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Integrated Approach of IoT, Big Data and AI (Case Study : Smart Village)

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ABSTRACT

In India, the growth of villages has a huge effect on the nation's success now the smart villages will use technologies to improve living standards, minimise costs and resource consumption (like transportation, electricity, health care, education, social services, water, and waste management), and communicate with their people more efficiently and effectively. The main aim of IoT, Big Data, and AI technologies is to streamline these operations in multiple fields, increase device performance (technologies or particular processes), and eventually improve life quality which ensures self-sufficiency and self-reliance by optimising natural resources with the assessment of local people's interests and a greater knowledge of village dynamics.
This paper discusses the principle of smart villages. It focuses solely on villages in order to research them and then offer alternatives for their needs. It also assists in the development of their standard of living.

Keywords : Smart Village, Big Data, IOT, Sensor, AI, SDG.

I. INTRODUCTION

In most of the rural areas depend on agriculture. Rural villages have emerged as a critical priority for achieving the SDGs (Sustainable Development Goals). Inadequate infrastructure, a lack of Internet access, low-income levels, transportation challenges, the education system, etc. endanger rural life and the economy. Big data, AI and IOT's can helps us in numerous ways to solve these problems like Monitoring water level of a from various water source, such as water tank, borewell etc., plays a key role in agriculture. Real-time data together with AI will assist in the identification of different problems as they occur, more use of IoTs, AI and good infrastructure would be able to manage network problems more quickly, like VR, AR, and other technologies. Learners can achieve successful learning opportunities and outcomes, as well as realistic knowledge and problem-solving skills, these things can help with transportation and traffic control, as well as change the generation / delivery of energy, etc.

II. METHODOLOGY

Some firms, including Cisco, IBM, and others, are already collaborating with universities and local governments to create data-driven systems for transportation, waste management, law enforcement,

and energy use to make them more efficient and improve the lives of peoples. The research on "Smart Villages" requires multidisciplinary studies: the integration of cutting-edge technologies for enabled services for social services.

III. DISCUSSION

Technologies can solve some problems like -

- Lower Income
- Illiteracy
- Unemployment
- Various Problems and etc.

Challenges lie ahead are tough and will require a lot of work in the technology and research sector before implementing smart technologies in villages and after that telling people how to use that technology and how they will be benefited from that. Especially farmers there are still many farmers who are using old techniques to improve their work which eventually takes time and energy and they still do not get many benefits from them. By implementing Big Data, IOT and AI which will help determine farmers the quality of crop they are growing and can make smart future decisions based on the data provided by the intelligent technologies.

Importance of Climate Change, Energy, Environmental Science and sustainable development should be taught in schools and colleges. There should be competition on providing the best solutions to the people living in villages to improve their lives. The best idea can be selected and funded by various angle investor / Governments, Industrial Sectors in order to improve lives in villages.

There are numerous problems faced by villagers, but we can solve those problems in many ways.

A. Improvement of Irrigation:

Precision agriculture relies heavily on smart irrigation. It assists farmers in reducing water waste and improving crop growth quality in their fields by

- Irrigating at the correct times.
- Minimizing runoffs and other wastages.
- Accurately determining soil moisture levels and, as a result, determining irrigation requirements in any location.

Replacing manual irrigation valves and systems with automated valves and systems eliminates human error (for example, failing to turn off a valve after watering the field) and is beneficial in saving energy, time, and valuable resources. Smart irrigation system installation and configuration are also relatively simple in general.

[8] To solve these problems Agricultural Robot Applications can also be used and farmers will focus more on improving total production yields by using agricultural robots to automate long, routine activities.

The following are some of the most popular agricultural robot applications.

- Harvesting and picking.
- Weed control.
- Autonomous mowing, pruning, seeding, spraying and thinning.
- Phenotyping.
- Sorting and packing.
- Utility platforms.

❖ Use Sensors for Irrigation:

[9] Various methods can be used to determine the soil moisture content (in volumetric and gravimetric forms), which can be classified into traditional and modern techniques for both laboratory and in situ measurements. Precision agriculture makes use of a variety of sensing technologies to provide data that

helps farmers track and maximise crops as well as respond to evolving environmental factors.

B. F2C (Farmer to consumer):

Farm Direct Marketing aims to capture a larger portion of the customer rupee. The delicate balancing of production and distribution must be mastered by all effective farming operations. As opposed to selling wholesale, many farmers choose to direct market their crops because it makes for higher profit margins. Cut out the middleman and having direct input from customers will make these marketing avenues worth the time and effort taken to implement.

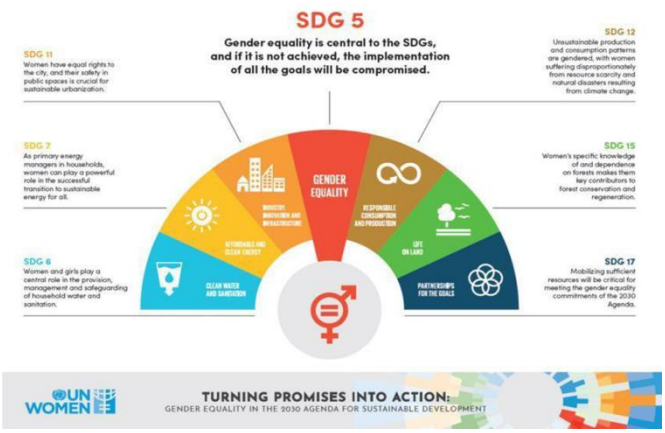
C. Water Scarcity:

Water shortage affects billions of people, and access to safe drinking water is a fundamental human right. There is more salt water on the planet than fresh water, making drinking water scarce. Some have created technologies for this reason. The top four technologies are mentioned below.

- The Water Seer
- The Desolenator
- Janicki Omni Processor
- Desalination

D. SDGs Approach:

SDG5, achieving gender equality and empowering both women and children, is one of the most important SDGs because it would have positive cascading impacts on the other SDGs, including higher schooling, poverty reduction, green energy, reduced injustice, good health and healthcare, zero hunger, lean water and sanitation, decent employment and economic growth, and, most importantly, climate change.



E. Involvement of women's

Investing in girls and women has a multiplier impact, benefiting not only individual women but also their families, communities, and nations. One study found that countries with higher female parliamentary representation are more prone to ratify international environmental treaties. Evidence also shows that when women have stable rights and access to property, they are more likely to use resources sustainably. Women's participation in climate change mitigation would serve to ensure that future generations have access to clean air, healthy drinking water, adequate food, and safe housing.

The battle against climate change becomes more intense every year as the 2030 deadline for meeting the Sustainable Development Goals approaches, with policymakers pouring money into achieving them.

F. Labour:

"The robots are coming." "No jobs are safe." "The way we work is coming to an end."

As technologies have the potential to change the employment landscape, these concerns about automation and technology's effect on jobs continue to intensify. While new technologies may result in the loss of millions of jobs, they will also result in the creation of millions of new jobs (although it is still uncertain if there will be enough new jobs).

Concerns about robotics, automation, and artificial intelligence (AI) overlook the fact that technological

advancements are more likely to alter rather than remove employment. In the manufacturing industry, businesses are experimenting with using mechanical exoskeletons on floor and line staff to minimise pressure and fatigue when lifting large items. In sales, members would need to improve their online marketing and engagement skills in order to respond to changing consumer tastes.

Technology is changing the way we work, but questions about which jobs are lost and which are added, as well as how these changes impact, are critical in determining whether people will be able to transition from yesterday's jobs to tomorrow's jobs.
The evidence shows that technological advancements have reduced the need for repetitive mechanised work while increasing demand and pay for high-skilled technical and analytical work.

The effect of automation and artificial intelligence is accelerating a process that has been developing for decades. Many grocery store clerks have been replaced by self-checkout machines, and switchboard operators have recently been replaced by phone and interactive voice response menus. According to studies, advances in AI can cause truck drivers, paralegals, and even surgeons to have their careers disrupted.

In this world, tech workers can appear to be the only ones with steady job growth. But they're not the only ones. While developers and data scientists are in high demand, jobs in personal care and the medical field are also rising.

IV. ADDITIONAL APPROACHES to PROBLEM SOLVING:

1) Financial assistance from angle investors/NGO's or Individuals needs to be strengthen. Strategic planning plays an important role for given domain. Government frameworks for supporting in these domains. Transparency should be maintaining and donor should get the details of amount spend With the help of prior data, we can in like manner anticipate future headway that in what ways our next progress should be gone before this can be cultivated with the help of creating data which can be explored for later use with the assistance of Data Science and Big Data.
2) We should encourage and motivate eco-tourism, agro-tourism to create job opportunities.
3) We should furnish extra data with legitimate direction such as meeting, video's and article to assist farmers with various cultivating techniques. We should organize farming campaigns and motivate our "Youth" to take part effectively.
4) We can utilize innovation to capacity and refine water in the event of precipitation.
5) We should direct survey for every region to know the diverse climatic condition, water level, soil moisture and various offices to amplify the benefit and increase the production.
6) A non-agricultural land is an infertile land, unsuitable for development and in the event that we own an agrarian land and need to raise a structure for private or modern or business purposes by transformation, it is conceivable by Law.

V. IOT'S

Renewable energy IoT applications that are enabling the development of a sustainable future:

1) Automation to Improve Overall Production
2) Smart Grids for Elevated Renewable Implementation:
3) Balancing Supply and Demand

IoT has enhanced the use of renewables drastically. Renewable energy sources are now being used by energy providers to ensure a steady supply of power

to their customers. The Internet of Things has already boosted solar and wind energy adoption.
It has potential uses in geothermal, biogas, and hydroelectric power plants.
As per a survey, the global geothermal resource base is even larger than that of coal, gas, uranium, and oil combined. Clearly, renewables are the future of existence. Their acceptance will gradually but definitely fulfil our growing electricity requirements.

VI. BIG DATA

Farming processes will become increasingly computer-driven and data-enabled as smart machines and sensors appear on farms and farm data grows in quantity and scale. The phenomenon of Smart Farming is being driven by rapid advances on the Internet of Things, AI, Big Data and Cloud Computing.

[1] Machines are equipped with a variety of sensors that measure data in their environment that is used to guide the machines' behaviour. Big Data innovations play an important, mutual role in this development: machines are equipped with a variety of sensors that measure data in their environment that is used to guide the machines' behaviour. This can range from basic feedback systems (such as a thermostat that regulates temperature) to complex deep learning algorithms (e.g., to implement the right crop protection strategy). This is enhanced by integrating it with external Big Data sources like weather or business data, as well as benchmarks from other farms. Since Big Data and Smart Farming are both emerging technologies, it is likely that awareness of their uses and implications for research and development is limited.

Table 1: Examples of Big Data applications/aspects in different Smart Farming processes. [1]

Cycle of Smart Farming	**Arable**	**Livestock**	**Horticulture**	**Fishery**
Smart sensing and monitoring	Robotics and sensors	Biometric sensing, GPS Tracking	Robotics and sensors, greenhouse computers	Automated Identification Systems (AIS)
Smart analysis and planning	Seeding, Planting, Soil typing, Crop Health, yield modelling	Breeding, monitoring	Lighting, energy management	Surveillance, monitoring
Smart control	Precision farming	Milk robots	Climate control, Precision control	Surveillance, monitoring
Big Data in the cloud	Weather/ climate data, Yield data, Soil types, Market information, agricultural census data	Livestock movements	Weather/ climate, market information, social media	Market data

[1] Big Data is projected to have a major effect on Smart Farming, with implications around the whole supply chain.

- Smart sensors and devices generate massive volumes of data, allowing for exponential decision-making.
- Conventional and non-traditional actors are likely to see significant changes in positions and power ties as a result of Big Data.
- Business and governance (including data ownership, anonymity, and security)

VII. THE DIGITAL TWINS:

[2] Here, digital twins will help farmers make better use of their equipment. A digital twin is a mirror of a real machine that is always learning. Gartner has listed the digital twin as one of the Top Five innovation trends for 2017. These software models can provide deep perspectives from each physical asset through continuous learning, allowing them to track agricultural machine output and minimise costs. Smart solar/wind farms will transform rural areas into sources of local and urban electricity. [3] States like Karnataka, where wind energy is a big initiative, will use AI and IoT to optimise wind farm layouts and the directional alignment of individual windmills and turbine blades under varying wind speeds and wakes. Bengaluru, the state capital, now has 51 percent of the population.

[3] Despite the difficulties, a variety of companies in India are working to implement IoT in agriculture. Gramophone, for example, uses technologies to counter information asymmetry and Sat Sure uses IoT and big data to provide financial protection to growers. Avanijal's software irrigates fields while saving water and allowing farmers to sleep! Green Robot uses 3D vision technology to create smart farm machinery.

VIII. CSR (CORPORATE SOCIAL RESPONSIBILITY) AND GOVERNMENT

[4] With the current reverse migration, this number is expected to rise in the coming months. The SMART Village programme was born in 2016 after the Union Ministry of Rural Development brainstormed with Prime Minister Modi. The main goal of the Shyama Prasad Mukherji R-urban Mission (SPMRM) is to transform villages into smart growth centres.

The below are the highlights of the CSR programme:

- Community-based solar microgrids are being built to provide electricity to homes, government schools, and Aanganwadi centres.
- Establishment of the 'Renew Edu Hub', a career-building education centre for children and youth that uses technology to impart education and promotes digital literacy.

IX. IMPACT OF SVARG (Smart Village Adopted by ReNew Group)

[4] In 2016, 11-kilowatt cooperative solar mini-grids were constructed in the village, bringing electricity to 50 households. Renew Power completed three neighbourhood solar grids in the village in 2017, electrifying 115 households from the village's economically disadvantaged portion. Renew Power assisted in the construction of community solar grids with a combined capacity of 25 kW by the end of August 2017.

[7] It is possible to overcome difficulties with the help of these points:

- Mind the investment Gap.
- Level the playing field.
- Overcome Non-Market Barriers.
- Stay Up to Date.
- Plan for a Just Transition.

- Do the Hard stuff too.
- At the same time, work on technology, policy, and markets.

Many villagers were adopted, and their effect on the community's growth was positive. e.g.-

[6] Smart Village the Social Outcomes at Dhanora

- The village has been designated as a "Crime Free Village" by the District Police since no FIR has been filed with the police station.
- The village is transforming into an Alcohol-free village.
- Open Defecation free village.
- The Rajasthan government has introduced the smart village model for the state.
- Village awarded by Government of Rajasthan for its development.

Nearby 100 villages have been influenced by Dhanora's smart village and have joined the "Soch Badlo Goan Badlo" campaign for rural reform in India.

X. FUTURE THINKER:

There are such countless ways that urban areas make life unreasonable furthermore, hopeless the clamour the cost stuffing social turmoil contamination and the division from nature individuals are separated also, stuck in these small boxes that make it inconceivable to feel associated and be sound or even see the stars these urban areas are based on an extractive and destructive financial model that annihilates biological systems and is held together.

We could construct our Villages towns and urban communities on the standards of biomimicry to be tough decentralized assorted and adjusted to the nearby climate.

We have many solutions to make our village more strong and smart :

1. Conceptualize the system for "Smart Village".
2. Build a model to draw an execution system.
3. Plan innovation arrangements, strategy for better and enabled provincial administration.
4. Plan for speculation and asset distribution system for actualizing smart town activity and many more.

And these things are only possible when we actively use the new technology with the help of big data,AI and IoT.

XI. LIMITATION:

The results show that due to lack of education, infrastructure, technology our village has not grown much more.

But this is the time where we have a good education system, infrastructure, technology and good government policies and support of NGO's to make our village smart. And here we can have great support from Iot's, Big Data and AI which can change things in more smartly ways.

XII.CONCLUSION

- The foundation and pre-requisites for scaling up digital platforms are cost effectiveness and convergence. The plurality of digital technologies that an individual requires cannot be scaled up by a single government agency or service provider. It is therefore crucial to embrace new mindsets and approaches for integrated digital investments, especially in rural areas where investment effectiveness can be increased by reusability.
- We have to make sure that to make villages smart we have to put technology first agenda everywhere. Connect every single citizen of this nation digitally.

- We ought to gather different guidance meeting for villagers to comprehend that how this new technology work.
- It will come with great price tag, but it will do the work for the next generations to come and there should not be language barriers for villagers to recognise the IOT.
- Everyone deserves to live with technology and move with technology. No people should be untouched by technology and this can be done with help of:
    - Analyse and plan.
    - Design and Develop.
    - Deploy and Implement.
    - Monitor and Evaluate.
- The smart village concept is a citizen-driven project and a learning journey for digital change and rural growth.
- With the help of Big Data, IOT and AI we can reach out a great success to make our village smart.

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