

# SLAM-BASED FLEET

PRESENTED BY  
TEAM-NEXUS NUMERICS

# PROBLEM STATEMENT

Modern agriculture faces challenges in monitoring large farmlands efficiently. Traditional methods are labor-intensive and lack real-time insights.

 Inefficient Farm Monitoring

 Limited Real-Time Data

 Lack of Automation in Task Management

 Operational Challenges

 Need for Remote Supervision

# Drought worries farmers

By JACK POIRIER  
The Observer

The stifling heat, coupled with another summer drought has local farmers fearing crop yields will be hampered for the second consecutive summer.

Lambton Federation of Agriculture president Jim Duffy says if the area doesn't see some significant rainfall in the next seven to 10 days some crop yields could be cut in half.

"The next 10 days will be crucial," Duffy said. "But I think we're going to be in worse condition than we were last year."

Last year a large soybean aphid population along with a summer drought resulted in local soybean farmers harvesting less than half their typical yield. Corn was also hampered by the lack of rainfall, with farmers losing about 25 per cent of their crops.

This year, however, the summer drought has started earlier. According to Bryan Smith, climatologist for Environment Canada, there has only been a trace amount of rainfall in Lambton County for the first half of July.

"The pattern is somewhat similar to last year," he said, when Sarnia-Lambton recorded 12 mm of rain over the same span.

"Normally for the first half of the month the area gets 35 mm."

Mix in the fact that this year's planting season came late, under more extreme conditions and that makes



The Observer file photo

The current drought conditions in Sarnia-Lambton have farmers worried they could experience another summer like the one which devastated crop yields last year. Rain is in the forecast, but could just be sporadic.

for a recipe for disaster, said Duffy.

"It's starting to look pretty bad," he said.

Although he expects the soybean crops to rebound somewhat, as the dreaded soybean aphid looks to have flown the coop, the drier conditions should have a more negative impact on the corn crops.

Duffy said corn plants need a lot more water to flourish and currently the crops are showing "more and more stress every day."

"But it is not a loss yet. A good rain would do wonders.

And the blistering temperatures look to continue as well.

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But to get two back-to-back summers like this, it's kind of scary,"

And there could be some relief on the way. Smith says a cold front is expected to move through the area tonight, but how much relief will rain down on local crops is debatable.

There is a 40 per cent chance of precipitation overnight and a 60 per cent chance tomorrow. But don't break out the umbrellas just yet. Smith says if the area does see rain it will only be in the form of scattered showers.

Today's UV index is high at 7.5, meaning sunburn can occur within 15 to 20 minutes.

The Ministry of Environment and Energy has also expanded its smog advisory issued yesterday for Sarnia-Lambton to include today.

# Water Related Issues

CITY [www.punemirror.in/city](http://www.punemirror.in/city)

PuneTimesMirror | WEDNESDAY, JUNE 17, 2015 | 3

# Low rainfall in central India to affect crops

IITM study finds that increasing El Niño effect over Indian Ocean will disrupt southwest monsoon this year; agri ministry continues to believe monsoon could be good

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**T**he crucial southwest monsoon may experience interferences this year, according to the findings of a recent study conducted by a group of young scientists from the Indian Institute of Tropical Meteorology (IITM), eventually impacting agriculture. Research has found that at least six central Indian states may get "deficit rainfall" due to the well-documented El Niño effect over the Indian Ocean.

The study also points to a significant decrease in summer monsoon rainfall over the central Indian subcontinent during the past century—scientists suggest that the observed rapid warming over the Indian Ocean is playing an important role in weakening monsoon circulation and rainfall.

Considering this, scientists believe the kharif season may be adversely af-



The young IITM team that conducted the research along with foreign counterparts

fected in Madhya Pradesh, Chhattisgarh, Jharkhand, Bihar, Uttar Pradesh and Uttarakhand. They observed data dating from the 1870s for the summer monsoon, procured from the Indian Meteorological Department (IMD) and other sources.

Lead author and IITM scientist Roxy Mathew Koll said, "Using data from 1901-2012, we found that rainfall has been decreasing over central South Asia. The decrease is highly significant over central India, where agri-

culture is still mostly rain-fed. A reduction of up to 10-20 per cent in mean rainfall can be seen. Land over the sub-continent has not been heating up as much as the ocean. Besides, temperatures—particularly along the west of the ocean—have increased by 1.2 degrees Celsius. This is quite significant. It will affect the progress of the monsoon towards the central regions."

Koll elaborated, "We also found there were only seven El Niño events reported from 1900-1950. But this has

changed—thereafter, 12 El Niño events were reported so far, with high intensity." The study was part of an Indo-French collaboration under the National Monsoon Mission, set up by the ministry of earth sciences. Koll conducted the research in collaboration with other IITM scientists Ritika Kapoor, Ashok Karumuri and B N Goswami. The study also included Raghu Murtugudde from the University of Maryland in the US, and French scientist Pascal Terry from the Sorbonne University.

Meanwhile, agricultural scientists and officials from the ministry of agriculture still believe sowing time is the most crucial for productivity in rain-fed areas; although sowing begins from June, they believe there is still time to do so, as the monsoon rains have not yet fully spread across the country.

Dr N Chattpadhyay, deputy director general of Agromet, said, "We cannot ignore that the present monsoon is progressing well and

has already covered Maharashtra, south Gujarat and Odisha. Now, we are expecting that it will cover central India, too. Thereafter, we can talk about further developments. At this juncture, it is mere prediction."

An official from the agriculture ministry said, "Since there is a poor monsoon forecast, some states have already been asked to prepare contingency plans to reduce the impact of erratic rains on kharif crops. These plans have been kept ready for 580 districts; similar ones are being prepared for other states as well."

Ministry sources added, "Since the sowing of kharif crops normally begins with the onset of the monsoon in June, harvesting starts from October. If the IITM scientists' prediction is correct, production of rice, pulses and soybean, along with oil seeds, will be severely affected. Eventually, it will disturb demand and supply chains in those states."

## WATER SHORTAGE

# Climate change threatens our food security



**DR  
SHAMSHUDDIN  
JUSOP**

IT seems that farmers in the northern region of Peninsular Malaysia worry more about dry spells or droughts that affect their rice yield than the Covid-19 pandemic. They are worried about the rice in fields that generate adequate income to sustain their life. This was articulated by some writers in the mainstream media last week.

The concern by the farming communities is real, given the serious shortage of water to sustain rice growth and production in the Muda Agricultural Development Authority (Mada) area of Kedah-Perlis plains, the main granary of the country. We are talking about the country's food security, which is being threatened to the core by the recent drought in the region.

As a senior soil scientist working to help enhance rice production to sustain food security, I am worried about the situation. No matter what we do, if there is insufficient irrigation water, the agro-technologies we have developed are of little use, unless there is a rice variety available in the country that can withstand without much water during the vegetative stage. What has gone wrong with the climate in Peninsular Malaysia of late?

To put it in proper perspective, I made a visit to the area in mid-March. The visit was to start a research project with farmers in Pendang, Kedah, who wanted to participate in the project. Sad to say that water was lacking in some areas that rice plants in the fields were left unattended.

The rice plants turned brown due to insufficient water to support their growth. The plants could no longer grow or survive, let alone produce rice that the farmers were looking for. It was a sad end to farmers' dream of having a good harvest.

Based on the geological record, Kedah-Perlis plains were once inundated by sea water when the

sea rose to its highest level some 4,300 years ago. During that period of the geological history, mineral pyrite ( $FeS_2$ ) was formed and remained in the sediments where the Mada area is.

That geological episode leaves a fingerprint that affects soil fertility. During dry spells, the water table level drops and exposes the pyrite, which is subsequently oxidised, releasing acidity and toxic iron. The phenomenon affects rice production negatively.

This seems to be the case in certain rice fields in Pendang that I visited. The problem of high acidity and iron toxicity has to be rectified via agronomic means. The objective of my visit to Mada areas was to look for the best ways to do it. Alas, the project was put on hold until the Covid-19 pandemic is done and over with.

The rice self-sufficiency level (SSL) in Malaysia stands at 71 per cent. With the improved infrastructure put in place, the SSL is expected to be increased to 80 per cent by 2022. The drought situation in Mada areas right now is made worse by the Covid-19 pandemic.

With the problems facing the



*Global warming is of great concern among those in the agriculture fraternity across the globe.* PIC BY SHAHRIZAL MD NOOR

farmers, I hope Malaysia can still sustain the SSL at 71 per cent. The powers-that-be should have already started working to alleviate the problem facing the rice farmers.

Recently, the government invited researchers nationwide to submit research proposals for Trans-disciplinary Research Grant and Long-term Research Grant Schemes. Among the 14 areas of research offered for full funding is "Impacts of 1.5-2.0°C Global Warming on Malaysia". This shows how important is the impact of global warming on the economic wellbeing of Malaysians.

The phenomenon of water shortage for rice production is unprecedented in the history of Malaysia. Water in dams at the upper reaches of rivers is almost dry due to the lack of rainfall. It has much to do with the change in weather patterns, the so-called global warming.

Global warming is of great concern among those in the agriculture fraternity across the globe. It is accelerated by the increase of carbon dioxide (CO<sub>2</sub>) concentration in the atmosphere.

We have more than 400 ppm of CO<sub>2</sub> in the atmosphere, almost double in amount compared with that before the industrial revolution.

The worldwide increase in the Earth's surface temperature has already reached the alarming level of 1.5°C increase in the Earth's surface temperature to 2°C.

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# Climate Related Issues

## CITY GROUNDWATER BEING POLLUTED

### MULTIPLE SEWAGE TREATMENT PLANTS ALONG MUSI

Secondary treatment of sewage instead of recommended Tertiary treatment

### MIXED WATER USED FOR FARMERS FOR IRRIGATION OF CROPS

Paddy in Peerzadiguda, city outskirts  
Horticultural crops, leafy vegetables in city, peripheral areas

Treated water is released into Musi, resulting in a mix of untreated and treated water



Farmers weighing harvests of paddy on Musi river bank



Musi flows with industrial effluents and rain water at Pirzadiguda,Uppal

During irrigation, chemical contaminants in the treated wastewater seeps into ground. Contaminants include mercury, lead, chromium, pharma and medical residue and domestic waste

Pollutes the natural rock aquifers, affecting the groundwater table

Pollution of groundwater is high during monsoon

### THE EXPERTS SUGGEST

Regular monitoring of water resources to keep aquifers clean

Optimum utilization of wastewater to check pollution, proper treatment



# ○ Articles related to the problem statement

- The sector is plagued by the problem of low productivity due to outdated farming techniques, lack of proper irrigation facilities, and inadequate use of fertilizers and pesticides that led to lower yields and lower profits for farmers.
- A lack of awareness among farmers about the use of modern technology and best practices in the field has limited their ability to adopt new farming techniques and improve their yields.

Citations - <https://www.smsfoundation.org/the-challenges-and-opportunities-for-agriculture-development-in-india/>

# SOLUTION TO THE PROBLEM

To address our problem, we propose SLAM-enabled agricultural robots (Slambots) that can enhance farm supervision through:

- ✓ Autonomous Navigation – Using SLAM for efficient movement across farmlands.
- ✓ Distributed Monitoring – Collecting & analyzing real-time data on soil moisture, temperature, and crop health.
- ✓ Adaptive Collaboration – Optimizing task distribution among robots for efficiency.
- ✓ Remote Supervision – Allowing farmers to monitor operations via a web/mobile app.

# TechStack Used

## Website

- CSS
- React js
- API

## APP

- Python
- PowerBi
- MySQL
- CSV
- API