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Contingency Crop Planning under Aberrant Weather

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Contingency Planning (CP)

It means a future event or circumstance which is possible but cannot be predicted with certainty is known as the contingency planning. After sowing of crops and early growth any unexpected or unfavorable weather abnormality like long dry spell of three to six weeks, drought/early cessation of monsoon may occur. Unexpected or accidental occurrence of unfavorable weather after sowing is contingency and crop planning to overcome this contingency is called contingency crop planning.

Contingency Crop Planning (CCP)

Contingency crop planning is defined as the planning the cropping system under aberrant weather condition such as delay of onset, erratic monsoon, rainfall distribution to meet the requirement of food, fodder and grain of the farmers as well as the State or CCP refers to making available a plan for providing alternative crop or cultivar or varieties choice in tune with the resource endowments of rainfall, delay onset and soil in a given location.

Contingency planning refers to mitigate any unexpected, unusual, unfavorable and hence unwanted accidental weather situations occurring at any time without prior knowledge at any time before the crops are sown or even after the crops are sown. The contingency crop planning therefore is proposed to mitigate such situation through the choice of appropriate crop and varieties, cropping systems or other necessary relevant farm practices. To develop a contingency plan for an area, a detailed study of the rainfall data should be done first. Based on this rainfall data, the planning should be done. In any areas generally following rainfall situation may occur:

- Early onset of monsoon.
- Normal onset of monsoon followed by immediate prolonged dry spell.
- Delayed onset of monsoon.
- Early cessation of rains.
- Extended monsoon.

Brief about aberrant weather and impact

The weather aberration affects the normal cropping systems and causes negative impact on sowing, growth, development, logging and productivity of the different crop during the major season as *kharif* and *rabi* of the country. The two major weather parameters (during monsoon rainfall amount and winter temperature or mean temperature for the decide the sown of mustard or gram, wheat etc.) are playing the significant role for the sowing of crops, *kharif* season the south west monsoon onset and normal precipitation will be help the Indian farmers for their timely sowing. The rainfall of 274 mm with 14 rainy days occurred against normal (350 mm). Rainfall of 76.7 mm in 36th SMW (1st week of Sept.) had mixed effect (-ve & +ve) for *kharif* 2014 crops. After timely start but poor onset (upto 3rd week, were 22.8 mm rains occurred in 3 rainy days), rainfall of 51.8 mm occurred during 4th week of July, which helped in sowing as

well as better crop establishment at initial growth. However, later on long dry spell in August adversely affected the *kharif* crops production.

Late onset of monsoon

During some of the years the onset of south west monsoon gets delayed so that the crops/varieties which are regularly grown in the region cannot be sown in time. Delayed sowing of the crops can lead to reduced and even uneconomical crop yields. Under these circumstances, two management options are available. Crop production in dryland suffers from instability due to aberrant weather condition from time to time.

1. Transplantation-This is the surely way of compensating the delay in the commencement of rains, through transplantation is labour intensive operation.
2. Alternate Crops/Varieties-certain crops/varieties can perform better even if sown late in the season.

Dry spell immediately after sowing

Dry spells are common in dryland agriculture. Due to dry spell after sowing of crop it might result in poor germination due to soil crusting, withering of seedlings and poor establishment of crop stand. The adverse effect of moisture stress should be mitigated to avoid total crop failure. It is necessary to maintain proper plant stand to ensure better yield. Therefore it is better to re-sown the crop than to continue with inadequate plant stand.

Mid season correction or dry spells during crop period

To mitigate the damaging effects of droughts after sowing of crop following mid season corrections are recommended:

- a. Ratooning: The rate of soil moisture depletion increases with increasing leaf area. If drought occurs at 40- 50 DAS, reduction in leaf area either by rationing or thinning plant population can mitigate the adverse effects of drought.
- b. Mulching: If the break in monsoon is very brief, soil mulching was found to be tool in extending the period of storage of water in the soil profile due to reduced heat load on the soil and hence the evaporation losses which in turn leads to extended periods of water availability. Soil mulch minimizes deep cracking leading to reduced evaporation losses.
- c. Thinning: If drought occurs during pre-flowering stage thinning is useful. Every third plant or alternate row may be removed to reduce the soil moisture loss and preserve it. Moisture stress of 35-50 days can be lessened by such thinning.
- d. Weed Control: Weed control is very essential to save the crop from onslaught of drought as weeds rob soil moisture and nutrients as well.
- e. Rain water harvesting and recycling: In situ water harvesting and /runoff recycling are the potent measures for crop life saving during the periods of moisture stress. There is no control over the receipt of rainwater but it can be managed in a way better what is being done at present after it is received. Supplementary irrigation provided to crop through rainwater harvesting and recycling particularly during the grain formation stage will be very much rewarding.
- f. Stripping of crop leaves: Generally, photosynthesis occurs in the upper 3-4 leaves. Hence excluding these leaves, lower leaves from plant may be removed to reduce transpirational losses.
- g. Intercropping and risk distribution: Application of meteorological information in terms of the frequency and probability of breaks in monsoon rains can be made to select a combination of crops of different durations in such a way that there is time lag in the occurrence of their grow for appropriate intercropping systems. The choice of intercrop depends upon the pattern of rainfall.

There are 3 possibilities as:

- Rainfall more uncertain in the early part of season.
- Rainfall more uncertain in the later part of season.
- Rainfall more or less uniformly distributed (in other words, risk is uniformly distributed).

Region System crop suggested

Hisar Pearl millet + Cowpea, Agra Pearl millet + green gram

Early Withdrawal of Monsoon

Early withdrawal of monsoon before *rabi* seeding leads to problem of crop stand establishment and terminal drought. Therefore, *rabi* seeding should be as far as possible in early September to avoid the above two problems. All the suggested measures to mitigate the adverse effect of prolonged dry spells during crop period are necessary to overcome the soil moisture stress during the early withdrawal of monsoon.

Extended monsoon

Extended monsoon is seldom a problem in dryland agriculture. It benefits long duration kharif crops taken as a component crops in intercropping system and is also advantageous for *rabi* crops.

Weather fluctuation

In the winter season, the temperature fluctuations, foggy weather, fog, frost, thunderstorm, high wind speed and hailstorm (In many parts of the state, hailstorms and thunderstorms caused significant losses to field, vegetable and fruit crops) completion along with rainfall events cause severe crop damage in Haryana during recent or past few year or decade. Both maximum (T_{max}) and minimum temperature (T_{min}) was abnormally higher during first fortnight of October and as such the sowing of mustard crop was delayed. Thereafter, temperatures were subdued and remained around normal. The weekly T_{max} continuously remained below normal upto 1st fortnight of Feb which helped in proper growth and development of crops.

Extreme weather events

An extreme (weather or climate) event is generally defined as the occurrence of a weather or climate variable above (or below) a threshold value near the upper (or lower) ends of the range of observed values of the variable. Some climate extremes (such as drought, flood, and flash flood) may be result an accumulation of weather or climate events that are individually. High intensity rains are quite common during the rainy season contributing 75% of seasonal rainfall. The inevitable runoff (10-40% of the total rainfall) could be stored in dugout ponds of appropriate sizes and recycled to the donor area, in the event of severe moisture stress. Unseasonal rain and Hailstorm in various pocket of crop growing in the state during February 2014 and Feb-March 2015 caused losses in several districts of the state and the extent of crop loss was varies in percentage.

Extreme events in India

The India mainly agriculture country the economic and further its growth purely depends on the vagaries of the weather and in particular the extreme weather events. Basically the climate of India is dominated by the summer monsoon from June to September. The entire year is however divided in to four seasons: Winter (January and February), Pre monsoon or hot weather season (March, May), South West Monsoon or Summer Season monsoon (June-September) and post monsoon (October, December). Year to year deviation in the weather and occurrence of climatic anomalies/extremes in respect of these four seasons are.

- Cold wave, Fog, Snow storm and Avalanches
- Hailstorm, Thunderstorm and dust storms

- Heat wave or Loo during summer season specially north west or north east India
- Tropical cyclone and tidal waves
- Floods, Heavy rain and landslides, and
- Droughts (Meteorological, agriculture, seasonal, temporal, hydrological drought)

Adaptation and mitigation strategies

Adaptation and mitigation strategies in several districts of the state are to be devised to reduce the negative or adverse impacts of aberrant weather situation on wheat, mustard, gram etc. cultivation during the *rabi* seasons. Used of alternative varieties adapted to climate change, shift of sowing windows, water management, nutrient application, foliar spray of agrochemical might help in reducing the adverse effect.

The aberrant weather and results of Haryana in recent year

a. Kharif: Delayed monsoon results in non-sowing of traditional kharif crops which accounts for nearly 25 to 30% of the total area under crops. So also early withdrawal of monsoon interferes sowing of Rabi a crop which is main constraint of crop production in the region.

- Weak monsoon leads to create the drought situation and failure of crops to negative impact over the socio-economic status of the farmers.
- The delay start of monsoon in the Haryana state reduced the sowing of kharif crop specially the transplanted rice in North east districts of the state.
- The delay release canal water due to the delay monsoon or erratic rainfall, distribution from the department of agriculture, Haryana.
- Rainfall received during the season at Hisar was 264.1 mm which was almost 4 times higher than normal (60 mm). From 2nd fortnight of Feb. upto 3rd week of April, rainfall amounted to 209 mm.
- The continuous high rainfall or cloud burst situation in a short span leading to water logging.

b. Rabi season crops

- The rainfall coincided with the anthesis in wheat, affected the number of grains per ear thus resulting in poor wheat productivity.
- Higher rains also promoted white rust in mustard, incidence and spread of yellow rust of wheat in some parts of the state. Rainy spells from Jan to March favoured the development & multiplication of karnal bunt also.
- Un-usual rains (ultimately, unseasonal etc.), thunderstorm and hailstorm, high wind speed for both rainfed and irrigated situation negative impact.
- Cold wave, frost (damage the crop cells) and foggy (promote the insect, pest and diseases) weather also negative impact of crops.

Prepare the contingency crop planning for rice crop

In different weather situations or aberrant, various contingency plans are prepared which can be followed for the better rice crop yield and rice based cropping system in the state:

In the summer operation

1. Deep ploughing should be done to facilitate the conservation of moisture and sun exposure of the fields for the control of pests and diseases and also for the better conservation of soil moisture in all types of farming situations.
2. The canals and ponds must be desilted in the month of May and June each year, irrigation pumps must be in functioning condition. If required, new equipments/water pumps/ diesel pumps can be purchased.

3. Line sowing to avoid mortality of germinating seed in case drought follows after scanty or erratic rainfall events.
4. Due weak monsoon forecasted farmers go for less water requirement crop such as late Narma/cotton, maize, sugarcane, guar, bajra etc. do the sowing operation at right time in the State.
5. Adopt the water conservation technology to harvest rain water.

District level contingency plans cover contingency strategies to be taken up by farmers in response to major weather related aberrations such as delay in onset and breaks in monsoon causing early, mid and late season droughts, floods, unusual rains, extreme weather events such as heat wave, cold wave, frost, hailstorm and cyclone.

Strategies for weather related contingency (Drought, Rainfed situation)

Condition			Suggested contingency measures		
Early season drought (delay onset)	Major farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomics measures	Remark on implementation
Delay 2 week July 2 nd week	Light texture sandy soils susceptible to wind erosion	Pear millet	No change	-	
		Pearl millet+Greengram/Mothbean (Intercropping 8:4 or 6:3)	No change	-	
		Clusterbean Cowpea Castor Sesame Clusterbean+Bajra	No change	-	

Condition			Suggested contingency measures		
Early season drought (delay onset)	Major farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomics measures	Remark on implementation
Delay 4 week August 1 st week	Light texture sandy soils susceptible to wind erosion	Pear millet	No change	-	
		Pearl millet+Greengram/Mothbean (Intercropping 8:4/6:3)	No change	-	
		Clusterbean Clusterbean+Bajra (8:4/6:3)	Pearl millet/Pearl millet+Greengram/Mothbean	-	
		Cowpea	No change		
		Castor Sesame	No change		

Condition			Suggested contingency measures		
Early season drought (delay onset)	Major farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomics measures	Remark on implementation
Delay 6 week (August 3 rd week)	Light texture sandy soils susceptible to wind erosion	Pear millet	Don't grow sesame beyond mid August. Go for pear millet or intercropped Castor/Cowpea (grain or fodder)	-	
		Pearl millet+Greengram/Mothbean (Intercropping 8:4/6:3)		-	
		Clusterbean Clusterbean+Bajra (8:4/6:3) Cowpea Castor Sesame		-	

Condition			Suggested contingency measures		
Early season drought (delay onset)	Major farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomics measures	Remark on implementation
Delay 8 week (September 1 st week)	Light texture sandy soils susceptible to wind erosion	Pear millet	Fallow	Conserve soil moisture for rabi sowing	
		Pearl millet+Greengram/Mothbean (Intercropping 8:4/6:3)	Fellow	-do-	
		Clusterbean Clusterbean+Bajra (8:4/6:3)	Fellow	-do-	
		Cowpea Castor Sesame			

Condition			Suggested contingency measures		
Early season drought (delay onset)	Major farming situation	Normal Crop/cropping system	Change in crop/cropping system	Agronomics measures	Remark on implementation
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		Clusterbean Clusterbean+Bajra (8:4/6:3)	Fellow	-do-	
		Cowpea Castor Sesame			

Source: CCS HAU Hisar

References

Anonymous. 2014. District wise agriculture contingency plan under aberrant weather situation. www.hau.ernet.in