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Linking Smallholders via Contract Farming to the Export Markets

AGRICULTURAL MARKETING IN TRIBAL AREAS: SOME POLICY ISSUES

FLORICULTURE SECTOR DEVELOPMENT IN KARNATAKA: AN OVERVIEW

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EDITORIAL

According to Shashanka Bhide, senior research counselor at NCAER, "Improvements in technology induced productivity changes are more perceptible in agriculture than in the other sectors. In the other sectors, productivity changes may alter the product itself. In agriculture, it is the inputs that change as we continue to get the same rice and wheat."

In the Indian context this statement is of utmost importance since agriculture contributes to the Gross Domestic Product of the nation even though it may have shown a recent declining trend. This is because over half of our populace is still dependent on this crucial segment of the Indian economic setup which though in a transitional phase now, continues to portray some prominent agrarian characteristics.

Through our cover story, we have tried to delve on all aspects of contract agriculture and organic farming which was started by some Indian private sector companies for basmati rice with the help of farmers' cooperative in Haryana.

With the further opening up of the processed food segment, organic farming got a big boost and with it arose some questions too. Like, what is the minimum acceptable level of pesticides on farms, bad weather resistance etc. There can be no definitive answers to these. Nevertheless it can be said with absolutely certainty that use of innovative technologies in both input and output agriculture has gained much momentum.

Land reforms, is of extreme significance since it bears a direct link with the poverty scenario of India. Hence we have tried to highlight problems of land reforms and also its relationship with agricultural productivity. Here also, use of new technologies acquires immense importance. Therefore for economic prosperity, researching and strengthening of extension agriculture is essential.

While, all sectors of the field are either directly or indirectly linked, it can be undeniably said that the connection is very deep rooted. Especially because new innovations and technologies have touched Indian agriculture like never before, an elaborate insight into the concept of organic farming speaks volumes about innovative and technological prosperity in agriculture.

This sums up how the question of agriculture sector reforms needs immediate attention.

Our current issue can be read against this backdrop.

A.K. Garg
Editor-in-Chief

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Linking Smallholders via Contract Farming to the Export Markets

A Case Study of Organic Basmati Paddy

By Shiv Kumar*, Subhash Chandra Kanika** and Digvijay Singh Negi***

Introduction

As agricultural production has become a subject of economic liberalization and privatization, new regulatory forms have appeared with a focus on health, food, and environment. These new regulatory forms have been translated into a full legally vetted system of organic food production and certification from the inception of organic food production to end users in agro-food chains. Rapid growth and premium prices in the organic sector have attracted many farmers and merchants. As the organic food market has expanded, demands on certified organic production and processing systems have increased and the nature of the institution and certification processes have also changed. To meet compliance with foreign standards, the farmer has to apply certified inputs in adequate quantities and hence needs costly control systems. This has brought transformation of international organic certification as part of a global trend involving a shift from public to private regulation in the global agro-food system. Contract farmers are supported by Agribusiness Company in both input and output markets, besides getting legal, economic and communicative policy support. The free trade agreements, especially the World Trade Organization (WTO), have actually enabled the rise of certification systems that allow consumers to express environmental and social values through their purchases.

The label on organic product has guaranteed that it has been produced as per international codex and is of requisite qualities as stipulated in the contract. Quality is not a condition inherent in the product but is socially constructed, based on notion of environmental value and local identity. Then, these socially constructed values are reinserted into global markets to achieve market recognition through quality labels and certification with the intent of creation of market niches revolving around specific quality definitions. Henceforth, valorisation of quality within the market is produced via certification and oriented toward a sector of conscientious consumers willing to pay more if they are guaranteed that a price premium will actually reach producers. Acceleration of globalization process in the market attained importance due to the development of organic agriculture to build a trade relationship between northern consumers and southern producers who usually remain invisible in the market. This could become possible only when corporate agri-business companies started organising farmers into cooperatives. The company viz. Agrocel Industries (P) Ltd. and VeeTee Fine Foods (P) Ltd. started organic basmati contract farming with the help of farmers' cooperative (The Super fine Organic Basmati Growers' Association, registered at Kaithal, Haryana), with an area of around more than 2,500 acres spreading in around twenty five villages of Kaithal and Kurukshetra with membership of around 800 farmers.

This period of reorganization, when many things change simultaneously, is a challenge to farmers. For instance, the production of certified organic basmati paddy in the field under the auspicious aegis of Agrocel Industries (P) Ltd. and VeeTee Fine Foods (P) Ltd., where prohibited substances (synthetic fertilizers, herbicides, pesticides, growth regulators, fungicides etc.) have not been applied for a period of at least three years prior to obtaining certification. Farmers experience some loss in yields after discarding synthetic inputs and converting their operations from conventional systems to organic production. The degree of yield loss varies and depends on inherent biological attributes of the farms, the farmer's expertise, the extent to which synthetic inputs were used under previous management and also the state of natural resources. The farmer has to adjust the stocking rate to the natural carrying capacity of the farm and has to change the management

to maintain plant health with limited inputs available according to organic production standards. It may take many years to restore the ecosystem to the point where organic production becomes economically viable.

In general, a conversion from conventional to certified production is perceived and promoted as a viable opportunity to differentiate products and therefore, to achieve substantially higher prices. In this backdrop, it was aimed to quantify the differentials among yield behaviour and associated costs and returns structure, entailing from conventional paddy farming to organic farming, including in-conversion period. The information emanating from the findings of the study would help all stakeholders at field level in organics to understand the strengths and weaknesses of yield dynamics in the statutory transition period. Moreover, researchers would be able to describe and explain the process and possibly develop ways to manage the conversion more effectively.

Data and Methodology

Farmers across India have been practicing certified organic farming and have accumulated considerable knowledge and experience in this regard. Due to absence of information on comparative economics, crop yields and soil health impacts; mainstreaming of organic farming is being resisted. Scientific institutions may take years to provide answers to widespread apprehension that crop productivity under organic farming declines which might lead to food and income insecurity. Hence the farmers were selected as respondents in the sample survey for collecting longitudinal data.

This study pertains to the period 2002-2007 and is based on both longitudinal and secondary data. The analysis based on longitudinal data is superior to cross-sectional data in understanding socio-economic changes and the processes and causal mechanisms underlying that change. For conducting field survey, pre-tested schedule was used to elicit information from the respondents on cost return structure by using personal interview method. Secondary data over a period of time (2002-2007) on a number of farmers, volume of production (acreage under crop), quantity of inputs and rates etc. collected from official records of the Agrocel Industries (P) Ltd. and VeeTee Fine Food (P) Ltd. at Kaithal. Longitudinal data of each year by field survey and secondary data of the study period were cross checked to authenticate the validity of data and removing personal biases from the respondents.

For many farmers, the period of conversion to organic farming involves a far reaching reorganization of many aspects of their farm and is a big challenge to farmers. The changes in fixed costs are especially difficult to analyse because the decision to convert often also involves a decision to invest in parts of the farm, change in machinery, equipment, building etc. Some investments can be assigned exclusively to conversion and some can be designated as specific to conversion. Material expenses were based on the actual prices paid by the company. Manures were charged on application cost only. A land charge was excluded from the analysis since the type of farming system used would not influence land charges in the short term. Animal manures and other bio-inputs can effectively replace fertilizers to supply fertility needs during the transition phase. Assets are valued at the original costs minus accumulated depreciation as per cost accounting method up to C2 cost (all paid up cost of inputs and management charges) as per cost accounting method.

For this, we have chosen the organic basmati paddy farming scheme under the umbrella of Agrocel Industries (P) Ltd., at Kaithal district and Veetee Fine Food (P) Ltd., at Kaithal and Kurukshetra districts of Haryana. Basmati is selected because of requirement of specific agro climatic attributes of ecosystem and this ecosystem falls in the famous rice-wheat belt of the Indo-Gangetic plains of Northern India. This scheme is closely monitored by Agrocel Industries (P) Ltd. under the fully legally vetted system of organic basmati production. Organic basmati is premium product and grown by farmers for overseas markets.

Measured yields over a number of years from carefully matched pairs of organic and conventional farms of comparable size, soil and climate, imposes difficulties in establishing and maintaining comparative studies on a scale that would satisfy the requirements of both the holistic and reductionist approaches to reach production potential. The total sample size of 122 contract farmers was selected using stratified random sampling technique and followed by a lottery method for the selection of the name of farmers. Post Stratification was done to characterize the farmers as small, medium and large categories. An equal number of conventional basmati farmers were randomly selected from the adjoining areas for the sake of comparison.

Composition of farmers and distribution of area farmed organically and in-conversion by farm-size was computed by tabular analysis. Comparative yield for organic and conventional varieties of basmati paddy was computed as ratio of organic yield and conventional yield. This would give us the idea of yield gap between conventional and organic basmati paddy production.

The organic production scheme explicitly wants the final consumer to pay a higher price for basmati paddy production not only in recognition of the reduction in externalities but also to avoid negative externalities assuring him of the insertion of socially constructed values (eco-friendly, economic and socially equitable production) in certified organic production. In order to assess the entire economic benefit of organic basmati for the producer, premium prices were computed after standardization of prices.

CONTRACT FARMING: IMPACT

There has been a long debate regarding impact of contract production that inserts smallholders into domestic or export supply chains and the potential role in rural development and poverty alleviation strategies in developing countries. New regulatory models in agribusiness fulfil economic functions by establishing barriers to entry to the market niche and by establishing process of economic cooperation between actors around quality. Standardized and certified Good Agricultural Practices (GAP) in organics in accordance with international standards constitute in effect, mechanisms of market entry and exclusion, converting owner of business model into a source

of power for modifying and controlling the organic production processes. Participants in such schemes may be selected by scheme owners rather than be self-recruited. As the organic scheme goes on expanding the volume of organic basmati paddy production, with the passage of time more and more farmers get a chance to enter the fold of contract production. Hence, it becomes essential to see the composition of farmers across categories from conventional production to organic production under the umbrella of Agribusiness Company.

The distribution of area farmed organically and in-conversion by farm size is presented in Table 1. It clearly reveals that more than two-third of organic farmers in contract scheme is large and around 19 percent are medium but small holders' participation in schemes is less than 5 percent comprising nearly negligible share in the total land area. On the other hand, a little more than half of total farmers in in-conversion process of organic farming are large and having almost double the size of land area compared to counterparts after attaining full organic status in organic production scheme. The remaining two categories show almost a similar pattern in composition of farmers in in-conversion process of organic farming.

the fold of organic production. This might be due to two reasons; firstly, smallholders would not be able to spare some land organic paddy as per Codex and contract production mechanism due to compulsory family requirements and more risk aversion. Secondly, farmers in this contract scheme were selected by cooperatives on consultation with scheme owners rather than self-recruited. Therefore, this contract model is not proving to be an instrument to encourage development through commerce in smallholder-dominated agriculture in the study area.

The transition to organic basmati paddy production revealed the existence of a marked negative transition period, with regard to the quality and quantity of the crop produce, the standards adopted by the IFOAM, the demand of a statutory three- year transition period after the last conventional crop before a field can produce an organic crop. This transition is difficult for farmers to manage especially on input intensive and environmentally degraded farms, though farmers attempted with the help of the agribusiness company to return humus and soil fertility to their basic place in the biological balance. To sustain crop production and productivity per unit area, we need to build upon the

different other elements needed for plant growth, besides suppressing functions of beneficial micro-organisms. A crop does not differentiate whether nutrient elements are offered from fertilizers in a bag or from compost prepared by a farmer. Most soils have all the 30 plus elements needed for crop production but these are in bound form. Plants can't use elements as food unless converted to soluble form or available form. The job of solubilizing these elements is largely done by micro-organisms in nature, if they are given food in the form of plant biomass and enabling environment (e.g. moisture and temperature).

Transition effect could well be especially important in commercial organic agriculture. This is the effect of modifications of cultural treatments and some common key technologies to maintain soil fertility and produce high quality products. Besides this, there are different types of agriculturally beneficial micro-organisms in compost and other bio-inputs that have the ability to mobilize crop nutrients and even help in crop protection. When there is a large population of beneficial micro-organisms around, the scope of pathogens to take over is greatly reduced. However, with increasing knowledge and improvements, the system stability increases.

Table 1: Distribution of Area (Ha) Farmed Organically and in Conversion by Farm Size as a Percentage of Total Organic and in Conversion Area

Category	Organic Paddy			In-Conversion*		
	No. of Farmers	Farm size	Total area	No. of Farmers	Farm size	Total area
Small (<2ha)	5(5.56)	1.62	16.20 (01.25)	03 (13.64)	1.78	5.34(2.56)**
Medium (2-4ha)	19(22.78)	3.75	153.75 (11.91)	07 (31.82)	3.96	27.72(13.27)
Large (>4 ha)	76 (71.67)	8.69	1121.01(86.84)	12 (54.54)	14.65	175.80(83.33)
Total	100(100)		1290.96(100)	22(100)		208.86(100)

**Conversion includes farmers in conversion process of 1st year, 2nd year and 3rd year*
***Figures in brackets indicate the percentage of their respective values*

This concludes that current niche market mechanism is effecting limited access (exclusion) to smallholders in cooperatives to meet democratic and economic principles and availing of new opportunities with the expansion of contract organic production scheme. Simply to put, this scheme is not encouraging smallholders to come into

foundation of traditional knowledge by articulating modern science.

Bagged fertilizers used in conventional agriculture in soluble form, can be readily taken up by plants. Excessive and/or inappropriate use of NPK (Nitrogen, Phosphorus and Potassium) can cause imbalance in availability of

The category-wise comparative yield of conventional and organic basmati paddy production (weighted average of all varieties)1 of the study period is shown in figure 1. It reveals the extent of reduction in average yield of conventional to organic, including in-conversion period was between 10 to 23 percent across the categories and

found statistically significant. The relative yield, between conventional to organic basmati rice after attaining full organic status, is 90 percent. The average yield gap between the pairs- conventional paddy to first year, conventional paddy to second year, and conventional paddy to third year of in-conversion process, was 22, 25 and 17 percent, respectively. This confirms that yield reduction is highest in the initial two years of conversion but the yield gap starts narrowing after the second year of conversion and reaches around 10 percent at the end of in-conversion period. This conversion process has brought a transformation in building up of humus content depending upon microbial population and speed of degradation of biomass in the soil. On perusal of intra-farm categories, yields of organic basmati on small and medium farms, was higher than that of large farms. Correspondingly, the yield gaps on small and medium farms were lower than that of large farm. Yield gap and farm size were directly related due to better management and intensive care by the small and the medium farmers and vice versa in case of large farmers.

The expansion of the organic food market has forced agribusiness firms to identify and promote use of agro-technologies that are environmentally benign, and production and protection approaches based on traditional knowledge of farmers as per contract. The stoking rate and exiting rate of nutrients to plants by natural and artificial means decides the realization of yield potential existing in the plant variety. The realization of high yield potential in the organic crop depends on stocking of adequate nutrients in a balanced form in the form of organic certified inputs. The requirement for certification of standard organic farms have to adopt a new set of farming practices and technology to maintain soil fertility and product quality, have impacts on the production process, farm management and consequently the structure of production costs. To maintain the balanced budget of nutrients and energy flow with limited inputs available according to organic standards, farmer has to adjust the stocking rate to natural carrying capacity of the farm. The variable costs of entry of nutrients by organic resources and exit of artificial chemicals is presented in table 3.

Table: 2 Category Wise Yield (Quintal Per Ha) Comparison in Transition Phase (2002/03-2006/07)

Particulars	Small Farmer	Medium Farmer	Large Farmer	Average
Conventional	27.62	28.73	25.68	27.34
1st year	20.32	21.46	22.09	21.29
2nd year	20.01	20.01	21.06	20.36
3rd year	23.75	22.68	22.64	23.05
Organic	25.00	24.68	24.14	24.61

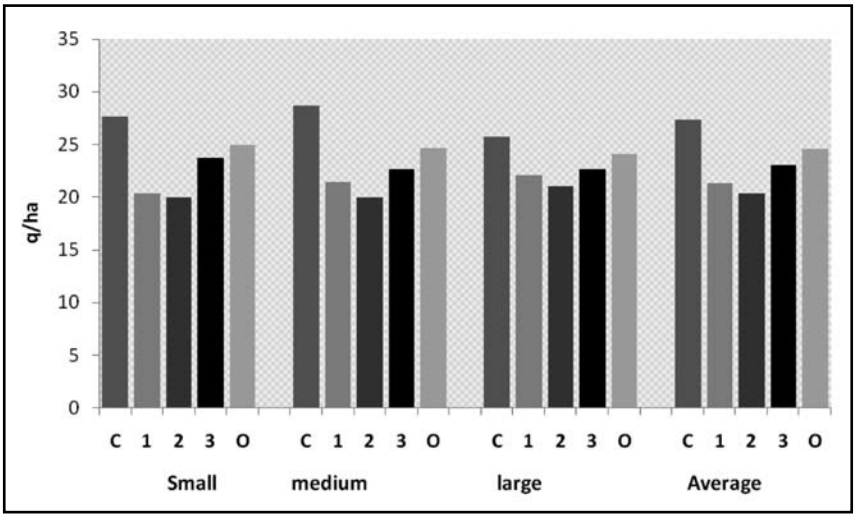

Figure 1 Category wise yield comparison in transition phase
Note: C= conventional, 1 = first year of conversion, 2 = second year of conversion, 3= third year of conversion and O = full organic (4th year)

Table 3 reveals that the average variable costs of stocking of nutrients and exiting of artificial chemicals to plant field in all categories of farmers were around Rs 6341 and Rs 1900 per hectare, respectively. The variable cost of stocking of nutrients by organic sources was the highest in third year of transition to organic and the average variable cost of exit of artificial chemicals was the lowest in the corresponding year in the transition period. The variable costs of both exiting of artificial chemicals and stocking of nutrients by organic sources, to basmati paddy field, was the highest and the lowest respectively in second year of conversion process. The difference of average variable costs of stocking nutrients by organic sources and exit of artificial chemicals was higher than that of average variable cost of conventional basmati paddy farming and found statistically significant. It could be concluded safely that average variable cost of in-conversion process of organic basmati paddy farming was higher than that of conventional basmati paddy farming. This might be due to compliance to Good Agriculture Practices (GAPs) as per Codex. Moreover, the anxiety triggered by recurring food crisis in societies of the global North led to construction of norms and standards and setup of institutions for applying and verifying these standards. This incurs extra cost for extra care and efforts as per contract regime.

Table 3: The Variable Costs of Entry of Nutrients by Organic Resources and Exit of Nutrients by Artificial Chemicals in Transition to Organic Basmati Paddy Production, Kaithal, Haryana

	Time horizon of conversion process (Rs per ha)									
	Conventional	1st year			2nd year			3rd year		
Category	Variable cost (Rs per ha)	Entry	Exit*	Variable cost	Entry	Exit	Variable cost	Entry*	Exit	Variable cost
Small (<2ha)	3865	6303	1880	4423	5624	2242	3383	6663	1390	5273
Medium (2-4ha)	3895	6416	1926	4490	5721	2314	3407	7013	1271	5741
Large (>4 ha)	3643	6304	1896	4441	5349	2154	3195	6279	1129	5150
Overall Average	3801	6341	1900	4451	5565	2237	3328	6651	1263	5388

** Item wise Computation of entry and exit rates of chemical and organic inputs is given in Appendix III.*

ORGANIC AGRICULTURE AND INCENTIVE PRICE STRUCTURE

Price premiums are inducement for new farmers to convert to organic agriculture. In general, a conversion from conventional to certified production is perceived and promoted as a viable opportunity to differentiate products and therefore, to achieve substantially higher prices (see FAO, 2004). The valorisation of quality of organic basmati rice depends on the confidence consumers give to it and on the information that reaches them and the confidence they have in the truth of that information (Carimentrand and Ballet, 2004). This reposed trust of the conscious consumers for willingness to pay more for the quality product. Transition to organic require new set of farming practices and technology that impacted the organic farming economically to raise productivity of low-input agricultural system and provide new market opportunities (FAO, 2004; GTZ, 2004). Notion among farmers and policy makers are that initial decline in crop yields did not result in food insecurity though some of the farmers suffered from income insecurity. The comparative gross return and net profit (incentive price structure) of conversion from conventional to organic paddy production is presented in figure 2.

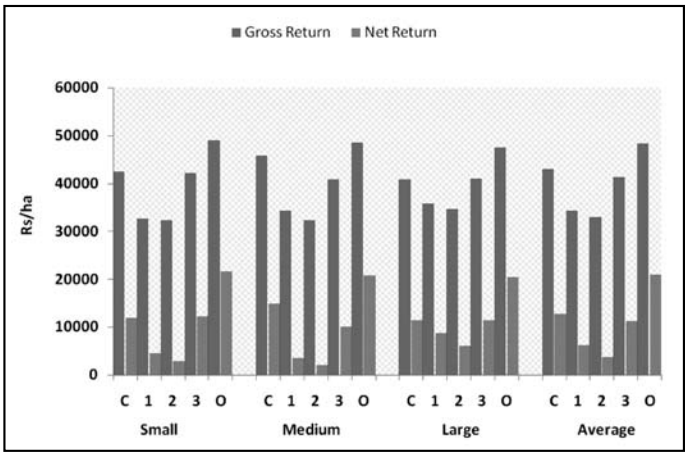

Figure: 2 Gross and net returns from conventional to full organic paddy production across farm categories

Note: C= conventional, 1 = first year of conversion, 2 = second year of conversion, 3= third year of conversion and O = fully organic

Table: 4 Gross and Net Returns (Rs Per Ha) from Conventional to Full Organic Paddy Production across Farm Categories (2002/03-2006/07)

Particulars	Small		Medium		Large		Average	
	GR	NR	GR	NR	GR	NR	GR	NR
Conventional	42460	11905	45822	14796	40772	11385	43020	12693
1st year	32648	4526	34244	3543	35746	8627	34212	6232
2nd year	32223	2850	32215	1974	34515	6036	32984	3620
3rd year	42161	12130	40797	10029	40953	11384	41303	11234
Organic	48950	21548	48390	20756	47485	20316	48275	20961

Note: - GR =Gross Return, NR = Net Return

The figure 2 reveals that comparative gross return and net profit of conventional paddy farming vis-à-vis in-conversion process declined drastically in initial two years. This is due to two main reasons- firstly, decline in yield after discarding synthetic inputs and converting operations of conventional system to organic production; and secondly, absence or very less incentive price on the sale product in in-conversion stage. This transition to organic is very taxing to farmer to manage without financial compensation, especially on small and medium farms. On the contrary, the comparative gross and net profit of conventional vis-à-vis full organic increases rapidly. This shows that farmer is suffering income loss in initial two years of conversion process to gain larger from niche market later on after attaining full organic status. This clearly indicates that this contract organic scheme is not technology driven but is mainly market driven.

Comparison of standardized values of market price and incentive price are presented in table 5. It clearly reveals that percent margin of organic basmati paddy over conventional basmati paddy was around 25 percent as shown in figure 6.3. This margin is major inducement for farmers to stay in organic paddy production model. Organic basmati paddy, which is predominantly grown under assured irrigated conditions in the study area, experienced very less risk (around 2 percent) in yield. Risk in inorganic paddy in the adjoining area was around 28 percent which is very high almost 14 times of risk in yield of organic basmati paddy. Organic basmati paddy grown under contract regime of organic firms which assured all timely quality inputs to farmers for crop production, organic firms' in return realised assured quality and quantity of the organic paddy.

Thus, we can conclude that risk in production fluctuation of certified organic paddy could be substantially reduced with the help and collaboration of organic firms with farmers using string of innovative institutions like contract farming. Risk of the margin percent price of organic paddy was around 15 percent. Though yield risk of organic basmati paddy was very low but margin price risk is almost 7 times of yield risk of organic basmati paddy (Table 6).

This might be due to pricing strategy adopted by organic firms. The strategy of organic firms is when open market price of inorganic basmati paddy shoot up then the organic firms priced organic paddy at relatively lower percentage basis and vice versa. Since the base of deciding the incentive price of organic basmati paddy was on prevailing price of open market of the inorganic basmati paddy.

Table 5: Comparison of Standardized Values of the Market Price and Incentive Price (2003-07)

Year (1)	Market price (2)	Incentive price (3)	Standardized values, Base 2003=100		Column (4) x 100 (6)	Column (5) x 100 (7)	Percent margin=IP (P)/ MPx100
			(4)	(5)			
2003	910.78	1257	1.00	1.38	100.00	138.01	27.54
2004	989.53	1343	1.09	1.47	108.65	147.46	26.32
2005	1362	1789	1.49	1.97	149.54	197.41	24.25
2006	1389	1750	1.52	1.92	152.51	192.14	20.63
2007	2250	2996	2.47	3.29	247.04	328.95	24.90

Source: Survey data

SAVINGS IN TRANSACTION COSTS IN INPUT AND OUTPUT MARKETS

The level of transaction cost in input and output markets of both organic and inorganic basmati paddy decides the ease and difficulties of business firms to carry out contract farming models. Moreover, transaction costs are influenced by the degree of asset specificity, uncertainty, amount of information involved, and the type of market structure. Transaction

Table 6: Risk in Market Price, Margin and Yield (%) 2007-08

Organic paddy	% risk*	Inorganic paddy	% risk
Marginal price	15.51	Margin	NA
Yield	2.21	Yield	27.67

**instability indicator as an index of risk = Standard Deviation of natural log (Yt+1/Yt). Yt is the yield/marginal price in the current year and Yt+1 represent the same in the next year.*

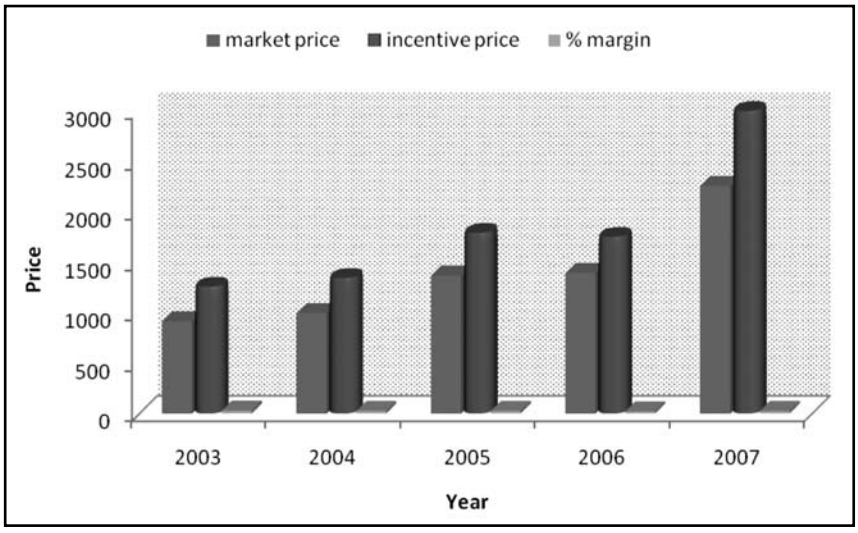

Figure 3: Comparison Of Standardized Values of the Market Price and Incentive Price (2003-07)

costs are high under conditions of high asset specificity, high uncertainty, high information involvement, or a non-competitive market structure. Thus, agribusinesses are likely to adopt contract farming under the above conditions in order to reduce transaction costs.

A comparison of transaction costs of various parameters of organic and inorganic basmati paddy production is presented in table 7. The transaction costs of 15 pairs of organic and inorganic input and output markets were computed and compared using paired t-test for testing statistical significance. All pairs except: 2 pairs viz. organic seed transportation vis-a-vis inorganic seed transportation and travel cost of organic output vis-a-vis travel cost of inorganic output were found non-significant because the market of organic output and inorganic output was at same place so distance covered by all farmers irrespective of category, was same. Organic seed was supplied by company to organic paddy growers at par with of conventional paddy seed. Though, the cost of organic seed production might be higher than that of inorganic basmati paddy seed but this arrangement is made by company for farmers hooked to contract farming scheme.

Technology for organic basmati rice production as per international codex is not universally available in market. All inputs used in production must go in production as per specification of the contractor. All the producers have to work under the dictates of the company. Hence the onus of making available all such essential branded input lies on the company. So the company on behalf of the farmers' co-operative have to make arrangement of such inputs from designated input suppliers in bulk. The bulk purchase of technology inputs and their prices are settled with suppliers by company with the consultation and active participation of farmers' cooperative. In particular, this section contains about the nature of input sharing between the grower and the organic firm. The proportion of cost of technology sharing by farmers and company for production of organic basmati paddy is presented in table 8.

The major components of organic basmati paddy production technology are: organic seed, organic bio-fertilizers, bio pesticides, neem-cakes and rock phosphates. These organic technology components form more than 80 percent of total input costs Out of total technology component cost, company is sharing around 19 percent. Rest of the cost of technology components (81 %) was borne by farmer himself. On the contrary, out of total cost of procedural activities, farmer is sharing around 19 percent whereas company is sharing around 81 percent. Pooling costs of both components of technology and procedural activities, sharing by farmer was around 74 percent and rest of the cost was borne by company. Merely, one fourth of total cost of technology sharing

Table 7: Transaction costs of organic and inorganic basmati paddy production

Pairs	Designation	Mean1	SD	Standard Error Mean	t-value	Sig. (2 tailed)
1	Organic distance seed-inorganic Distance seed	5.71	8.72	0.92	6.18	0.00*
2	Organic seed communication-inorganic seed communication	-12.95	13.73	1.45	-8.90	0.00*
3	Organic seed transportation-inorganic seed transportation	-0.45	17.19	1.82	-0.247	0.81
4	Org seed loading unloading-inorganic seed load.-unload.	-9.58	8.68	0.92	-10.41	0.00*
5	Org communication bio-fertilizer-in organic communication bio-fert	-13.57	12.86	1.36	-9.96	0.00*
6	Org bio-fertilizer travel cost-inorganic bio-fertilizer travel cost	-10.68	11.72	1.24	-8.59	0.00*
7	Org load bio-fert in org load bio-fert	-88.02	84.04	8.90	-9.88	0.00*
8	Org comm bio-pesticide in org comm bio-pesticide	-10.69	11.89	1.26	-8.49	0.00*
9	Orgtravel cost bio-pest in org travel cost bio-pest	-10.50	14.08	1.49	-7.04	0.00*
10	Org load bio-pest-in org load bio-pesticide	-8.28	8.60	0.911	-9.08	0.00*
11	Org visit cost output-in org visit cost output	-17.17	13.51	1.43	-11.99	0.00*
12	Org comm cost output	-11.06	14.07	1.49	-7.41	0.00*
13	Org delay payment-inorganic delay payment	-	623.14	66.05	-10.40	0.00*
14	Org weighing cost output-inorganic weighing cost output	0.71	1.43	0.15	4.67	0.00*
15	Org travel cost output-inorganic travel cost output	-0.60	9.07	0.98	-0.62	10.40

[1]negative sign are showing that transaction cost of organic is more than inorganic and vice- versa.
** Statistical significance at 1percent level*

by company was coming in the form of moving support only.

Summary and Conclusion

The transition process to organic basmati paddy farming involves restructuring and reorganization the farm business. This challenge requires development and designing a high degree of innovative planning and learning on the part of farmer that have some financial expenses. A paradigm shift of conventional agriculture to development of organic agriculture leads to adjust structure of agro-production and to strengthen competitive ability of organic product in the niche markets in the environment in globalization era. Although the demand of quality product is more than the supply and share of organic product at niche market is less than 1 percent (Rao, 2006).

As the scheme of organic agriculture under umbrella of Agrocel Industries (P) Ltd increases, the scope of entry of smallholders in the fold of contract farming is very dismal due to two main reasons: firstly, the farmers' participation is at the mercy of scheme owners rather than self-recruited; and secondly, implication of the changes in farmers' outlays on synthetic inputs and for reduction in yield when conversion take place. Moreover, no independent financial support to conversion when credit and domestic savings of small holders are generally too low that gives a realistic option for large scale operators in privately financed and coordinated contract farming scheme.

Transition to organic basmati production implies about 10 to 25 percent reduction in yield. The yield gap between the yield potential in crop realized by use of artificial chemicals and potential realized by use of organic sources on small and medium farmers are lower than that of large farms due to better management and intensive care of small and medium farms.

Yield gap between conventional and each year in in-conversion process of statutory three years existed very large. After full organic status, the yield gap between conventional and organic basmati paddy existed but less than the statutory three years in-conversion process. From perspective of incentive price structure, comparative gross return and net profit of conventional paddy farming vis-à-vis in-conversion process declines drastically in initial two years due to fall in yield and missing or less incentive price of product in the market. But the comparative gross return and net profit of conversion vis-à-vis full organic status increases rapidly due to moderate increase in yield and sharp increase in incentive price.

This organic contract scheme is not technology driven but mainly market driven. Farmer has no independent compensation support in-transition to organic process and is left to suffer income loss in initial two years in anticipation of larger profit after full organic status. Further, out of total technology component cost, company is sharing around 19 percent. Rest of the cost of technology components (81 %) was borne by farmer himself and reverse is the case in procedural activities. Pooling costs of both components of technology and procedural activities, sharing by farmer was around 74 percent and rest of the cost was borne by company. Merely, one fourth of total cost of technology sharing by company was coming in the form of moving support only. The company is making farmer free from certification procedural activities for linking them to markets under the umbrella of Agribusiness Company.

Table: 8 Cost of Technology Sharing by Company and Farmer in Organic Paddy Production (2007-08)

Technology components	Cost of technology components (Rs per ha)	Technology cost borne by farmer (Rs per ha)	Technology sharing by farmer (%)	Technology cost borne by company (Rs per ha)	Technology sharing by company (%)
FYM, green mauring & vermicompost	2000	1600	80	400	20.00
Rock phosphate & bio-organic manures	1080	970	89.82	110	10.18
Neem cake	400	298	74.5	102	25.5
Azadaractin & larvocel	756	646	85.45	110	14.55
Ovis & pseudomonas	299.42	150	50.10	149.42	49.90
Total	4535.42	3664	80.79	871.42	19.21
Procedural activities	**Cost of activities (Rs per ha)**	**Activity cost borne by farmer (Rs per ha)**	**Activity cost share by farmer (%)**	**Activity cost borne by company (Rs per ha)**	**Activity cost share by company (%)**
Field inspection and certification	386	Nil	0	386	100
Field layout: buffer zone	68	68	100	Nil	0
Extension & communication activities	127	41	32.29	86	67.71
Total	581	109	18.77	472	81.23
Grand Total	5116.42	3773	73.75	1343.42	26.25

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Importance of Land **Reforms in Indian Agriculture**

By **Dr J.C. Tarafdar***

Land reforms in India are associated with poverty reduction. Land can serve as an essential asset for a country to achieve economic growth and social equity. The reforms have been central to strategies to improve the asset base of the poor. It is a daunting task involving realignment of the forces of economic and political power. One roadblock to achieving this comes from the landholding class which is a strong resisting force.

Land related problems such as tenancy rights and access of land for subsistence farming continue to challenge India. The importance of this issue may be inferred from the fact that, notwithstanding the decline in the share of agriculture in the GDP, more than half of our population (nearly 58%) is dependent on agriculture for a livelihood. Over half (nearly 63%) own small holdings of less than one hectare, and large parcels of 10 hectares of land or more are with less than 2 percent. The absolutely landless and the nearly landless (those owing up to 0.2 hectares of land) account for 43 percent of the total peasant households.

The government-led land reforms were imbued with equity, social justice, and dignity unlike the new agenda which seems solely market-driven. The thrust, of course, is on increasing GDP but it is callous of externalities or costs associated with the process. Although land reform is among the government's list of priorities, the manner in which it is being undertaken and its impact on people, especially those already marginalized and now being further deprived of a stake in the system, raises a number of questions and prompts us to look for alternatives.

The present economic trends in India are negatively affecting land use and distribution in a variety of ways. Increasing the prominence of land reform challenges through public discourse is particularly important since more comprehensive agrarian reform has virtually disappeared from the popular, political and elite radar screen throughout the country. The growing size of urban-based population in India presents another challenge to establishing a national, comprehensive land reform policy. Most urban dwellers perceive land in a compartmentalized and detached way, and are unable to identify with the problems of the small or marginal farmers.

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Also, higher capital costs on the part of farmers drive the demand for borrowing from individual or credit institutions. As farmers' debts rise, along with the frequency of bankruptcy, they are forced to sell land to richer farmers or corporate houses and move into cities in search of other jobs. Equipped with few skills, they are now landless people living in slums.

From an economic perspective, the land-related question is linked to critical issues of agricultural productivity; for instance, agrarian relations, industrial uses, infrastructure development, employment opportunities, housing and other related issues. Each one of these aspects are crucial for enhancing national security by ensuring consistent

economic growth, food security, goods for export, and so on, which reinforce the country's economic strength, and therefore, its bargaining power in the international community.

In order to envisage viable land-use patterns that ensure high agricultural production along with social justice and environmental sustainability, land must be conceived within an equity-based development strategy that is economically viable, ecologically sound, socially acceptable and politically feasible through the creation of an institutional framework. The important challenges are: shifting economic imperatives; maintaining ecological balance;, preserving human diversity; and, complexities.

It is estimated that over 20 million people have been displaced by large projects (dams, rail, and roads) since independence, and a majority of these people have been from tribal groups. Driven away from their homes and with little or no resettlement assistance, they join the ranks of the landless. One attempt at correcting this ongoing marginalization was the official endorsement of five principles called 'Panchsheela' that valued the presentation of tribal land use patterns and land distribution practices. According to 'Panchsheela' or five principles tribal people have the right to develop tribal lands; and achievements in tribal areas will be judged according to human growth rather than productivity. The 'Panchsheela' principles have been most difficult to achieve, and in many ways they lack sufficient definition for use in policy making. The resource rich regions of the tribal people in India have been drawn into the plans for national development, with emphasis on industrialization and even higher productivity. Already, industries and irrigation schemes built on large dams have displaced many tribal people and transferred them into the landless migrant labour category The Indian government has presented tribal development schemes as a principal tool for poverty alleviation. However, these schemes have not taken into account the total dependence of the tribal population on land and their lack of other productive assets.

Resources controlled and managed as common property present yet another challenge in the context of land-related issues. Besides private or state-owned property, common property such as forests, grazing lands, water and fisheries can also be held and managed through a community resource management system. These are different from open-access land and natural resources. The system of common property operates through a complex system of norms – specifying rights of joint use, and common property regimes envisage tacit cooperation among individuals. On the counts of efficiency and equity, common property regimes traditionally existed as a viable proposition for more equitable national development. This has been especially true for a developing economy in which poverty and natural resource dependency have arisen out of a skewed distribution of resources.

In India, land reforms have been the policy agenda. These reforms have involved only limited efforts at land redistribution, mostly through legislated ceilings on land holding. Legislation aimed at regulating tenancies, reducing the power of absentee landlords and intermediates are more common. While the latter need not change the distribution of land holdings, they may improve tenants' claims to the returns from their land. This may also benefit the landless by raising agricultural wages.

The high incidence of poverty and post-independence land reforms make this an issue of considerable interest from a public policy prospective. The impact on poverty is likely to have been greater had large-scale redistribution of land been achieved; the partially best reforms which mainly affect production relations in agriculture can play a significant role in reducing rural poverty.

It becomes important to widen the scope of land reforms beyond the mere activity of redistribution of land or revisions of ceilings limits. In order to be effective, land reform must be seen as part of a wider agenda of systemic restructuring that undertakes simultaneous reforms in the sectors of energy and water. Deeper structural reforms will ensure that the exercise of land redistribution actually becomes meaningful, enabling small farmers to turn their plots into productive assets. Future efforts to quantify the empirical relationship between growth, poverty and redistribution will doubtlessly benefit even more from a detailed specification of how particular policy interventions are structured and implemented across space and time.

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Agricultural Marketing in Tribal Areas: **Some Policy Issues**

By **Subah Singh Yadav* and Satyaveer Singh****

Introduction

The dynamics of Agricultural Marketing, being multi-dimensional, looks into primarily the developmental policies as the focal theme of India's planning process: the process of driving the various segments of social structures to the path of progress. Based largely on the parameters of agricultural marketing and social development, there has been adequate recognition of the fact that certain variables of economic deprivation, especially in tribal belts, have not changed meaningfully in all these years despite our efforts, zeal, initiatives and resource layout. The expectations of developmental gains trickling down to the roots of the society are yet to materialise optimally. The target group, though may be dwindling in percentage terms, is becoming giant in absolute numbers. This is a challenge to policy makers. All these are to be faced with heavy constraints on fiscal, physical as well as natural resources. Tribal upliftment has been accorded top priority in the national agenda. Their progress and well being has been of central importance in our plans for national development and for the preservation as well as enrichment of our cultural heritage and artistic traditions. Since tribals constitute one of the sensitive segments of population, efforts for their acculturation and integration should not undermine their identity. Percolation of benefits of development to the tribal has been marked by problem and challenges. In spite of our consistent efforts for the last five decades, we have not achieved much as far as the integration of tribal in the national mainstream is concerned. Their economic right have not been protected in a right way. It is imperative to acquaint the tribals with the operational part of the various schemes launched for their overall socio-economic development; particularly those specific schemes under which financial assistance is provided through tribal cooperatives. In the light of the above, the basic purpose of this article is to establish such an institutional arrangement which can secure to the tribal farmers their reasonable share in the price paid by consumers.

Tribal Scenario

The tribal population of the country is more than 8 percent of the total

population of the country. Of the total tribal population, about 85 percent is living in Gujarat, Chhattisgarh, Maharashtra, Orissa, Rajasthan and West Bengal. The main clusters lies on the north-eastern periphery of Himalayas on the Meghalya Plateau, in Chhotanagpur, on eastern flanks of Aravalies and the Vindhyan Uplans in east Rajasthan and Madhya Pradesh and on the Sahyadri as well as Gujarat and in Himachal Valleys. Ecologically all these areas are hilly, forested or semi-arid and largely negative from the point of view of supporting settlements of agricultural communities on a large scale. Their life style is largely being conditioned by their eco system.

Tribal Farming

Agriculture is the mainstay of tribal economy both in term of quantitative contribution as well as labour input. Land is a prized possession in tribal areas. However, the scale of operation at all levels puts the constraints on professional, managerial inputs in the activity. The most vulnerable are the small and marginal farmers. Tribal economy and tribal culture is also reflected in their operations. But the agro-climatic conditions and the resource potentials vary considerably from one tribal area to another. On the one hand, there are rich regions with vast agricultural lands which are underutilised. Apart from these two extreme situations, there are a large number of tribal groups which are still at the food gathering stage; some other practise shifting cultivation; yet other may be pursuing settlement cultivations. This shows that there are endless variations in the tribal economy from shifting cultivation to settlement agriculture. But even settled agriculture is also the primary source of livelihood for a good number of tribal populations in India and this consists of terraced cultivation as wet rice besides upland cultivation. Most of the tribal are marginal farmers having an average size of 0.48 hectares as against 0.39 hectares for all social groups.

Forests are the second resources of tribals to draw their sustenance. The forest provides them food, fuel, fodder, fibre, warmth, apart from satisfying the deep rooted sentiments. Tribal are born in forests and also fold the inning their life in forests. So forests are their last succour in times of distress. Historically tribal and forests have existed in symbiotic harmony, forests being natural abodes of various tribal groups play a significant role in their life. It has been both a major means of livelihood for tribes and is significant part of their culture and socio-economic lifestyle. They feel pleasure is collecting various items of Minor Forest Produce (MFP) from the forests as an important source of earning and sustenance for their families' food budget. Such as accustomed collection of MFP supplement their meagre earnings from agriculture and other allied sources (Since the forests are endowed with rich variety of minor forest items). According to the studies conducted by the Ministry of Environment, in Bastar district of Chhattisgarh, in any family at least two adult members of the house would receive approximately Rs 1500/- out of the total annual income of Rs 1750/- through the sale of MFP. Similarly, a study in Gujarat region shows that between 25 percent of the elderly persons and 70% of the children from the tribal families go to forest for collection of leaf, vegetables, bamboo shrubs and other MFP for their domestic consumption as well as for marketing. It is estimated

that collection, processing and marketing of minor forest produce can generate a gainful employment of 10 million standard persons per year (Gaikwad John. 1986). The National commission on Agriculture in their report in 1976 observed that Minor Forest Produce has the potential to bring about an economic revolution for the Scheduled Tribe and the minor forest production, collection, processing and marketing can generate gainful employment for approximately one crore people every year. All these studies bear out the doctrine that tribal life is inextricably intertwined with the collection of MFP. It is noteworthy that most of MFP items have acquired commercial value due to national and international demand. By and large the trade of MFP has been in the hands of private traders who are primarily interested in the short term gain rather than development of trade on long term basis. Key areas such MFP has potential to bring about an economic revolution for tribal community.

Agricultural Marketing in Tribal Areas

The catalytic role that agricultural marketing system can play should be visualised beyond the horizons of the developed areas. Marketing has to play a vital role in taking care to improve the living conditions of even the most primitive people living in the remote tribal areas of the country with their own cultural pattern and primitive economies. A well organised institutional set up of agricultural marketing can create there healthy market environment to provide smooth channels for produce transfer, physical infrastructure to support the same; easy cash support to large tribal families of their scattered agricultural and MFP, besides creating marketing orientation among the farmers. Their casual approach to production strategies at the doorstep of farmers reverses the cycle of inadequacy by offering better price to the tribal farmer bringing him above mere subsistence level. The small and marginal tribal farmers and also the landless are trapped in the cycle of economic inadequacy. Under such circumstances, a well coordinated marketing network would strengthen the fibre of tribal life by making them conscious that what used to be their weakness so far could be converted into strength, by pooling their surplus produce, selling it through their own organisations.

The strategy of marketing especially with reference to the tribals in India evolve with the generation of surplus entailing further movements of goods from producers to consumers. The agricultural scenario in tribal economy is still tradition bound is not conducive for fostering fully developed permanent market centres. The problem of agricultural marketing is significantly related to the poor growth of agriculture. Marketing arrangements for the agricultural produce in the tribal areas are not adequate. The only type of economically feasible markets in tribal areas is traditional and undeveloped and some of them are working for a period of more than 100 years. It has been observed that 90 percent of the marketed surplus is sold in these village haats which are held for few hours in a week in a central village to serve a group of tribal villages and remaining 10 percent in the regulated markets. A large number of traders and their agents move from one market to another market covering long distances by overnight for the sake of purchasing and selling of a large variety of tribal commodities. The high proportion of sale of marketed surplus in village haats is due to conditional loans obtained from village money lenders, greater distance of villages from regulated markets, poor transportation, uneconomic size of marketed surplus, ignorance of advantages of regulated markets etc. Due to little monetisation, the tribal producers are forced to resort to barter system for a portion of their produce. The practice of large sale in village haats puts the farmers in a disadvantageous position because they receive un-remunerative prices for their produce.

Some Constraints

The marketing of tribal produce takes place at a small scale; the tribal bring only as much quantity of the produce as they think will suffice for procuring their requirements on barter. On the other hand, the trader knows that due to their economic backwardness, the tribals do not have sufficient money to purchase the articles of their daily necessities from a periodical market held in a central village on fixed days and as such they are left with no other source. In this distress situation, the tribal community is compelled to purchase the articles of their daily use as also to sell their produce at an unreasonable price determined by the unscrupulous traders. They have to get bound to a particular trader in one way or other. The entire tribal economy is under the control of intermediaries and petty traders. Hence the private traders

manipulate the marketing transactions in such a way that the tribal farmers are at a great disadvantage both while buying as well as selling. Often the small traders do not allow the farmers to reach their agricultural produce to the market and grabs it on the way itself. Even if the tribal farmer succeeds to have an access in the market, sometimes he has to hold bargains under compulsion. This way there is no end to his exploitation. They are exploited by such banned traditional methods as the use of false weights and measures, coupled with prevailing malpractices like unnecessary deductions and non payment of sale proceeds.

A major constraint of agricultural marketing in tribal area is that it is not properly connected by roads and tribals in such inaccessible area are at the mercy of traders and find marketing a distant dream. Though with the passage of time tribals have come forward to undertake planned development of their agriculture but in many cases due to take of adequate loan facilities they commit their crop to indigenous money lenders before it comes to the stage of harvesting. Hence, difficulty to do away with the middlemen who dominates the weekly markets still persists.

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Marketing Strategy

The impact of age old exploitation has been well realised by the Government and with a view to eliminate this greater emphasis is being given by the Government on the implementation of a series of economic programmes for strengthening institutional set up in tribal areas. The planned marketing structure which flashed on the horizon of tribal produce during the fifth plan has, by and large, come to stay. The Fifth Five Year Plan gave a real impetus and paved a path to provide an integrated credit cum marketing support to the tribals. Consequently, a large number of organised institutions came into existence, basically manifested with the objective of procuring MFP and other agricultural produce from the tribals at remunerative price and also to undertake at marketing functions not only to narrow down and price spread between the tribal producers and non-traditional consumers, but also try to eliminate the exploitative and non-functional margins of traders and commission agents from the tribal economy. The marketing and credit needs of the tribals are catered by a network of grass root level societies mostly located in States namely, Madhya Pradesh, Chhattisgarh, Bihar, Jharkhand, Maharashtra, Rajasthan and Orissa.

Any strategy of marketing for tribal areas should entail the element of effective control over the role of unorganised sector in providing marketing finance to the tribal which would in fact eliminate their unfair trade transactions with the tribal people. This is possibly the only way of providing adequate institutional finance to the tribals for different marketing activities and encouraging them to market their surplus agricultural produce at most appropriate time and at the highest available price through the existing organised marketing set up. There exist established needs to supply the daily requirement goods to the tribals at a reasonable, and, through a well-defined mechanism. The grass root societies which at present are not very much concentrating on this aspect may be strengthened suitably.

There also appears to be scope for setting up small scale processing units to help the tribal youths to gain some employment. This way the Tribal Development Corporation can get paddy milled and rice supplied to schools. The processing units should be installed at central places so that the collection centres can easily transfer the produce to the thrust points. Extreme care should be taken before and after processing of product which gives value to the money. The storing function of the product so processed is much more important, the product already being touched the stage of marketing. Likewise a fool proof packaging for maintaining the quality characters of the product. Packaging in sub standard packages results in degradation of the product and ultimately affects adversely the credibility in the market. The tribal should also be trained in the product collection.

A scheme of minimum support prices may be launched in tribal areas and private traders allowed to purchase the agricultural produce and minor forest produce at competitive rates. Such

arrangements will provide scope to tribals to choose the purchaser and they will get better prices due to competition. The organisations working with them should create confidence in them by supporting them during their "lean period" and protecting them from money lenders by providing immediate payment for their produce and if necessary by providing loan.

There is an emergent need to explain the tribals the right time of harvesting of the produce and the value of the product. They should also be advised devices of storage, appropriate place for storage; mode of transportation for easily transferring the produce from the place of production to the processing centre.

There is an imperative need of creating a chain of regulated rural haats in the tribal areas. This will facilitate the system of open auction and tribals may get better prices. This will easily eliminate the malpractices that unscrupulous traders may follow. A well integrated transport network and communication system for quick transportation of materials as well as of information is a prerequisite for enhancing the marketing system and quality of the product too. Assured public transport to tribal places is necessary for easy mobility of man and material. Initially, these areas should be linked with all weather road networks enabling their agricultural produce to flow from these areas to the nearby markets as well as to reach the extension services and institutional area.

A storing database on the production, availability and specification use of the tribal produce should be created. Though we have innumerable forest products, but unfortunately, many of them have not been made known to a lay man. Hence, information percolation system should be developed for the benefits of various sections of the society. This may be supplemented by a professional approach to the marketing of these products.

In the areas which are cut off due to heavy rainfall and are an uphill task, cooperative societies are the best way to cope up with such adversities. The performances of some of the cooperatives have been remarkable, particularly in preventing exploitation

at the hands of unscrupulous traders. Apart from marketing the farm outputs, these cooperatives can purchase their member's limited produce, pool them and market them as a single lot. Some of the problems which these cooperatives encounter can be tackled by Tribal Marketing Development Federation as the apex body of national level. Likewise, an innovative idea of group marketing is introduced in the areas where farmers are unorganised and marketable lots are very small, so that small lots could be pooled together and from a marketable lot of sizable quantity which could be sold through open auction system.

Tribal produce marketing can only be successful in near future when all the resources and technology are available with us. It has also been realised that strategy of tribal development will be possible when all the scientific approach are linked and integrated with social approach and bias with a definite will and enthusiasm.

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Furrow Irrigated Raised Bed (FIRB) System and Advantages of Raised Bed Planting in Crop Production

By **Vimal Pratap Pandey, Dr. Bhagwan Singh and Dr. H.P. Tripathi ***

Introduction

In bed planting systems, wheat or other crops are planted on the raised beds in ridge- furrow system. This system is often considered more appropriate for growing high value crops that are more sensitive to temporary water logging stress. Farmers often raise crops such as cotton, maize-soybean and wheat on the raised beds. However, the practice of growing rice, the major water-using crop in rice-wheat systems, on narrow raised beds was introduced only very recently in the Indo-Gangetic Plains (IGP) to reduce water use, conserve rainwater and improve system productivity. Recent work shows that system of raised bed planting of crops may be particularly advantageous in areas where groundwater levels are falling and herbicide-resistant weeds are becoming a problem. This tillage and crop establishment option also facilitates crop diversification and intercropping of wheat, chickpea and Indian-mustard with sugarcane, maize with potato, mint with wheat, rice with soybean, and pigeon pea with sorghum or green gram. Although bed planted wheat in rotation with soybeans covered more than 75 percent area under wheat by 1994 in Mexico, the South Asian rice-wheat farmers are still experimenting with this system of crop planting in the IGP to address issues of receding water tables, crop losses due to temporary water logging in monsoon season, declining factor productivity and for crop diversification. Results of farmer participatory trials indicate that significant water savings can be affected by planting rice (major consumer of irrigation water in rice-wheat systems) on raised bed besides improvement in crop yields.

Potential of Raised Beds

Change over from growing crops in flat to ridge-furrow system of planting crops on raised bed has the following consequences:

- Alters the crop geometry and land configuration
- Offers more effective control over irrigation and drainage
- Impacts on transport and transformations of nutrients
- Rainwater management during the monsoon season

In furrow irrigated raised bed (FIRB) system, water moves horizontally from the furrows into the beds (subbing) and is pulled upwards in the bed towards the soil surface by capillarity, evaporation and transpiration, and downwards largely by gravity. In determining the dimensions of the beds, factors such as spacing between tractor tyres, soil types, rainfall and groundwater conditions, salinity and irrigation water quality and requirements of crops grown in rotation are of prime importance. For developing a permanent system of bed planting, factors like irrigation and fertilizer management, crop residue management, inter-tillage and weed management must be considered together. For major soil types (sandy loam to loam soils) and crops (inter-row crop spacing requirement) grown in the IGP, ridge-furrow system, of 67cm width (top width of bed-37cm; and of furrow-30cm) is often considered appropriate. On the raised beds, two rows of rice, wheat, maize or chickpea are generally grown. Yields with 2 and 3 rows of wheat per bed are comparable, but lodging is greater with 3 rows per bed. It is advantageous to plant on beds a single row of pigeon pea or intercropped wheat/mustard with furrow planted sugarcane. For effective weed control, choice of crop cultivars that cover the surface early in the season is of great

Zero-tillage, stubble management and reduction of herbicide use are some of the possibilities that would maintain soil structure and organic matter content while reducing air and water pollution

importance. Crop cultivars are known to vary significantly in their performance on FIRB. Efforts are in progress to identify appropriate cultivars in rice, wheat and other crops which are better suited for raised bed planting system.

Advantages

There are several advantages associated with bed planting systems, which are as follows:

- Management of irrigation water is improved is simpler, and more efficient. On an average it uses, 30 percent less water than flat bed methods and improves crop yields by more than 20 percent.
- FIRB planting saves 30 to 50 percent wheat seed compared to flat bed planting.
- Better upland crop production is possible in the wet monsoon because of better drainage. Fertilizer efficiency can be increased because of better placement including top dress applications.
- Wheat seed rates are lower. Plant stands are better.
- Better tilling, increased panicle/ear length and bolder grain.
- Farmers can apply N and irrigation water at grain filling stage in wheat to improve protein content without lodging. Reduced lodging can have a significant, positive effect on yield, as many farmers do not irrigate after heading precisely to avoid lodging. As a result, water can become a limiting factor during grain filling, resulting in lower yields.
- Bed planting facilitates irrigation before sowing and thus provides an opportunity for weed control prior to planting. If pre-sowing irrigation is likely to delay planting, bed planted crops can be irrigated immediately after seeding.
- Weeds between the beds can be controlled mechanically, early in the crop cycle.
- Herbicide dependence is reduced, and hand weeding and rouging between rows are easier. The major weed species affecting wheat, Phalaris minor, is less prolific on dry tops of raised beds than on the wetter soil found in conventional flat bed planting. Raised beds make it easier to apply herbicides because the beds allow the person spraying to follow the line. They also make possible mechanical weeding and easier rouging or hand weeding.
- On raised beds, border effects allow the canopy to intercepts more solar radiation, it strengthens the straws, and the soil around the base of the plant is drier to prevent crop from lodging.
- In hand harvested rice fields, wheat crop can be planted in just one pass. The bed planter reshapes the beds and furrows, plants the crop and places fertilizer at appropriate depth into the soils along seed or between seed rows in the centre of the bed at 5-10cm depth. In combine harvested rice fields, crop straws can be incorporated into the beds using a shovel type furrow openers fixed on the front bar of the bed planter frame. In the absence of appropriate machinery, farmers partial layer interactions and less burn the rice straws before seeding of wheat.
- Yield potential is enhanced through improved nutrient-water lodging.
- Yield of rice transplanted on FIRB is comparable with traditional rice culture with as much as 25-50 percent saving in irrigation water.
- Compaction of soil is limited only to the furrows used as tramlines (tractor tracks).

Conservation Tillage with Raised Beds

Research into permanent bed systems started at CIMMYT, Mexico, is showing encouraging results. An additional advantage of bed planting becomes apparent when beds are "permanent", that is, when they are maintained over the medium-term and not broken down

for every crop. Making of permanent beds can help overcome constraints of resource depletion and pollution of existing systems. This has the potential of reducing cost of rice-wheat cultivation by 20-25 percent over conventional methods. In this system, wheat is harvested and straw is left or burnt. The beds are reshaped by passing a shovel down the furrows. The next crop (soybean, maize, sunflower, cotton, etc.) can then be planted into the stubble in the same bed. The advantages of this system are reduced costs, erosion control, reduced soil compaction and, perhaps, better soil physical structure over time.

Zero-tillage, stubble management and reduction of herbicide use are some of the possibilities that would maintain soil structure and organic matter content while reducing air and water pollution. With permanent FIRB, crop diversification and the ability to rapidly change crop choice, for example from rice to soybean or vegetables, is possible in response to market opportunities. After harvest, most farmers burn the crop residues and destroy the raised beds by tillage before forming new beds afresh for planting the next crop. They also apply 75% of the nitrogen fertilizers during tillage operations before planting. A long-term experiment, established in 1992 in north-western Mexico, compared this practice with "permanent" raised beds that were formed for the first crop and only superficially reshaped before planting subsequent crops. Fourteen crops, including seven spring wheat (planted in winter) two soybean and five summer maize crops had been raised on the plots by 1998-99.

Farmer's expressed reasons for adopting bed-planting of wheat.

- Improves irrigation water management
- Facilitates pre-seeding irrigation, thus providing opportunity for initial weed control prior to planting
- Allows better stand establishment
- Makes it possible to perform inter-bed mechanical weed control during early crop cycle
- Uses lower seed rate
- Reduced crop lodging
- Same beds are re-shaped for planting the succeeding soybean crop (with straw burning)
- Reduces herbicide dependence
- Facilitates hand-weeding

Table: Effect of Tillage Options on Plant Attributes and Yield of Rice and Saving in Irrigation Water

Tillage options	Experimental Area (Ha.)#	Spike Length(cm.)	Grains Per Panicle	Saving In Irrigation Water %	Grain Yield q/ha.
Transplanted rice on beds	12(20)	23.4	41.5	41.5	56.2
Direct seeded rice on flats	12(10)	21.9	17.8	17.8	56.9
Conventional tillage	14(35)	21.5	-	-	52.9

Percent saving in water (in terms of irrigation time) when compared to farmers' practice
 # Number of farmers' participation in trials in parenthesis

Table: Benefits of Bed Planting Observed in India

Crops	Yield on beds (t/ha.)	Yield on flat (t/ha.)	Water savings (%over flat)	Yield increase (% over flat)
Maize	3.27	2.38	35.5	37.4
Urdbean	1.83	1.37	26.9	33.6
Mungbean	1.62	1.33	27.9	21.8
Green peas	11.91	10.40	32.4	14.5
Wheat	5.12	4.31	26.3	6.4
Rice	5.62	5.29	42.0	6.2
Okra	34.4	29.1	33.3	18.2
Carrot	36.3	28.6	31.8	26.9
Radish carrot	34.7	26.7	29.4	30.0
Cabbage	33.0	27.8	26.8	18.7
Pigeon pea	2.2	1.5	30.0	46.7
Gram	1.85	1.58	27.3	17.1
Cauliflower	25.9	18.8	36.4	37.0
average	-	-	31.2	24.2

Precautions for FIRB Planting in Unfavourable and Marginal Environments

Alkali soils having high exchangeable sodium are slowly permeable. These soils need o be amended with gypsum, iron-pyrite and or other acid formers and leached before making raised bed. Gypsum should be mixed in surface 10cm layer of alkali soils and reaction products leached for several days.

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Strengthening Extension Architecture

By **Parveen Kumar** *

Introduction

The living legend of Indian agriculture, Dr. M.S. Swaminathan has aptly said that, 'if agriculture in India goes wrong than nothing in India has the chance of going right'. For agriculture to keep going in the right direction, the timely delivery of extension services is crucial. As extension personnel, the biggest concern for agriculture in India today, what I think is not only stagnation in production and low productivity but also lack of effective extension services in the country. The extension approaches in the country become systematic during the Green revolution era and thereafter with the introduction of Training and Visit system. The Training and Visit system was a brainchild of Israeli Engineer Daniel Benor and it proved highly successful in Israel, Thailand, Nigeria, Pakistan and other countries. The scheme was launched in India in 1974 firstly in the command areas and then later extended to other areas. The Krishi Vigyan Kendra (KVK) was another institutional innovation of Indian Council of Agricultural Research set up for disseminating the technology to the farmers. The first KVK was set up in 1974 at Pondicherry by Tamil Nadu Agricultural University (TNAU). The earlier programmes like Operational Research Project (ORP) and Lab to Land Programme (LLP) were integrated with KVK. KVK were envisaged as a platform for integration of extension efforts at the district level for sustainable agricultural production. Thereafter the Institute Village Linkage Programme (IVLP), Agricultural Technology Information Centre (ATIC) and many other programmes were started with the basic objectives of reaching out to the farmers. Presently Agricultural Technology Management Agency (ATMA) is going on in the country. But despite all this we have still been able to reach only 40% of our farming community. The rest 60 percent is still outside the reach of extension services. The problem is not with the programmes but somewhere it is the people's participation which is absent. KVK at the District level is having limitation of resources in terms of finance and functionaries. For a district body comprising of team of six scientists it is difficult to do justice with the entire District. As such there is an urgent need to strengthen the existing resources. This article is an attempt to find out some of the innovative approaches for strengthening the extension architecture and increasing its outreach.

Farmer's Organization: One of the drawbacks of Indian research system

has been that policies and programmes are made without participation of the farming communities. As a result of this seldom are the views of farmers taken into consideration. The lack of an effective farmers' voice acts as an impediment to agricultural development. The presence of strong and representative farmer's organizations and their formal recognition as partners in research and extension is therefore an essential basis for agricultural and rural development. The effective functioning of an agricultural research and extension system requires not a linear, but a triangular arrangement between research institutions, extension and teaching agencies and farmers' organizations. Farmer organizations act as pressure groups and ensure that their voice is heard at all levels from research and extension to policy formulation. Whether it is the development of agriculture or of rural society or the protection of environment, farmers play a vital role. A two-way dialogue therefore needs to be established between farmers, and other actors which determine the political, economic, legal as well as technological framework within which farmers operate. A strong network of farmer organizations help to extract out the best for the farming community in terms of timely delivery of extension services.

Farmer Led Extension: Farmer is the ultimate stakeholder in the agriculture production process. The earlier schemes like the T&V were based on top down approach and were supply driven. The technology was not provided on the basis of felt needs of the farming community. The farmer participation in the entire process of technology development and diffusion was almost nil. Therefore T&V lost track. Farmer led extension is an innovative approach in which farmer leads from the front. Over time, extension provision has been supply-driven, with little direct consultation with the farmers to whom the extension technologies, information and associated services are intended. The linear model of technology transfer (researcher - extension- farmers) has been the dominant approach to agricultural and rural development resulting in the delivery of technologies that have failed to alleviate farmers' problems. Recently, farmer-led extension approaches have come to be considered as appropriate for farmers' need. These approaches increase farmer's basic knowledge and ability to make their own choices and decision on particular technologies. Farmers assume a central role and become key players in technology identification, generation, adaptation and dissemination. Farmer association on cluster or block basis can than federate into larger ones. This helps in quick absorption of technology. Farmer Field Schools (FFS) are a unique example of Farmer led extension. It is a way of disseminating technical information based on a participatory and interactive learning approach. Through farmers' field schools, small-scale producers form groups, learn new methods and share useful experiences, to make the most of their agricultural potential. All learning is a group activity and field based which empowers farmers to solve their field problems by themselves. It helps in fostering participation, interaction and joint decision making. Farmers learn by carrying out activities through constant observation. The Farmer Field School is a form of adult education, which evolved from the concept that farmers learn optimally from field observation and experimentation.

Para Extension Workers: To overcome the shortage of extension functionaries the concept of Para extension workers is a useful option. India has about six lakh villages and about 2.5 lakh Panchayats. About 80 percent of the members of the Panchayat are farmers. A certain number of volunteers can be picked from each Panchayat and trained by the nearest KVK or the state department of Agriculture regarding the agricultural technology in agriculture and allied fields. Their field of work can be expanded to include other rural development programmes also. A classical example of this is the Poorest Area Civil Society in Jharkhand and other adjoining states where a group of volunteers riding in their bicycles go from village to village and carrying MGNREGA job cards, Postal insurance forms and all other literature related to various developmental schemes. It is an innovative exercise in the sense that instead of peoples going to the institution, it is the institution going at their doorsteps to avail various services.

Input Dealers: Input dealers constitute the important stakeholders in dissemination of agricultural technology to farmers. This was vindicated by the study of National Sample Survey Organization (NSSO) which reported that that out of 40 percent farmers who access information on agricultural technology, 13 percent contacted agri-input dealers. India has around 3 lakh agri-input dealers, out of which around 85 to 90 percent do not have any formal education. For these three lakh input dealers having immense importance in disseminating

agricultural technology National Institute of Agricultural Extension Management (MANAGE), Hyderabad has started a One year Diploma programme in Agricultural extension services for input dealers (DAESI). It can go a long way in increasing the outreach of extension services. Instead of reaching out to 12 crore farmers we can easily reach 2.5 lakh input dealers. Dhanuka, a leading pesticide company had earlier sponsored 50% fee of a batch 40 Agri-input dealers of East Godavari District, AP, for a one-year Diploma in Agricultural Extension Services for Agri Input Dealers. Similarly many other private firms can sponsor some of the input dealers operating in their area for undergoing one year training regarding agricultural extension services.

Agri Business Professionals: Every year thousand of agricultural graduates and post graduates come out of the various agricultural universities. A very small percentage of these get employment. The government of India has started Agri clinics and Agri business Center (ACABC) scheme for these unemployed graduates. The scheme aimed at providing two months training to the graduate and post graduates to set up their own enterprises. The purpose of the scheme was dual. One was to strengthen the extension and the second was to turn job seekers into job providers. Available data shows that ACABC have trained 22,000 agricultural graduates and 8099 among them have established 32 categories of activities in different parts of the country. These 8099 peoples have created 50,000 jobs in rural India, covering around 2.5 lakh villages and around 50 lakh farmers. If we are able to make all these trained graduates to establish their own venture, it will be a big boost in increasing the outreach of extension services besides creating a lot of employment opportunities. The final year agriculture students can also contribute a lot by participating in their respective extension networks.

Information and Communication Technology: ICT today is emerging as an important source for transfer of technology. It has all the potential of replacing human efforts. The National Commission on Farmers has also recommended setting up of rural knowledge centres for providing timely services to the farmers. All our extension efforts have been directed towards production with no emphasis on the marketing aspect of the produce. Farmers had little knowledge of the market. As a result of which he was exploited by various intermediaries. ICT is one such tool which can provide market intelligence to the farmers. Indian Tobacco Company's e choupals, M.S. Swaminathan Warna village Project, Tata Kissan Kendra are some of examples of successful application of ICT for providing timely services to the farmers. The Short message service (SMS) by mobile companies can also address issues like providing weather and marketing updates to the farmers and fishermen in coastal areas to plan for fishing services.

Female Extension Workers: Women are an important stakeholder in Indian agriculture. They are important partners in most of the farm operations ranging from sowing to harvesting and processing, but have little access to inputs, assets and services. Regarding the contribution of women a recent report of the Food and Agricultural Organization (FAO, 2011) is an eye opener. Had they enjoyed the same access they could have boost the yield by 20-30 percent raising the overall agricultural output in developing countries by 2.5 to 4 percent. This could have further lessened the number of hungry people in the world by 12-17 percent. Today India has 120 million farmers and this number can be an exactly multiplied by two if farm women are also to be considered. Available figures show that only 5 percent of extension services have been addressed to rural women, while no more than 15 percent of the world's extension agents are women. In addition, most extension services are focused on cash crops rather than food and subsistence crops, which are the primary concern of women farmers and the key to food security. Therefore, if we are to really strengthen the extension architecture we have to train a cadre of women extension personnel at the grassroot level. This cadre should be entrusted the responsibility of ensuring last mile delivery of input services to the female farmers.

Agricultural extension has to change the approach. It has to lay focus on establishing farmer's organizations; crop and commodity based associations and finally linking them to the markets so as to empower them. At the same time only those who have the passion for extension must shoulder this responsibility and go to the farming community with innovative ideas and ways.

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Evaluation of Adoption of Recommended Technologies for Sorghum in Buldhana District of Maharashtra – A Principal Components Analysis Approach

By **Dr. Devyanee Nemade * and Rachana Wankhade ****

Agricultural production has increased manifold due to the introduction of high yield varieties along with the use of improved production practices. In kharif Sorghum crop many technologies were evolved by the Dr. Panjabrao Deshmukh Agriculture University (Dr. P. D. K. V). It is important to know that at what extent these technologies have been adopted by the farmers on their field and what constraints they are facing in adopting the technologies. Effect of the adoption of these technologies on production and economics of production also needs to be investigated.

The study pertains to Buldhana district and in this district two tehasil were selected i.e. Nandura and Shegaon tehasils. In all 120 farmers were selected. The study was based on primary data and collected by survey method in the year 2009-10.

At high adoption level (above 70%), the gross returns and net returns at Cost 'A' and cost 'C' were the highest. The benefit-cost ratio was the highest in high level of adoption groups at cost 'C' (1.47).

Introduction

In India, Sorghum ranks third in area and production after rice and wheat, with 10.39 Million ha area, under its cultivation, which accounts for 24.40 percent of the world sorghum area. However, the yield per hectare of sorghum in India is only 852 kilogram per ha. which is lower than the world average yield of 1391 kg per ha. Maharashtra, Karnataka, Madhya Pradesh, Andhra Pradesh and Tamilnadu are the top five sorghum-growing states of India. These five states together account for about 91 percent of the country's total Sorghum production.

Agricultural production has increased manifold due to the introduction of high yield varieties along with the use of improved production practices. For kharif jowar crop many technologies were evolved by the Dr.Panjabrao Deshmukh Agriculture University. It is important to know to what extent these technologies have been adopted by the farmers and what constraints they are facing in adoption of the technologies. Effect of the adoption of these technologies on production and economics of production also need to be investigated. The new agricultural strategy involved the adoption of the various recommended improved practices for optimizing the

yield level. Keeping in view these technologies on production and economics of production also needs to this study has been undertaken with following objectives.

1. To study the extent of adoption of technologies.
2. To study the economics of production at different level of technologies.

Methodology

The Buldhana district was selected purposively. From this district, Nandura and Shegaon tahasil were selected for the study.

The farmers were categorized on the basis of land holding. In all 120 farmers were selected i.e. 48 farmers each were selected under Small (0 to 2 ha land) and medium (2 to 4 ha land) groups and 24 farmers from large group were selected (4 ha and above), on the basis of land holding.

Four tahsil viz; Akola, Murtizapur, Nandura and Shegaon were selected. From each tahsil six villages were selected and from each village 10 farmers were selected. Thus, in all the sample of 120 farmers were selected. The list of selected villages and farmers is given below.

The study was based on primary data. The primary data was collected for the year 2009-10 by survey method through personal interview.

Analytical Techniques

Technologies of State Agricultural University, Akola

The technologies developed by Dr.Panjabrao Deshmukh Agriculture University, Akola for kharif jowar were considered. These technologies pertain to the following:

1. Seed Rate 2. Nitrogen (Basal Dose) 3. Phosphorus 4. Potassium 5. Nitrogen(Top Dose) 6. Hoeing 7. Weeding 8. Plant Protection

The technologies for Kharif Sorghum are presented in Table 1.

Table 1: Recommended Technologies for Kharif Sorghum

S.N.	Technologies	Units	Recommendation
1	Seed Rate	Kg/ha	7.5 to 10 Kg/ha
2	Nitrogen(Basal Dose)	Kg/ha	40
3	Phosphorus	Kg/ha	40
4	Potassium	Kg/ha	40
5	Nitrogen(Top Dose)	Kg/ha	40
6	Hoeing	No.	2 to 3
7	Weeding	No.	2 to 3
8	Plant Protection	Rs.	Thirum, Carbenzium etc.

Extent of Adoption of Technology

Actual level of adoption of each item of technology on farmers field was identified. Using the recommended technologies developed by SAUs, efficiency of each technology were calculated. All efficiency score were scaled down to zero to one and all the groups of farmers were classified as zero adoption, greater than zero to 0.5, 0.5 to 0.8 and 0.8 to 1.

$$\text{Extent of Adoption} = \frac{\text{Actual Adoption}}{\text{Recommended Technology}}$$

Development of Composite Index

The components of technology recommended by the University for jowar crop expressed in terms of adoption score (X1, X2 …….. X8) were utilized for developing composite index of technology adopted. A composite index is a single numerical value representing the net adoption of all components of technologies whose values lies in between 0 and 1.

The Principal Component Analysis (PCA) approach was used for developing composite index. The principle components based on 8 x 8 co-relation matrix of 8 components of technology were computed. A set of 8 principal components explaining 100 percent of total variation of all components of recommended technology were considered.

Consider Eight Eigen vectors in the form of 8 x 8 matrix where rows represent variables and columns represent Eigen vectors from which weight (wi) coefficient of component of technology say Σ was determined as under.

$$Wi = \frac{Mi}{\Sigma Mi}$$

Where,

Wi = Weight

Mi = Maximum element in ith row

Σ Mi = Sum of maximum element in ith row.

The components of technologies recommended by the University for Kharif Jowar were identified and then the level of adoption of each component of recommended technology by the farmer is expressed in terms of adoption scores and same is utilized for developing composite score of technology adoption. In this process, weights were properly scaled so that the composite scores lie in between 0 and 1. Composite scores were computed for all selected farmers using the following function.

The estimated composite adoption score (Si) is;

Si = W1X1 + W2X2 + ---------- + W8X8.

Where,

1. X1 = Seed Rate, 2. X2 = Nitrogen(Basal application), 3. X3 = Phosphorus, 4. X4 = Potassium, 5. X5 = Nitrogen(Top dressed), 6. X6 = Hoeing 7. X7 = Weeding, 8. X8 = Plant Protection

This provides adoption index (of all components of technologies) for each cultivator.

The composite index obtained in the process lie in between 0 & 1. The net adoption of recommended technologies expressed in terms of composite score of the total 120 was followed, tabulated and classified into three groups as follows:

i. Low level adoption (30 to 50%)

ii. Medium level adoption (above 50 to 70%) adoption

iii. High level adoption (above 70%).

Economics of production at different level of technology adoption

After developing composite index of adoption, farmers were classified into low, medium and high adopters on the basis of composite index and economics of production at different levels of technology adoption was worked out.

To accomplish the objectives of the study, cost concept i.e. Cost 'A', Cost 'B' and Cost 'C' were used to estimate per hectare cost of cultivation of Kharif- Jowar.

Returns

The yield of main product and by-product was considered for this purpose.

i. Farm business income = Gross returns – Cost 'A'

ii. Family labour income = Gross returns – Cost 'B'

Net income = Gross returns – Cost 'C'

iii. Benefit Cost ratio at Cost 'A' and Cost 'C' were calculated as under,

iv. Benefit Cost ratio at Cost 'A' $= \frac{\text{Gross returns}}{\text{Cost 'A'}}$

v. Benefit Cost ratio at Cost 'C' $= \frac{\text{Gross returns}}{\text{Cost 'C'}}$

Results and Discussion

Extent of Adoption of Technology

The extent of adoption of different technologies is presented in tables i.e. Table 2(a) to Table 2 (i).

Table: 2 (a) Extent of Adoption of Recommended Technology: Seed Rate

S.N.	Efficiency	No. of Farmers			
		Small	Medium	Large	Total
1	0	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
2	Above 0 to 0. 40	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
3	Above 0.40 to0.80	0 (0.00)	9 (18.75)	0 (0.00)	9 (7.50)
4	Above 0.80 to 0.1	48 (100.00)	39 (81.25)	24 (100.00)	111 (92.50)
Total		48 (100)	48 (100)	24 (100)	120 (100)

Note: Figures in parentheses indicate percentage to the total.

As per the recommendations of Dr. Panjabrao Deshmukh Agriculture university (Dr. PDKV) Akola, seed rate of Kharif Sorghum is 7.5 to 10 kg/ha. From table 2(a), at overall level, it is observed that in farmers group above that 92.5 percent farmers had adopted the above 80 to 100 percent level technology while 7.5 percent farmers had adopted the above 40 to 80 percent technology efficiency.

Recommended dosage by the university for NPK was 40: 40: 40 kg/ha. The fertilizer recommendation used as basal application in different groups is presented in Table 2(b) to 2(d).

Table: 2(b) Extent of Adoption of Recommended Technology: N Basal Doses

S.N.	Efficiency	No. of Farmers			
		Small	Medium	Large	Total
1	0	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
2	Above 0 to 0. 40	10 (20.83)	22 (45.83)	3 (12.50)	35 (29.17)
3	Above 0.40 to0.80	20 (41.67)	18 (37.50)	11 (45.83)	49 (40.83)
4	Above 0.80 to 0.1	18 (37.50)	8 (16.67)	10 (41.67)	36 (30.00)
Total		48 (100)	48 (100)	24 (100)	120 (100)

Note: Figures in parentheses indicate percentage to the total.

From Table 2(b) and 2(c), it is observed that the 40.83 percent farmers had adopted above 40 to 80 percent technology at overall level. It means farmers were applied more basal dose of Nitrogen in field.

Table: 2(c) Extent of Adoption of Recommended Technology: Phosphorus

S.N.	Efficiency	No. of Farmers			
		Small	Medium	Large	Total
1	0	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
2	Above 0 to 0. 40	5 (10.42)	7 (14.58)	4 (16.67)	16 (13.33)
3	Above 0.40 to0.80	34 (70.83)	36 (75.00)	15 (62.50)	85 (70.83)
4	Above 0.80 to 0.1	9 (18.75)	5 (10.42)	5 (20.83)	19 (15.83)
Total		48 (100)	48 (100)	24 (100)	120 (100)

Note: Figures in parentheses indicate percentage to the total.

In case of Phosphorus 70 percent farmers had adopted above 40 to 80 percent technology and nearly 16 percent farmers had adopted above 80 to 100 percent technology.

Table: 2(d) Extent of Adoption of Recommended Technology: Potash

S.N.	Efficiency	No. of Farmers			
		Small	Medium	Large	Total
1	0	13 (27.08)	8 (16.67)	3 (12.50)	24 (20.00)
2	Above 0 to 0. 40	29 (60.42)	38 (79.17)	16 (66.67)	83 (69.17)
3	Above 0.40 to 0.80	6 (12.50)	2 (4.17)	5 (20.83)	13 (10.83)
4	Above 0.80 to 0.1	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Total		48 (100)	48 (100)	24 (100)	120 (100)

Note: Figures in parentheses indicate percentage to the total.

From Table 2(d), it is observed that Potash at overall level 69.17 percent farmers had adopted above 0 to 40 percent technology efficiency. There was no farmer in the Above 80 percent technology application of potash.

Table: 2(e) Extent of Adoption of Recommended Technology: N Top Doses

S.N.	Efficiency	No. of Farmers			
		Small	Medium	Large	Total
1	0	5 (10.42)	3 (6.25)	2 (8.33)	10 (8.34)
2	Above 0 to 0.40	22 (45.83)	21 (43.75)	2 (8.33)	45 (37.50)
3	Above 0.40 to 0.80	15 (31.25)	18 (37.50)	13 (54.17)	46 (38.33)
4	Above 0.80 to 0.1	6 (12.50)	6 (12.50)	7 (29.17)	19 (15.83)
Total		48 (100)	48 (100)	24 (100)	120 (100)

Note: Figures in parentheses indicate percentage to the total.

Recommended dosage of Nitrogen for top dressing after one month of sowing, is 40 kg/ha. It can be seen from table 2(e) at overall level 8.34 percent farmers had not applied the top dressing nitrogen at all. In large group, 54.17 percent farmers had adopted above 40 to 80 percent technology.

Table 2: (g) Extent of Adoption Of Recommended Technology: Hoeing

S.N.	Efficiency	No. of Farmers			
		Small	Medium	Large	Total
1	0	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
2	Above 0 to 0. 40	31 (64.58)	29 (60.42)	13 (54.17)	73 (60.83)
3	Above 0.40 to 0.80	17 (35.42)	19 (39.58)	11 (45.83)	47 (39.17)
4	Above 0.80 to 0.1	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Total		48 (100)	48 (100)	24 (100)	120 (100)

Note: Figures in parentheses indicate percentage to the total.

From Table 2(g), it is observed that in case of hoeing 60.83 percent farmers had adopted above 0 to 40 percent technology. Above 80 to 100 percent technology was not adopted by any of the groups.

Table: 2(h) Extent of Adoption Of Recommended Technology: Weeding

S.N.	Efficiency	No. of Farmers			
		Small	Medium	Large	Total
1	0	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
2	Above 0 to 0. 40	24 (50.00)	19 (39.58)	8 (33.33)	51 (42.50)
3	Above 0.40 to0.80	24 (50.00)	29 (60.42)	16 (66.67)	69 (57.50)
4	Above 0.80 to 0.1 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0
Total		48 (100)	48 (100)	24 (100)	120 (100)

Note: Figures in parentheses indicate percentage to the total.

From Table 2 (h) it is observed that in case of weeding near about 50 percent farmers had adopted 40 to 80 percent technology.

In case of Plant Protection recommendation, farmers who used insecticide they got score one and those who did not used it get the score zero.

Table: 2(i) Extent of Adoption of Recommended Technology: Plant Protection

S.N.	Efficiency	No. of Farmers			
		Small	Medium	Large	Total
1	0	39 (81.25)	33 (68.75)	18 (75.00)	90 (75.00)
2	Above 0 to 0. 40	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
3	Above 0.40 to0.80	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
4	Above 0.80 to 0.1	9 (18.75)	15 (31.25)	6 (25.00)	30 (25.00)
Total		48 (100)	48 (100)	24 (100)	120 (100)

Note: Figures in parentheses indicate percentage to the total.

It can be seen from Table 2(i) that in case of spraying, that 81.25 percent of small farmers had not used any pesticide. Only 18.75 percent of small farmers had adopted above 80 to 100 percent efficiency level of technology adoption.

From above different technology adoption, it can be concluded that, in case of level of technology of Seed rate, 88 percent farmers had adopted the seed rate above 80 to 100 technology. In some cases farmers had used more seed rate as compared to recommended doses and few farmers have adopted low seed rate.

Distribution of Farmers According to Composite Adoption Index

In the methodology paragraphs, we have explained how the Composite Adoption Index was developed. On the basis of technology adopted, the farmers were categorized under low, medium and high adoption groups as under.

Table: 3 Distribution of Farmers on the Basis of Composite Index

S.N.	Ranges of Composite Adoption Index	No. of Farmer	% to total no. of cultivators
1	Low (0.30 to 0.50)	51	42.50
2	Medium (0.50 to 0.70)	63	52.50
3	High (Above 0.70)	6	5.00
	Total	120	100

It is observed form Table 3 that, the 42.50 percent farmers were categorized under low level of adoption index i.e. 0.30 to 0.50. However 52.50 percent were categorized under medium level of adoption. The high level of adoption of technology represents the farmers who had adopted more than 70 percent of recommended technology.

Per Hectare Input Utilization

Table 4: Per hectare Physical Inputs used for Kharif Jowar

S. N.	Particular	Units	Low	Medium	High	Overall
1	Total Human Labour	Days	82.67	89.24	88.34	86.75
	Male	Days	33.63	37.56	39.40	36.86
	Female	Days	49.04	51.68	48.95	49.89
2	Bullock Labour	Days	11.99	10.70	13.36	12.02
3	Machine Labour	Hrs.	9.58	5.85	7.34	7.59
4	Seed	Kgs.	8.42	8.57	8.75	8.58
5	Manuring	Qtls.	9.02	10.40	17.30	12.24
6	Fertilizer N	Kg	30.70	64.70	74.53	56.64
	P	Kg	23.60	26.41	23.63	24.55
	K	Kg	6.93	12.96	11.63	10.51

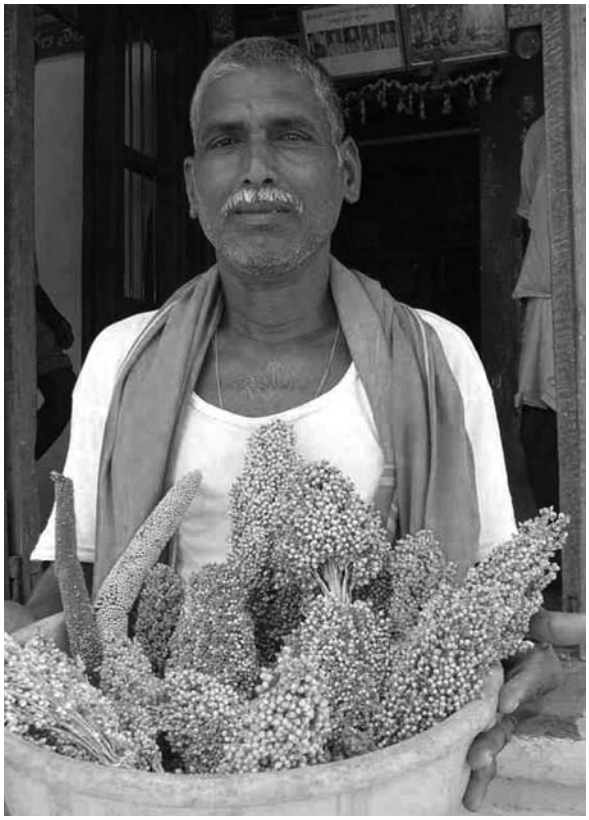
Table 4 depicts the pattern of utilization of resources by farmers indicating the degree of management of resources, their choice and decision making. Besides this, it indicates the local level of technology adopted by the farmer. Human labour, bullock labour, seed, manures and fertilizers for Kharif-Jowar are the basic type of resources used.

An attempt was made to measure the extent of labour use, according to farm positions; labour utilization for a crop depends on the intensity of preparatory and cultural operation done for raising crop. Local human labour employed per hectare for Kharif- Jowar, were 86.75 man-days. Among the total human labour employed, proportion of the female labour was more.

Total bullock labour employed per hectare worked out to 11.99, 10.70 and 13.36 pair days for low, medium and high adoption group. Seed is the important input in crop production. The recommended seed rate per hectare is 7.5 to 10 kg/ha. It is observed from the table that utilization of seed by growers was near to recommended level in all the groups.

FYM and fertilizers are important components of modern technology. Recommended dose per hectare for FYM and fertilizer in the form of Nitrogen, phosphorous and potassium is 30 qt/ha and 80:40:40 kg per hectare respectively.

In respect of manure as against recommended dose of 30 qt per hectare the actual level of use for low, medium and high adoption group were 9.02, 10.40 and 17.30 qt/ha, respectively.



From the foregoing discussion, it can be concluded that, the large group of adopters used the highest input or resources as compared to other groups.

Per Hectare Cost of Cultivation

Table 5: Cost of Cultivation of Kharif - Jowar

(Value in Rs.)

S. N.	Particular	Low	Medium	High	Overall
1	Hired Human Labour	2291.40 (17.55)	2476.79 (18.09)	2340.41 (14.03)	2369.53 (16.37)
2	Bullock Labour	1745.39 (13.37)	1678.24 (12.26)	1779.03 (10.66)	1734.22 (11.98)
3	Machine Labour	1511.13 (11.57)	956.38 (6.99)	1202.00 (7.20)	1223.17 (8.45)
4	Seed	573.05 (4.39)	575.37 (4.20)	639.17 (3.83)	595.86 (4.12)
5	FYM	764.35 (5.85)	763.49 (5.58)	1322.00 (7.92)	949.95 (6.56)
6	Fertilizer N	567.04 (4.34)	823.52 (6.02)	936.23 (5.61)	775.60 (5.36)
	P	403.82 (3.09)	415.37 (3.03)	411.49 (2.47)	410.23 (2.83)
	K	59.64 (0.46)	82.50 (0.60)	76.12 (0.46)	72.75 (0.50)
7	Plant Protection	32.95 (0.25)	83.49 (0.61)	195.51 (1.17)	103.98 (0.72)
8	Repairing Charges	84.36 (0.65)	129.51 (0.95)	142.77 (0.86)	118.88 (0.82)
9	Interest on Working Capital	481.99 (3.69)	479.08 (3.50)	542.68 (3.25)	501.25 (3.46)
10	Depre-ciation	174.64 (1.34)	204.37 (1.49)	280.60 (1.68)	219.87 (1.52)
11	Land Revenue	57.75 (0.44)	64.48 (0.47)	70.00 (0.42)	64.08 (0.44)
12	Cost 'A'	8747.50 (66.98)	8732.59 (63.79)	9938.01 (59.55)	9139.37 (63.12)
13	Interest on Fixed Capital	218.62 (1.67)	558.48 (4.08)	1536.64 (9.21)	771.24 (5.33)

14	Rental value of land	2818.44 (21.58)	3157.59 (23.07)	4030.28 (24.15)	3257.66 (22.50)
15	Cost 'B'	11784.55 (90.24)	12448.66 (90.94)	15504.92 (92.92)	13246.04 (91.49)
16	Family Human labour	1274.67 (9.76)	1240.78 (9.06)	1182.25 (7.08)	1232.57 (8.51)
17	Cost 'C'	13059.22 (100)	13689.44 (100)	16687.17 (100)	14478.61 (100)

Note: Figures in parentheses indicate percentage to the total

The cost of cultivation has been worked out by using standard cost concepts i.e. cost 'A', cost 'B' and cost 'C'. The purpose of calculating these costs is to workout profitability of Kharif-Jowar on the basis of direct costs and imputed cost. The group wise and item wise per hectare cost of cultivation of Kharif-Jowar is presented in Table 5.

The per hectare cost of cultivation of Kharif-Jowar observed that hired human labour, fertilizer, Bullock labour was the main item of cost. Among the level of adoption groups per hectare cost of cultivation was highest in high level adoption groups i.e. Rs. 16687.17 followed by medium and low adoption group with Rs. 13689.40 and Rs. 13059.22 respectively.

Economics of Production of Kharif-Jowar

Table 6: Economics of Production of Kharif-Jowar

S. N.	Particular	Units	Low	Medium	High	Overall
1	Yield	Qtl/ Ha	18.46	21.38	28.82	22.89
2	Main Produce	Rs.	12986.13	14941.84	20171.67	15566.54
3	By Produce	Rs.	4270.98	4390.57	4430.00	4363.85
	Gross Returns	Rs.	17257.11	19332.41	24601.67	20397.06
4	Cost (Rs)					
	Cost 'A'		8747.50	8732.59	9938.01	9139.37
	Cost 'B'		11784.55	12448.66	15504.92	13246.04
	Cost 'C'		13059.22	13689.44	16687.17	14478.61
5	Net Returns	Rs.				
	Cost 'A'		8509.61	10599.82	14663.66	11257.69
	Cost 'B'		5472.56	6883.75	9096.75	7151.02
	Cost 'C'		4197.89	5642.97	7914.50	5918.45
6	Benefit Cost Ratio at					
	Cost 'A'		1.97	2.21	2.48	2.22
	Cost 'C'		1.32	1.41	1.47	1.40

The cost of cultivation has been worked out by using standard cost concepts i.e. cost 'A', cost 'B' and cost 'C'. The purpose of calculating these costs is to workout profitability of Kharif-Jowar on the basis of direct costs and imputed cost

Per hectare production of Kharif-Jowar at overall level was observed to 22.89 qt/ha. Among groups, the highest per hectare Kharif-Jowar production of 28.82 qt. was obtained by high level of adoption group. It was followed by 21.38 qt in medium level adoption group and then 18.46 qt in low level of adoption group.

It is observed from Table 6, per hectare gross return from Kharif-Jowar cultivation at overall level was Rs. 20397.06. Net returns at Cost 'A' at overall level was Rs. 11257.69. Among this group it was highest in high level of adoption group i.e. Rs. Rs. 14663.66 and lowest was observed under low level of adoption group i.e. Rs. 8509.61.

At overall level per hectare net returns at cost 'C' were Rs. 5918.45 per ha. Net returns at cost 'C' was highest under high level of adoption groups.

The benefit cost ratio at overall level was 2.22 at cost 'A'. Among level of adoption groups Benefit cost ratio was highest in high level of adoption groups at cost 'C' i.e. 1.40.

Conclusion

It is concluded from the study that at high adoption level (above 70%), the gross returns and net returns at Cost 'A' and cost 'C' were the highest. The benefit cost ratio was highest in high level of adoption groups at cost 'C' i.e. 1.47. Hence, it is recommended that in order to achieve higher economic returns from Kharif-Sorghum cultivation, farmers should adopt more than 70 percent technologies adoption level.

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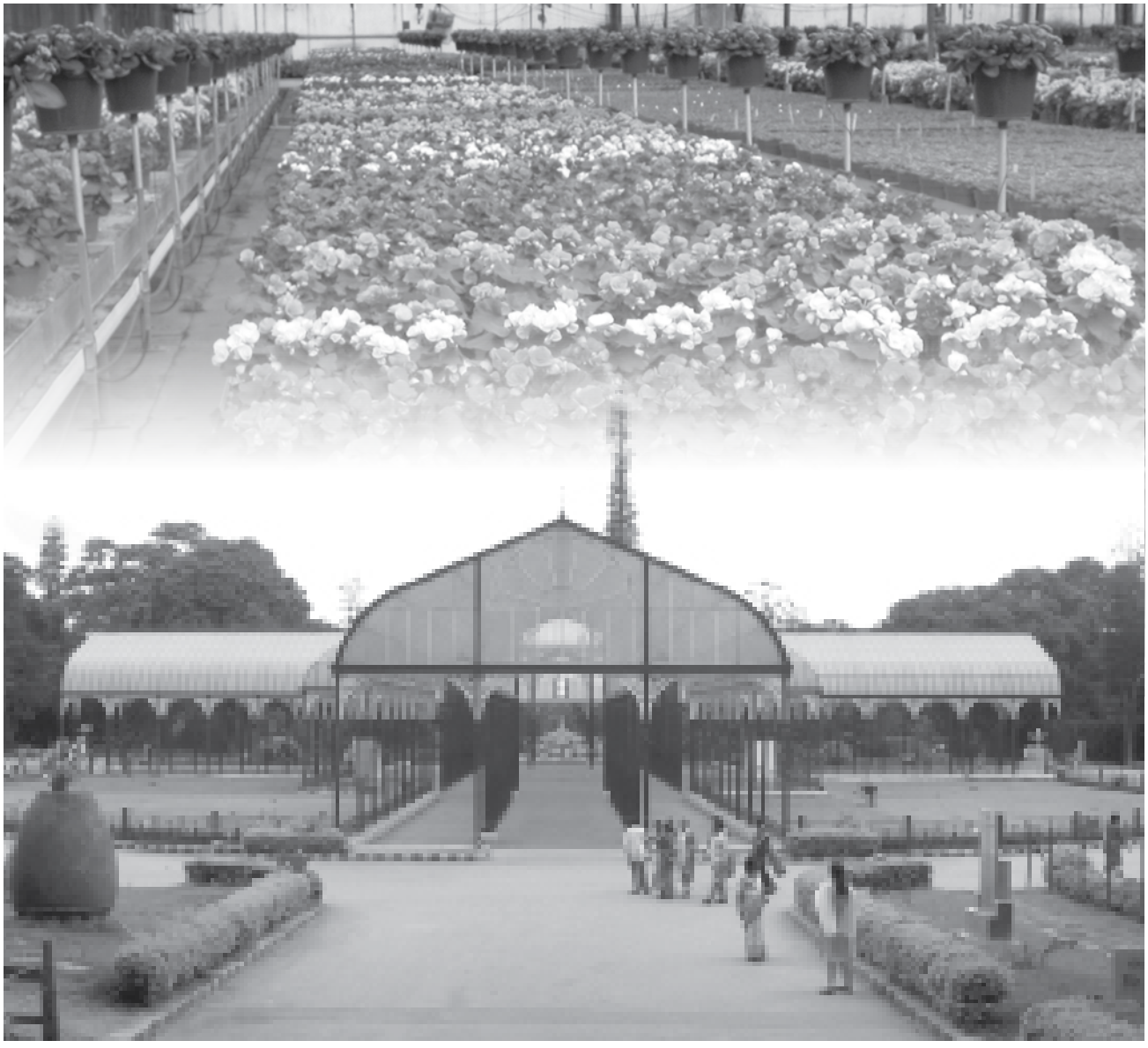
Floriculture Sector

Development in Karnataka: An Overview

By Kiran Kumar P * & Dr. Jayasheela **



Being endowed with a wide range of agro-climatic conditions makes Karnataka congenial for cultivation of different floricultural crops. The state has been famous for floriculture right from the 18th century. From the era that witnessed the reign of Hyder Ali and Tipu Sultan, this sector received an impetus. Their efforts were carried forward by the British-led colonial government. The existence of Lalbagh and Cubbon Park in Bangalore and Vrindavan Garden of Mysore is a testimony. This led to the farmers growing various traditional flowers due to positive encouragement by different rulers. These flowers were grown either for domestic consumption or for trade.

The traditional flowers such as Rose, Chrysanthemum, Tuberose, Aster, Jasmine, Crossandra, Marigold, Champaka, Gladiolus, and Bird of Paradise are grown in open conditions. Some of these flowers are also being cultivated as cut-flowers in recent years. The Rose, Carnations, Gerbera, and Anthurium were grown under protective covers and these have gained momentum

in the last 10 years. Recently, new crops like Lilies, Calla lilly, Iris, Limonium, Alstroemeria, Gypsophila, Liatris, Lisianthus and Freesia have also emerged as potential cut-flowers in the state. Modern cut-flowers are relatively better in quality, have longer vase life and always fetch high unit price in the market. All these new trends have turned floricultural activity into an important agri-business activity in the state.

The state government has clamped patents to protect the three local rare and unique flower species such as Mysore Mallige (Jasminum grandiflorum), Udupi Mallige (Jasminum sambac) and Hadagali Mallige (Jasminum auriculatum). The Geographical Indication (GI) status has provided exclusive rights to the local community to cultivate these three crops and continue to grow for 10 years and more.

Present Status of Floriculture in Karnataka

Concentration of Flower Crops in Karnataka: Traditional flower crops such as Chrysanthemum, Jasmine, Crossandra, Rose, Tuberose, Aster, Marigold, Champaka, Roses, Gerbera, Carnation, Heliconia etc. are grown widely in the state. Box 1 provides information on the concentration of a variety of flower crops in the state across the district.

The area around Bangalore has the advantage for production of commercial flowers such as Rose, Carnation, Gerbera, Chrysanthemum, Gladiolus and other ornamentals and cut-flowers. The majority of the flowers and ornamentals grown in the state till the late 1980s were of the indigenous type. The process of liberalization and globalization of the Indian economy has paved the way for transformation of this traditional activity into a commercial enterprise. The expert group on floriculture development in India constituted by the Government of India in 1989 has identified areas around Bangalore as potential zones for intensive development of floriculture and recommended the cultivation of specific crops as Rose, Carnation, Chrysanthemum, Gladiolus, Ornamental foliages and Seed for export purposes.

Concentrated Regions of Traditional Flower Cultivation in Karnataka

District	Region	Flowers Grown
Bangalore	In and around Bangalore, Devanahalli and Hosakote	Chrysanthemum, Aster, Rose, Jasmine, Crossandra, Tuberose, Marigold
Mysore	In and around Mysore, Nanjangud and T. Narasipua	Jasmine, Tuberose and Crosandra
Kolar	Bagepalli and Chikballapuar	Marigold, Chrysanthemum
Tumkur	Baduvanahalli	Jasmine
Davangere	Harihara	Marigold
Udupi	Shankarapura	Jasmine
Bellary	Hoovinahadagali and Hagribommanahalli	Jasmine
Gadag	Lakkundi	Jasmine, Crosandra, Chrysanthemum

Source: (Jayasheela et al 2005)

Area and Production of Flowers

Growth Rates: The data on trends in area, production and yield of commercial crops are provided in Table 1. The data indicates that the flower crops registered an appreciable growth of 0.21 lakh ha in 1999-2000 to 0.27 lakh ha in 2008-09 in the area and 1.32 lakh MT in 1999-2000 to 1.98 lakh MT in 2008-09. But a variation was found in yield; it was 6.28 percent in 1999-00 and increased to 8.16 percent in 2002-03. It came down to 7.33 percent in 2008-09.

Table 1

Trends in Area and Production of Floricultural Crops in Karnataka

Year	Commercial Floriculture		
	Area (Lakh ha)	Production (Lakh M.T)	Yield (Per ha)
1999-00	0.21	1.32	6.28
2000-01	0.21	1.57	7.47
2001-02	0.18	1.42	7.88
2002-03	0.18	1.47	8.16
2003-04	0.18	1.44	8.00
2004-05	0.20	1.50	7.50
2005-06	0.21	1.68	8.00
2006-07	0.23	1.92	8.34
2007-08	0.25	1.96	7.84
2008-09	0.27	1.98	7.33

Source: Horticulture Crop Statistics of Karnataka state at a Glance 2008-09:pp70.

Table 2 presents the data on area and production of major floricultural crops in Karnataka. It has been observed that a sustainable increase has been found in area and production in respect of many flower crops, but the increase was more in the case of Marigold, Jasmine and Chrysanthemum. Out of the total area of individual crops in respect to total area and production it was again the Marigold that accounted for a major share with an area of 7,933 ha, followed by Jasmine 5,451 ha, Chrysanthemum with 4,429 ha. These together accounted for about 17,813 ha of the floricultural area in 2008-09. Again Marigold accounted for a major share in production with 69945 MT. But Jasmine, which was second in area, became third in respect of production 31,541 MT, and Chrysanthemum accounted for 54,092 MT in production, which was third in respect of area. Government Programmes for the Development of Floriculture SectorUntil 1990, there were no systematic efforts or policies to promote floriculture activity and its trade in India as well as in the state. Only a small proportion

Table 2

Area and Production of Major Floricultural Crops in Karnataka, 2008-09

Name of the Crop	Area (ha)	Production (MT)	Yield (MT/ha)	Value (Lakh Rs)
Aster	2194(8.11)	20646	9.41	2865
Crossandra	2372(8.77)	10469	4.41	3900
Marigold	7933(29.35)	69945	8.82	6055
Jasmine	5451(20.17)	31541	5.79	13831
Chrysanthemum	4429(16.38)	54092	12.21	14528
Tuberose	1364(5.04)	10323	12.22	2460
Gladiolus	313(1.15)	499	1.59	849
Rose	22968.49)	4565	1.99	2905
Bird of Paradise	54(0.19)	129	2.39	170
Orchids	1(0.003)	1	1.00	2
Carnation	40(0.14)	51	1.27	85
Anthurium	54(0.19)	42	0.79	240
Gerbera	93(0.34)	199	2.14	177
Free Flowering Variety	74(0.27)	10	0.14	1
Seasonal Variety	65(0.24)	29	0.45	7
Other Flower Crops	588(2.17)	1974	3.36	289
Total	27024(100)	197963	7.33	48381

Source: Horticulture Crop Statistics of Karnataka state at a Glance 2008-09:pp35

of flowers were exported and this was very meagre when compared to other small countries like Kenya and Columbia. Government realized the importance of floriculture industry in the international market. In this direction, it identified the sector as a thrust area along with horticulture and provided facilities to promote the activity in the state. Bangalore has been identified as the potential export centre by the International Flower Centre. Having realized this, the Government of Karnataka initiated several measures for the overall development of floriculture. Important among them were: The Agricultural Policy of Karnataka 1995, which identified floriculture as the sunrise industry, and the Amendment of Land Reform Act 1961, which provides that a non-agriculturist can purchase land of up to 109 acres to take up flower cultivation.

Establishment of Flower Auction Centres: Karnataka Industrial Area Development Board (KIADB) and APEDA have planned to set up an International Flower Auction Centre on the lines of The Netherlands, Alsmier International Flower Auction Centre. The state also plans to set up the Karnataka Floriculture Development Board to promote floriculture as a sunrise industry in Karnataka.

With a view to strengthen the marketing/forward linkages for flower crops, approval has been accorded for the implementation of the project on 'Establishment of Flower Auction Centres' in Tumkur, Davanagere, Udupi, Uttara Kananda, Kodagu and Belgaum districts, at a total cost of Rs.15.00 crore for a period of 3 years from 2008-09 to 2011-12. The tender process for Establishment of Flower Auction Centres at Tumkur and Davanagere during 2008-09 and Udupi during 2009-10 has already commenced.

Suvarna Karnataka Udhyanavanagala Prathishtana: The Government parks, gardens and hill stations have been developed to attract tourism with the involvement of private participation through the public private partnership mode and have been brought under the preview of the 'Suvarna Karnataka Udyanavanagala Prathishtana'. The salient feature of this policy includes development and maintenance of well known parks, gardens and hill stations. Lalbagh botanical garden was the nucleus for all horticultural activities in the state. Under the scheme for development of Parks, Gardens & Floriculture, during 2009-10, Rs 215.80 lakh was spent up to the end of November 2009 as against the released amount of Rs. 300.00 lakh.

Model Floriculture Centre (MFC): Karnataka is one among the States in India to establish MFC in 1995 in an area of 9.132 acres at Nagarur village near Bangalore with the assistance of the Ministry of Agriculture, Government of India, under the centrally sponsored scheme for commercial floriculture under the following objectives:

- To demonstrate new technology of flower cultivation to the growers; and,
- To serve as a Germaplasm bank for conserving a wide diversity of flowers.

Commercial Tissue Culture Laboratory: A laboratory was established at Hulimavu near Bangalore. The objective of the lab was to develop disease-free planting material on a large scale for distribution to farmers. There are also 10 commercial tissue culture laboratories producing more than 30 million plants and flower crops.

Model Floriculture Village: The Karnataka State is the first one in the country to introduce the concept of Model Floriculture Village. Under this programme, two villages were identified, one near Bangalore and another near Belgaum, for demonstrating new varieties of flowers developed by the Indian Institute of Horticultural Research (IIHR) Bangalore.

Cargo Centre at Bangalore Airport: After 1990, Karnataka made remarkable progress in hi-tech floriculture and its exports. Realizing the exporters' difficulties at airports due to lack of facilities, a Cargo Centre for perishable commodities like flowers, vegetables and fruits was established at Bangalore Airport in 1998. APEDA jointly started this unit and Karnataka owned Mysore Sales International Ltd. (MSIL) at a cost of Rs. 2.5 crores in an area of 4,200 sq. ft. developed a receiving area of 1,000 sq ft. A cold storage unit of 250 tonnes capacity was established in this centre to store the flowers before loading the aircraft.

Floriculture Auction Centre: Karnataka Agro-Industries Corporation Limited (KAIC), with a view to providing domestic market for high-tech flowers, established a permanent auction house for flowers in its premises on 15 October 1995, in association with the South India Floriculturists Association (SIFA) and Karnataka Flower Growers' Marketing and Processing Co-operative Society. The basic objective of the centre is to promote high-tech flowers, maintaining transparency in operation and facilitating direct links between the buyers and sellers. This is the only auction centre in India and South East Asia as well. The

export surpluses and flowers rejected for exports and seconds are auctioned here. The centre deals in Roses, Carnations, Gerbera, Anthurium, Orchids and other cut flowers.

South India Floriculture Association (SIFA): SIFA is mainly based in Bangalore. About 36 exporters are members of this body. Of this, 28 are involved in the pursuit of floriculture in an area of more than 100 hectares. Their organization is facilitating the growers in marketing their cut-flowers and roses by arranging chartered flights, with the support of APEDA and the Ministry of Agriculture for export of flowers to different destinations. SIFA is also helping growers largely in fixing the base price in the auction markets located in KAIC premises.

Conclusion

Undoubtedly, the floriculture industry of Karnataka is poised for a big boom provided strategies are implemented at the appropriate level properly and international quality concerns are honoured. In the near future, Karnataka state can hopefully emerge as an important leader in the Indian floriculture scene. If India has to achieve its ambitious export target of Rs. 1,000 crore per annum over the next 5 years, a paradigm shift is required; only then can our country afford to look towards a colourful and multihued export future and emerge as a flower power in the global market.

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AGRI NEWS

MP Gov't to buy Wheat at MSP starting from March 15

Bhopal: The Madhya Pradesh government's move to purchase wheat from farmers at minimum support price (MSP) under e-Procurement process will begin from March 15. The state government is using e-Procurement process for online registration of farmers and to give them early notification about date and place for purchase. The government has already successfully tested sending SMSs to notify the farmers on wheat purchases last year in Harda district of the state. SMSs will be sent twice to the farmers, first before March 15 to inform them about the details of the purchase date and place and also amount of wheat to be procured. The second SMS will be sent as a reminder to the farmers just four days prior to the beginning of the procurement. Interestingly, the service provider is giving its services at a charge of only 2 paise per SMS and the cost will be borne by the state government.

Assam Launches Forest Project with French Support

Guwahati: Assam is taking up a Rs 425 crore forest resource management project with financial support from France. "The project will be implemented for protection and conservation of the state's forests and its resources," Chief Minister Tarun Gogoi said. "Destruction of hills, forests and natural environment is causing global warming and leading to problems like flashfloods, drought and landslides. In order to check such problems we must check destruction of forests and hence we are going to launch the project soon," Gogoi said here. The project will be implemented by the state Forest and Environment Department. Gogoi launched a project for setting up 18 forest camps in Guwahati for protection of the hills and wetlands. The first camp will come up on the Gotanagar hills. "Encroachment on forests, hills and wetlands is a big problem and the camps will be set up where the government lands are still free from encroachment. We must ensure that there is no further encroachment," the Chief Minister said. The purpose of the project is to ensure a healthy green cover on the hills and to protect the shrinking wetlands. Gogoi said that the city's 18 hills would soon have Assam Forest Protection Force outposts for checking encroachment and protecting the green cover. Forest and Environment Minister Rockybul Hussain said that the state government was giving emphasis on protecting the state's forest cover and check tree felling and protection of wildlife.

Karnataka to Set Up Hi-Tech Weather Monitoring Systems

Hyderabad: Karnataka is gearing up to tackle natural disasters by installing hi-tech weather monitoring systems across the state soon. The Karnataka State Natural Disaster Monitoring Centre (KSNDMC) will build 500 weather stations at an estimated cost of Rs 30 crore across the state during the next three years. KSNDMC said that it will implement 4,000 more rainfall sensors in addition to the existing 2,000 field sensors, to increase the resolution of the data they collate. KSNDMC Director VS Prakash said that the state has lost more than Rs 70 crore over the past decade because of natural disasters and having an advanced weather-monitoring mechanism would go a long way in minimizing the costs.

"In the past year, the department built 200 weather stations and installed 770 sensors in the state. However, more than the funds, the focus should be on the quality of the technology implemented," said Prakash. He is also upbeat that GPRS connectivity at the panchayat level will be available in the next two years. The department said that it will complete the weather stations installation project in a phased manner. "Extensive use of bio- and space- technology inputs can improve India's agricultural production and ensure food security for all," ex-ISRO chief says.

AGRI NEWS

New Evergreen Revolution Needed, says Space Scientist UR Rao

Agartala: "India must embark on a "new evergreen revolution" with the extensive use of appropriate bio- and space-technology inputs to ensure food security for all and enable the country to compete successfully in a globalised economy," says renowned space scientist UR Rao. India's population is bound to cross 1.6 billion by 2050, which will demand doubling of our food grain production to ensure food security to all our people, according to him. And in the past one decade, India's agricultural production has remained stagnant between 220 and 240 million tonnes. Agricultural productivity (1.8 tonne per hectare) is much less than the world productivity of 2.6 tonne per hectare. The solution, according to the former Chairman of the Indian Space Research Organisation (ISRO) lays in the application of science and technology.

Rao was a member of an expert committee headed by economist A Vaidyanathan which in a recent report to the Agriculture Ministry suggested using remote sensing technology in the development of agriculture. The committee has also recommended setting up of a National Crop Statistics Centre to deal with all aspects of crop area and yield estimation. Rao said that development of Indian satellites and their posting at the space orbits were for the development of humankind. "Improvement and posting of satellites in space are meant for development of agriculture, education, health and medical treatment, forest and environment, communication, resource assessment and banking business."

Rao said that India's remote sensing satellites were being used to monitor and manage agricultural practices. These include analysis of cropping system (satellites provide valuable inputs for diversification and intensification of crops), mapping of sodic and user soils, assessing the impact of droughts and floods, weather forecasting and monsoon prediction. He added that the Indian software industry had emerged as the fastest growing economic sector from a modest $150 million two decades ago to over $75 billion. Closely following IT, bio-technology has now become the new pulse and the buzz, with a revenue exceeding $5 billion. It has been found that plant biotechnology offers significant and tangible benefits to farmers, consumers and the environment— from increased agricultural productivity to improved food quality, increased farmer incomes, and reduction in the environmental impacts of agriculture.

Good News for Jharkhand's Tribal Populace

Ranchi: Tribal populace in Jharkhand will have yet another scope to prosper on minor forest produces. They can now collect non-timber forest produces (NTFP) and add value, and market them with the government's intervention in rural pockets falling under the areas of Maoist influence. As part of the strategic exercise to maximise return on non-timber products and jack up their earnings in forest areas, the Centre has announced launching special projects in the Naxal-affected areas of Jharkhand and other five districts to promote cultivation of lac, gum, medicinal plants, tasar, bamboo and non-edible oil seeds like neem and mahua.

The newly announced scheme of the Union Ministry of Rural Development (MoRD) forms a part of the National Rural Livelihood Mission and will be executed through cooperative mode with the help of local forest officials and self-help groups. Entrepreneurs keen on exploiting the collects for various kinds of industrial use might also be roped in under the Private-Public-Partnership mode. Union Rural Development Minister Jairam Ramesh announced the scheme in New Delhi recently, which will benefit 60 districts across six states including Jharkhand. Other states to benefit from the scheme include Chhattisgarh, Odisha, Madhya Pradesh, Andhra Pradesh and Maharashtra. The minister is keen on expansion of market and regeneration of NTFP in a sustainable manner, which will mainly focus on livelihood generation and value addition of non-timber produces.

AGRI NEWS

US Promises Aid to India for Farm Sector Growth

New Delhi: While the Indian government announced allocation of Rs 300 crore in the 2011-12 fiscal to help the Eastern states usher in second green revolution in the country, the US promised to help India set up 30 agri hubs in the country. In an attempt to boost bilateral economic ties, USAID Administrator Rajiv Shah said at a CII function, "We will provide technical assistance in setting up 30 agri hubs in the eastern states of India to help the region achieve a second green revolution."

Shah, who is the highest-ranking Indian-American in the Obama Administration, remarked that the US was keen to promote partnership, especially in the farm sector through engagements with private enterprises, research centres and institutions like CII.

"Bihar whose almost 80 percent population is dependent on agriculture continues to suffer from agricultural backwardness. We would like to assist it and other states in the eastern areas to help them achieve agricultural growth", Shah, heading a US delegation here, said.

80% Farmers Most Affected by Changing Climate

New Delhi: According to a study conducted by ActionAid and Centre for Sustainable Agriculture, over 80 percent of small farmers will be impacted by changing climate. These are the ones whose contribution to crop produce is half. Since the change is faster than predicted by the Intergovernmental Panel on Climate Change (IPCC), this is a very significant development. The cost of fertilisers, except urea, has increased by more than 300 percent after the nutrient-based subsidy scheme was introduced and manufacturers were given a free hand to fix the price, the study noted.

Govt Initiative to Help Job Scheme Aid Agriculture

New Delhi: The government has launched a second initiative to help the job scheme aid agriculture. It has decided to include some agriculture-related works under the rural job guarantee scheme. Synergy between the scheme and agriculture at the Centre's cost will help the farm sector with men and money. A committee headed by Planning Commission member Mihir Shah is looking into the issue and may give its report by January. Agriculture minister Sharad Pawar recently wrote to the PM that the job scheme be taken off for a certain period every year to help the farm sector.

AP Govt Flayed for Meagre Fund Allocation for Agriculture

Hyderabad: At a press meet, the Andhra government was staunchly criticized by Rythu Swarajya Vedika for allocating meagre funds for agriculture and allied sectors in the 2012-13 Budget. It was argued that the government was not giving enough focus to the farming sector. Asserting that the agriculture sector in India was under a crisis due to a sharp hike in production cost, a 20 percent allocation demand by the farmers and the NGOs was not much considering that 60 percent of the population drew sustenance from this vital component of Indian economy.

"Support prices announced by the Centre for various crops are not sufficient enough to meet the costs. They have been asking for an increase in MSP. But what should they do if the Union Government fails to listen to their appeals? It is the responsibility of States to see to it that farmers get remunerative prices," it was asked.

TNAU Granted Pearl Millet Patent

Coimbatore: The Tamil Nadu Agricultural University which undertook research to develop a new process for production of ready-to-cook mix and food from pearl millet has been a patent for producing a ready-to-cook mix from pearl millet (cumbu). Pearl millet (cumbu in Tamil and bajra in the North) is an important millet that occupies more than 55 percent of global production.

The technology has been developed by R. Kailappan, professor, Department of Food And Agricultural Process Engineering, TNAU. Incidentally, Pearl millet is grown in over 40 countries, predominantly in Africa and Asia, and India is the largest producer of pearl millet, both in terms of area (9.1 million hectares) and production (7.3 million tonnes).

The Patent Office of Chennai, Government of India, granted the first of its kind patent on January 12.

BOOK REVIEW

Authored by **R.S. Deshpande** and **Saroj Arora**

Agrarian Crisis and Farmer Suicides

A part of the series on 'Land Reforms in India', Agrarian Crisis and Farmer Suicides is a collection of essays that builds a clear linkage between an agrarian crisis and its impact on farmers, and its dovetailing effect on public policy. Looking at the root causes, not the immediate reasons for the dilemma that Indian farmers are increasingly facing, this book by R.S. Deshpande and Saroj Arora takes into account regional specifics in agricultural growth and implementation of policies. Highlighting the employment shift that is taking place due to the changing economic environment, with the agriculture sector also becoming demand-driven, the book asks clear questions from policy-makers on issues as disparate as globalisation, governance, technology and the resources needed to give life to a sector that still supports a majority of the country's population. The book builds a clear linkage between the bad policy and bad weather with increasing farmer distress to buttress its point that farmers' distress is not isolated in the country, rather it spans its borders.

Again, like the regions it covers, the book is clear that while the symptoms are many, the root disease is almost the same – official apathy, economic indifference, market imperfections and increasing marginalisation of the agriculture sector. The book also makes a clear distinction between agriculture distress, which relates to declining productivity and poor yields and agrarian crisis, which relates to the failure of policy support systems. What it is clear about, however, is that the impact of the latter on civil society is more deleterious than that of the former.

Picking on issues like globalisation, marginalisation, politics and the reforms movement, the book wonders how small and marginal farmers were excluded from the umbrella of change that has been enveloping the country for some time now. Picking up on farmers' suicides in Vidhrbha, Punjab and Andhar Pradesh, the book emphasises the need for a level-playing field for small and marginal farmers. While the book is clear that the reasons for farmers' suicides in these regions were not common, it highlights the indifferent government response to such actions. It also clearly highlights how the government has failed to respond to what is called 'increasing globalisation and liberalisation' of the agriculture sector in the country, which has apparently rendered the farm sector economically unviable.

And this, the authors note, has been the prime cause for the rising indebtedness in the farming community across the country, forcing more and more farmers to commit suicide. The way forward, the authors note, is to ensure sustainability of small farm agriculture, initiate an effective process of land reforms, promoting greater financial inclusion by addressing the small credit needs of such farmers, and improved marketing at the ground level. And, for doing this, the authors feel that what is of prime importance is that the government is able to take the latest technology to the grassroots level.

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BOOK EXCERPTS

Farming's climate-smart future: Placing agriculture at the heart of climate change policy

By **Charlie Pye-Smith**
Published by CTA
Website: www.cta.int

Global warming will change the face of farming, and is already doing so in some parts of the world. Increases in temperature, changing patterns of rainfall, more extreme droughts and floods, and the shifting distribution of pests and diseases all can be attributed in part to the increase in emissions of greenhouse gases resulting from human activities. All will have an impact on food production in the future.

Although the proportion of the world's population suffering from hunger has declined from 24 to 13 percent since 1970, largely as a result of dramatic increases in crop and livestock productivity, around 1 billion people still go hungry every day.

Nevertheless, there are reasons to be optimistic. A range of practices which come under the heading of 'climate-smart agriculture' could increase food production, help farmers to become more resilient to climate change and reduce emissions of greenhouse gases. How widespread these practices become will depend to a significant degree on the importance given to agriculture in international climate change negotiations and national policymaking.

Carbon dioxide, the most significant greenhouse gas in terms of its impact on the climate, accounts for only a small proportion of the emissions caused by activities directly related to the production of food, fibre and vegetable oils. Agricultural soils both emit and absorb large quantities of carbon dioxide, resulting in relatively small net emissions of 40 Mt CO2e a year.

In contrast, the clearance of forests and scrubland to make way for crops and livestock releases an estimated 5900 Mt CO2e a year. Small-scale agriculture is a significant cause of forest loss, especially in sub-Saharan Africa.

There is compelling evidence that the increase in greenhouse gases caused by human activities is responsible for global warming. However, there is considerable uncertainty about its extent and scale.

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Consulting Services

Specialised services which by no means are exhaustive, can be classified as:

- Agribusiness Management
- Water Resources Management
- Watershed Development and Management
- Environment Impact Assessment & Environment Management Plans
- Horticulture & Plantation
- Micro Enterprises and Micro-Finance
- Fishery, Forestry, Wasteland Development
- Gender Development
- Resettlement & Rehabilitation
- CDM Services

Capacity Building and Training

Projects included in this category are:

- Consultancy for World Bank Assisted Process Monitoring of Andhra Pradesh Rural Poverty Reduction Project – Phase-II (Zone-II) – Society for the Elimination of Rural Poverty, Government of Andhra Pradesh – 2007-08
- Implementation of DFID funded Western Orissa Rural Livelihood Project (WORLP) – Watershed Development Mission, Govt. Of Orissa – 2005-2010
- Comprehensive Watershed Development Project in Karnataka - Watershed Development Department (WDD)-Government of Karnataka – 2006-07
- Madhya Pradesh Tribal Development Project - The International Fund for Agriculture Development (IFAD), Rome – 1997

Grass Roots level Livelihood Implementation

AFC has undertaken large scale Agricultural Extension Programme in 820 Blocks covering all 71 districts of Uttar Pradesh.

The mission of the implementation project is to increase the farm productivity, profitability and sustainability of farming systems, efficient use of natural resources and agricultural inputs etc., by customised farmers' trainings at village cluster level and to provide online information on weather parameters, demand and use of agricultural inputs and market intelligence.

Organic Farming

This project involves the adoption and certification of Organic Farming in 22000 hectares.

Watershed Development

AFC is implementing Livelihood Development Programme based on Watershed Development with funding by DFID, and NABARD.

Panchayati Raj Institutions

AFC has set up an independent division for providing support services in terms of grass roots level planning, training of various stakeholders in UP, Bihar and Jharkhand. AFC has prepared Perspective District Plans in 25 districts of Uttar Pradesh under Backward Region Grant Fund (BRGF).AFC has also conducted TNA and prepared Training Manual for PRIs in Jharkhand.

The PRI division will also provide the following services:

- Organise training programmes for the senior & middle level executives of the NGOs.
- Capacity building of the ERs and various stakeholders.
- Conduct research studies, develop learning material for each level on local self governance, organise seminars and workshops, promote exchange of academic expertise on various aspects related to local planning & DPCs, disseminate specialised information and provide expert advice to all concerned.
- Take up advocacy role to strengthen democratic process, particularly grassroots level democracy through decentralised institutions.
- Lay special emphasis on involving the poor, marginalised and weaker sections of the society in the democratic governance.

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