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Climate Change Impact On Rice/Wheat Zone: Farmer's Perceptions in Pakistan

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Abstract

Agriculture sector is one of the most vulnerable sectors to any change in climate pattern. The crops are directly dependent on climatic parameters for optimum growth, yield and disease epidemics. Unfortunately in Pakistan, less attention has been given regarding dissemination of data and information, in order to have a farming community that is well equipped with new and innovative technologies. Dissemination of knowledge to farmers is responsibility of extension department of the provinces. This study was conducted to analyze present situation of extension services in rice/wheat zone of Pakistan and perception of farming community about climate change impacts. This study utilized primary source for data collection. Structured questionnaire is used for data collection from 5 rice/wheat growing zones of Pakistan. Results revealed are not satisfactory. The role of extension department has now become more vital in the changing. Farmers have shown concerns over climate change issue. They are facing issues in credit availability, water availability and absence of technical knowledge by extension services. It has disturbed their farming practices. Meanwhile, access to latest information regarding technical advancement in farming practices is stagnant. TV and radio could be good medium of extension information, however, in person visits of extension officers to the farms is the need of time. Farmers demand timely accessibility of information to have a sustainable production in current situation.

Introduction

The world of today is facing many changes around the globe. Most of these occurred due to the contribution of human to alter its world for own sake, cover necessities and to a greater extent enjoy a luxurious life. These alterations can physically be witnessed by decreasing area of forest (deforestation), changing in the time period of different seasons, change in crop growth period etc. Cumulatively, all of these signs are alarming and rising to a phenomenon of International Security (Karas, 2003).

Climate of the world has changed and still changing and affecting every colour of life. The intergovernmental panel for climate change has notified that continuous emission of greenhouse gases is changing the climate of earth. The outcome of these changes is affecting the pattern of precipitation and temperature. (IPCC, 2007). In some parts of the world, the impacts of these changes are positive, while in others, negative impacts are insight. To cope with these changes more efficiently, role of extension service is

going to be more critical to adapt strategies (Aydinalp and Cresser 2008). Studies conducted by number of organizations revealed that the amount of CO_2 in the atmosphere is now at much elevated levels than that of the situation of pre-industrial times (Stern, 2006). Seventy five percent emissions of GHGs are caused by the developed countries. A research conducted by Farooqi and his fellows, showed that mean surface temperature has a consistent rising trend in Pakistan. This trend is continuing since the 20th century all over the country followed by decrease in rainfall trend. This increase in temperature and reduction in rainfall has significant impacts on the yield of crops (Farooqi *et al.*, 2005).

Agriculture and allied practices are economic activities that are performed to get food for the mankind. The sector, no doubt, heavily depends upon the climate and its different variables. So, any deviation in the trend of climate variables may impose its impacts on the growth of agriculture sector as well. Some regions of the world are adversely affected and some get benefit from the climate change. Mostly, the developing countries like in sub-tropics and tropics are very much vulnerable to change in climate patterns while developed countries enjoy overall benefit from the said change due to technological advancement and adaptation practices easily (International Institute for Sustainable Development (IISD) and Environmental Adaptation Research Group, 1997).

In this situation, the role of extension services is important to address the changes in climate. The responsibility of extension workers has increased in providing timely and accurate information regarding crop production and other allied agriculture practices. Researchers in Kenya highlighted the importance of extension services. They argued that, Kenyan agriculture is much vulnerable to climate change and affects will be negative. They debated in favour of extending the extension services, which supply knowledge to farming population. The assurance of quality information is of critical importance, that not only help the farmers in short run but also guide them in managing long term plans of cultivation (Mariana and Karanja, 2007).

In Ethiopia, a study was conducted to assess the climate change impact on agriculture in low income countries. The study utilized the Ricardian approach. One feature of Ricardian approach is---it not only asses the said impacts, but also emphasize on designing adaptation strategies to deal with resulting impacts of climate change. The findings of the study enumerated it more clearly that coping strategies suggested by extension workers increases the chance of its adaption by the farmers. Furthermore, information provided by extension workers is proved to be of great importance in making decision regarding the household coping methods against the climate change impacts (Falco *et al.*, 2011).

In India, a study conducted on climate change sensitivity on its agriculture sector revealed that extension services, which are provided by the government, are not up to the mark. The author highlighted an important flaw that most of the information provided to the farmers is in uniform manner i.e. for every crop, same kind of information is provided, rather disseminating separate information for every single crop. As climatic requirement for each crop is different from another, separate supply of information is lacking, resulting in the lower production of crops which eventually elevates poverty in the farming community of Indian farmers (Kumar, 2009a). Similarly, African continent is badly affected by climate change. The cutting down in budget for agriculture extension services and farmers training by

Nigerian government has slowed down the process of knowledge transfer to the farmers (Ajetomobi et al., 2010).

Economy of Pakistan is fuelled by a large share of agriculture sector, engaging almost half population of the country. For country like Pakistan, where economy chiefly depends on agriculture production, a slight variation in climate variables may cause a significant change in overall agricultural production. Rice has a significant share in exports of Pakistan. It is a cash crop that earns substantial foreign exchange for the country. It accounts for 6.7 percent in the value added in agriculture sector while, 1.6 percent in GDP. Good quality is grown to cover both domestic demand and allow for exports (Rice Exporters Association of Pakistan, 2011).

Extension services are backbone of agriculture sector of Pakistan. Due to climate change, the role of extension services has been proved important in developed countries while the developing countries are still far behind in this regard.

To fill the gap of communication between farmers and extension personnel, government of the Punjab has made a drastic policy change by privatizing extension services during 1988. Up till now there are several private, national and multi-national companies on input side of agriculture sector which are not only providing inputs for agricultural production, but also have field officers, who guide the farmers in different aspects of production. The demise of public sector extension service was mainly due to fewer funds for travelling, food and other expenses for the agricultural Officer (Riaz, 2010).

But this policy change did not let free the public sector extension agencies from their duties. Each year a number of extension officers are recruited from all over the country but still they are not fruitful. Shakoor and his team conducted a survey in Punjab province during 2009. The results were dis-satisfactory on the performances of extension services. Also, private sector mostly relies on group discussions instead of practical demonstrations on the demonstration plots (Shakoor *et al.,* 2011).

Extension services do not solely provide the incentives to improve production but availability of credit to purchase inputs and to adapt new technologies is of key importance. A study conducted in Swat district to analyse the role of extension services on farm productivity highlighted this issue that beside efficient extension system, easy access to credit facility on low or zero mark-ups builds a strong incentive for farmers to accommodate with new innovations in agriculture sector (Ahmad *et al*., 2007).

In such a case, the deliverables by the extension department of Pakistan must be effective and efficient. This paper spotlighted the view of farmers about climate change in rice/wheat zone of Pakistan. In addition to this, the existing condition of extension services was also identified in the zone. As rice is one of the major export commodities, the role of extension department/workers is of key importance.

Materials and Methods

Survey for the study was conducted in a systematic manner during March/April 2012 for collection of primary data. Data was gathered from targeted districts of rice/wheat zone in the country. Structured questionnaire was designed as a tool for data collection purpose. Multistage cluster sampling technique is exercised to obtain information with the help of questionnaire. Through this technique, data were collected from minimum 2 *Tehsils* in each district. Further, from each *Tehsil*, at least 2 villages were

selected for data collection. The districts that were selected purposively ranked high in rice productivity in the country. Sialkot, Shakargarh and Sheikhupura districts were selected from Punjab, Jacobabad and Larkana were selected from Sindh. Multistage cluster sampling technique was exercised. Regarding budget constraint coupled with time space availability a total of 100 samples that make hundred respondents were taken i.e. from each district we selected twenty respondents.

n_1= 20 samples from Sialkot
n_2= 20 samples from Shakargarh
n_3= 20 samples from Sheikhupura
n_4= 20 samples from Larkana
n_5= 20 samples from Jacobabad
$\sum n_i$ = 100 samples

Similar quantities of respondents were interviewed in every district visited. This was intended to have uniformity in sampling procedure. Every district has equivalent representation in the sample taken. Further twenty respondents were chosen in a way that they cover the village from all four sides, viz., east, west, north and south. In this way, each village has an equal representation in the study. Further descriptive approach is used to analyse experience of the farmers. Simple percentages are then computed on the qualitative data obtained from the farmers. Statistical package "SPSS" is applied to run the analysis.

Results and Discussion

During the survey, a total of hundred samples were interviewed. Out of these, five respondents did not share their experiences accurately, so they were excluded from the total. Resulting, ninety five samples were analysed.

The respondents selected belonged to various age groups, having different experiences. We choose both young and old farmers in search of gathering new ideas and information. Table 1 shows descriptive statistics regarding minimum and maximum experiences of the respondents interviewed with their mean age and standard deviation. Farmers with minimum of 10 year experience to 50 year experience were interviewed. Mean experience of the total respondents came out approximately 24 years.

Table 1 Descriptive Statistics

	Number of Samples	Minimum	Maximum	Mean	Standard Deviation
Farming Experience of the Respondent	95	10.00	50.00	23.7053	8.46378

Farmer's Perspective on climate change

In the first step, farmers were asked about the soil condition at their farm. Long term shifts in mean temperature and any long term fluctuation in rainfall pattern they had observed was also asked. Most of the farmers were satisfied with their farm soil with 86 % claimed that their soil condition is good. The reason behind this fact is the heavy application of fertilizer on the farm fields to have sustainable nutrient count in the soil that is required for optimum growth of crop plants. Table 2 highlights their response

Table 2 Soil Condition of the Farm

Response	Respondents	Percent
Excellent	13	13.7
Good	82	86.3
Total	95	100

Table 3 Long Term Shifts in Mean Temperature on Your Farm

Response	Respondents	Percent
No Idea, No Change, Never Noticed	41	43.2
Increase in Temperature, Long Summer Season	53	55.8
Unexpected Changes in Temperature	1	1.1
Total	95	100

Moving further, table 3 shows farmer's view about changing temperature. Farmers showed serious concerns over the increase in temperature during recent past. Almost 56 % of the farmers said that temperature has been increased especially in summer season. They claimed that this has caused the shortening of growing period of their crops. While rainfall is decreasing this is confirmed by the respondents. About 59 percent of the respondents replied that the rainfall has decreased in the recent past, while 19 percent were of view that the rainfalls are not on time i.e. at the time of requirement. Table 4 highlights these results. As the survey for this study was conducted in April, 2012, farmers supported their reply with the current situation at that time that they were having unexpected rainfalls in April (2012). This increased in temperature and decrease in rainfall pattern over Pakistan is confirmed by Farooqi *et al.* in 2005.

Table 4 Long Term Shifts in the Mean Rainfall on your Farm

Response	Respondents	Percent
Decline in Rainfall	56	58.9
Rise in Rainfall	9	9.5
Not on Time Rainfall	18	18.9
Unexpected Changes in Rainfall	6	6.3
No Change	6	6.3
Total	95	100

Aydinalp and Cresser in one of their study "*the effects of global climate change on agriculture"* indicated that the lower rainfalls and higher temperatures could have negative impacts on the soil moisture and soil condition. They also highlighted that this impact could be more threatening for the countries that lie in tropics and mid-continental regions. In the light of this study, Pakistan, as most of its area lies in the tropics, is also facing the same threat due to climate change (Aydinalp and Cresser, 2008). About 82 % farmers revealed that moisture availability is a serious issue as availability of moisture has not increased on their farms which eventually affect their crop production.

Table 5 Moisture Availability has Increased Over the Time

Response	Respondents	Percent
Same as earlier	17	17.9
Decreased	78	82.1
Total	95	100

Less availability of moisture in soil, decline in rainfall and particularly unexpected changes in rainfall pattern has pushed the farmers to have some adjustment in their farming practices especially in irrigation facility. Almost 47 % of the respondents said that they have installed tube wells, motors or turbines on their farm to have sustainable moisture availability.

Table 6 Adjustments in Irrigation to have Sustainable Moisture Availability

Response	Respondents	Percent
No Adjustment	50	52.6
Use of Tube well, Motor, Turbine	45	47.4
Total	95	100.0

Extension services

Farmers were inquired about the visits of extension workers to their farms. The response was quite alarming on part of working of extension workers that their visits were very less. During the study only 12.6 percent of the respondents (Table 7, cumulative of once a year, twice a year, and more than twice a year) were able to confirm that they have access to the technical information from the public agriculture extension service. About 87 % percent confirmed that agriculture officer has never visited them. Farmers mostly rely on the information they obtained from the private companies like fertilizer, insecticides and pesticides companies. According to farmers, these companies conduct training sessions for the whole village in regular intervals where they provide basic and necessary information.

Table 7 How Many Times do the Extension Workers Visit you Annually?

Response	Respondents	Percent
Never	83	87.4
Once a Year	2	2.1
Twice a Year	8	8.4
More than Twice a Year	2	2.1
Total	95	100

Question regarding the payments to extension workers was asked from the farmers. All respondents confirmed that they did not pay any amount to the extension workers. Farmers argued that most of the information they obtained from the shopkeepers when they buy insecticides and pesticides from them.

Table 8 Payment for Receiving Extension Services

Answer	Respondents	Percent
No	95	100
Yes	0	0

Farmers were inquired about any assistance they obtained from the extension workers regarding the expected rainfall so that they can make future plans for their cultivation practices. Only 4.2 % of the respondents said that they got information on expected rainfall from extension workers. These 4 farmers shared the information with other farmers within their vicinity. However the outreaching of this information was not possible to all community farmers though it can be a good and practicable mode for dissemination of knowledge. If some farmers are selected from each

community who can spread the important information from the designated extension officer in the area, it can be cost effective and time efficient. In addition to this, these 4 farmers find that information helpful in adjusting their harvesting time period accordingly.

Table 9 Extension Worker Provided you With Expected Rainfall Information?

Response	Respondents	Percent
Yes	4	4.2
No	91	95.8
Total	95	100

Due to lack of help from the extension department/workers, farmers have to rely mostly on other sources of information like Television, Radio and in some villages through internet. However, these sources of information are not reliable. These sources are meant for entertainment and hence do not proved to be efficient for information dissemination (Kumar, 2009b).

The results were dis-satisfactory on the performances of extension services. Also private sector mostly relies on group discussions instead of practical demonstrations on the demonstration plots. Most of the farmers replied that T.V (Electronic Media) and print media are big sources of information for technical information as it was confirmed during the present study.

Table 10 Source of Technical Advice and Assistance for Necessary Information

Response	Respondents	Percent
Printed Media	24	25.3
Electronic Media	2	2.1
Neighbouring Farmers	2	2.1
Printed Media. Electronic Media	18	18.9
Printed Media, Electronic Media, Neighbouring Farmer	15	15.8
Printed Media, Neighbouring Farmer	13	13.7
Printed Media, Electronic Media, Neighbouring Farmer, Shopkeepers in Village	9	9.5
Printed Media, Neighbouring Media, Shopkeepers in Village	9	9.5
Neighbouring Farmer, Shopkeeper in Village	1	1.1

Electronic Media, Neighbouring Media, Shopkeeper in Village	2	2.1
Total	95	100

Conclusions and Recommendations

Climate of Pakistan is changing and is posing serious threats to agriculture sector of the country. This Sector demands a high level of attention by the concerned public as well as private authorities. Government has established Climate Change Ministry which has launched first Climate Change Policy of Pakistan in September, 2012. So government is showing some interest in this scenario. But a lot more is needed to be done on implementation side of the policy.

There is a dire need of new innovations and methods to be implemented for the proper functions of the extension department. Most of the farmers claimed that they had some supply of latest information by the private pesticides and fertilizers companies, but the participation of public sector in this regard is absent to a great extent.

Government should launch a T.V channel especially for farming community that can help them to get aware of new methods of production. A private channel "Sohni Dharti" is on-air however; it is available only on cable or Dish T.V, which is not in access to a large population in rural areas. Government may initiate to launch a new channel on terrestrial T.V network for easy accessibility of the farmers.

Proper funding and teaching schools for the extension workers may also be installed to further facilitate the extension services. A sense of proper accountability by the government authorities on extension workers will compel them to perform their duties more efficiently.

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