

An Indian-Australian research partnership

Project Title: **Crop Yield Forecasting using Earth Observation (EO) Satellite datasets**

Project Number **IMURA0898**

Monash Main Supervisor

(Name, Email, Phone)

Prof. Jeffrey Walker

Email: Jeff.Walker@monash.edu

Full name, Email

Monash Co-supervisor(s)

(Name, Email, Phone)

Monash Head of

Dept/Centre (Name, Email)

Prof. Jeffrey Walker

Email: Jeff.Walker@monash.edu

Full name, email

Monash Department:

Department of Civil Engineering

Monash ADGR

(Name, Email)

Full name, email

IITB Main Supervisor

(Name, Email, Phone)

Prof. RAAJ Ramsankaran

Email: ramsankaran@civil.iitb.ac.in

Full name, Email

IITB Co-supervisor(s)

(Name, Email, Phone)

Prof. Eswar Rajasekaran

Email: eswar.r@civil.iitb.ac.in

Full name, Email

IITB Head of Dept

(Name, Email, Phone)

Prof. T.I. Eldho

Email: eldho@civil.iitb.ac.in

Full name, email

IITB Department:

Department of Civil Engineering

Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? <i>(Please nominate JUST <u>one</u>. For more information, see www.iitbmonash.org)</i>		Highlight which of the Academy's Theme(s) this project will address? <i>(Feel free to nominate more than one. For more information, see www.iitbmonash.org)</i>	
1	Material Science/Engineering (including Nano, Metallurgy)	1	<i>Advanced computational engineering, simulation and manufacture</i>
2	Energy, Green Chem, Chemistry, Catalysis, Reaction Eng	2	Infrastructure Engineering
3	Math, CFD, Modelling, Manufacturing	3	Clean Energy
4	CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control	4	Water
5	<i>Earth Sciences and Civil Engineering (Geo, Water, Climate)</i>	5	Nanotechnology
6	Bio, Stem Cells, Bio Chem, Pharma, Food	6	Biotechnology and Stem Cell Research
7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng	7	Humanities and social sciences
8	HSS, Design, Management	8	Design

The research problem

Crop yield forecasts a few months before harvest can be of paramount importance for a range of agricultural and food security decisions. Forecasting enables planners and decision makers to determine how much to import (in shortfall case) or optionally, to export (in surplus case). Traditionally, crop yield estimation depended upon the data collected from ground-based field visits. Such a technique is often subjective, costly and is prone to large errors, leading to poor crop assessment and crop area estimation. With the successful launch of various satellites having different spatial, temporal and spectral imaging capabilities, efforts are being made worldwide to use remote sensing data for yield forecasting. However, still many challenges exist due to crop model parameterization, remote sensing data (scale effect, retrieval strategy and method) and linking remote sensing data with the crop model. Therefore, how to combine the advantage of different remote sensing data with crop models for improving the estimation accuracy of canopy state variables and soil properties using intelligent algorithms becomes an important question, which needs immediate attention.

Project aims

Considering that satellite remote sensing has the potential to provide timely, systematically high quality spatial and accurate information on crop growth, the project aims to develop a crop yield forecasting framework for major food grain such as wheat crop, through sequential assimilation of various remotely sensed data (ET, soil moisture) into crop growth models. The project also aims to test and validate such a forecasting system in diverse regions like India and Australia.

Expected outcomes

Remote sensing-based crop yield forecasting framework suitable for operational purposes. There is a likelihood of obtaining patent for the proposed framework.

Two-three high impact publications.

How will the project address the Goals of the above Themes?

The project fits into the themes of "Advanced computing & simulations and Water". For example, the project involves big data analysis involving space borne Earth Observation (EO) datasets, simulation of complex crop growth models and data assimilation of the EO data. In addition, crop yield forecasting will also lead to an understanding about crop water requirement and irrigation which are crucial in water management.

Capabilities and Degrees Required

The candidate should have an exceptional academic background and a strong interest in research. Candidates with B.Tech/MSc./M.Tech degrees related to the fields of water resources/ Remote Sensing/Agriculture are encouraged to apply. Experience in computer programming (Matlab, Python etc.) and mathematical knowledge including numerical techniques and probability and statistics are required. Any prior experience of using numerical models will be considered as an advantage. The student should have good attitude towards mathematical concepts and modelling. In addition the candidate should have excellent oral and written communication skills in English and should be able to undertake field visits for crop data collection.

Potential Collaborators

At IITB

Prof. Pennan Chinnasamy, CTARA;
Prof. Adinarayana, CSRE

Select up to **(4)** keywords from the Academy's approved keyword list (**available at <http://www.iitbmonash.org/becoming-a-research-supervisor/>**) relating to this project to make it easier for the students to apply.

Data Science Optimisation, Algorithm; Modelling and Simulations; Water