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ZEOLITES IN AGRONOMY

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Abstract

Green Approach is an approach that protects human and environmental health by replacing hazardous chemicals, processes, and products with safer processes and safer alternatives. Mineral fertilizers applied to agricultural crops have great potency to improve yield but they have adverse effect on environment and cause air, water and soil pollution when applied at large scale. Zeolites are most appropriate in agricultural uses due to their unique structure and properties like ion exchange and adsorption. Application of zeolites as fertilizers improves quality and yield of crops and reduces the harmful and negative effects. Zeolites improve the nutrients holding capacity and act as water moderator. These promote plant growth, improve the efficiency and value of fertilizer & increase the yield. Zeolites can retain important plant nutrients like nitrogen (N), potassium (K), and calcium (Ca), magnesium (Mg) in the root zone to be used by plants when required. This leads more efficient use of N and K fertilizers by reducing their application rates for same yield. These zeolite samples can be characterized by FTIR, XRD, N_2 adsorption, TGA & DSC and SEM.

Keywords: *Zeolites, Green chemistry, ion exchange capacity, Heavy metals, Soil remediation.*

INTRODUCTION

Fertilizers are used for proper and healthy growth of plants but with this they are very harmful for environment. Fertilizers are substance, which can be synthetic or organic and can be is added to the soil in order to increase the supply of essential nutrients that boost the growth of plants and vegetation in that soil. With the rapid increase in population globally, the demand of food and agricultural yield has been rising tremendously. To increase the production at high level almost 40-60% of agricultural crops are grown with the use of different types of fertilizers. More than 50% people

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feed on crops that are grown as a result of using synthetic fertilizers. Excess use of fertilizers increases the amount of harmful chemicals in soil by leaching process.(B.Wiedenfeld,2003) Zeolites are being used as fertilizers in agriculture for past many years, due to the microporous structure .(Jakkula 2005)

Zeolites are micro porous hydrated aluminosilicate mineral that contain different metal ions in its cavities. Their framework composed of $[SiO_4]^{4-}$ and $[AlO_4]^{5-}$ tetrahedral in which corner share to form different open structures. These tetrahedrons link together to form cages connected by pore opening of different sizes. The pore size ranges from 0.3 – 1 nm. A general formula for zeolite may be written as $M_{x/n}: Al_2O_3: xSiO_2: yH_2O$, where M is the charge balance cation, n is the charge on cation, x is generally ≥ 2, and y is number of water molecules in the voids of zeolites. (G.Gottardi, 1986)

Natural Zeolites are formed as a result of chemical reaction of volcanic ash and alkali water. Synthetic zeolites are produced in lab by different methods according to need. About 50 natural zeolites are known and 150 have been synthesized. Zeolites are largely distributed in Deccan traps of India. (R.N.Sukheswala et al, 1974)

Ion exchange process in zeolite is reversible. Due to this property zeolite behaves as a filter for dust, toxin removal and as catalyst in many chemical reactions. Zeolites are very efficient and cost effective minerals with high usability in many fields. To study the properties of zeolites and applicability, its characterization is most important. (R. Malekian et al, 2011)

METHODS USED FOR THE ZEOLITE CHARACTERIZATION

Zeolite characterization and –application are strongly related. Not all zeolite properties are of the same importance for every application. (J.C.H.van Hooff et al 1991) Individual analysis techniques probe only a particular aspect of the material and, consequently, a combination of methods is necessary to give a balanced description of the zeolite.(A.Jentys et al 2001)

As zeolite may be modified or exchanged with some particular ions for better growth of crops, different methods of characterization are again applied. Particle size may be analysed for comparing efficiency of zeolite with different particle size, which can be analyzed with particle size analyser. Different experimental methods like Infrared

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Spectroscopy (IR), X-Ray diffraction (XRD), Nitrogen adsorption, DTA, TGA, DSC, SEM-EDAX, AFM and ICP/MS are used to identify the structural group, crystal structure, acidity, binding sites and trace elements in zeolites. N_2 Adsorption is used to determine the pore sizes of zeolites. (R.Panek et al, 2014; Marian Holub et al, 2016).

Exchanged zeolite has a significant effect on nutrient release, therefore percolation reactor may be used for a comparison of slow release tendency for adsorbent and fertilizer (A.Manikandan,2014) S,Preetha have observed that nanosized zeolite fortified with nutrients behaves as long lasting behaves as long lasting fertilizer.(S.Preetha,2014)

Infrared Spectroscopy is used in identifying major structural groups present in zeolites . The characterization of zeolites by FTIR technique is based on the presence of bands in three regions. Especially mid IR region [4000 – 200 cm^{-1}] is used for the determination of zeolite structure type and groups. A higher one corresponds to the OH stretching modes (3650 – 3450 cm^{-1}) with an additional band at 1620 – 1640 cm^{-1}(Lewis sites).(Marian Holub et al, 2016). Finger printing region of zeolites ranges from 1500 – 400 c^{-1} in infrared spectroscopy. (K.S.Prasad et al, 2007)

Pore size and structures plays an important role in defining applicability of zeolites in different areas. Nitrogen adsorption/desorption is commonly used to characterise the pore structures, the pore size distribution and surface area of pores in the zeolites. (M. A. A.Musa et al, 2011)

SEM is a powerful tool for morphological studies of zeolites. It gives a complete knowledge of surface structure and distribution of particle size. Using SEM, different images of zeolites are taken with the help of different signals which are produced by various energy sources like Backscattered secondary and auger electrons and X-Ray fluorescence photons etc. These energy sources produce different images of surface which give a broad idea of morphology and distribution of particles. Energy dispersive X-Ray spectroscopy provides elemental information of the zeolites. (F.A.Mumpton et al, 1976)

APPLICATIONS OF ZEOLITE:

Soil Amendment

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Zeolite is a natural super porous mineral (part of a group of hydrated alumino silicates). It carries a negative charge balanced by freely moving cations with positive charges, which provide an ideal trap for positive cations like nitrogen rich ammonium and potassium, which are then released when demanded by plants. (H. Ghorbani et al, 2008) .It can hold nutrients in the root zone for plants to use when required. This leads to more efficient use of N and K fertilizers - either less fertilizer for the same yield or the same amount of fertilizer lasting longer and producing higher yields. An additional benefit of zeolite application is that unlike other soil amendments (gypsum and lime) it does not break down over time but remains in the soil to help improve nutrient and water retention permanently. With subsequent applications the zeolite will further improve the soil's ability to retain nutrients and produce improved yields. (W. Shia et al, 2009).

Fertilization Efficiency

Zeolites have a very open framework with a network of pores giving it a large surface area for trapping and exchanging valuable nutrients. Natural zeolite clinoptilolite saturated with ammonia has been used as a fertilizer. Clinoptilolite itself has special physical and chemical properties, which improve soil fertility, develop property of slow release of fertilizer and also affect buffer capacity of soil. Enrichment of soil by clinoptilolite does not influence soil properties. (H.Kusa,) Modified zeolitic concentrate has been used to increase the yield and similar results have been obtained as obtained by other commercial products. (M.B.M.Monte, 2009). Not only Clinoptilolite improves nitrogen fertilization efficiency of soil. Zeolites also reduce the leaching of nitrates by inhibiting the nitrification of ammonia to nitrate (Perrin et al., 1998). A.K.Bansiwal have investigated that surfactant modified zeolite behaves as a better carrier for fertilizer and also help in slow release of nutrients. In his experiment zeolite A was modified by using hexadecyltrimethyl ammonium bromide which is a cationic surfactant followed by treatment with fertilizer. It was observed that after modification capacity to retain anion increases and tendency of slow release of nutrient also developed in it. (A.K.Bansiwal, 2006).

Zeolites can enhance the efficiency of nutrient use by increasing the accessibility of P from phosphate rocks, and the consumption of NH4, N and NO3, reduce loss by leaching of k+ and also act as a slow releaser of fertilizer without harming the

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environment. (M.Mahesh et al,2018)

The Results of the study by Jiang et al showed that the zeolite, applied to the poor soils, improved their chemical and physical properties, decreasing the salt concentration in the salinized soils with increasing in fertilizer efficiency (C. Jiang, 1993)

The effect of Ca-K clinoptilolite on available potassium in salinized soil and its subsequent effect were studied by Zhou and others .The results showed that the content of available potassium in soil increased with clinoptilolite application increase. (E. Zhou, 1999)

Reduction Of Volatilization And Leaching Losses

With the current high price of ammonium fertilizers zeolite can be used to extend their efficiency and performance. Blending fertilizer with zeolite can produce the same yield from less fertilizer applied because of the reduction of volatilization and leaching losses. It is particularly suitable for banding under drip irrigation planting where it will assist water infiltration, distribution and retention. When fertigation is practiced it will actively hold the nutrients in the root zone. (A.M. Torkashvand, 2012). Earlier studies showed that the Zeolites could be used as artificial soil. The Agricultural cultivation with the artificial soil containing zeolite is known as zeoponics (Mumpton, 1999).

The ammonia nitrogen volatilization and nitrate leaching can be reduced or prevented by the use of zeolite carrier material applications which have N in their framework and act as slow/controlled release fertilizers. These materials will reduce ammonia volatization and nitrate leaching and at the same time increase crop yield.

Nitrogen is an important nutrient for the growth and development of plant as it improves biomass production and increases photosynthetic rate. Urea is a rich source of nitrogen but N-use efficiency of urea may be decreased sometimes. There are many factors, which may be responsible for it. One of the main causes is that, as urea is applied on soil surface, therefore loss of nitrogen may take place by volatilization of ammonia to atmosphere. Using zeolite as an additive in fertilizer may reduce these losses. Zeolites have high cation exchange capacity, they help to decrease N_2

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concentration in soil solution through cation exchange. It was also observed that when urea is applied with zeolites volatilization of ammonia is also reduced which increases silage corn dry matter production (A.C.C. Bernardi, 2011). A study shows that the application of zeolite has a significant effect on essential oil yield and medicinal peppermint. (Ghanbari and Ariafar, 2013)

B. Kwakye has worked on the activity of zeolite exchanged with ammonium. It was observed by him that addition of ammonium exchanged zeolite LTX(NH4-LTX) increases pH ,total nitrogen content, potassium and sodium content and water retention capacity of soil. It also leads a significance increase in fresh weight, dry weight, plant height, stem thickness, stem elongation, no. of leaves, leave area as investigated for maize and okro plants.(B.Kwaye,2013)

It has been also observed that zeolite doped with potassium proved fertilizer for K releaser in growing oats and wheat. It also help to increase transfer factor of K significantly. Transfer factor is then measure of metal quantity which pass from soil to root tissue and transferred to other parts of plant. (C.Orha, 2015)

Zeolite also promoted the formation of soil aggregate that increase in soil porosity and decreasing soil bulk density and improving the output of crops (X.Huo et al., 1991)

More Efficient Use Of Water

Zeolite assists water infiltration and retention in the soil due to its very porous properties and the capillary suction it exerts. Acting as a natural wetting agent, it is an excellent amendment for non-wetting sands and to assist water distribution through soils. Due to this property zeolite has been also proved an important tool in cultivation of invasive species in many areas of southwest U.S. It was difficult to grow these species there due to unavailability of water. In such conditions clinoptilolite behaved as a wicking material which helped to draw water through capillary action from shallow ground water table up to the root zone of plants as a result of which plants became able to reduce dependence on surface water or precipitation. (B.Tanzy,2006) . Leaching of different forms of nitrogen in the soil can be controlled by the use of zeolites. It can maintain the water balance of the soil , increases the soil water retention capacity and decreases the percolation by holding more water in its pores. (Colombani et al., 2015).

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A STUDY ON SOFTWARE MECHANISM TO ENHANCE THE SECURITY OF IOT AND ANDROID SOFTWARE FOR SMART HOME IN REAL WORLD SCENARIO

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A STUDY ON SOFTWARE MECHANISM TO ENHANCE THE SECURITY OF IOT AND ANDROID SOFTWARE FOR SMART HOME IN REAL WORLD SCENARIO

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Abstract
The Internet of Things is the idea of associating any gadget (inasmuch as it has an on/off change) to the Internet and to other associated devices. A safe home framework comprises of an entryway lock framework which has been perhaps the most popular purchaser devices replacing many of the conventional locks because of sheer client comfort and affordable costs. IoT security covers both physical gadget security and network security, and impacts the cycles, advancements, and measures necessary to ensure IoT devices and networks we proposed the application will learn from the client behavior and increase security accordingly. The details of the client accessing the lock will be put away in the server along with date and time which can be additionally used to foresee the occasions when the client will go into the house and handle security accordingly. We used House Module, control module. Home automation, being quite possibly the most integral parts of the sprouting realty industry paves forward the need to establish a basic yet productive system that through training anticipates the client's actions and executes it for them.
Keywords: *Software, Enhance, Security, IoT, Android, Smart Home, etc.*

1. INTRODUCTION

The Internet of Things is the idea of associating any gadget (inasmuch as it has an on/off change) to the Internet and to other associated devices. The IoT is a giant network of associated things and individuals all of which gather and share data about the way they are utilized and about the climate around them. Classic smart home, internet of things, cloud computing and rule-based occasion handling, are the building squares of our proposed advanced smart home integrated compound. Each segment contributes its center attributes and advancements to the proposed structure. IoT contributes the internet association and far off management of versatile appliances, incorporated with a variety of sensors. Sensors may be attached to home related appliances, for example, air-conditioning, lights and other environmental devices. And thus, it inserts computer insight into home devices to give ways to measure home conditions and screen home appliances' functionality. A safe home framework comprises of an entryway lock framework which has been perhaps the most popular

Purchaser devices replacing many of the conventional locks because of sheer client comfort and affordable costs many remote network arrangements, for example, Bluetooth, ultra wide band (UWB), remote Ethernet and many more have a place with the area of home networking. From among these, Bluetooth has become the most attractive procedure in the research and commercial domain as Bluetooth enables to create various sort of remote frameworks via handsets or smartphones and also lead research by utilizing handset and actuator by distant operation of various electrical devices at home. Since Bluetooth is so prevalent in cell phones, it was viewed as a basic, economical and secure answer for remote network for associating a cell phone to home network framework.

- ✓ **IoT security:** IoT security covers both physical gadget security and network security, and impacts the cycles, advancements, and measures necessary to ensure IoT devices and networks. It spans industrial machines, smart energy grids, building automation systems, entertainment devices, and more, including devices that often aren't intended for network security. IoT gadget security should ensure systems, networks, and data from a broad range of IoT security attacks, which target four sorts of vulnerabilities:
  - Communication attacks on the data transmitted between IoT devices and workers.
  - Lifecycle attacks on the IoT gadget as it changes hands from client to maintenance.
  - Attacks on the gadget software.

The main challenge in IoT is to overcome any issues between the physical world and the world of information, for example, how to handle data obtained from electronic hardware through an interface among clients and gear. The creating IoT arrange has approached with essential requirements for affecting it to make sure about. A ton of security issues has transformed into a challenge for the IoT organize. Security specialists have warned of the potential danger of large quantities of unstable devices interfacing with the Internet since the IoT idea was first to propose in the late 1990s. There are SixLayer IoT Architecture that is a coding layer, perception layer, network layer, a middleware layer, application layer, and business layer. These all layers also can apply in the Smart Home.

1.1 Smart home development for home security based on android

Improvement of Android-based applications that applied in the fast-developing network began a broad level today we know as a smart city or smart village and the smallest extension we realize the term called a smart-home. Nicola King characterizes smart-home as an asylum outfitted with a communications network that associates various administrations and electronic gear and allows it to be observed, accessed and controlled remotely. Along with the increasingly perplexing existence of the network, increased portability, increasingly more extreme wrongdoing popping up by abusing the situation and environmental conditions, the most regular offense is wrongdoing of robbery and brutality in the home climate the part of the information innovation especially smart home is relied upon to help give security and solace to the homeowner built up a smart-home application that can screen the state of the house when the house is in its proprietor's home. Expected by the application of the smarthome the homeowners can screen the state of the house remotely and allowing occupants to get a warning.

2. LITERATURE REVIEW

Islam, Akib (2018) the aim of this research paper is to plan and actualize a financially savvy and yet adaptable and incredible application based smart home automation framework utilizing the Internet of Things. Our framework is intended to recognize burglary, increase in the concentration of harmful gasses, smoke and fire flames, discovery of dubious activities and illuminating the client through instant message or pop-up message. Our framework is planned so that it can arrange itself dynamically based on the change in necessities of the client. Our framework eliminates the greater part of the drawbacks in the past framework, for example, significant expense of proprietorship, resoluteness, helpless manageability, and trouble in achieving security, lack of integration of various conventions utilizing new techniques or improving the current strategies to achieve better outcomes. The whole home climate can be observed by various sensors sent all over the home and constrained by the easy to understand android application. Our framework and application uphold dynamic addition or removal of devices without changing the home framework or architecture.

Alaa, Musaab and Zaidan, A. and Bahaa, Bilal et. al (2017) the new and problematic innovation of smart home applications (hereafter alluded to as apps) based on Internet of Things (IoT) is largely restricted and scattered. To give valuable experiences into technological conditions and backing researchers, we should understand the available alternatives and gaps in this line of research. Hence, in this examination, a survey is led to map the research landscape into a sound taxonomy. We lead an engaged search for each article related to (1) smart homes, (2) apps, and (3) IoT in three major databases, namely, Web of Science, ScienceDirect, and IEEE Explore. These databases contain literature zeroing in on smart home apps utilizing IoT. The final dataset coming about because of the classification conspire incorporates 229 articles separated into four classes. The top notch involves audit and overview articles related to smart home IoT applications. The inferior remembers papers for IoT applications and their utilization in smart home innovation. The second rate class contains proposals of frameworks to create and operate applications.

P. Gupta and J. Chhabra (2016) the paper presents the plan and implementation of an Ethernet-based Smart Home astute framework for checking the electrical energy utilization based upon the real time tracking of the devices at home an INTEL GALILEO 2ND generation improvement board, which can be utilized in homes and social orders. The proposed framework chips away at real time observing and voice control, so the electrical devices and switches can be distantly controlled and

checked with or without an android based app. It utilizes various sensors to screen the real time gadget tracking as well as maintaining the security of your home. It is observed and controlled distantly from an android app utilizing the Internet or the Intranet network. The proposed result of the venture aims as different advantages of saving on power bills of the home as well as keep the clients updated about their home security with an alternative of controlling the exchanging of the devices by utilizing their voice or straightforward switch address their smartphone, and last however most importantly, screen the usage to moderate the valuable natural assets by decreasing electrical energy utilization.

Lin, Huichen and Bergmann, Neil (2016) Often the Internet of Things (IoT) is considered as a solitary issue domain, with proposed arrangements planned to be applied across a wide range of applications. Notwithstanding, the privacy and security needs of critical designing infrastructure or touchy commercial operations are totally different to the requirements of a homegrown Smart Home climate. Additionally, the financial and human assets available to execute security and privacy vary greatly between application domains. In homegrown conditions, human issues may be as important as technical issues. After reviewing existing answers for enhancing IoT security, the paper recognizes key future prerequisites for confided in Smart Home systems. Gateway architecture is chosen as the most appropriate for asset constrained devices, and for high framework availability. Two key innovations to assist framework auto-management are distinguished. Right off the bat, uphold for framework auto-configuration will enhance framework security. Also, the automatic update of framework software and firmware is expected to maintain continuous secure framework operation.

3. OBJECTIVES

- To study about Iot security and home security based on android.
- To study modules present in the system communicate for security.

4. RESEARCH METHODOLOGY

The proposed system is keyless that is we won't have an extra key, for example, the RFID tags. There are various mechanisms of security, for example, fingerprint scan, facial recognition, pin, and password. The application will learn from the client behavior and increase security accordingly. The details of the client accessing the lock will be put away in the server along with date and time which can be additionally used to foresee the occasions when the client will go into the house and handle security accordingly. On locking the door, the lights that are on will automatically kill. On opening the door the lights turn on accordingly. Client can set vacation days and the system will be on maximum security till the client returns User can also set temporary keys (will be active for a set time) for homegrown assistance or for visitors.

A. Control Module:

- ❖ **Android application:** The application gives and interfaces between the client and the lock and it is utilized to control the lock and the other segments of the system.
- ❖ **Server, DB:** The server is utilized to store the client activities and all the clients that are allowed to access the lock and store the authorized client's credentials, for example, login id or password.
- ❖ **Raspberry pi:** Raspberry pi is the central controlling unit and is utilized to communicate with and control all the segments utilized in the system.

B. Door/Window Module:

- ✓ **Camera:** The camera is utilized to capture anyone accessing the lock and in case of a unidentified client the client is alerted about the same, the camera turns on just when there is somebody near the door or the windows.
- ✓ **Motor:** The motor is the gadget that controls the latch.
- ✓ **Fingerprint sensor:** Fingerprint sensor is utilized to authenticate the client and give a faster, secure and more productive way to open the door.

- ✓ **Motion sensor:** The motion sensors screen the activity before the door and near the windows the places that can be utilized to gain entrance in the house in case of development near these places the camera is activated to record the individual going into the house.

C. House Module:

i. **Relay:** The relay module is a separate hardware gadget utilized for remote gadget switching. With it you can remotely control devices over a network or the Internet. Devices can be remotely fueled on or off with commands.

ii. **Smoke/gas sensor:** This sensor is utilized to check if there is a fire or a gas leakage in the house and alert the client and trigger the alarm if there is any.

iii. **Light sensor:** Light sensors check if the room needs artificial lighting when the client goes into the house if the room is dark and the client goes into the house the lights turn on automatically.

D. Alert Module:

- o **Alarm:** The alarm is utilized to alert the encompassing in case of a crisis, for example, fire, gas leakage or constrained section in the house.
- o **GSM module:** The gsm module is a gadget that will have the option to send sms to the client it helps in alerting the client even without an internet association.

5. RESULT AND DISCUSSION

All the modules present in the system communicate with each other to give smooth working of the system. The doors and the windows have motion sensors that can detect development before them in case somebody approaches the doors or the windows the client is alerted and in the event that somebody breaks in and the motion sensors recognize development inside the house despite the fact that the lock was not accessed the alarm is sounded. The client can open the door utilizing the fingerprint sensor or if the client wants the door will open itself when the client draws close to the door with the authorized gadget or can utilize the face open there are different strategies for opening the door, for example, utilizing a pin or a password that can be entered in the telephone, can be arrangement by the authorized client and could keep more than one way to authenticate an individual going into the house.

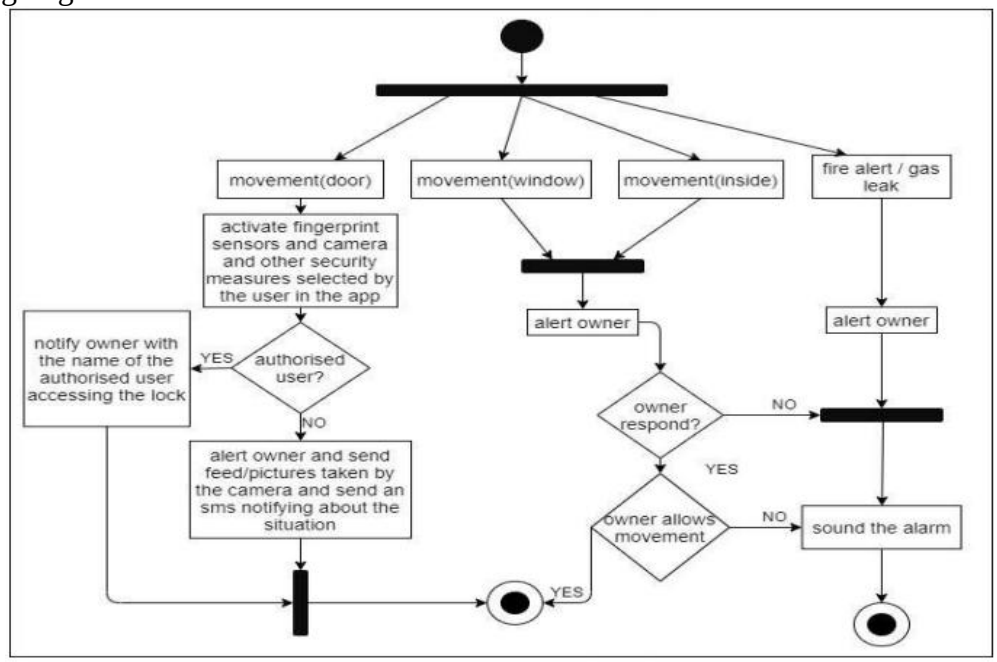

Figure 1: Activity plan

The owner can also create temporary keys for the visitor and add their fingerprints too this key is temporary as the proprietor can set the time till which the visitor will be an authorized client. The light sensors check the light power in the room and in the event that it is dark the raspberry pi will turn on the lights utilizing the relay board. The portable application tracks the client behavior and in

case of an alternate behavior then the client usually shows the lock increases the security measures and also alerts the other authorized clients. In case of a gas leakage or fire the alarm is sounded in order to alert the environmental factors the gsm module alerts the client via a SMS in case the client fails to get any app notification because of lack of internet association.

5.1 Software

The software in the proposed system comprises of a real time database which is firebase the lock is controlled by an android application along these lines the android operating system is needed by the client the improvement of the application requires JAVA, Python, XML and the operating system utilized in the Raspberry pi is Raspbian OS.

5.2 Hardware

The hardware necessity for the proposed system are as per the following: Servo motor to operate the lock , piCam to record and stream the happenings around the house, a fingerprint sensor that will help in client authentication a relay board to control the lights and fans ,Raspberry pi light sensor to recognize the degree of darkness a MQ2 smoke sensor to distinguish fire, Raspberry pi 3 acts as the control controlling unit and a GSM module to alert the client in case the client isn't associated with the internet.

6. CONCLUSION

The IoT is a giant network of associated things and individuals all of which gather and share data about the way they are utilized and about the climate around them. Home automation, being quite possibly the most integral parts of the sprouting realty industry paves forward the need to establish a basic yet productive system that through training anticipates the client's actions and executes it for them. This paper presents an adaptable and easy to understand technique to actualize the same by integrating relays to Raspberry pi for controlling home appliances from a remote location in a real scenario. The proposed system can be utilized in different scenarios like parking parts, cars, and so forth, apart from one's home. As an expansion, authors propose a non-exclusive lOT framework and use cloud computing infrastructure for interfacing and managing remote devices and also store sensor data.

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A STUDY ON THE FIRST EIGENVALUE OF THE P-LAPLACIAN AND CRITICAL SETS OF HARMONIC FUNCTIONS BY DEFINING GEOMETRIC P-LAPLACIAN ON RIEMANNIAN MANIFOLDS

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A STUDY ON THE FIRST EIGENVALUE OF THE P-LAPLACIAN AND CRITICAL SETS OF HARMONIC FUNCTIONS BY DEFINING GEOMETRIC P-LAPLACIAN ON RIEMANNIAN MANIFOLDS

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Abstract
In mathematics, the p-Laplacian, or the p-Laplace administrator, is a quasilinear elliptic incomplete differential administrator of second request. It is a nonlinear speculation of the Laplace administrator, where p is permitted to go over $1<p<\infty$. The properties of the spectrum of the weighted p-Laplacian on a complete Riemannian complex with evolving geometry it is a notable component that spectrum as an invariant amount advances as the space does under any geometric flow. The variation recipes, monotonicity, and differentiability for the first eigen value of the p-Laplacian on a n-dimensional shut Riemannian complex whose measurement develops by a summed up geometric flow. the spectrum of the Laplacian on noncompact non-complete manifolds also attracts attention of mathematicians and physicists in the past three decades, since the investigation of the spectral properties of the Dirichlet Laplacian in infinitely extended regions has applications in elasticity and so on. The PDEs involving p-Laplacian are considered in differential geometry in the investigation of critical points for p-harmonic maps between Riemannian manifolds and the eigenvalue problems for p-Laplacian on Riemannian manifolds serve for estimations of the diameter of the manifolds. By using the theory of self-adjoint operators, the spectral properties of the linear Laplacian on a domain in a Euclidean space or a manifold have been concentrated broadly.
Keywords: *Eigen value, P-Laplacian, Harmonic Functions, Geometric, Riemannian, Manifolds, etc.*

1. INTRODUCTION

In science, the *p*-Laplacian, or the *p*-Laplace operator, is a quasilinear elliptic partial differential operator of second request. It is a nonlinear generalization of the Laplace operator, where p is permitted to range over $1<p<\infty$. In science, numerical physics and the hypothesis of stochastic processes, a harmonic function is a twice continuously differentiable function $f: U\rightarrow R$, where U is an open subset of R^n, which fulfills Laplace's equation. The properties of the spectrum of the weighted *p*-Laplacian on a complete Riemannian complex with evolving geometry it is a notable component that spectrum as an invariant amount advances as the space does under any geometric flow. All through, we will consider a *n*-dimensional complete Riemannian complex $(M, g, d\mu)$ equipped with weighted measure $d\mu=e^{-\phi}dv$ and potential function $\phi\in C\infty(M, d\mu)$, whose metric $g=g(t)$ advances along

Either the Ricci-harmonic flow or volume preserving Ricci-harmonic flow

2. THE FIRST EIGENVALUE OF *p*-LAPLACIAN ON EVOLVING GEOMETRY AND APPLICATIONS

The variation method, monotonicity, and differentiability for the first eigen value of the *p*-Laplacian on a *n*-dimensional shut Riemannian complex whose measurement develops by a summed up geometric flow. It is demonstrated that the first nonzero eigen value is monotonically non-diminishing along the flow under certain geometric conditions and that it is differentiable all over the place. These outcomes provide a brought together approach to the investigation of eigen value variations and applications under numerous geometric flows.

2.1 Geometric flow

Let (M, g) be an *n*-dimensional shut Riemannian complex ($n>1$). Let $g(x, t)$ be a one parameter group of measurements for $t \in [0, T]$ and $x \in M$. We state that $g(x, t)$ is a summed up geometric flow in the event that it advances by the accompanying equation with $g(x,0) = g_0(x)$, where $0<T<T_\varepsilon$ is the

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maximal time of presence, i.e., T_ε is the first time where the flow explodes and h is an overall time-dependent symmetric 2-tensor. Here h is thought to be smooth in the two factors t and x. This is clear since g is likewise smooth in the two factors. The scaling factor 2 in (1) is immaterial while the negative sign might be important in some specific applications to keep the flow either forward or in reverse in time.

$$\frac{\partial}{\partial t}g(x,t) = -2h(x,t), \quad (x,t) \in M \times [0,T] \tag{1}$$

Two popular examples of geometric flows in this class are: the Ricci flow with h being the Ricci shape tensor, and the mean bend flow with $h = H\prod$ (where H is the mean arch and $\prod$ is the second crucial structure on M). Different examples incorporate Yamabe flow, Ricci-harmonic flow, RicciBourguignon flow. One may impose boundedness condition on tensor h. Truth be told, such boundedness and sign assumptions on h are preserved as long as the flow exists, so it follows that the measurements are consistently same. Precisely, if $-K_1 g \le h \le K_2 g$, where $g(t)$, $t \in [0, T]$ is the flow, at that point

$$e^{-K_1 T} g(0) \le g(t) \le e^{K_2 T} g(0).$$

To see the last limits, we consider the evolution of a vector structure $|X|_g = g(X, X)$, $X \in T_x M$. From (1) and the boundedness of the tensor h, we have $|\partial_t g(X, X)| \le K_2 g(X, \boldsymbol{X})$, which implies (by coordinating from t_1 to t_2)

$$\left|\log \frac{g(t_2)(X,X)}{g(t_1)(X,X)}\right| \le K_2 t\Big|_{t_1}^{t_2}.$$

Taking the exponential of this gauge with $t_1 = 0$ and $t_2 = T$ yields $|g(t)| \le e^{K_2 T} g(0)$ from which the uniform boundedness of the measurement follows. In this manner, if there holds boundedness assumption

$-K_1 g \le h \le K_2 g$

The metric $g(t)$ are consistently limited underneath and above forever $0 \le t \le T$ under the geometric flow (1). At that point, it doesn't make a difference what metric we use in the contention that follows.

2.2 Eigen value of *p*-Laplacian

The p-Laplace operator is characterized by

$\Delta_{p,g} f(x) := \mathrm{div}(|\nabla f|^{p-2}\nabla f)(x)$

For $p \in [1, \infty)$, where div is the difference operator, and the adjoint of inclination (graduate) for the L^2 -standard instigated by g on the space of differential structures at the point when $p = 2$, $\Delta_{2,g}$ is the standard Laplace-Beltrami operator. The eigen values and the corresponding eigen functions of $\Delta_{p,g}$ fulfill the accompanying nonlinear eigen value problem

$$\Delta_{p,g} f = -\lambda |f|^{p-2} f, \quad f \ne 0. \tag{2}$$

It is notable that the principal image of (2) is nonnegative all over and carefully positive at the neighborhood of the point where $\nabla f \ne 0$. We likewise realize that (2) has feeble solutions with only partial routineness of class $C^{1,\alpha}$,$(0 < \alpha < 1)$ as a rule. Intrigued perusers can locate the traditional papers by Evans and Tolksdorff. Notice that the least eigen value of $\Delta p,g$ on shut complex is zero with the corresponding eigen function being a constant. Subsequently, we allude to the infimum of the positive eigen values as the first nonzero eigen value or simply the first eigen value. The first eigen value of $\Delta p, g$ is portrayed by the min-max principle

$$\lambda_{p,1} = \inf_f \left\{ \frac{\int_M |\nabla f|_g^p \, d\mu_g}{\int_M |f|_g^p \, d\mu_g} \;\middle|\; f \ne 0, \;\; f \in W^{1,p}(M) \right\} \tag{3}$$

Satisfying the following constraint $\int_M |f|_g^{p-2} f d\mu_g = 0$, where $d\mu_g$ is the volume measure on (M,g). Clearly, the infimum doesn't change when one replaces $W^{1,p}(M)$ by $C^\infty(M)$. The corresponding Eigen function is the energy minimizer of Rayleigh remainder (3) and fulfills the accompanying Euler-Lagrange equation

$$\int_M [|\nabla f|^{p-2}\langle \nabla f, \nabla \phi\rangle - \lambda |f|^{p-2}\langle f, \phi\rangle] d\mu_g = 0 \tag{4}$$

For $\varphi \in C_0^\infty(M)$ in the cognition of distribution it is notable that p-Laplacian has discrete eigen values yet remains obscure whether it only has discrete eigen values for limited connected domains. Other notable outcomes reveal to us that the first nonzero eigen value is simple and confined. Here the simplicity shows that any nontrivial eigen function corresponding to $\lambda_{p,1}$ doesn't change sign and that any two first eigen functions are constant multiple of one another. In contrast to the spectrum of the Laplace-Beltrami operator (the case p=2), the p-Laplacian is nonlinear as a rule. Besides, it isn't known whether $\lambda_{p,1}$ or its corresponding eigen function is C^1-differentiable (or even locally Lipschitz) along any geometric flow of the structure (1). Notwithstanding, it has been pointed out that the differentiability for the case p=2 is a consequence of eigen value perturbation theory; see, for instance, and the references therein. Consequently, any approach that accepts differentiability of eigen values and eigen functions under the flow must be applied to the case p=2.

Presently to keep away from the differentiability assumption on the first eigen value and the corresponding eigen function for the situation $p \neq 2$, we will apply strategies introduced in under the Ricci flow to examine the variation and monotonicity of $\lambda_{p,1}(t) = \lambda_{p,1}(t, f(t))$, where $\lambda_{p,1}(t, f(t))$ and $f(t)$ are thought to be smooth. The evolution and the monotonicity formulas for the first eigen value inferred here don't depend on the evolution of the eigen function. The eigen function only requirements to fulfill certain normalization condition. There are numerous outcomes on the evolution and monotonicity of Eigen values of the Laplace operator on evolving manifolds with or without ebb and flow assumptions. One can find under the Ricci flow, under Ricci-harmonic flow and along unique geometric flow with entropy techniques. The investigation of the properties of eigen values of the p-Laplacian on evolving complex is still youthful. The main point of this paper is to investigate if those known properties of $\lambda_{p,1}$ on static measurement and for the case p=2 on evolving metric can be stretched out to different geometric flows. We anyway intend to develop a brought together calculation that can be utilized for this purpose on time-dependent measurements. Many interesting outcomes concerning the conduct of $\lambda_{p,1}$ can be found in for static measurements and for evolving measurements along different geometric flows.

3. GEOMETRIC PROPERTIES OF SOLUTION TO THE ANISOTROPIC *p*-LAPLACE EQUATION IN DIMENSION TWO

We consider solutions to the equation (5) with a consistently elliptic and Lipschitz continuous symmetric lattice, in dimension two. We consider solutions $u \in W^{1,p}_{loc}(\Omega)$ to the following savage elliptic equation which we will call the anisotropic p-Laplace equation

$$\operatorname{div}(|A\nabla u \cdot \nabla u|^{(p-2)/2} A\nabla u) = 0 \quad \text{in } \Omega \quad (5)$$

Where Ω is a two-dimensional domain, p fulfills $1<p<\infty$, and $A = A(x)$ is a symmetric network satisfying hypotheses of uniform ellipticity and of Lipschitz continuity. Equation (5) can be seen as the Euler equation for the variational integral

$$J(u) = \int_\Omega |A\nabla u \cdot \nabla u|^{p/2}\, dx \quad (6)$$

And its interest arises from various applied contexts related to composite materials, (for example, nonlinear dielectric composites, whose nonlinear behavior is displayed by the supposed power-law. In such a case many things are thought about the local behavior of solutions and about the structure of level lines and critical points. First, the Hartman and Wintner theorem [HW] discloses to us that for each $x^0 \in \Omega$, and up to a linear change of coordinates which renders $A(x^0) = $ const. I, $u(x) - u(x^0)$ is asymptotic to a homogeneous harmonic polynomial of $x - x^0$, and this asymptotics carries over to first request derivatives. From this basic fact, one can infer that in the event that u is non-identically constant, then its critical points are isolated. Besides, on the off chance that x^0 is a zero of multiplicity m for ∇u, then the level set $\{x \mid u(x) = u(x^0)\}$ is composed, near x^0, by exactly $m+1$ simple arcs intersecting at x^0 only. Next, it is possible to evaluate the number, and the multiplicities, of critical points of a solution as far as properties of its Dirichlet data [A1], [A2], or of other types of

boundary data [AM1]. Such outcomes have also been generalized to weak solutions *u* to (6) when the coefficient matrix A is simply limited measurable [AM2].

4. EIGENVALUE INEQUALITIES FOR THE *P*-LAPLACIAN ON A RIEMANNIAN MANIFOLD AND ESTIMATES FOR THE HEAT KERNEL

By using the theory of self-adjoint operators, the spectral properties of the linear Laplacian on a domain in a Euclidean space or a manifold have been concentrated widely. Mathematicians generally are interested in the spectrum of the Laplacian on compact manifolds (with or without boundary) or non-compact complete manifolds, since in these two cases the linear Laplacians can be particularly reached out to self-adjoint operators. Nonetheless, the spectrum of the Laplacian on noncompact non-complete manifolds also attracts attention of mathematicians and physicists in the past three decades, since the investigation of the spectral properties of the Dirichlet Laplacian in infinitely extended regions has applications in elasticity, acoustics, electromagnetism, quantum physics, and so forth As of late, the author has proved the presence of discrete spectrum of the linear Laplacian on a class of 4-dimensional rotationally symmetric quantum layers, which is non-compact non-complete manifolds, in under some geometric assumptions therein.

A natural generalization of the linear Laplacian is the purported *p*-Laplacian underneath. Although many outcomes about the linear Laplacian (*p*=2) have been obtained, many rather basic questions about the spectrum of the nonlinear *p*-Laplacian remain to be addressed. Let Ω be a limited domain on a n-dimensional Riemannian manifold (*M, g*). We consider the following nonlinear Dirichlet eigen value problem.

$$\begin{cases} \Delta_p u + \lambda |u|^{p\ \ 2} u = 0 & \text{in} \Omega, \\ u = 0 & \text{on} \partial\Omega, \end{cases}$$

Where $\Delta_{\,p}\, u$=div ($|\nabla u|_g^{p-2}\, \nabla_u$) is the *p*-Laplacian with $1<p<\infty$. In local coordinates $\{x_1,\ldots ,x_n\}$ on *M*, we have

$$\Delta_p u = \frac{1}{\sqrt{\det(g_{ij})}} \sum_{i,j=1}^{n} \frac{\partial}{\partial x_i} \left(\sqrt{\det(g_{ij})} g^{ij} |\nabla u|^{p-2} \frac{\partial u}{\partial x_j} \right)$$

Where

$$|\nabla u|^2 = |\nabla u|_g^2 = \sum_{i,j=1}^{n} g^{ij} \frac{\partial u}{\partial x_i} \frac{\partial u}{\partial x_j}$$

And $(g^{ij})=(g^{ij})^{-1}$ is the inverse of the metric matrix.

5. MAXIMUM RELATING RADIAL *p*-LAPLACIAN BY APPLICATIONS TO NONLINEAR EIGEN VALUE PROBLEMS

Problems involving p-Laplace operator are subject of intensive investigations as they illustrate many of phenomena that happen in nonlinear analysis. Among their applications are singular and non-singular boundary value problems which appear in various branches of mathematical physics. They arise as a model example in the liquid dynamics; glaciology; stellar dynamics; in the theory of electrostatic fields; in the more general context in quantum physics; in the nonlinear elasticity theory as a basic model; and many others. The PDEs involving *p*-Laplacian are considered in differential geometry in the investigation of critical points for p-harmonic maps between Riemannian manifolds and the eigenvalue problems for *p*-Laplacian on Riemannian manifolds serve for estimations of the diameter of the manifolds. Eigenvalue problems involving *p*-Laplacian are applied in functional analysis to infer sharp Poincar'e and Writinger type inequalities, Sobolev embeddings and isoperimetric inequalities. Geometric properties of p-harmonic functions play significant part in the theory of Carnot–Caratheodory groups like Heisenberg group and in the analysis on measurement spaces. One of the problems we experience when investigating p-harmonic equation is that not many explicit solutions are known – affine, quasiradial, radial. Among them radial solutions form the most

stretched out nontrivial class in which many properties of p-harmonic world can be recognized? Another motivation to examine radial solutions comes from the seminal paper by Gidas, Ni and Nirenberg who expanded Serrin's moving plane strategy from and proved that at times only radial solutions are admitted. Additionally, it can happen that among the solutions of the PDE are the radial ones regardless of whether the radial solutions are by all account not the only ones. We shall consider radial solutions of the equation

$-a(|x|)\mathrm{div}(|\nabla w(x)|^{p-2}\nabla w(x)) = \varphi(w(x))$ a.e. in $B = B(0, R) \subset R^n$ (7)

We assume that $p>1$, $n>1$, $R\in(0,\infty]$ (for $R=\infty$ the above equation is defined on R^n), $a(.)$ is nonnegative and belongs to a certain class of functions which will be depicted later, while φ is an arbitrary odd continuous function with the end goal that $\tau\varphi(\tau)$ is of constant sign for L^1 almost all τ 's. In general our equation is given in a non-divergent form.

6. CONCLUSION

In mathematics, the *p*-Laplacian, or the *p*-Laplace operator, is a quasilinear elliptic partial differential operator of second request. It is a nonlinear generalization of the Laplace operator, where p is allowed to range over $1<p<\infty$. The variation formulas, monotonicity and differentiability for the first eigenvalue of the *p*-Laplacian on an n-dimensional shut Riemannian manifold whose measurement develops by a generalized geometric flow. By using the theory of self-adjoint operators, the spectral properties of the linear Laplacian on a domain in a Euclidean space or a manifold have been concentrated broadly. Mathematicians generally are interested in the spectrum of the Laplacian on compact manifolds (with or without boundary) or non-compact complete manifolds, since in these two cases the linear Laplacians can be extraordinarily stretched out to self-adjoint operators. Problems involving *p*-Laplace operator are subject of intensive investigations as they illustrate many of phenomena that happen in nonlinear analysis. Among their applications are singular and nonsingular boundary value problems which appear in various branches of mathematical physics.

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DESIGNING AND EXPERIMENTING THE INNOVATIVE, ALTERNATIVE AND COMLIMENTARY WIRELESS COMMUNICATION TECHNIQUE USED FOR THE IOT APPLICATION

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Abstract
Internet of Things (IoT) is a new computing worldview that visualizes changing over regular common articles into keen items. Wireless technologies will be the most ideal choice to associate IoT devices on account of its advantages over wired technologies including simpler establishment, cheaper frameworks, portability backing, adaptability, and simplicity of association. There are various types of wireless technologies applicable for IoT; these technologies range various spaces from not many centimeters to numerous kilometers. In this paper the Internet Engineering Task Force (IETF) presented 6LowPAN protocol and ZigBee union created ZigBee protocol over low power IEEE802.15.4 protocol. Sensors in wireless sensor networks applications are assembled as bunches to inform hubs called sensor hubs. These hubs are typically powered by battery power supply. In IoT applications these hubs should do its capacity for years without change their batteries. IoT helps making choices upheld by real data gathered utilizing large number of ordinary day-to-day devices that have been augmented with knowledge through the installation of detecting, processing and communication capabilities. IoT devices mainly utilize wireless communication for communicating with different devices.

Keywords: Innovative, Wireless, Communication, Technique, IOT, etc.

1. INTRODUCRION

Internet of Things (IoT) is a new computing worldview that visualizes changing over regular common articles into keen items. IoT has been recognized as one of troublesome technologies of the here and now that will change the way sees and understands our general surroundings and responds to its changes. The Internet of things portrays the organization of actual articles "things" that are embedded with sensors, software, and different technologies for the motivation behind associating and trading information with different devices and frameworks over the Internet. Advances made in universal and inescapable computing, embedded devices, communication technologies, sensor networks, Internet protocols and online applications are the basic hidden technologies that help make normal devices keen ones and consequently made IoT conceivable. Thus, these technologies are regularly known as the empowering technologies of IoT. As of late, the advances in different wireless

Communication protocols in technologies, for example, 5G, RFID, Wi-Fi-Direct, Li-Fi, LTE, and 6LoWPAN have significantly helped the likely capacities of IoT and caused it to turn out to be more common than any time in recent memory, which additionally quicken the further reconciliation of IoT with arising technologies in different territories, for example, detecting, wireless reviving, information trading, and handling. However, how these technologies particularly the relating wireless communication protocols can be very much lined up with IoT to boost their advantages on such performance as adaptability, administration quality, energy productivity, and cost viability is as yet open to examination and consequently calls for novel arrangements. And the elaborate protection and security issues likewise should be painstakingly inspected and tended to.

2. WIRELESS TECHNOLOGIES FOR INTERNET OF THINGS APPLICATIONS

In IoT frameworks, IoT devices gather information from actual frameworks, speak with entryways for information total, and associate with the Internet to forward the information to the cloud or edge computing devices for additional preparing and examination. By associating IoT devices to the Internet, the IoT environment vows to carry enhancements to our nature of lives, climate and

framework performance in the home, building, city, electric force lattice, vehicles, transportation, coordinations, medical care, and some more. Figure 1 represents some of arising IoT application situations. Albeit wireless sensor networks (WSN) are one of the principle segments of IoT frameworks, in contrast to WSN devices, IoT devices are savvy enough to take ideal choices with or without negligible human mediation. As per the new Cisco report (2018), the quantity of IoT devices associated with the Internet will arrive at 50 billion by 2020. Diverse communication technologies (wired, optical, and wireless) can be used for information communications among an enormous number of IoT devices and for backhaul network situations. Wireless technologies will be the most ideal choice to associate such IoT devices on account of its advantages over wired technologies including simpler establishment, cheaper frameworks, portability backing, adaptability, and simplicity of association. Therefore, in this work, we just spotlight on wireless technologies.

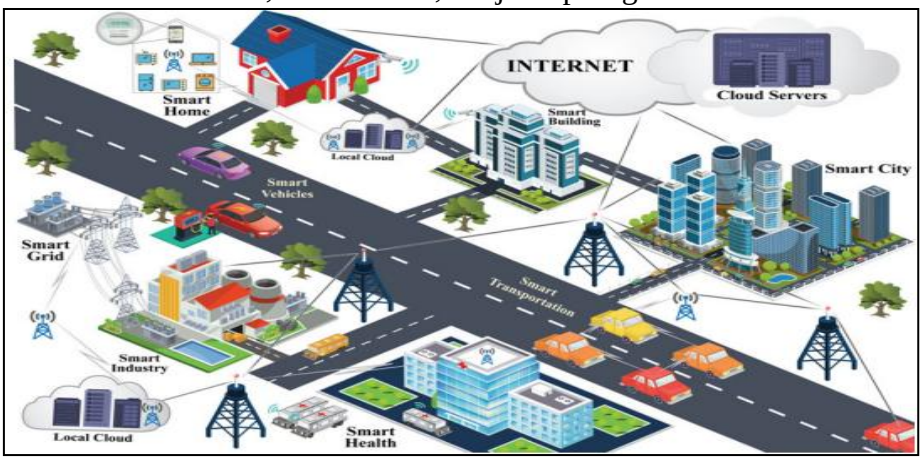

Figure 1: Emerging IoT application scenarios

While all IoT devices communicate and get information wirelessly, they don't do it in the very same manner. There are various choices for network, and some are more qualified to specific applications than others. Components like battery life, range of inclusion, power prerequisites and bitrate should all be considered when choosing which choice to use for a given application.

- **WiFi:** WiFi turns into a regular instrument as of now for Internet access in our regular daily existences. The WiFi standard IEEE 802.11 was first delivered in 1997 and numerous changes were affirmed after that.It has been allocated the standard 802.11 by the Institute of Electrical and Electronics Engineers (IEEE), and works at either 2.4 Ghz or 5 Ghz. Most switches offering a greatest range of 100 meters.
- **Bluetooth:** Next we have Bluetooth. That little sans hands earpieces for your telephone has been around for a spell now, yet this technology can accomplish such a great deal more. Bluetooth (IEEE Standard 802.15.1) is used in a wide range of clinical and mechanical devices. Like WiFi, it additionally works at 2.4 Ghz, yet it has some key contrasts that make it ideal for implanting in more modest items.
- **Zigbee:** Zigbee (IEEE 802.15.4) is a wireless standard which is normally used for mechanical applications, yet additionally in some home items. Like WiFi, it utilizes 2.4 Ghz bandwidth, yet has lower power necessities and is intended for considerably more restricted data trades, working at 250 kbits/second.

3. COMPETENT POWER CONSUMPTION WIRELESS COMMUNICATION TECHNIQUES FOR IOT APPLICATIONS

A sensational change towards a general association between each thing and processing will prompt a third modern upheaval named Internet of Things (IoT). This unrest gathers a few sciences and technologies with one another, for example, Data Acquisition, Power Consumption, Wireless Sensor Networks, Radio and Mobile Communications, Data Analytic and Processing, Internet Technology. IoT takes its name from its wide spread applications from wearable wellness trackers to associated vehicles, traversing the ventures of utilities, transportation, medical care, purchaser electronics, and

numerous others. The customary utilization of the Internet has gotten insufficient to meet the mechanical and common necessities. The IoT is the candidate object to add new technologies to internet technology by empowering communications with and among keen items, accordingly prompting the vision of "whenever, anyplace, any media, anything" communications. To this reason, the IoT should be considered as a component of the general Internet of things to come, which is probably going to be significantly not quite the same as the Internet use today.

IoT is a framework dependent on billion keen sensors and actuators and to fabricate such a framework, novel thoughts regarding clever sensors and data calculations and processing should be presented. Notwithstanding, the main inquiry should be presented, that is the means by which these sensors and actuators are interconnected, Ethernet cabling look like not a smart thought. Undoubtedly, just wireless offers the adaptability, versatility and cost proficiency expected to guarantee practical take-up of the Internet of Things. The radio recurrence wireless communication with its huge number and existing framework offers a best answer for data traffic in IoT frameworks. A restricted power supply issue thinks of a wireless network between sensors. In a perfect world, a framework where a sensor can run on a solitary AAA battery for years is favored in IoT applications. The arrangement which tackles the issue of restricted power supply is the IEEE 802.15.4 standard. IEEE 802.15.4 standard determines a wireless connection for low-power personal area networks (LoWPANs). This standard is embraced by ZigBee Alliance to present ZigBee gadget which is a low cost, low power, wireless cross section organizing standard focused at wireless control and observing applications. As a rule, while choosing a wireless technology for associated devices, a couple of contemplations should be considered relying upon the last application.

- Maximum throughput
- Power consumption
- Maximum distance range

4. WIRELESS IOT CONNECTIVITY TECHNOLOGIES

There are various types of wireless technologies applicable for IoT; these technologies range various spaces from not many centimeters to numerous kilometers. For short to medium range communication Wireless Personal and Local Area Network technologies (WPAN\LAN, for example, Bluetooth, ZigBee, 6LowPAN, and Wi-Fi are suggested. For long range communication the proposal is for Wireless Wide Area Network technologies (WWAN) and these can be isolated into two types whether to utilize authorized (Cellular 2G/3G/4G and 5G in future) or authorized excluded technologies (LPWA LoRa, SIGFOX, and other). Connectivity is the establishment for IoT, and the type of access required will rely upon the idea of the application. Numerous IoT devices will be served by radio technologies that work on unlicensed range and that are intended for short-range connectivity with restricted QoS and security prerequisites commonly appropriate for a home or indoor climate.

4.1 Short Range Connectivity Technologies

Wi-Fi is an extraordinary candidate to guarantee connectivity in IoT applications because of its huge development over the previous years, despite the a lot higher power consumption. Today, most places where there is something to send or some data to be sent, there's Wi-Fi inclusion. Unfortunately, Wi-Fi has been far off for sensor communications because of the genuinely enormous energy consumption with its customary protocols. Since 2006, this has changed when the Wi-Fi people group began to apply notable technologies, for example, obligation cycling, that is, placing contributes a rest mode for more often than not and low power Wi-Fi modules see lights, for example, Microchips RN171 module which is a standalone, embedded 802.11 b/g Wireless Local Area Network (WLAN) modules. Another great candidate for short range connectivity is IEEE 802.15.4 technology. A few driving radio makers have actualized IEEE 802.15.4. The Internet Engineering Task Force (IETF) presented 6LowPAN protocol and ZigBee union created ZigBee protocol over low power IEEE802.15.4 protocol. Specifically the IETF 6LowPAN characterize the casing format and a few components required for the transmission of IPv6 bundles on top of IEEE 802.15.4 networks. 6LowPAN is the abbreviation for IPv6 over low-power personal area networks.

4.2 Long Range Connectivity Technologies

Presently, there are two alternative connectivity tracks for the numerous IoT applications that rely upon wide-area inclusion:

i. **Cellular Technologies:** 3GPP technologies like GSM, WCDMA, LTE and future 5G. These WANs work on authorized range and truly have principally focused on great mobile voice and data administrations. Presently, nonetheless, they are by and large quickly developed with new usefulness and the new radio access technology narrowband IoT (NB-IoT) explicitly custom fitted to form an alluring answer for arising low power wide area (LPWA) applications.

ii. **Unlicensed LPWA:** New restrictive radio technologies, given by, for instance, SIGFOX and LoRa, have been created and planned exclusively for machine-type communication (MTC) applications tending to the super low-end sensor portion, with restricted demands on throughput, unwavering quality or QoS. One approach to section IoT applications is to sort them as per inclusion needs and performance necessities, (for example, data speed or inactivity demands). Figure 2, represents the various types of technologies that can be used for IoT with various inclusion area and inside the unlicensed range.

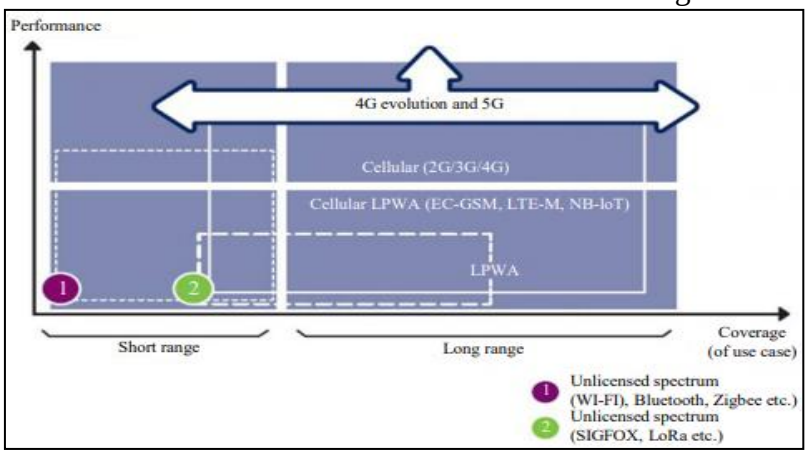

Figure 2: Technologies addressing different segments

Applications of cellular connectivity remain concentrated in traditional applications, for example, transportation, automotive, and location management. Cellular 2G connectivity gives the benefit of overall Nevertheless; there are limitations to cellular connectivity which LPWA addresses.

5. WIRELESS SENSOR NETWORKS FOR IOT APPLICATIONS

Sensors in wireless sensor networks applications are assembled as bunches to inform hubs called sensor hubs. These hubs are typically powered by battery power supply. In IoT applications these hubs should do its capacity for years without change their batteries. Thus, the battery lifetime is the main parameter in the plan of sensor hubs for IoT applications.

5.1 Used Module for a Certain Wireless Communication Protocol

- **Low Power Wi-Fi Modules for Short Range Connectivity:**

The low-power Wi-Fi chip/module has an impact factor in diminishing the power consumption of battery used in Wi-Fi sensors. Low-power WI-Fi modules increase years of battery lifetime in same time they giving easy installation to existing Wi-Fi network without any extra gateway. New low-power Wi-Fi modules have been presented in the markets that help IEEE 802.11 protocols. The famous available low power Wi-Fi chips/modules in markets today are G2M5477 module from G2 Microsystem, RN171 module from Microchip, QCA4004 module from Qualcomm, GS1011M from Gain Span, RS9110-N-11-02 Module from Red pine and RTX41x arrangement Modules from RTX. A particular comparison between these modules in term of power consumption is illustrated in Table 1.

Table 1 Particular comparison for different low power Wi-Fi modules

Company	Module	IEEE Protocol	V_{DD} (Volt)	I_{TX} (mA)	I_{Rx} (mA)	Isleep (µA)	Max. Bit Rate (Mb/S)

Microchip	RN171	802.11 b/g	3.3	190	40	4	54
Qual Comm	QCA4004	802.11 n	3.3	250	75	130	10
Gain Span	GS1011M	802.11 b	3.3	150	40	150	11
G2 Micro system	G2M5477	802.11 b/g	3.3	212	37.8	4	11
Redpine	RS9110-N-11-02	802.11 b/g/n	3.3	19	17	520	11
RTX	RTX41x Series	802.11 b/g/n	3.3	0.760	0.760	3	10

5.2 Wireless Communication Protocols

a) Comparison between Different IoT Protocols:

Table 2 summarizes the main contrasts between Low Power Wi-Fi, ZigBee, 6LowPAN and LoRaWAN protocols. This table has been filled according to the data sheet for each fruitful candidate module. According to the data appeared in Table 2, impact of distance between hubs on transmission power can be considered. Also, the impact of transmission time on power consumption can be examined.

Table 2 Main differences between protocols that may be used in IoT applications

Standard	**Low Power Wi-Fi**	**ZigBee**	**6LoWPAN**	**LoRaWAN**
IEEE spec.	802.11 b/g/n	802.15.4	802.15.4	802.15.4
Max Data Rate	10 Mbps	250 Kbit/s	250 Kbit/s	5468 bps LoRa Technology modulation
Nominal range	70 m^2 indoors and 225 m^2 Outdoors	10-100m	25 -50m	5-15km
Frequency band (GHz)	2.4/5	2.4	2.4	433/868 MHz
Nominal TX power (mW) dBm	19.95	52.22	2.23	Adjustable with Max. Value + 14 dBm

b) Transmission Time and Power Consumption:

The transmission time relies upon the data rate, the message size, and the distance between two hubs. From Table 2, it is noticed that the transmission time for the ZigBee and 6LoWPAN protocols is longer than the low power Wi-Fi, because of its low data rate (250 Kb/s) and its long-range reasons. In long range connectivity, LoRaWAN requires more transmission time compared to small range connectivity protocols because its low rate data rate.

6. CONCLUSION

Internet of Things has gained the attention of almost everyone because of its capability of checking and controlling the climate. IoT helps making choices upheld by real data gathered utilizing large number of ordinary day-to-day devices that have been augmented with knowledge through the installation of detecting, processing and communication capabilities. One of the main and important aspects of any IoT gadget is its communication capability for transferring and sharing data between different devices. IoT devices mainly utilize wireless communication for communicating with different devices. It's seen that the decision of module for each protocol plays a vital job in battery life because of the distinction of power consumption for each module/protocol. The maximum range for transmission and accepting relies upon modules and protocols type. In this way, in feeling of distance impact on power consumption, there is no certain module or protocol can be candidate for IoT applications, because the distance relies upon the nature of application.

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केन्द्रीय कृषक उपज व्यापार और वाणिज्य(संवर्धन और सरलीकरण) विधेयक कानून 2020 का मध्यप्रदेष की कृषि उपज मंडियो पर आर्थिक प्रभाव का अध्ययन

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केन्द्रीय कृषक उपज व्यापार और वाणिज्य(संवर्धन और सरलीकरण) विधेयक कानून 2020 का मध्यप्रदेष की कृषि उपज मंडियो पर आर्थिक प्रभाव का अध्ययन

श्रीमती दुर्गेषनंदिनी अग्रवाल, षोध छात्राए मानसरोवर ग्लोबल विष्वविद्यालय भोपाल

म.प्र. की कृषि उपज मंडी समितियों पर किसानों की आय वर्ष 2020 तक दोगुना करने एवं कृषको को उनके द्वारा उत्पादित उपज स्वतंत्रतापूर्वक विक्रय किये जाने हेतु केन्द्र सरकार द्वारा वर्ष 2020 में देष में कृषि सुधारों को लागू करने हेतु कोराना अवधि में 05 जून 2020 तीन कृषि सुधार अध्यादेष केन्द्र सरकार द्वारा स्वीकृत किये गये और जिन्हें बाद में संसद के दोनों सदनों में पारित कर कानून का दर्जा प्रदान किया गया।

इन तीन कानूनों में केन्द्रीय कृषक उपज व्यापार और वाणिज्य (संवर्धन और सरलीकरण) विधेयक 2020, कृषि (सषक्तिकरण और संरक्षण) कीमत आष्वासन और कृषि सेवा करार विधेयक, 2020 और आवष्यक वस्तु (संषोधन) विधेयक 2020 हैं।

हम इस शोध में केन्द्रीय कृषक उपज व्यापार और वाणिज्य (संवर्धन और सरलीकरण) विधेयक 2020 का अध्ययन एवं विष्लेषण कर रहे है जो कि कृषि उपज विक्रय एवं कृषि उपज मंडी समितियों से जुड़ा है। इस कानून के लागू होने के उपरांत अभी तक जहां कृषि उपज विक्रय में राज्य सरकारों की कृषि उपज मंडी समितियों ;।च्डब्द्ध द्वारा कृषि विपणन का कार्य किया जाता था अब इस कानून के लागू होने के बाद मंडियो के साथ–साथ निजि क्षेत्र और पेन कार्ड धारक व्यक्ति, प्रसंस्करण यूनिट एवं निजि बाजार यार्ड, उपयार्ड, प्रत्यक्ष खरीदी कैन्द्रो और ई टेडिग प्लेटफार्मो द्वारा भी मंडी क्षेत्र के बाहर कृषि उपज क्रय का कार्य एवं कृषको द्वारा अपनी उपज का सीधा विक्रय किसी को भी किया जा सकता है।

यह कानून लोकसभा द्वारों 17 सितंबर 2020 एवं राज्यसभा में 20 सितंबर 2020 को पारित होने और राष्ट्रपति के हस्ताक्षर उपरांत कानून बन चुका है। केन्द्र सरकार के पारित होने के उपरांत मध्यप्रदेष सरकार द्वारा भी अपने प्रदेष में लागू मध्यप्रदेष कृषि उपज मंडी अधिनियम 1972 के स्थान पर मध्यप्रदेष कृषि उपज मंडी (निजि बाजार यार्ड, निजि बाजार उप यार्ड प्रत्यक्ष खरीदी कैन्द्र और ई– टेडिग पलेटफार्म) नियम 2020 मध्यप्रदेष में लागू किया गया । जो संपूर्ण मध्यप्रदेष में लागू हो गया हैं । और इसके लागू होने के बाद मंडी क्षेत्र के बाहर में लागू मध्यप्रदेष कृषि उपज मंडी अधिनियम 1972 निष्प्रभावी हो चुका हैं ।

अध्यादेष के मुख्य प्रावधान–

1. कृषकों को अपनी उपजों को जो कि उनके द्वारा पूर्व में मंडियों में विक्रय की जाती थी से विक्रय में स्वतंत्रता देते हुए मंडी क्षेत्र से बाहर विक्रय करने का प्रावधान।
2. कृषक अपनी उपज पूरे भारत में कहीं भी और किसी को भी विक्रय कर सकते है।
3. किसानों को उत्पाद पर उपकर समाप्त कर माल ढुलाई व्ययों को समाप्त करना।
4. किसानों को इंटरनेट माध्यम से ई–ट्रेडिंग की सुविधा उपलब्ध कराना।
5. किसनों को मध्यस्थों से मुक्ति दिलाकर सीधे–सीधे प्रसंस्करण यूनिट, कोल्ड स्टोरेज, मिलों, प्रायवेट मंडियों अन्य व्यापारियों को विक्रय अवसर प्रदान करना।
6. किसानों को कृषि उपज के लिऐ कृषि मंडियों तक जाने वहॉ इंतजार कर बेचने की बाध्यता को समाप्त करना।
7. सरकारी मंडियों के साथ–साथ निजि मंडियों की स्थापना कर कृषि विपणन को सरल बनाना।

8. कृषि उपजों के लिए एक देष एक बाजार की कल्पना

नवीन अध्यादेष का मध्यप्रदेष की कृषि उपज मंडियों पर प्रभाव

लागू कानून के पूर्व भारत में बिहार राज्य को छोड़कर अधिकतर राज्यों में राज्य सरकारों की कृषि उपज मंडी समितियों द्वारा कृषि उपज विपणन कार्य स्थानीय सरकारों द्वारा कानून बनाकर किया जा रहा था। जैसे म.प्र. में वर्ष 1972 में कृषि उपज मंडी कानून (मंडी एक्ट 1972) लागू था जो कि राज्य शासन में म.प्र. राज्य कृषि विपणन बोर्ड के माध्यम से कृषि विपणन कार्य 257 मंडियों, उपमंडियों के माध्यम से कर रही है।

कृषि उपज मंडियां अनुज्ञप्ति जारी कर व्यापारियों, उद्यमी ,प्रसंस्करण ईकाइयों के माध्यम से कानून व बायलॉज के माध्यम से कृषि उपज का विक्रय करने की व्यवस्था उपलब्ध कराकर मंडी शुल्क के रूप में आय प्राप्त करती है। मंडी शुल्क के अतिरिक्त राज्य सरकार के लिऐ 0.20 प्रतिषत निराश्रित शुल्क भी एकत्र करती जो कि सरकार सामाजिक कल्याण विभाग को प्रदान किया जाता है जिससे प्रदेष के निराश्रित जनो को पेंषन भुगतान किये जाने का कार्य किया जा रहा है।

कृषि उपज मंडियों में निर्वाचित कृषकों, व्यापारियों, हम्माल तुलावटीयों एवं अन्य प्रतिनिधियो की समितियों द्वारा मंडी एक्ट एवं कैन्द्र एवं राज्य शासन के कृषि कल्याण एवं कृषि विकास विभाग के दिषा निर्देषो के साथ कृषक हित, मजदूर हित व व्यापारिक हित के निर्णय लिये जाते है।प्राप्त मंडी शुल्क से ही मंडियों द्वारा संचालन, अवसंरचना एवं आधारभूत निर्माण, मंडी अधिकारी एवं कर्मचारियो के वेतन भत्तो , कृषकों , हम्माल एवं तुलावटियों के कल्याण की व्यवस्था, ग्रामीण सड़कों का निर्माण, गौ वंष कल्याण हेतु व्यवस्था, राज्य सरकार को कृषि कल्याण हेतु निधि उपलब्ध कराना प्रमुख कार्य है।

कृषि उपज मंडियो द्वारा कृषकों को अपनी उपज विक्रय हेतु उचित प्लेटफार्म उपलब्ध कराकर उपज का प्रतिस्पर्धात्मक मूल्य प्रदान कराना, उनकी उपज की सही तोल के साथ साथ उन्हें तत्समय कृषि उपज मूल्य दिलाकर कृषकों के कल्याण हेतु कार्य प्रमुख ध्येय था।

राज्य स्तरीय मुख्यालय एवं संभागीय व तकनीकी कार्यालयों व 259 मंडियों में वर्तमान में कार्यरत अधिकारी एवं कर्मचारियो व सेवानिवृत अधिकारी एवं कर्मचारियो के साथ साथ आउटसोर्स एजेंसियो के माध्यम से गार्डों, आपरेटरों व अन्य कर्मचारियों को रोजगार उपलब्ध कराती है।

प्रदेष में 25000 से अधिक हम्माल तुलावटियों 35000 व्यापारियों के यहॉ लोग रोजगार प्राप्त कर रहे है। इसके अतिरिक्त मंडियों से ही व्यापार वाणिज्य उद्योग, ठेला, गुमठियों , ठेकों से निर्माण कार्य पान, ठेका चालकों व अन्य मजदूरों को अप्रत्यक्ष रूप से रोजगार प्राप्त हो रहा है।

नवीन अध्यादेष के लागू होने मध्यप्रदेष की कृषि उपज मंडियो पर से निम्न प्रभाव पड़ने की आषंका है–

1- राज्य की मंडियां समाप्त हो जायेगी लाखों जुड़े अधिकारी, कर्मचारियों, मजदूरों व अन्य प्रत्यक्ष व अप्रत्यक्ष वर्ग जो अभी तक रोजगार प्राप्त कर रहा था,पर रोजगार का संकट पैदा हो जायेगा।

2- मंडियों के बाहर व्यापार होने से कृषकों का शोषण होगा, ठग व्यापारी किसानों की उपज खरीदकर भाग जाऐंगे क्योंकि उन पर कोई सहज एवं सरल शासकीय नियंत्रण नहीं रहेगा।

3- मंडियों के समाप्त होने से करोड़ों व अरबों रूपयों की आधारभूत संरचना बेकार हो जाऐगी। जैसा कि पूर्व में बंद किये गये निगम मंडलो के आधारभूत संरचना बेकार हुई हैं ।

4- राज्य सरकारों के करोड़ों रूपये के मंडी राजस्व नुकसान होने एवं आये की कमी से सरकार द्वारा कृषि विकास व कृषक हितैषी कार्य प्रभावित होंगे।

5- किसानों को डर है कि न्यूनतम समर्थन मूल्य ;डैच्द्ध समाप्त हो जायेगा।

6- कृषि व्यवस्थासरकारा से से उद्योगपतियों के हाथ में चली जाने से कृषको का शोषण होने की आषंका ।

7- कृषि से जुड़े मजदूरों हम्माल एवं तुलावटियों की कल्याण कारी योजनाओं के समाप्त होने के साथ–साथ उनका रोजगार खत्म हो जायेगा।

8- मप्र. में मंडियों से ही मंडी क्षेत्र से लगे व्यापार, वाणिज्य, उद्योग, सेवा एवं अनेको को मिलने वाले रोजगार जीवित है जब मंडियां खत्म तो इन पर नकारात्मक प्रभाव के साथ इनका रोजगार भी खत्म हो जायेगा ।

अध्यादेष लागू होने के बाद प्रभाव –

मध्यप्रदेष में जून 2020 से अध्यादेष प्रभावी होने के बाद माह नवम्वर 2020 के बाद कुल 6 माह मे निम्न प्रभाव देखने में आये हैं ।

1. प्रदेष की मंडियों में 50 प्रतिषत से 70 प्रतिषत तक आवक कम हो गई है। और जिसके आने वाले समय में और अधिक कम होने की संभावना हैं ।
2. माह नवम्बर की स्थिति में मंडी खलिहान पत्रिका के आधार पर म0प्र0 की 80 मंडियों में 80 प्रतिषत तक आय घट गई है। जिससे कृषि उपज मंडियो का विकास कार्य ठप्प हो गया हैं ।
3. प्रदेष की 40 से 50 मंडियों में कर्मचारियों को वेतन नहीं दिया जा सका है। जिसकी संख्या निकट भविष्य में बढ़ने की संभावना है क्योकि सरकार द्वारा 14 नवम्वर से शुल्क 1.5पैसा के स्थान पर 0.50 पैसा कर दिया हैं ।
4. मध्यप्रदेष की कई ब ग्रेड व क ग्रेड की मंडियों में कई माह से वेतन मिलना बंद हो चुका है एवं प्रदेष की । ग्रेड व ठ ग्रेड की मंडियों में भी केवल आने वाले 06 माह तक वेतन भुगतान करने की व्यवस्था है।जबलपुर, रीवा, सागर संभाग की मंडियो की स्थिति तो और अधिक खराब हो चुकी हैं जहॉ की आय 90 प्रतिषत तक कम हो चुकी हैं।
5. अध्यादेष के लागू होने से प्रदेष की मंडियों में सुरक्षा गार्डों, कम्प्यूटर ऑपरेटरों, लेब टेक्नीषियनो व अन्य कुषल एवं अकुषल मजदूरो के साथ विभिन्ननिजी कंपनियों व ठेकेदारो के अनुबंध समाप्त होने से अनेको मजदूरों को हटाया गया हैं ।
6. प्रायवेट मंडी बनने से पूर्व से कार्य कर रहे छोटे व्यापारी , कमीषन ऐजेंटों का तो रोजगार समाप्त हो ही जायेगा साथ ही उनसे जुड़े अनेको का भी रोजगार समाप्त हो जायेगा ।
7. राज्य सरकार द्वारा अध्यादेष लागू होने के बाद अधिकारी कर्मचारियों के वेतन,भत्तों व पुनर्वास हेतु कोई ठोस नीति नहीं बनाई गई।
8. इस अध्यादेष के दवाब में ही सरकार को मंडी शुल्क 1.50 /– के स्थान पर 0.50 किया गया जो कि मंडियो को गर्त में ले जाने की दिषा में एक ओर कदम माना जा रहा हैं । सरकार द्वारा मंडी शुल्क कम होने से क्या प्रभाव होगा, प्रभावित पक्षकारो से पक्ष जाने बिना ही इसे लागू किया गया ।

9. मंडी शुल्क कम होने से बोर्ड मुख्यालय, आंचलिक कार्यालय , तकनीकी कार्यालयों, मंडियों में वर्तमान कार्यरत अधिकारियों के वेतन भत्तों पेंषन पर असर के साथ–साथ कृषि , कृषक, हम्माल, तुलावटी, कृषि विकास योजनाऐं , कृषि संस्थागत व आधारभूत संरचनात्मक कार्य प्रभावित होगा।
10. देष में कृषकों द्वारा आंदोलन किया जा रहा है जिसका देष की अर्थव्यवस्था पर नकारात्मक प्रभाव पड़ना लाजिमी है।

निष्कर्ष :–

नवीन कानून लागू किया जाकर सुधार किया जाना अच्छा है। लेकिन देष की अर्थव्यवस्था का आधार कृषि हो तो कानून कनाने के पहले उससे प्रभावित होने वाले पक्षकारों, कृषकों, व्यापारियों, अधिकारियों , कर्मचारियों, अर्थषास्त्रियों , कषक संगठनों , मजदूर संगठनों से सलाह व सुझाव लेकर यदि यह अध्यादेष एवं कानून लागू किया जाता है तो सरकार को कृषि विपणन सुधार के लिए जमीनी व वास्तविक सुधार में तर्क प्राप्त होते जिससे सरकारो को किसान आंदोलन, कर्मचारी आंदोलन के विरोध का सामना न करना पड़ता।

यह भी सच है कि कृषि एवं राज्य की वाणिज्य, राज्य का विषय है ऐसे में राज्य सरकारों की मंषाा को भी इसमें शामिल किया जाता तो उचित होता।

पिछले कई दषकों से मंडियोद्वारा कृषि उपज विपणन व्यवस्था का कार्य किया जा रहा हैं और अभी भी कर रही है उनको अचानक इस तरह समाप्त किया जाना उचित प्रतीत नहीं होता है । यह अवष्य है कि उनमें कमियां समस्याऐं व विसंगतियां हैं उनमें सुधार कर नवीन स्वरूप में लाकर उनके पूर्ण अस्तित्व को जीवित रखा जाता जिससे उनसे जुड़े अधिकारी , कर्मचारी, आपरेटर , सुरक्षागार्ड , मजदूर छोटे व्यापाारी और अप्रत्यक्ष रूप से जुड़े रोजगार प्राप्त करने वाले बेरोजगारी की ओर धकेला जाने से बचा जा सके ।

11. इस संबंध में होषंगाबाद के नर्मदापुरम संभाग पर इन नवीन कानूनो का अध्ययन व विष्लेषण किया गया तो पाया कि संभाग के तीनो जिलो पर ही इस नये कानून का प्रभाव देखने को मिलाअध्यादेष के लागू होने से मंडियों में 50 प्रतिषत से 70 प्रतिषत तक आवक कम हो गई है। और जिसके आने वाले समय में और अधिक कम होने की संभावना हैं । इसके साथ ही इस कानून के लागू होने के बाद जिलो की मंडियों में सुरक्षा गार्डों, कम्प्यूटर ऑपरेटरों, लेब टेक्नीषियनो व अन्य कुषल एवं अकुषल मजदूरो के साथ विभिन्न निजी कंपनियों व ठेकेदारो के अनुबंध समाप्त होने से अनेको मजदूरों को हटाया गया हैं जिससे इन पर रोजी रोटी का नया संकट पैदा हो गया हैं ।

संदर्भ स्रोत :–

1 मंडी और खलिहान मासिक पत्रिका
2 मंडी अधिकारी एवं कर्मचारियो, पूर्व मंडी जनप्रतिनिधियो, हम्माल तुलावटियो, कृषको एवं व्यापारियो से व्यक्तिगत साक्षात्कार ।
3 अध्यादेष एवं कानून लागू होने के पश्चात् समाचार पत्रो में जारी समाचार साहित्य संग्रह आधार पर
4 इंटरनेट आधार
5 मध्यप्रदेष राज्य कृषि विपणन बोर्ड भोपाल की बेबसाईट से अध्ययन आधार
6 भारत सरकार कृषि विभाग, की बेबसाईट से अध्ययन आधार