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To: NICIS-CHPC  
From: INNOBIZ Group Pty Ltd (IBG)  
Date: 30 September 2024

**PROJECT TITLE: IMAGE BASED ANALYSIS AND CROP PREDICTION USING SMARTPHONE.**

**ABSTRACT**

The 2019 White Paper on Science, Technology, and Innovation in South Africa emphasises the core themes of inclusivity, transformation, and partnerships. Following the introductory discussion with the farmers, it became clear that the majority of them have an urgent need for up-to-date soil-health data and assistance with managing their crops in order to maximize their profits. Addressing this, our consortium aims to create a smartphone app that will empower small-scale farmers with immediate soil-health predictions derived from soil digital images. Additionally, this app will extend its functionality to provide crop recommendations and assist the farmer in smart decision-making by incorporating regular weather updates and nowcasting of local weather parameters. An integrated energy and sustainability management module will be designed to monitor and control energy consumption and carbon emission. This project proposal unites partners from South Africa, Scotland, and Turkey, leveraging their collective expertise in science, agriculture and digital technologies.

This innovation integrates advanced technologies such as digital image processing (DIP), machine learning (ML), and artificial intelligence (AI), with deep-learning algorithms and large language models (LLM) used for ML training, and AI chatbot services for enhanced functionality. The app architecture includes a mobile front-end API connected to a dynamic back-end system, featuring a database, knowledge base, and external APIs, with

Python serving as the core programming language. Therefore, this project is using Sebowa Cloud Services – Commercial (4x vCPU, 16GB RAM, 200 GB Disk).

## **TEAM MEMBERS PROFILE**

- **Mr Lindokuhle Mdletshe**, is a Founder and a Chief Enabler of INNOBIZ Group (Pty) Ltd (INNOBIZ), with more than 10 years of working experience. He holds an MSc (Chemistry) from the University of Johannesburg (UJ), and is an experienced Project Manager and Instrument Scientist with a demonstrated history of working in the research and innovation industry. He is skilled in technology development, policy creation, strategic planning, and project management. Lindokuhle have been part of the South African and European Commission delegations at International High-Level Policy Dialogues on Science, Technology and Innovation (STI).
- **Dr Kaustav Bhattacharjee**, Ph.D. (Material Science), has more than 12 years of research experience in the field of Material Science and Nanotechnology. Dr Bhattacharjee is a Chief Technology Officer (CTO) at INNOBIZ Group. His current interests include digital image processing and data analysis for practical applications He has published several research papers, reviews and book chapters with a total citation count of close to 300 citations. He is currently our image analyst and a leader of this noble quest. He was part of the Indian government funded projects delegation as the National Postdoctoral fellow and the Fellow of Council of Scientific and Industrial Research, India. Dr Bhattacharjee is not new to the African scientific research community, since he was with National Centre for Nano-structured Materials (NCNSM – CSIR) in the year 2015.
- **Mr Newcayen Maluleke** holds a NDip in Information and Communication Technology from Tshwane University of Technology (TUT). Mr Maluleke is a passionate Software Developer at INNOBIZ Group, with more than 5 years of experience in web development, embedding programming and mobile application development with database design. Over the years he has gained an experience in back-end and front-end technologies such as JavaScript, Node.js, Python,

Docker, React, Flutter, Java, PHP, MySQL, and Postgresql as well as the cloud platform AWS. A dedicated professional who specializes in applying agile methodologies to the continuous integration and development of Android mobile applications, interactive web applications as well as machine learning applications in speech signal processing and image processing. A developer with interests in machine learning, data engineering and web application development.