

visibility, involvement, accessibility, prestige and power than others.

Similarly, high out-degree centrality reflects the extent to which actors are being influenced by others in the network. Individuals with high out-degree are usually interested in exchanging knowledge with others or they want to bring awareness to the community of their opinions. They have the ability to mobilize and diffuse information to the larger network and spread information faster than others. These are the focal actors with maximum connections to others and thereby, can be targeted for motivating the network and for rapid diffusion of information through the network.

Betweenness centrality: Actors with high betweenness scores are significant as members are depended on them to access other members. They take the role of a bridge or connectors in or between groups. Being between means that an actor has the ability to control the flow of knowledge, information, goods and services. In this way, they direct flow in the network and consequently can spread as well as distort or withhold information, services, etc. easily. When removed, the vertices with highest betweenness also results in the largest increase in typical distance between members.

Closeness centrality (in closeness centrality and out closeness centrality):

Actors with high in-closeness and out-closeness centrality takes into account the ability of the actors to extend influence throughout the network, and measures how close or proximate that extended sphere of influence is. They are able to disseminate information in the network in the quickest possible time due to their close proximity with rest of the members. This indicates that these individuals are the ones who have the shortest path to all the group members and can influence more members in fewer steps. In other words, these are the actors who receive and diffuse the information via shortest paths and in shortest possible time as they are closer to each other.

Conclusion: The domain or the field of study of networks and network analysis is vast and wide. With new discoveries adding to the existing domains, the knowledge base of social networks and its analysis is rather expanding. Though the concepts of social networks have been in use in various field of study, the understanding required for using network analysis as a technique in social and behavioural sciences is however limited, more so ever in using it to identify individuals' roles in a social network. Therefore, developing an understanding of its application in social and behavioural sciences is a prerequisite for its utmost use.

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78. Disruptive Technologies in Extension and Advisory Services

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The ever increasing growing human population and its demands for food, increases the importance and urgency of introducing disruptive technologies in agriculture. Already a number of disruptive technologies and solutions such as Unmanned Aerial Vehicles for remote sensing, input application, autonomous fertigation, magnetic spraying etc. are being used benefitting agriculture globally. But, their large scale adoption remains a challenge due to the *high initial costs associated with purchase, setup and maintenance, more so for small and marginal farmers. The variability in local and regional cropping and agronomical practices also hinder the quicker adoption of such technologies unless validated locally for its feasibility. Therefore, a combination of all these technologies is necessary which would*

have a synergistic effect on crops yields, both quantitatively and qualitatively, benefiting the farmers and consumers

But what exactly are these disruptive technologies? Disruptive technologies according to Clayton M. Christensen (1995), is an innovation that creates a new market and value network, and eventually disrupts an existing market and value network, displacing established markets, leading firms, products and alliances. In most of the digital pilot projects introduced in agriculture sectors during 1990 - 2002, such disruptions were witnessed. As technologies evolve and become more sophisticated, its efficiency improves and the innovation meets the needs of the customers. Eventually, the original firms are driven out as the disruption created by the introduced technology

over time meets the needs of the mainstream market. However, in the case of Extension and Advisory Services (EAS), the magnitude of the disruption witnessed is not comparable to that of e-commerce though such disruptions may have been seen in agri-commerce.

In agricultural extension to date, there is no blueprint on how to proceed with disruptive technologies. However, there are three distinct areas where the potential of disruptive technologies can be harnessed in EAS viz.

Pre-Production

Extension advisory services such as weather details, aberrations, climatic factors, crop selection, soil health etc., depend largely on remote sensing, geographic information systems, management information systems, predictive modeling solutions and knowledge management models. This requires harnessing big data analytics, Internet of Things and mixing of farming systems, various government schemes, access to credit and insurance with the emerging technologies to give personalized solutions to farmers wherein, digital networking solutions will be of great help.

Production

Operations in production can be effectively handled by developing sensory devices, proximity

devices, ecommerce/ m-commerce platforms/ applications, digital networking solutions, big data analytics, smart mobile apps and high impact knowledge management solutions. Sowing, land preparation, input management, water fertilizer management and pest management apps can be developed to suit the farmers need.

Post-Harvest

Post harvest factors viz., marketing, food processing, packing, storage and transportation in the coming years will drive global agriculture in the coming years and this will have a bearing on the way small farmers operate. Digital cashless transactions, linking of transactions to unique IDs and bank account numbers and linking credit and marketing with bio metrics is already giving EAS leverage over the past efforts. Digital networking solutions, risk sharing systems for agricultural lending, agricultural value chain networks, e-vouchers distributed through mobile interfaces, will transform EAS strategies.

EAS have widely been focusing on ways to provide information on how to improve productivity, crop and pest management, fertilizer use efficiency and climate resilience. Adoption challenges aside, EAS coupled with digital technologies and the conventional methods of information dissemination have potential to change the way agriculture is practiced.

AGRIBUSINESS

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79. Zero Budget Natural Farming (ZBNF)

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Introduction

Across the world, agriculture is facing multiple setbacks, in the form of extreme weather conditions like floods and droughts or factors such as soil degradation, soil salinity and water shortage. To feed the global population of 9.6 billion by 2050, as projected by United Nations, report scaling up food production is important. Ensuring food security, producing more with less resources and encouraging the smallholder smaller farmers are also important in creating a food secure future.

Lately Indian economy led to a deep agrarian crisis that made small scale farming an unviable

vacation. Markets and quality inputs such as seeds, fertilizers, insecticides etc are costly and thereby not accessible to farmers. Indian farmers increasingly find themselves in a cycle of debt, high production costs, high-interest rates for credit and volatile market prices of crops. With the given scenario, zero budget farming ceases a dependency on loans and therefore reduces cost of production.

The term 'Zero Budget' means not relying on credit and cutting the expenditure on inputs. 'Natural Farming' implies farming naturally without application of any synthetic chemicals.

ZBNF is a set of farming methods and also grassroots peasant movement. It was first proposed