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Agriculture Sector can Reap the Benefits of 21st Century's Agriculture and Web-Based Technologies for Development: *A case of Agricultural Science Centres of ICAR in India.*

By

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Abstract: This paper is divided into 6 parts, the first part, *"The Background"*, highlighted the saga of agriculture knowledge transfer through various institutional mechanisms. The second part *"The Problem"*, deals with, faulty strategy of technology selection and implementation. The third part *"The New Initiatives"*, deals with in transfer of technology through agriculture science centre with re-engineered approach of Information and Communication Technology (ICT). The fourth part, *"The Solution"* brings about implementation and monitoring process through Info-kiosks. The fifth part *"The Technology"*, deals with essence of technology for knowledge transfer. Final the sixth part deals with economics for sustainability.

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1. THE BACKGROUND

Agriculture earlier was considered as a way of life but after Liberalization, Globalisation and WTO, the agriculture scenario has changed the sector as a business. The effect of Globalisation has made farmers in analysing the cost, profits and benefits in the form of Balance Sheet as in the industrial sector. The main cause for analyzing the problem is simply because of the present day agricultural practices. These practices are highly depending on external inputs like hybrid or genetically modified plant martial or seed, synthesized fertilizers and pesticides, etc. And also farmers started thinking that the technology should be market-driven and profitable.

To make the agricultural sector as profit-oriented sector, the farmers and agriculture Dept together have tried the different delivery institutional mechanisms since 60's. Few worth mentioning[1] are Community Development (CD), National Extension Service (NES) and Intensive Agriculture Development Programme (IADP). These technology transfer and training delivery mechanisms have failed to achieve the end results because, either the problem in information and knowledge flow or exchange between stakeholders or failing to make farmers to understand intricacies of technology and development. Several studies have revealed, the success in getting an end results are at, not only in the delivery mechanism but also failing to develop the market-driven cost effective technologies. The CD, NES and IADP have not properly addressed the agriculture value-chain and market acceptance of the produce. Their main focus was, to transfer the technical and knowledge inputs to achieve the department's target then the stakeholders or the end user and the societal interest. The clashes of interest and different priorities among the stakeholders have led the programme into non-contributing function for economic development.

2. THE PROBLEM

2.1 Selection of Technology and Faulty Implementation Strategies: A Case of Oil Palm Project[2]

Traditionally, the technology transfer through extension system is either from State Agriculture Dept. or Central Govt. Agencies; these transfers are pushing the technology with out taking into confidence the farmer's opinion or market acceptance or clear cut policies. For instance, the Oil Palm Development Programme (OPDP) supported by Technology Mission on Oil Seeds and Pulses has taken up planting the oil palm in south states during 1991-92. The reason for this decision, as claimed in one of the official document was, for a long time India has been an importer of edible oil despite the fact that around 23 million ha is under different oil seed crops grown mostly under rainfed condition with hardly 1 tonne/ha. Low production and erratic rain condition causes the

country to import huge quantity of edible oil from Indonesia and Malaysia to meet the domestic consumption demand.

As part of the technology mission on oil seeds, Government of India has taken the decision to grow high yielding alternative oil seed crop like Oil Palm with a yield potential of 4 to 5 tonne/ha. But after taking up the project for commercialization in farmers' field, things did not give any intended results because of lack of understanding the process, policies, infrastructure, profit margin for farmers and market condition etc. Table 4 is providing the details of current status of oil palm crop in the State of Karnataka.

In 1992-93, actual commercial cultivation started in Karnataka and subsequently, during 1993, Karnataka Government allotted the area to 4 organisations to develop the processing capacity. All the four units had withdrawing their participation in 1998 without creating any facility, but by that time, crop started yielding the Fresh Fruit Bunches (FFB's) for crushing. The reasons for withdrawn the participation are various. Worth mentioning are Government's decision to decrease in import duties on crude palm oil from 65% to 15% during 1993 to 1999 and slowly drop in area cover under palm plantation as targeted. Because of sudden dropping of the area covered and 73% uprooting of fully-grown plants the farmers have shifted the cultivation to some other plantation crops, which fetches then a high margin of profit, apart from speculation in Government's policies and poor industry response in developing the process capacity.

Table 1

Oil Palm Crop Status in Karnataka State as on March 2004

Plan Period	Area Developed in ha	Total Area Uprooted in ha	Area Existing in ha	Fresh Fruit Bunches (FFB's) Production area in ha
VIII Plan	7545			
IX Plan	1420			
X Plan (up to 2004, March)	452			
Total	9417	6858	2896	1661

However, with Government initiatives, a Joint Venture Company with Government participation started crushing FFB's with 10 tonnes capacity/Hr. But this company also stopped its crushing activities in the year 2000 for various reasons. All these problems lead to huge loss of money both for farmers and Government.

The inference of the above case depicts, lack of understanding the intricacies of the new technology, adaptability and suitability, competitive advantage, national priorities and policy implications.

3. THE NEW INITIATIVES:

3.1 Knowledge and Technology Transfer: Method of Horizontal Organisation: *Agricultural Science Centres of ICAR*

Traditionally, the vertical organisation[3] or top-down approach focus on functional goals rather than outward looking and information exchange among the stakeholders; the

implementing agencies and the end-users. The top-down approach leads to the loss of important information as knowledge travels up and down and stakeholder's different priorities like, one is for target and other is for economic development. The net results in this approach are high cost, delay in delivery and fragmented performance.

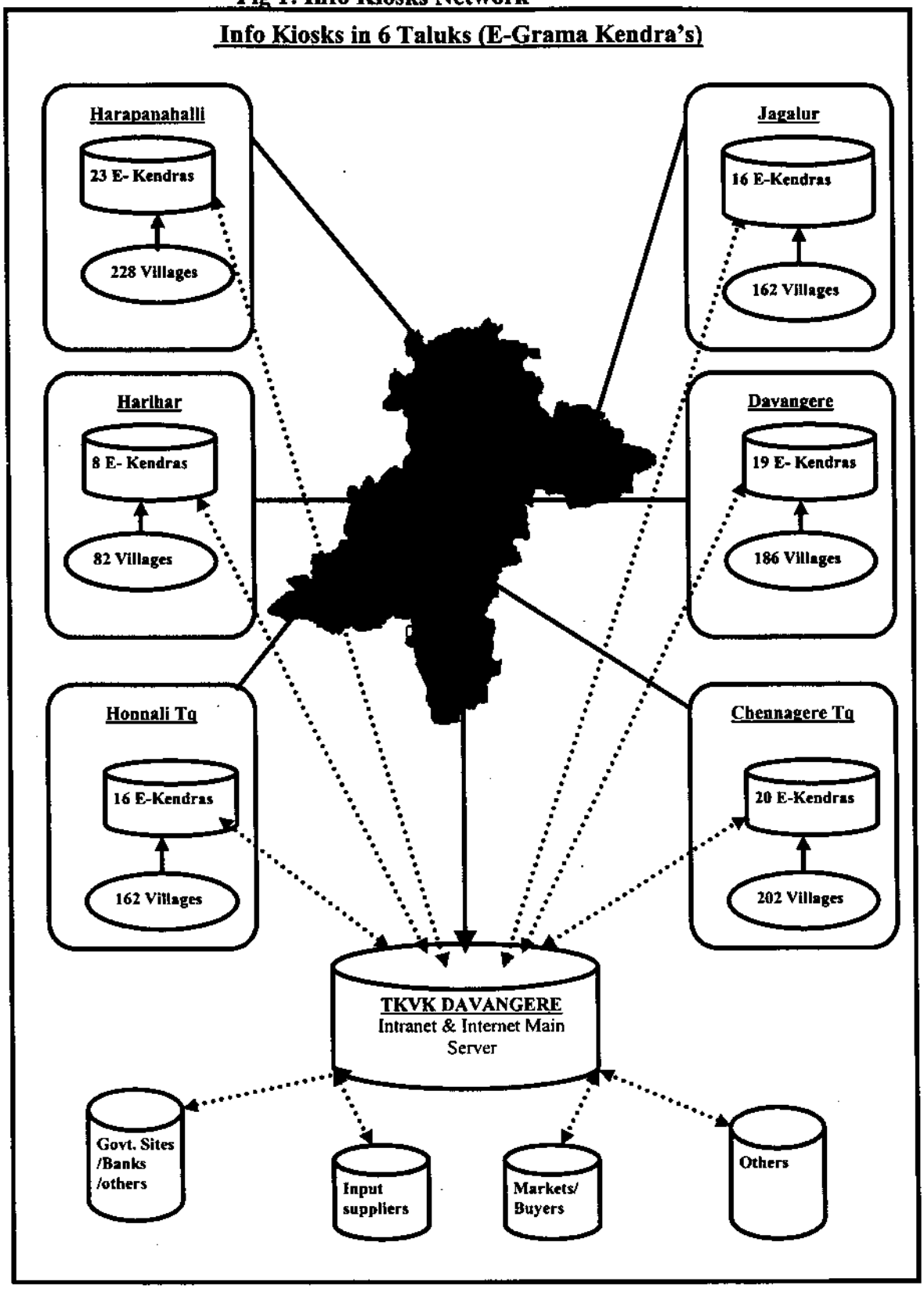
To overcome these issues, the education commission constituted by Government of India, thoroughly discussed during 1966-72 with different ministries. Finally, the Indian Council of Agricultural Research (ICAR) came out with the idea of establishing Agricultural Science Centres, here after called as *KVK- Krishi Vigayan Kendra*. The first such centre was started in Pondicherry under the administrative control of Tamil Nadu Agriculture University, which covered one district with main focus to impart the state-of-the-art knowledge to farmers by conducting "*on-farm*" training and other advisory services.

KVK's also addressed the issues related to farming and associated issues of village economy by adopting participatory approach. But, this mechanism also did not deliver the intended results because of two parallel institutions operating in a district, one is State Government's District Agriculture Unit headed by Joint Director and different level officers up to a village level agriculture assistant, the other one is ICAR's KVK with same mandate.

Though there is a clear mandate spelt out in the policy document[4] of KVK is *"in order to be effective, the Kendra must develop and maintain functional linkages with allied institutions. The training courses and other programmes of the Kendra should be in line with development programmes of the area/government, and their resources both men and materials should be utilised for training purposes and such other programmes. Thus, follow-up action and supply of inputs could be ensured by developing very close linkages with the government departments, land banks, cooperative and other institutions"*. But none of these things are materialised except in few cases. For example, a KVK located in Chitradurga district of Karnataka, a corner taluk called Hiriyur, under the control of Bangalore Agriculture University. This district is comprised of 6 taluks, mostly all the taluks are drought affected with very minimal rainfall as low as 500-550 mm in a year. If you ask any farmer from the villages of adjacent taluk, they will ask you back "what is this KVK". May be this is because of non-accessibility and non-coordination with district's line departments, etc.

In 2003-2004 ICAR has sanctioned about 201 KVK's along with 450 existing KVK's in different districts of India. Now ICAR should think to redesign the delivery or institutional mechanism to cater the programme for complete district with the close coordination of government line departments. One such KVK was sanctioned to Davangere district in Karnataka State recently to an NGO called Taralabalu Rural Development Foundation (TRDF).

Fig 1: Info Kiosks Network



After carefully examining the data of Davangere district and background of the implementing organisation, the Information and Communication Technology (ICT) model has been suggested to fulfill the aspiration of the village community as in Figure 1. It is essential to develop a link; the forward linkages with market inputs-outputs and backward linkages with research and other agencies. There are several success stories using ICT tool to reach the village communities, worth mentioning are *Information Shops*[5] promoted by MSSRF (M.S.Swaminathan Research Foundation), *ITC's E-Choupal*[6], and *TARAHAAT's Portal for Rural India*[7]. The famous study by Management "Guru" Prof.CK.Prahalad's *"Serving the Poor, Profitable*[8]*"* highlights the Public-Private partnership by plugging the digital divide and capture the BOP (Bottom of the Pyramid) market.

The above discussions, facts and evidences press the need for a re-designed mechanism to delver the knowledge for development.

4.THE SOLUTION

4.1 Info Kiosks Works as Information Center and Business Hubs: A Case of KVK in Davangere District, Karnataka

The table 2 provides the geophysical details of the district. There are 1022 villages spread over in 6 taluks. On an average, population in a typical village is around 2000 and number of families or households is about 400. The district average landholding families is around 60% out of total households. Therefore, the main line of business and dependence is on agricultural economy. The rest of the households are either agriculture labourers or other trades related to rural economy.

Table 2
Geo-Physical Details of Davangere District, Karnataka, India[9].

Items	
Average Distance from Habitation to Hobli in Kms	10
Average Distance from Habitation to GP in Kms	2
Average Distance from Habitation to Taluk Headquarters in Kms	18
Total Number of Electrified Habitations	1022
Total Geographical Area in Hectares	624518
Total Cultivable Area in Hectares	446900
Total Canal Length in Kms	670
Total Area Irrigated Under Canals in Hectares	80396
Total No. of Tanks	322
Total Area Irrigated Under Tanks in Hectares	7408
Total No. of Wells	10976
Total Area Irrigated Under Wells in Hectares	20038
Other Sources in Number	11682

Table 2...Contd.
Geo-Physical Details of Davangere District, Karnataka, India[9].

Items	
Total Area Irrigated Under Other Sources in Hectares	32507
Total Area Irrigated in Hectares	143209
Total No. of Electrified Pumps	34600
Total No. of Non-Electrified Pumps	1922
Total Forest Area in Hectares	65027
Total Male Population	598993
Total Female Population	561109
Total Population	1160102
Total No. of Families	242701
Total No. of Agricultural Families	145344

The district's major cultivable land about 80%, is used to grow maize (34%) and Paddy (20%) the reaming area is growing other cereals. As for as commercial crops are concerned, groundnut (5%), sugarcane (4%) and cotton (3%). Very less focus is given to money fetching horticulture and plantation crop, even though there is lot of scope like market access, road network to grow vegetables and tropical export quality fruits like Pomegranates, Grapes, Mangoes and Bananas etc.

Though there are 260 Agricultural Assistants in the State Agriculture Department in Davangere district, which is supposed to work as knowledge transfer units, the main problem in transfer of knowledge is, the hierarchical institutional mechanism and non-accessibility to information made the system incapable to act as link between different stakeholders like Government, Research and Technical Community, Market and Farmers. To bridge or coordinate this gap, there is a need of ICT network or web-based solution as in Figure 1.

4.2 The Structure of Agricultural Science Centre (KVK)

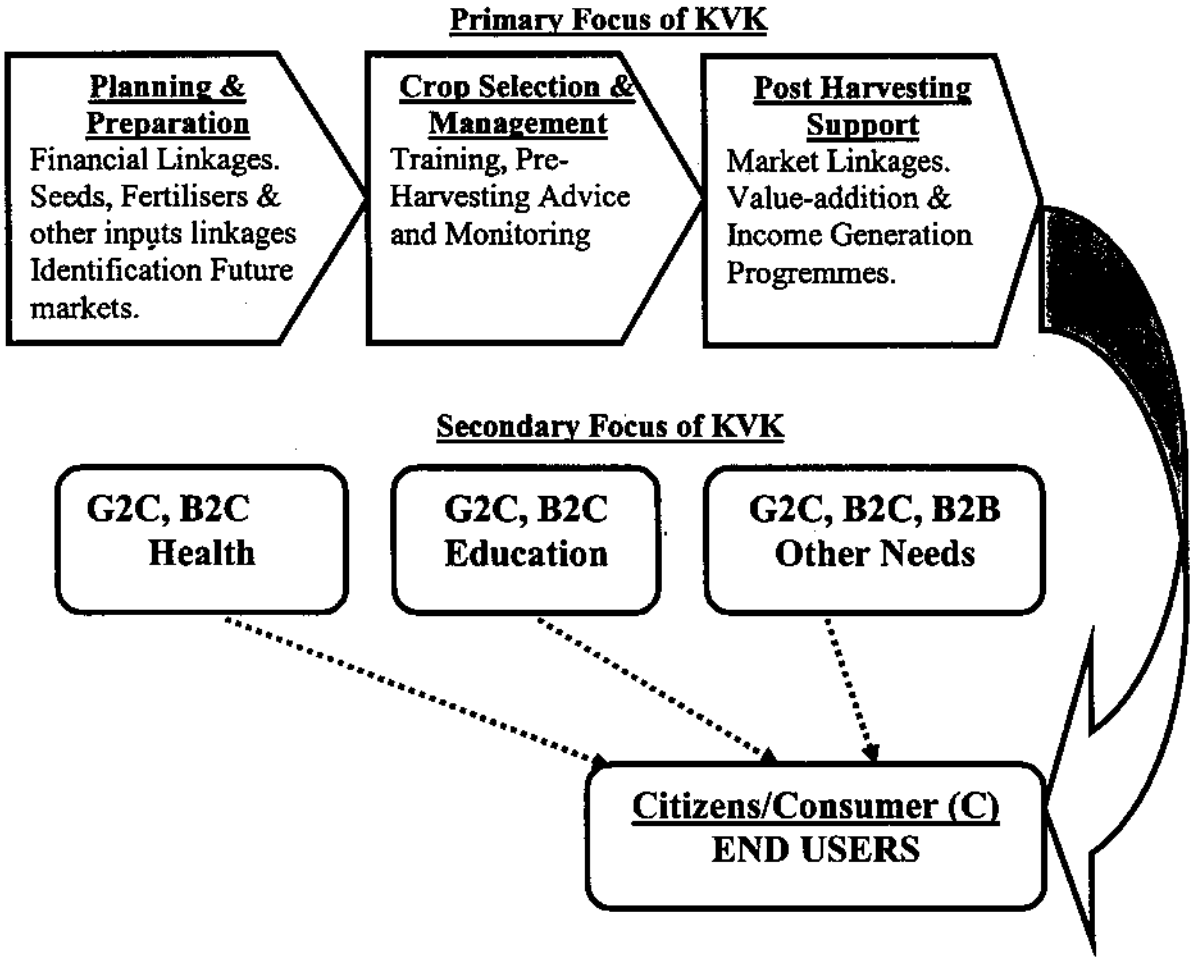
Normally, the area of operation of each KVK is a district and the administrative control will be either with the State Agriculture Universities (SAU) or with some NGO. A Training Organizer heads the KVK with doctoral degree in agricultural sciences and he is supported by nine technical persons with various expertise in agriculture, horticulture, animal science, food & nutrition and agricultural engineering, and 6 supporting staff. There will be a Scientific Advisory Committee (SAC) constituted with line department officials of the concerned district. The SAC will provide all intellectual and advisory inputs to KVK administration.

4.3 The Integrated Business Model of KVK

The business model as depicted in Figure 2, there are two sub-models, one is dealing with the primary focus of *"Planning & Preparation"* by way of linking to financial institution, inputs supply direct to users by eliminating middle-man link. *"Crop Selection & Management"* by way of suitability to the agro-climatic condition and market demand, the other important role is crop monitoring advice. And, *"Post-Harvesting Support"* a crucial linkage need for the farmers is, tie-up with markets by way of future market arrangement and agro-processing industries. The other one dealing with secondary focus, this may not be a core area of KVK domain but value-

added service for sustainability of KVK's info kiosks. These info kiosks will provide the part of value-added inputs into the Children Education, Health Needs and Advice, other issues, like the details regarding various information form Government web sites, more specifically digitised land records, etc.,

Figure 2
WEB-BASED INTEGRATED BUSINESS MODEL OF KVK



4.4 Info Kiosks Technology and Content

Mainly Info Kiosks are operated on web-based technology with different analytical and query-based software. In this case, cluster Kiosks and central server at KVK are working both on intranet and internet web technologies. These centres are internally connected with intranet to share the data warehouse for decision planning and knowledge exchange. The info kiosks and main server at KVK head quarters are connected with Internet for data mining, establishing the links for E-Governance and E-Commerce.

4.5 Info Kiosks Management and Delivery Mechanism

As shown in figure 1, all the villages are grouped into a cluster. Each cluster will be of 10 villages. An average distance from each village to the cluster is around 5 KM. Each village will be having KVK users groups in the lines of Self-Help Groups (SHG). All the 10 villages' executive members form the federation at cluster and become the executive committee to run the cluster level **Info Kiosk.** All these info Kiosks are connected and controlled by KVK management at KVK head quarters to provide the service as shown in Figure 2. Now, the question arises whether this delivery mechanism works to cater the community with intended service. Yes, there are several participatory programmes of Government has taken in the recent years. Worth mentioning are World Bank assisted SUJALA, a watershed programme and JSYS (Jalasamvardhan Yojana Sangh) a tank rehabilitation programme in Karanataka, India.

JSYS project focus on targeting assistance to the predominantly rain fed districts of the state, where the rural poverty is around 40% and promote greater access to tank water by rural poor, by addressing the following issues:

- Building community ownership and responsibility for the management of tanks
- Fostering an integrated approach to water and land management in tank systems
- Deepening the rural decentralisation
- Instituting cost recovery arrangements for future sustainability.

With the above objectives Government of Karnataka, in 2001, intended to rejuvenate 2000 tanks in 8 districts of Karnataka in a phased manner with the help of NGO's. One such NGO is TRDF, which was selected for to establish a KVK.

TRDF is providing consultation services to fulfill the above objectives of JSYS to rejuvenate 40 tanks. TRDF was already completed the task of capacity building and collection of 12 % (6% voluntary labour, 6% financial) contribution in 15 tanks. This experience shows that the people are aware that there is no other alternative then **"collective ownership"** for their development.

Table 3 and figure 3 depicts the importance of agriculture and geographical spread of villages substantiate the need and absorption capacity of new technology for development.

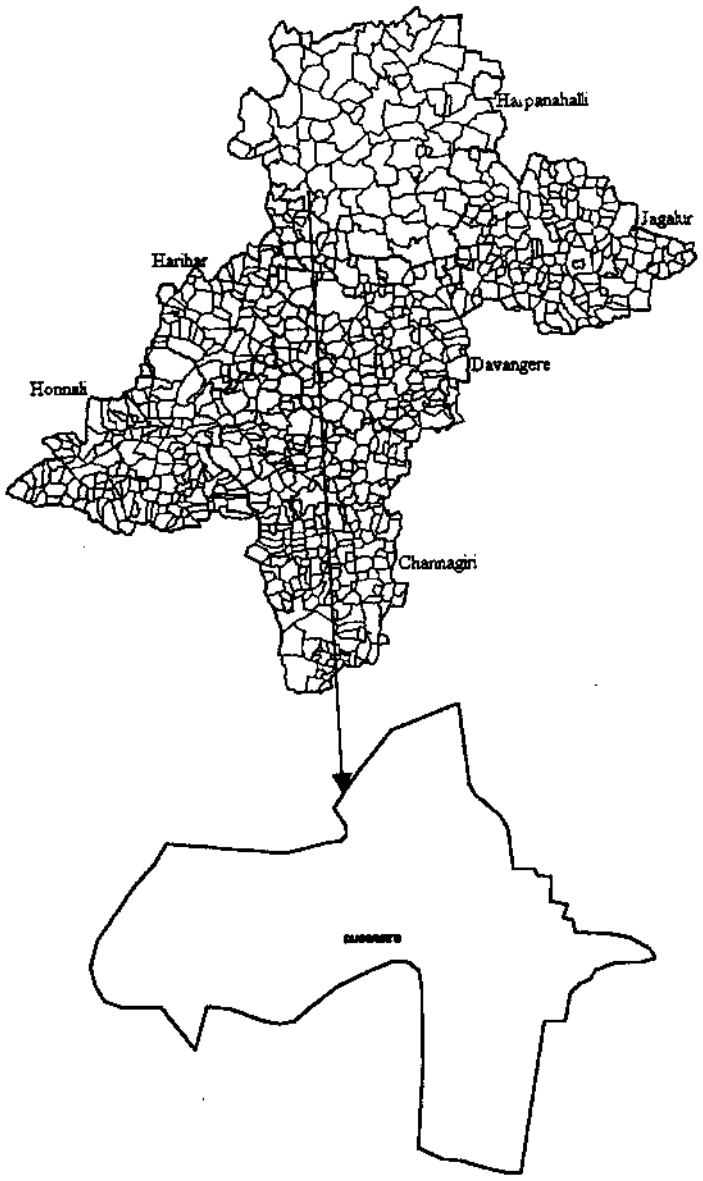
Table3 [9]

Socio-Economic Profile of Taluk

	Taluk	No. Villages	No. of E-Grama Kendra's	Population	No.Agri Families	No.Non-Agri Families	Cultivable area	Area Under Irrigation
1	Channagiri	202	20	249250	27977	17620	79796	30008
2	Davanagere	186	19	233261	29621	20586	82559	37613
3	Harihar	82	8	156823	17124	15935	49506	29070
4	Harapanahalli	228	23	203564	23962	20213	93894	10763
5	Honnali	162	16	186163	25165	14025	68164	23093

	Taluk	No. Villages	No. of E-Grama Kendra's	Population	No.Agri Families	No.Non-Agri Families	Cultivable area	Area Under Irrigation
6	Jagalur	162	16	131041	21495	8978	72981	12661
	Total	1022	102	1160102	145344	97357	446900	143208

Figure. 3.
Dizitised Village Boundry Map of Davangere District and a Typical Village Map



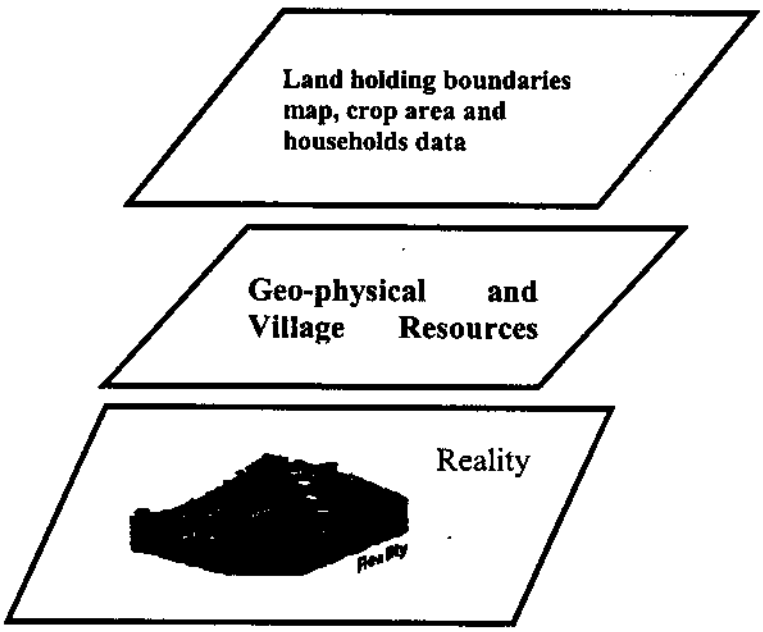
4.6 Can KVK change the Agriculture Scenario of the District

The district is classified into two micro agro-climatic zones, 3 taluks normal rainfall between 650-800 mm and other 3 taluks, normal rainfall between 550-650 mm. The market accessibility, road network to near-by towns and value-added service from KVK according to agro-climatic conditions of different zone can change the economic conditions of the villages of this district.

5. THE TECHNOLOGY

The network of villages and Kiosks are connected by web-based technology as shown in Figure 1. The connectivity at the main server level state-of-the-art hardware and VSAT connection. In the initial stages all the Kiosks are connected with dial-up access. The main software's used are web based GIS and Remote Sensing Image Analysis Packages. The following chart will provide the GIS application as decision-making tool.

Fig .4
GIS Application as Decision-Making Tool.



GIS combines layers of information about a place to give us a better understanding of that place like, what layers of information you combine depends on our purpose. In today's competitive market, obtaining the optimum crop yield is critical to the success of farming. The key to achieving such results is "precision agriculture," which means knowing and responding to the specific conditions of the field. GIS lets farmers perform site-specific spatial analyses of agronomic data. The results identify the interactions between physical, chemical, and crop data that can be the cause for variations in yield. The basic requirements for GIS application are as follows:

- Digitised and Scanned Maps: Distrcit, Village and Landholding Boundary Map.

- Data Bases –Tables of Data, Periodical Data Collection from Field.
- Field Sampling of Attributes.
- Remote Sensing & Aerial Photography.

6. The Economics for Sustainability

As discussed earlier, the collective ownership is an alternative for development, based on some success stories, running of a Kiosk on sustainable manner is not that difficult, because the data in Table 4 shows that, the irrigated area on an average 35% and landholding families on an average 61% in this district. Therefore the need of Kiosk is essential and affordable.

Table 4

E-Grama Kendra Economics[9]

Taluk	% of Irrigated Area	Agriculture Family %	Non-Agriculture Families %	Total Membership Fee from Agriculture Family (Rs100/Family)	Total Membership Fee from Non-Agriculture Family (Rs25/Family)	No. of E-Grama Kendras	Avg Membership Fee /Kiosk
Channagiri	37.61	61.36	38.64	2797700	440500	20	
Davangere	45.56	59.00	41.00	2962100	514650	19	
Harihar	58.72	51.80	48.20	1712400	398375	8	
Harapanahalli	11.46	54.24	45.76	2396200	505325	23	
Honnali	33.88	64.21	35.79	2516500	350625	16	
Jagalur	17.35	70.54	29.46	2149500	224450	16	
Total				14534400	2433925	102	166031

Then the question arises, who should bear the initial cost to establish the Kiosks. At the KVK level, ICAR can fund to develop the database and other infrastructure for main server base. To establish a Kiosk at cluster level, the required fund is around Rs.1 to 1.5 lakh- cluster Kiosks can be on 80:20 ratio partnership of state government and users federation. Initially, the running expenditure can be bear from corpus fund generated out of membership fee. Once Kiosk starts earning, all the cost can be met out of the revenue earned by Kiosk.

According to some studies, net revenue earning is about Rs.3000 and a typical running expenditure to run a Kiosk is about Rs.1500 including honorarium for the person who takes care of the centre. All these facts indicate, sustainability is not a problem.

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References:

1. Suresh Pal, Mruthyunjaya, et.al, a report of Institutional Change in Indian Agriculture, National Centre for Agricultural Economics and Policy Research, 2003.
2. Dr.G.K.Vasanth Kumar, Director of Horticulture, Programme and Progress Under OPDP in Karnataka, Government of Karnataka
3. . Frank Ostroff, The Horizontal Organization, Book, Oxford University Press, 1999.
4. . ICAR, Krishi Vigyan Kendra (Agricultural Science Centre): A guide for the KVK Manager, 1999
5. Community Knowledge Partnerships Research Programme, M. S. Swaminathan Research Foundation. http://www.mssrf.org
6. Kuttayan Annamalai, Sachin Rao, What Works: ITC's E-Choupal and Profitable Rural Transformation: Web-based information and procurement tools for Indian farmers, Michigan Business School, Kenan-Flagler Business School, World Resources Institute, August 2003.
7. Caitlin Peterson et.al, What Works: TARAHAAT's Portal for Rural India, A digital Divide Study by the World Resources Institute, July 2001.
8. C.K.Prahalad, Allen Hammond, What Works: Serving the Poor, Profitability: A Private Sector Strategy for Global Digital Opportunity, Markle Foundation, World Resources Institute.
9. http://nitpu3.kar.nic.in/samanyamahiti/smeng/default.htm, Government of Karnataka website, Samanya Mahithi (source for Table 2, Table 3 and Table 4).