Impacts of Heavy Rain and Flood during October 11-15, 2020 on Crop, Animal & Fishery in Some Areas of Maharashtra:

Assessment & Recommendations

ICAR-National Institute of Abiotic Stress Management
Malegaon (Kd), Baramati, Pune, Maharashtra

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1. Background

The abundant rainfall received during monsoon under COVID-19 pandemic and lockdown situation, raised the farmer's hopes for getting more yield and better income from *kharif* crops. However, unexpected post-monsoon rains occurred during 11-15th October 2020, once again grappling farmers into huge losses from agriculture sector in Western and Marathwada region of Maharashtra.

In the week 11-15th October, 2020, the return monsoon had caused damage to ready to harvest crops across western Maharashtra and Marathwada region. In Pune district, Baramati and Indapur tehsil has received more than 150 mm of rainfall within 24 hours which further caused flood and excessive crop loss, soil loss and some extent livestock mortality. To record these damages, the team of scientists from ICAR-NIASM visited and conducted a preliminary assessment/survey in the nearby villages of Bhigwan (Village: Madanwadi, Nimbodi and Shetphalgade) and Baramati (Village: Karavagaj, Karahate and Jalgaon- Supe) and Indapur to understand the nature of damage, crop loss and farmers conditions to cope up with sudden disaster. The main aim of the visit and discuss with farmers to assess the relentless of unexpected excess post-monsoon showers, floods and their impact on agriculture occurred during this week (11-15 October 2020).

During the survey it was observed that there was considerable loss to the farmers in terms of agricultural and horticultural crop, and losses related to livestock components, infrastructure and disruption of social amenities.

2. Observations by the Scientists during Visit

2.1. Cereal Crops

The almost all *kharif* crops like bajara, maize, soybean, sunflower, onion etc. are at harvesting stage and largely affected by these untimely rains. Most of farmers are unable to harvest matured *kharif* crops from field either lack of labor or harvester. Further, some farmers failed to shift the harvested produce from field to safe location on time. Even in few cases farmers successfully shifted their produce at safe location but unable to save it from heavy rainfall showers and floods. This has resulted to germination or sprouting in the maize and bajara cobs in the field and threshing yard itself. Moreover, blackening of bajara and maize grains and straw was also seen because of high humidity, lack of sunlight and continuous rains. It will have a serious negative impact on yields, quality and market prices of the farm produce.

Although sugarcane is tolerant to water stress, but it is severely affected at tillering and harvesting stages by rotting owing to standing water in the fields. Continuous rains have also brought higher weed emergence in the fields as no time to weeding operations, which will ultimately resulting to financial burden on the farmers. Unwanted weed growth in the fields will definitely adversely affect crop growth in due course of time. In sunflower fields, attack of army worm on leaves and unwanted fungi growth in mature flowers was observed.

One farmer in Shetphalgade village told that this year he was expected a bumper crop yield but his happiness totally spoiled due this unexpected heavy rain. The maize crop was at mature stage and ready to be harvested, this excess rains have caused inundation in the fields and causes loss of crop. Also, some of the harvested produce was flown with water and remaining will be getting infected with fungal damage. One Sugarcane farmer in village Nimbodi reported that acres of sugarcane crops and maize crops along with drip system were flown with water flow. The hundreds of acres of sugarcane and other crops were lodged. Sugarcane yield has been adversely impacted due to widespread lodging which may be reducing the yield in this year.

The crops such as sugarcane was affected by heavy rains and flood, which resulted in waterlogging and caused severe crop damage in range of 30-90% with average expected loss around 60% as reported by the farmers. The expected loss in crops such as Maize and Jowar is in the range of 40-80% with an average loss of 60%. The vegetable were affected more due to flood with loss in range of 70-80% as reported by farmers.

2.2. Vegetables and Fruit Crops

Several insect, pest and disease emergence was also noticed in many seasonal field and vegetable crops *viz.*, sunflowers and onion due to congenial weather for the insect pests. Particularly in *kharif* onion fields, scarce plant population, yellowing, stunted growth and shrinkage of leaves, rotting and unburied bulbs in soils were noticed. It will increase the chances of complete loss of the *kharif season* onions and expected to hike onion prices in the market.

In perennial fruit crop orchard *viz.,* citrus and pomegranate, excess rainfall delayed hast bahar treatment schedule and created several management issues. This will be delayed and reduced the flowering as well as fruiting; which may ultimately led to late harvesting and non-availability of fruits during peak market season.

Heavy rainfall resulted in water logging in onion, brinjal, papaya, Banana, vineyards and pomegranate field. These unpredicted heavy rains have induced flower shedding in newly emerged bunches in grape orchard. Due to cloudy and standing water conditions, grape crop is under attack of several disease and insects and unable to have spraying due to restricted movements in field. In case of dragon fruit, pomegranate and banana, the lodging was not observed but losses may occur due to fungal attack in fruit crops. The standing water in brinjal, onion and papaya field has reportedly root-rotting and wilting, leading to complete crop failure.

The horticulture components such as grape orchards are affected and expected loss is in range of 50-60% due to shedding of inflorescence of grapes, more than 90% farmers in Pimpli village are grape growing farmers. Pomegranate is also affected by fruit shedding and expected loss is in range of 30-40% as reported by farmers.

2.3 Livestock and Fisheries

In lowland areas of these villages, severe problems of waterlogging have been observed in the standing crops. The lodging of maize, bajara, sugarcane, fodder jawar, lucerne grass, etc. was observed in waterlogging field. This will cause huge crop yield losses and several difficulties related to low productivity and shortage of fodder for dairy animals including harvesting of crops.

The problems such as dysentery, diarrhea and foot disease were also reported in goats, sheep's and other grazing animals while talking to the affected farmers of these regions. This excess rainfall will be also affecting prices of the poultry, meats and other dairy products in markets.

The livestock were affected by heavy rains, which resulted in 40-60% decline in milk production as reported by farmer. The stored feed and fodder was washed away/drowned by rains and flood. Poultry birds were also drowned/ washed away by floods as reported by few farmers in surveyed area. Heavy rains also damaged some animal sheds and facilities such as chaff cutter, silage making equipment's/structures. Few farmers also reported the death of 1-2 goat kids due to heavy rains and humid conditions.

Livestock shelters were damaged and mortality of cattle and Goat reported by couple of farmers. The Ambika Machi Vyavasay Sahakari Sanstha working on fishing on Madanwadi reservoir. This reservoir/lake was under almost under 175 ha area and having 70-80 families livelihood dependant on only this reservoir. One fishermen in Madanwadi village told that 5-6 lakh fish seed (3-4 inhes) has been stocked into reservoirs recently. Due to heavy rain the embankment was collapsed and has suffered huge losses, estimated more than 25 lakh rupees, due to breaking of embankment of reservoir, and flood washed away all stocked fish. Fish farmers were among those who were severely hit by heavy rain and floods across the district over the last week. Due to heavy rain, the owner of the Bhigawan Carp Matsybij Utpadan Kendra, Tahsil: Indapur told that their loss was extensive this time due to breaking/destruction of farm ponds, dyke, etc, as most of their ponds were stocked with approximately 1200 kg of brooder fish (IMC) and 30 -40 thousands fish seed. While speaking with him, he told that he had spent Rs 8 lakh for this. The flooding/overflowing of ponds, escape and lost substantial quantity of fingerlings and brood fish stock from the ponds and causes heavy financial loss.

2.4. Social Amenities

Social amenities such as drinking water supply, electricity to farms and houses were disrupted. The roads and bridges also got damaged due to rains. The irrigation facilities such

as pipeline, motor were also reported washed away during flood in rivers. One farm family was rescued from flood by National Disaster Response Force team. One farmer family lost most of the belongings in the flood.

Even some farmers in Nimbodi village reported that flood occurred due to heavy rain. The runoff/flood water enters in the houses and stagnated 7-8 feet in the houses and thus damaged all stored grains and physical structures. The water tanker was provided for drinking water purpose in Nimbodi village as the drinking water supply wells were overflowing and submerged during flood. The drinking water supply was affected in villages.

The landslides in the dug wells, breaking of bunds of the fields and flow of flood water on the roads were also observed at many points during the visit, which will also have financial burden on the shoulders of farmers and villagers. Some farmers reported that damage of irrigation pumps and electricity problem due to flood conditions.

Severe soil erosion was observed near the river and canal areas. The loss of top fertile soil from the field causes indirect effect on future growing crops in that field. The soil erosion of top soil in the surveyed area was in the range of 10-30% with average soil erosion around 15% as observed.

During interaction with the farmers and farmers group, the farmers requested the government institutions and administration to conduct survey and provide the compensation depending upon the loss incurred to the individual farmers.

3. Future Effects on Rabi Crops

Present untimely rains occurred during the month, not only negatively impacted the *kharif* crops but will also have serious impact on *rabi* (winter) crops also. Owing to continuous rains, waterlogging in the fields will delaying field preparations operation of for *rabi* season crops. Off course, this will delayed sowing of *rabi* season crops, which will ultimately resulted to reducing *rabi* crop yields due to mismatch of ideal weather conditions. Being a major areas of sorghum, some of the farmers somehow managed sowing of *rabi* sorghum for grains purpose in the fields, are also faced difficulties due to continuous rains and waterlogging in the fields. Failure of seed germination, spoiling of young seedlings or germinated plants was observed in these fields. Thus, farmers have to go for re-sowing of the crops in low land areas.

3.1. Positive Impacts in Upland Areas

It was observed that some of sorghum farmers have sown the crop timely and taken advantage of this excess monsoon showers for better germination. The excess rainfall will definitely helpful for moisture retention in the upland fields during rest of cropping season. In some cases, healthy growth of sugarcane crop has been observed. The non-cultivable rainfed lands will be grazing sites for animals. The excess rainfall and flood water will definitely helpful for recharging the ground water and open wells in these areas during this year and will solve some problem of water scarcity during summer.

4. Suggestions and Recommendations to Address Excess Rainfall and Flood Situations

1) The immediate focus should be on farming communities that cannot cope up with the effects of the floods using their own resources. The immediate action should be taken for crop loss assessment by line department/NGOs/insurance companies.

2) Appropriate open drain system for immediate removing water from field. Improving water drainage in fields is very essential. Use of deep tillage practices, subsoiler for breaking hard pans, row plantation and network of cutting drainage channels for collecting flood water should be needed.

3) Most of crop recovers within 3-10 days after removal of water from fields. As soon fields dried and necessary farm implements can be brought back into field for light inter cultivation around young plants, which may help for better aeration of the soil.

4) Removal of flood water within three days from field of vegetables and perennial crops. Most of crops recover if stayed water logged for less than 48 hours.

5) Proper spraying arrangement in orchards and field crops required under this situation as crops need immediate spraying to avoid the fungal and bacterial diseases in field crops and horticulture crops such as grape and pomegranate.

6) Immediate mitigation strategies will be foliar spray to waterlogged field and horticulture crops. Fungicide/weedicide/insecticide programs should be implemented with foliar sprays and particularly root pathogens/weed management. Application of foliar sprays of plant bio-regulators (thio-urea and potassium nitrate) on fruit and vegetable crops for alleviating adverse impact of water logging/flood.

7) Spraying with drones will be better option for immediate action, as it is difficult to go into the field/ orchard for spraying under waterlogged condition.

8) Replacement/ transplantation of damaged plants with new plants in vegetables. Immediate gap filling by new seedlings in sugarcane or re-sowing of seeds in sorghum.

9) Raised bed furrow system should be followed for the kharif season onion crop.

10) Most of the fertilizers washed out in flood affected fields. Hence to retain crop health, nitrate based fertilizers are preferred over ammonium based fertilizers. This can be applied in soil or foliar application.

11) Ripened fruits that have come in contact with flood waters should not be harvested for sale since most of the time flood water contaminated with human/animal pathogens. It should be harvested and dumped in some place to avoid further infection. Immature produce should be handled carefully when harvested in the future including washing with chlorinated water.

12) The design of embankment structure for fish pond/reservoir should be taken care.

13) The removal of excess water from fish ponds or water tank by syphoning process and maintain safe water level in pond to avoid further damage of side wall of fish ponds or water tank.

14) Need to adopt the flood based farming systems including provision for ground water recharge structure for offseason water supply system.

15) Poultry and animal sheds/shelters should be constructed in uplands areas free from the hazards of flood or excess water.

16) Need maintain rehabilitation/disaster funds at village level to tackle the problems related to floods or excess water occurred and damaged agriculture crops as farmers/villagers are immediately demanding the financial support from government for compensating crop yield losses.

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Photos of Affected Areas Due to Heavy Rain and Flood

Bajara field

Fodder maize field

Severely damaged sugarcane crop (almost uprooted) during flood

Plant-sugarcane damaged due to flood water

Waterlogged and lodged sugarcane field

Maize cobs in threshing yard

Lodging of Sugarcane crop

Sugarcane logged due to heavy rainfall, and post logging bud-emergence

Severely damaged fodder-sorghum crop due to heavy water logging condition

Cereal crop completely damaged due to flood

Breaking of bunds and loss of Soil fertile soil from field

Soil loss from sugarcane field

Maize field

Maize cob sprouting

Maize cobs

Rotting maize cobs due to rainwater flooding in storage room

Sorghum crop field

Sorghum-seedlings

Germinating sorghum grains due to soaking in floodwater

Wasted stored grains due to flooded water

A vegetable farm (brinjal) completely damaged due to rainwater and waterlogging

Waterlogged field after flood

Kharif onion-scarce plantation

Kharif onion-yellowing & stunted growth

Waterlogging in grape orchard

Fruit-shedding in grapes affected due to heavy rainfall and waterlogging

A team member observing damaged grape fruit shedding

NIASM-Scientific team interacting with flood affected farmers

NIASM scientific team interacting with grape grower farmer

NIASM-Scientific team interacting with farmers of affected village-Songaon located at river bank of Karha river

Waterlogging in citrus orchard

Wilting of Papaya (Variety Taiwan)

Waterlogging in onion

Wilting of Brinjal

Water stagnation in Banana orchard

Dragon fruit orchard

Waterlogging in Vineyard

Bud initiation and sprouting problem in vineyard

Damage of fish ponds

Collapsed embankment of Lake

Drinking water supply through tanker in villages due to overflowing of wells

Interaction with farmers about flood situation

Breaking of bunds and soil loss

Positive impact on sugarcane at grown at upland

Dysentery and foot diseases in goats

Grazing sites for sheeps

Flow of flood water in Karha river

Overflow of flood water over village road

Attack of army worm on sunflower

Sunflower field affected by army worm

Loss of sunflower crop at harvesting stage

Infection of fungus in sunflower

Soybean field at harvesting stage

Sorghum crop in rainfed area

A animal shed damaged due to heavy rainfall

A farmer's house and animal shed flooded due to heavy rains

Damaged house/shelter due to flood

Damaged/broken road bridge over big stream

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