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A framework for implementing information and communication technologies in agricultural development in India

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Abstract

Knowledge is an increasingly significant factor of production in modern agriculture. Information and Communication Technologies (ICTs) can accelerate agricultural development by facilitating knowledge management. Based on an evaluation of several ICT initiatives in rural India, a framework to guide policy and implementation of ICTs in Indian agriculture is proposed. In this framework, agricultural development is visualized from two perspectives, a rural incomes and livelihoods perspective at the farm level, and a sustainability perspective at the regional level. The implementation of ICTs is proposed in three unique institutional environments: (i) closed vertical supply chain network for agribusiness enterprises, (ii) an open chain network with dynamically evolving partners and supply chain situations for the public, non-governmental and multilateral organizations, and (iii) a spatial data services network to address natural resources management and sustainability concerns. Each environment is assessed to identify its appropriate business models centered around ICTs, required technologies, scope for up-scaling the models, and required institutional and policy initiatives. In the future, as ICT infrastructure grows and connectivity and hardware costs decline, the critical constraints are likely to be the development of appropriate policy and institutional environments for the creation and delivery of information and knowledge to the end users. Significant policy, institutional networking and capacity building initiatives will be required at various levels to overcome the constraints and effectively integrate ICTs into the agricultural development process in India.

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1. Introduction

The agriculture sector in India accounts for about 24% of its GDP, 15% of the total export earnings and employs about 56.7% of the country's workforce [1]. It is an important source for generating demand for industrial goods and services, and rural domestic savings are a major source of resource mobilization in the national economy. The sector plays a key role in ensuring national food security, and in the process, national security as well. For these reasons, agricultural development has a strong multiplier effect across the economy. There is increasing consensus that, in a globalizing economy, a long-term economic growth agenda for India is feasible only if it has agricultural development that raises rural incomes as its central concern.

Further intensification of agriculture would be required in future to meet the demands generated by the growing population and increasing incomes. This can lead to significant environmental impacts like depletion of surface and underground fresh water resources, deterioration of soil and water quality, soil erosion, loss of biodiversity and even climate change. 'Future agricultural practices will shape, perhaps irreversibly, the surface of the Earth, including its species, biogeochemistry and utility to society. Agricultural practices will determine not only the level of the future food production but also to a great extent the state of the future environment' [2].

Agriculture in the 21st century will therefore be an extremely diverse industry driven by the twin concerns of raising rural incomes and ensuring long-term sustainability of its natural resource base. It will involve a diversity of economic activities that affect a far wider range of stakeholders than ever before, including consumers, farmers, government, industry, and the society at large. A long and discontinuous supply chain, inadequate policy support, limited infrastructure for storage, transportation and marketing of agricultural produce, limited opportunities for value addition, and inefficient information and knowledge flows have constrained agricultural development in the past in India, and have been the principal causes for low rural incomes. The agricultural development agenda would therefore require planned interventions at all links in the agricultural supply chain—delivery of farm inputs, increasing productivities and input use efficiencies through efficient management at the farm level, lowering post-harvest losses in handling and storage, providing for storage and transportation infrastructure and for processing farm outputs into higher value foods [1]. Every activity in this chain involves the creation, processing and communication of information. Farming will, therefore, have to be intertwined with information and communication technologies (ICTs) across the supply chain to attain targeted outcomes and impact.

ICTs are a range of technologies that integrate information technology devices like personal computers with communication technologies such as telephones and telecommunication networks. Both the range of the technologies and their convergence with conventional media is expanding all the time. ICTs can become key enablers of the agri-food sector by making dynamic and real-time global level exchange of data, information and knowledge quick, interactive and easy throughout the agricultural value chain. Their effective deployment can lead to increased agricultural competitiveness through cuts in production and transaction costs, raising production efficiencies and farm incomes, conserving natural resources, and by providing more information, choice and value to stakeholders.

ICTs have transformed the face of agriculture in many developed countries. Most agricultural activities in these countries are now based on the use of web-linked interactive databases for obtaining information on weather, natural resources, quantities of products demanded, credit, and government programmes, as well as technical knowledge. In fact information has become a fourth critical factor of

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