CHITKARA UNIVERSITY

REPORT ON

COMBATING CROP FAILURE AND CLIMATE CHANGE IN PATIALA DISTRICT (CREATING AMRIT MITTI)

INTRODUCTION

The agriculture sector in Punjab, particularly in districts like Patiala and SAS Nagar, is facing a significant challenge due to declining soil fertility, frequent crop failures, and the increasing impact of climate change. Most of the land in these districts is used for farming, and over half of the population relies on agriculture for their livelihood. However, a lack of proper training, awareness, and access to scientific knowledge has become a major obstacle for the farming community. To address this important issue, Chitkara University has established the Agriculture Resilience Centre (ARC) under the Community Resilience Resource Centre (CRRC) project, funded by the Department of Science and Technology (DST), Government of India. This centre aims to strengthen the resilience of farmers by addressing crop failures, climate change impacts, and declining agricultural productivity in the region of Patiala Rural and SAS Nagar.

INSPIRATION

One of the major causes of crop failure is the declining fertility of soil, which often results from excessive use of chemical fertilizers, poor crop rotation, or sowing at inappropriate times. To address this critical issue and enhance soil productivity, we propose the adoption of Amrit Mitti, an organic soil revitalization technique. The foundation of this initiative was inspired by the research of Late Shri Deepak Sachde, whose work was brought to our attention by Shri Rajpal Makhni, a folk science advocate from Nabha. He learned this art in Bajwada and implemented it at his Ideation Centre in Nabha, where he demonstrated remarkable results.

OUR INITIATIVE

Under the CRRC project, in collaboration with our NGO partner Kisan Sanchar, we are working on a sustainable and organic soil formulation known as “Amrit Mitti”. This innovation aims to restore and enhance soil health using eco-friendly methods and promote sustainable farming practices. Dr. O.P. Rupela (Former Senior Microbiologist, ICRISAT), recognizing its potential named it Amrit Mitti as it lasts long forever.

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What is Amrit Mitti?

Amrit Mitti is a man-made organic soil, carefully developed over a 140-day process to mimic the rich, fertile soil naturally found in rainforests. It enhances soil health by supplying essential nutrients, boosting microbial activity, and restoring the soil's natural balance. The use of Amrit Mitti significantly reduces reliance on synthetic fertilizers and chemicals, supporting healthier crops and more resilient, sustainable farming. By revitalizing the soil microbiome, it improves long-term soil fertility and promotes environmentally friendly agriculture.

Objectives

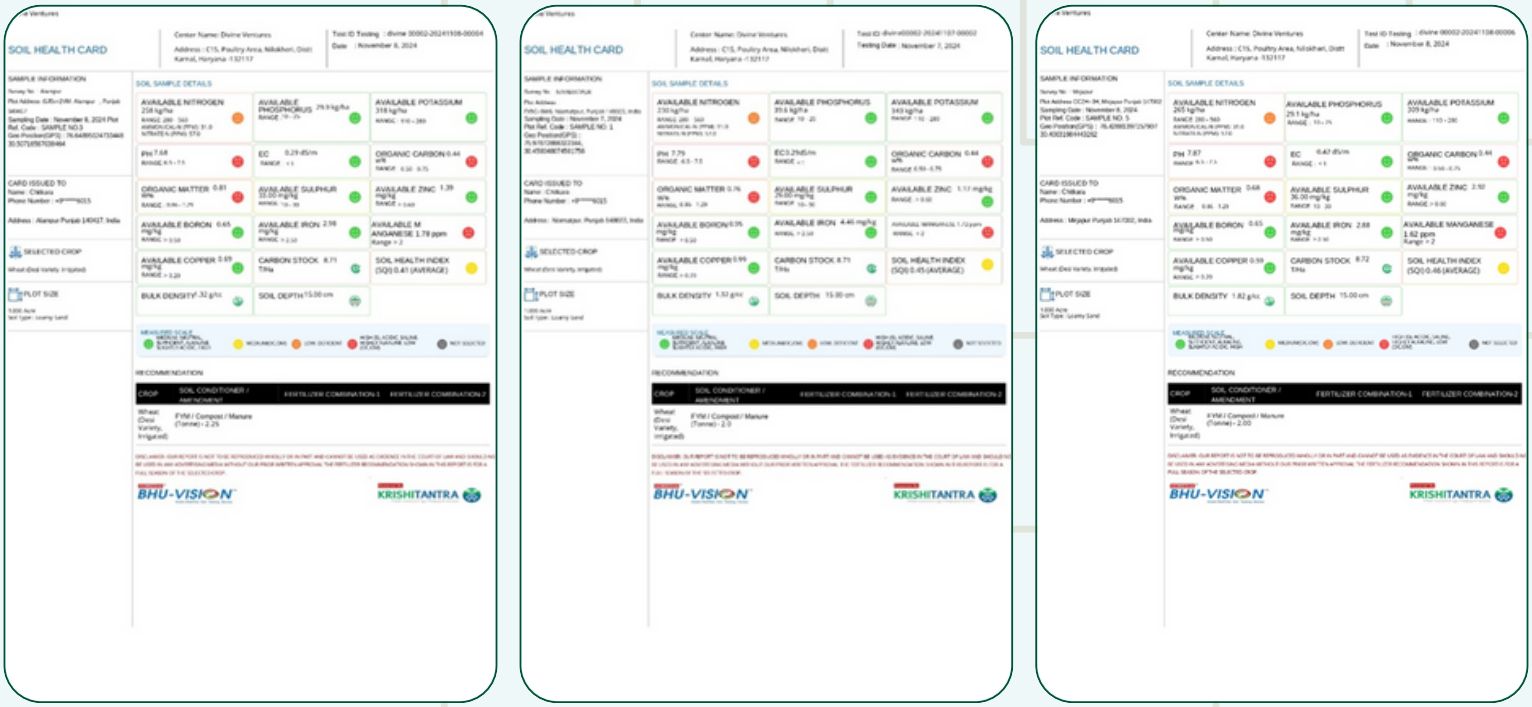
- To combat crop failure
- Mitigate climate change effects
- Improve agricultural yield (by implementing Amrit mitti to restore soil fertility)

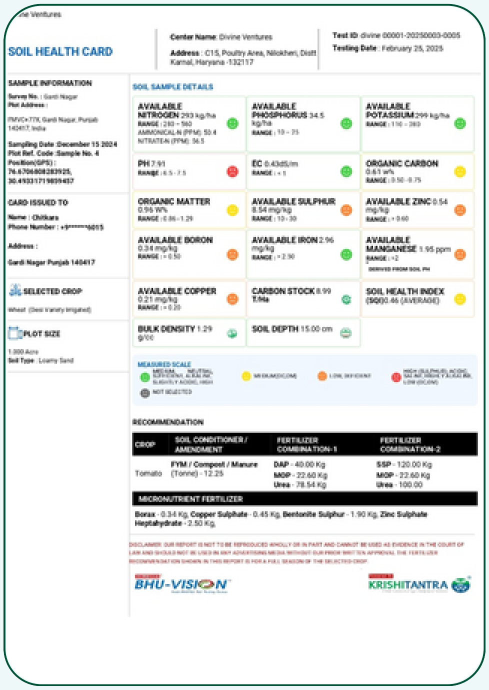
Methodology and Outcomes

1. To analyse the crop failure data of different blocks of Patiala and SAS Nagar.
2. Test the organic carbon value of Soil (from NABL Accredited Lab) of different blocks of Patiala and SAS Nagar.

Outcomes: We have conducted soil testing in various villages, which has revealed the presence of different nutrients. These nutrients are either within the acceptable range or fall below the threshold level, as you can see in the figures.

Soil test results of different villages





SOIL HEALTH CARD

Center Name: Divine Ventures
Address : C15, Poultry Area, Nilokheri, Distt Karnal, Haryana -132117
Test ID: divine 00001-20250003-0005
Testing Date : February 25, 2025

SAMPLE INFORMATION
Survey No. : Gardi Nagar
Plot Address :
FMVC+77X, Gardi Nagar, Punjab 140417, India
Sampling Date :December 15 2024
Plot Ref. Code :Sample No. 4
Position(GPS) : 76.6706808283925, 30.4933171989457

CARD ISSUED TO
Name : Chitkara
Phone Number : +9******6015
Address :
Gardi Nagar Punjab 140417

SELECTED CROP
Wheat (Desi Variety Irrigated)

PLOT SIZE
1.000 Acre
Soil Type : Loamy Sand

SOIL SAMPLE DETAILS

AVAILABLE NITROGEN 293 kg/ha RANGE : 280 - 560 AMMONICAL-N (PPM): 50.4 NITRATE-N (PPM): 56.5	AVAILABLE PHOSPHORUS 34.5 kg/ha RANGE : 10 - 25	AVAILABLE POTASSIUM 299 kg/ha RANGE : 110 - 280
PH 7.91 RANGE : 6.5 - 7.5	EC 0.43dS/m RANGE : < 1	ORGANIC CARBON 0.61 W% RANGE : 0.50 - 0.75
ORGANIC MATTER 0.96 W% RANGE : 0.86 - 1.29	AVAILABLE SULPHUR 8.54 mg/kg RANGE : 10 - 30	AVAILABLE ZINC 0.54 mg/kg RANGE : > 0.60
AVAILABLE BORON 0.34 mg/kg RANGE : > 0.50	AVAILABLE IRON 2.96 mg/kg RANGE : > 2.50	AVAILABLE MANGANESE 1.95 ppm RANGE : > 2 DERIVED FROM SOIL PH
AVAILABLE COPPER 0.21 mg/kg RANGE : > 0.20	CARBON STOCK 8.99 T/Ha	SOIL HEALTH INDEX (SQI)0.46 (AVERAGE)
BULK DENSITY 1.29 g/cc	SOIL DEPTH 15.00 cm	

MEASURED SCALE
MEDIUM, NEUTRAL, SUFFICIENT, ALKALINE, SLIGHTLY ACIDIC, HIGH — MEDIUM(OC,OM) — LOW, DEFICIENT — HIGH (SULPHUR), ACIDIC, SALINE, HIGHLY ALKALINE, LOW (OC,OM) — NOT SELECTED

RECOMMENDATION

CROP	SOIL CONDITIONER / AMENDMENT	FERTILIZER COMBINATION-1	FERTILIZER COMBINATION-2
Tomato	FYM / Compost / Manure (Tonne) - 12.25	DAP - 40.00 Kg MOP - 22.60 Kg Urea - 78.54 Kg	SSP - 120.00 Kg MOP - 22.60 Kg Urea - 100.00

MICRONUTRIENT FERTILIZER
Borax - 0.34 Kg, Copper Sulphate - 0.45 Kg, Bentonite Sulphur - 1.90 Kg, Zinc Sulphate Heptahydrate - 2.50 Kg.

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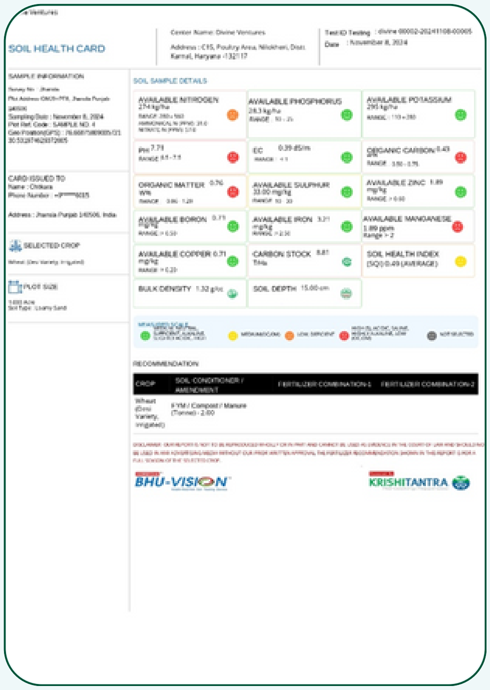
BHU-VISION KRISHITANTRA



SOIL HEALTH CARD

Center Name: Divine Ventures
Address : C15, Poultry Area, Nilokheri, Distt Karnal, Haryana -132117
Test ID Testing : divine 00002-20241108-00005
Date : November 8, 2024

SAMPLE INFORMATION
Sampling Date : November 8, 2024

CARD ISSUED TO
Name : Chitkara
Phone Number : +9******6015
Address : Jhansia Punjab 140506, India

SELECTED CROP
Wheat (Desi Variety Irrigated)

PLOT SIZE
1.000 Acre
Soil Type : Loamy Sand

SOIL SAMPLE DETAILS

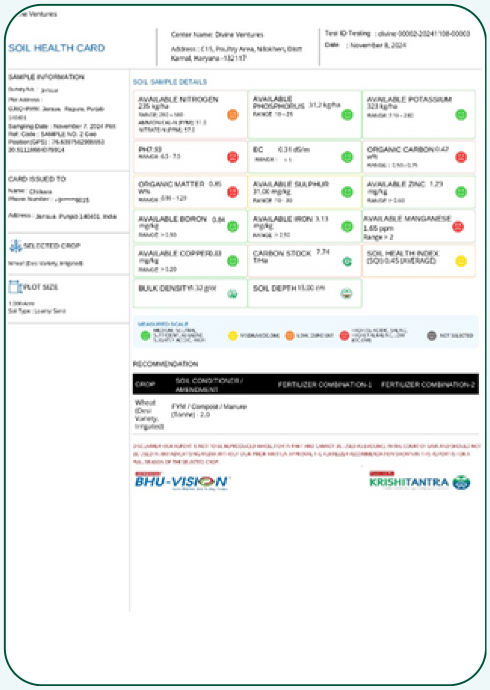
AVAILABLE NITROGEN 274 kg/ha RANGE : 280 - 560	AVAILABLE PHOSPHORUS 28.3 kg/ha RANGE : 10 - 25	AVAILABLE POTASSIUM 295 kg/ha RANGE : 110 - 280
PH 7.71 RANGE : 6.5 - 7.5	EC 0.39 dS/m RANGE : < 1	ORGANIC CARBON 0.49 W% RANGE : 0.50 - 0.75
ORGANIC MATTER 0.76 W% RANGE : 0.86 - 1.29	AVAILABLE SULPHUR 33.00 mg/kg RANGE : 10 - 30	AVAILABLE ZINC 1.89 mg/kg RANGE : > 0.60
AVAILABLE BORON 0.71 RANGE : > 0.50	AVAILABLE IRON 3.27 mg/kg RANGE : > 2.50	AVAILABLE MANGANESE 1.89 ppm Range : > 2
AVAILABLE COPPER 0.71 mg/kg RANGE : > 0.20	CARBON STOCK 8.87 T/Ha	SOIL HEALTH INDEX (SQI) 0.49 (AVERAGE)
BULK DENSITY 1.32 g/cc	SOIL DEPTH 15.00 cm	

MEASURED SCALE

RECOMMENDATION

CROP	SOIL CONDITIONER / AMENDMENT	FERTILIZER COMBINATION-1	FERTILIZER COMBINATION-2
Wheat (Desi Variety, Irrigated)	FYM / Compost / Manure (Tonne) - 2.00		

BHU-VISION KRISHITANTRA



SOIL HEALTH CARD

Center Name: Divine Ventures
Address : C15, Poultry Area, Nilokheri, Distt Karnal, Haryana -132117
Test ID Testing : divine 00002-20241108-00003
Date : November 8, 2024

SAMPLE INFORMATION
Sampling Date : November 7, 2024

CARD ISSUED TO
Name : Chitkara
Phone Number : +9******6015
Address : Jansua Punjab 140401, India

SELECTED CROP
Wheat (Desi Variety Irrigated)

PLOT SIZE
1.000 Acre
Soil Type : Loamy Sand

SOIL SAMPLE DETAILS

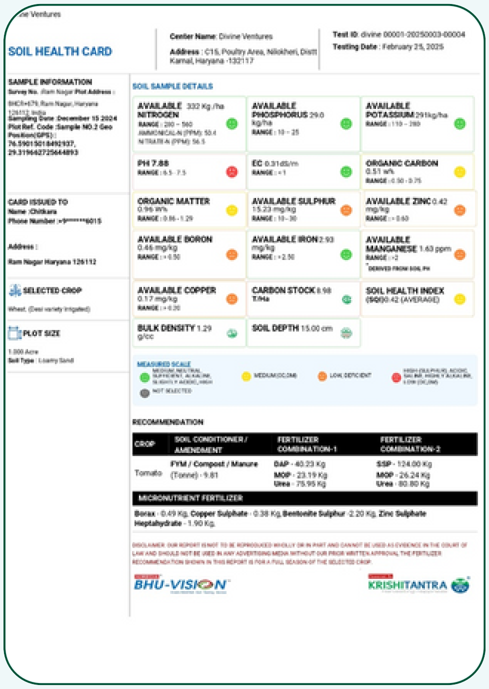
AVAILABLE NITROGEN 235 kg/ha RANGE : 280 - 560	AVAILABLE PHOSPHORUS 31.2 kg/ha RANGE : 10 - 25	AVAILABLE POTASSIUM 323 kg/ha RANGE : 110 - 280
PH 7.93 RANGE : 6.5 - 7.5	EC 0.31 dS/m RANGE : < 1	ORGANIC CARBON 0.47 W% RANGE : 0.50 - 0.75
ORGANIC MATTER 0.85 RANGE : 0.86 - 1.29	AVAILABLE SULPHUR 31.06 mg/kg RANGE : 10 - 30	AVAILABLE ZINC 1.29 mg/kg RANGE : > 0.60
AVAILABLE BORON 0.86 mg/kg RANGE : > 0.50	AVAILABLE IRON 3.13 mg/kg RANGE : > 2.50	AVAILABLE MANGANESE 1.65 ppm Range : > 2
AVAILABLE COPPER 0.83 mg/kg RANGE : > 0.20	CARBON STOCK 7.74 T/Ha	SOIL HEALTH INDEX (SQI) 0.45 (AVERAGE)
BULK DENSITY 1.32 g/cc	SOIL DEPTH 15.00 cm	

MEASURED SCALE

RECOMMENDATION

CROP	SOIL CONDITIONER / AMENDMENT	FERTILIZER COMBINATION-1	FERTILIZER COMBINATION-2
Wheat (Desi Variety, Irrigated)	FYM / Compost / Manure (Tonne) - 2.0		

BHU-VISION KRISHITANTRA



SOIL HEALTH CARD

Center Name: Divine Ventures
Address : C15, Poultry Area, Nilokheri, Distt Karnal, Haryana -132117
Test ID: divine 00001-20250003-00004
Testing Date : February 25, 2025

SAMPLE INFORMATION
Survey No. :Ram Nagar Plot Address :
Sampling Date :December 15 2024
Plot Ref. Code :Sample No.2
Position(GPS) : 76.59015018492937, 30.319462725644893

CARD ISSUED TO
Name :Chitkara
Phone Number :+9******6015
Address :
Ram Nagar Haryana 126112

SELECTED CROP
Wheat (Desi variety Irrigated)

PLOT SIZE
1.000 Acre
Soil Type : Loamy Sand

SOIL SAMPLE DETAILS

AVAILABLE NITROGEN 332 Kg /ha RANGE : 280 - 560 AMMONICAL-N (PPM): 50.4 NITRATE-N (PPM): 56.5	AVAILABLE PHOSPHORUS 29.0 kg/ha RANGE : 10 - 25	AVAILABLE POTASSIUM 291kg/ha RANGE : 110 - 280
PH 7.88 RANGE : 6.5 - 7.5	EC 0.31dS/m RANGE : < 1	ORGANIC CARBON 0.51 W% RANGE : 0.50 - 0.75
ORGANIC MATTER 0.96 W% RANGE : 0.86 - 1.29	AVAILABLE SULPHUR 15.23 mg/kg RANGE : 10 - 30	AVAILABLE ZINC 0.42 mg/kg RANGE : > 0.60
AVAILABLE BORON 0.46 mg/kg RANGE : > 0.50	AVAILABLE IRON 2.93 mg/kg RANGE : > 2.50	AVAILABLE MANGANESE 1.63 ppm RANGE : > 2 DERIVED FROM SOIL PH
AVAILABLE COPPER 0.17 mg/kg RANGE : > 0.20	CARBON STOCK 8.98 T/Ha	SOIL HEALTH INDEX (SQI)0.42 (AVERAGE)
BULK DENSITY 1.29 g/cc	SOIL DEPTH 15.00 cm	

MEASURED SCALE
MEDIUM, NEUTRAL, SUFFICIENT, ALKALINE, SLIGHTLY ACIDIC, HIGH — MEDIUM(OC,OM) — LOW, DEFICIENT — HIGH (SULPHUR), ACIDIC, SALINE, HIGHLY ALKALINE, LOW (OC,OM) — NOT SELECTED

RECOMMENDATION

CROP	SOIL CONDITIONER / AMENDMENT	FERTILIZER COMBINATION-1	FERTILIZER COMBINATION-2
Tomato	FYM / Compost / Manure (Tonne) - 9.81	DAP - 40.23 Kg MOP - 23.19 Kg Urea - 75.95 Kg	SSP - 124.00 Kg MOP - 26.24 Kg Urea - 80.80 Kg

MICRONUTRIENT FERTILIZER
Borax - 0.49 Kg, Copper Sulphate - 0.38 Kg, Bentonite Sulphur -2.20 Kg, Zinc Sulphate Heptahydrate - 1.90 Kg.

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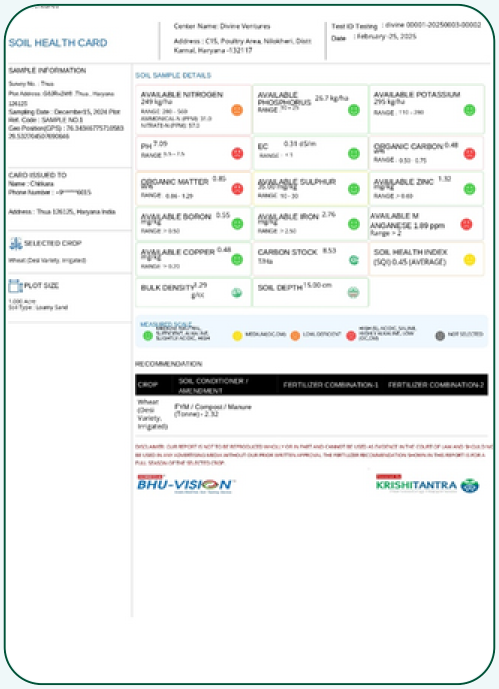
BHU-VISION KRISHITANTRA



SOIL HEALTH CARD

Center Name: Divine Ventures
Address : C15, Poultry Area, Nilokheri, Distt Karnal, Haryana -132117
Test ID Testing : divine 00001-20250003-00002
Date : February 25, 2025

SAMPLE INFORMATION
Survey No. : Thua
Sampling Date : December 15, 2024
Plot Ref. Code : SAMPLE NO.3

CARD ISSUED TO
Name : Chitkara
Phone Number : +9******6015
Address : Thua 126125, Haryana India

SELECTED CROP
Wheat (Desi Variety Irrigated)

PLOT SIZE
1.000 Acre
Soil Type : Loamy Sand

SOIL SAMPLE DETAILS

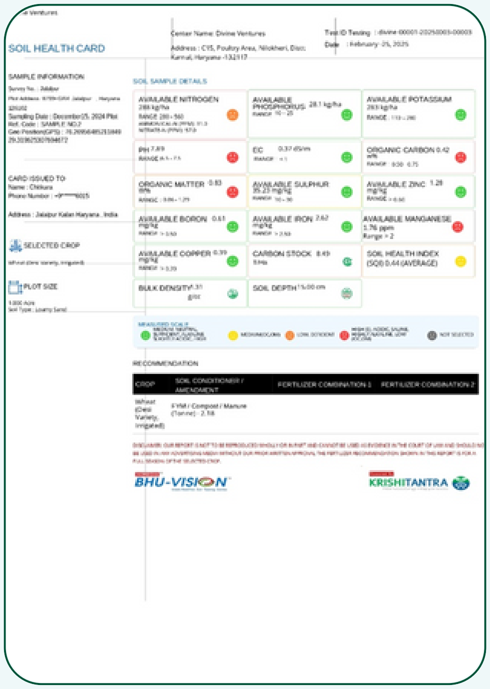
AVAILABLE NITROGEN 249 kg/ha RANGE : 280 - 560	AVAILABLE PHOSPHORUS 26.7 kg/ha RANGE : 10 - 25	AVAILABLE POTASSIUM 295 kg/ha RANGE : 110 - 280
PH 7.09 RANGE : 6.5 - 7.5	EC 0.31 dS/m RANGE : < 1	ORGANIC CARBON 0.48 W% RANGE : 0.50 - 0.75
ORGANIC MATTER 0.85 W% RANGE : 0.86 - 1.29	AVAILABLE SULPHUR RANGE : 10 - 30	AVAILABLE ZINC 1.32 mg/kg RANGE : > 0.60
AVAILABLE BORON 0.55 RANGE : > 0.50	AVAILABLE IRON 2.76 mg/kg RANGE : > 2.50	AVAILABLE MANGANESE 1.89 ppm Range : > 2
AVAILABLE COPPER 0.48 mg/kg RANGE : > 0.20	CARBON STOCK 8.53 T/Ha	SOIL HEALTH INDEX (SQI) 0.45 (AVERAGE)
BULK DENSITY 1.29 g/cc	SOIL DEPTH 15.00 cm	

MEASURED SCALE

RECOMMENDATION

CROP	SOIL CONDITIONER / AMENDMENT	FERTILIZER COMBINATION-1	FERTILIZER COMBINATION-2
Wheat (Desi Variety, Irrigated)	FYM / Compost / Manure (Tonne) - 2.32		

BHU-VISION KRISHITANTRA



SOIL HEALTH CARD

Center Name: Divine Ventures
Address : C15, Poultry Area, Nilokheri, Distt Karnal, Haryana -132117
Test ID Testing : divine 00001-20250003-00003
Date : February 25, 2025

SAMPLE INFORMATION
Survey No. : Jalalpur
Sampling Date : December 15, 2024
Plot Ref. Code : SAMPLE NO.2

CARD ISSUED TO
Name : Chitkara
Phone Number : +9******6015
Address : Jalalpur Kalan Haryana, India

SELECTED CROP
Wheat (Desi Variety Irrigated)

PLOT SIZE
1.000 Acre
Soil Type : Loamy Sand

SOIL SAMPLE DETAILS

AVAILABLE NITROGEN 288 kg/ha RANGE : 280 - 560	AVAILABLE PHOSPHORUS 28.1 kg/ha RANGE : 10 - 25	AVAILABLE POTASSIUM 283 kg/ha RANGE : 110 - 280
PH 7.89 RANGE : 6.5 - 7.5	EC 0.37 dS/m RANGE : < 1	ORGANIC CARBON 0.42 W% RANGE : 0.50 - 0.75
ORGANIC MATTER 0.83 W% RANGE : 0.86 - 1.29	AVAILABLE SULPHUR 35.23 mg/kg RANGE : 10 - 30	AVAILABLE ZINC 1.28 mg/kg RANGE : > 0.60
AVAILABLE BORON 0.61 mg/kg RANGE : > 0.50	AVAILABLE IRON 2.62 mg/kg RANGE : > 2.50	AVAILABLE MANGANESE 1.76 ppm Range : > 2
AVAILABLE COPPER 0.39 mg/kg RANGE : > 0.20	CARBON STOCK 8.49 T/Ha	SOIL HEALTH INDEX (SQI) 0.44 (AVERAGE)
BULK DENSITY 1.31 g/cc	SOIL DEPTH 15.00 cm	

MEASURED SCALE

RECOMMENDATION

CROP	SOIL CONDITIONER / AMENDMENT	FERTILIZER COMBINATION-1	FERTILIZER COMBINATION-2
Wheat (Desi Variety, Irrigated)	FYM / Compost / Manure (Tonne) - 2.18		

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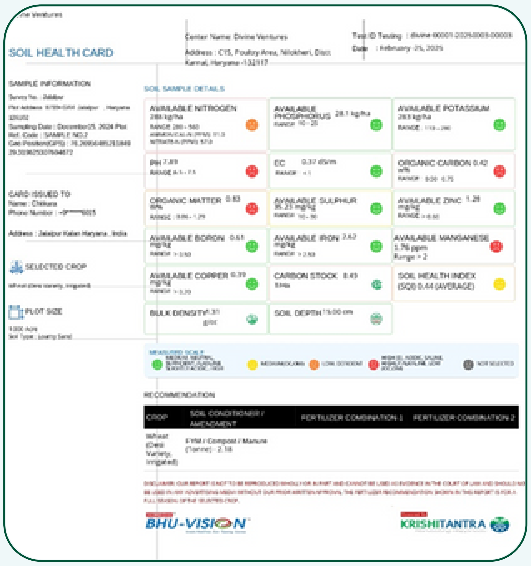

SOIL HEALTH CARD

Center Name: Divine Ventures
Address : C15, Poultry Area, Nilokheri, Distt Karnal, Haryana -132117
Test ID Testing : divine 00001-20250003-00003
Date : February 25, 2025

SAMPLE INFORMATION
Survey No. : Jalalpur
Sampling Date : December 15, 2024
Plot Ref. Code : SAMPLE NO.2

CARD ISSUED TO
Name : Chitkara
Phone Number : +9******6015
Address : Jalalpur Kalan Haryana, India

SELECTED CROP
Wheat (Desi Variety Irrigated)

PLOT SIZE
1.000 Acre
Soil Type : Loamy Sand

SOIL SAMPLE DETAILS

AVAILABLE NITROGEN 288 kg/ha RANGE : 280 - 560	AVAILABLE PHOSPHORUS 28.1 kg/ha RANGE : 10 - 25	AVAILABLE POTASSIUM 283 kg/ha RANGE : 110 - 280
PH 7.89 RANGE : 6.5 - 7.5	EC 0.37 dS/m RANGE : < 1	ORGANIC CARBON 0.42 W% RANGE : 0.50 - 0.75
ORGANIC MATTER 0.83 W% RANGE : 0.86 - 1.29	AVAILABLE SULPHUR 35.23 mg/kg RANGE : 10 - 30	AVAILABLE ZINC 1.28 mg/kg RANGE : > 0.60
AVAILABLE BORON 0.61 mg/kg RANGE : > 0.50	AVAILABLE IRON 2.62 mg/kg RANGE : > 2.50	AVAILABLE MANGANESE 1.76 ppm Range : > 2
AVAILABLE COPPER 0.39 mg/kg RANGE : > 0.20	CARBON STOCK 8.49 T/Ha	SOIL HEALTH INDEX (SQI) 0.44 (AVERAGE)
BULK DENSITY 1.31 g/cc	SOIL DEPTH 15.00 cm	

MEASURED SCALE

RECOMMENDATION

CROP	SOIL CONDITIONER / AMENDMENT	FERTILIZER COMBINATION-1	FERTILIZER COMBINATION-2
Wheat (Desi Variety, Irrigated)	FYM / Compost / Manure (Tonne) - 2.18		

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3. Assessment of organic carbon value of Soil and suggesting suitable intervention to increase crop yield.
Outcomes: After assessing the soil's organic carbon content, custom interventions including Amrit Mitti application, organic mulching, and reduced chemical input are recommended. These practices aim to:

- Improve soil microbial life
- Enhance water retention
- Increase crop yield sustainably

A live demonstration setup has been established at Chitkara University's Punjab campus (Yellow Point Farm), where farmers can witness the Amrit Mitti preparation process firsthand and be inspired to adopt it, and also get to know how Amrit Mitti help to provide additional source of income to the farming community.

4. Analyze the Weather Data (Temperature & Rainfall Data) & Agromet data of different blocks of Patiala and SAS Nagar.
5. Prediction of future rainfall using machine learning techniques and suggesting different crop types for fighting crop failure and climate change.
6. Conducting awareness and capacity building programs for farmers in association with Kisan Sanchar NGO.
Outcomes: We have conducted sensitization cum awareness camps for farmers in different village (10 villages) of different target blocks of Patiala rural and SAS Nagar.

Field Activities

We have engaged with farmers across various villages and conducted sensitization-cum-awareness camps to introduce them to the concept of Amrit Mitti.


Patiala, Punjab, India
, Punjab 140601, India, Patiala, Punjab 140601, India
Lat 30.534313° Long 76.65778°
18/03/2025 12:15 PM GMT +05:30
Google


Jhansala, Punjab, India
Gmh7+395, Jhansala, Punjab 140601, India
Lat 30.52773° Long 76.663926°
18/03/2025 11:09 AM GMT +05:30
Google


Ghagar Sarai, Punjab, India
Fm26+mcg, Ghagar Sarai, Punjab 140417, India
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26/03/2025 12:00 PM GMT +05:30
Google


Tangori, Punjab, India
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Google


Nagari, Punjab, India
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Pehar, Punjab, India
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Pehar, Punjab, India
Gj3f+xw7, Pehar, Punjab 140401, India
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Google

Conclusion

The Chitkara University Agriculture Resilience Centre (CU-ARC), in partnership with Kisan Sanchar NGO, is taking a holistic and inclusive approach to address Punjab's agricultural challenges. By integrating Amrit Mitti, a regenerative soil practice, with climate-smart tools and data-driven strategies, the initiative aims to:

- Restore soil fertility
- Improve crop yield
- Reduce the dependence on chemical inputs
- Build long-term resilience to climate change

This model not only empowers farmers but also serves as a scalable solution for agricultural sustainability across India.