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Short communication

Economic impact analysis of agro-advisory services during kharif season in central plain agroclimatic region of Punjab*

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Punjab has 1.5% of India's geographical area, but its production represents more than 50 and 60% of the central pools of wheat and rice, respectively. Rice-wheat is the predominant cropping system covering about 60% of the cultivated area, the Ludhiana, representing the central plain agroclimatic zone of Punjab, India. In Punjab, the rice is the main *kharif* season crop and crop season extends from May to November. Rice can grow well on soils with low permeability and over a wide range of soil reaction viz., pH 5 to 9 and generally loamy soils are best for rice cultivation. It is best suited to regions of high temperature, high humidity, prolonged sunshine and assured water supply. A temperature range of 20 to 37.5°C is required for its optimum growth. The crop requires higher temperature at tillering than that during early growth. For early sown varieties, the favourable range of humidity is 83 to 85% and for late ones it is 67 to 68%. Farmers of the area are very much progressive and aware about the new agricultural techniques. Farmers' option on selection of varieties, input use, crop management and protection practices and harvest is influenced by spatial and temporal changes in important weather parameters like rainfall, temperature, wind speed and direction, cloud cover and humidity. The weather forecasting and weekly agroadvisory services at regional level have been critical in instrumentalising the farmers to adjust their production plans in favour of optimum production but lack of timely and reliable agrometeorological information is a serious limitation for effective farm planning operations.

For this study, two villages were selected in well-developed area in the central plain agroclimatic zone. Similarly, two villages were selected in less developed area within the agroclimatic zone. Forty farmers were selected from well-developed area that adopts agroadvisories and 40 farmers from less developed area that does not adopt agroadvisories. The farmers were categorized on the basis of their age, education level and land holdings. Detailed survey data as per approved performa were collected from all 80 farmers during both the *kharif* 2003-04 to *kharif* 2006-07. The Agromet Advisory bulletins were handed over directly to AAS farmers on every Tuesday/Wednesday during the study period. The benevolent and malevolent effects of AAS were collected through regular field visits as per the questionnaire given by NCMRWF/NCAP and the economic impact analysis was carried out based on the feedback obtained from the identified AAS and non-AAS farmers.

Table 1 represents the weather sensitive crop growth stages of rice crop, where weather sensitivity for different crop growth stages is shown that which weather parameter is more sensitive to which growth stages like during *kharif* season mainly high temperature is the main concern. Even after harvesting, rainfall and temperature play a great role in post-harvest techniques. Table 2 shows the major diseases of the rice crop related with weather. The crop-wise farm operations based on weather summary are given in Table 3 signifying the importance and relevance of weather-based agro advisory service and its utility during the growing seasons of both the crops for the period under study. While analyzing season-wise impact of AAS, it may be concluded that in rice crop (2004), the overall total income of AAS adopted farmer group was higher by a value of Rs. 1220 per acre over non-AAS group. This was due to increase in rice yield (2.7 q $acre^{-1}$) over non-AAS farmers. This income may be due to better fertilizer and irrigation management, which resulted on the basis of weather-based advisories.

Impact of advisory on paddy

During *kharif* 2005, overall total income of AAS adopted farmer group was higher by a value of Rs. 2193 per acre over non-AAS group. This was due to increase in total yield (28.0 q $acre^{-1}$) over non-AAS farmers, whereas a net profit of Rs. 10,502 per acre was gained by AAS over non-AAS farmers. This profit may be due to better fertilizer and irrigation management due to the time to time advice given in the form of agroadvisories to the AAS farmers (Singh *et al.*, 2008). The price and quantity analysis for rice in *kharif* (2006) revealed that overall total expenditure of AAS farmer group was lower by a value of Rs. 2119 per acre in comparison to

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Table 1: Weather sensitive crop growth stages of rice crop

Crop growth stage	Standard met. week	No. of days	Important weather parameter related to respective crop growth stage	Effect of weather parameter
Seedling	22	14-22	Rainfall	Seedling mortality and less growth at lesser rainfall
Transplanting	26	30-35	High temperature	High temperature is harmful
Tillering stage	28	45-60	Temperature	Increased temperature less tillering, effected by low night temperature
Panicle initiation stage	31	60-70	High wind speed	High wind speed desiccates panicles
Booting stage	35	90-95	High temperature and high humidity	High temperature less elongation, susceptible to rainfall
Heading stage	36	95-105	High temperature	Very sensitive to high temperature
Flowering stage	38	105-125	High temperature	Long days delay flowering, anthesis sterility with high temp., inflorescence inhabitation
Milky stage	39	110	Rainfall	Sensitive to high rainfall
Maturation stage	42	135	High wind velocity	Strong winds cause lodging

Table 2: Effect of weather on major diseases of the rice crop

Crop	Disease	Crop growth stage	Standard met. week	Critical weather parameters	Control measures (Chemical/Biological)
Rice	Sheath Blight	Late tillering	28-35	High humidity	Spray foliar fungicides
	Bacterial leaf blight	Seedling stage/ early tillering	22-28	High rainfall, strong wind	Rolling of stubbles

Table 3: Weather summary of observed and forecasted weather–Crop-wise and operation-wise

Crop	Operation	Period of operation	Critical weather parameter	Forecast of the critical weather parameter during the period of operation	Observation of the critical weather parameter during the period of operation	Vetification in terms of the skill, RMSE, usability, correlation of the weather parameter	Specific comments on the positive/ negative effects of the forecast on the crop
Rice	Sowing	Sowing	Rainfall	Yes	Yes	Unusable	Timely sow the nursery
	Transplanting	Transplanting	High temp.	Yes	Yes	Usable	Enough moisture availability

non-AAS farmer group. Weather-based Agro Advisory Services provided through AAB to the AAS adopted farmers could help in proper management of different farm inputs like irrigation, pesticides and human labour by AAS adopted farmers (Rathore *et al.,* (2003). Forecast of rainfall on 5 July 2005 helped AAS adopted farmers to applying irrigation to rice crop during transplanting and consequently saved the expenditure of human labour. The overall total income of AAS adopted farmer group was higher by a value of Rs. 1325 over non-AAS group. This was due to increase in total yield (2.2 q/acre) over non-AAS farmers. Whereas a net profit of Rs. 1843 per acre was gained by AAS over non-AAS farmers.

The grain yield increase was nearly 8% on an average in the case of AAS farmers over non-AAS farmers and the economic gain was Rs. 3416 per acre irrespective of the season. Interestingly, the percentage increase in grain yield was more (8.5%) in *rabi* when compared to *kharif* (7.8%). It was attributed to the effective implementation of agro-advisories during *rabi* season rather than *kharif* season due to less accuracy of monsoon rainfall during *kharif*. The maximum increase (9.2%) in grain yield was noticed in *kharif* 2003-04, followed by *kharif* 2004-05 (8.1%) and least during 2005-06 (6%). It was 7.3 and 9.4% in *rabi* 2004-05 and 2006-07, respectively. Sheath blight is the common disease of this region of state during *kharif*. The occurrence of this disease is more abundant during the rainy season when high humidity and cloudy conditions prevail. AAS farmers reaped more yield when compared to non-AAS farmers owing to timely action taken against the disease and percentage increase in yield varied from 6.3 to 9.0 during *kharif* season. During *kharif* season, rice leaf folder in vegetative to early reproductive phase and rice stemborers during reproductive to maturity phase were the two major pests. Incidence of these pests reduces the final yield and quality of paddy grains. The population of rice borers increases at the end of rainy season. Warm weather, overcast skies and frequent drizzles favour its population build up. Due to agroadvisory service, the economic grain varied from Rs. 2932 to 3581 per ha in the case of AAS farmers during *rabi* season.

REFERENCES

Prasada Rao, G. S. L. H. V. and Manikandan, N. (2008). Economic impact of agrometeorological advisory services over the Central Zone of Kerala. *J. Agrometeorol.*, (*Spl. issue–Part I*). pp. 230-34.

Rao, G. S. L. H. V. P. (2008). *Agricultural Meteorology.* Prentice Hall of India Private Limited, New Delhi. pp. 364.

Rathore, L. S., Singh, K. K. and Gupta, A. (2003). National Centre for Medium Range Weather Forecasting : Activities, current status and future plans. In : National Seminar on Agrometeorology in the New Millennium : Prospectives and Challenges, October 20-31, 2003, PAU, Ludhiana. Abstract/Souvenir. pp.141-47.

Singh, Surender, Rao, V. U. M. and Diwan Singh, (2008). Economic evaluation of weather-based advisories in semi-arid region in India. *J. Agrometeorol.*, (*Spl. issue–Part I*). pp. 225-29.