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Agricultural Resource Planning Through- IT Platform - An Approach

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Abstract

Agriculture happens to be the mainstay of Indian Economy. Even today seventy percentage of the population depend on agriculture as the core economic activity. Nevertheless as the commodity market is the farmers – particularly the small farmer are unable even to cover their cost of production. Unlike in US-EU they do not have a back up of significant subsidy. The result is a diminished attractiveness of agriculture as a paying industry. The farmers mostly operate in production segment of the value chain and as such is not in a position the capture major share of the total value created. In fact much of the value created by this chain is captured by the segments both upstream & downstream of this chain. It is a fact that in the current scenario – the powerless (economic) farmers cannot do much because of immense competition in the production segment. However this paper makes an attempt to capture some more value with the help of some more knowledge captured through an IT platform.
This paper proposes an economic model that integrates through a computer network some of the upstream segments like the producing centers, Market, logistics so that the farmers can capture some more value. This paper proposes a network environment for the producers as well as the marketing associates which can use the IT tools to forecast commodity prices in different markets and accordingly advice the farmers to shift this producer to a particular Mundi for an expected price recovery. ARP – as its called (Agricultural Resource Planning) will help the farmer to the extent that the latter knows that for maximization of value capture he needs to sell his commodity in which market. This also calls for free movement of grain / commodity to different market. This exercise will help reduce some of the uncertainty associated with today's production-logistics-sale-scenario.
This model is proposed and not tested yet. Model results can be discussed once it is put on test at least with a control group of farmers.

Keywords: ARP (Agriculture resource planning), Value chain, (DSS) Decision support system

1. Introduction

Agriculture marketing is possibly closest to a free market where numerous farmers are fundamentally price takers and are not in a position to change any of the market

forces. WTO CANCON ministerial exposes a pert of the fact through deliberation and protest. In addition – agricultural production unlike a normal manufacturing system suffers from incredible fluctuations caused by numerous reasons like weather, pests, and application of fertilizers and availability of water. All these phenomena make it difficult to predict the production Quantum & the price of the final product and to that extent affect investment decision of farmers for the next crop. As in the production stage so the producer suffers from some kind of uncertainty in marketing the produce at a reasonable price. The farmer is not in a position to actually predict the supply on a particular day he carries the risk of underselling the produce in the market, as his produce cannot be protected from deterioration or it cannot be done with out incurring additional transport and storage cost.

Agriculture marketing can be compared with a complex model of supply chain usually applied to business organization who continuously strive to reduce risk by supplementing with knowledge as much as possible. Agriculture market unlike the stable manufacturing industries also operates with numerous unorganized variables. Assessment of demand for farm input, quantification of cultivation area as well as supply of different input are difficult due to (a) lack of knowledge (b) unsound analysis & formulation of problem for investment decision. Limitation existing on the logistics for transportation causes further complications

in planning for marketing and storage. Because unlike the manufacturing sector which is highly organized, the agricultural market did not provide necessary cushion or a smooth distribution channel. It suffers from fluctuation and that basically causes pain either to the consumers or to the producers.

Some of the characteristics of this Industry are:

- Agriculture operates in a horizontally undifferentiated market. It leads to lowest possible equilibrium price. This implies bigger volume of production to sustain profitability.
- The farmer does not have any direct control on the shape or size of the product.
- The farmer do not have either buyer power or supplier power
- Neither the farmer can easily control the quality of product. As a result small farmer cannot capture the value it intends.

It was one of the most strident steps that outlined an integrated agrarian strategy. It was expected that through a network of Panchayats and co-operatives the rural reconstruction can be set in. With in the constrains it was also an attempt to look into the productivity goal. However the equity growth approach enunciated by the Nagpur resolution (1959) did not take off despite the recognition of the fact that the joint co-operative farming was the future agrarian pattern. "While the small farmers were to pool their land voluntarily to create a co-operative farm, the new beneficiaries of the

ceiling legislation could not claim rights to the newly acquired land since the surplus land resulting from ceiling was to be vested with the Panchayats".

In retrospect the idea of farming co-operative did not work because it got entangled with retention of property rights while farmers were free to deposit their land with Panchayats or co-operative, withdrawal of land was not feasible. Nevertheless this idea germinated in other areas of even agricultural production like sugar co-operatives and milk co-operatives that have written their success stories. The feasibility of this farm co-operative needs to be explored particularly on IT platforms.

In the 90s, Indian external trade did move towards some exciting figure. In 1995-96, agricultural imports were placed at Rs 2340 corers (approximately 2% of the total imports to India) while export of agricultural goods was Rs 2113 corers (around 20% of total exports from India). Yet India's share in the total world export is hardly 1.4%. The structure of Indian export is not qualitatively different from what it was earlier. Agricultural commodities still count for more than 20% of exports. Still agriculture is not a paying profession in this country and this sense basically repels the application of expert knowledge for agricultural production cum marketing. Gradually marketing of agricultural products is exhibiting many symptoms, which were not prevalent in commodity selling. Apart from addition basic uncertainty, production fluctuation and unorganized activities are making it a more uncertain game. It calls for introducing some semblance of certainty into these affairs. Might be it can be done through an integrated IT approach.

Even today's – value capturing framework includes a number of functions and processes that go in making a successful competitive strategy for an organization. It involves agencies and channels of distribution, movement of the produce from one production-marketing zone to another. It also involves packing, storage, transportation, quality control, grading and even expert facilitation. When this paper talks about resource planning – it talks of the downstream links of the total value chain.

For a farmer two criteria plays a pivotal role in decision-making

1) Stable price
2) Stable income as narrated

While he needs to scan the external environment for his entire input requirement he needs to deploy assets on the basis of his own analysis of internal context. Assessment of internal context becomes extremely difficult for his deficient management skill. Thus he is not the one who can do a tight rope walking in the face of numerous crises issuing from non-availability of power, water, seeds, oil, pesticides and fertilizers. To help the farmer's vis-à-vis the society, the latter created a number of socio-economic institutes who can intervene in the market to save both the producers and the consumers. Yet this institution also lack the knowledge essential to

run the agriculture so that if fulfills the earlier mentioned objectives. Social compensation through support is one thing while bringing proper managerial input into agriculture is altogether another aspect. As mentioned institutional intervention is therefore necessary to meet some of the problems of uncertainty. Today two institutions have emerged - one in the form of co-operative society and the other in the form of government institutions. Some of these co-operatives help in marketing some of the inputs. Similarly government institutions help in offering credit or ware housing and even in transportation.

The national agricultural co-operative marketing federation of India is such an apex body to co-ordinate the activities of all cooperatives. The government institutions are fundamentally involved in market regulation, credit facilitation, procurement, storage, transportation & market intelligence. They continually strive to ensure the protection of interests of stakeholder viz producers, consumers and even middlemen.

It is also estimated that in this area of farm production the farmers share of total value created is quite low of the total PIE (Potential Industry Earning) generated by this industry. The farmers share in hardly anything more than 10% of this value. The other 90% of the value created by this production system is shared by others namely suppliers of input, distributors & finally consumers. Possibility of enhancement of this share of PIE is one of the focus of this paper.

The idea explored here in this paper is an integration of marketing with production, logistics and even the taxation if any and input management. Reference is again given of the integrated agrarian strategy mooted by the congress. The model illustrated here needs experimentation to conclude whether it will succeed.

Information technology as an enabler of managerial decision support is well recognized. Also recognized by the government of India is the potential of IT for rapid and all round national development. The national agenda for governance, which is the policy blue print of government of India had taken due note of the information and communication revolution that swept the globe in the last decade. Accordingly it mandated the government to take necessary policy and programme initiatives that would facilitate India's emergence as an information technology super power in the shortest possible time.

The government constituted a national task force on information technology and software development in 1998. This included eminent personalities representing the government, industry and academia. The recommendations given by this tasks force cover the important sector of rural development. In its policy document "IT for all by 2008", it says that government shall take all necessary steps to boost IT in agriculture and integrated rural development. It talked about a unique wired village project at Warananagar co-operative complex in Kolhapur district of Maharashtra. It had developed ambitious plans on infrastructure development so as to reach each remote

place in the country. Government of India envisions achieving connectivity down to the block level.

The task force guidelines put great emphasis on "IT in government". It asked each department to prepare a five year IT plan and that 1-3% of their budget be earmarked for applying IT in that department / agency. Some of the government institutes dealing in agricultural marketing have already launched their websites and they provide a lot of useful information concerning agricultural marketing. However, plethora of this information will not make a right decision unless these information's are analyzed and chafes are separated from the grains. This can be done with the help of proper problem formulation and finding the solution of the problem. The present article is trying basically to give a meaningful shape to these information so that it can be used easily by the producer / marketer and speed is injected into the whole process.

Application of IT has already begun in a meaningful way in some of the states like MP, AP & Karnataka. The storey of gyandoot .com is already old and needs no repetition.

Yet it must be said in favour of these projects that they are helping bringing both the sides closer through two-way communication made easier by the Internet application. It is reasonably hoped that this technology would bring a further social evolution in due course of time. Today "IT for agriculture" meets quite often a derisive laughter. The general cynicism is based on the premises that farmers are not educated enough to derive any benefit. However this argument cannot stand a close scrutiny of logic for the simple reason that today IT delivers a few usable tools and set of knowledge, which can be used by any farmer without the benefit of a postgraduate education. IT today is a great facilitator and not really a divider of the society.

Nevertheless the education that bestow the farmer the ability to operate, maintain and understand the IT equipments and its output appears to be a big cause of worry for many people. Though the formal education may not be entirely necessary for this purpose. In fact the past of the Indian peasantry affirms that Indian farmers can easily take to the technological up-gradation as it happened in sixties when Hybrid seeds & chemical fertilizers were introduced. Mechanization of agriculture has taken place. In the same way it is expected that Indian peasantry will take to the IT application as a part of their normal routine. In the recent past it has been reported that a number of NGOs are actively working in rural sector and helping create an IT environment where they can work easily. It is also reported that a number of students of IIITM, Gwalior are in the forefront of this activity.

To make this model viable additional social support will be needed in terms of creation of networked infrastructure as discussed later. Financial institution or even World Bank need to be roped in to finance at least a few exemplary models in two or three states so that on success this can be replicated in other states. The society as

such can create these assets and the cost can be offset by raising finance through necessary tax. If necessary separate service charges can be levied on all concerned stakeholders.

Application of IT in industry or in other services is no longer frowned upon - however application of IT in agriculture or for that matter in agricultural marketing is not so much in vogue. Undoubtedly IT has serious and practically feasible applications in the field of agricultural marketing. IT can be effectively applied for marketing of inputs as well as agricultural produce. Out of the four stakeholders like producers, consumers, traders and government at least three groups i.e. the producer, traders and government might be linked to the agricultural marketing information communication network that will prove beneficial to all concerned.

Marketing information system is the backbone of agriculture. It is essential for the government for a smooth and regulated marketing business and also for the protection of all groups associated with. It can play a crucial role in monitoring and managing the complete value chain from input to the consumer's door. This model proposed here would also work on real time basis. Additionally IT will give enough security coverage to the data exchange.

It may be recalled here that the Congress initiated the concept of Technical Universities for reforming the agriculture scene in the country much prior to the independence. The seeds of agricultural Universities were sown at that time and the first such university came into existence in Pantnagar in fifties. In Sixties green revolution particularly the success of it in some parts in northwest created another social hiatus particularly in the eastern & central part of the country. Today we lay emphasis on agriculture for several reasons – one of them might be to remove the social distance among the farming class by bringing them closer to the wealth they created by facilitating their capacity to capture and retain the value they create. To enhance the capacity of these farmers – expert systems could be developed to help them gather as much value as possible.

2. *Application of Expert System*

AN intelligent computer programme that can capture knowledge in its explicit or tacit form and can make use of it to solve a particular problem that is difficult to address otherwise is called an expert system. Use of computer based expert systems for agricultural sector for maximization of farmers gain is not a far-flung idea. Industry has already made use of the speed, accuracy and capability of their machines together with communication network to realize some of the organizational goal. Even in agriculture some of the expert system that is working is:

1) Agriculture Resource planning – in pest control, spraying need, selection of pesticide etc.

2) Grain Marketing Advisor for determining marketing alternatives and it also supports optional strategy search.
3) COMAX for integrated Crop Management.
4) Gossya helps in day to day Management.
5) POMME for orchard Management etc.

These programmes captures some of the observations & tacit knowledge to arrive at a decision pertaining to Strategic aeration system, storage or even the various ratio for cattle feed mix – The performance of these systems can be as such measured by past observations.

Some scholars feel that process of knowledge transfer can be quickened and made more effective through the intervention of Information Technology platforms. Some of the current software's help in making optimum decision on the use of fertilizers. Some generate the normal cropping pattern (DSS & Ag) by using data mining technique. These are also production centric in a way that they treat numerous variables that go as an input to the production system. Similarly the Parkland Agriculture Research Initiative support producers for fostering conservation farming through diagnosis of soil erosion, economic consideration, weed identification, pest control and even selection of machinery.

PRICE MAN is another software that presents graphs so that prices can be forecast on the basis of historical data.

3. Proposed Marketing Model

In the marketing function of agricultural produce the most important management input is for making a decision as to where and how much should be supplied so that farmer does not suffer from any financial loss. The current problems from the farmer's point of view are

- Failure to forecast the supply positions in any market.
- Failure to gauge the demand in a particular market.

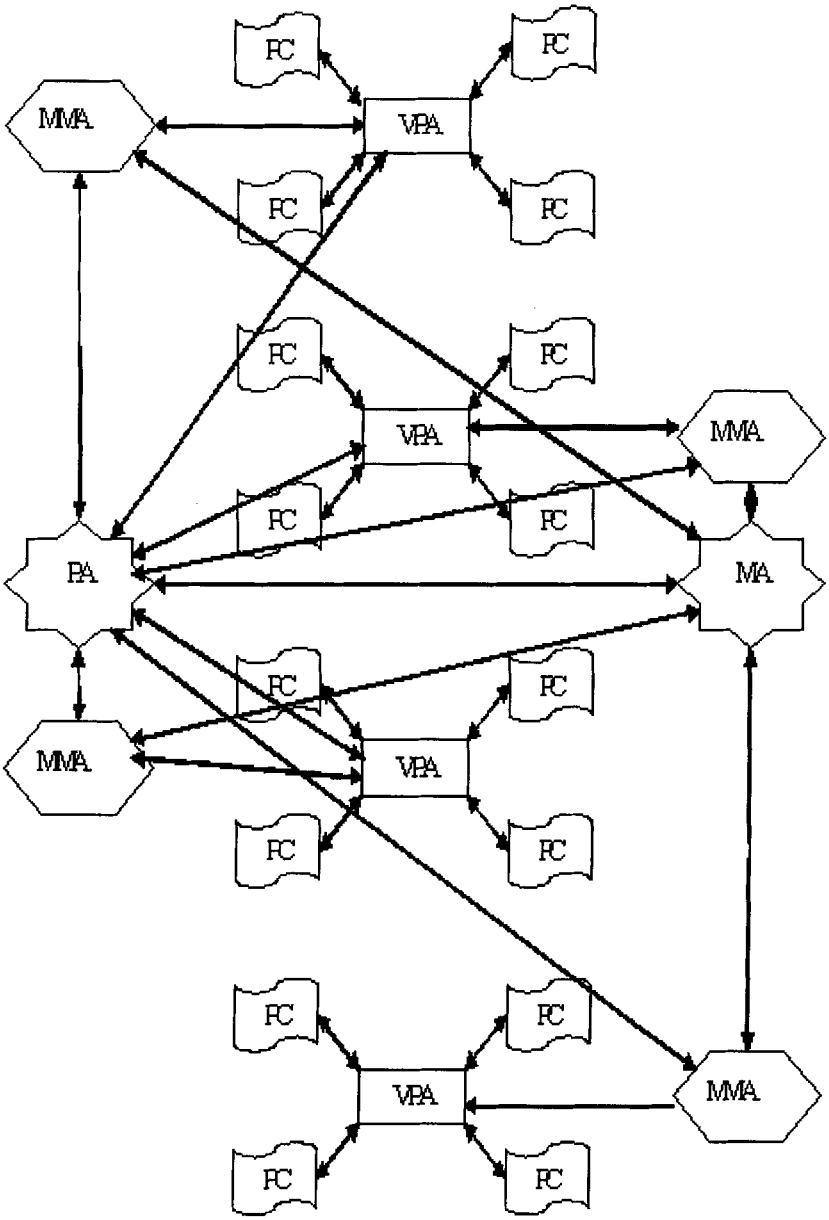

Figure 1: *Proposed marketing model (PC: Production Center, PA: Producers' Association, VPA: Village Producers' Association, MMA: Market Management Association, MA: Marketing Association)*

Currently as part of management of this demand & supply is left to the private traders – which may not necessarily go towards the interest of the farmers / producers because in most of the cases he faces a fait accompli. To remove a part of uncertainty towards making a right decision or towards helping the farmer to avoid a wrong decision, a meaningful management model is suggested. This particular model will help the farm to take a decision, which is presumed to be statistically a better decision.

Table 1. *Farm harvest prices of principal crops in India state "punjab" district (Rs. Per quintal)*

District Name	Year	Paddy	Wheat	Gram	Sugar Raw	Rape / Mustard
HOSHIARPUR	97-98	470	485	1485	1190	1500
	98-99	470	550	1500	1190	1600
JULLUNDER	97-98		530		1050	1225
	98-99	500	580		1050	1200
LUDHIANA	97-98	420	600	1600	1100	1200
	98-99	450	600		1450	1250
FEROZEPUR	97-98	435	470	900	890	1151
	98-99	463	527	1000	1125	1296
AMRITSAR	97-98	428	510	1700	800	1900*
	98-99	505	510	1700	890	2000
GURUDASPUR	97-98	460	460	1100	800	1200
	98-99	480	510	1100	900	1250
KAPURTHALA	97-98	448	530		890	1300
	98-99	470	550		890	1300
BHATINDA	97-98	445	510	1270		1350
	98-99	570	580	1300		1400
PATIALA	97-98	445	550	1325	750	1020*
	98-99	470	550	1325	750	1075
FARIDKOT	97-98	450	475	1325	1800	1075
	98-99	470	550	1600	1850	1275

As already talked about the farmers are so numerous and the commodity market so competitive – that farmers are compelled to sell the commodity at a price that just covers their production cost. In the total value chain as conceived here

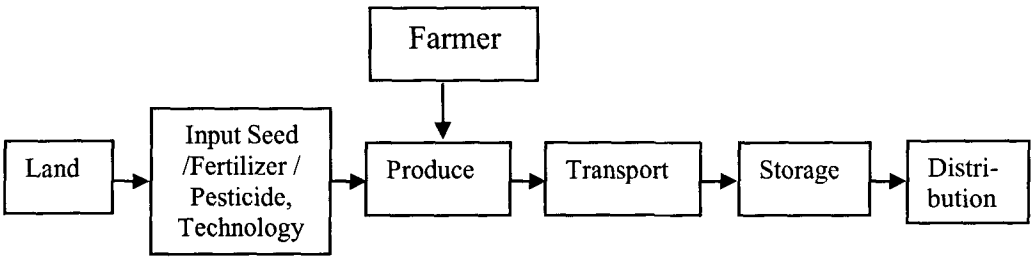

Figure 2: *The value chain for farming.*

The producers cannot capture the complete value or major share of the value for they are facing immense competition. Where in the landowner tries to capture a much higher value for they operate almost in a monopoly market. To some extent he can exert the supplier power for there is no substitute for the land. Similarly the Input suppliers strive for capturing higher share by using their position and capability as the suppliers of those special Inputs like seeds, fertilizers, pesticides etc. On the right side again transport storage distribution is again out of bound for the farmer. Sequel to this the share of the PIE retained by the producer is abysmally low. To capture a major share of the value the farmers or the agriculture Industry needs to vertically integrate some of the down stream or up stream activity. The idea of land co-operative could have captured much value by bringing the land under its control. Similarly down stream segments if not facing any competition will capture larger share than it's due. A sample data of some crop prices obtaining in Punjab is shown in Table - 1. Reader will appreciate the kind of large variation of prices eg. Rs. 450- 570 for paddy in 98-99. For Gram the price variation is Rs. 1000-1700. It is quite evident that this value difference is captured by some one other than the farmer. It is also evident that without suitable structural change only an IT platform cannot help capture the complete value neither it is intended. What is intended is structural change in the downstream and its integration through IT so that some more value can be retained by the farmer.

The model shown here tries to use the IT for assessing the demand in a particular market, supply in a particular node and on the basis of this it will allocate a particular market to a particular producer for a particular day.

A cluster of villages, which are taken to be production centers, will form an association (Village Producers Association VPA). This VPAS will be connected through net with every producer who can / will register his estimated supply everyday through the connectivity envisaged here. Thus VPA will gather total potential supply data of different itemized vegetables / grains and other agricultural produce. All VPA's thus will gather this data on daily basis and transmit it through the network to PA or Producers Associates which is an apex body in the taluka level. Consequently the PA will be in a position on daily basis to assess the supply potential of the clusters as defined.

In the same way the Mandis will send the demand data i.e. market demand for a particular commodity and its corresponding price to MA, which is again an apex body for coordinating the demand assessment. MA after receiving the complete detailed demand / actual sales figure from all MMAS will exchange this information with PA where a special software will analyze the demand in different market, supply available at different centers, cost of shipment and storage and allocate these supplies to different markets so that price of the particular commodity remains in a prefixed level or in other words prices do not fall / or rise alarmingly in any market. These allocations will be transmitted through VPA's to individual producers who will be guided to take his products to the market. In fact this information can be shared by the agencies providing logistics support so that the latter can organize the required logistics support.

This infrastructure will provide almost online guidance to every producer who will be told which market to carry the goods to at what expense and how much will be the price realization. In the event of a shortage / surplus condition, the system will decide about the storage requirement of produce at lowest cost and also will allocate the storage facility.

This model will help in

1) Guiding the producers to the market for a profitable sale.
2) Market will be well regulated by knowledge driven interfaces
3) Farmer's will have assured sale and enough guidance for future investment, in crops and other allied areas.
4) This will reduce fluctuation in income for the farmers for whom stability means a lot
5) Accurate demand and supply analysis and transmission of this analytical result to the concerned farmer's, market managers will also help in creating plans for removing surplus production or preventing production shortage.
6) This taluk network can be expanded to the district and even to the whole nation at a later date. This expanded network can use an ERP like model to plan the national production vis –a - vis resource requirement, resource utilization, shipping requirement and market fluctuation. This model will help in compiling the national requirement and lead to countrywide resource planning model (CRP) that will guide in establishing.

   a) Panchayat / zone / nationwide requirement of various agricultural produce
   b) Assess the quantum of land required for meeting the supply need.
   c) Give input for assessing energy requirement in terms of electricity, oil, fertilizers.
   d) Accurately estimate the water / irrigation requirement and help in planning the infrastructure.

e) Create a climate where every taluka can develop into a developed market even in remote areas of Arunachal Pradesh or Meghalaya
f) The expanded module may be connected with the meteorological observatories to predict accurately the monsoon vis-à-vis production of grains.
g) It will help in advising how much land should be kept out of cultivation in a particular season so that creation of surplus is avoided.
h) It will accurately assess the need for buffer and remunerative price for the farmer's so that agricultural import does not create a local problem of unsettling the farmers.
i) It may incorporate proper soil analysis far deciding the most productive zone for the particular agricultural commodity.

4. Scope of IT

As presumed in this article the scope of IT basically hinges on assessing the supply of individual producers and there by the market supply. Also by collecting data from the market it will be in a position to derive a demand equation. The economist will agree that demand determinants are varied in nature so are the supply determinants. Some of them can be jotted down as

A. Demand Determinants

a) Taste
b) Availability of substitute
c) No & price of complementary goods
d) Distribution of income / Employment Scenario
e) Income
f) Expectation of future price change
g) Governments policy for investment in infrastructure
h) Education of masses
i) Monsoon forecast
j) Monetary policy of the reserve bank

B. Supply Determinants

a) Cost of Production
b) Substitutes in supply
c) Profitability of goods in joint supply
d) Random shocks and other unpredictable
e) Aims of producers
f) Expectation of future price change

The demand equation can be written as the function of some on all of those demand determinants. Similarly the supply function can be framed in terms of supply determinants.

A real life equation of this nature defies human power of compilation if unaided by computers.

Formulation of these two equations in Taluk level and also finding out the equilibrium price for each commodity in every market is a job that will give enough shock & awe to any investigator. One can imagine the difficulty if some body tries to develop an equation that ill take cognizance of all factors emerging on the national scene. In fact doubt can be raised whether a computer of Deep Blue nature even can help this within a reasonable time. However, to begin with, a taluk or district level data can be analyzed and results can be shared with all the stakeholders.

This analytical help can augment export potential of some of the agricultural surpluses-be it pulse, or vegetable or even grains.

Through the application of IT, the benefits that can be shared with the producers are:

1) Producers query as to what he should produce, at what cost and on which land, can be easily answered by the central computer to the terminal of the producers.
2) Producer may secure data on the expected cash flow during a particular season that will enhance his financial viability.
3) Banks and other financial institutions can use these data to accurately determine the financial solvency of the farmers.
4) This will enhance transparency in production of some of the restricted cultivation like opium etc. so that supply in black market reduces.
5) This will help in creating proper nodal market with adequate wired infrastructure to assess and guide the production and distribution of agricultural goods.
6) This will in effect take way the distinction between a city market and a village market and in the process invite even the multinational organizations to move into new space.
7) This will help in accurately determining infrastructure requirement like roads and communication network.

5. Infrastructure:

Technicalities involved in putting this work plan into action are:

i) Networking all farmers and subsequently the clusters with a central node in taluka level
ii) Several taluka can be networked this way
iii) Markets need to be networked and connected to a central node in taluka level.
iv) Several taluka market nodes can be connected
v) Multifarious modes can be used to connect various nodes; these may be wired connections or even wireless satellite connection.

The software requirements will be

1) Gathering individual sales data and production / supply data so as to formulate the demand and supply equation based on which it can postulate the equilibrium price and consequently allocate supply for keeping the price at a particular level.
2) Transmitting the allocation to the central nodes, which in turn will decipher it and transmit further down and towards forecasting the demand for a particular agricultural commodity at a later date along with capacity planning for production and allocation.
3) Input requirement analysis may be done on the basis of aforesaid analytical model and this result can be shared by input suppliers wherein an additional software requirement arises.
4) Software requirement further arises for aiding in detailed crop planning by the individual farmer who can log on to the site and ask for the details after specifying his broad objective.
5) Local government can interact with this system through software to assess whether the present supply and demand position fulfills the requirement. Data can be analyzed for assessment of subsidy / tax to encourage / discourage certain production.
6) Additional software's can help individual farmer to forecast demand for his product and corresponding supply and investment need so that he can plan for longer period.
7) Software requirement will further arise with installation of e-governance mechanism that will establish further link with local government and the farm clusters.

Agriculture, the reader might have realized, is very close to a possible free market and as a result there is a high risk for the producers i.e. the farmer's vis-à-vis the consumers. It is quite possible that due to extra production, supply shoots up and consequently pull down the prices. Agricultural demand is not very price elastic and as a result it causes suffering for the producers who gets very low price sometime. Similarly consumers may have to pay a very high price in the face of shortage. A society cannot survive without helping maintain a reasonable price for the agricultural commodities. The reasonable price for the consumer happens to be the lowest price particularly for the consumers in the lowest income brackets who constitute nearly a fifth of the total population today.

The European union as well as the other developed countries have virtually granted minimum payment to the individual farmer so that their income remains stable. Through Mcsherry reforms WTO tried to persuade the EU to reduce the financial support extended to agricultural activities, Macshery reforms postulated a 27% reduction in support together with an agreement to keep 15% cultivable land fallow for the EU members. This regulation was necessitated to enhance the possibility of exchange of goods across the border of the EU. Another effect of the high support of EU to its agriculture was creation of surplus, which is usually diverted to poor countries killing the latter's capability to compete even in home grounds. These

jeopardizes the chance of survival of agriculture as an occupation in the third world countries. Today agriculture accounts for only 2 percent of the national income of the Great Britain. Indian economy has not gone through such a major structural change. Consequently survival of agriculture is a sheer necessity in this country and consequently to talk about the support for agricultural marketing cannot be a wishful thinking.

6. Conclusion

India is a country with a lot of inter regional diversity in agro climatic conditions. One end of the spectrum is held by gangetic basin of UP, Bihar, Bengal with rich alluvial soil, on the other side is the black cotton soil of western MP and Maharashtra ending at the rann of Kutch. The variegated landscape grows different crops. As such one region does not grow all crops, neither it consumes all that it produces. Hence exchange of goods is a necessity.

Recently interstate barrier on crop movement has been revoked. This will ease the crop or produce movement from one region to another. This will also unify the market and call for a huge logistic operations. While the application of modern technology will boost up the productivity – a model should be developed to remove part of the production from normal market to counter any price depression. This may necessitate ancillary processing industry that can add extra value to the raw produce like surplus potato can be diverted for manufacturing Vodka.

To make agriculture a paying proposition a constant attempt is necessary to prevent any market surplus. Only a regulated unified market supported by logistic and a decision support system as described here can help create an ambience where farmers won't have to commit suicide any more. A combination of various optimization software's, other IT tools like online information compilation and dissemination, database management systems, various statistical packages will help improve the profitability of the agricultural operation.

A networked resource-planning model will be a basic platform for all financial institutions, research laborites to make their contribution in this area. For India external trade accounts for nearly Rs. 25000 crore. In the new economic order initiated by WTO it will be necessary to review all the regulations and recreate new path for survival. As in industry, the practice of JIT may usher in agricultural production and marketing. Internet will not remain a retort only for show casing our capability. It will help in making right decision in the face of constraints.

Institutes like National Institute of Agricultural Marketing, Jaipur and National Institute of Agriculture Extension Management, Hyderabad are currently engaged in imparting training for agricultural marketing to students and staff of state / central agricultural departments. Some of them have initiated e marketing through launching

of websites. As ERP works for the industry the day is not far off when we talk of ARPM (agricultural resource planning and marketing) as a reality. The model described here will definitely help in raising agriculture from the slough of despair.

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