

# EMERGING TECHNOLOGY SOLUTIONS

Bringing new digital experiences in remote areas via  
satellite

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PRESENTED BY:  
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PRESENTED ON:  
7 July 2021

# Connectivity landscape

## Pacific's digitalisation

### ▲ SATELLITE

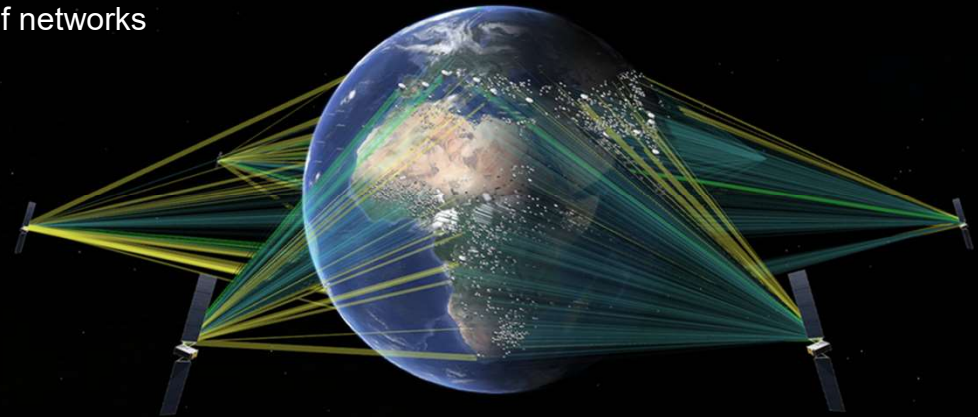
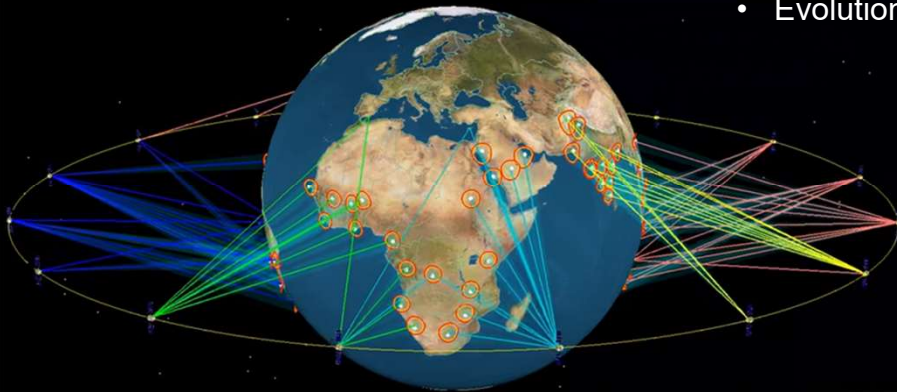
- Before 2014, GEO connectivity
- Beginning 2014, O3b MEO became available

### ▲ CABLE & OTHER NETWORKS

- Government Aid, World Bank/Asian Development Bank Funding a proliferation of undersea cables
- Evolution of networks

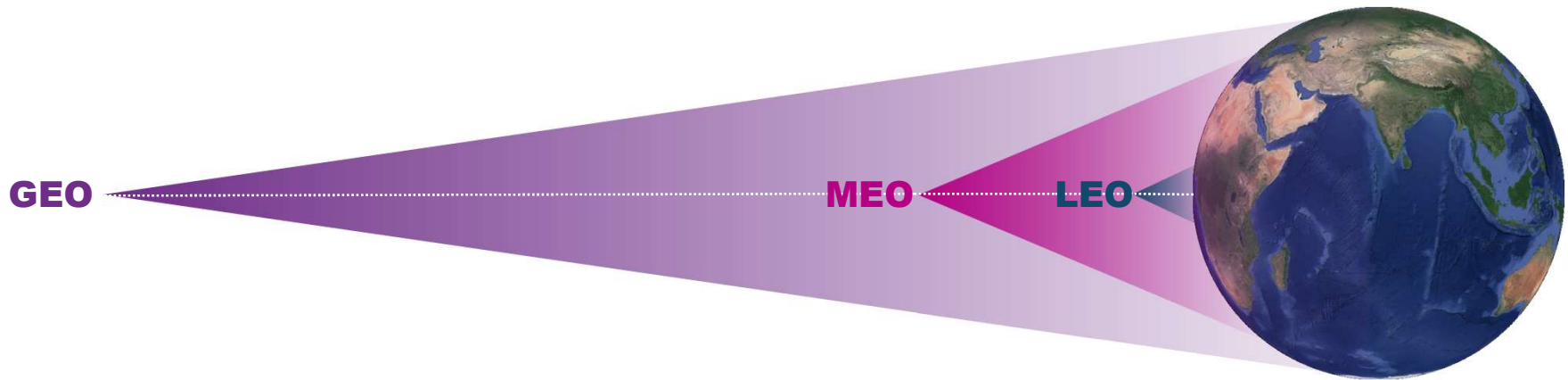
### ▲ FUTURE OF CONNECTIVITY

- NGSO constellations
- Proven NGSO System in O3b mPOWER is coming



# Comparing orbits

## What works best?



GEO ~ 36,000km	O3b MEO ~ 8,000km	NGSO LEO ~ 1,000km
Readily available, provides traditional connectivity in the region	Providing high-throughput, low latency connectivity in the Pacific since 2014	Hundreds of satellites launched Consumer broadband focused
High latency (~700 msec)	Low latency (~150 msec)	Very low latency (~50 msec)
Continental gateways (HTS for data)	Regional gateways (high throughput)	Many local gateways (low throughput)
100s Mbps per terminal	Multiple Gbps per terminal	100s Mbps per terminal

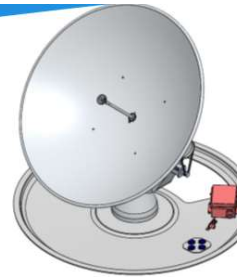
# Advancements in Gateways and Terminals

Ground infrastructure is the key

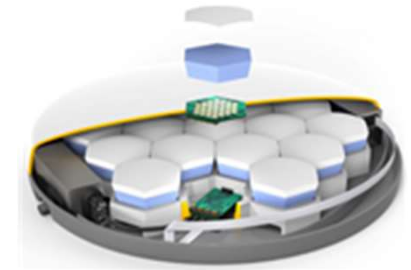


Fixed Gateways

Backhaul and Fixed Network



Emerging Technologies



Mobility and Maritime



Smaller, lighter and more cost-effective antennas

Flat panel phased array technology

Software integration and intelligence



Transportable Government Gateways

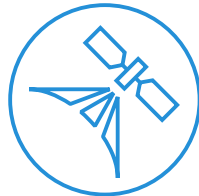
## Multi-orbit satellite fleet strategy

More opportunities to extend networks and drive digitalisation



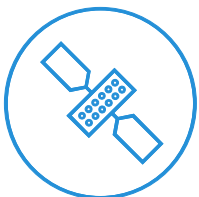
**54**

GEO widebeam



**3**

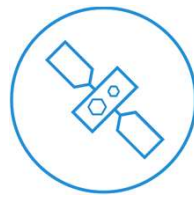
GEO HTS



**20**

MEO HTS

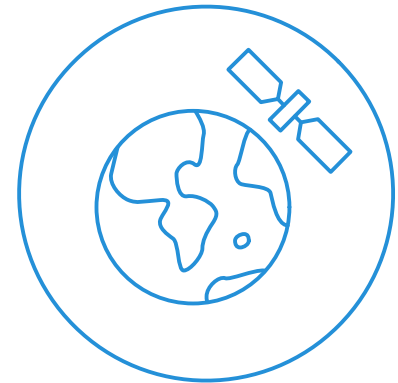
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O3b mPOWER

One network offering differentiated capabilities delivering value to our customers' businesses & missions



**99%**  
global coverage

## O3b mPOWER

The next generation of MEO built on a legacy of performance

- ▲ Fully digitised payload
- ▲ Electrically steered beam-forming
- ▲ High throughput (10Mbps+ to 10Gbps+) per end user
- ▲ Terabit per second scalable system
- ▲ Flexible forward-to-return throughput ratio
- ▲ Low latency MEO (<150msec)
- ▲ Inherently secure & flexible

- Currently being manufactured by Boeing
- First launch in – 2H 2021
- Full operational readiness - 2H 2022

## Digitalisation via advanced satellite technologies

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**Satellites play a crucial role** in extending connectivity and bring digitalisation to both urban and remote areas



**Use of new satellite technologies**—including next-generation, multi-orbit satellite communication systems—can help accelerate digitalisation timelines by bringing the best of technology to the Asia-Pacific region.



**Collaboration between operators, in market access, and a good partner ecosystem** are equally important to achieve digital access.



# THANK YOU!

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# Dhiraagu 5G Implementation

Strategy, Experience and Learnings

# Maldives



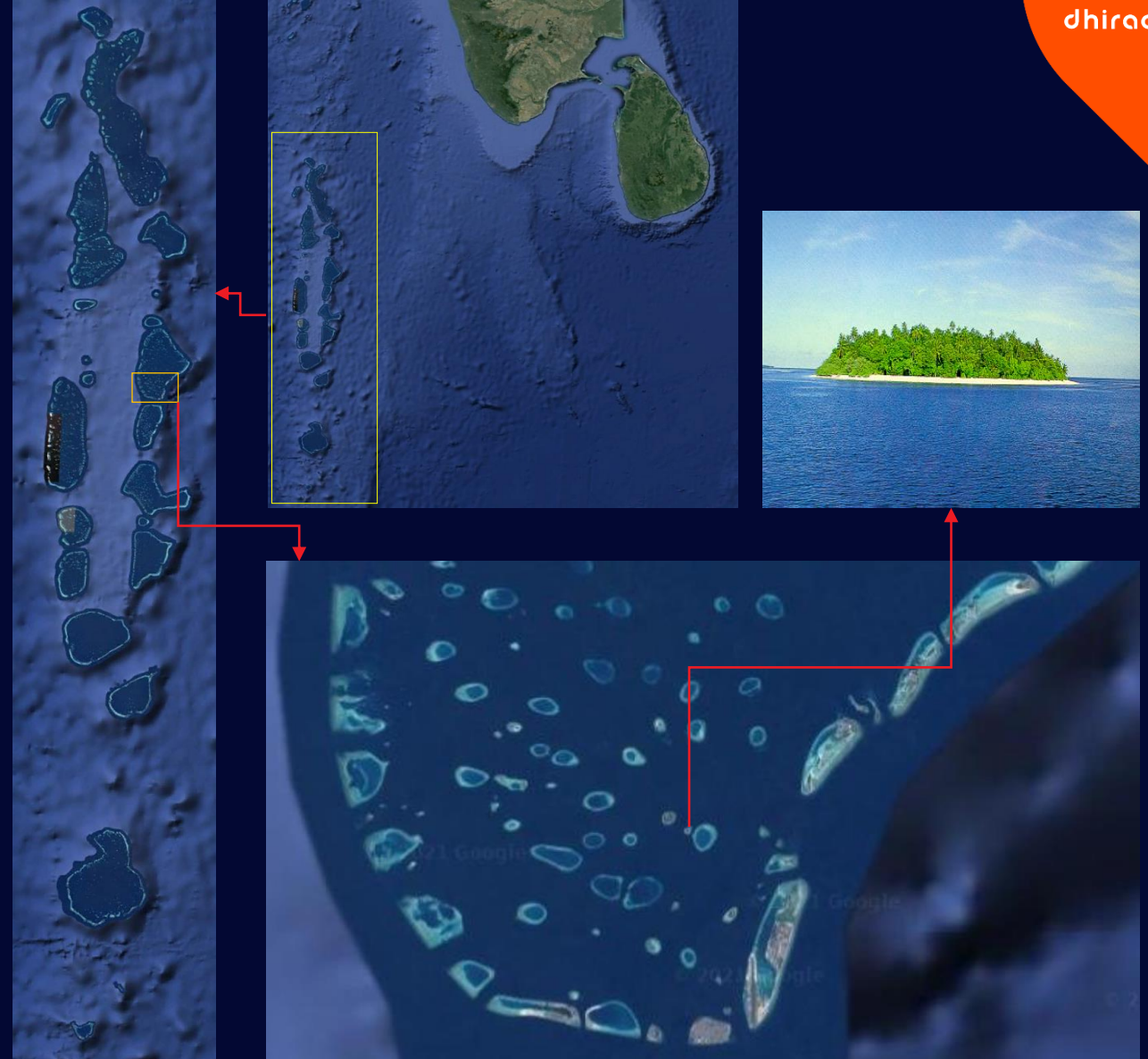
dhiraagu

## Geography

- A chain of coral atolls
- 26 geographical atolls
- 860 km long, 80 -120 km wide
- over 80% of land area less than 1m above mean sea level
- Island size: from 0.5 to 2 sq.km
- Total land area: less than 1%
- Small population: ~400,000

## Telecom Challenges

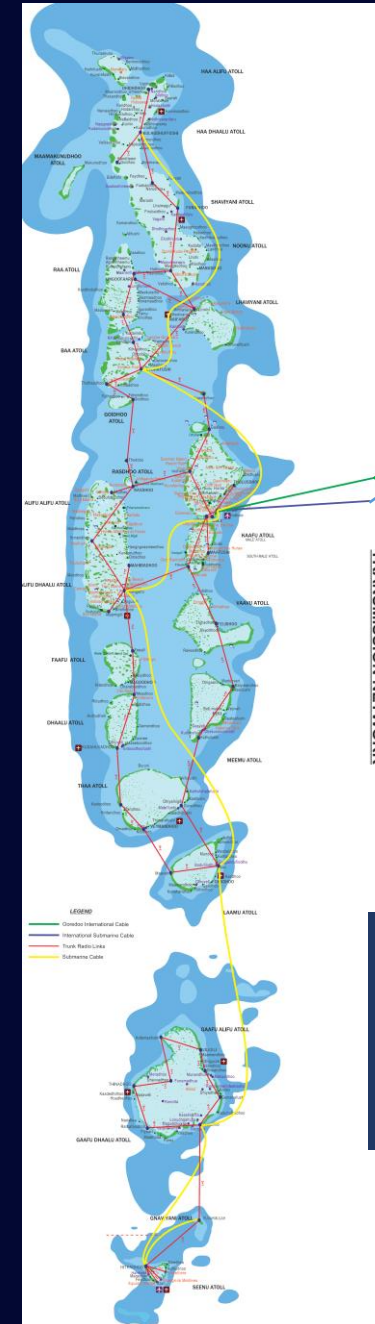
- International connectivity
- Connectivity between islands
- Submarine cable option expensive for all islands
- Microwave Radio – capacity limitation for high traffic services like FTTH, 5G, IPTV, etc.



# Dhiraagu



- Dhivehi Raajjeyge Gulhun Public Limited (Dhiraagu) established in 1988
- First and Leading Telecom Operator in the Maldives
- Mobile Network
  - 2G, 3G and 4G nation-wide coverage
  - 4G+ in main islands
  - 5G introduced
- Fixed cable network (FTTH and ADSL) in 60+ main islands (80% of the households)
- Dhiraagu IPTV in 55 main islands
- 2 International Submarine Cable Networks
- Domestic Submarine Cable Network (9 cable landing stations)
- Microwave Radio Network connecting all islands



- Domestic Submarine Cable Network
- Microwave Trunk Network
- DS submarine cable terminating in Sri Lanka SLT
- MSC submarine cable terminating in Sri Lanka Dialog

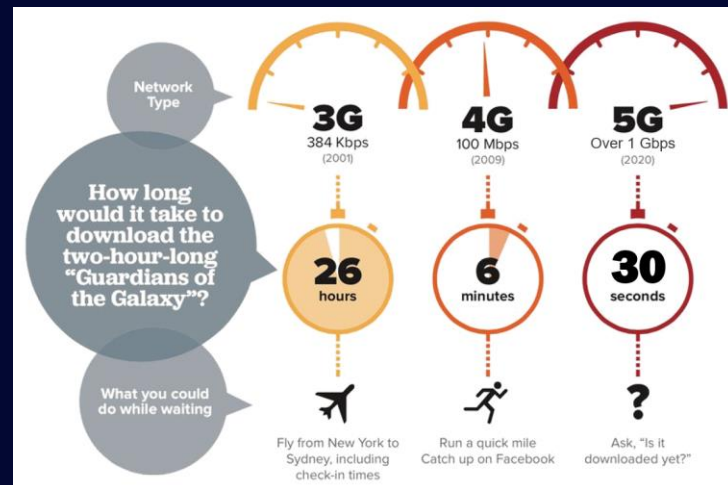
# Promise of 5G Network

## 5G Network Offers

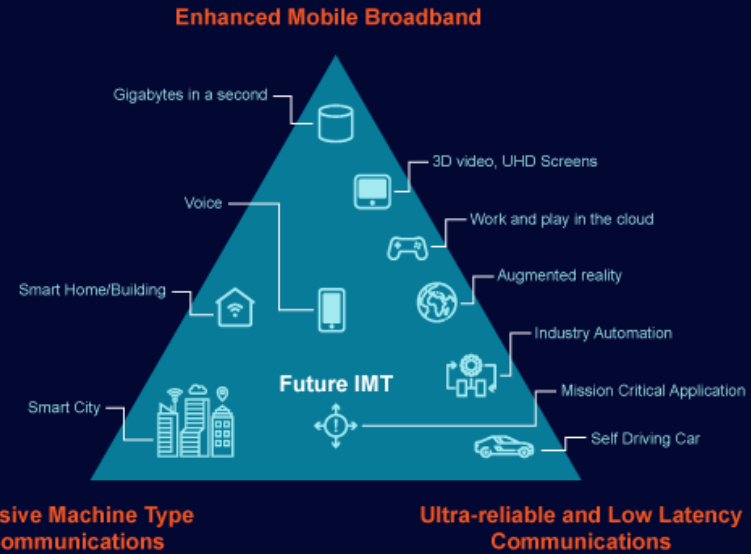
- Enhanced Mobile Broadband
- Ultra-reliable Low Latency communication
- Massive Machine Type communication

## Key Techniques used to realize this enhancement

- Massive MIMO with beam forming
- Multiple Carrier Aggregation
- High Radio Frequency bandwidth (100MHz)
- Virtual Network Functions and Network Slicing



5G speed (<https://i.pining.com>)



5G use case families (source: ITU-R, 2015).



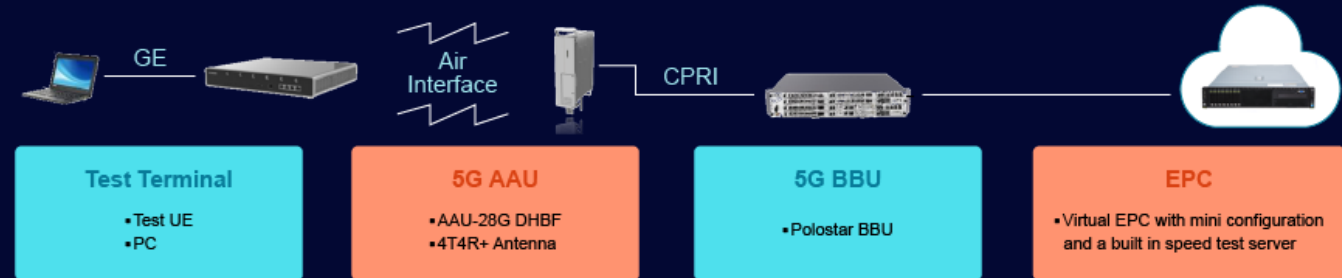
IoT devices, mMTC (<https://www.iot-now.com>)

# 5G Implementation

Show customers our commitment to provide latest technology when available

## 5G Trial

- First 5G demonstration in the Maldives - 2018
- Showcase and experience 5G air interface and RAN capabilities
- Millimeter wave frequency range
- Throughput reached 5-6 Gbps
- Handset availability: used 5G capable test terminal



## 5G Introduction

- 5G Introduction in 2019
- First commercial 5G service in Maldives and South Asia
- The main objective was to create hotspots and allow customers to use 5G network
- Use as Enhanced Mobile Broadband

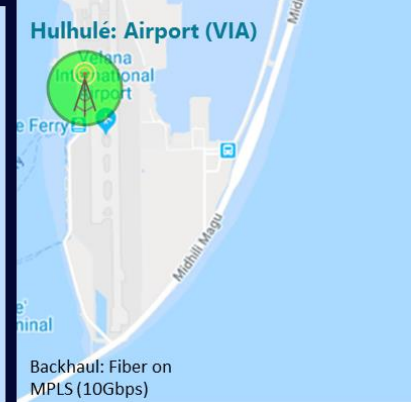
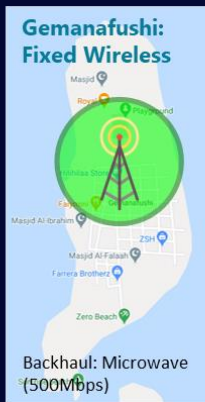
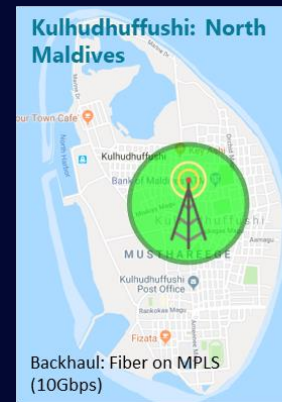
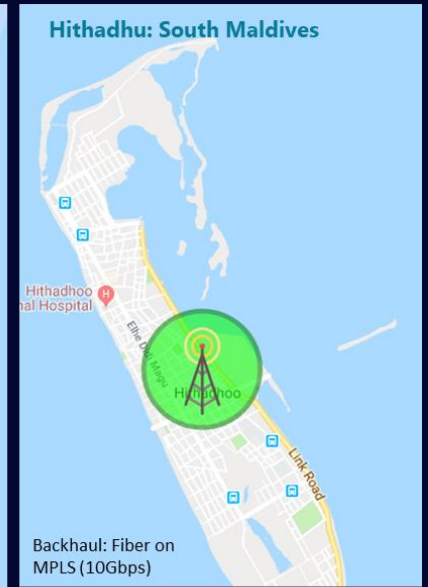
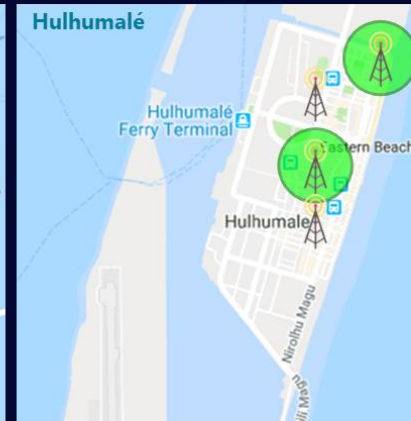
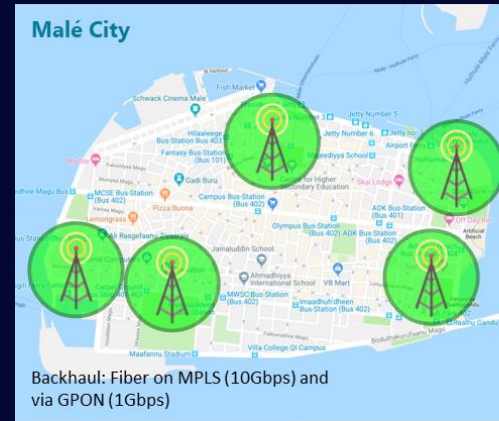


# 5G Introduction - Strategy

- Limited location – create hotspots
- Site Selection
  - Limited
  - Strategically selected locations
  - Cover Greater-Malé area where population is heavily concentrated
  - Cover more open areas where people gather like parks and cafés
  - Off-Malé highly populated Islands
  - An island without FBB for Fixed Wireless Internet
  - A Resort
  - Place sites where infrastructure and backhaul change is minimal



## Dhiraagu 5G Network



# 5G Introduction – Design and Preparation

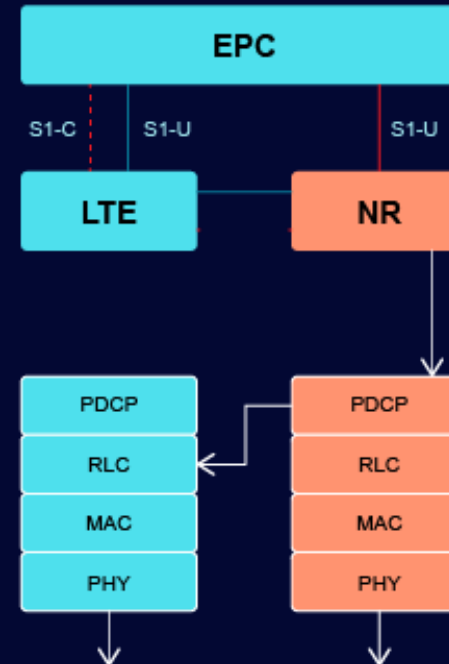
## Design

- Deployment of a SA core is costly and time consuming
- Deployment is done with NSA Option 3x. This does limit the radio vendor to existing 4G radio vendor in collocated sites
- Frequency Band: 3.6-3.8GHz, Bandwidth: 200MHz, 64T64R MIMO

## Preparation

- Space in the equipment cabinet and tower for 5G equipment were made
- Power and cooling capacity was upgraded
- Transmission was made available from nearest node site (with either direct fiber, GPON or Microwave)
- Both Core Network and RAN software needed to be upgraded to Support 5G

## Option 3x



- Avoid impact to Legacy LTE for user data
- Use 4G for signaling



### AAU5613(C-Band)

- Frequency Band: 3.6-3.8GHz
- Bandwidth: 200MHz
- Max output power: 200W
- 64T64R MIMO
- Weight: 40kG

# 5G Introduction – Testing

## Functional Tests

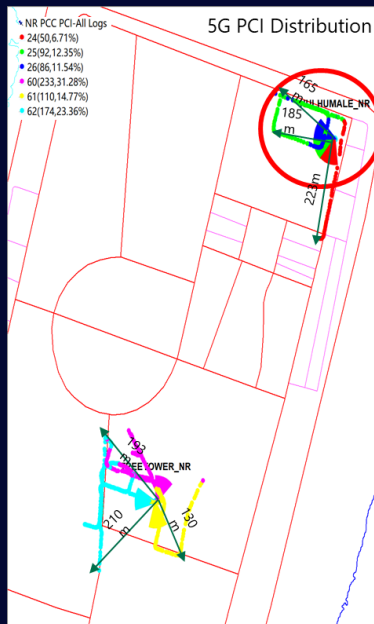
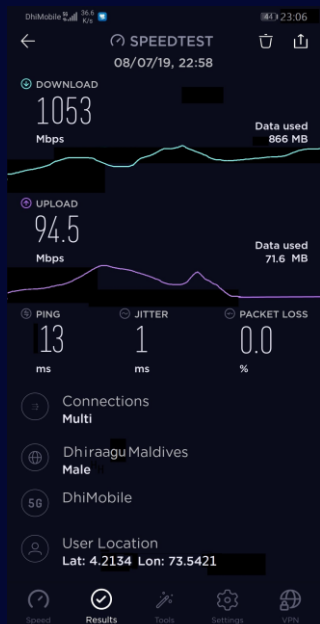
- Cell radius around 200m- matched initial planning
- Throughputs of more than 1Gbps observed from all sectors
- CSFB is successful from 5G to 4G to 3G
- Cell reselection from 4G to 5G is successful
- Handover between 5G cells are successful

## Effect of 1Gbps transmission on Access Speeds

- Transmission of gNodeB moved to 1Gbps interface
- Speed reaches over 900Mbps

## Broadband for non-Fiber locations with limited transmission over Microwave:

- A gNodeB installed in an island with a 200Mbps microwave transmission capacity
- Throughput reaches the transmission capacity



Type	Date	Mbps	Mbps
5G	13/10/19 13:31	913	57.4
5G	13/10/19 13:30	912	69.7
5G	13/10/19 13:29	911	84.5
5G	15/10/19 13:28	912	75.5
5G	15/10/19 13:28	912	75.8
5G	15/10/19 13:27	912	70.1





# Challenges



## Satellite TV related

- C band also use by Satellite TV operators
- 5G spectrum interfere with satellite TV reception
- Mitigation Action
  - Use C band LNB with 5G filter to avoid full band saturation
  - Obtain lower band for 5G outdoor coverage

## Handset related

- Handset verification requires manufacturing giants takes over six months.
- Even with verification all supported models are not readily approved.

## Coverage

- Indoor coverage is poor due to high penetration loss 5G spectrum used
- Buildings with glass fronts get acceptable coverage
- 5G Coverage gets easily shaded by buildings and vegetation

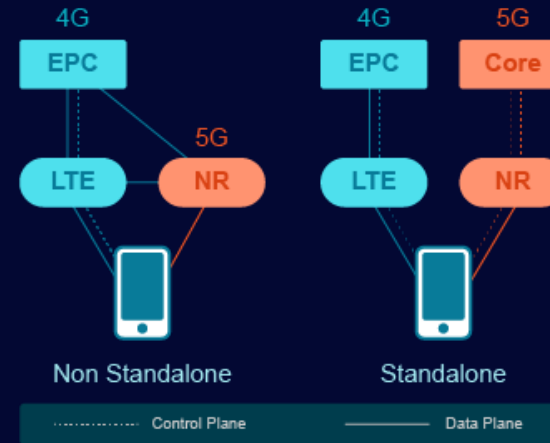
# What's Next?



dhiraggu

## Rollout of 5G Coverage

- Expand 5G coverage to all areas in phases
- Explore more cost effective 5G solutions
- NSA core to 5G SA core to deploy an NFV solution
- Deploy VoLTE and Vo5G to enhance voice experience

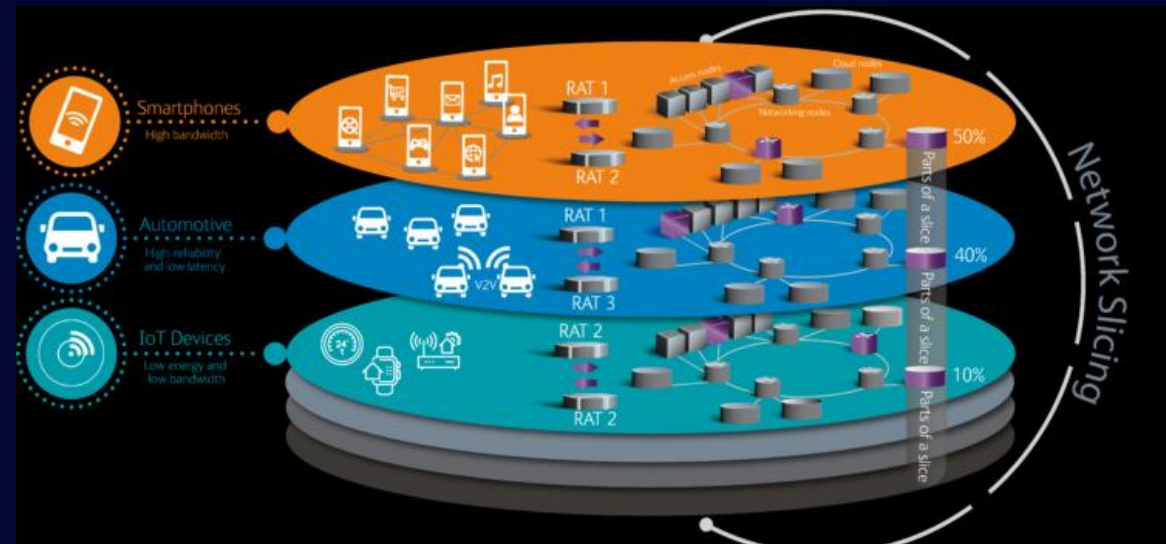


5G SA and NSA (<https://support.oppo.com>)

# Vo5G

## New Services

- IoT based smart city services
- Network slicing can be offered to government, law enforcement, emergency services and major corporate customers
- Real-time applications



Network Slicing (<https://www.viavisolutions.com>)



**Thank you**

The image shows three women in vibrant, colorful saris (red, pink, and yellow) smiling warmly. The woman in the center is holding a young child. The background is slightly blurred, suggesting an outdoor setting. The text 'Digital Green' is overlaid at the top in a white and green font. Below it, a white text box contains the main message: 'An Integrated portfolio of digital solutions for rural communities' and 'Empowering farmers to lift themselves out of poverty'.

Digital Green

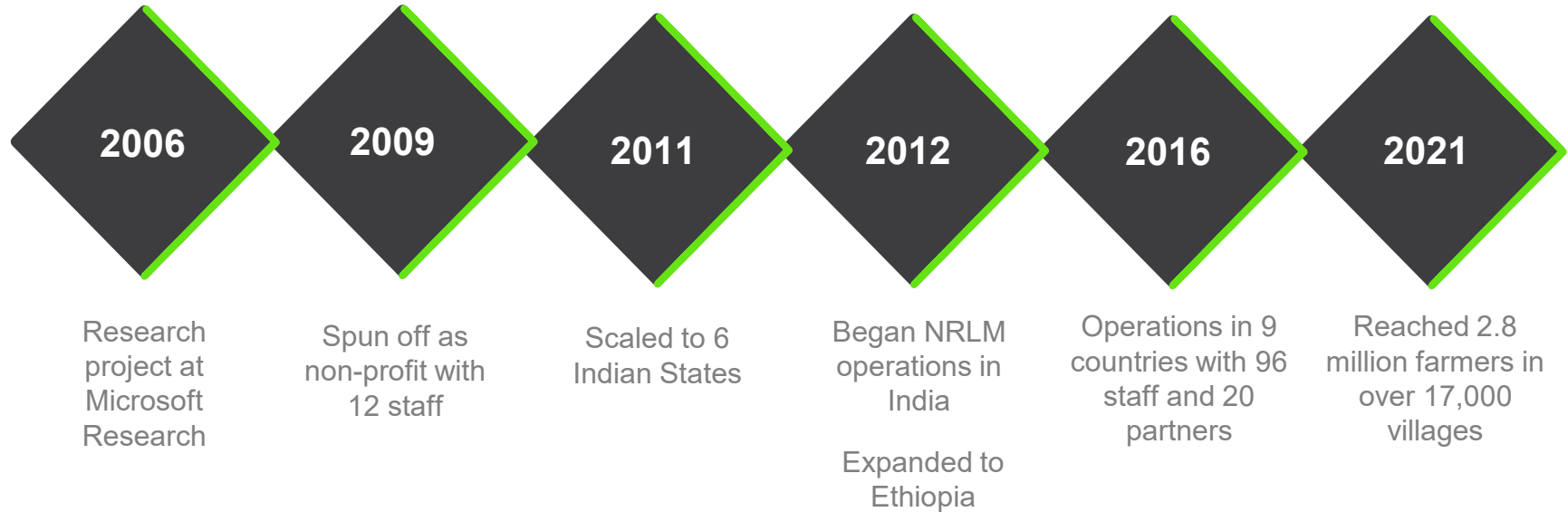
**An Integrated portfolio of digital solutions for rural communities**

Empowering farmers to lift themselves  
out of poverty

## JOURNEY SO FAR

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We began by focusing on community videos



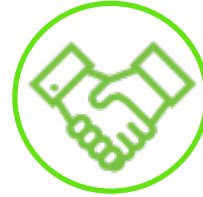
## OUR APPROACH

In every community,  
we begin with  
assessment and diagnosis



- Work with community organizations
- Listen to their experience and assess systems already in existence
- Find ways to use technology as an entry point

We don't create systems in  
parallel to existing ones



- Integrate solutions into existing ones
- Work through partnerships
- Test & iterate to find what works for the community

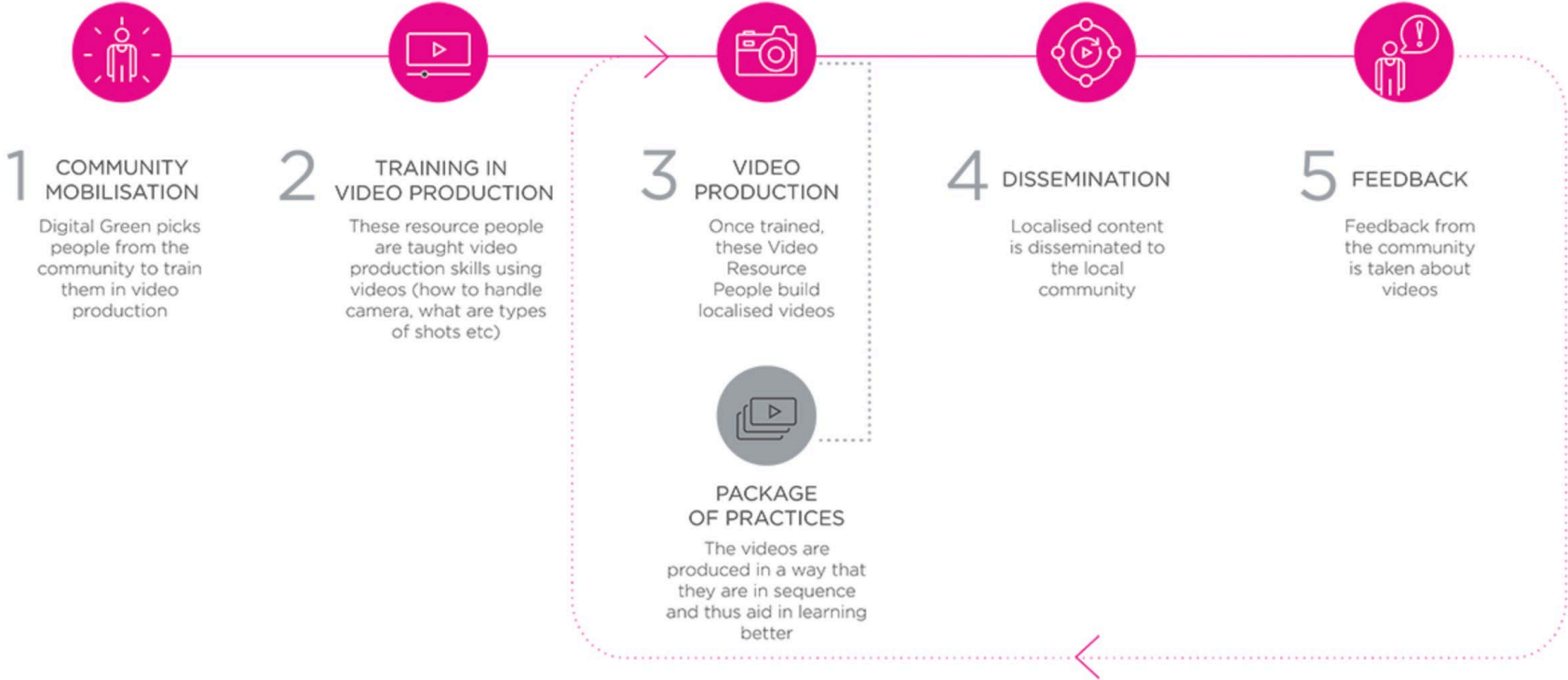
We listen closely to the  
data we collect



- Collect data continuously
- Invest in analysis to adapt our approach
- Use learnings to galvanize stakeholders to advance broader agriculture development

We believe that  
smallholder farmers  
are the heroes

# COMMUNITY-BASED VIDEO APPROACH



## OUR SOLUTIONS

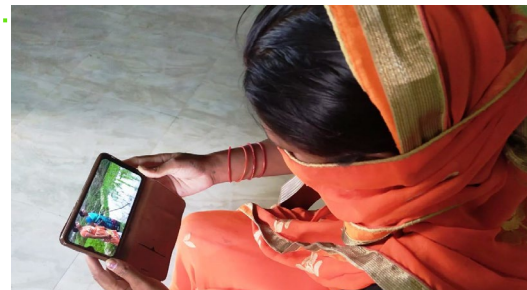
Integrated Digital solutions for rural communities around the world

### WhatsApp Chatbot



Customized automated advisories in text, audio and video forms

### WhatsApp Groups



Virtual groups for easy and ongoing interaction

### SMS



Timely reminders for farmers with limited connectivity

### IVR

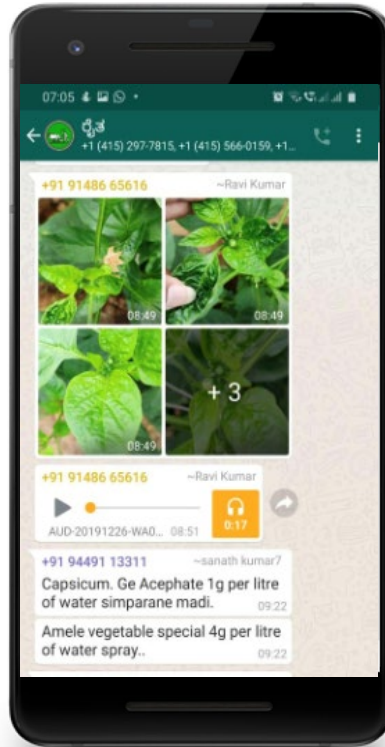


Personalized messages for the semi-literate with limited connectivity

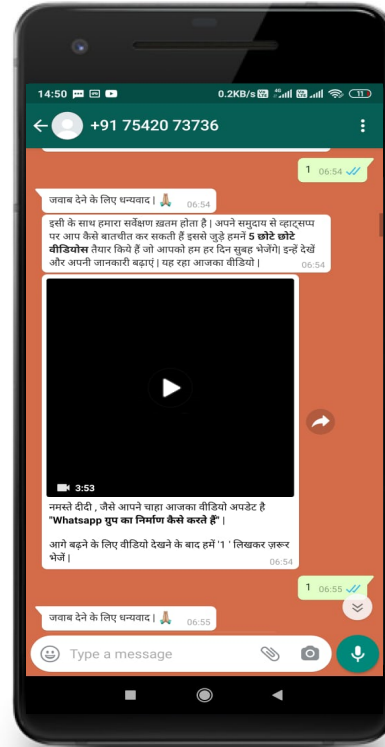


# INITIAL EXPERIMENTS

## WhatsApp groups for sharing advisories



## Chatbot-based micro-learning modules



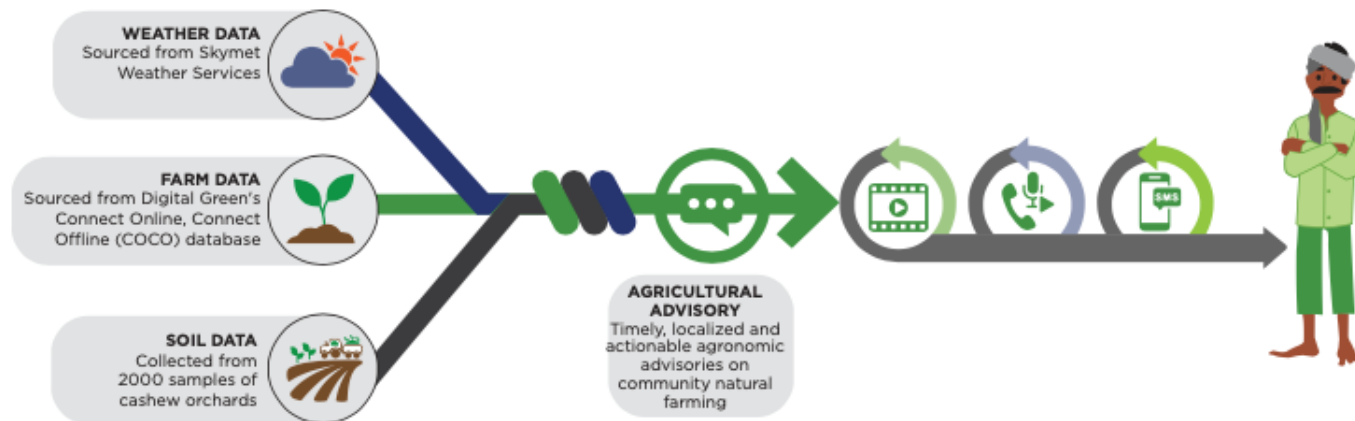
## Chatbot-based Customized Advisories



# CUSTOMIZED DIGITAL ADVISORY SERVICES

- Need for customized information in both agriculture and health was evident
- Receiving timely information was crucial for farmers and rural communities
- Information shared in various formats, audio, video and text was helpful

## A USE CASE



## IMPACT AT THE FIELD



- 95% (out of ~250,000 farmers) of those who received advisories through digital tools reported to actually listening/watching audio and video messages they received across India, Ethiopia and Nepal
- An increase by almost 10% in adoption of promoted practices and 12% increase in yield in Andhra Pradesh where customized advisories were provided over generic advisories
- 90% of farmers who were onboarded on the chatbot in Jharkhand continued engaging with the bot, 97% wanted to recommend it to other farmers and 99% wanted to continue the service in the next season
- 48% farmers who received customized advisories through chatbot adopted the promoted practices, where the typical rate of adoption through traditional extension system is 10%

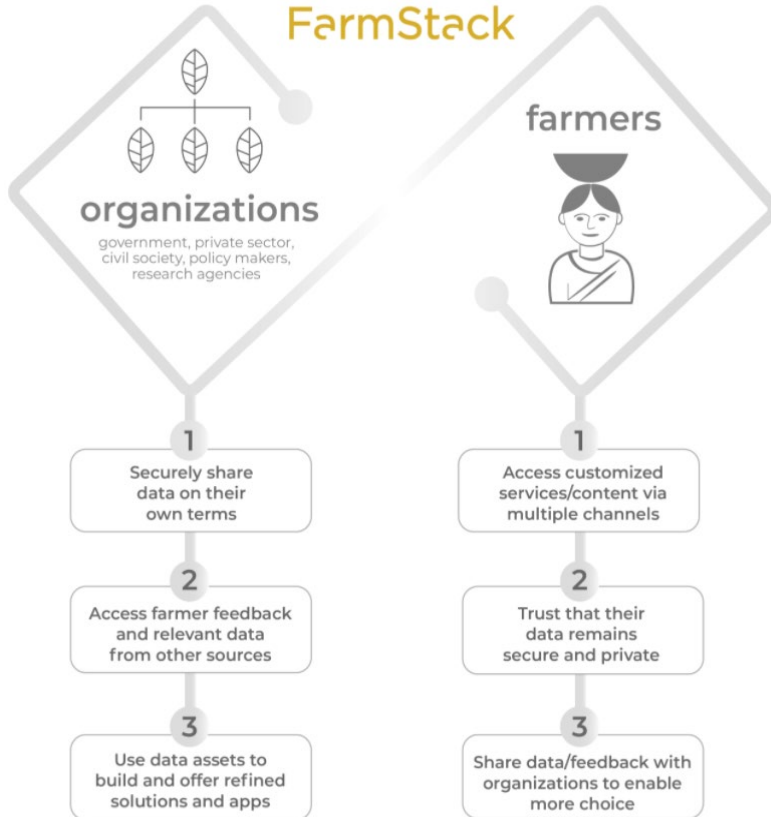
## FINDINGS FROM THE FIELD



- Rural communities are increasingly getting access to smart devices and internet connectivity, including women community members
- Onboarding users to a new digital channel is challenging – issues range from those of trust to limited digital skills.
- Designing the service responsive to rural communities' needs see a high uptake, or else there are high dropouts
- Users have to see high value to continue using the service – timely, personalized services are valued. Technology adoption is not necessarily the biggest barrier

# WAY FORWARD

## FarmStack



- Enabling more choice for rural community members on how they want to access information and services
- Delivering content via multiple channels that complement each other and address rural communities' issues of access
- Keep farmers and communities in the center when using data – ensuring data privacy and security
- Sharing data between different actors more securely, with consent of each actor to deliver high value to the end-user – the rural community

THANK YOU



@digitalgreenorg

