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FARMERS PERCEPTION REGARDING ENVIRONMENTAL IMPACTS ON LIVELIHOODS OF RICE GROWING FAMILIES

Asif Yaqoob, Tanvir Ali, Muhammad F. Imam
Institute of Agricultural Extension and Rural Development, University of Agriculture Faisalabad, Pakistan.
PMAS, Arid University Rawalpindi, Pakistan.

A B S T R A C T

Environmental factors are viewed as the significant factors influencing rice production. Truncated production of rice is the loss of livelihoods of rice dependents. Present study aimed to examine the effects of environmental factors on the livelihoods of rice growing families. Through multistage random sampling, 120 rice growers were selected. Data were collected through pre-tested and validated questionnaire administered through face to face interviews. Analysis made using Statistical Package for Social Sciences (SPSS) unveiled that rainfall was a significant factor reducing rice production. Majority (74.2%) of respondents reported high effect of inadequate rains and temperature on rice production. More than half (64.2% and 54.2%) respondents agreed medium level effect of humidity and low level effect of wind on rice production, while hailstorm appeared least with minimal likelihood of damage. Exclusively, effect of rainfall and temperature appeared more threatening for rice production. This study urges the dissemination of effective strategies among rice growers and inception of drought resistance varieties and water conservation techniques could result in better. Early warning system ad weather forecasting information delivery may work better for farmers' betterment.

Keywords: Environmental factors, livelihood, climate, temperature.

INTRODUCTION

Improving Livelihood is represented as a whole of vigorous interactions between actors and five vital capitals i.e. human, natural, physical, financial and social capital. Livelihood is sustainable if it is capable of adequately satisfying self-defined needs and securing people against shocks and stresses. A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living (Csaki & Truck, 2000). Income generated from farming is anticipated as source of livelihood. On contrary, Csaki & Truck (2000) described that rural sector is much more than just farming. In this case rural livelihoods are not limited to income generated farming only but also dependent upon holistic way. However, further expansion in infrastructure through diversified approaches could harness the best returns (Fatima *et al.,* 2016). Rice is one of the major crops on which many farming communities reside. Rice was cultivated on area of 2891 "000" hectares with production of 7005 "000" tones (Government of Pakistan, 2014). Same year Pakistan earned 1.53 billion US$ through rice export. Rice have several varieties in which some are early maturing and some late i.e. course varieties are early maturing varieties cultivated on almost 27% area while late maturing varieties include fine Basmati which is cultivated on almost 62% rice cultivated area. The remaining 11% area is under other rice varieties. Punjab is leading rice growing province where about 96% Basmati is grown because of the suitable climatic conditions for the late varieties (Khan, 2006). In Pakistan, rice is grown under diverse climatic conditions and requires high amount of water. Likewise, Rice timely availability of irrigation water, more acreage under high yielding varieties and more area under cultivation had caused increased in production higher than potential in Pakistan in 2014 (Government of

* Corresponding Author:
Email: asif_yaqoob@ymail.com

Pakistan, 2014). Rice farming is dependent on the environmental factors which are most important among the several factors that influence agricultural production (Treitz & Narrain, 1988). To achieve remarkable yield rice depends upon optimum combination of inputs compulsory for production. Rainfall (intensity and duration), relative humidity and temperature these environmental factors affect the yield of rice. Some factors help in improving production while some have opposite impact (Mbah *et al.,* 2000). When production of rice is low it ultimately affects the sustainability of livelihood of those people who resides on it. In Pakistan, most of the farmers belong to small farmer's category out of total population living in rural areas. Today, climate changes and environmental degradation has increased farming complexities and farmers seem unable to cop the challenges. In this regard, present study is an attempt to explore the impact of environmental factors on production of rice and livelihood of rice growing families.

METHODOLOGY

District Narowal consists of 3 tehsils names as Narowal, Shakargarh and Zafarwal. Tehsil Narowal was selected as study area being one of the significant rice producing area of district. Farming is the major economic activity of the respondents in the area. Almost 80% of population is rural-based with livelihoods mostly dependent on crop farming particularly rice farming. Over the past years, multiple environmental factors such as temperature, rainfall, hailstorm, humidity and wind have contributed to constant food insecurity gradually affecting livelihoods. Tehsil Narowal consists of 39 union councils. Five union councils were selected using random sampling technique. Two villages were selected at random from each selected union council. Twelve (12) rice growers were selected from each village by random sampling technique thereby making a sample size of 120 respondents. Reliable and validated Interview schedule was used as research instrument for the sake of data collection. Data collected were analyzed using Statistical Package for Social Sciences (SPSS). Five point likert scale was used to collect growers' response and in order to compute the impact each frequency was multiplied with the order value allotted (1-5) to each category of the scale used to assess the impact.

RESULTS AND DISCUSSION

Environmental factors directly influence the physiological processes that affect the growth, development, and grain formation in rice plants. Indirectly, these factors influence the incidence of crop insects and diseases and hence, grains yield (Yoshida & Parao, 1976). Effects of these factors are different at different stages of rice plants growth. Data in this regard are mentioned in Table 1, 2 & 3.

Table: 1. Frequency distribution of respondents' view according to effects of environmental factors on the livelihoods.

Environmental Factors	1 Very Low		2 Low		3 Medium		4 High		5 Very High	
	f	%age	f	%age	f	%age	f	%age	f	%age
Temperature	-	-	6	5.0	81	67.5	31	25.8	2	1.7
Humidity	-	-	41	34.2	77	64.2	2	1.7	-	-
Wind	-	-	65	54.2	51	42.5	4	3.3	-	-
Rainfall	-		11	9.2	6	5.0	89	74.2	14	11.7
Hailstorm	3	2.5	84	70.0	33	27.5	-	-	-	-

Table 2. Scoring of environmental factors affecting the livelihoods.

Environmental Factors	1 Very Low		2 Low		3 Medium		4 High		5 Very High		Total Score
	f	Score	f	Score	f	Score	f	Score	f	Score	
Temperature	-	-	6	12	81	243	31	124	2	10	389
Humidity	-	-	41	84	77	231	2	8	-	-	323
Wind	-	-	65	130	51	153	4	16	-	-	299
Rainfall	-	-	11	22	6	18	89	356	14	70	466
Hailstorm	3	3	84	168	33	99	-	-	-	-	270

Table 3. Ranking of environmental factors affecting the livelihood.

Environmental Factors	Score	Rank	Mean	Standard Deviation
Rainfall	466	1	3.88	0.724
Temperature	389	2	3.20	0.643
Humidity	323	3	2.63	0.549
Wind	299	4	2.48	0.533
Hailstorm	270	5	2.25	0.489

Rainfall appeared prominent environmental factors affecting the livelihoods by obtaining 3.88 mean value and standing on 1st rank. Mean value implies that effect is approaching towards impact of high level as perceived by 74.2% respondents. Farmers also described during informal discussion that inadequate rains cause heavy destruction to rice crop which was a mighty blow to our livelihoods. These findings are coincided with those of IPCC (2007) documenting inconsistency of rainfall effects on the rice crop at different times and stages just like growth duration of rice, termination of ripening stage and the ultimate result is reduction in yield. Likewise, Tasleem (2010) had also reported 20% rice production loss in 2010 pertinent to lethargic rains and insufficient water availability. Basak (2008) also presented the same view that lessening rainfall in winter season may cause 0.73-16.6% reduction in rice production. Small number (11.7%) of respondents reported very high effect of rain variability on rice yield and ultimately on their sustainable livelihood as excessive rainfall can destroy the spikes and plants of rice crop. Islam (2011) has also documented the reduction in rice yield pertinent to erratic rainfall.

Rice is a tropical and sub-tropical plant and temperature is another climatic factor that significantly influences the development, growth and yield of rice (Basak, 2010). Islam (2011) was of the view that high temperature cause yield reduction of rice particularly on grain filling stage. Data mentioned in the Table-3 depict that temperature got score of 389 (SD: 0.6430) and ranked 2nd among the factors affecting the rice crop and livelihoods as well. Farmers reported significant effect of temperature on rice production. Due to high temperature water requirement of rice increases and few times the production reduces when farmers failed to fulfill irrigation requirements. Negligible number (5%) of the respondents reported low effect of temperature on rice production followed by greater than half (67.5%) respondents who reported medium effect while one fourth (25.8%) respondents reported high effects on rice production causing reduction in production. Findings are similar to those of Peng *et al.* (2004) where they reported yield decline of rice in tropical climate areas due to temperature severity and similar reaction was recorded when climate of tropical character develops (Peng *et al.,* 2004). Whenever mean temperature exceeds to 26C^{o}, it stops tiller production in rice (Lalitha et al., 2000).

Along with maximum temperature, minimum temperature also has negative impact in reducing about 0.40 to 13.1% of the rice yield and temperature increased in February, March, April and May months (1.21oC, 0.50oC, 0.70oC and 0.83oC) caused almost 13-14% reduction in rice yield (Vergara *et al.,* 1976) which is loss to rice growing families. Shakir & Ahmed (2015) also revealed increasing population of pests subject to increasing temperature. Moreover, the reduction due to maximum and minimum temperature in rice yield affects the sustainable livelihood of farmers as they mostly reside on rice farming.

Data depicted in Table-3 further indicate that humidity got the score of 323 (SD=0.5490) with 3rd rank in order. Humidity had low effect on rice production and livelihoods as was reported by (34.2%) of the respondents followed by greater than half (64.2%) of the respondents reporting medium effect while negligible number (1.7%) of respondents reported humidity have high effect (Table 1). High relative humidity affects the rice crop on flowering stage under increased temperature, including decrease in spikelet fruitfulness (Khan & Sardar, 2008). Results are also line with Matsui *et al.* (1997) indicated that relative humidity of 85-90% at the spikelet fruiting stage induced almost complete grain infertility in rice at a day/ night temperature of 35/30 °C.

Wind got the score of 299 (SD=0.5339) with 4th rank in order. According the data in Table 1 more than half (54.2%) of the respondents reported low effect of wind on rice production and livelihood while less than half (42.5%) of the respondents argued medium effect and

negligible number (3.3%) of respondents showed consensus about high effect on rice yield and livelihood. Farmers were of the view that wind destroys rice plants especially on fruiting stage and strong winds often burn the panicles of a rice crop. Sunil (2000) reported that wind speed during active tillering to heading stage had a significant negative correlation with number of panicles per plant and straw yield. Matsubayashi *et al.* (1963) acclaimed that wind during the growing period of the rice plant shows positive impacts by improving yields by increasing turbulence in the canopy. Moreover, air blown around the plants replenishes the CO_2 supply of the plant and photosynthesis of the plant community increases with the wind speed. However, wind speeds greater than 0.75-2.25 cm/s has no further positive effect except the damage to plants (Matsubayashi *et al.,* 1963). Strong winds also play role in spread of bacterial leaf diseases of rice. These also cause mechanical damage of leaves (Wadsworth, 1959). High wind speed during flowering had instigated pollen dehydration and subsequent spikelet sterility in rice (Rao, 2003).

Hailstorms have negative impacts on livelihood as it damages the rice plant which cause ultimate reduction in production. However, hailstorm appeared least among all factors by obtaining total score of 270. Hailstorm may cause defoliation before flowering which have considerable effect on yield but hail storm during flowering stage of rice cause significant damage to the final yield of rice (Shapiro *et al.,* 1985). Farmers didn't respond exceptionally about the damage caused by hailstorm in recent past. However, some of the farmers who experienced varied level of damage due to hailstorm in past reported the extent of effect on different level as documented in Table 1.

CONCLUSION AND RECOMMENDATION

Reduction in rice yield is subjected to the factors like insufficient rainfall, water deficiency, and high temperature. These factors are threat to sustainable livelihood of rice growers having reliance as income source. Thus, effective and proficient adaptation strategies promotion in area by extension field staff is inevitable. It will help farmers in modifying their strategies and uplifting livelihood by improving production. For the support of farmers' led policies by the coordination research, extension and metrological department are necessary for instance; early warning systems and weather forecasting information delivery could be fruitful. It is need of hour to develop drought tolerant and temperature resistant rice varieties with immediate campaign of water conservation for future irrigation requirement.

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