising from the complexity of systems responses to weather, climate, environment and management.

Risk is a central issue that affects many different aspects of people's livelihoods in the developing world. It affects whether people can maintain assets and endowments, how these assets are transformed into incomes via activities and how these incomes and earnings are translated into broader development outcomes. In rural areas, risk is present in all management decisions of agricultural systems, as a result of price, yield and resource uncertainty. The existence of such risks has been found to alter household behaviour in ways that at first glance seem suboptimal. Indeed, farmers take their decisions in a risky environment so that the consequences of these decisions are often not known with certainty until long after those decisions occur (Adebusuyi, 2004, Alderman, 2008).

The IPCC (2007a) describes Africa generally as "one of the most vulnerable continents to climate change and climate variability. Many parts of Africa in 2007 suffered severe drought while floods on the other hand destroyed roads and buildings and wiped out millions of hectares of farmlands in many parts of the continents (Solomon, 2002). Local knowledge indicates that climate change impacts are leading to significant negative effects on livelihoods in Africa, particularly among subsistence and small-scale agricultural communities (IMSG, 2010, Magrath, 2006). The group of people that bears much of the burden of these impacts is rural farmers, who practice rain-fed agriculture and hence depend on adequate rainfall for good crop yield. For instance, Kenya faces considerable negative impact to its economy due to the more variable and more severe climatic and weather patterns occurring due to climate change. These are already causing a range of effects on agriculture in Kenya.

In Nigeria, as in numerous countries around the world, the poorest sections of the society are often disproportionately represented by women, young children and the elderly, and these groups will accordingly be most vulnerable to climate change (United Nations International Children Emergency Fund (UNICEF, 2007). For example, the women's traditional role in the household, such as collecting water, is likely to be made more difficult through exacerbation of water shortages as a result of dryer weather (as anticipated in the north east of Nigeria as a result of the ongoing drying of Lake Chad). Similarly, an increase in the frequency and severity of weather extremes in Nigeria, such as flood and heat wave (as anticipated to occur, for example, in southern regions of the country), will disproportionately affect young people who are most vulnerable due to their age and relative inability to care for themselves. According to Okali, 2004, Nigeria's high vulnerability to climate change is due to a number of factors, as highlighted below:

1. Its geographical characteristics: Nigeria lies between 4ºN and 14ºN, and between 3ºE and 15ºE and spans 6 major vegetation zones, reflecting the highly variable climate throughout the country. Its sub-Saharan location is one of the 'hot spots' of climate change likely to experience the most severe impacts due to the delicate nature of the existing ecosystems.
2. There is limited capacity to adapt due to low levels of awareness, financial resources, and institutional and technological capability.
3. Much of the economy is dependent on climate-sensitive resources. For example, the agriculture, forestry and fishing sectors employ up to 70% of the workforce (Library of Congress- Federal Research Division (2008).
4. A high population, general food insecurity issues and serious social tensions (in some parts of the eastern states population density is over 1000ppl/km2 and rising).
5. The heavy concentration of Gross Domestic Product generating industry in locations (Lagos and the Niger Delta) that is highly vulnerable to climate change.

Hence, Nigeria's hopes of becoming one of the world's top twenty biggest economies by 2020 by strengthening the non-oil growth may be threatened by climate change. Particular threats are posed to Nigeria's competitiveness in agriculture from changes to rainfall patterns in the Sahel resulting in increased desertification and flooding, to economic activity in Lagos, Nigeria's commercial hub, which has recently been identified among the twenty one cities most likely to be affected by rising sea levels (Spurgeon et al., 2009). Other threats include effects on power generation and distribution due to the effects of river levels on major dams, on transport infrastructure vital for trading, and possibly on oil and gas production and investment. The IPCC fourth assessment report explains that between 1961 and 2003, the average sea level rose by 1.8 ± 0.5 mm per year. While sea level rise varies between regions, Nigeria's entire coastline has been affected by this observed rise (IPPC 2007a). Such increase would lead to an increase in coastal erosion and exacerbated flooding damages.

In Imo state, the most significant effects/impacts of climate change experienced by Farmers are: soil erosion, lack of portable water for human consumption and livestock use, loss of vegetation/pastures, intense weed growth, incidence of pests and diseases distortion and destruction of wildlife ecosystems, decrease in soil fertility and health related issues of climate change which can affect production, drudgery and stress from heat, etc (Ozor and Nnaji, 2011). They argued that the biggest

effect of climate change in the state include reduced farm yield and income, drying up of streams/rivers, reduction in storage quality of crops, loss of pastureland/vegetation and destruction of wildlife ecosystem. This according to them is perhaps attributable to the fact that Imo State has a drier weather; being closer to the North, and hence inherent insufficient rain water for maximum crop yield.

To effectively adapt to the vagaries of climate change, rural farmers need information on climate change; as information deficit, in itself, is a type of vulnerability as it is easy for the void to be filled with inaccurate and misleading information. Information need if effectively met will enable the user (farmer) to make an appropriate decision on any related problem (climate change) facing him or her. In other words, rural farmers are aided by the amount of information available to them about their felt needs in decision making process (Solomon, 2002).

It is obvious that many rural farmers are aware that climate is changing through some observable changes in the weather pattern, environment and on their farms too. Changes they describe as prolonged bad weather, change of weather conditions, situation of volatile weather, short rainfall duration and prolonged dry season, thunderstorm and heavy rains, too much rain and too much sun, unpredictable change in the pattern of rainfall, unpredictable start and end of rains, unstable weather, and variation in rainfall pattern and sunshine intensity (Ozor et al., 2010). However, it is not just enough to know that there are changes in the weather conditions; it is important to understand what these change are all about. Rural farmers may lack a precise and comprehensive understanding of climate change and this can lead to misconceptions and their inability to adapt to the changes. In other words, many of them may be incapacitated to face the future challenges if they are not adequately informed.

Besides that, many rural farmers may not know the causes of climate change for instance; Some of their agricultural activities like bush burning, deforestation, urine and other droppings from their farm animals, and swamp rice production are some of the major causes of climate change. In other words, they may unintentionally contribute to the global threat of climate change. Some of them may equally be ignorant of the fact that urbanization; industrialization and burning of fossil fuels equally contribute to climate change.

As a result of ignorance too, many rural farmers misconceive and mix up the effects of climate change to some other factors that may arise as a result of their activities. For instance blocking of water ways can result to erosion and flooding. Erosion in this case may not be as a result of climate change but as a result of the farmers' activities. Similarly, continuous cropping can result to poor yield and hence may not be as a result of climate change. But due to misinformation, many of them may not differentiate between these problems and the ones caused by climate change.

Climate change challenges call for both mitigation and adaptation measures. Mitigation can be seen as the behavioural changes targeted to reduce GHG emissions, for example avoiding bush burning, deforestation and improved agricultural production practices. However rural farmers in Imo state may not mitigate properly when they are ignorant of what causes climate change and why they should mitigate. They may adapt to cushion the effects of changes they observe, but the adaptation strategies may not be fully effective if the farmers are not adequately informed of what climate change is, the causes and the effects. Only when farmers can understand the negative effects of climate change and its impacts can they prepare for and adapt to them. While many farmers are already coping with varying climatic conditions, the weather is becoming less predictable, and some of their strategies may no longer work. To a significant degree therefore, the effectiveness with which the farmers adapt to climate change depends on how well it is understood by individual farmers.

According to Ozor and Nnaji, 2011, the farmers' ability to effectively respond to climate change challenges is determined by the quality of information available to them and how easily they access the information. In other words, adequate climate change information availability and accessibility is important in farmers' adaptation decision making process. Farmers face new challenges due to lack of information on how to deal with the issues of climatic variability, market uncertainty, new technology etc. For example, farmer producing wheat on his field for generations now faces new changes of weather, temperature, soil moisture, soil quality, and biological factors (Mittal and Mehar, 2013). This has resulted in emergence of new types of weeds, pests, and diseases (such as stem rusts) that can significantly affect the health, and thus yield and profitability, of the wheat crop. It is difficult for a farmer to find information on these new challenges from their conventional sources of information, to maintain or improve their yield. Farmers need to adapt to these challenges with information about the advanced techniques and methods that are relevant to their local environment.

Climate information is key to understanding climate as a major influence on lives, livelihoods, resources, ecosystems and development. It provides a way of analysing the nature and scale of impacts due to past and current climate and the potential future impacts as the climate continues to vary and change. Actors can then make informed and appropriate decisions and plans to deal with climate-related impacts through adaptation, risk reduction and development actions. Climate information is also a valuable resource for confronting and living with an increasingly uncertain future (CARE INTERNATIONAL (2014). It provides a basis on which people whose livelihoods are affected by climate can

make forward looking and flexible plans that are adapted to a range of climate possibilities. Consequently, climate information allows us to move from strategies which react to conditions as or after they occur, to those which seek to build resilience under all possible conditions and ultimately, to proactive strategies informed by forecasts and forecast probabilities. Effective adaptation involves developing a range of adaptation options with flexibility to switch from one strategy to another or to combine options as a way of spreading climate risk. Climate information supports decision making on which option to invest in, when and how much to invest.

In fact, the use of information to manage climate risks to livelihoods is not new for many communities in the study area. Poor communities dependent on economic activities influenced by climate are exposed to risks brought about by climate variability and change at local scales. Many communities in Imo State, Nigeria are particularly vulnerable since they are exposed to several hydro-meteorological hazards due to factors such as heavy rainfall, flooding, erosion and many more. Current climate variability, viewed along with future climate change scenarios, highlights the need for delivering climate information in a timely manner. Effective use of weather and climate information to manage current climate risks and prepare adaptive actions to face future changes is therefore urgently needed. The specific objectives of this work therefore included

a) To describe the socioeconomic characteristics of the respondents;
b) Ascertain agricultural risks caused by climate change variability;
c) Determine level of need of agro-climatic information by respondents;
d) Identify agricultural management strategies of farmers against risks posed by climate change;
e) Examine factors militating use of climate variability

METHODOLOGY

Specifically, this study was conducted in Owerri Agricultural Zone of Imo state, Nigeria. Imo State is situated east of River Niger in the South-Eastern part of Nigeria. It is made up of twenty-seven (27) Local Government Areas and its capital is Owerri. It lies within longitude 6˚50E to 3.35E and latitude 4˚30N to 6.30N (IMSG, 2010). The state is divided into three (3) agricultural zones which are Owerri, Orlu, and Okigwe. It lies within the tropical rain and evergreen forest with a tropical climate that is humid all year round. The rainy season spans from March to October and is bimodal with a two-week break (in rainfall) in August. The main annual rainfall in the state is 20,000m while the annual temperature is between 25˚C and 28˚C with a relative humidity of about 98% during the rainy season and between 50% and 60% during the dry season (IMSG, 2010). Owerri Agricultural zone is made up of Ezinihitte, Aboh, Ahiazu, Ikeduru, Mbaitolu, Owerri North, Owerri West, Owerri Municipal, Ngor-Okpala and Ohaji/Egbema Local Government Areas. Owerri Agricultural Zone has 18 extension blocks. A list of all registered farmers in the 18 extension blocks was obtained from the ADP office in the zonal headquarters. The list has a total number of 2500 farmers and 10% was selected which gives a total sample size of 250 farmers. The data for the study was sourced from primary and secondary sources. The former was gotten from field investigation or survey using structured questionnaires and interview schedule, while the latter was extracted from documented facts in existing literature, reports, books, journals, publications, bulletins, etc.

Data was analyzed using descriptive statistical tools such as percentages, mean and standard deviation presented in tabular forms. This was used to analyze **objective 1**. A 4-point Likert type scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) assigned scores of 4, 3, 2 and 1 was used to analyze objective 2. Mean was computed on 24 statements, 4-point Likert type rating scale of strongly agree, agree, disagree and strongly disagree assigned weight of 4,3,2,1 to capture the perceived agricultural risks **(objective 2)**. The values were added and divided by 4 to get the discriminating mean value of 2.5. Any mean value equal to or above 2.5 was regarded as a major risk, while values less than 2.5 were regarded as minor risks. Again, mean was also computed for **objective 3** which looked at level of need of agro-climatic information on a 18 item statements on a 3 point Likert type rating scale of highly needed, needed and not needed assigned values of 3,2,1. The values were added and divided by 3 to obtain a discriminating mean value of 2.0. Any value with mean equal to or greater than 2.0 was considered highly needed information.

Also, mean was computed on 15 statements, 4 – point Likert type rating scale of used always, used often, used seldomly and not used assigned weight of 4, 3, 2,1 used to rate respondents risk management strategies **(objective 4)**. The values were added and divided by 4 to get the discriminating mean value of 2.5. Any mean value equal to or above 2.5 was regarded as a strategy used always by the respondents, while values less than 2.5 were regarded as not used. Mean was also computed on the factors militating against respondents use of agro-climatic information **(objective 5)** using a 13 item statements on a 3 point Likert type rating scale of very serious, serious and not serious assigned weights of 3, 2 and 1.

The values were added and divided by 3 to obtain a discriminating mean value of 2.0. Any value with mean equal to or greater than 2.0 was considered very serious and mean values less than 2.0 was considered not serious.

Table 1: Socio-economic Characteristics of Respondents

Characteristics	Frequency	Percentage
Sex		
Male	156	62.4
Female	94	37.
Age		
31-40	17	6.8
41-50	23	9.2
51-60	114	45.7
61&above	96	38.4
Marital status		
Married	136	54.4
Widow	88	35.2
Widower	26	10.4
Educational level		
No formal education	6	2.4
Primary	130	52.0
Secondary	84	33.6
Tertiary	30	12.0
Farm size		
0.5-1	150	60.0
2.5-2	67	26.8
2.5- above	33	13.2
Household size		
1-4	143	57.2
5-8	87	34.8
9 & above	20	8.0
Farming experience		
1-20	50	20.0
21-30	86	34.4
31-& above	114	45.7
Extension visit		
Not at all	162	64.8
2 weeks interval	58	23.2
Once in a while	30	12
Membership of organization		
Yes	177	70.8
No	73	29.2

Field survey data, 2016

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

The result in table 1 reveals that 62.4% of the respondents were males, while 37.0% were females. This shows the dominance of males as owners of land and family heads who take major decision in the family production business. It was also revealed that majority (45.7%) of the respondents were between 51 – 60 years which makes them experienced and knowledgeable in the topic of agro-climatic information. Table 1 shows also that 54.4% of the respondents were married, 35.2% were widows who fend for themselves and their family members having lost their husbands to death. The number of widows also revealed that women are custodians of traditional seeds used as food and sale in the market. The respondents had certain level of education as indicated by 52.0 % with primary education, 33.6% had secondary education, while 2.4% had no formal education. This implies that the respondents are not illiterates. Education provides valuable knowledge on the benefits of conservation of natural resources. Majority (60%) of the respondents had small land holding of 0.5 – 1 hectares, 26.8% had 1.5 – 2 hectares, with a mean farm size of 1.9 hectares, mean household size of 8.2 members, and a mean farming experience of 25.6 years. The above implies that larger households engage in farm work readily as they provide the farm labour needed for conservation practices. Again, as age increases among farmers, years of farming experiences also increases making them experts in the field of conservation of nature.

Table 2: Agricultural Risks Faced By Respondents.

Perceived Agricultural Risks	Mean	SD
Long drought	3.34	0.666
Excessive rainfall at harvest	3.25	0.470
Insufficient rainfall	3.37	0.532
Pests damage of crops	2.56	1.104
Insect infestation of produce	3.06	0.537
Decrease/poor crop yield	3.14	0.525
Changes in price of output/inputs	2.82	0.917
Loss of market access	2.91	0.444
Poor quality of produce	3.06	0.515
Insufficient cash to start business	3.26	0.608
Low profit generation	2.56	0.877
Increased input cost	3.09	0.428
Higher interest rates	2.58	0.603
Excessive borrowing	3.12	0.950
Lack of adequate cash or credit reserves	3.10	0.641
Unfulfilled business agreements /contracts	3.15	0.869
Damage of farm property	2.50	1.165
Illness /sickness	2.92	0.849
Disability/ injury	2.98	0.847
Poor communications	2.91	0.771
Land use/ tenure changes	2.72	0.716
Theft of produce/pilfering	2.99	0.688
Fire out break	2.99	0.847
Poor farm management skills	2.80	0.480

Field survey data, 2016.

Majority (64.8%) had not received extension visit, while 23.2% received such visits at 2 weeks interval and 12% received once in a while. This visit is important as it serve to educate and train farmers on the need and benefits of agro-biodiversity conservation. Finally, 70.8% belonged to social organizations, while 29.2% belonged to no organization. Membership of social group is an avenue of change and information gathering by farmers and information sharing. Farmers gather information and benefit from others when they join and belong to social organizations.

Agricultural Risks faced by Respondents

The risks faced by respondents are very numerous and varied. Table 2 revealed that the respondents faced risks caused by both climate change market/economic and political/institutional forces. The risks caused by climate change were long period of drought with mean response of 3.34, excessive rainfall at harvest (M = 3.25), insufficient rainfall (M = 3.37), pests damage of crops (M = 2.56), insect infestation of produce (M = 3.06), decrease crop yield (M = 3.14), poor quality of produce (M=3.06), illness/sickness (M = 2.92), disability/injury (M = 2.98), and fire out break (M = 2.99). The risks posed by market and or economic forces included changes in price of output/inputs (M = 2.82), loss of market access (M = 2.91), poor quality of produce (M = 3.06), insufficient cash to start business (M = 3.26), low profit generation (M = 2.56), increased input cost (M = 3.09), higher interests rates (M = 2.58), excessive borrowings (M = 3.12), lack of adequate cash reserves (M = 3.10), unfulfilled business agreements/contracts (M = 3.15), damage of farm property(M=2.50), illness/sickness (M= 2.92), and disability/injury (M=2.92). Other risks termed institutional/political included poor communication network (M = 2.91), land tenure change (M=2.72), theft of produce/pilfering (M= 2.99), and poor farm management skills (M = 2.80).

Climate knowledge is the appropriate use of climate information for reducing economic and environmental risks and strengthening resilience against climate variabilities (Glantz, 2005). The transition from information to knowledge requires the integration of locally relevant experiences and practices into climatic information and scientific evidence. It also needs to be converted to timescales appropriate for planning and developing actions to address risk resilience of vulnerable communities.

The standard deviation values of the mean distribution of farmers' perceived agricultural risk were less than one in most cases. This shows that the responses of the farmers on the perceived risks did not very much. On the contrary, the standard deviation values above 1 show

Table 3: Level of Information Needs of Respondents.

Agro – climatic Information Needs	Mean	SD
Change in rainfall pattern	2.31	0.835
Information of temperature	2.85	0.351
Forecasting and monitoring of floods	2.51	0.539
Information on causes of climate change	2.89	0.387
Appropriate socio-cultural practices	2.96	0.217
Information on erosion & flood control	2.96	0.251
Information on effects of climate change	2.04	0.710
Information on drought	2.47	0.560
Information on growing season length	2.92	0.351
Information on sunshine hours	2.62	0.752
Forecast of start/cessation of rains	2.85	0.408
Forecast of pests/diseases outbreak	2.35	0.478
Information on planting time	2.37	0.547
Information on early maturing crop varieties	2.26	0.609
Information on resistant crop varieties	2.20	0.682
Information on water harvesting techniques	2.84	0.254
Information on harvesting time/ periods	2.53	0.553
Information on expected date of dry spell	2.75	0.574

Field survey data, 2016 . SD – Standard Deviation.

that the responses of the farmers on the risk factors differ much.

Level of Information Needs of Respondents

Table 3 showed the agro-climatic information needs of respondents and their level of need of such agro-climatic information. The respondents high mean responses of 2.31 for change in rainfall pattern, information on temperature (M = 2.85), forecasting and monitoring of floods (M = 2.51), information on causes of climate change (M = 2.89), appropriate socio-cultural practices (M = 2.96), information on erosion and flood control (M = 2.99), information on effects of climate change (M=2.04), information on drought (M = 2.47), and information on sunshine hours (M= 2.62) were highly needed areas of information. Other areas of highly reveled information were information on growing season length (M = 2.92), information on planting time (M = 2.37), forecast of start and cessation of rains (M= 2.8), forecast of pests/diseases outbreak (M = 2.35), information on early maturing crop varieties (M = 2.26), information on resistant crop verities (M 2.20), information on water harvesting techniques (M = 2.87), information on harvesting time/period (M = 2.53) and information on date of dry spell (M = 2.75).

The above shows that information related to climate change like tracking meteorological patterns, forecasting impacts and assessing risks is crucial for planning climate change adaptation at the local level; for example, farmers having access to information on change in rainfall patterns or temperature and also to technology can make a difference in production (Manoranjan et al., 2012). Climate information is to be combined with other information for assessing the risk, good decision for loss reduction strategies and timely information to local stakeholders; for example, forecasting and monitoring floods needs weather data to be combined with hydrological data to provide information about the likelihood of flooding and project impact according to vulnerability. Hence information, knowledge and communication that are related to climate variability will be the way and means for protecting rural livelihoods of rural communities. Advances in climate prediction, analysis and synthesis of climate knowledge have helped improve CRM with the potential to enhance livelihood opportunities in agriculture (Selvaraju et al., 2011). Climate information at all-time scales is crucial to advance risk management and improve sustainable production. The climate information and likely decisions are:

(i) Climate change scenario to understand the trend and alter system-level decisions (cropping or grazing);
(ii) Seasonal climate information to make strategic decisions (crop type, marketing, forward selling, livestock herding rate, etc.);
(iii) Intra-seasonal forecasts to schedule tactical operations (e.g. fertilizer, water and other adjustable inputs); and
(iv) Weather forecasts for the day-to-day operations. Climate information at a range of temporal scales benefit agricultural decisions (Meinke and Stone 2005).

Advanced information in the form of seasonal climate

Table 4: Agricultural Risk Management Strategies.

Risk management strategies	Mean	SD
Adoption of recommended production practices	2.63	0.738
Crop varieties diversification	2.90	0.300
Expansion of production hecterage	2.92	0.294
Purchase of crop insurance coverage	2.92	0.367
Use of resistant varieties of crops	2.94	0.277
Increase direct marketing	2.44	0.732
Marketing through multiple channels	2.67	0.660
Spreading harvesting crop times	2.78	0.460
Developing a strategic farm business plan	2.76	0.651
Carrying of adequate cash reserve/saving	2.80	0.480
Proper training/ education of farmers	2.31	0.835
Proper communication with farm workers	2.81	0.491
Willingness to adjust investments	2.51	0.539
Reduced family expenditures and withdrawals	2.89	0.387
Proper financial planning	2.96	0.217

Field survey data, 2016. SD- standard Deviation

forecasts has the potential to improve farmers' decision-making, leading to reduced risks and increased opportunities. Climate information (seasonal) has the potential to improve livelihoods, enable farmers to adopt improved technology, intensify production and enhance soil fertility, and farmers are capable of investing in more profitable enterprises when conditions are favorable (Hansen et al., 2007). The approaches to seasonal to inter-annual climate predictions and sources of predictability, including ENSO (El-Nino Southern Oscillation)-related indices, offer a greater potential for risk reduction and opportunity management. These developments have the capability to improve the economic return for both smallholder farmers and rural companies, such as grain traders, sugar mills and cotton gins (Meinke et al., 2006). The standard deviation values of the mean distribution of farmers' perceived level of need of agro-climatic information were less than one in all cases. This shows that the responses of the farmers on these factors did not very much.

Agricultural Risk Management Strategies

Farmers manage risks in a number of ways in order to continue the business of farming Table 4 showed that the respondents employed strategies such as crop diversification (M = 2.90), proper financial planning (M = 2.26), expansion of production hectarage (M = 2.92), purchase of crop insurance coverage (M=2.92), use of resistant varieties (M = 2.94), carrying of adequate cash reserves (M = 2.80), proper communication with farm workers (M = 2.81), reduce family expenditures/ withdrawals (M = 2.89), spreading harvesting of crop times (M = 2.78), developing a strategies farm business plan (M= 2.76), and marketing through multiple channels (M= 2.67). Other strategies were adoption of recommended production practices (M = 2.63), willingness to adjust investments (M = 2.51), increase direct marketing (M= 2.44), and proper training/education of farmers (M = 2.31).

The above agrees with Kouamé, 2012. who posited that risk sources cause adversity in yield, prices and production units. Each or any combination of the outcomes of the risk sources (bad yield, poor and instable prices, and inadequate production units) leads to poor farm income. There are several strategies that farm operators can use to reduce the farm exposure to risks. The strategies can be classified into modern and traditional risk management tools. The modern instruments include insurance, forward contract, options, futures etc. In the absence of modern risk management tools (this is the case in rural Africa), farmers can rely on some traditional strategies to deal with risk (Kouamé, 2012) summarizes the most important traditional risk management strategies used by the surveyed cocoa farmers in Côte d'Ivoire; these are: crop diversification, precautionary savings and participating in social network. The percentage of producers in the sample using some form of crop diversification is 32.87%. Producers who utilize precautionary savings represent 57.46% and those who are members of social network comprise 42.82% of the sample.

Factors Militating Against Use of Climate Information

Though farmers highly needed agro-climatic information to manage farm risks, they were faced with numerous problems in their quest for the information. The problems included poor communication skills, (M = 2.96), untrained climate information communicator (2.28), lack of

Table 5: Factors Militating Against use of Agro-climatic information.

Militating factors	Mean	SD
Poor communication skills	2.96	0.251
Untrained climate information communicator	2.28	0.818
Inadequate/ lack of communication facilities	2.89	0.397
Poor access to timely information	2.92	0.351
Lack of participatory approach	2.71	0.591
Weak communication channels	2.53	0.553
Illiteracy among users	2.70	0.676
Poverty	2.63	0.738
Poor electricity network	2.90	0.300
Bad road network	2.92	0.294
Lack of access to improved inputs/varieties	2.92	0.367
Irregular extension service delivery/training	2.94	0.277
Delays in provision of climate information	2.45	0.543

Field survey data, 2016 SD = standard Deviation

communication facilities (M = 2.89), poor access to timely information (M=2.92),lack of participatory approach(M= 2.71),weak communication channels (M = 2.53), illiteracy among users (M = 2.70), poverty (M=2.63), poor electricity network (M = 2.90), bad road network (M = 2.92), lack of access to improved inputs/varieties (M = 2.92), irregular extension service delivery (M= 2.94) and delays in provision of climate information (M = 2.45).

This study therefore agrees that a growing amount of information on climate change in the form of weather forecasts, seasonal forecasts, climate change scenarios, climate-induced vulnerabilities, adaptation methods and so on, is available for use. However, in most of the cases, the information does not reach the potential end-users in an accessible way so that they can interpret and use it. In addition, information available on the global scale generally is not applicable for local areas. Second, in some cases, information on climate variability is available, but the process and the capacity for integrating this information into vulnerability (Manoranjan et al., 2012) and capacity assessments, to feed into adaptation strategies, poverty reduction strategies and planning at the local level, etc. is lacking. Third, historic meteorological data are not available for more accurate predictions. Since it has been argued that the developing world would be the hardest hit by climate change, inaccurate predictions would certainly make the problem more complicated. Fourth, there is lack of relevant information in the local and social contexts. Information should be provided to complement the local knowledge and be locally relevant; thus people can easily practice and get accustomed to it (Manoranjan et al., 2012.

Again, Manoranjan et al., 2012, agrees with the findings when they opined that apart from these methodological and theoretical lacunae in prediction and interpretation of climate change, there are other challenges in establishing the system of effective information delivery to the rural households in high elevation. Despite the revolution in ICT, the reach of these technologies and quality of services to common people are still low in the developing countries. Internet penetration and its awareness in rural areas is poor. Second, awareness level of people about these technologies and services is quite low. They generally rely on the traditional sources of information rather than the use of advanced technologies to tackle natural and climate-induced calamities (Manoranjan et al., 2012). Third, there is lack of supporting infrastructure for building an operational information system such as electricity, skilled human resources and so on. Unfortunately, such infrastructural facilities are not available in rural and remote areas of the developing world. Fourth, the problem in this context is content creation in local languages. People do not communicate or understand English in rural areas, and therefore information available in English is meaningless for them.

CONCLUSION

Climate change is a global menace affecting everyone and every production sector including agriculture. Farmers are in high need of agro-climatic information to cope with the numerous risks associated with climate change variability. Even though farmers employ various strategies for managing risks they are face with other challenges which will need the attention of everyone to resolve.

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