



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

## **Innovative Payment Solutions in Agricultural Value Chain as a Means for Greater Financial Inclusion<sup>§</sup>**

**Tushar Pandey\***, Nagahari Krishna, Venetia Vickers, Antonio Menezes,  
and **M. Raghavendra**

Strategic Initiatives Government Advisory (SIGA) Group, YES BANK Limited, Worli, Mumbai 400 018

### **Abstract**

The efforts for financial inclusion need to be designed with a vision beyond just the percentage of the country population with access to a bank account or a no frills account; to focus more on how this can enhance the capability and convenience for the un-banked and under-banked, specifically the small and marginal farmers in this case, to enable greater transparency, accountability, efficiency and convenient access to necessary facilities. The growth of ICT industry and mobile telecom revolution in India has provided immense opportunities for targeting various nodes in an agricultural value chain; and in linking small and marginal farmers. By leveraging on the available technology, payment systems such as mobile-based and card-based can extend the convenience and will revolutionize the transaction environment with the agricultural value chain. These new payment mechanisms aim not only at introducing cashless payments but also at greater financial inclusion by being more affordable and easily available to everyone. In the age of collaboration and partnerships, the triad of mobile operators, technology developers and banks have begun to work closely in what is emerging as a revolution. The Government will play an important role in facilitating this partnership and scaling successful models as part of its policy to enable greater financial inclusion, with a focus on the small and marginal farmers.

### **Introduction**

An agricultural value chain encompasses the input supply, production, post-harvest, storage, processing, marketing and distribution, food service and consumption functions all along the farm-to-plate continuum for any given product. Modern agricultural value chains are networks that typically support three major flows:

**Physical Product Flows:** Physical product movements from input suppliers to producers to buyers to final customers,

**Financial Flows:** Credit terms and lending, payment schedules and repayments, savings, and insurance arrangements, and

**Information Flows:** These coordinate the physical product and financial flows.

For the smooth functioning of the agricultural sector and success along the agricultural value chain, all the three flows need to be regular, uninterrupted and continuous. In the Indian context, while the government and other players have worked to strengthen the physical product flows, financial flows and information flows still need to be seriously addressed.

This paper seeks to address the issue of financial flows and how innovative payment solutions along the agricultural value chain can act as a means to greater financial inclusion.

### **Conventional Methods of Payment in India along the Agricultural Value Chain**

The conventional agricultural value chain system in India follows a 'push'-based system, where the

\* Author for correspondence,  
Email: tushar.pandey@yesbank.in

§ The views expressed in this paper are those of the authors alone and not necessarily those of the organization they proudly represent.

farmer's commodities are pushed into a crowded and competitive market place, without any regard to the demand and preference of end-consumers. Market push tends to be several independent transactions at each step, or between each node in the value chain. Farmers get isolated from majority of the end-consumers and have little control over the input costs or the proceeds from their produce, resulting in minimal profits. Primary exception is where local farmers sell produce directly at local farmer markets to the end-consumers. The issue of decreasing the number of intermediaries and creation of 'demand-based' market system is complex and will require structural changes, both at the level of farmers and the industry. Any approach towards improving the value chain needs to first concentrate on decreasing the transactions costs and increasing market transparency (Nitin, 2008).

The existing system is afflicted by lack of accurate weighing systems and quality standards, slow processing times and long payment periods, including knowledge on accurate market price and trends, which are critical for high profits for farmers. It is primarily due to three dominant factors: (i) Industry structure; (ii) Product complexity; (iii) High-touch nature of transactions. These factors influence largely the implementation and adaptability of any improvement in the payment system.

### Industry Structure

Indian agricultural supply chain is a complex exchange involving multiple intermediaries and fragmented marketplaces (Figure 1).

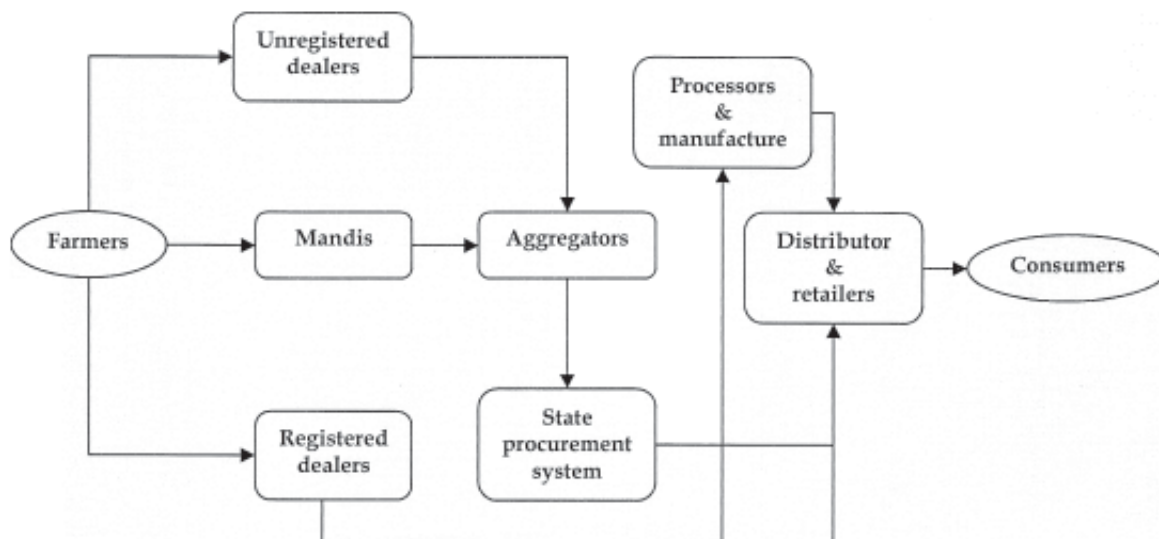


Figure 1. Conventional agricultural supply chain model

Though the consolidation of businesses is changing the traditional relationships that exist between partners in a supply chain, there is still a great deal of development required for the growth of transparent electronic marketplaces. The impact of consolidation is already evident in the Indian agricultural industry with the concentration of numerous diverse segments in the market. Increased consolidation can be observed at different levels of agri-food industry value chains, e.g. consolidation in: seed and chemical suppliers, grain handling, meat packaging and processing, food processing and retailing.

### Product Complexity

Agriculture can generally be characterized by a high level of complexity of products being delivered to the final customers. This increased complexity is due to the conventional industry structure and user-driven system. It eventually leads to multitude of transactions — each one unique to the other. The first factor in India originates in the development of universal price references for commodities. Due to variations based on differences in location, period of shipment and actual quality of delivered product, it is rather hard to standardize all the attributes for electronic transactions.

### High-touch Nature of Transactions

Agricultural transactions, as for example obtaining credit for production, coordination of transport, purchasing of the technology, or selling final products, are heavily based on personal contact and are

characterized by one-to-one relationships. This particularly is the case in India where the majority of farmers and intermediaries are uneducated and repulsive to the use of technology. Various studies have indicated that trading & food processing companies recognize personal relationships as very difficult to be recreated by the use of ICT-based platforms (Zaremba *et al.*, 2002).

**Challenges Faced by Farmers in Accessing Needed Financial Services**

Environmental challenges such as lack of adequate collateral, lack of registered credit history, lack of market information, weak policy, legal and regulatory framework, and income variability among farmers have slowed down the development of microfinance and agricultural financial markets in India.

This apart, a number of risks such as weather risk, commodity risk, seasonality, geographical dispersion and poor physical infrastructure further impede the supply of finance and the ability of farmers to access the financial services they need (Table 1).

The impact of these constraints on lenders is the increased operating costs, greater information costs and higher real and perceived risks.

In the current scenario, mostly all payments are made through cash. While on the input side of the supply chain, farmers face the problem of lack of proper price information, commission agents and product

quality, on the output side, payments receivable by farmers are more often than not ridden with delays.

**Need for Streamlining the Payment Processes all along the Supply Chain**

Inadequate and inaccessible financial services are undoubtedly one of the prime reasons why the poor remain trapped in poverty. Without access to finance, the poor people cannot invest in tools to increase productivity, start a microenterprise, invest in education or healthcare, or even take time to search for better opportunities. In addition, monetary exchanges require a physical location and people need transportation to get to the location, both of which can be problematic in infrastructure-constrained countries such as India, particularly in the rural areas.

Proliferation of modern payment systems have far reaching economic and social implications for India where significant population have so far been excluded from the benefits of the financial system. Efficient payment systems help in financial inclusion. Implementation of such systems increases transparency, lower transaction costs, improve operational efficiency of trade and commerce, and provide support to globalization of economy.

**Need of the Hour:** There is a need of integrating as much of the financial supply chain with the physical supply chain as possible. There is also an urgent need to ramp up technology-based delivery channels,

**Table 1. Different risks faced by farmers**

Risk	Description
Weather	Drought, excessive rainfall, earthquake or other disasters
Commodity	Future value of produce is affected by cost and price volatility in local, regional, and global markets
Seasonality	Rural farms and households are vulnerable to the cyclical or seasonal nature of the agricultural sector. Harvest season is a period of positive revenue, planting season is a period of heavy spending and very little, if any, revenue generation and during the harvesting season, liquidity is scarce and families in many regions need access to loans or other, non-agricultural sources of income.
Distance to urban centre/ financial institution	Because clients live far from urban centres where financial institutions are often located, it increases the transaction cost for the borrower. These transaction costs include transportation costs and the opportunity cost of lost labour days.
Poor physical infrastructure	Poorly-developed roads or other public infrastructure can limit a borrower’s access to financial institutions in urban centres or increase the time it takes to get there, thereby increasing transaction costs.

particularly in the rural areas. The challenge would be to identify a delivery channel that is not only cost-effective but user-friendly given the literacy levels of potential users in the rural areas and migrant labour.

### **Utilization of ICT-enabled Payment Solutions — Global Scenario**

World over, ICT-enabled payment solutions are being experimented with and a number of innovative technologies have rolled out. Various technologies show promise for lowering the costs, managing the risks and increasing the efficiency of financial services in the rural areas, including automated teller machines (ATMs), point-of-sale (POS) devices linked to smart cards, cellular phones, GIS mapping systems, and loan officers using personal digital assistants (PDAs).

ATMs, smart cards, and debit cards can provide flexible payment options and a more convenient access to client accounts. They can also reduce branch infrastructure and employee costs, and facilitate financial services in areas with poor communications and electricity supplies.

The PDAs can streamline the work of loan officers and speed decision making—as long as the financial institution's loan analysis and client monitoring systems are sufficiently developed. The value of fast, field-level decisions can occasionally be enhanced by incorporating credit scoring into PDA systems.

Cellular phones can be used to check loan balances and repayment schedules. They have the potential to be used for stored-value transactions and to facilitate remittance transfers and payments if linked to point-of-sale devices and other payment points. Cellular networks may also be used for low-cost deposits and withdrawals if they are linked to local merchants and agents.

### **A Successful Case Study —M-Pesa in Kenya**

Developed by Vodafone and launched commercially by the company's Kenyan affiliate Safaricom, M-Pesa was launched in March 2007 in Kenya, where it has reached 5 million customers. M-PESA is a small-value (all transactions are capped at \$500) electronic payment and store of value system accessible from ordinary mobile phones. Once customers have an M-PESA account, they can use their phones to transfer funds to both M-PESA users

and non-users, pay bills, and purchase mobile airtime credit for a small, flat, per-transaction fee. Money is transferred from one individual to another by SMS with any mobile phone that has a SIM-enabled card. Individuals can register at any agent kiosk by showing an identity card and pay no registration fees. Individuals buy airtime that is transferred to the mobile phone account of the recipient who can cash out at another agent kiosk (Mas and Radcliffe, 2010).

M-Pesa has been successful because it relies on traditional practices and structures and modernizes these features. It is indeed a model based on indigenous payment practices, extended mobile phone networks and a large distribution network. The distribution network is based on agents who were already present in markets. Agents receive basic training from M-Pesa. Only three months after the launch of M-Pesa, the service had 400 agents, compared to 450 bank branches and 600 ATMs in Kenya. By 2009, M-Pesa had 3400 agents. It is simple and quick, taking less than 30 seconds to carry out a transfer (African Economic Outlook, 2008).

Another important aspect of M-Pesa is its adaptability to local specificities. It recently started in Afghanistan, instead of using the Kenyan SIM toolkit menu on the mobile, the provider is delivering a user interface model based on voice recognition that is adapted to the low literacy levels in the country. In Kenya, M-Pesa plans eventually to include bill payments and international remittances.

Three important lessons that can be learnt from this successful case study are:

- (1) The value of leveraging mobile technology to extend financial services to large segments of unbanked poor people,
- (2) The importance of designing usage-based rather than float-based revenue models for reaching poor customers with financial services, and
- (3) The need for a low-cost transactional platform that enables low-income customers to meet a range of payment needs

### **Innovative Payment Solutions as a Means for Greater Financial Inclusion**

Payment systems are the backbone of the financial infrastructure of the nation, enhance globalization and act as tools of economic empowerment by financial



inclusion. There is a need to create payment systems that are efficient, reliable, affordable and of global standards. Implementation of such systems increases transparency, lowers transaction costs, improves operational efficiency of trade and commerce and provides support to globalization of economy.

Payment systems improve financial transparency, by bringing cash into the banking system, which would otherwise have been kept out of the system. Banks can then effectively deploy additional cash flow, thus stimulating business growth and consumption. This is especially significant in the Indian context, where, as per NCAER estimates, more than 90 per cent of the consumer spending is handled by cash basis — money which never enters the payment systems. In fact, according to a study by the McKinsey, India ranks No.4 in the world, in terms of currency in circulation. India's currency in circulation is 11.8 per cent of GDP against the OECD average of 6.3 per cent. This could be attributed to the fact that more than half of India's economic output is produced by small-scale agriculture and some 44 million household businesses. McKinsey estimates that improving the payment systems in India, by fully moving to the electronic systems, could result in an annual savings of close to US \$6.3 billion (Murthy, 2006).

Various payment solutions can be considered and their modalities designed in order to create fool-proof payment systems that cater to various users and situations. Some of these would include smart cards, magnetic stripe cards, mobile accounts, mobile wallets, mobile purse and paper vouchers. For the purpose of payment systems across the agricultural value chain, there are two main solutions that can be considered — card-based and mobile based payment systems.

### Card-based Payment Systems

The objective of card-based payment systems is to introduce multipurpose stored value card of various denominations which can be used to purchase various goods and services from affiliated merchants based on anywhere, anytime concept, which would result in increased sales for all affiliated merchants and better safety and convenience for the consumer.

### Types of Pre-paid Instruments

1. *Closed System Payment Instruments:* These are not reloadable with cash and do not permit cash

withdrawal (for example: phone calling, prepaid voucher and gift vouchers).

2. *Semi-Closed System Payment Instruments:* These are used at merchant locations, and can be reloaded, but do not allow cash withdrawal (for example: cash cards and smart cards).
3. *Semi-Open System Payment Instruments:* These can be reloadable or non-reloadable, and can be used at any point-of-sale terminal, but they do not allow cash withdrawal (for example: gift cards issued by banks).
4. *Open System Payment Instruments:* These can be re-loadable or non-reloadable, but most importantly, they permit cash withdrawal at ATMs (Example: Payroll cards and travel cards) (Carr, 2010).

### Mobile-based Payment Systems

If the technology revolution is to fully impact the rural areas, concentration on providing soft infrastructure is a must. The potential of mobile phone usage should be maximized. It is estimated that today while there are 15 crore savings account holders in India, there are approximately 43 crore subscribers with 1 crore subscribers being added every month. This highlights itself in the form of a great opportunity of almost 25 crore customers. Mobile phone usage transcends social and economic barriers. This is thus an application of technology that could be examined to expand the scope and reach of our payment and settlement systems.

A mobile payment service in order to become acceptable in the market as a mode of payment the following conditions have to be met:

- (a) **Simplicity and Usability:** The m-payment application must be user-friendly with little or no learning curve to the customer. The customer must also be able to personalize the application to suit his or her convenience.
- (b) **Universality:** M-payments service must provide for transactions between one customer to another customer (C2C), or from a business to a customer (B2C) or between businesses (B2B). The coverage should include domestic, regional and

global environments. Payments must be possible in terms of both low value micro-payments and high value macro-payments.

- (c) **Interoperability:** Development should be based on standards and open technologies that allow one implemented system to interact with other systems.
- (d) **Security, Privacy and Trust:** A customer must be able to trust a mobile payment application provider that his or her credit or debit card information may not be misused. Secondly, when these transactions become recorded, customer privacy should not be lost in the sense that the credit histories and spending patterns of the customer should not be openly available for public scrutiny. Mobile payments have to be as anonymous as cash transactions. Third, the system should be foolproof, resistant to attacks from hackers and terrorists. This may be provided using public key infrastructure security, biometrics and passwords integrated into the mobile payment solution architectures.
- (e) **Cost:** The m-payments should not be costlier than the existing payment mechanisms to the extent possible. An m-payment solution should compete with other modes of payment in terms of cost and convenience.

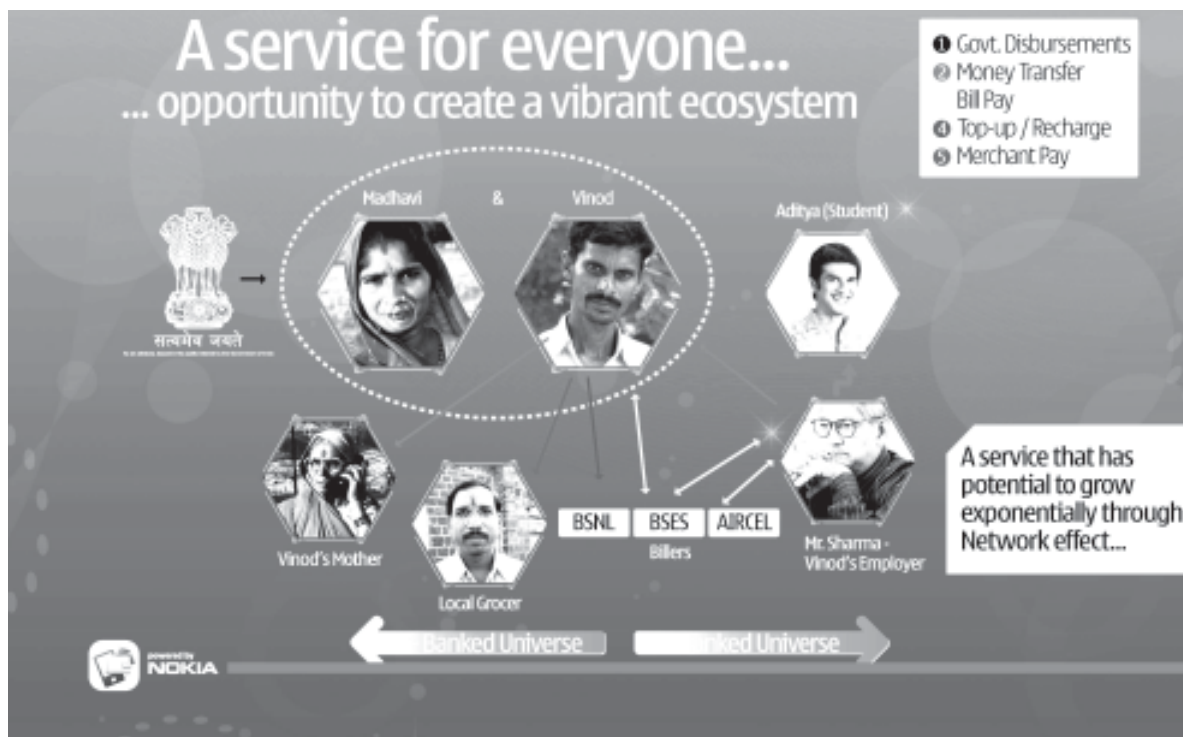
- (f) **Speed:** The speed at which m-payments are executed must be acceptable to customers and merchants.

Thus, the key defining characteristics of a successful mobile payment service are simplicity, usability, universality, interoperability, security, privacy, trust, cost and speed.

### Usage of these Payment Solutions across the Agricultural Value Chain

There is ample opportunity in the agricultural sector across the value chain for these new payment solutions to be used. Financial transactions like government scheme disbursements, sending money, receiving money, bill payments, cash deposits, cash withdrawals, NEFT can be carried out in a cashless, efficient and hassle-free manner. The in-text diagram below shows how mobile money services offer an opportunity to create a vibrant ecosystem.

No longer will distance to the nearest financial institution be a cause of concern for the farmers; neither will it be a cause of tedious cash transactions. Both, paying vendors and receiving money from buyers will be literally as easy as 'a click of a button'. With everyone owning a mobile phone now, it will require



only a demonstration for everyone to understand the usage of these user-friendly and easy payment solutions.

With the onset of the Unique Identification Authority of India (UIDAI), each resident across the country will be provided a unique identification. This would act as a tool for effective monitoring of various programs and schemes of the Government as well as a fool-proof basis for mobile money transactions. This however would require a strong synergy between three major players — the mobile service provider/s, the technology developer and the license holder (the bank).

## Conclusions

With agriculture being an important component and contributor to GDP growth and employment in India, banks play an important role in the way the sector emerges. On one hand while banks have to meet priority sector lending commitments to ensure credit delivery to this sector, there is a significant need to compliment this with efforts for an enhanced and comprehensive integration and participation in the formal banking and financial system. The efforts for financial inclusion need to be designed with a vision beyond just the percentage of the country population with access to a bank account or a no frills account; to focus more on how this can enhance the capability and convenience for the unbanked and under-banked, specifically the small and marginal farmers in this case, to enable greater transparency, accountability, efficiency and convenient access to necessary facilities.

It is from this perspective that it is important for financial institutions to integrate across the entire agriculture value chain. The challenge in this is the last mile delivery. It is clearly evident that there is a burgeoning need for new payment solutions to be created and that ICT is going to be the backbone of this revolution. These new payment mechanisms aim not only at introducing cashless payments but also at greater financial inclusion by being more affordable and easily available to everyone. While the potential for a brick-and-mortar model of branch expansion continues, technology has enabled quicker and wider access, at a relatively lower cost; the ultimate beneficiary being the end-user who can now participate in the formal system from the most distant and rural pockets.

The mobile telecom revolution in India has changed the way we need to look at this. Mobile phones today have the highest penetration levels and can serve as a medium of access for a much larger section of India's population. This is particularly relevant in efforts across the agricultural value chain; and in linking small and marginal farmers. Not only can mobiles be a medium for transacting in a cashless environment, the potential of mobiles to comprehensively deliver farmers a one-stop solution to several other needs of information and knowledge such as commodity prices, weather updates among others is behind its enhanced potential and acceptability.

Some banks have already been making strides in this direction. YES BANK, for example as part of its efforts under the National Agriculture Innovation Project has been working closely with its partners in a pilot effort to evolve a business model built on a mobile-based platform for delivery of crop insurance to farmers by creating an enabling transaction environment for a farmer to access such facilities through the most simplistic handset; leveraging technology to extend the convenience that will revolutionize the transaction environment for this section of population. In the age of collaboration and partnerships the triad of mobile operators, technology developers and banks have begun to work closely in what is emerging as a revolution. The government will play an important role in reverse-integrating successful attempts which would have a defined impact into scalable development models as a part of its policy to enable wider participation of businesses; enhanced competition and maximize benefits to the end-user — in this case with a focus on the small and marginal farmers.

## References

- African Economic Outlook (2008) *M-Pesa leads Mobile-Payments in Kenya* (Homepage of African Economic Outlook), (Online). Available: <http://www.africaneconomicoutlook.org/en/in-depth/innovation-and-ict-in-africa-2009/pro-development-innovative-applications/box-22-m-pesa-leads-mobile-payments-in-kenya/> [Accessed: 10/10/10]
- The Value Chain Approach to Poverty Reduction and Development of Livelihoods* (2008) (Homepage of Research Into Use), (Online). Available: <http://www.researchintouse.com/nrk/RIUinfo/valuechain/valuechain.htm#> [Accessed: 8/10/10].



Carr, M., *Mobile Payment Systems and Services: An Introduction* (Homepage of Mobile Payment Forum of India), (Online). Available: <http://www.mpf.org.in/pdf/Mobile%20Payment%20Systems%20and%20Services.pdf> [Accessed: 10/10/10].

Jaffee, S., Siegel, P. and Andrews, Colin (2008) *Rapid Agricultural Supply Chain Risk Management*, Agriculture and Rural Development, World Bank.

Mas, I. and Radcliffe, D. (2010) *Mobile Payments Go Viral: M-PESA in Kenya*, Bill & Melinda Gates Foundation & World Bank.

Murthy, N.N.R. (2006) *International Seminar on Payment and Settlement Systems*, Reserve Bank of India, New Delhi.

Nitin (2008) *Role of Agri Intermediaries in Food Inflation* (Homepage of Analectic), (Online). Available: <http://www.analectic.org/agriculture-intermediaries-and-their-role-in-indian-inflation/> [Accessed: 8/10/10]

Zaremba, M., Wall, B. and Browne, J. (2002) EBXML Registry/Repository implementation in the agri-food industry, *Frontiers of E-Business Research*, p. 537.