



REAL TIME CONTINGENCY MEASURES FOR CROP MANAGEMENT UNDER RAINFED CONDITIONS IN SHIWALIK FOOTHILLS



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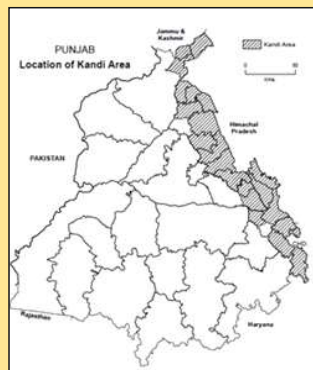
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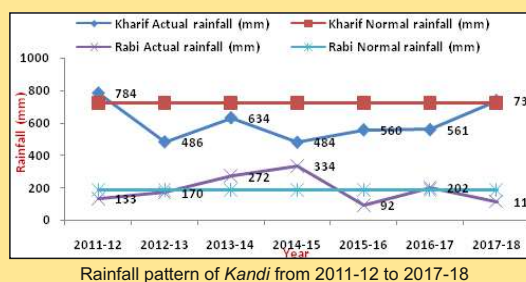
INTRODUCTION

In the North-Eastern part of the Punjab about 0.393 mha area (7.8 % of state area) in the Shivalik foot hills known as *Kandi* stretches from Dhar Kalan block of Pathankot district to Dera Bassi block of SAS Nagar, covering parts of Pathankot, Hoshiarpur, Shahid Bhagat Singh Nagar, Roop Nagar and SAS Nagar districts. The per capita availability of food grains in the *Kandi* belt is low which is 1871 g/day as compared to 3188 g/day in the rest of Punjab. Despite having surplus food grain production in Punjab, *Kandi* belt is still facing the problem of food security.



The crop production in *Kandi* is dependent on the rainfall which varies from 845 mm to 1500 mm annually and 80% of rainfall occurs in monsoon from June to September. Most of the rain water is lost through the seasonal streams called '*choes*' resulting in acute moisture stress and drought like situation in crops during dry spells. Moreover, due to climate change the rainfall pattern has also shown a declining trend in *Kandi* belt particularly in *kharif* season. Further, the weather aberrations like delayed onset of monsoon, mid-season dry spells and early withdrawal of monsoon have intensified. The dry spells mostly occur during the critical stages of the crop growth which have an adverse impact on crops resulting in low productivity.

The Regional Research station (Punjab Agricultural University), Ballawal Saunkhri under the schemes, All India Coordinated Research Project for Dryland Agriculture (AICRPDA) and NICRA under the guidance of ICAR-Central Research Institute for Dryland Agriculture (CRIDA) has developed and upscaled real time contingency measures to



Rainfall pattern of *Kandi* from 2011-12 to 2017-18

get sustainable crop production and to ensure food security under rainfed conditions in *Kandi* Region. The real time contingency interventions implemented in rainfed ecologies maintain optimum crop stand in the field which when properly managed ensure adequate yield and income to the farmer. The following preparatory measures may be adopted in *kharif* season to ensure good yield:

- Summer ploughing before the onset of monsoon during peak summer in the month of May or early June.
- Minor land leveling for uniform distribution of water and fertilizer in the field.
- Field bunding to reduce runoff and soil loss and increase infiltration of water into the soil.
- Selection of crop varieties suitable for cultivation under drought conditions.
- Sowing of *kharif* crops on ridges to mitigate the effect of excess rains.

A. Real time contingency measures for *kharif* cropping: The normal onset time of monsoon in *Kandi* belt is around 1st July. Under normal monsoon onset conditions maize is the most remunerative *kharif* crop in *Kandi* belt. The other important *kharif* crops of the domain area are sesame, bajra, greengram, blackgram etc. Based on

the prevailing weather conditions following crop management strategies may be adopted to obtain good economic yield under different scenarios:

Scenario I: Normal onset of monsoon and early stress

- Create soil mulch with improved wheel hand hoe to prevent the loss of soil moisture and to control weeds
- Remove weaker plants to reduce plant population
- Apply foliar spray of 1% Potassium Nitrate (10 g per litre of water)
- Use harvested rainwater for life saving irrigation
- Remove weeds to avoid competition for water
- In case of crop failure grow alternate crops like sesame, blackgram and greengram up to mid July
- If crop fails due to the prolonged dry spell then fodder bajra may be sown in the month of August.



Water harvesting pond



Foliar spray

Scenario II: Normal onset and mid season stress

- Apply supplemental irrigation, if available
- Remove less vigorous plants up to 20% and use as fodder
- Apply foliar spray of 1% Potassium Nitrate (10 g per litre of water) at pretasseling stage,
- Remove weeds to avoid competition for water.
- Apply locally available vegetative mulch material in between crop rows

Scenario III: Normal onset and terminal stress

- Apply supplemental irrigation, if available.
- Remove cob less plants and use as fodder.
- If crop is at milk stage, harvest and sell the green cobs in market.
- At dough stage, harvest the crop and do vertical staking of the crop.
- If field is vacated due to early maturity of crop, then cultivate the field to conserve moisture for *rabi* crops.
- Toria may be sown to compensate the loss due to failure of maize crop and sow late sown variety of wheat like PBW 658 and PBW 590 after the receipt of winter rains in December.

Scenario IV: Delayed onset of monsoon

Sowing window of maize is very short (20th June to 7th July). It performs well only when it is sown in time. Late sown maize suffers due to moisture stress at the time of grain filling. So, the maize crop should not be sown if monsoon onset is delayed beyond 7th July.

- If monsoon onset is delayed by 15 days sow alternate crops like greengram,

blackgram and sesame.

- If monsoon onset is delayed by 30 days sow greengram for grains or pearl millet for fodder.

B. Real time contingency measures for *rabi* cropping: For raising a successful *rabi* crop in *Kandi* area follow these soil moisture conservation practices:

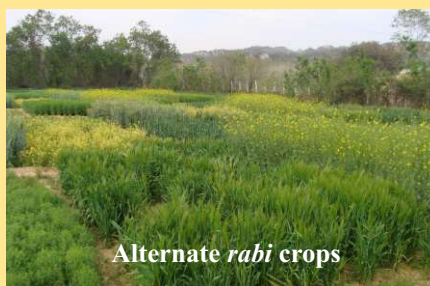
- Apply locally available vegetative mulch material in standing maize crop in the month of August.
- After the harvest of *kharif* crops plough the field in evening hours followed by planking in the morning.

If soil moisture is optimum at the time of sowing then wheat, raya, taramira, chickpea and lentil may be sown in the first fortnight of November.

Based on the prevailing soil moisture conditions the following real time contingency measures should be followed for *rabi* cropping:



Alternate *Kharif* crops



Alternate *rabi* crops

Scenario I: Low soil moisture at sowing:

- Place the seed in the moist soil zone to ensure uniform germination in the field.
- If the seed zone moisture is inadequate increase the row to row spacing for wheat to 30 cm as compared to sowing at row to row spacing of 22-25 cm in good soil moisture conditions.
- Chickpea, linseed and rapeseed & mustard should be preferred for sowing than wheat.
- Sow chickpea after seed priming in 0.05% molybdenum solution (0.5 g molybdenum per liter of water)
- Sow wheat crop after soaking seed in 0.1% thiourea solution (1 g thiourea per liter of water).
- Sow the wheat crop after pre-sowing irrigation with the harvested water, if available.
- Sow late sown varieties of wheat like PBW 658 or PBW 590 after the receipt of winter rains.
- To mitigate the effect of high temperature on grain filling apply 2 sprays of 2% potassium nitrate (20 g per litre of water) at boot leaf and anthesis stages.

Scenario II: Failure of winter rains: If winter rains fail then adopt following measures to save the crop sown under optimum moisture conditions:-

- Apply supplemental irrigation with the harvested rain water.
- Apply foliar spray of 0.1% thiourea solution (1 g thiourea per liter of water) to wheat at maximum tillering and booting stage.

So, by adopting these real time contingency measures farmers can mitigate the adverse effect of the weather aberrations on the crops.