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Innovative Irrigation Management Techniques

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Abstract - Irrigation is necessary when it comes to agricultural productivity and growth. For Irrigation, more than 80 percent of water is used all over the world and in India as well. However, the standard amount of water used in India for irrigation projects is evaluated to be around 30-35 percent. Though it is very certain that rehabilitation of irrigation system is revolutionary and will save water dramatically. But modernization and new techniques demands colossal funding expenditure, therefore precarious to endorse and it is necessary to to visualise pioneering, effortless, cheap and sophisticated water transmission techniques that are being used in few irrigation project in Maharashtra today. The paper discusses the need to boost or escalate the water consumption efficiencies of existing irrigation projects and new project. The input reveal that such progressive techniques will be enforced in other areas of irrigation projects which will be economically feasible to achieve improvement in crop yield and excellent water management with high water use efficiency.

Keywords - Innovative Irrigation Management ; Internet Of Things ; Saisanket ; Innovation.

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1. INTRODUCTION

Water is essential for the germination and growth of crop plant, swater is supplied to agricultural fields either naturally to rainfall or artificially through canals or other methods of suppling water to Agri-felds is referred as irrigation. This can be done using different methods before learning about these methods let us find out how irrigation is important for crop production[1]. In the absence of rainfalls irrigation maintains the minimum amount of moisture required for craft production it maintains proper growth of frost and helps to protect them against frost and hot air currents. The duration time gap and amount of irrigation are determined by the type of soil and crop and also the season in which a crop is sown. Different methods of irrigation has been used since humans took to agriculture the traditional methods of irrigation are a moat or fully system, a chain pump system, Bakley system and rahat systems of late, these methods of irrigation have been replaced with modern methods like sprinkler system and drip systems. Let us learn about all these methods starting with the traditional methods- a mold system is one of the simplest and cheapest education systems, in this water is drawn from a well or water source by a bucket row, the roof is passed over a fully and fits to an animal, the animal walks down an earthen flow away from the wells to lift water the water is then emptied into a channel and the fields are variegated in a chain pump system. Two large wheels connected by a chain opposition at an angle to each other one wheel is near the source and the other is near the sink one end of the chain dips into a pool of water, the chain carries the bucket add the wheel turn with the help of a shaft and handle the buckets disc into the pool and draw water, the chain then lifts the bucket to the upper wheel well they are tipped and dumped into an upper pool the chain then carries the empty buckets down to be refilled. The water in the pool is then released by gates into channels which act as artificial screens to water the crops indirectly system of irrigation water is drawn from a waterfall with the help of a log of wood placed on a fork shaped tree for support the nozzle side to a large stone which acts as a lever but it is tied to the other end of the log during irrigation the rope tie to the bucket is pulled down so that the bucket goes into the water source and fills up with water the bucket is again drawn up by pulling up the rope the water is then collected manually and poured into the channels. The hot system of irrigation involves two

wheels one placed vertically over a water source typically and open well and the other placed horizontally at a distance a bunch of pockets is fixed to the first wheel and an ox or buffalo or camel is tied to the other wheel as the animal holds the wheel around in a circular motion it sets in motion the first wing with a bucket which draw water from the water source and irrigate the field.

The traditional methods of irrigation are cost-effective but time consuming dark these methods have been replaced with drip system and sprinkler systems. Let us learn about these two methods in detail, a sprinkler system is used in added and uneven regions as an alternative method of irrigation this system employs many perpendicular pipes with rotating nozzles and the top install it at regular intervals the pipes are placed on the field and are connected to the main pipelines that emerge from the main water storage tank, water is conveyed under high pressure through the pipe with a help of a pump, the water comes out from the rotating nozzles in the form of prey somewhat as rain in a drip irrigation system, water is delivered at or near the root zone of crops drop by drop a drip irrigation system is the most efficient system of irrigation as there is absolutely no wastage of water this system is mostly used in areas with poor water availability both the modern systems of irrigation are crafty but require less labor and time. In this module you have their irrigation is the artificial method of supplying water to crop fields to assist graph production a motor pulley system, pump system, Bakley and rahat are traditional methods of irrigation they are post effective but time-consuming a sprinkler system and a drip system our modern methods of progression they are costly but require less labor and time. [2, 3]

2. INNOVATIVE IRRIGATION MANAGEMENT

Farming is the hand that feeds us, but as an industry, agriculture is something we often take for granted. The land is plowed, the crops are grown, and the livestock raised, but pressures on farmers to feed our booming population are increasing.

By 2050, it's estimated there'll be over 9 and 1/2 billion of us, and that's a lot of mouths to feed. Farming has long been considered a risky investment, with tight profit margins and often unpredictable yields. But it's a sector with enormous potential. According to the World Bank Group, it accounts for about a third of global GDP. And by 2050, it's thought that productivity in agriculture will need to rise by 70% just to keep up with demand. In their efforts to meet rising demand, food producers are now turning to digital innovations to increase their yield and farming efficiency. Agricultural technology, or agri-tech, is thriving and attracting investment like never before. Digitization along the entire value chain is seeing tech companies forge new relationships with agricultural business, with even digital heavyweights like Google and Amazon starting to dig in. So how is farming changing in the face of the digital revolution? And what business opportunities and challenges lie ahead?

Let's take a look on Indian Irrigation Management System. India's population today is around 1.3 billion and food security is a challenge. It has a cultivable land of 159.7 million hectares, irrigation land 8.2 million hectares and even today, 50% of the farmers are still dependent on the rainfall for farming. Water plays a critical role in India's food security and wfare. Today a farmer can frow everything but water. [4]

To address the requirements of the farmers the Government of Madhya Pradesh water resources department has an ambitious program to increase water use efficiency through various projects such as major, medium, minor and lift irrigation projects one such project is the Garoth Pressurized Micro Irrigation Major Project. The Madhya Pradesh water resources department has awarded the Garoth Project to Offshore Infrastructures Limited for execution. The project is located in Bhanpura, Thesil of Mandsaur district. Saisanket; a technology integrator and smart solution provider to water management projects were in the business since 1999. Saisanket is implementing smart water management solution through innovative isreali Technologies. Saisanket works closely for the socio-economic upliftment of farmers by forming water's user association which gives information on the project and also create awareness on efficient use of water for their crops and scientific techniques for Agriculture. Farmers Producers Organisation is another initiative to bring farmers together and educate them about cropping patters for different seasons. The cropping pattern is designed considering the soil and atmospheric conditions in a specific area. Farmers Producer organisation also has the farmers grow high quality produce based on the market demand and also identify suitable buyers with increase in food produce Mega Food Park can be set up in Association with government Agencies and helps in establishing food processor and other ancillary industry create readymade market locally for the farm produce this creates an entire ecosystem in local area in the farmers and generating employment. Saisanket is committed to bring a positive change by implementing world-class

technology and bring a socio economic transformation in the Indian agricultural sector.

The kanwali pumping station

his pumping station is responsible for pumping water from the Gandhi Sagar Dam the intake well as 19 in diameter and 23.4 deep using slipform construction technology, the construction of intake well was completed in record time of just one month. There are 5 sets of vertical turbine pump each delivering 1238 litres of water per second, the coast was a Storage tank on the Hill Top of 3 kilometres away. The total pipeline length of 429 kilometre covers 41 villages within the command area of 15000 hectares.

The Rewa Barrage Pumping station

This pumping station pumps water from the Rewa Barrage. There are five sets of vertical turbine pumps each delivering 527 litres of water per second to an overhead tank located in the vicinity of the total pipeline length of 145 kilometres covers the command area of 640 hectares through the pressurized distribution network.

A Solar power plant with capacity of 7 megawatts is the part of this project which runs offset electricity consumed he pumping station. A team of experts did a survey of the command area and further designed the water distribution network using state-of-the-art KY Pipe software which will ensure the equitable distribution of the water to hold the Jack at desired pressure. Using Saisanket's smart solutions the farmers will send a request to the control room with respect to the type of Crop and the water required for the crop. Once it is approved he will receive required quantity of water for his farming needs. The command area of 1400 hectares is divided into 20 hectares and further subdivided into 5 hectares for water delivering Outlets for 0.6 to 1.2 hectares to ensure last Mile delivery world's best water management system is being installed in the project consisting of various innovative solutions such as:

Bladder vessel based surge protection system

This provides excellent maintenance free compressed air Based Surge protection system for the pipeline, it protects pipeline from extremely low and high pressure conditions, Thereby reducing future leakages and likely bite burst conditions.

Air management system

Preventing Entrapment of air along the pipeline is the key to maintain high carrying capacity of the pipeline these air valves are designed and developed by world's best isreali ARI system Air Management System at regular intervals identify the linkages in the pipeline. This system is equipped with SaiSanket smart solutions which monitors the system 24 by 7 to take preventive measures for ensuring trouble-free operation.

Distribution Management System

The DMS controls as well as measures the flow of water to individual chuck. The distribution management system is wirelessly connected through Saisanket's smart technology which avoids draining of the pipe network.

Control Valve

Also known as C-Valve. This allows rapid response to fluctuating hydraulic conditions, thus maintaining constant and stable pressure. The rapid opening and closing of C-Valve causes less turbulence and hence helps in reducing the search in the system.

Rotation Management System

The RMS ensures supply of water to alternate outlets and predefined intervals as per the cropping patterns and approved water usage. These systems are solar powered with battery backup ensuring ensuring 24 by 7 working of the smart system to control flow rate and volume for designated time period.

Booster Pump Station

Booster pumping station will be installed at various locations for online hosting of water and to back it up in high elevation areas. The pumps installed in booster pumping stations will operate in tandem with main pumping station using the hydraulic scada system with the help of wireless communication.

Hydraulic Scada System

All components of the pressurized distribution Network are controlled through the hydraulic scada system which provides live updates on the registered mobile phone besides giving Access on demand to historical data. The complete system can be monitored and controlled remotely through cloud computing technology and wireless communication system. This system allows informed decisions in cases of vandalism, pipe leakage and unattended

deficiencies in the system in real time. The system sends SMS alerts and notifications these will reduce the operational cause and improve delivery service with these State of the art technology and smart solutions, Saisanket ensures trouble free operations and efficient delivery of water in the command area.

Saisanket works closely for the socio-economic upliftment of farmers by forming water's user association which gives information on the project and also create awareness on efficient use of water for their crops and scientific techniques for Agriculture. Farmers Producers Organisation is another initiative to bring farmers together and educate them about cropping patters for different seasons. The cropping pattern is designed considering the soil and atmospheric conditions in a specific area. Farmers Producer organisation also has the farmers grow high quality produce based on the market demand and also identify suitable buyers with increase in food produce Mega Food Park can be set up in Association with government Agencies and helps in establishing food processor and other ancillary industry create readymade market locally for the farm produce this creates an entire ecosystem in local area in the farmers and generating employment.

Saisanket is committed to bring a positive change by implementing world-class technology and bring a socio economic transformation in the Indian agricultural sector. [5,6,7]

3. INNOVATIVE WATER CONVEYANCE AND DISTRIBUTION TECHNIQUE

Conveyance of water means Carrying water from the source to the intake structure constructed near the source.Conveying the water from intake to water treatment plant and from there treated water is conveyed to consumer through distribution pipe.[10]. A typical main water distribution chamber model is shown in the figure 1.

Transmission of water

The name conveyance is nothing but the transportation of water from one place to another place and this is carried out in two stages of conveyance. There are two stages in the transportation of water: Conveyance of water from the source to the treatment plant. For this type of conveyance we have seen the arrangement called intake works.

Conveyance of treated water from treatment plant to the distribution system.[11]

Pumping

A pump is a device which converts mechanical energy into hydraulic energy. It lifts water from a lower to a higher level and delivers it at high pressure.Pumps are employed in water supply projects at various stages for following purposes:

- To lift raw water from wells.
- To deliver treated water to the consumer at desired pressure.
- To supply pressurized water for fire hydrants.
- To boost up pressure in water mains.
- To fill elevated overhead water tanks.
- To backwash filters.

To pump chemical solutions, 5 Types of pumps are needed to pump water Based on mechanical principle used Displacement pump.

1) Reciprocating pump

2) Rotary pump

3) Centrifugal pump

4) Air lift pump

Pipes:

Factors affecting selection of pipe materials are :

1. Carrying capacity of pipes.

2. Durability of pipe.

3. Availability of funds.

4. Maintenance cost, repairs.

5. Type of water to be conveyed and it's possible corrosive effect on pipe material. To destroy or damage by chemical action.

Methods of Distribution of Water :

Distribution system is classified as:

1. Gravity System

2. Pumping System

3. Combined Gravity and Pumping

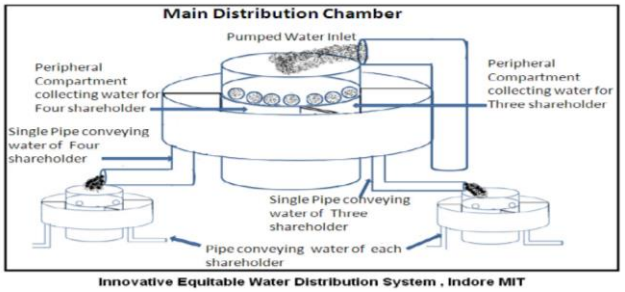

Fig.1: Main Water Distribution Chamber

Guaranteed irrigation for Grape

Management of water is done in a way so that everyone gets sufficient water to irrigate every per hectare Grapes. The amount of water which is required annually is available with guarantee even after inclusive of evaporation and some other losses the water is kept reserved and the excess water is used to irrgate some other crops which is decided by WUA. This helps them to irrigate more resulting high yield crops. Also then farmers do not worry about traditional rainfall as farmers never run out of water. [1]

Adoption of the advance irrigation Like drip irrigation method

Water that a farmers receive to irrigate it's crops are then stored into their well and as per their requirement is then consumed. The water collected in wells is then used by them with the method known as Drip Irrigation Method. Since farmers are usinf Drip Irrigation Method the utility of water becomes very efficient and the yield of plantation and crops is increased dramatically. [8]

Efficient and conjunctive use of ground and surface water

The ground water present in the farmer's well is now used, near the month of December or January usage of well for irrigation reduces and at the time like that WUA takes decision of delivering the water that is stored in the reservoirs. Pumping hours per day of the main pump on the reservoir are worked out in such a way that the surface water harvested in the reservoir will be available to irrigate one hectare of land of each shareholder, till the starts of the monsoon.[9]

Benefits to Government

The management is made very simple. Conflicts are reduced. Irrigation staff requirement is reduced, thus saving in wages of management staff. Assessment of water charges is made simple. Recovery of water charges is 100%. The irrigation revenue is increased from Rs. 5000 to Rs. 130000 per annum.[12]

4. CONCLUSION

We finally conclude that associations like Saisanket are effectively bringing world of technology in farming to help with better irrigation, production, safety, etc. For effective irrigation projects Internet Of Things or IOT department is working very hard to bring technologies that are feasible and cheap so that water and crops both can be saved and production increases with less input and time. For food saftey and innovation scientists are working every day very hard. Each and every country is sharing and developing their brilliant ideas and supporting farming and food production as their own. Implementation has increased the technology and growth so much that now feeding 7.8 billion people around the world isn't a big and problematic task anymore. More so as water is depleting it is essential to save and all these new technologies are gathering together to serve society and save our natural resources from destroying. Also world of Artificial Intelligence and Internet Of Things has started to reaching it's peak and with the help of more A. I. We can actually reduce human help and less implementing with more productive outcome. Associations like Saisanket must be developed all over the worldso that not only Irrigating but also other resourceful wors can be done with ease. Technology which is easy to use, cheap, and easy to install is must as technologies which are not practical cannot come into practice at high frequencies.

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