KU Digital and AI Platform for Agriculture, Food, Biodiversity and Natural Resources

ทิศทางแหล่งทุนวิจัยต่อการสนับสนุนงานด้าน AI กับการเกษตร

โดย รองศาสตราจารย์ ดร.กล้าณรงค์ ศรีรอต

วันที่ 27 พฤษภาคม 2567
เวลา 09.00 – 16.00 น.
ณ ห้อง Auditorium (306)
ชั้น 3 สำนักบริการคอมพิวเตอร์
มหาวิทยาลัยเกษตรศาสตร์

1. บทนำ

2. AI กับการเกษตร

- การปรับปรุงพันธุ์
- ประเมินผลผลิต
- การเฝ้าระวัง (Monitoring)
- Soil
- Smart Farming

3. สรุป

บทนำ

- **Agriculture**
  - Genome Sequenced
  - AI Breeding Program

BENSON·HILL
BIOSYSTEMS™

Benson Hill developed an AI powered, predictive breeding platform (CropOS).

- Reduces new variety time to market by 50% to 75%.
- Demonstrated yield increases of 12% to 15% in corn.

CropOS™

BENSON HILL

BENSON HILL AWARDED AI-BASED SOLUTION OF THE YEAR HONORS AT AGTECH BREAKTHROUGH AWARDS

IBM Watson Decision Platform for Agriculture

Using A.I. to Aid in Decision Making from Farm to Fork

Dan Wolfson, IBM Distinguished Engineer
Dir. Data & Analytics
IBM Watson Media & Weather

IBM

Where IBM is using Artificial Intelligence & Advanced Analytics for Ag Decision Support

Weather:	IBM GRAF Weather Model Seasonal Probabilistic Alerts
Remote Imagery:	Crop Stress
Soil:	Soil Temp/ Moisture Soil Tests Auto Field Boundaries
Pest and Disease:	Risk and Identification
Risk Management:	Crop Type Identification
Farm Operations:	Operations Dashboard
Geospatial Analytics:	Geo-spatial Analytics

Potato: Yield, Pest & Disease

In addition to in-season Potato Yield Forecast, we have experience with Early & Late Potato Blight Disease and with Whitefly Pest.

Plant Village dataset:

Label	#of samples
Healthy:	152
Late blight:	1000
Early blight:	3167

Randomly split into equal parts
Train and Test (90+% accuracy)

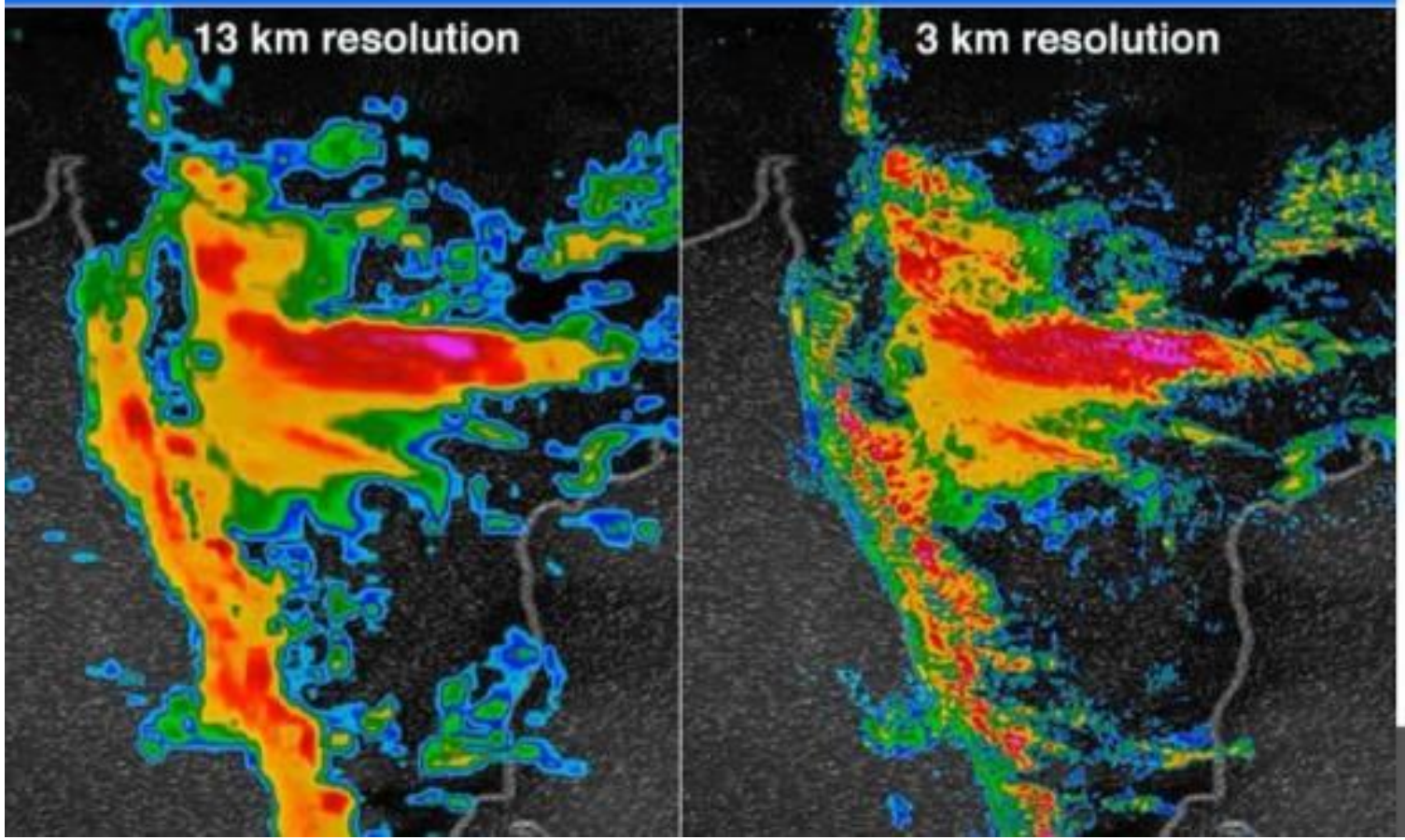
"possible blight symptoms

Alert

Deep Image Learning

BM GRAF Next Generation Weather Model

Model for Prediction Across Scales (MPAS)



Driven by IoT data including:

- 20M barometric pressure sensors
- Temperature and wind data from commercial aircraft, radars, satellites, and ground observations

Powered by:

- Purpose-built IBM super computers utilizing parallel processing

Resulting in:

- 3X-5X resolution and frequency improvement in global forecasting
- Ability to resolve individual thunderstorms

Soil Management

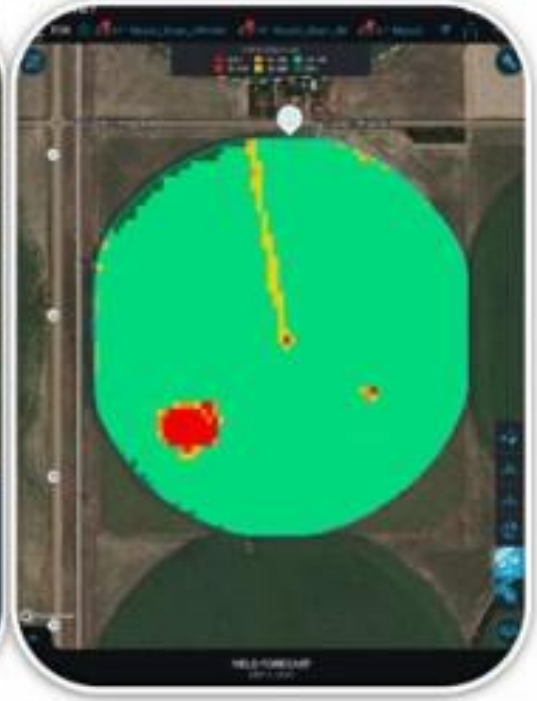
Soil Management is critical to crop yield and quality. Yet traditional methods are complex and time consuming.

AgroPad is AI-powered technology to help farmers check soil and water health.

NDVI Crop Health

Soil Moisture & Temperature @ 5 depths

Precision 0.5km Weather + Alerts



Yield Forecast

Operations Dashboard – actionable insights that influence crop decisions

- Soil moisture and temperature for irrigation and soil-based nutrients
- Crop stress to identify geolocations requiring scouting
- Weather alerts and forecast for spraying and harvest
- Pest & disease for eradication plan
- Yield projection for trading timing

สวทช. จับมือ IBM ร่วมกับกลุ่มมิตรผล นำ AI พลิกโฉมการทำไร่อ้อย...

Mitr Phol Pioneers AI to Modernize Thai Sugar...

Visit ›

AI กับการเกษตร

Agremo – AI Crop analytics Tailored for Ag professionals

Food and Agriculture Organization of the United Nations

ITU

DIGITAL AGRICULTURE IN ACTION

ARTIFICIAL INTELLIGENCE FOR AGRICULTURE

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

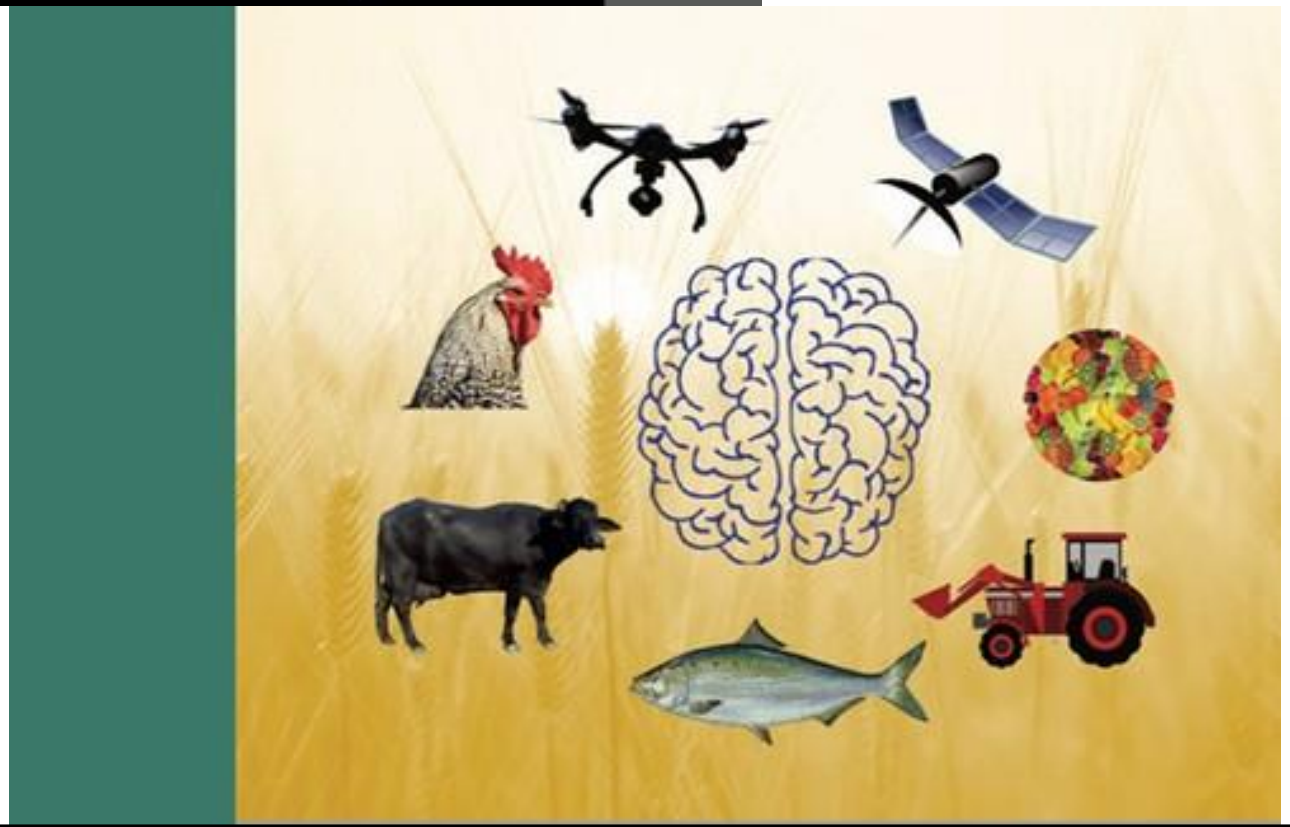
Proceedings and Recommendations

National Workshop on

Artificial Intelligence in Agriculture

30-31 July, 2018

NASC Complex, New Delhi



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AI กับการเกษตร

การปรับปรุงพันธุ์

Program for plant breeding

1) Data analysis
2) Prediction modeling
3) Genetic optimization
4) Speeding up the breeding process
5) Enhancing precision breeding

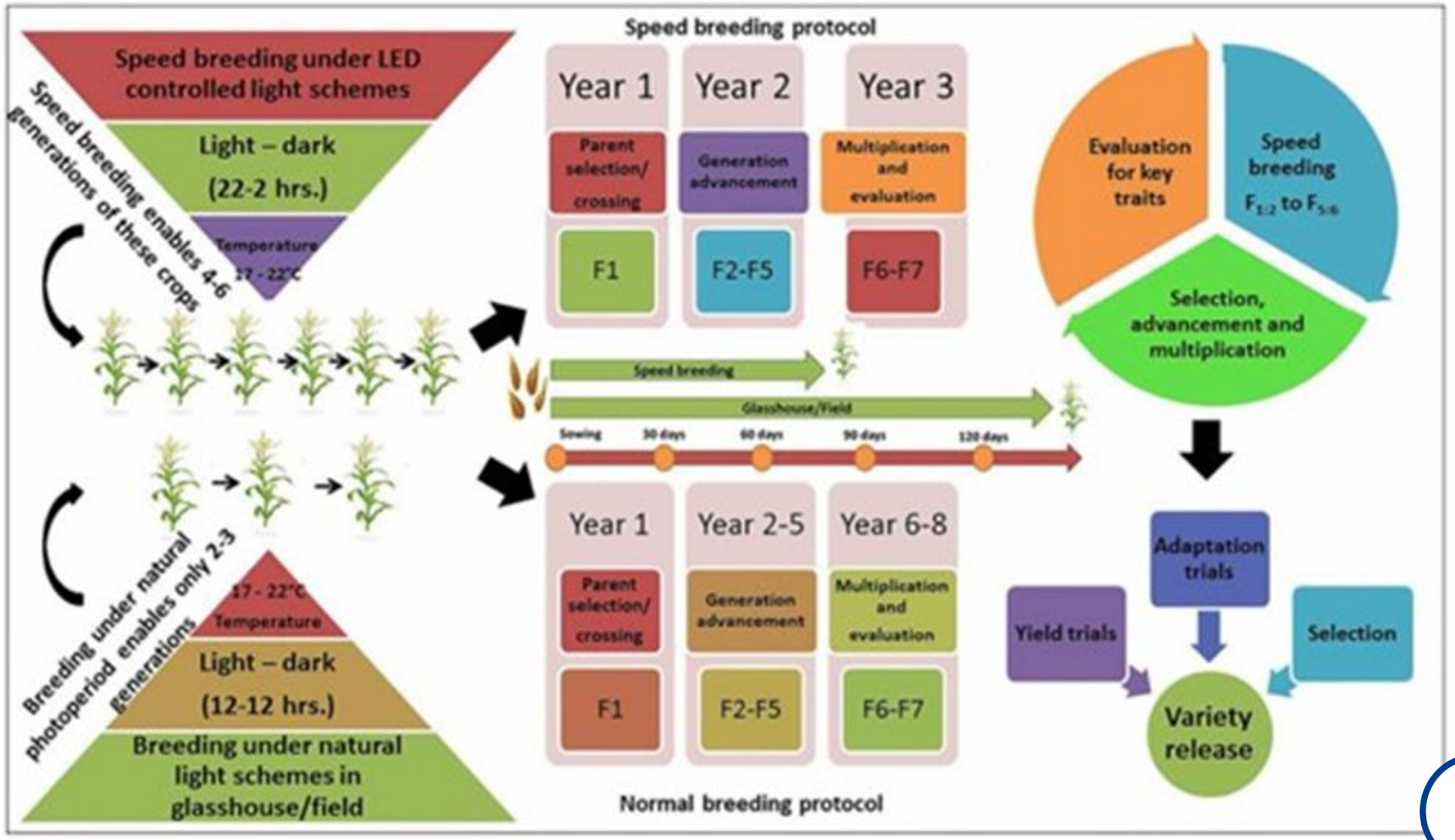

Fig. 1 An outline of speed breeding protocol and its implication for accelerating breeding cycles for improving growth and yield as compared to the conventional breeding approach under regular photoperiod

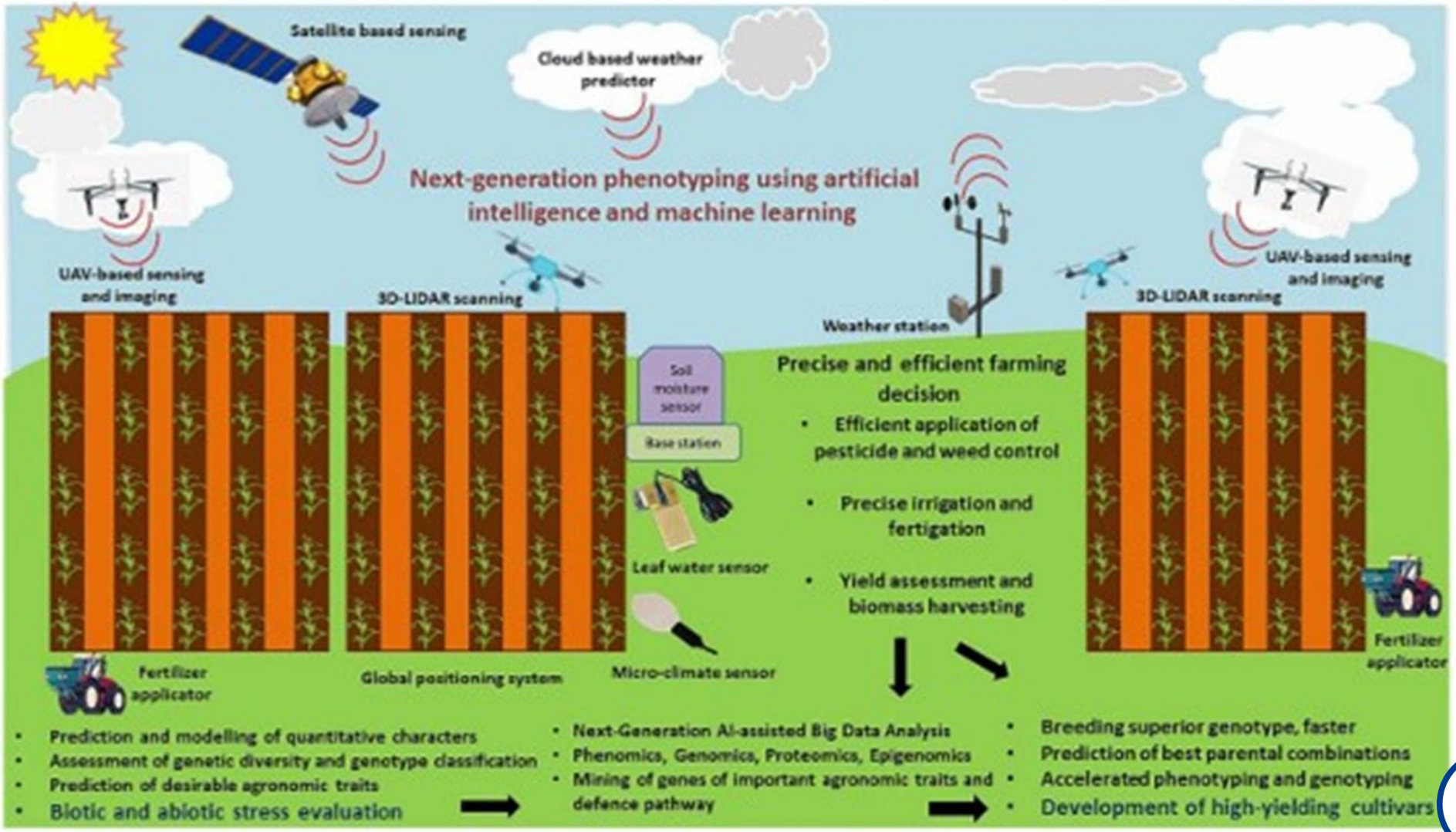

Fig. 2 An overview of the potential application of artificial intelligence in augmenting plant breeding technology for easy, precise, and early prediction of genotypes/parental combinations for varietal development

Table 1 Successful implementation of speed breeding techniques for rapid generation advancement in different crops

Crops	Speed breeding technique	Days to flowering	Generation achieved/year	Selection method	Trait enhanced	References
Glycine max L.	Photoperiod incandescent lights) and temperature	21	5	Single pod descent	Production of recombinant inbred lines	[56]
Arabidopsis thaliana L.	Photoperiod (LED light) and temperature, growth regulators	20–26	10	-	Shortening of the generation time	[57]
Arachis hypogaea L.	Photoperiod (PAR light), gas heating	25	4	Single seed descent	Advancement of early generation breeding material	[58]
Triticum aestivum L., Hordeum vulgare L.	Photoperiod (LED light) and temperature, growth regulators, embryo rescue	24–36	9	Single seed descent	Rapid production of segregating populations and pure lines	[59]
Sorghum	Photoperiod (LED light), temperature and immature seed germination	40–50	6	Single seed descent	Rapid development of high yielding variety	[60]
Vicia Faba L., Lens culinaris L.	Photoperiod (LED light) and temperature, growth regulators	29–32, 31–33	7,8	Single pod descent	Early flowering and seed development	[61]
Amaranthus. spp	Photoperiod (LED light) and temperature	28	6	Single seed descent	Rapid production of segregating populations	[62]
Pisum sativum L.	Photoperiod (LED light) and growth regulators	33	5		Development of recombinant inbred lines	[63]
Oryza sativa L.	Photoperiod (LED light), temperature	75–85	4	Single seed descent	Rapid development of high yielding variety	[64]
Trifolium subterraneum L.	Photoperiod incandescent lights) and temperature, growth regulators	32–35	6	Single seed descent	Rapid development of bi-parental and multi-parental populations	[65]
Triticum aestivum L.	Photoperiod incandescent lights) and temperature, embryo culture	20–25	8	Single seed descent	Production of recombinant inbred lines	[66]
Brassica napus L.	Photoperiod (LED light) and temperature	73	4	Single seed decent	Pod shattering resistance	[5]
Cajanus cajan L.	Photoperiod (LED light), temperature and immature seed germination	50–56	4	Single pod descent	Development of photoperioid insensitive lines	[67]
Pisum sativum L.	Photoperiod (LED light), temperature, growth regulatorsand micro-nutrients	18–26	5	Single seed descent	Production of recombinant inbred lines	[68, 69]
Triticum aestivum L., Triticum duram L., Hordeum vulgare	Photoperiod (LED light) and temperature	37	6–7	Single seed descent	Biotic stress tolerance and development of pure lines	[5, 6, 70]

ELSEVIER

Journal of Cleaner Production

Volume 331, 10 January 2022, 129956

Artificial intelligence in animal farming: A systematic literature review

Jun Bao [a c], Qiuju Xie [b c]

https://doi.org/10.1016/j.jclepro.2021.129956 | Get rights and content

Abstract

Some scientific researches have been conducted recently based on Artificial Intelligence (AI) to solve animal welfare and health related

According to the literature review, a systematic application involving the Basic data collection devices, data processing, and smart algorithms needs to Be developed to facilitated the overall animal farming. Especially, the costless loT based data collection system and high time-efficiency AI models were very necessary to achieve a smart animal farming.

ประเมินผลผลิต

CROP YIELD

PREDICTION

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INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ELECTRICAL, ELECTRONICS, INSTRUMENTATION AND CONTROL ENGINEERING
Vol. 2, Issue 1, January 2014

Agricultural Crop Yield Prediction Using Artificial Neural Network Approach

Miss.Snehal S.Dahikar[1], Dr.Sandeep V.Rode[2]

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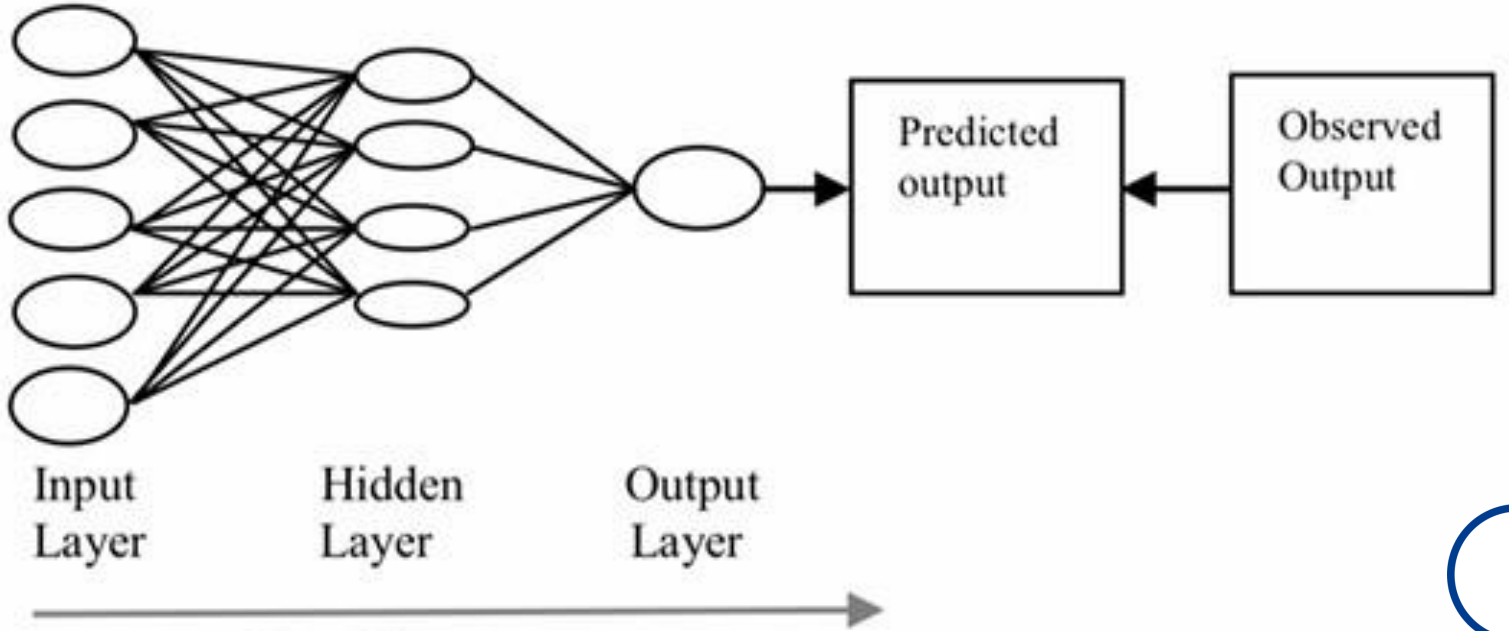

Fig 1.Layer and connection of a feed-forward back-propagating ANN.

NDVI Crop Health

Soil Moisture & Temperature @ 5 depths

Precision 0.5km Weather + Alerts

Yield Forecast

Operations Dashboard – actionable insights that influence crop decisions

- Soil moisture and temperature for irrigation and soil-based nutrients
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การเฝ้าระวัง (Monitoring)

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AI IN FARMING AND CROP MONITORING

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ABSTRACT:

Section A-Research paper

ARTIFICIAL INTELLIGENCE IN AGRICULTURE : CROP MONITORING AND DISEASE DETECTION

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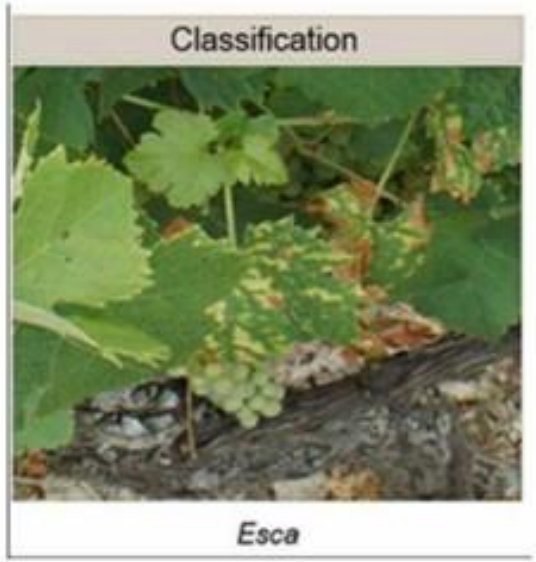


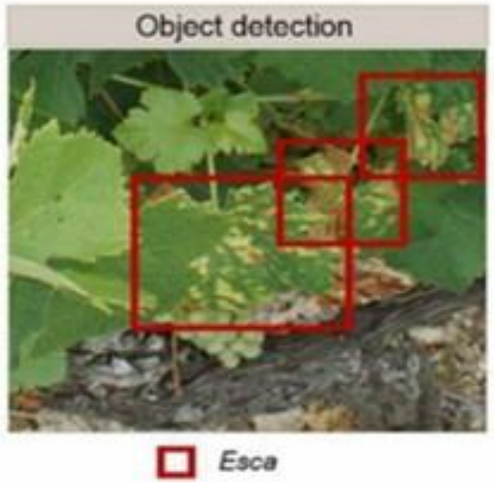


Figure 2: Convolutional Neural Networks for the Automatic Identification of Plant Diseases Accessed 17 April 2022

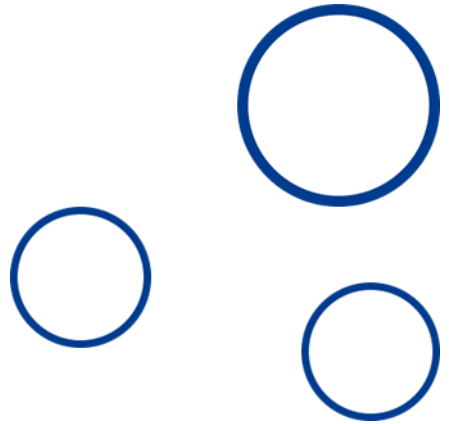
2.3 Sensors

Agricultural sensors are sensors that are utilized in smart farming. These sensors give information that helps farmers monitor and optimize crops by allowing them to adjust to changes in the environment. Weather stations, drones, and agricultural robots all have these sensors attached. They can be controlled using dedicated smartphone applications. They may be controlled directly through WiFi or via cellular towers and operated using mobile phones and also used in weather stations. Sensors in this system provide information

Microorganisms for Sustainability 47
Series Editor: Naveen Kumar Arora

Aditya Khamparia
Babita Pandey
Devendra Kumar Pandey
Deepak Gupta *Editors*

Microbial Data Intelligence and Computational Techniques for Sustainable Computing



SOIL

Corpus ID: 214676139

Soil Health Monitoring System using AI

Prof. A. V. Deorankar, Ashwini A. Rohankar, Pg Scholar •

Published 2020 •

Environmental Science, Agricultural and Food Sciences, Computer Science •

Journal of emerging technologies and innovative research

University Kasdi Merbah– OUARGLA
Faculty of New Technologies of Information and Communication
Department of Computer Science and Information Technology

Field: Mathematics and Computer Science
Sector: Computer Science
Specialty: Fundamental Computer Science

Final Project Report
For obtaining the Master's degree in Computer Science

Theme:

Soil recognition and features measurement using AI

A Review on Applications of Artificial Intelligence for Identifying Soil Nutrients

September 2023

September 2023

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Authors:

Shagun Jain

Delhi Technological University

Smart Farming

Innovative and Transformative Smart Farming using Artificial Intelligence,

Indira Gandhi agriculture University, Raipur

Expert Group Meeting on Harnessing Innovative Technologies to Advance Green Transformation for Sustainable Development in North and Central Asia

Leveraging mechanization-based innovation and technologies for sustainable and climate-smart agriculture in North and Central Asia

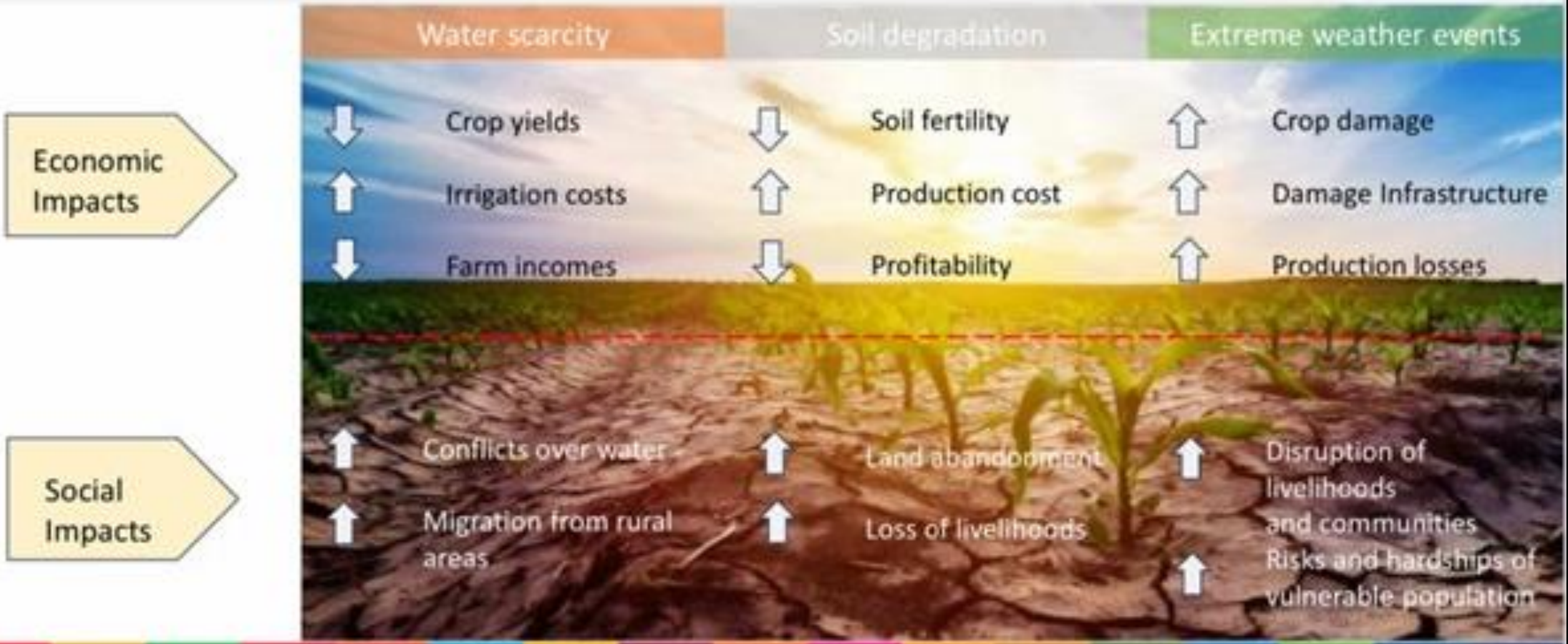
Qiang Li, National Programme Officer, Centre for Sustainable Agricultural Mechanization (CSAM), ESCAP

27 March 2024

ESCAP CSAM

Economic and Social Commission for Asia and the Pacific

Climate Change Impacts



Examples of Mechanization-based Technologies and Practices

No tillage and subsoiling stubble traw mulching

Permanent Soil Organic Cover

Diversification of Species

High-efficiency water-saving irrigation technologies

Drones for fertilizer/pesticide/herbicide spaying

Low pressure irrigation technologies

Integration of Digital Devices and Artificial Intelligence (AI)

Weather monitoring + agricultural mechanization

big data of weather +agricultural mechanization

Anti-evaporation pond

UVM for plant protection

- Digital devices such as smartphones, tablets, and IoT sensors play a pivotal role in modern agriculture.
- They enable farmers to access real-time data, make informed decisions, and optimize resource use.
- AI could help agriculture by enabling predictive analytics, automation, and providing some recommendations.
- AI-powered tools could help to analyze data to provide valuable insights for farmers.

สรุป

THANK YOU