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Analysis of farmers' communication network and factors of knowledge regarding agro meteorological parameters

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ABSTRACT

Understanding communication networks bear significant importance for undertaking interventions regarding local information needs. It becomes more important if the issues of sensitivity like climate change and its effect on agriculture has to be dealt. The agricultural sector needs accurate, reliable and timely weather and climate information for daily tactical decisions and long-term planning for crop management. They can potentially alter selection and management of crops based on new information obtained within a few weeks or days of planting. The information systems integrating agricultural educators, researchers, extensionists and farmers need to be introduced for agriculture sector for which sufficient data base regarding the gap between the possessed knowledge and the available knowledge and the information source utilization pattern need to be generated. The present study to find out the factors of the knowledge of farmers regarding climate and weather in relation to crop management and the analysis of farmers' communication network was undertaken in Adilabad district (highly vulnerable to climate change effects) of Telangana state of India. A knowledge test specifically designed was administered to 120 respondents and was found that majority of the respondents had moderate level of knowledge. The socio-economic and psycho-personal variables like education, occupation, family type, land holding, social participation, economic motivation, innovativeness, scientific orientation and risk orientation showed positive and significant relationship with knowledge level and in regression analysis education, scientific orientation were positive and had significant contribution to the knowledge level of respondents. Television, radio, agriculture officer and progressive farmers were categorized into strong group of information sources usefulness. In order to support farm level decisions and minimize the loses in adverse climatic and weather conditions farmers' understanding about interaction of climate and agro-ecosystem need to be bridged through inclusion of farmers' communication network

Key words: Climate and weather, Communication network, Crop management, Interpersonal information sources, Knowledge of farmers, Mass media

Achieving sustainable agricultural development with material inputs like seeds fertilizer and plant protection chemicals etc. is hardly possible without active involvement of the people to use them. For achieving this there is a need to focus on human resources for increased knowledge and information sharing about agricultural production, as well as on appropriate communication methodologies, channels and tools. Weather and climate, in current context are considered as important factors impacting the farming community leading to decline in agricultural production and affecting their livelihood, particularly in arid and semi-arid zones. There is need to assist farmers to develop their understanding of relation between climate and crop production with improved planning and better crop management before expecting from them to cope up from vulnerability and manage the effects of weather and climate on crop production. They need to understand that climatic and weather factors like rainfall, water, light, temperature, relative humidity, air and wind in addition to abiotic components including topography and soil, have a profound influence on; crop growth, development and yields, incidence of pests and diseases, water needs, nutrient requirements and also harvesting and marketing time of the produce. There are several farm-level decisions such as the choice of cropping pattern, investment in fertilizers and pesticides, choice of the period for planting, plant population density, choice of planting dates, seed rate etc. which can effect overall production in the variable climate, for which the appropriate choice associated with maximum production or minimum risk depends upon the nature of the climate variability or the prediction for a specific year. Knowledge being a mix of experiences, values and insights (Alvesson 2004), the farmers' confidence in traditional knowledge in relation to weather and climatic information is reducing due to increasing variability in

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climate. Farmers' knowledge and skills are not static but continuously revised integrating modern input along with new ideas and innovations (Rarkasem *et al.* 1999). Majority of the farmers lack knowledge regarding environmental issues and practices for better judicious use and conservation of natural resources (Sarkar 2009).The climate information relevant to production decisions lead to their effective use (Jones *et al.* 1999). To gauge what farmers already know about climatic events and information may be useful in assessing their value, as this knowledge influences their perceptions concerning the use of that information (Stern and Easterling 1999).

An understanding of communication networks and knowledge sharing about weather and climate for crop management bears significant importance for undertaking interventions regarding local information needs. The relationship between technology learning and farmers' personal networks in information gathering has been important (Massey *et al.* 2002). A network consists of a set of actors or nodes along with a set of ties that link them (Borgatti and Halgin 2011). The communication of information being a major concern in agricultural extension services (Demiryiirek 2000) help farmers in their decision making and ensuring that appropriate knowledge is implemented in order to obtain the best results in terms of sustainable production, rural development and also the traders, support and input services to harness knowledge and information from various sources for better farming and improved livelihoods (FAO 2005). Better preparation, through modification of existing and new strategies and policies, developing communication plans to reach low-income farmers, under-served populations and other vulnerable groups can build the resilience of the farming community against climatic shocks. Present investigation is an attempt to generate the data related to knowledge level and communication network of the farmers in venerable zone regarding climate and weather for crop management so that the technology and curriculum to successfully adapt to present and potential variations in climate and weather conditions may be designed.

MATERIALS AND METHODS

The study was conducted in Adilabad district of Telangana state, selected purposively as crop failure is a prevalent phenomenon in this region due to irregular trend of weather and year to year increase in climate variability, which also leads to the indebtedness of several farmers due to increasing cost of crop management. Changes in production and productivity during El Nino years compared to remaining years decreased by 18.0 and 7.0 per cent respectively, in Telangana region whereas average productivity of rice during *kharif* season decreased by more than 10 per cent in Adilabad district falling in Deccan Plateau, hot arid agro ecological region at 19^{0}40'0''N and 78^{0}46'60''E at an height of 263 meters above mean sea level (Rao *et al.* 2011). The net sown area is 35.4 % out of the total geographical area of 40, 04,035 acres of the district where 23 % is sown more than once. The most important river of the district is the Godavari in addition to rivulets such as Penganga, Wardha and Pranahitha. O'Brian *et al.* (2004) described Adilabad district among the most vulnerable to climate change effects. Out of the fifty two mandals of Adilabad district, three mandals were selected randomly by lottery method. Two villages from each selected mandal namely Kubeer and Chondi of Kubeer mandal, Tosham and Takiguda from Gudihathnur mandal and Muthampet and Tatipalle from Kouthala mandal were selected randomly and from each village, twenty farmers were interviewed to make a total of one hundred twenty farmers for primary data collection.

A standardized knowledge test was developed and used to measure knowledge level of respondents. The test included 18 items related to five sub heads namely weather and climate parameters (3), crop planning (4), crop production (4), crop protection (5) and post-harvest management (2). Usefulness and utilization of inter personal information source and media sources were assessed on five point continuum. To assess the psychological variables, standard designed measures like economic motivation, scientific orientation and risk orientation with scale of Supe (1969) and innovativeness with Prasad (1983) were utilized.

RESULTS AND DISCUSSION

Knowledge level of farmers regarding climate and weather parameters and relationship with socio-economic and psycho-personal characteristics

On the basis of the data received from 18 items related to five sub-heads, the sum of all the scores on each item was totaled to obtain the individual farmers' knowledge score and farmers were categorized in low, medium and high categories on the basis of mean and standard deviation. It is evident from Table 1 that highest number of farmers (41.7 %) were in medium category followed by high (30 %) and low (28.3 %). Subject matter wise possessed knowledge of all the respondent farmers has been shown in Table 2. It is clear that farmers possessed highest knowledge in 'post harvest management' (70%) in comparison to other subject matter areas like 'general climate and weather parameters'(49.73%), 'crop planning' (46.47 %), 'crop production' (49.15) and 'crop protection' (56 %). However, the variation among subject matter areas was less except 'post harvest management'. The results are in support of Dietz *et al.* (2007), where it was reported that two third of the respondents were having knowledge regarding climate change.

Table 1 Level of farmers' knowledge about climate and weather in relation to crop management

Level of knowledge	Percentage of farmers
Low	28.3
Medium	41.7
High	30.0

Table 2 Distribution of subject matter area according to possessed farmers' knowledge about climate and weather in relation to crop management

Major subject matter area	Percentage of knowledge
General climate and weather parameters	49.73
Crop planning	46.47
Crop production	49.15
Crop protection	56.00
Post harvest management	70.00
Average	54.27

The coefficient of correlation of each of the personal, socio-economic and psychological variables with knowledge level of farmers about climate and weather in relation to crop management presented in Table 3 revealed that among 14 variables of farmers under study, nine variables, *viz.* education, occupation, family type, land holding, social participation, economic motivation, innovativeness, scientific orientation and risk orientation showed positive and significant relationship at 0.01 level of significance whereas the three variables namely, age, caste and gender had shown not any significant relationship with knowledge level. Lazo *et al*. (2000) also reported similar observations.

Factors contributing to farmers' knowledge regarding climate and weather parameters in relation to crop management

The correlation analysis merely gives an idea about the association of independent variables with the dependent variables. In order to assess the contribution of each independent variable to the prediction of dependent variable the data were adapted to regression analysis. The results presented in Table 3 showed that the variable, education had positive and significant contribution to the knowledge level of respondents at five per cent level of significance while scientific orientation had significant contribution to knowledge level at one percent level of significance. As found in Table 3, 'F' value was significant at one per cent level of probability. The R^2 value was 0.810 that revealed that 81.0 per cent variation in the knowledge level of farmers was explained by the 14 independent variables under study. The strength of contribution of these variables could be explained as one unit increase in education, farming experience and scientific orientation would bring an increase of 0.210 and 0.683 units in knowledge level respectively. The farmers having high knowledge level might be due to due to higher education and scientific orientation. Other reason for medium knowledge level of farmers might be due to positive and significant relationship of occupation, family type, land holding, social participation, economic motivation, innovativeness and risk orientation of farmers with knowledge level about climate and weather in relation to crop management

Table 3 Correlation coefficient and multiple regression analysis of socio personal and psychological variables with knowledge about climate and weather in relation to crop management

Characteristics	'r' value	Coefficient multiple regression		Signifi-cance
		'β' values	't' values	F value
Constant			0.045	0.965
Age	0.015^{NS}	0.070	0.813	0.418
Gender	0.072^{NS}	0.020	0.251	0.624
Caste	0.088^{NS}	0.004	0.074	0.941
Education	0.639**	0.210	2.612*	0.010*
Occupation	0.373**	-0.010	0.181	0.856
Family type	0.250**	0.067	1.356	0.178
Land holding	0.439**	-0.073	-1.011	0.314
Social Participation	0.707**	0.077	0.893	0.374
Economic motivation	0.734**	-0.070	-0.568	0.571
Innovativeness	0.736 **	-0.172	-1.231	0.221
Scientific orientation	0.835**	0.683	6.312	0.000**
Risk orientation	0.687**	0.114	1.181	0.240

**Significance at 0.01 level of probability,* Significance at 0.05 level of probability, R^2=0.810

Sources of climate and weather information in relation to crop management

The results of frequency of information source contact has been explained in the form of radar chart (Fig 1 and 2) in which the extent of distance from the centre point of the chart explains the strength of information contact, lesser the distance from the centre, weaker the information source contact. Television among the mass media had shown the strong contact among the farmers as far as frequency is concerned (Fig 1). 59.2 % opined that they often exposed with television. Whereas radio was considered as moderate source of information contact, this may be due to decreased use of radio among the farmers. Similarly mobile was also categorised under moderate source of contact. Newspaper, farm publication and internet were regarded as weak source of information contact among the farmers. The results in Fig 2 indicate that among the interpersonal information sources family members, progressive farmers and neighbours had shown the strong information source contact which might be due to the easy availability of these sources. Majority of the farmers often contacted family members, progressive farmers and neighbours as information source. These findings are in close conformity with the findings of Somasundaram and Singh (1978) and Bhagat *et al.* (2004), whereas it was reported that progressive farmers, neighbours and relatives were the most utilized personal localities. Agriculture officers, input agencies, NGO's and relatives were moderately contacted by the farmers, which may be due immediately unavailability of the sources. University scientist was considered weak source of information contact may be due to non availability in near proximity.

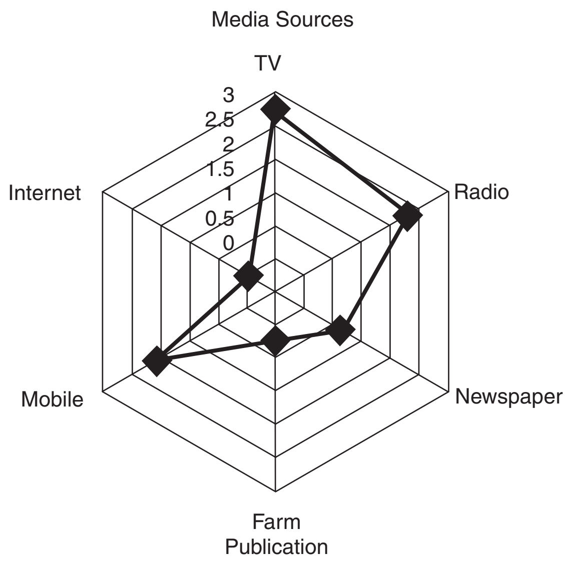

Fig 1 Frequency of contact with interpersonal sources

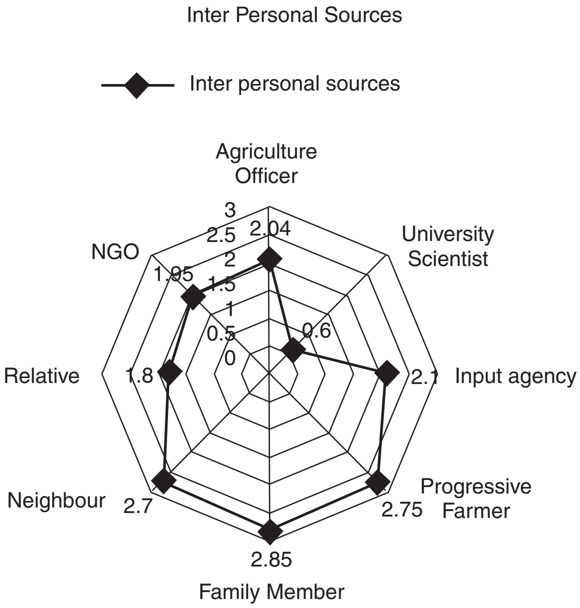

Fig 2 Frequency of contact with mass media sources

The communication network of the farmers

As communication network is important for interaction and exchange of knowledge among the members of the sub-system, communication network of farmers has been worked out from the analysis of usefulness of information sources (Fig 3). The interaction of respondents and nature of information exchange is represented in communication network form. The degree of information source usefulness was categorized into three groups based on their mean frequency as Weak (up to 1.33), Moderate (> 1.33 to < 2.66) and Strong (> 2.66 to < 4.00) information sources. From Fig 3 it can be interpreted that television, agriculture officers, progressive farmers and radio had shown strong degree of usefulness for the farmers and interaction with these sources constituted a good level of dissemination of information within sub system, which was mainly due to

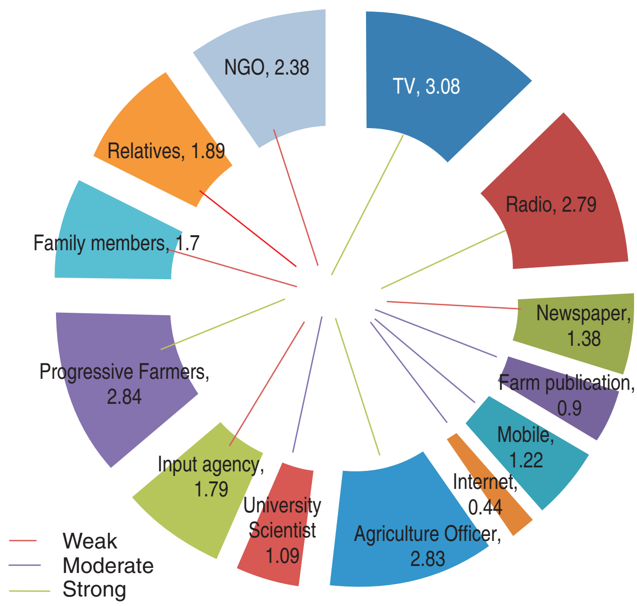

Fig 3 Farmers' Communication network about climate and weather in relation to crop management

timeliness, need based and understandable content of message. Family members, relatives, neighbours, input agency, NGO's and newspaper were reported moderately usefulness which might be mainly due to homogeneity of information sharing between farmer and these information sources. Other information sources such as internet, mobile, farm publication and university scientist had shown weak degree of usefulness, which might be due to complexity in usage and practicality of information sources among the farmers. It may be inferred that information sources such as television, radio, progressive farmer and agriculture officer showing the strong degree of usefulness, need to be promoted for the dissemination of information with high degree of effectiveness. Other sources such as mobile and internet which were considered as modern tools of dissemination had not found proper place in terms of usefulness and contact among the farmers which need to be promoted in mission mode so that real time information on sensitive issue of climate and weather can be disseminated among the farmers.

Network analysis identified strong linkage of contact for television, family member, neighbour and progressive farmers as information sources, even in the era of modern information sources such as mobile and internet with which the farmers were less aware and accessed at very limited scale, may be due to the problem of complexity of their use, lack of trainings in their use, format and content relevancy. Regarding the knowledge part, the weather and climatic information pertaining to crop protection and crop production were the grey areas which need to look into through appropriate content designing and human resource development activities. The socio psychological factors which explained almost 81 per cent of the knowledge need to strengthen through expansion of capacities and exposure of farmers. As such, bridging the knowledge gap through improvement in communication network has to go a long way in supporting farm level decisions and minimize the agricultural production and income loses in adverse climatic and weather conditions. Policy planners, extension institutes and other stakeholders need to develop alternate extension approaches inclusive of the farmers' communication network and their information seeking behaviour.

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