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Impact Of E-Governance Initiatives On Agricultural Development In Karnataka

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1.1 Abstract

Agriculture is the main occupation of the people, contributes 15.4% to the state's GDP, and is a major source of income and employment in the rural areas. The development of agrarian sector always depends on the farmer's active participation in adopting scientific methods of technology, fertile land, availability of basic inputs, finance, favourable weather conditions, marketing information on real time and simultaneously pro-active policies and initiatives from the government side are the essential pre-conditions required for the attainment of real development. But while delivering public services in the farming sector, in the organization mechanism itself, we found problems like corruption, red-tapism, delay, inefficiency, lack of transparency and accountability, reasoning that 100% achievement cannot be achieved in the farming sector. However, the ICT-based public services will resolve all these obstacles due to their qualitative features, such as efficiency, effectiveness, transparency, accountability, and responsiveness, bringing out the grassroots level upliftment of farmers. In this respect, this paper analyzes the impact of E-governance initiatives on agricultural development focus on the production area, major E-governance initiatives of the Karnataka government, and issues and challenges while delivering public services to the farmers in rural areas.

Key words: E-governance initiatives, agricultural development, issues, and challenges

1.2 Introduction

Agriculture is the main occupation of the population in Karnataka, contributes 15.4% to the state's GDP, and is a major source of income and employment in the rural areas. The development of agrarian sector always depends on the farmer's active participation in adopting scientific methods of technology, fertile land, availability of basic inputs, finance, favourable weather conditions, marketing information on real time and simultaneously pro-active policies and initiatives from the government side are the essential pre-conditions required for the attainment of real development. In this respect, the government, since the 1950s, has implemented various policies and programs both for pre-harvest and post-harvest management in the agrarian sector, and the ultimate aim is to ensure that no one is left behind in the development process. But while delivering public services in the farming sector, in the organization mechanism itself only, we found problems like corruption, red-tapism, delay, inefficiency, lack of transparency and accountability, reasoning that 100% achievement cannot be achieved in the farming sector. However, the ICT-based public services will resolve all these obstacles due to their qualitative features, such as efficiency, effectiveness, transparency, accountability, and responsiveness, bringing out the grassroots level upliftment of farmers. The E-governance initiatives here will identify left-out non-beneficiaries through collecting a big database, will analyze and bring to the mainstream the economy, and possibly bring the fruits of development to all the farmers. In this respect, this paper analyzes the impact of E-governance initiatives on agricultural development, major E-governance initiatives of the Karnataka government, and issues and challenges while delivering public services to the farmers in rural areas.

1.3 Objectives

1. To study the impact of E-governance initiatives on the agricultural development in the study area.

2. To analyse E-governance initiatives of the Government of Karnataka for the farming sector development.

3. To review issues and challenges in delivering E-governance initiatives in the study area.

1.4 Methodology

The research study has been confined to the secondary sources of data collected from various sources such as Newspapers, magazines, research articles, web sources, etc.

1.5 Scope of the study

The research study has been limited to Karnataka state on the E-governance initiatives and their impacts on agricultural development especially focus on the production area. In the agricultural sector, the government has initiated E-projects like BHOOMI, SAMRAKSHANE, FRUITS, ReMSL, e-SAP, KUTUMBA etc. Covering the major aspects both in pre-harvest and Post-harvest farming management to get maximum benefit to the farmers from the farm land to the sale of agricultural produce. The study has been confined to the production aspects where real development can be evaluated through comparative analysis of production status from the 1960s, where government initiation started and from the 1990s onwards, where the E-

projects were started. Here, production comprises all food grains, all cereals, commercial crops, and livestock scenario, their growth, status, and change in the habits of the farmers are analysed.

1.6 Review of literature

The literature review provides glimpses of reviews, thoughts, ideologies, and empirical analysis on the study area, helping to know the research gap and further studies to be conducted. These literature studies enable us to know the area of studies to be carried out in the future and the earlier studies had carried.

Menno Mandemaker, Martha Bakker, and Jetse Stoorvogel(2010): An analytical study named **"The Role of Governance in Agricultural Expansion and Intensification: A Global Study of arable agriculture"** analysis the interrelations between the World Bank's six indicators of Governance and agricultural production between 1975 to 2007 in 173 countries. The paper hypothesized that when a lower quality of governance existed, agricultural production increases were more likely to be achieved by area expansion than by an increase in yields. It analyses the governance-production causal relationship in the study area. The result states that governance in poor countries brings out expansion in the agriculture sector.

Leili Abolthassani, Fatemeh Eghbali, and Naser Shahnoushi(2015); An analytical study named **"The impacts of governance on Agricultural efficiency"** highlights the relationship between governance and agricultural efficiency. Agricultural development depends on a good governance system where the government formulates and implements policies and programs for the welfare of the farming community to uplift society. The study shows that in developed countries governance system does not have much impact on agricultural efficiency, but in underdeveloped countries, it plays a very important role in agricultural development and efficiency.

NIC and Revenue Department, the government of Karnataka (2014) an empirical study named "Case study- Electronic integration of BHOOMI with stakeholders, Karnataka" depicts e-governance system in the land management system will enhance efficiency, and effectiveness in the organizational setup. The paper highlights the beginning of the project to the successful implementation, and the hurdles undergone at each stage. The Record of rights, tenancy, crops, land authentication, and proper land record maintenance are the major issues in the manual management of land records. The paper discusses the grassroots level working of the group to digitalize the entire land records database and develop the web portal for accessing the information.

V.A. Chowdappa and Dr.Basavaraj S.Benni(2018): an analytical study named "Study on the implementation of E-governance programs in Karnataka" depicts the e-governance initiatives in the Karnataka state successfully implemented are analyzed. The UNDP indicators of good governance, such as participation, rule of law, transparency, responsiveness, consensus orientation, equity, effectiveness and efficiency, accountability, and strategic vision, are highlighted and strongly state that success can be attained only if we incorporate ICT into an organizational system.

In the end paper highlights that the technology-based re-engineering of the government setup will enhance the efficiency of the whole mechanism and ultimately achieve the development of an economy

Menaka Thammaiah. D and Dr. Reetika Syal(2019): An analytical study named **"Evaluation of Bhoomi Project in Karnataka: A case study from Kodagu District"** depicts, the e-governance initiatives of the government of Karnataka, Bhoomi Project implemented in the year 2001, has been a most successful project. The paper highlights how the Bhoomi project has brought transparency in the maintenance and updating of land records. It especially focuses on how BHOOMI has provided farmers easy access to their land records and RC/RTC within a short period. The paper highlights the traditional disadvantage of the manual land record system and its loopholes and strongly promotes the digital record management system in rural areas.

V.N.Narendra, Satya Prakash, and Ashok K. Singh (2022): "**Constraints faced by farmers and suggestions for effective utilization of ICTs in mitigating climate change effect in Agriculture: A study of the eastern dry zone of the Karnataka, India"** highlights on the importance of ICT, usage, and applications in agricultural sector concentrate on the climatic conditions. The farming activity also depends on the availability of credit, marketplace, size of holdings, and precision in climatic conditions, is feasible in enhancing farming production. The appropriate and timely information on weather conditions to the farmers helps to adopt modern technology and to decide on cropping patterns. The paper analyses the ICT adoption in agriculture, its usage, and constraints in using ICT, and talks about suggestions to improve and implement ICTs by farmers.

1.7 Need for E-governance initiatives in the agrarian sector

The agriculture sector is the backbone of our economy and a major source of income, employment, food, and fodder for human beings and animals. In this context, agricultural activity is a weather based occupation as it depends on rainfall, favourable climatic conditions, availability of fertile land, better quality seeds, fertilizers, pesticides, availability of finance, fair prices to their produce on real time etc are facilitated by the government for the betterment of the farming community. E-governance ensures real-time accessibility in delivering policies and programs of the government at the grassroots level, enabling farmers to avail all kinds of services, which support them in engaging in agricultural activity.

- The farmers need real-time information on weather conditions, climatic variation, which assists farmers to make better decisions in farming activity. E-governance ensures real-time information, easily accessible, even farmers residing in remote areas can also avail information through Apps, TV, Radios etc,.
- Online market systems are transparent, responsive, immediate payment, are accountable and real-time information is easily accessible, which helps the farmers to sell and to get better prices for their produce.
- E-governance projects will collect the information of all the farmers, which will be used for identifying beneficiaries and non-beneficiaries of the government programs, schemes, and bringing them to the mainstream is a major task.
- Big data analytics helps the government in formulating appropriate policies from time to time for the overall agricultural development in an economy.

- The digitalization of the finance sector ensures every farmer must have a bank account number, Aadhar number, Mobile number, which are linked with land documents assists the farmers easily availed the loan facilities, crop insurance, debt relief fund and any other governmental benefits which are directly transferred to the farmers in a transparent manner
- The capacity building of the farmers is very important for the farmers to upgrade their skills and efficiency level. The governmental E-initiatives reached all farmers through big data analytics, and no one lags in the development process.
- Information on the availability of basic inputs such as better quality seeds, fertilizers, pesticides, etc is known to the farmers only through digital platforms in a faster manner.
- The information on good agricultural practices, doubts, information on pest diseases, and controlling measures is available to the farmers with audio and video messages, Toll-free calls in a single digital platform.
- The main feature of E-governance is efficient delivery of services, especially in providing basic input facilities, crop insurance, subsidies, etc.
- Due to its multi-functional benefits, the relationship between the government and farmers was enhanced because of trust in government services in a transparent manner.
- The sustainability and inclusiveness in the E-governance initiatives bring about equitable development of an economy.

1.8 E-Governance initiatives in the agricultural sector in Karnataka state

BHOOMI Project (2002)

In the land record management system, the concept of digitalization was adopted by the revenue department with the assistance of the National Informatics Centre (NIC) project was known as BHOOMI and launched in 2002. The BHOOMI project enables the farmers to avail RC/RTC, authentic land records from the web portals in a faster, efficient, and effective manner. The farmers can easily log in through web portals and can avail themselves of any kind of land-related information in a faster manner.

NEMMADI Kendras(2003)

The Nemmadi Kendras were launched by the government in 2003, providing services such as issuing birth certificates, death certificates, caste certificates, land records-related certificates, old age pensions, etc, in the rural areas.

Common Service Centers (2009)

The CSC is a single platform where all kinds of services, such as agriculture, health, education, banking, utility services, and commercial services. (Internet providing village land BPO) Training in open (vocational) audio and video shooting is provided. The people can avail the services like payment of electricity, water bills, tax payment, enrolment in government programs, etc. The government intends to

provide minimum common services to the people at their doorsteps and create awareness among the people on governmental programs.

ReNMs(2013):

In the marketing of agricultural produce Karnataka government, in collaboration with the private agency NCDEX Market Limited, 2014, launched a project known as Rashtriya e-market Services Limited (ReMSL). This online marketing merged 13 markets(APMC)with the slogan of "Any time Anywhere" concept and started functioning as a single platform for farmers, traders, commission agents, and agricultural committees to be registered successfully and a model project in India and also inspired the central government to initiate an all India level digital marker known as e-NAM in the country.

SAMRAKSHANE (2016)

Karnataka state government, with the assistance of the Centre for E-governance and the National Informatics Centre, developed a portal for the farmers to assist in the enrolment of crop insurance, registering claims, calculation, payment, and updating information transparently. The portal is open for schemes such as Pradhan Mantri Fasal Bima Yojana, crop insurance schemes, and modified weather-based crop insurance schemes brought into the single portal, where the farmers benefit and are responsible for increasing the beneficiaries under this scheme.

e-SAP (2019)

The e-SAP project was launched by the University of Agricultural Science Raichur in 2011-12 under RKVY grants and after the successful implementation in the Kalyana Karnataka districts, it later spread to all the agricultural universities in Karnataka, and the government of Karnataka adopted it in 2019-20 as a major E-project to spread to all the districts in Karnataka.

The pest surveillance advisory measures available in this project concentrated mainly on an ICT-based solution to the pest diseases, microbial diseases, weeds, and nutritional disorders that are solved through this app-based technology by the farmers. The e-SAP is now operating in agriculture and horticulture crops of more than 53 and is capable of resolving more than 1000 problems.

AGRIS NET- (Agricultural information system network)

Under the national E-Governance plan of A-MMP, priority has been given to the facilitation of digital infrastructure in the rural areas. The development of digital infrastructure needs software databases, network connections, accessibility, and cloud network accessibility. In this context, in 2007, a scheme known as AGRIS NET was in coherence with central, NIC, and state government functions towards the maintenance of common dashboards and portals for accessing and availing agricultural-related information by the farmers.

E- Panchayat (2018):

The national e-governance plan under the mission mode project gave priority to digitalizing the panchayats to eliminate the digital divide and inclusive growth in rural areas. The services extended by the E-panchayats such as issuing birth and death certificates, payment of taxes, e-health, subsidy benefits, e-agricultural extension services, pension benefits, unemployment eradication programs of the government, farmers' welfare schemes, and disseminating information on agricultural and selected activities to the rural population.

KUTUMBA(2019):

The Karnataka government, with the assistance of the Centre for e-governance, Department of Personnel, and administrative reforms, introduced the KUTUMBA platform in the agricultural sector. The success of this portal instigated the government of Karnataka to launch the portal for an integrated social information system under which all the resident families' information is gathered under a single platform. This database has assisted the government in identifying beneficiaries and non-beneficiaries of the government schemes, and socio-economic status and taking appropriate policy measures to include those left out in the program.

FRUITS (2022):

The Government of Karnataka has launched a new web portal to collect the databases of farmers' information in a single portal, which helps in the formulation of appropriate policies and programs by the government for the well-being of the farmers. For the smooth functioning of the agricultural and allied sectors, development schemes are implemented by various departments. It is difficult for the farmers to produce documents for each department, like agriculture, horticulture, livestock, etc, and the same farmers applying and availing the benefits from all of these sectors make it very difficult for the government to consolidate the information for further steps to be undertaken. To resolve all these issues, the Karnataka government, in association with NIC, developed a software database to register the farmer's information in a single portal known as "Farmer Registration and Unified Beneficiary Information System" (FRUITS).

FAPS (2002)

Farmer agriculture produces support system those farmers registered in the FRUITS database shifted to FAPS where the farmers availed the facility of procurement of agricultural produce and get the money within fifteen days of the sale of their produce.

K-KISAN(Karnataka-Krishi information system and networking)

The Karnataka government launched a project known as K-KISAN will extend the services in the areas of farm mechanization, agro-processing, micro-irrigation, Krishi BhagyaYojane, Agriculture input supply system, and license for seed, fertilizers, pesticides, and insecticides for the farmers. The portal will assist the farmers in accessing and availing these services to enhance production and sustainability in agricultural production.

1.9 Agricultural scenario in Karnataka

Karnataka state is the seventh largest state in India, having seven crore residing in the Southern part of Indian. The Karnataka state is surrounded by many states, being landlocked by Maharashtra on the north side, South by Kerala and Tamil Nadu, and by Goa in the northeast, Andhra Pradesh and Telangana in the east. These land attachments, water resources sharing, and sharing of knowledge lead to favourable trade relations with neighbouring states, impacting on the inclusive growth of an economy. In the western part of the state, a coastal area covering the districts of Dakshina Kannada, Uttara Kannada, and the Arabian Sea. It is located at 11.30 degrees north, 18.30 degrees north latitudes, 74 degrees east, and 780.30 east longitude.

1.10 Geographical profile

The geographical area of Karnataka state comprises 1.91.791 Km, among these, east to west 400 km and north to South 700 km area are spread far and wide. The Karnataka state is covered on three sides with land and one side with water by the Arabian Sea. So having both land and water regiments helps for both internal and international trade.

The Karnataka state was formulated on November 1, 1956, on the basis linguistic division of the state restructured at the national level. It was known as Mysore State earlier, on 1973 November 1st, renamed as Karnataka state. For administrative purposes, the state was divided into 30 districts, 175 talukas a encompassing 29406 villages.

On the basis of physical structure availability of natural vegetation in this region can be broadly classified as the Coastal Region, Malnad region, Southern Deccan plateau.

1.11 Seasons in Karnataka

The seasons can be broadly divided into three, on the basis of weather conditions, climatic situations, and geographical base as follows

1. Rainy season- June to September.

2. Rainy season- October to December.

3. Winter season- December to February

4. Summer season- March to May

1.12 Crop production in Karnataka

After independence, the government's efforts for agricultural development have been reflected through the implementation of reformative measures in the First Five-Year Plan (1950-51), and a strategic consecutive five-year plan has brought change in the rural and agricultural development in Karnataka. The land reform measures, subsidies, awareness on new methods of cultivation, introduction of artificial sources of water, high-yielding varieties of seeds, chemical fertilizers, mechanization, and scientific methodology in the inputs have brought a drastic change in the output, resulting in the green revolution in our economy.

In the context of Karnataka, this green revolution has occurred particularly in rice production and also a change in the cropping pattern from traditional to commercial crop production. But the fruitfulness of the green revolution has not reached to everyone only few farmers have benefitted due to the governmental efforts have not reached at the grass root level and real time information not reached to all the farmers. Another important drawback is the non-availability of non-beneficiaries, and identifying them is the biggest challenge for the government for the inclusive growth of the agricultural sector.

The adoption of Information and communication technology in the organizational structure of the government and delivering services to the farmers is a big revolution where the government collects data of all the farmers to assist in formulating appropriate policies and programs for the neglected areas and farmers. These measures have more impact on the cropping pattern and production level in the state.

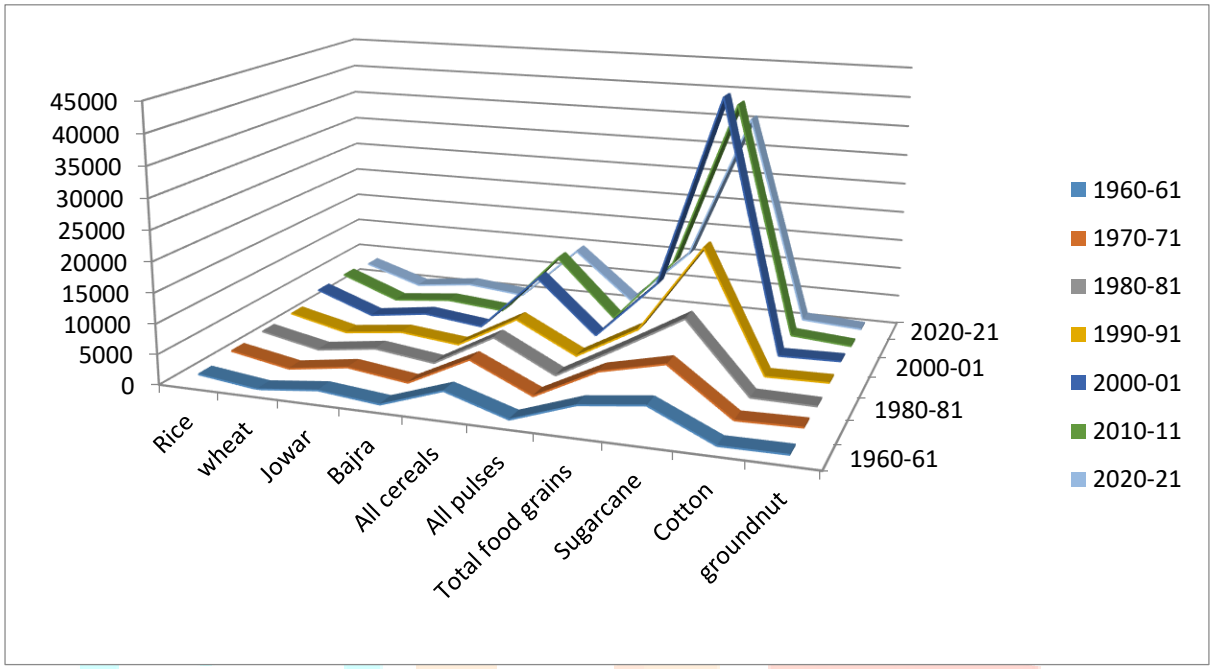
The increase in the production has been classified into two categories one, is before 1990-91 and another one is after 1990-91 where ICT has been adopted in the government structure and E-projects were initiated such as web portals, web sites, App based technology, machine learning, cloud computing, Artificial intelligence and Big data analytics. The change in the crop production over the decades has been analysed here, as it clearly shows the governance policies' impacts on the production and other aspects of how E-governance has resulted in a change in the production in the state.

Year	**Rice**	**wheat**	**Jowar**	**Bajra**	**All cereals**	**All pulses**	**Total food grains**	**Sugarcane**	**Cotton**	**groundnut**
1960-61	1328	77	1154	129	3578	352	3930	5184	382	448
1970-71	2000	130	1565	211	5235	511	5746	8106	570	780
1980-81	2258	174	1506	192	5714	488	6202	12127	597	475
1990-91	2428	123	1282	203	5705	539	6244	20750	640	816
2000-01	3847	230	1547	342	10004	956	10960	42924	855	1081
2010-11	3955	193	1166	278	10961	1061	12022	40010	1278	485
2020-21	3364	179	1315	285	9602	1362	10964	35732	1038	395

Source: Economic survey of Karnataka 2013-14. 2021-22. 2021-22

Above table depicts crop production from 1960-61 to 2020-21, comprising Rice, Wheat, Jowar, Bajra, All cereals, all pulses, Total food grains, and commercial crops like sugarcane, cotton, and groundnuts. The

agricultural production over the decades has been comparatively discussed from two dimensions one part is how the government policies resulted in a rise in production and another part is how E-governance has much more impact on further raising production.



The production impact analysis has been broadly classified into two categories. Firstly, crop production before ICT adoption and after the introduction of ICT in the governance mechanism, especially in the farming sector scenario. During 1960-61, the total crop production was 16562 million tonnes, comprising Rice, wheat, Jowar, Bajra, all cereals, all pulses, food grains and commercial crops such as sugarcane, cotton and groundnut. Due to governmental efforts, agricultural universities, banking sector digitalization, and KVK centres' approach towards farmer-centric innovation technology adoption have resulted in a tremendous increase in the production of 38730 million tonnes during the 1990s. The adoption of ICT in the farming sector started in the 1990s and has had more impact on production which as shown by the highest level of enhancement in production from 38730 million tonnes to 72746 million tonnes in 2000-2001. This drastic doubling in the agricultural production is a clear indication of E-governance's impact on the agricultural development in the Karnataka economy. Again, in 2010-11 the production has come to 71409 MT and in 2020-21 it reached 64236 MT.

1.13 Impacts in the agricultural sector

- The E-governance initiatives have created awareness among the rural farmers about new technology, availability of inputs at the local level, good agricultural practices, enabling them to adopt in their process of producing goods.
- The extended real-time information on weather reports, finance, marketing price, subsidies, crop insurance, and guidance from time to time has a direct and indirect impact on production.

- The digital land record management system is a perfect land authentication system is a moral support to the farmers and the availability of RC/RTC in a day assists them to continue agriculture as their main occupation.
- The KUTUMBA, FRUITS are the major initiatives of the Karnataka government in gathering farmers' database, which helps the government to identify beneficiaries and non-beneficiaries of the scheme and further steps to be taken for inclusiveness
- The online marketing transaction assists the farmers to sell their produce for better prices, and immediate payment for their produce. Even waiting time, warehousing facilities, and cold storage facilities are provided to the farmers.
- The crop insurance facilities (e-SAP) have been provided by the government for all seasons, and even affected crop areas were given relief fund directly to their account.
- The Kisan credit cards help farmers to avail the loan facilities up to Rs.5 lakh for agricultural purposes in a year.
- The capacity building programs, such as ATMA, drone training programs, livestock maintenance program, and good agricultural practices, empowered the rural farmers from various perspectives.
- The web portals' real-time information, app-based technology, and toll-free telephone guidance services will enable farmers to avail of many services will increase efficiency in production.

1.14 Issues and challenges

Issues in E-governance implementation in the agricultural sector

Organizational issues

1. Lack of funding for the project by the government due to the lack of financial grants to allocate more grants to the E-projects as other development activities are prioritized.

2. E-governance projects indeed a long-term projects, it’s very difficult for the government to maintain, sustain for a very long period of time.

Technical issues

1. The interoperability of the different departments and centre-state departments is the biggest challenge to bring coherence while working in a single portal. The technical issues arose while working in a federal setup and even in a federal setup, different political parties existed.

2. In the modern world, due to cybercrimes, virus attacks, and cyber hacking problems in the software of the concerned E-projects, it’s very difficult for the government to maintain the privacy of data and software maintenance.

3. The private participation in the E-projects reasoning in the misuse of big data and leakage in the data of the farmers due to the profit-oriented and commercial intention motive.

Social issues

1. Lack of awareness among the farmers due to illiteracy, negligence, superstitious beliefs, and following age-old methodology, denying acceptance of the new way of technical revolution in their occupation leads to non-usage of E-services.

2. The digital divide and digital illiteracy among rural farmers are responsible for the unawareness about the E-governance projects of the government implemented and denied the benefits of the projects.

3. Presently, due to cybercrime issues, the possibility of cheating is responsible for hesitation among the farmers in using ICT-based governmental schemes and programs in the rural areas.

4. In Karnataka state, enrollment in the KUTUMBA and farmers database information collection schemes like FRUITS is not more than 50%. This indicates that unawareness, superstitious beliefs, and a negligent attitude of the farmers are the reasons for not enrolling in the governmental data collection process.

5. Most of the farmers in Karnataka belong to the small and marginal farmer category, more than 80% and are unable to have smartphone facilities due to the low income and poverty level denied by the ICT-based programs of the government.

6. The simple, easier way of accessibility of web portals, software, availability in local language, and network availability, is very important in the inclusiveness of farmers in all perspectives.

Political issues

1. The government always plays a pivotal role in the development and implementation of the E-projects concerning agricultural development in an economy. If the government does not make the efforts to formulate, and implement E-projects automatically farmers will be unable to access the new technology accessibility.

2. If the centre and state government have a different political ruling party and regional disparities, there is a reason for quarrels over fund allocation bias in the E-projects implementation. The real sufferers are the citizens of the state only.

3. The integration of different departments is very important for the collective work of any project. But still, due to many issues, the vertical and horizontal integration of the different departments is not achieved in our state.

Economic issues

1. The cost of development of ICT-based project formation, maintenance and grading of software, data capture, and implementation is very expensive for the government.

2. The long-term Service Delivery to the public is very costly the maintenance and upgradation of services to the farmers in the changing scenario need governance support from all perspectives.

1.15 Challenges in delivering E-governance services

Technological challenges

1. The digital physical infrastructure provided in the rural remote areas is the biggest challenge to the government as it has to cover each village, hobli, and extend services to their doorsteps.

2. The integration of different departments horizontally and vertically as a big storage of data management has to be carried out for better functioning of the system.

3.The delivery of services becomes more complicated if more than one departments are interlinked with their big data source, very difficult for the data analytics in the system.

4. The poor rural connectivity, lack of sufficient physical digital infrastructure such as internet connectivity is very poor for downloading, accessing, and login to the web portal; at least 25 MBPS is required, but in most rural remote areas the net connection is very poor, it is less than 5 Mbps.

Organizational challenges

1. The e-governance effectiveness and efficiency always depend upon the digital-physical infrastructure facilities availed to the rural farmers free of cost to access, and download the information/content.

2. The efforts of the government in creating awareness of digital education, accessibility, and usage are limited as most of the farmers in India are illiterate, and even digital illiteracy is the biggest challenge.

3. The e-governance services available in the regional language are very important to reach the ground level because the literacy rate is very low in rural areas, even if government services available in the English language are unable to reach the rural population.

5. The key officials in e-governance projects, we found that in government jobs most of the staff are getting transfers frequently, so difficult to continue the existing project and maintain efficiency and effectiveness in the project and another issue is the lack of sufficiently trained staff available.

6. The connecting linkage with G2B, G2G, G2F, and G2C for the effective implementation of the Agribusiness corridor in the state needs governmental efforts to integrate the various departments.

Financial challenges

1. The funding of the project for the e-governance project formulation, implementation, extension, continuation, and maintenance requires adequate financial resources for the government. But the government has many responsibilities especially, targeting developmental activities. So, allocating more funds to start new E- E-projects, continuation, and maintenance is a big challenge with respect financial aspects of the government.

2. E-governance projects are always long-term projects and maintaining, sustaining, continuing, and upgrading software, and services requires more cost from the side of the government. So, it is very difficult for the government to allocate funds for the sustenance and continuation of the existing projects.

Governance challenges

1. The policies and regulatory framework on data governance management, citizen-centric service delivery approach and cyber-attacks are effective implementation is the biggest challenge in the state.

2. In the Karnataka government, more than 3000 departments operate in rural and urban areas. In this context, the interlinking and bringing coordination among all the departments for coherent functioning is the greater challenge for the government.

3. The cybersecurity issues are a major threat to the operational and functional processes of the digital means of delivering public services in an economy. Cybercrime, cyber-attacks, and virus reasoning in a losing trust, and morality among citizens about the usage of E-services.

Social challenges

1. The use of mobile apps, and login to specific web portals, and websites are hesitant to be adopted and unused by rural farmers due to digital illiteracy, unawareness negligence, and a traditional bounded mind-set that prefers to stick to the traditional methods.

2. In the rural agricultural market, we found that still dominated by middlemen, local buyers, and farmers are not able to come to the E-market or APMC and forcibly sell to the locally available middlemen because of transportation costs, waiting patience for better prices, unnecessary risk in the selling of the product, unawareness about the benefits of e-market.

3. Lack of practical exposure to farmers on the usage of apps, web portals, and websites, only the educated, especially digitally literate, can access the e-governance services. The illiterate and digitally illiterate farmers lag in the benefits and sometimes they depend on other people, misguiding, cheating, and wrong information happens in the rural areas.

4. The e-governance effectiveness and efficiency always depend upon the digital-physical infrastructure facilities available in rural areas, but the availability, and accessibility are denied by the rural poor because of the high cost of smartphones, mobile devices, laptops, and high net connection charges are the main reasons for digital non-inclusion in society.

5. The technological revolution in the information and communication sector enhances the adoption of new innovative techniques in web portals, apps, website access, login, and extended Service Delivery. It is very difficult for the farmers to access the updated technology and special skills needed to access the new technical services delivered by the government for the farmers.

6. The rural women mainstreaming in digital accessibility plays a key role because women play a major role in the agrarian sector. The lack of accessibility due to digital illiteracy, women entrepreneurs are unable to access online modes of information, the women-centric efforts must be taken to improve the effective implementation.

7. The small and medium landholders need new technology-based information that is available in cloud technology. The minimum data required for downloading, accessing, and sharing involves 25 Mbps, but the cost of using this information is very high, denying the farmers access to the information, and especially in remote areas, where the net connection is the biggest challenge.

Political challenges

1. The successful implementation of E-governance always depends on the ruling party's priority on the continuation and discontinuation of the existing project. The vision to achieve a set of targets, good motives, and intention for the implementation of digital projects always depends on efficient and good leadership in an economy.

2. India is a federal setup of government, at the Central level National Informatics Centre will initiate many E-projects and at the state level, every state government initiates governance projects of their own. The coherence between the Central and state government projects is necessary for the successful implementation of any project. Sometimes, different political parties ruling at the centre and the States cause rivalry in implementing projects.

1.16 Recommendations

Organisational perspectives

1. The re-engineering of the entire governmental organization system is a necessary precondition to introduce new ways of revolution and change in the workflow of functioning, and services available to the public. The technological transformation should be accepted and implemented in the entire organizational system.

2. Before launching any e-project throughout the economy, pilot projects are to be undertaken to test the initial level of the functioning of the projects, efficiency level, effectiveness level, responsiveness, and workflow of the project. This study also ensures to identification of the beneficiaries' level, and loopholes when operated, and implemented in the study area.

3. The evaluation and monitoring agency must be established to assess and evaluate every e-project launched by the government to know the status of impact, level of implementation, and effectiveness of the financial resources allocated. This evaluation and monitoring process also assists the government in knowing the loopholes in the projects, continuous monitoring of the existing projects and further improvements to be taken for the corrections in the project should be part of the government responsibility.

4. Creating awareness among the different stakeholders through social media such as Radio, Newspaper, Television, Twitter, internet, Instagram, etc, and in the rural areas through village Panchayats, KVK centres, FPOs, Raitha Samparka Kendras, SHGs about the E-Projects benefits. In this context, the government will take appropriate measures for the popularization of the projects among the public for the better utilization of the projects.

5. The success of any E-project depends upon the level of readiness that exists in an economy. Here, before creation and implementation, the government must build up readiness for digital infrastructure, capacity building among staff, awareness, internet connectivity, evaluation and an outcome-based approach to be built up in an economy.

6. The vision and mission of E-projects must be in the right direction to deliver public services. E-projects must be competent and have an international-level approach.

7. The priority must be given to cybersecurity and cyber laws to control hacking of software, attacks of viruses, and misuse of big data will lose trust among the different stakeholders concerning E-delivery of services.

8. In the long run, E-projects should be created to maintain sustenance and continuously deliver public services. So that people will have trust in the E-Projects, and inclusiveness can be attained.

9. E-participation must be encouraged among the rural farmers, to make them involved in the government policy and decision-making process, resulting in inclusiveness in the society.

10. The research and development must be prioritized in the creation and implementation of e-projects about the agrarian sector because it dominates our economy.

11. Our economy operates in a federal structure, central and state governments formulate E-projects in the agrarian sector, which leads to confusion among the users. So, the synergy between central and state government initiatives and also a model for agriculture digitalization must be formulated in the national level plan.

Economic perspectives

1. From the financial perspective, E-projects expenditure is always very high, sometimes, it is very difficult for the government to launch new projects as financial constraints restrict them. So, public-private partnership programs such as Build-own-operate(BOB), Build, own, manage, operate(BOMO), and private participation must be encouraged to introduce new projects.

2. The capacity building among the staff is an essential requirement at three levels in the structure of the organizational mechanism. Here, three levels of capacity building are required, such as in the formulation of E-projects level, implementation (Departments) level, and maintenance level.

3. The capacity building among the targeted groups is also very important for the effectiveness and inclusiveness of E-projects to remove the digital divide in society. The e-literacy, training, advisories, technological advice, awareness camp, hands-on –trainings should be undertaken for no one left behind in the development process. The demonstration of technological usage must be given to the farmers focusing on the easier methods of availing public services.

Farmers Perspectives

1. The farmer's active participation is a necessary precondition for the success of any E-projects. So, farmers' involvement in availing and accessing E-services through getting digital education, and visiting nearby service centres such as Raitha Samparka Kendra, KVK, Agricultural departments, and Village resource centres is helping the farmers.

2.Farmers should sell their agricultural produce in the digital market instead of middlemen, local traders will get transparent, accountable, better prices, and immediate payment through digital means to assist in getting better income.

1.17 Conclusion

The re-engineering of the government mechanism through digitalization and public service delivery assists the farmers in accessing governmental programs for agricultural development. The real-time information in all perspectives indeed attains inclusiveness and sustainability in the agricultural production, attained is empirically proven. The big data of farmers also helps the government in formulating appropriate policies and programs from time to time and even bringing the non-beneficiaries to the mainstream can be achieved through the new way of communication technology.

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